INDIVIDUAL STORMWATER DISCHARGE PERMIT APPLICATION

1. Applicant Name(s)[1]: **Jon Armstrong, Vermont Agency of Transportation**
2. Is this NOI being submitted in connection with a subdivision[2]? ☐Yes ☒No
3. Address of Applicant(s): **Vermont Agency of Transportation**
   1 National Life Dr.
   Montpelier, VT 05633-500

4. Telephone Number: **(802) 828-1332**
5. Fax: **(802) 828-2437**
6. E-mail: **jon.armstrong@state.vt.us**
7. Project Name: **Colchester HES NH 5600(14)**
8. Project Location Address: **US Route 7 & I-89 Exit 16**
9. Project Location Coordinates (center of project): Latitude: **44**°**30**′**36**″
   Longitude: **73**°**10**′**46**″
10. Act 250 Permit Number (if applicable): **TBD**
11. Existing Stormwater Permit Number related to this project (if any): **n/a**
12. Number of discharge points for the project: **8**
13. Receiving Water(s): **Sunnyside Brook**
14. If your project will discharge to a stormwater impaired water you will need to provide a sediment off-set for your project. Please contact the stormwater program to discuss this requirement.

15. Have or will you be submitting an application for coverage under a construction discharge permit also? ☒ Yes ☐ No ☐ Not Applicable

16. The following items **must** be included in your application materials for your application to be considered complete. **Be certain to use the most up-to-date forms by downloading them directly from our webpage**. Submitted applications using out-of-date forms may be rejected.

   ☐ Narrative
   - Provide the information requested on the "Application Narrative Instructions" ☒(✓)

   ☐ Schedule A(s) and Standard Treatment Practices (STPs)/Credit worksheets
   - Complete and attach a copy of Schedule A for each discharge point from the project. ☒(✓)
   - Complete and attach STP/Credit/Waiver worksheets for each STP/Credit/Waiver listed on the Schedule A for each discharge point, as well as any necessary WQ_v/Re_v calculation sheets. ☒(✓)

   ☐ Maps/Site Plans (11″ x 17″ preferred, all maps must have legend, scale bar and north arrow)
   - Topographic map showing the location of the site, points of discharge, discharge points and receiving water(s). ☒(✓)

[1] If the applicant is a business, the business must be registered with the Secretary of State.

[2] Includes, but is not limited to, residential or commercial subdivisions, condominiums or industrial parks.

- Soils map (with HSGs), overlaid with site outline. ☒(✓)
- If existing impervious/stormwater treatment systems are present, include a site plan of existing conditions. ☒(✓)
- Proposed conditions site plan, with existing impervious, redeveloped impervious and new (expanded) impervious clearly identified in the legend, labeled discharge points, and labeled locations of STPs or Credits. ☒(✓)
- A detail sheet containing all applicable STPs for your project and demonstrating adherence to the design criteria for the STPs. ☒(✓)
- Credit design detail sheet ("typical") when and where credits requiring specific design criteria will be used to meet standards. ☒(✓)

☐ Runoff Modeling (where applicable)
- Pre-development/existing conditions sub-watershed delineations with labels and labeled points of interest/discharge points, overlaid over existing site plan with contours. ☐(✓)
- Pre-development/existing conditions model schematic. ☐(✓)
- Post-development/proposed conditions sub-watershed delineations with labels and labeled study points/discharge points, overlaid over proposed site plan with contours. ☐(✓)
- Post-development/proposed conditions model schematic. ☐(✓)
- Sub-watershed information (area and curve number assignment) for pre and post scenarios.
- Time of concentration calculations for pre and post scenarios. ☐(✓)
- Runoff calculations for each element in the model. ☐(✓)
- Calculation time span adjusted to include entire volume of runoff. ☐(✓)
- Modified CN calculations if Water Quality (< 0.9") storm was modeled. ☐(✓)

☐ Additional Supporting Information
- Any information/calculations required by STP/Credit/Waiver worksheets

17. Include a check for the appropriate permit fees:
"Exempt; project funded by an appropriation of VTrans capitol transportation construction act."

Administrative processing fee ($120.00): $ **Waived**

plus +

Application review fee ($______x **4.779** impervious acre[3]): $ **Waived**
(A minimum fee of $220.00 applies)

Total Permit Fees (Check#):	**$ Waived**

The minimum fee total is $340.00.

Date of application: 1/5/15

[3] Class A waters: $1400/impervious acre
Class B waters: $430/impervious acre
Round impervious acreage listed on Schedule A's to nearest 0.01 acre (e.g. 1.35 acres vs. 1.4 acres)

18. DESIGNER CERTIFICATION: I hereby certify that the design-related information submitted with this application for coverage under General Permit 3-9015 was prepared under my direction or supervision and that the information is, in the exercise of my reasonable professional judgment, true, accurate and complete. I also hereby certify that the stormwater collection, treatment and control system design submitted with this application **complies with DEC's Stormwater Management Rule and the Vermont Stormwater Management Manual**.

Original Signature of Stormwater Designer

Traffic Design Supervisor
Title

Michael LaCroix
Print or Type Name

19. OWNER / OPERATOR CERTIFICATION: I hereby certify that I have read General Permit 3- 9015 and agree to abide by its terms.

20.

Original Signature of Owner or Authorized Representative[4]

Stormwater Management Engineer
Title

Jon Armstrong
Print or Type Name

Original Signature of Operator (if any) or Authorized Representative

Operations Environmental Program Manager
Title

Craig DiGiammarino
Print or Type Name

Note: Submission of a Notice of Intent does not confer coverage under General Permit 3-9015. A permit must be deemed technically complete and the applicant must receive a signed authorization to discharge before the discharge of regulated stormwater from impervious surfaces requiring coverage is authorized.

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[4] If the applicant is an individual, but the NOI is being signed by an authorized representative, then a letter indicating that said person is the authorized representative must accompany this NOI. If the applicant is a business (registered with the Secretary of State) then the signature must be provided by one of the following i) the person listed as the registered agent with the Secretary of State; ii) an executive figure such as the president, chairperson or superintendent, or; iii) an individual whose status as an authorized representative is verified in writing by the registered agent or executive figure.

Colchester
US Routes 2 & 7
VT Individual Stormwater Discharge Permit Application &
Notice of Intent to Discharge Stormwater

Narrative

Project Location:

Beginning at a point, in the town of Colchester, on US Routes 2 & 7 at the Winooski-Colchester town line extending northerly for a distance of 1.05 miles to a point 75 feet north of the US Routes 2 & 7/Sunderland Woods intersection; on I-89 southbound off ramp, beginning at the intersection with US Routes 2 & 7 and extending 273 feet west; on I-89 northbound on ramp, beginning at the intersection with US Routes 2 & 7 and extending 255 feet west; on I-89 southbound on ramp, beginning at the intersection with US Routes 2 & 7 and extending 188 feet east; on I-89 northbound off ramp, beginning at the intersection with US Routes 2 & 7 and extending 188 feet east; on Mountain View Drive, beginning at the intersection with US Routes 2 & 7 and extending 307 feet west; on Lower Mountain View Drive, beginning at the intersection with US Routes 2 & 7 and extending 365 feet east; on Hercules Drive, beginning at the intersection with US Routes 2 & 7 and extending 194 feet east; on Rathe Road, beginning at the intersection with US Routes 2 & 7 and extending 277 feet west; on Champlain Drive, beginning at the intersection with US Routes 2 & 7 and extending 147 feet east; and on Sunderland Woods, beginning at the intersection with US Routes 2 & 7 and extending 60 feet west.

Project Description:

Work to be performed under this project includes the construction of a double crossover diamond interchange, widening of existing roadway for new turn lanes, cold planing and resurfacing, new traffic signal equipment, new lighting, new signing and other roadway related work. In addition, traffic signal equipment at the Tigan Street/Main Street intersection in the city of Winooski will be upgraded.

Site Description:

The Colchester US Routes 2 & 7 project consists of a total project area of 18.404 acres of which 11.286 acres is impervious. The project site is bound by linear station limits and construction limits.

The project is located in an urban area with numerous commercial drives and parking lots. The terrain of the site varies. The southern-most section of the project is on a hill that slopes downward toward Winooski with the high point just north of Mountain View Drive. From Mountain View Drive north, the area is fairly flat. A majority of the surrounding topography to the east and west of US Routes 2 & 7 is relatively steep, becoming flatter toward the northern limits of the project. The project site is made up of 5 different soil groups: Hydrologic Soil Group A (16.6%), B (11.1%), C (3.9%), D (59.5%), and some soil that is Not Rated (8.9%). Soil that is classified as being Not Rated was treated as Hydrologic Group D for all calculations to be conservative. Appendix C contains more detailed soil information.

Jurisdiction

This project involves surfaces totally more than 1 acre of impervious area, it requires permit coverage under the Environmental Protection Rules, Chapter 18, and as such must comply with Vermont Stormwater Treatment Standards.

Existing and Proposed Discharge Points:

There are a total of nine (9) discharge points for this project. The proposed discharge points within the project are in the same location as the existing drainage points. Eight discharge points are located on the Sunnyside Brook, while the ninth is on the Winooski River east of the City of Winooski. In addition to the discharge points, there are nine points of interest, one associated with each discharge point. These POI's are the physical point at which stormwater leaves the project limits prior to the discharge point.

- S/N 001: Stormwater runoff from road surfaces between Sta. 48+94 and Sta. 55+63 is collected in existing closed drainage and leaves the project area from an existing culvert via POI 001 at Sta. 56+30, RT. Stormwater also sheet flows from the project down the roadway side slope on the east side of US Route 7 and into the Sunnyside Brook at S/N 001. There are no proposed stormwater treatment practices that will discharge to S/N 001 via POI 001.
- S/N 002: Stormwater runoff from road surfaces between Sta. 43+69 and Sta. 48+94 is collected in a grass channel designed to treat the Water Quality standard along the west side of US Route 7, north of Rathe Road and leaves the project through a new crossing culvert via POI 002 at Sta. 48+93, RT. Stormwater also sheet flows from the project down the roadway side slope on the east side of US Route 7 and into the Sunnyside Brook at S/N 002.
- S/N 003: Stormwater runoff from road surfaces between Sta. 39+16 and Sta. 43+69 is collected in two grass channels designed to treat the Water Quality standard along the west side of US Route 7, crosses below US Route 7 through an existing culvert and leaves the project from an existing swale on the south side of Champlain Drive via POI 003 at Sta. 43+66, RT. S/N 003 is a point on Sunnyside Brook where an existing pipe that runs beneath Champlain Drive where it makes a 90 degree turn enters the Sunnyside Brook. Stormwater enters this pipe from the end of the roadside swale on the south side of Champlain Drive.
- S/N 004: Stormwater runoff from road surfaces between Sta. 19+75 to 39+16 is collected in grass channels and the existing closed drainage system. There are two grass channels designed to treat the Water Quality standard on the west side of US Route 7. Runoff flows from those channels into an existing closed drainage system which outlets to an existing engineered stormwater ditch and off the project at POI 004. Stormwater runoff also flows to a roadside swale that outlets into a new pipe which crosses US Route 7 that outlets into a new dry pond on the east side of US Route 7 (at Sta. 38+90, RT.) that is designed to treat the Channel Protection standard. The dry pond discharges to the same

existing engineered stormwater ditch via POI 004. S/N 004 is a point on Sunnyside Brook where an existing pipe that runs beneath a large impervious surfaced used for commercial buildings and parking lots outlets. The inlet of this ditch is located at the end of an eastbound engineered stormwater ditch.

- S/N 005: Stormwater runoff from the road surfaces on Hercules Drive is collected in existing roadside swales and leaves the project via POI 005. S/N 005 is at the crossing culvert along Sunnyside Brook at Hercules Drive. There are no proposed stormwater treatment practices that will discharge into S/N 005.
- S/N 006: Stormwater runoff from the road surfaces between Sta. 17+77 and Sta. 19+75 on the east side of US Route 7 and from the road surfaces on Lower Mountain View Drive is collected in an existing roadside swale on the north side of Lower Mountain View Drive, and leaves the project via POI 006. Stormwater runoff also leaves the project area by sheet flowing down the south side of Lower Mountain View Drive. S/N 006 is at the crossing culvert along Sunnyside Brook at Lower Mountain View Drive. There are no proposed stormwater treatment practices that will discharge into S/N 006 via POI 006.
- S/N 007: Stormwater runoff from road surfaces between Sta. 4+08 and Sta. 12+32 is collected in one grass channel (located on the inside of the I-89 off-ramp) designed to treat the Water Quality standard and in a new closed drainage system which leaves the project at a Class III wetland at Sta. 9+29, RT. S/N 007 is at southern end of the crossing culvert along Sunnyside Brook which carries water north under both barrels of Interstate 89 into the Class III wetland.
- S/N 008: Stormwater runoff from road surfaces between Sta. 12+32 and Sta. 19+75 is collected in two grass channels designed to treat the Water Quality standard and in a new closed drainage system. The two grass channels are located along the west side of US Route 7 and Mountain View Drive. Stormwater leaves the project from a new dry pond on the south side of the Exit 16 northbound off-ramp via POI 008. Runoff then crosses to the north side of the Exit 16 northbound off-ramp through an existing culvert (at Sta. D 4+25) and into an existing roadside swale that discharges to S/N 008 on the Sunnyside Brook.
- S/N 009: Stormwater runoff from road surfaces between Sta. 0+00 and Sta. 12+32 is collected in the City of Winooski's closed drainage system and leaves the project area. All impervious area associated with POI 009 is non-jurisdictional resurfacing, therefore no stormwater treatment practices are proposed on this part of the project. S/N 009 is within an existing wetland system directly adjacent to the Winooski River within the river's floodplain in the Casavant Natural Area. A small portion of this sub-catchment area (0.12 acres of jurisdictional impervious area) outside of the Sunnyside Brook watershed is designed to be redirected by the proposed closed drainage system that outlets at POI 007 and discharges at S/N 007. This impervious area will be handled in a manner consistent with the remainder of the project that discharges to the Sunnyside Brook and was included in the impervious area calculations for POI 007.

Existing Stormwater Collection System:

Existing storm water is collected in swales and a closed drainage system and conveyed along the entire corridor of US Routes 2 & 7. Just north of the Winooski-Colchester town line there is a storm system that collects and conveys water to a stormwater pond (Permit # 3079-9010R) on the west side of US Routes 2 & 7 at approximately Sta. 1+25 LT. This pond will not be impacted by the proposed project; its continuing treatment of surrounding areas including the highway will have a positive impact to runoff treatment. Runoff from this facility then enters the City of Winooski's closed drainage system that outlets at a wetland system directly adjacent to the Winooski River within the river's floodplain. At the Interstate 89 Exit 16 on- and off-ramps, water is collected on both sides US Routes 2 & 7 and conveyed to the east side of US Routes 2 & 7. At approximately Sta. 23+00 there is a storm system that collects water on the west side of US Routes 2 & 7 and conveys it north where it outlets on the east side of US Routes 2 & 7 at approximately Sta. 39+14 RT, Sta. 43+66 RT, Sta. 48+93 RT, and Sta. 56+30 RT indirectly into the Sunnyside Brook.

Proposed Stormwater Collection System:

The proposed design includes curbing along US Routes 2 & 7 south of the Exit 16 Interchange. There are also 6 curbed splitter islands at the I-89 on and off ramps. Catch basins located periodically along the curb and in the grass channels were designed to collect runoff. The closed drainage system and the 8 grass channels with overland flow were designed to convey treated runoff into existing infrastructure and eventually into the Sunnyside Brook.

Site Balancing Approach: The concept of site balancing on a watershed level within the site was used due to several constraints such as excessive land acquisition, large amounts of exposed and buried bedrock, existing topography and prohibitive costs. It was impractical to collect and treat runoff from all expanded impervious surfaces due to these constraints. Sections of existing and redeveloped impervious surfaces will be collected and treated to compensate for the inability to directly treat all of the impervious expansion. These areas are all within the maintenance responsibilities of the Agency of Transportation, including areas owned by the Town of Colchester.

A detailed assessment of site balancing is listed below:

- The proximity of commercial buildings to the roadway from the beginning of the project to the I-89 Exit 16 interchange is the principle restriction for directly treating runoff at the edge of the roadway. Removing the existing roadway curbing to allow for runoff sheet flow to pervious areas is not possible due to the location of the buildings, their parking areas and drive accesses. Furthermore, buried utilities are also of concern here. There are only small amounts of expanded impervious in this area and the expense to relocate buried utilities in this area to accommodate stormwater treat is prohibitive.
- In the interchange area, where the majority of the project's expanded impervious is located, treatment was achieved where physically possible. However, a majority of the surfaces cannot be directly treated as the topography of the interchange on- and off-ramps restrict the use of grass channels due to excessive longitudinal grades and short residence times. Significant amounts of existing ledge located on the west side of US Routes 2 & 7 are present there. Despite large volumes of ledge removal are required to accommodate the widened roadways and ramps, and even greater amount of bedrock would need to be

removed to accommodate direct stormwater treatment. A Class III wetland sits on the southeast corner of the interchange. This point is a low spot and serves as the receiving point of the proposed closed drainage system.

- Along US Routes 2 & 7 north of the interchange to the Mountain View Drive and Lower Mountain View Drive intersection has constraints similar to that south of the interchange near the beginning of the project. Highly developed commercial properties lie on the east side, significant amounts of ledge and the need to acquire greater amounts of rights-of-way on the west side and buried utilities nearby are all factors in restricting the direct treatment of runoff in this project area.
- The portion of the project along US Routes 2 & 7 north of the Mountain View Drive intersection is essentially a repaving operation with improvements to the Hercules Drive and Rathe Road intersection. While there are small amounts of redeveloped and expanded impervious surfaces, there are several locations where direct treatment of stormwater is achievable. Due to the majority of this section being non-jurisdictional redevelopment and the fact that very little direct treatment of stormwater is necessary, it was the prime location to create treatment facilities to compensate for those areas that could not be directly treated. Those facilities are described in greater detail below in this narrative and in Appendices D, E, and F.

Watershed Descriptions: For this project, 8 different discharge points outlet to the Sunnyside Brook (Waterbody ID VT08-02) located within the Sunderland Brook watershed. The watershed area for the Sunnyside Brook was found to be approximately 584 acres. The land cover within the watershed is comprised mostly of impervious area associated with roadways and commercial development, grass, and lightly wooded forest. The confluence with Sunnyside Brook is located downstream of the impaired segment. One discharge point outlets into an existing storm system in the City of Winooski. The discharge of this system is a wetland system directly adjacent to the Winooski River within the Winooski River floodplain. The watershed area at this discharge point is 1,048 square miles.

Watershed maps can be found in Appendix B.

Stormwater Treatment Practices: The amount of impervious area that is required to be collected and treated was calculated using the entire discharge project area. This includes the entire project area inside the project limits of US Routes 2 & 7 and all the side roads. The stormwater treatment will be provided by 8 grass channels and 3 dry ponds:

Treatment Practice	Location	Discharge Point
Grass Channel 1	Sta. A -0+74.9, LT – Sta. AL 1+85.2, LT	S/N 007
Grass Channel 4	Sta. 13+51.6, LT – Sta. 403+07.5, RT	S/N 008
Grass Channel 5	Sta. 18+55.5, LT – Sta. 19+75.0, LT	S/N 008
Grass Channel 6	Sta. 19+75.0, LT – Sta. 22+93.3, LT	S/N 004
Grass Channel 7	Sta. 22+97.8, LT – Sta. 26+28.1, LT	S/N 004

Grass Channel 8	Sta. 39+19.3, LT – Sta. 43+67.4, LT	S/N 003
Grass Channel 9	Sta. 800+43.1, LT – Sta. 802+85.0, LT	S/N 003
Grass Channel 10	Sta. 44+77.2, LT – Sta. 48+92.1, LT	S/N 002
Dry Pond 004	Sta. 36+80, RT – Sta. 38+90, RT	S/N 004
Dry Pond 007	Sta. C 1+31 – Sta. C 2+99, RT	S/N 007
Dry Pond 008	Sta. D 3+84 – Sta. D 5+25, LT	S/N 008

The Grass Channels are designed to treat the entire required Water Quality Volume for the project; Dry Pond 004 is designed to detain the required Channel Protection Volume for the project for a 12-hour period; Dry Ponds 007 and 008 are designed to attenuate the 10-year storm to or below pre-development flows in the receiving water.

Five of the Grass Channels collect and treat off-site area. It should be noted that three of the Grass Channels are located such that off-site areas are not conveyed to them. Pretreatment was not feasible for the proposed Grass Channels on this project as the linear nature of the reconstruction and the elimination of existing roadway curbing will provide continuous inflow over the shoulders and grassed side slopes. Stone check dams are proposed on Grass Channel 4 to prevent scour from flow of the pipe outlets.

Also, two of the three Dry Ponds, are located in small Class III wetlands. The appropriate permitting process for impacting these wetlands has been completed.

Below is a table detailing the jurisdictional areas contributing to each discharge point:

Discharge Point	**Expansion Area (ac.)**	**Redevelopment Area (ac.)**	**Resurfacing Area (non-jurisdictional (ac.)**	**Pre-Impervious Area turned Pervious Area (ac.)**	**Grass Channel(s) contributing**
S/N 001	0.04	0.17	0.56	0.03	None
S/N 002	0.15	0.08	0.84	0.00	#10
S/N 003	0.04	0.10	0.53	0.01	#8, #9
S/N 004	0.09	0.53	2.28	0.08	#6, #7
S/N 005	0.02	0.01	0.17	0.00	None
S/N 006	0.13	0.09	0.40	0.11	None
S/N 007	0.52	1.28	0.38	0.09	#1
S/N 008	0.59	0.95	0.89	0.14	#4, #5
S/N 009	0.00	0.00	0.47	0.00	N/A

Below is a table detailing how much jurisdictional areas contribute to each stormwater treatment practice:

Stormwater Treatment Practice	On-Site Impervious Area contributing (ac.)	On- Site Pervious Area contributing (ac.)	Off-site Impervious Area contributing (ac.)	Off-Site Pervious Area contributing (ac.)
GC1	0.05	0.15	0.30	0.73
GC4	1.06*	0.41*	12.44	9.67
GC5	0.05	0.06	0.00	0.00
GC6	0.24	0.25	0.00	0.00
GC7	0.48	0.13	0.00	0.00
GC8	0.28	0.23	1.29	2.26
GC9	0.18	0.10	0.20	0.58
GC10	0.28	0.10	1.88	1.11
Dry Pond 004	See Channel Protection Treatment Standard Below & Appendix F			
Dry Pond 007	See Overbank Flood Protection Standard Below & Appendix G			
Dry Pond 008	See Overbank Flood Protection Standard Below & Appendix G			

*Grass Channel 4 conveys stormwater from area directly contributing to it and from area previously treated by Grass Channel 5. Grass Channel 4 directly treats 1.01 acres of impervious area and 0.30 acres of pervious area.

Proposed Stormwater Management:

Stormwater management practices were designed in compliance with the 2002 Vermont Stormwater Management Manual, Volumes I and II. There is one project site associated with the Colchester HES NH 5600 (14) project, which falls within two separate watersheds. The two watersheds are the Sunnyside Brook and the Winooski River. The five stormwater treatment standards were evaluated on a watershed basis. For the Sunnyside watershed, Water Quality, Groundwater Recharge and Channel Protection were found to be applicable while the Overbank Flood and Extreme Flood Protection standards were waived. For the Winooski River watershed, none of the treatment standards were applied as the runoff within the project limits in this watershed is all derived from non-jurisdictional impervious areas (strictly roadway curb-to-curb resurfacing work only).

Water Quality Treatment Standard:

This treatment standard captures 90 percent of the annual storm events, removes 80 percent of the average annual post development total suspended solids load and 40 percent of the total phosphorus load. To meet the Water Quality Treatment Standard, 100 percent of all expanded impervious area and 20% of all redeveloped area must be treated, a total of 2.217 acres. The project impervious area treated by the 8 grass channels is 2.569 acres. The grass channels are modeled to collect and treat new impervious, jurisdictional redevelopment and resurfacing area. The total Water Quality Volume provided by the grass channels is 60,844 cubic feet.

A more detailed summary of each of the grass channels can be found in Appendix E.

Groundwater Recharge Treatment Standard:

This treatment standard ensures that enough water infiltrates in order to preserve existing water table elevations. The manual states that if grass channels are used for storm water treatment and they meet the Water Quality Treatment Standard, then they also meet the Groundwater Recharge Treatment Standard.

Channel Protection Treatment Standard:

This treatment standard protects stream and river channels from erosion and degradation caused by volume of flow produced by the one-year, 24-hour storm event. The increase in impervious surfaces exceeded the 1-acre threshold, triggering the need to fulfill the CPv requirement. One sub-watershed site within the project, Site #4 (S/N 004), met conditions capable of treating Channel Protection. A Dry Pond was designed to treat the required Channel Protection Volume for 5.67 acres of impervious, including 3.19 acres of off-site impervious and 1.67 acres of on-site impervious. On-site impervious includes 0.09 acres of new impervious, 0.53 acres of redeveloped impervious and 1.05 acres of existing impervious not currently meeting the Channel Protection Standard. A combination of on- and off-site runoff is collected by a closed drainage system in Site #4 which outlets into the proposed dry pond. The location of the pond was the only location viable for any significant amount of storage. The Dry Pond detains a volume exceeding the required to meet the standard.

Site #4 – 0.475 ac-ft meets the 12-hour extended detention period.

- Dry Pond (treats 1.67 acres of on-site impervious area)
    - Sta. 36+80 – Sta. 38+90, RT.
    - Pond Berm Width = 10 feet
    - Pond Interior Width = Irregular
    - Pond Interior Length = Irregular
    - CPv Height = 2.02 feet (318.02')

See Appendix F for additional pond and channel protection treatment information.

Overbank Flood Protection Treatment Standard:

This treatment standard ensures that peak flows post-construction do not exceed peak flows pre-construction based on the 10-year, 24-hour storm event. An extensive investigation was conducted and the analysis of that survey showed that the post-development flows in the receiving water, Sunnyside Brook, exceeded the pre-development flows for only one of the eight discharge points, at S/N007, by 4%. Two Dry Ponds were designed to attenuate project flows during the 10-year storm event. One Dry Pond was assigned to each of two on-site sub-catchment areas with the highest amount of impervious expansion

Site #7 – Reduction of post-development flow

- Dry Pond 007
  - Sta. C 1+31 – Sta. 2+99, RT.
  - Pond Interior Width = Irregular
  - Pond Interior Length = Irregular

Site #8 – Reduction of post-development flow

- Dry Pond 008
  - Sta. D 3+84 – Sta. D 5+25, LT.
  - Pond Interior Width = Irregular
  - Pond Interior Length = Irregular

See Appendix G for more the downstream analysis of the Sunnyside Brook and additional information.

Extreme Flood Protection Treatment Standard:

This treatment standard is similar to the Overbank Flood Protection Treatment Standard with the only difference being that it is based on the 100-year 24-hour storm event. This treatment standard can be waived as no Site on the project has more than 10 acres of new impervious area. Furthermore, the sum of all jurisdictional impervious areas for the entire project is less than 10 acres.

Cold Climate Design Considerations:

A couple of different cold climate considerations were used in this storm water design. All proposed pipes were designed to be at least 18 inches in diameter. Also, all Grass Channels, with the exception of Grass Channels 5 and 6 have a longitudinal slope of greater than one percent but do not exceed the four percent maximum.

Chloride Management:

As the Sunnyside Brook has been identified as being stressed, but not impaired, by Chlorides, included in this permit application is a Chloride Management Plan. The Chloride Management Plan summarizes best management practices to control Chloride without decreasing desired levels of service.

See Appendix H for more information.

Version 11.11

Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 001
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 31' 2", 73° 10' 39"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	0.767
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.039
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.170
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.558

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	None. Site Balancing; see narrative.
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	n/a

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	None. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	N/A
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	n/a
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes; Decrease in post-development flow.
19	STP used (e.g. Dry Detention Pond LA-1)	N/A
20	Pre-development peak discharge rate (cfs)	77.9
21	Pre-routed, post-development peak discharge rate (cfs)	73.2
22	Routed, post-development peak discharge rate (cfs)	72.3

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No, Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 002
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 57", 73° 10' 44"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	1.063
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.149
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.078
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.836

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	Grass Channel O-3; Site Balancing; see narrative.
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes; Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	N/A
20	Pre-development peak discharge rate (cfs)	78.4
21	Pre-routed, post-development peak discharge rate (cfs)	73.5
22	Routed, post-development peak discharge rate (cfs)	72.9

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

Line		
	General Discharge Point Information	
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 003
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 51", 73° 10' 44"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	0.670
6	Drainage area of receiving water at discharge point (acres)	584.4
	On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*	
7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.044
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.096
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.530
	***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**	
	Water Quality (0.9 inches) Treatment Standard (WQ)	
10	STP used (e.g. Grass Channel O-3)	Grass Channel O-3; Site Balancing; see narrative.
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A
	Groundwater Recharge Treatment Standard (Re)	
12	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes; Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A
	Channel Protection (1-year) Treatment Standard (CP)	
15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.
	Overbank (10-year) Flood Protection Treatment Standard (Qp10)	
18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	N/A
20	Pre-development peak discharge rate (cfs)	77.5
21	Pre-routed, post-development peak discharge rate (cfs)	72.5
22	Routed, post-development peak discharge rate (cfs)	72.1
	Extreme (100-year) Flood Protection Treatment Standard (Qp100)	
23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 004
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 47", 73° 10' 44"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	2.889
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.085
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.528
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	2.276

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	None.

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	None.

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes.
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	Cold Fish Habitat
17	STP used (e.g. Wet Pond P-2)	Dry Pond LA-1

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	Dry Detention Pond #4
20	Pre-development peak discharge rate (cfs)	68.6
21	Pre-routed, post-development peak discharge rate (cfs)	61.2
22	Routed, post-development peak discharge rate (cfs)	65.0

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 005
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 40", 73° 10' 38"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	0.188
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.017
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.006
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.165

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	None. Site Balancing; see narrative.
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	No. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	N/A
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No.
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	N/A
20	Pre-development peak discharge rate (cfs)	23.3
21	Pre-routed, post-development peak discharge rate (cfs)	23.4
22	Routed, post-development peak discharge rate (cfs)	23.2

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 006
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 24", 73° 10' 41"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	0.621
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.128
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.092
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.401

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	None. Site Balancing; see narrative.
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	No. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	N/A
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No.
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	N/A
20	Pre-development peak discharge rate (cfs)	76.7
21	Pre-routed, post-development peak discharge rate (cfs)	77.6
22	Routed, post-development peak discharge rate (cfs)	77.3

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

Version 11.11

Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 007
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 15", 73° 10' 43"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	2.186
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.520
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	1.282
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.384

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

10	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	None.

Groundwater Recharge Treatment Standard (Re)

12	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	Dry Detention Pond #7
20	Pre-development peak discharge rate (cfs)	12.1
21	Pre-routed, post-development peak discharge rate (cfs)	16.1
22	Routed, post-development peak discharge rate (cfs)	12.5

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

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Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

General Discharge Point Information

Line		
1	Project name	Colchester HES NH 5600(14)
2	Discharge point serial number (e.g. S/N 001)	S/N 008
3	Name of receiving water	Sunnyside Brook
4	Latitude & Longitude of discharge point (DD, MM, SS.ss)	44° 30' 15", 73° 10' 39"
5	Site area draining to discharge point (acres) = impervious + disturbed pervious	2.435
6	Drainage area of receiving water at discharge point (acres)	584.4

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

Line		
7	New Impervious area contributing stormwater runoff to discharge point (acres)	0.594
8	Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.951
9	Existing Impervious area* contributing stormwater runoff to discharge point (acres)	0.890

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002**

Water Quality (0.9 inches) Treatment Standard (WQ)

Line		
10	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
11	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	None.

Groundwater Recharge Treatment Standard (Re)

Line		
12	Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes. Site Balancing; see narrative.
13	STP used (e.g. Grass Channel O-3)	Grass Channel O-3
14	Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	N/A

Channel Protection (1-year) Treatment Standard (CP)

Line		
15	Criterion applicable? (Yes or No) If No, indicate waiver applied	No
16	Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	N/A
17	STP used (e.g. Wet Pond P-2)	None. Site Balancing; see narrative.

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

Line		
18	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site < 5 acres and has capacity for the 10 yr. storm.
19	STP used (e.g. Dry Detention Pond LA-1)	Dry Detention Pond #8
20	Pre-development peak discharge rate (cfs)	50.5
21	Pre-routed, post-development peak discharge rate (cfs)	51.5
22	Routed, post-development peak discharge rate (cfs)	51.0

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

Line		
23	Criterion applicable? (Yes or No) If No, indicate waiver applied	No; Site is less than 10 acres
24	STP used (e.g. Dry Detention Pond LA-1)	N/A
25	Pre-development peak discharge rate (cfs)	N/A
26	Pre-routed, post-development peak discharge rate (cfs)	N/A
27	Routed, post-development peak discharge rate (cfs)	N/A

Version: 9/06

For the area draining to*: Grass Channel 1 (O-3)

Located in drainage area for S/N: 007

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	1.23	acres
2	Impervious area		0.35	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	28.46	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.306	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.275	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.275	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.028	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	1230	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 1 (O-3)

Located in drainage area for S/N: 007

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.275 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 1.2 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 90.6

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from On-site Area

Located in drainage area for S/N: 008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	1.36	acres
2	Impervious area		1.00	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	73.53	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.712	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.641	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.641	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.073	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	3162	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from On-site Area

Located in drainage area for S/N: 008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.641 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 1.4 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 97.4

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from GC5

Located in drainage area for S/N: 008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.12	acres
2	Impervious area		0.05	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	43.48	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.441	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.397	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.397	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.004	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	166	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from GC5

Located in drainage area for S/N: 008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.397 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.1 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 93.5

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from OS8a

Located in drainage area for S/N: 008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	2.56	acres
2	Impervious area		1.22	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	47.66	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.479	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.431	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.431	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.092	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	4005	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

For the area draining to*: Grass Channel 4 (O-3) from OS8a

Located in drainage area for S/N: 008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.431 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 2.6 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 94.2

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 4 (O-3) from OS8c
Located in drainage area for S/N:	008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.30	acres
2	Impervious area		0.02	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	6.67	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.110	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.099	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.200	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.005	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	218	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from OS8c

Located in drainage area for S/N: 008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.200 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.3 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 88.1

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 4 (O-3) from OS8d

Located in drainage area for S/N: 008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	2.19	acres
2	Impervious area		0.56	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	25.57	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.280	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.252	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.252	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.046	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	2004	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 4 (O-3) from OS8d
Located in drainage area for S/N:	008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.252 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 2.2 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 89.9

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 4 (O-3) from OS8_5
Located in drainage area for S/N:	008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	17.07	acres
2	Impervious area		10.65	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	62.39	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.612	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.550	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.550	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.783	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	34103	cu. ft.

Notes:
1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 4 (O-3) from OS8_5
Located in drainage area for S/N:	008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.550 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 17.1 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 96.1

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 5 (O-3)
Located in drainage area for S/N:	008

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.12	acres
2	Impervious area		0.05	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	46.47	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.468	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.421	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.421	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.004	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	177	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 5 (O-3)

Located in drainage area for S/N: 008

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.421 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.1 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 94.0

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 6 (O-3)
Located in drainage area for S/N:	004

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.49	acres
2	Impervious area		0.24	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	48.68	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.488	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.439	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.439	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.018	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	783	cu. ft.

Notes:
1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 6 (O-3)
Located in drainage area for S/N:	004

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.439 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.5 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 94.3

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 7 (O-3)

Located in drainage area for S/N: 004

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.62	acres
2	Impervious area		0.48	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	77.74	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.750	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.675	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.675	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.035	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	1519	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 7 (O-3)

Located in drainage area for S/N: 004

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.675 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.6 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 97.8

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 8 (O-3)
Located in drainage area for S/N: 003

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	4.06	acres
2	Impervious area		1.57	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	38.67	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.398	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.358	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.358	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.121	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	5279	cu. ft.

Notes:
1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

For the area draining to*: Grass Channel 8 (O-3)

Located in drainage area for S/N: 003

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.358 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 4.1 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 92.7

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 9 (O-3)

Located in drainage area for S/N: 003

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	1.06	acres
2	Impervious area		0.38	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	36.14	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.375	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.338	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.338	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.030	ac. ft.
10	**WQ Volume Calculation =** (line 9 * 43560) =	**WQv =**	1296	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 9 (O-3)

Located in drainage area for S/N: 003

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.338 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 1.1 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 92.2

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel 10 (O-3)

Located in drainage area for S/N: 002

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	3.37	acres
2	Impervious area		2.16	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	64.09	% (whole #)
4	Precipitation	P =	**0.9**	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.627	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.564	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.564	watershed inches
9	**WQ Volume Calculation =** (line 8 *A)/12 =	**WQv =**	0.158	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	6902	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*:	Grass Channel 10 (O-3)
Located in drainage area for S/N:	002

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.564 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 3.4 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 96.3

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 007

Grass Treatment Channel (O-3)

Grass Treatment Channel #__1__

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	91

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	1230

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.341

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	4

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	Yes	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for QP10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 008

Grass Treatment Channel (O-3)

Grass Treatment Channel #____4____

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	88-96

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	43658

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	2.12

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	5

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	No	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	Yes	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 008

Grass Treatment Channel (O-3)

Grass Treatment Channel #___5___

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	94

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	177

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.076

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	4

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	Yes	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 004

Grass Treatment Channel (O-3)

Grass Treatment Channel #_____6____

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	94

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	783

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.336

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	4

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	Yes	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 004

Grass Treatment Channel (O-3)

Grass Treatment Channel #____7____

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	98

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	1,519

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.653

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	4

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	Yes	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 003

Grass Treatment Channel (O-3)

Grass Treatment Channel #____8____

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	93

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	5,279

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	1.477

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	No	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	6

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	No	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	Practice not used for CPv

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 003

Grass Treatment Channel (O-3)

Grass Treatment Channel #_____9____

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒
2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards
3 Cpv ☐
4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	92

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	1,296

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.307

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	4

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	Yes	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	**No**	**n/a**

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	**No**	**Practice not used for Qp10**

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	**No**	**Waived. See Appendix G.**

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 002

Grass Treatment Channel (O-3)

Grass Treatment Channel #__10__

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☒

2 Rev ☒ This practice automatically meets Rev if you have met the WQv treatment standards

3 Cpv ☐

4 Qp10 ☐ { Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.

5 Qp100 ☐

Line	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	96

Line	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	6,902

Line		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	1.635

Line	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	Yes	See Appendix E

Line	Conveyance (2.7.5.B)	Yes	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	Yes	See Appendix E, Mathcad Calcs
11	Are the channel slopes less than or equal to the 2:1 maximum?	Yes	See Appendix E
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	Yes	See Appendix E
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	Yes	See Appendix E

Line	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	No	n/a

Line	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	5

Line		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	Yes	See Appendix E
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	Yes	See Appendix E
18	Is the depth of the WQv peak discharge 4 inches or less?	No	See Appendix E
19	Were check dams used to meet the requisite treatment design criteria?	No	See Appendix E

Line	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	Yes	See Narrative

Channel Protection Treatment Standard (Cpv)

		Response
21	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	No	n/a

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
24	What is the calculated average release rate (cfs)?	n/a
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Practice not used for Qp10

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Appendix G.

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 004

Dry Detention Pond (LA-1)

Dry Detention Pond #4

Line **Indicate the treatment standards met for the site area draining to this practice:**

1. Cpv X
2. Qp10 ☐
3. Qp100 ☐

Line		Response	Attachment location
4	Have you performed a site evaluation to establish the Hazard Classification of the pond?	Yes	See Appendix F.
5	Have you determined depth to bedrock and soil properties using geotechnical investigations?	Yes	See Appendix F.
6	Have the outfalls been designed/protected to avoid erosive velocities?	Yes	See Appendix F and plan.
8	Is the principal spillway accessible from land and equipped with a removable trash rack?	Yes	See Plan.
9	Have all low flow orifices been designed or sized to ensure no clogging occurs?	Yes	See Detail.
10	Have the potential impacts of frozen culverts and deicers on vegetation been addressed in the design?	Yes	See Narrative.
11	Does the application include oultet elevation and size information for the basin?.	Yes	See Appendix F.
12	Has the peak storage volume and elevation information for the 1, 10 and 100-year storms been included?	Yes	See Appendix F.

Channel Protection Treatment Standard (Cpv)

Line		Response
13	Check which detention time must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

Line		Response	Attachment location
14	Did you use the Storage Volume Estimation Method? If yes, skip to Line 19.*	No	

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

Line		Response
15	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	38028
16	What orifice size (inches) is necessary to meet the required detention time?	3
17	What is the calculated average release rate (cfs)? (Divide the Vs by detention time)	0.88
18	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	0.33

Overbank Flood Protection Treatment Standard (Qp10)

Line		Response	Attachment location
19	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	Yes	Waived. See Narrative & Appendix G

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

Line		Response	Attachment location
20	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Narrative.

*Please include runoff and routing calculations of the 100-year storm event.

Please see VSMM-Vol. II, Appendix D7 for guidance about maintaining non-erosive conditions. Ensure that appropriate overflow outlets are designed to safely release all off-site water that may also be entering the pond. Visit VSMM-Vol.II, Appendix B for dam safety design specifications.

Attachment location: Indicate the specific location (i.e. appendices, pages, plan sheets) where the requisite support documentation has been provided within the application.

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 007

Dry Detention Pond (LA-1)

Dry Detention Pond #7

Line **Indicate the treatment standards met for the site area draining to this practice:**

1 Cpv ☐
2 Qp10 X
3 Qp100 ☐

Line		Response	Attachment location
4	Have you performed a site evaluation to establish the Hazard Classification of the pond?	No	See Appendix G.
5	Have you determined depth to bedrock and soil properties using geotechnical investigations?	Yes	See Appendix G.
6	Have the outfalls been designed/protected to avoid erosive velocities?	Yes	See Appendix G.
8	Is the principal spillway accessible from land and equipped with a removable trash rack?	Yes	See Plan.
9	Have all low flow orifices been designed or sized to ensure no clogging occurs?	Yes	See Detail.
10	Have the potential impacts of frozen culverts and deicers on vegetation been addressed in the design?	Yes	See Narrative.
11	Does the application include oultet elevation and size information for the basin?.	Yes	See Appendix G.
12	Has the peak storage volume and elevation information for the 1, 10 and 100-year storms been included?	Yes	See Appendix G.

Channel Protection Treatment Standard (Cpv)

Line		Response
13	Check which detention time must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

Line		Response	Attachment location
14	Did you use the Storage Volume Estimation Method? If yes, skip to Line 19.*	No	

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

Line		
15	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
16	What orifice size (inches) is necessary to meet the required detention time?	n/a
17	What is the calculated average release rate (cfs)? (Divide the Vs by detention time)	n/a
18	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

Line		Response	Attachment location
19	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Waived. See Narrative & Appendix G

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

Line		Response	Attachment location
20	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Narrative.

*Please include runoff and routing calculations of the 100-year storm event.

Please see VSMM-Vol. II, Appendix D7 for guidance about maintaining non-erosive conditions. Ensure that appropriate overflow outlets are designed to safely release all off-site water that may also be entering the pond. Visit VSMM-Vol.II, Appendix B for dam safety design specifications.

Attachment location: Indicate the specific location (i.e. appendices, pages, plan sheets) where the requisite support documentation has been provided within the application.

Project Name: Colchester HES NH 5600(14)
Discharge Point: S/N 008

Dry Detention Pond (LA-1)

Dry Detention Pond #8

Line **Indicate the treatment standards met for the site area draining to this practice:**

1 Cpv ☐

2 Qp10 X

3 Qp100 ☐

		Response	Attachment location
4	Have you performed a site evaluation to establish the Hazard Classification of the pond?	No	See Appendix G.
5	Have you determined depth to bedrock and soil properties using geotechnical investigations?	Yes	See Appendix G.
6	Have the outfalls been designed/protected to avoid erosive velocities?	Yes	See Appendix G.
8	Is the principal spillway accessible from land and equipped with a removable trash rack?	Yes	See Plan.
9	Have all low flow orifices been designed or sized to ensure no clogging occurs?	Yes	See Detail.
10	Have the potential impacts of frozen culverts and deicers on vegetation been addressed in the design?	Yes	See Narrative.
11	Does the application include oultet elevation and size information for the basin?.	Yes	See Appendix G.
12	Has the peak storage volume and elevation information for the 1, 10 and 100-year storms been included?	Yes	See Appendix G.

Channel Protection Treatment Standard (Cpv)

		Response
13	Check which detention time must be used, based on the fisheries designation of the receiving water:	☒ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
14	Did you use the Storage Volume Estimation Method? If yes, skip to Line 19.*	No	

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

15	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	n/a
16	What orifice size (inches) is necessary to meet the required detention time?	n/a
17	What is the calculated average release rate (cfs)? (Divide the Vs by detention time)	n/a
18	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	n/a

Overbank Flood Protection Treatment Standard (Qp10)

		Response	Attachment location
19	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	No	Waived. See Narrative & Appendix G

*Please include runoff and routing calculations of the 10-year storm event.

Extreme Flood Protection Treatment Standard (Qp100)

		Response	Attachment location
20	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	No	Waived. See Narrative.

*Please include runoff and routing calculations of the 100-year storm event.

Please see VSMM-Vol. II, Appendix D7 for guidance about maintaining non-erosive conditions. Ensure that appropriate overflow outlets are designed to safely release all off-site water that may also be entering the pond. Visit VSMM-Vol.II, Appendix B for dam safety design specifications.

Attachment location: Indicate the specific location (i.e. appendices, pages, plan sheets) where the requisite support documentation has been provided within the application.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N002

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*):

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	◉ **Yes**	☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	◉ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	◉ **Yes**	☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N003

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*):

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	● **Yes**	☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	● **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	● **Yes**	☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N004

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	◉ **Yes**	☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	◉ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	◉ **Yes**	☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N005

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*):

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	● Yes	☐ No
Has adequate conveyance from the site to the discharge point been verified?	● Yes	☐ No
Has supporting information (e.g. narrative description, calculations, modeling) been included?	● Yes	☐ No

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N006

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for <u>each</u> discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check <u>only</u> one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

<u>Guidance</u>: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	● **Yes**	☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	● **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	● **Yes**	☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N007

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:	
Drainage Area of Receiving Water at Discharge Point (square miles):	

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	☒ **Yes**	☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	☒ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☒ **Yes**	☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N008

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check only one*):

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	● **Yes** ☐ **No**
Has adequate conveyance from the site to the discharge point been verified?	● **Yes** ☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	● **Yes** ☐ **No**

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N001

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.039

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified? ☐ **Yes** ☐ **No**

Has supporting information (e.g. narrative description, calculations, modeling) been included? ☐ **Yes** ☐ **No**

Note: These waivers are applied per receiving water.

For additional information please go to the Vermont Stormwater Management Manual, Volume 1, Section 1.1.2, Page 1-11

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N002

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.149

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified? ☐ **Yes** ☐ **No**

Has supporting information (e.g. narrative description, calculations, modeling) been included? ☐ **Yes** ☐ **No**

Note: These waivers are applied per receiving water.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N003

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.044

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified?	☐ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ **Yes**	☐ **No**

Note: These waivers are applied per receiving water.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N004

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.085

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified?	☐ **Yes** ☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ **Yes** ☐ **No**

Note: These waivers are applied per receiving water.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N005

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.017

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified?	☐ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ **Yes**	☐ **No**

Note: These waivers are applied per receiving water.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N006

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.128

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified? ☐ **Yes** ☐ **No**

Has supporting information (e.g. narrative description, calculations, modeling) been included? ☐ **Yes** ☐ **No**

Note: These waivers are applied per receiving water.

For additional information please go to the Vermont Stormwater Management Manual, Volume 1, Section 1.1.2, Page 1-11

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N007

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:	
Drainage Area of Receiving Water at Discharge Point (square miles):	

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres):	0.520

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified?	☐ **Yes**	☐ **No**
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ **Yes**	☐ **No**

Note: These waivers are applied per receiving water.

Print Form

Project Name: Colchester HES NH 5600(14) **Discharge Point:** S/N008

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for each discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check only one*)**:**

☐ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:

Drainage Area of Receiving Water at Discharge Point (square miles):

Guidance: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☑ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres): 0.594

Guidance: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

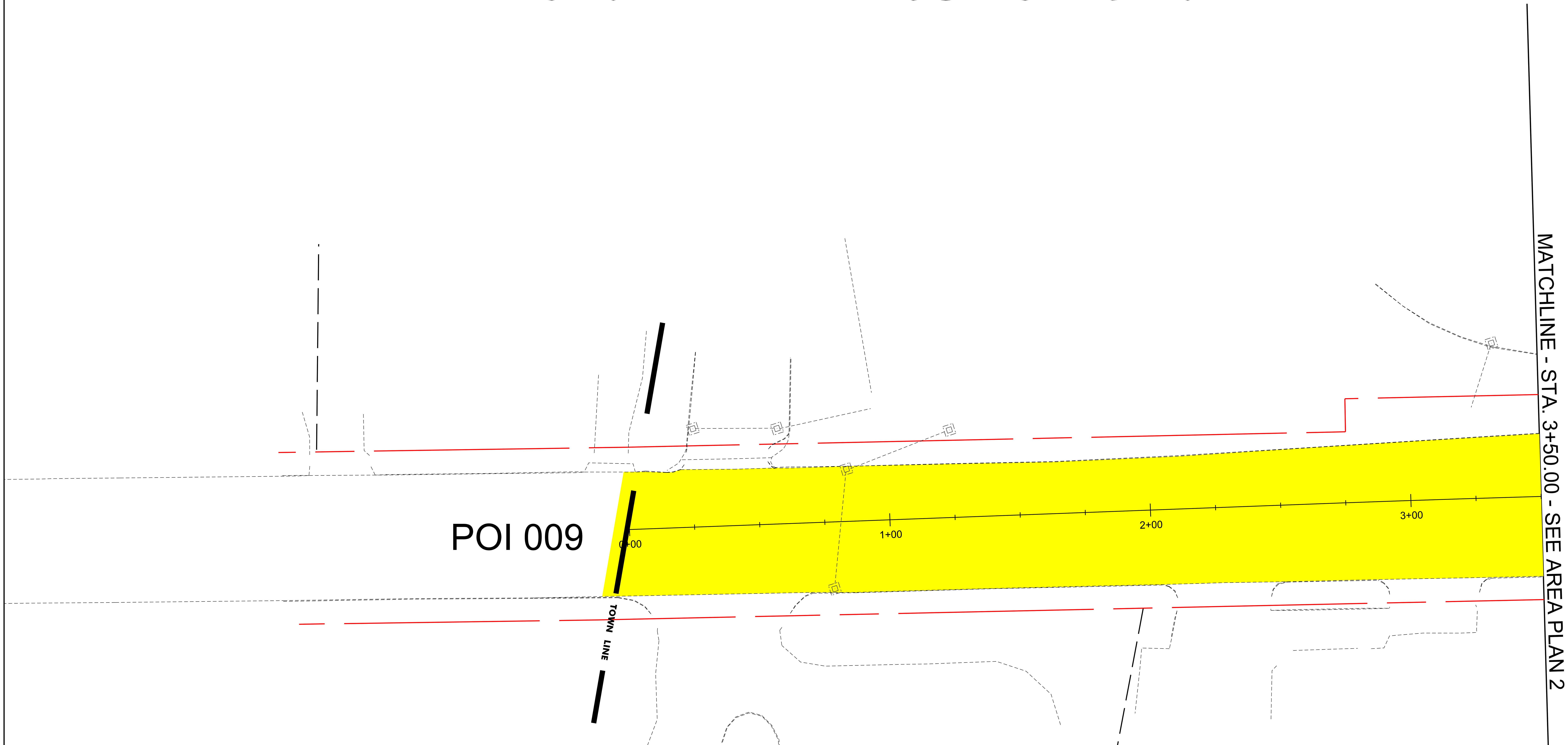
☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified? ☐ **Yes** ☐ **No**

Has supporting information (e.g. narrative description, calculations, modeling) been included? ☐ **Yes** ☐ **No**

Note: These waivers are applied per receiving water.

COLCHESTER HES NH 5600(14)
STORMWATER JURISDICTION



PROJECT TOTAL

JURISDICTIONAL REDEVELOPMENT:	3.203 AC
RESURFACING (NON-JURISDICTIONAL):	6.507 AC
PRE-IMPERVIOUS TURNED POST-PERVIOUS:	0.457 AC
EXPANSION:	1.576 AC

WATER QUALITY (TRADITIONAL)

100% EXPANSION =	1.576 AC
20% JURISDICTIONAL REDEVELOPMENT =	0.641 AC
	2.217 AC

WQv TREATMENT PROVIDED = 111,889 SF = 2.569 AC

0 20 40
SCALE IN FEET

PROJECT NAME:	COLCHESTER		
PROJECT NUMBER:	HES NH 5600(14)		
FILE NAME:	NAME$DGN	PLOT DATE:	$$$$DATE$$$
PROJECT LEADER:	P. COBURN	DRAWN BY:	T. SISSON
DESIGNED BY:	M. LACROIX	CHECKED BY:	M. LACROIX
JURISDICTIONAL AREA PLAN 1		SHEET	1 OF 13

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

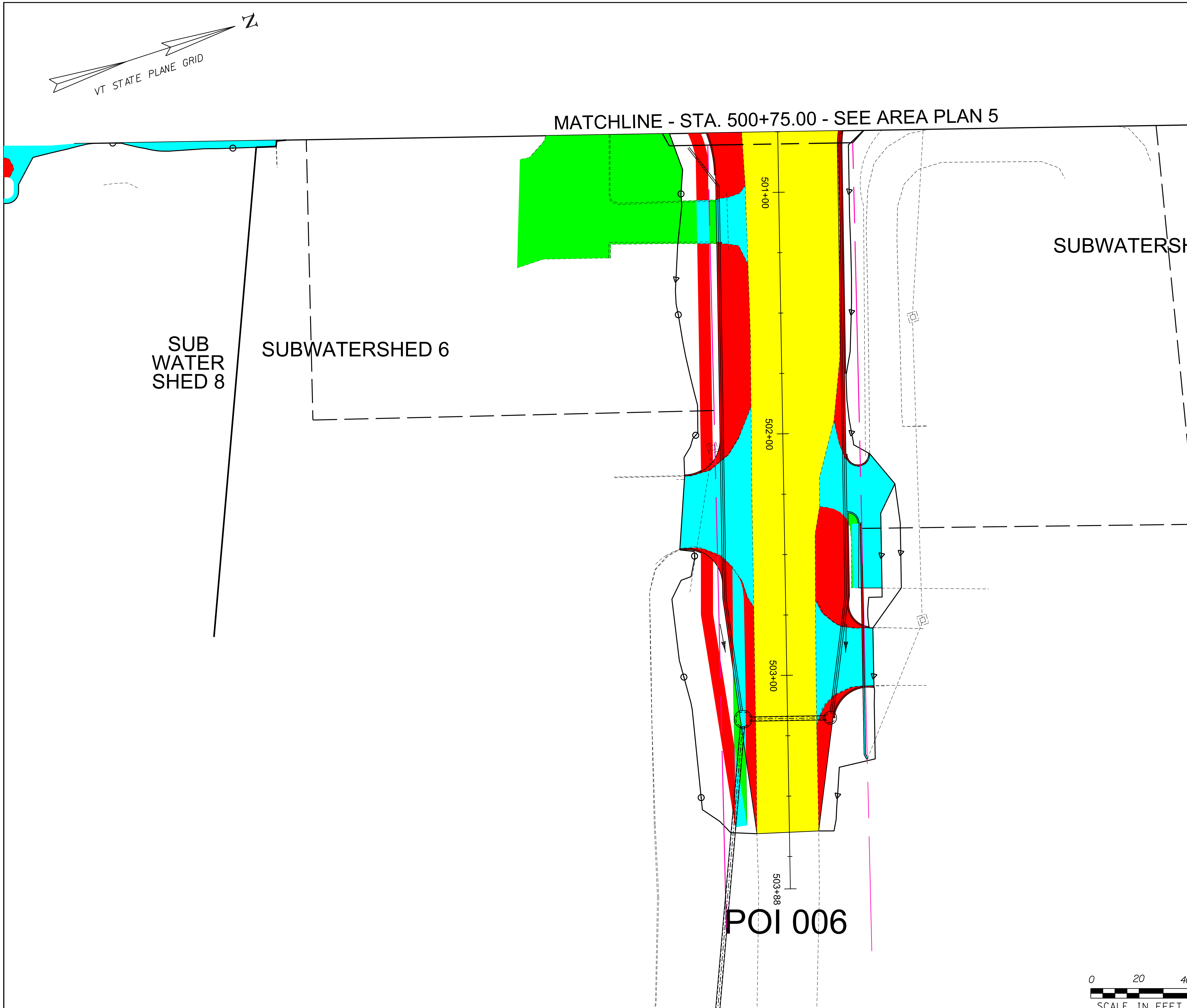
FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 2

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 2 OF 13

PROJECT NAME:	COLCHESTER		
PROJECT NUMBER:	HES NH 5600(14)		
FILE NAME:	NAME$DGN	PLOT DATE:	$$$$DATE$$$
PROJECT LEADER:	P. COBURN	DRAWN BY:	T. SISSON
DESIGNED BY:	M. LACROIX	CHECKED BY:	M. LACROIX
JURISDICTIONAL AREA PLAN 3		SHEET 3 OF 13	

MATCHLINE - STA. C 1+00.00 - SEE AREA PLAN 3
MATCHLINE - STA. D 1+25.00 - SEE AREA PLAN 3
VT STATE PLANE GRID
N
RAMP C
C 2+00
C 3+00
RAMP D
6+00
5+00
4+00
3+00
SC
INV. = 321.8'
POI 007
POI 008
IMPERVIOUS AREA TREATED BY GRASS CHANNEL
IMPERVIOUS AREA TREATED BY POND
PRE-FABRICATED CHECK DAM
STA. D 2+10, RT
STA. DL 1+43.5, LT - STA. DL 4+53.8, LT
CONSTRUCT 278' SPECIAL CHANNEL
AVERAGE LONGITUDINAL SLOPE = 3.7%
613.10 - STONE FILL, TYPE I
STA. CR XX+XX, RT (4' x 32')
STA. C XX+XX, RT (8' x 16')
STA. D XX+XX, LT (6' x 12')
STORMWATER LEGEND
STORMWATER GRASS CHANNEL
0 20 40
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 4
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 4 OF 13


N
VT STATE PLANE GRID
INV. = 357.6'
IMPERVIOUS AREA TREATED BY GRASS CHANNEL
IMPERVIOUS AREA TREATED BY POND
GC4 STA. 14.75.0, LT - STA. 403+07.5, LT
CONSTRUCT 625' GRASS CHANNEL
AVERAGE LONGITUDINAL SLOPE = 3.8%
GC5 STA. 18+55.5, LT - STA. 19+75.0, LT
CONSTRUCT 120' GRASS CHANNEL
AVERAGE LONGITUDINAL SLOPE = 0.2%
GC6 STA. 19+75.0, LT - STA. 20+75.0, LT
CONSTRUCT 318' GRASS CHANNEL
AVERAGE LONGITUDINAL SLOPE = 0.7%
PRE-FABRICATED CHECK DAM
STA. 17+01, LT
STORMWATER LEGEND
STORMWATER GRASS CHANNEL
DIVERSION TRENCH
4' CURB CUT FOR RUNOFF
SUBWATERSHED 8
SUBWATERSHED 4
403+00
402+00
401+00
MOUNTAIN VIEW DRIVE
T.H. #172
4' CURB CUT FOR RUNOFF
GRASS CHANNEL 4
IMPERVIOUS = 43,853 SF
GRASS CHANNEL 5
IMPERVIOUS = 2,349 SF
GRASS CHANNEL 6
IMPERVIOUS = 10,391 SF
CPv - POND 98
IMPERVIOUS = 125,961 SF
GC4
HIGH POINT
INV. = 348.8'
NOT CURBED
INV. = 348.6'
GC5
GC6
FB
UFB
MATCHLINE - STA. 14+75.00 - SEE AREA PLAN 3
MATCHLINE - STA. 20+75.00 - SEE AREA PLAN 6
ROOSEVELT HIGHWAY
US ROUTE 7
ROOSEVELT HIGHWAY
15+00
16+00
17+00
500+00
18+00
19+00
20+00
U8
FB
UFB
MATCHLINE - STA. 500+75.00 - SEE AREA PLAN 6
0 20 40
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 5
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 5 OF 13



PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 6

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 6 OF 13

VT STATE PLANE GRID

N

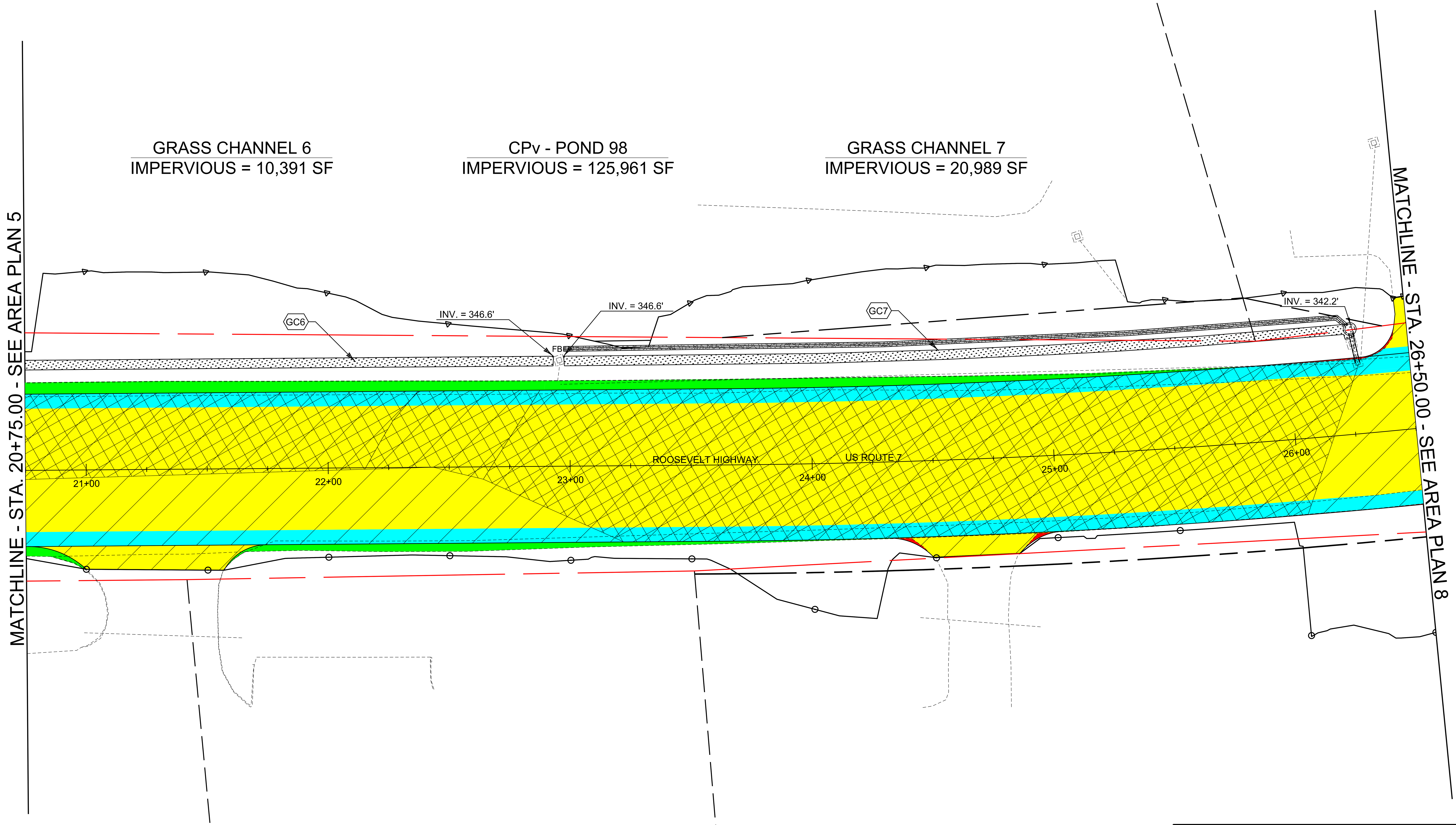
GC6 STA. 20+75.0, LT - STA. 22+93.3, LT
CONSTRUCT 318' GRASS CHANNEL
AVERAGE LONGITUDINAL SLOPE = 0.7%

GC7 STA. 22+97.8, LT - STA. 26+28.1, LT
CONSTRUCT 327' GRASS CHANNEL
AVERAGE LONGITUDINAL SLOPE = 1.3%

STORMWATER LEGEND

STORMWATER GRASS CHANNEL

DIVERSION TRENCH



IMPERVIOUS AREA TREATED BY GRASS CHANNEL

IMPERVIOUS AREA TREATED BY POND

0 20 40
SCALE IN FEET

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: NAME$DGN	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: P. COBURN	DRAWN BY: T. SISSON
DESIGNED BY: M. LACROIX	CHECKED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 7	SHEET 7 OF 13

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

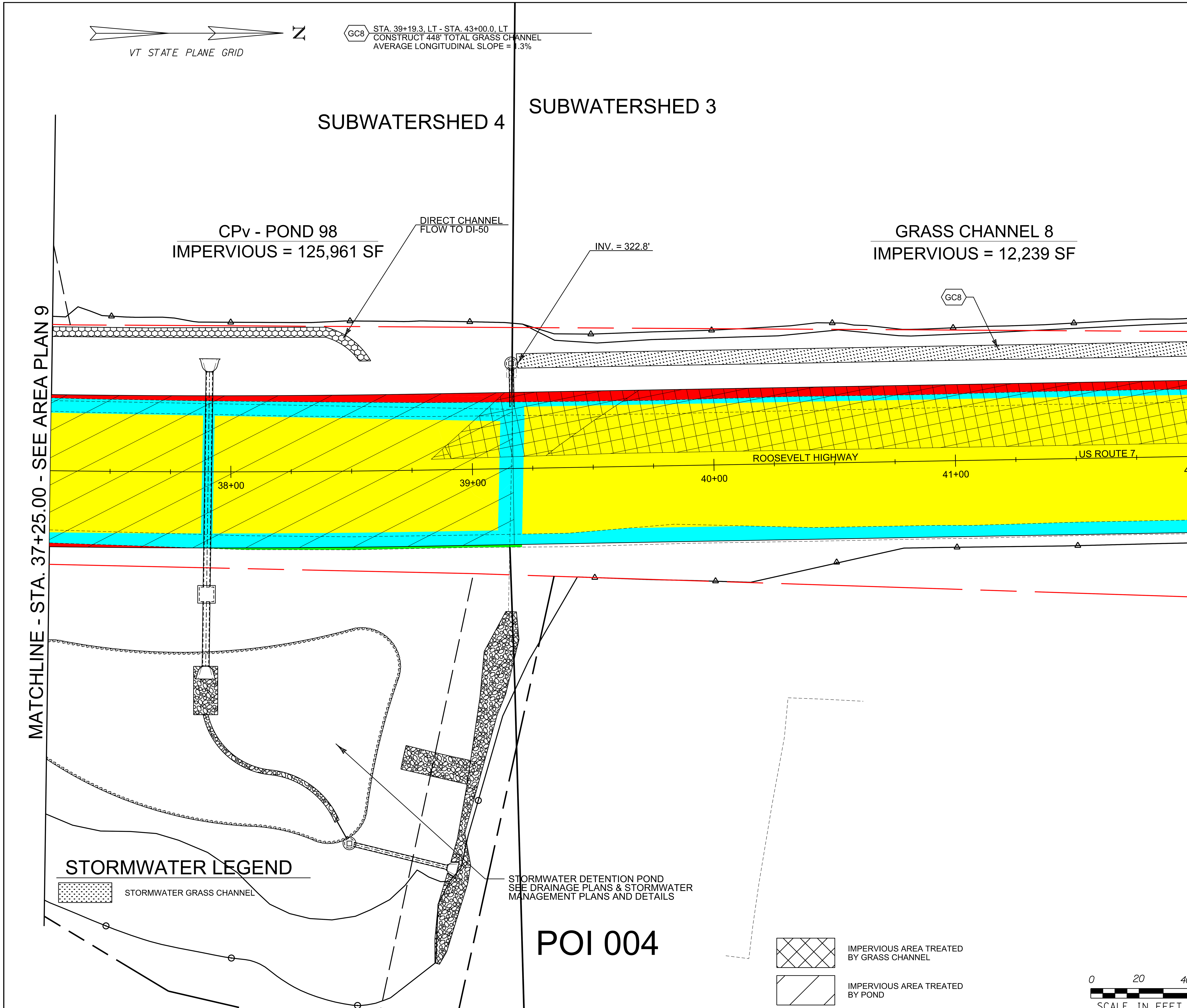
FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 8

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 8 OF 12

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 9

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 9 OF 13



PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: NAME$DGN	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: P. COBURN	DRAWN BY: T. SISSON
DESIGNED BY: M. LACROIX	CHECKED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 10	SHEET 10 OF 13

STORMWATER LEGEND

STORMWATER GRASS CHANNEL

IMPERVIOUS AREA TREATED BY GRASS CHANNEL

IMPERVIOUS AREA TREATED BY POND

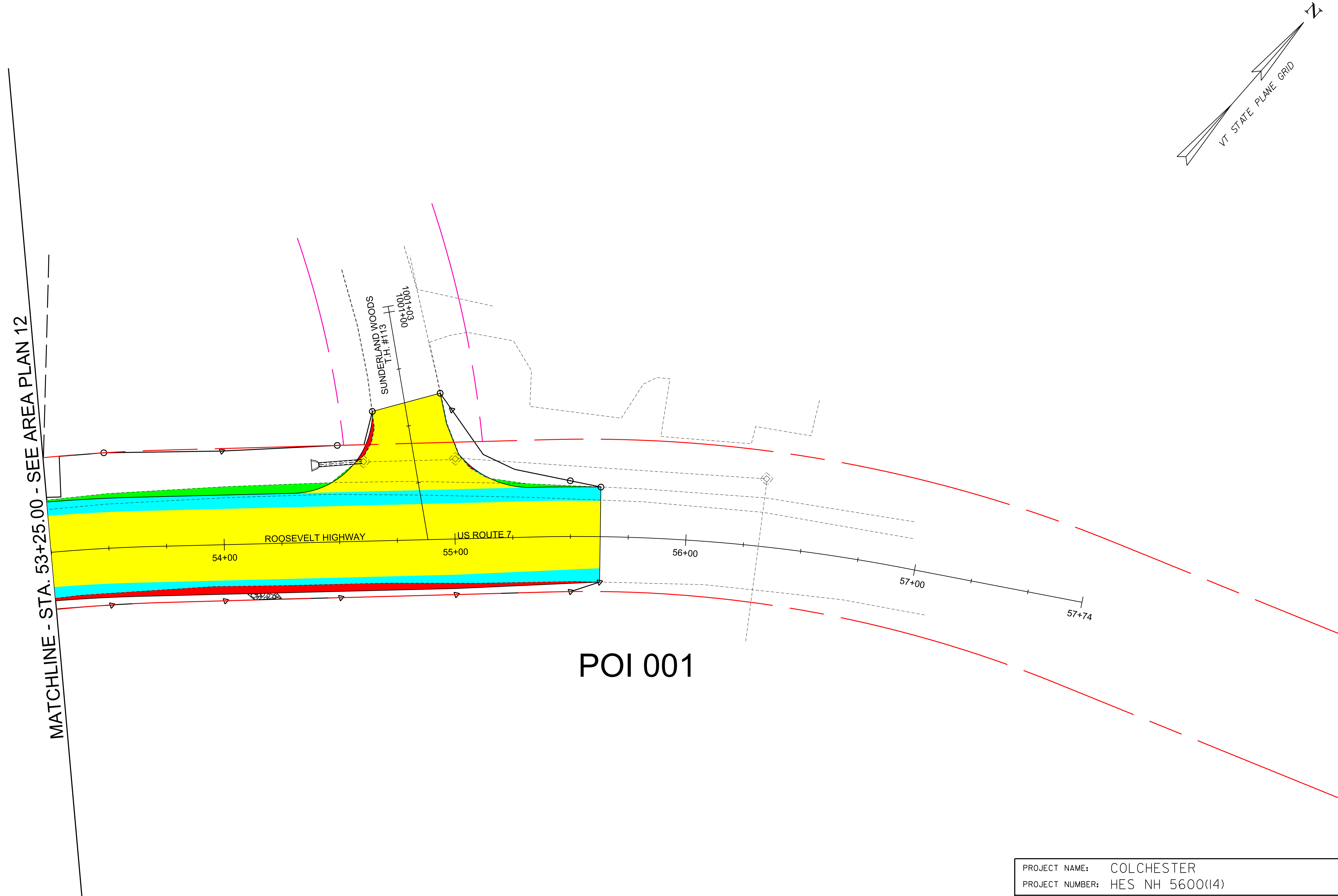
0 20 40
SCALE IN FEET

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN II

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 11 OF 13

PROJECT NAME:	COLCHESTER		
PROJECT NUMBER:	HES NH 5600(14)		
FILE NAME:	NAME$DGN	PLOT DATE:	$$$$DATE$$$
PROJECT LEADER:	P. COBURN	DRAWN BY:	T. SISSON
DESIGNED BY:	M. LACROIX	CHECKED BY:	M. LACROIX
JURISDICTIONAL AREA PLAN 12		SHEET	12 OF 13



PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
JURISDICTIONAL AREA PLAN 13

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 13 OF 13

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA01.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 1

PLOT DATE: 9/15/2014
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 153 OF 386

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA02.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 2	SHEET 154 OF 386

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA03.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 3

PLOT DATE: 9/15/2014
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 155 OF 386

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA04.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 4	SHEET 156 OF 386

PROJECT NAME: COLCHESTER	
PROJECT NUMBER: HES NH 5600(14)	
FILE NAME: eroA05.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 5	SHEET 157 OF 386

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA06.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 6	SHEET 158 OF 386

0 20 40

SCALE IN FEET

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA07.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 7	SHEET 159 OF 386

0 20 40
SCALE IN FEET

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA08.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 8	SHEET 160 OF 386

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA09.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 9
PLOT DATE: 9/15/2014
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 161 OF 386

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

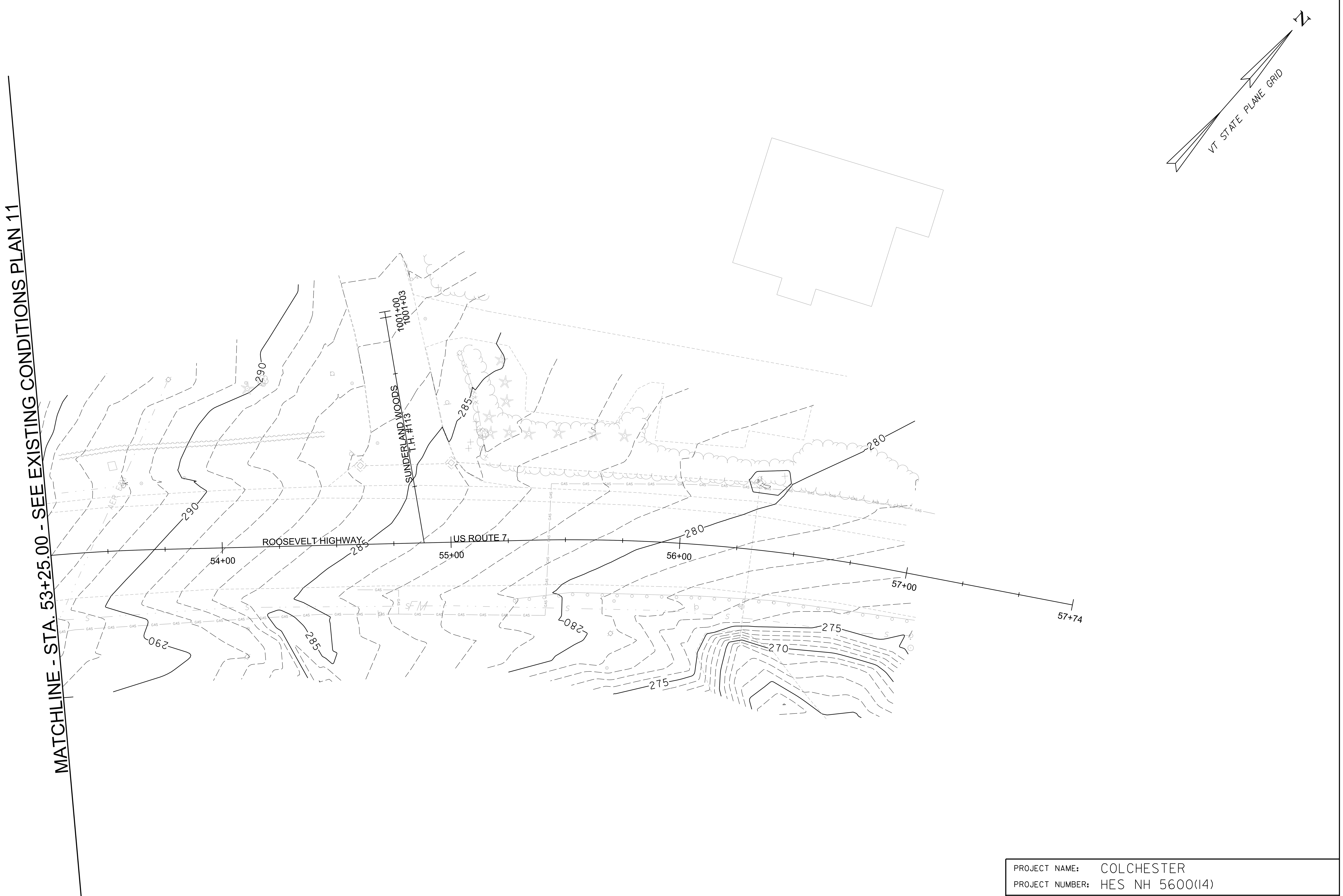
FILE NAME: eroA10.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 10

PLOT DATE: 9/15/2014
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 162 OF 386

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroAll.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN II

PLOT DATE: 9/15/2014
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 163 OF 386



PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA12.dgn	PLOT DATE: 9/15/2014
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 12	SHEET 164 OF 386

0 20 40
SCALE IN FEET

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA01.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 1

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 14 OF 29

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA02.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 2

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 15 OF 29

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA03.dgn	PLOT DATE: 6/12/2015
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 3	SHEET 16 OF 29

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: eroA04.dgn	PLOT DATE: 6/12/2015
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 4	SHEET 17 OF 29

PROJECT NAME: COLCHESTER	
PROJECT NUMBER: HES NH 5600(14)	
FILE NAME: eroA05.dgn	PLOT DATE: 6/12/2015
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN 5	SHEET 18 OF 29


N
VT STATE PLANE GRID
COVINGTON SILTY CLAY
HYDROGROUP = D
K FACTOR = 0.49
FARMINGTON EXTREMELY ROCKY LOAM, 5%-20% SLOPES
HYDROGROUP = D
K FACTOR = 0.32
FARMINGTON-STOCKBRIDGE ROCKY LOAM, 5%-12%
HYDROGROUP = D
K FACTOR = 0.32
MATCHLINE - STA. 20+75.00 - SEE EXISTING CONDITIONS PLAN 4
MATCHLINE - STA. 26+50.00 - SEE EXISTING CONDITIONS PLAN 7
ROOSEVELT HIGHWAY
US ROUTE 7
21+00
22+00
23+00
24+00
25+00
26+00
365
360
355
350
345
340
335
AER E&T
F.D.
FARMINGTON-STOCKBRIDGE ROCKY LOAM, 5%-12%
HYDROGROUP = D
K FACTOR = 0.32
COVINGTON SILTY CLAY
HYDROGROUP = D
K FACTOR = 0.49
0 20 40
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: eroA06.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 6
PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 19 OF 29

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA07.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 7

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 20 OF 29

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA08.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 8

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 21 OF 29

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroA09.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 9

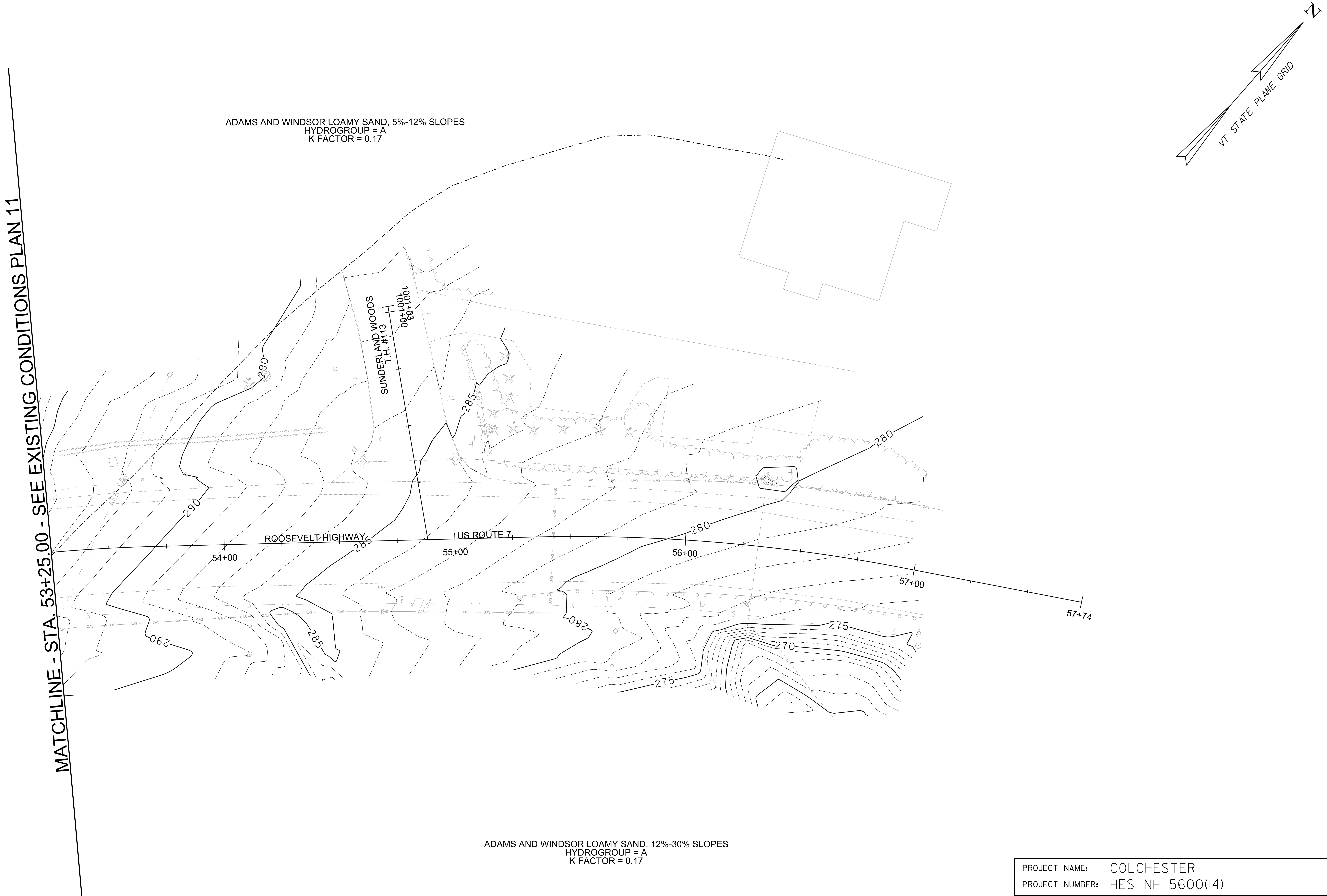
PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 22 OF 29

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: eroAl0.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 10

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 23 OF 29

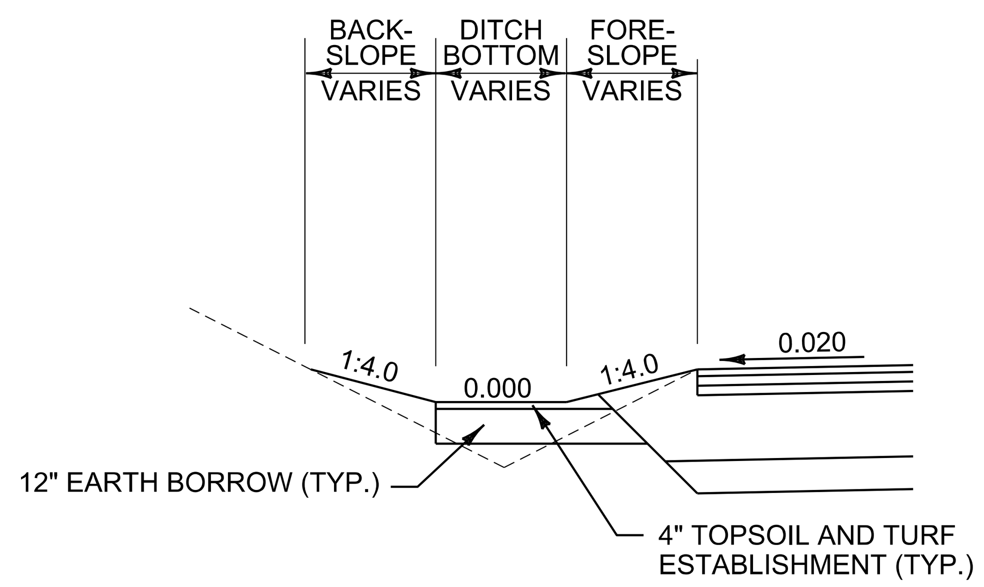
PROJECT NAME: COLCHESTER	
PROJECT NUMBER: HES NH 5600(14)	
FILE NAME: eroAll.dgn	PLOT DATE: 6/12/2015
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
EPSC - EXISTING CONDITIONS PLAN II	SHEET 24 OF 29



PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

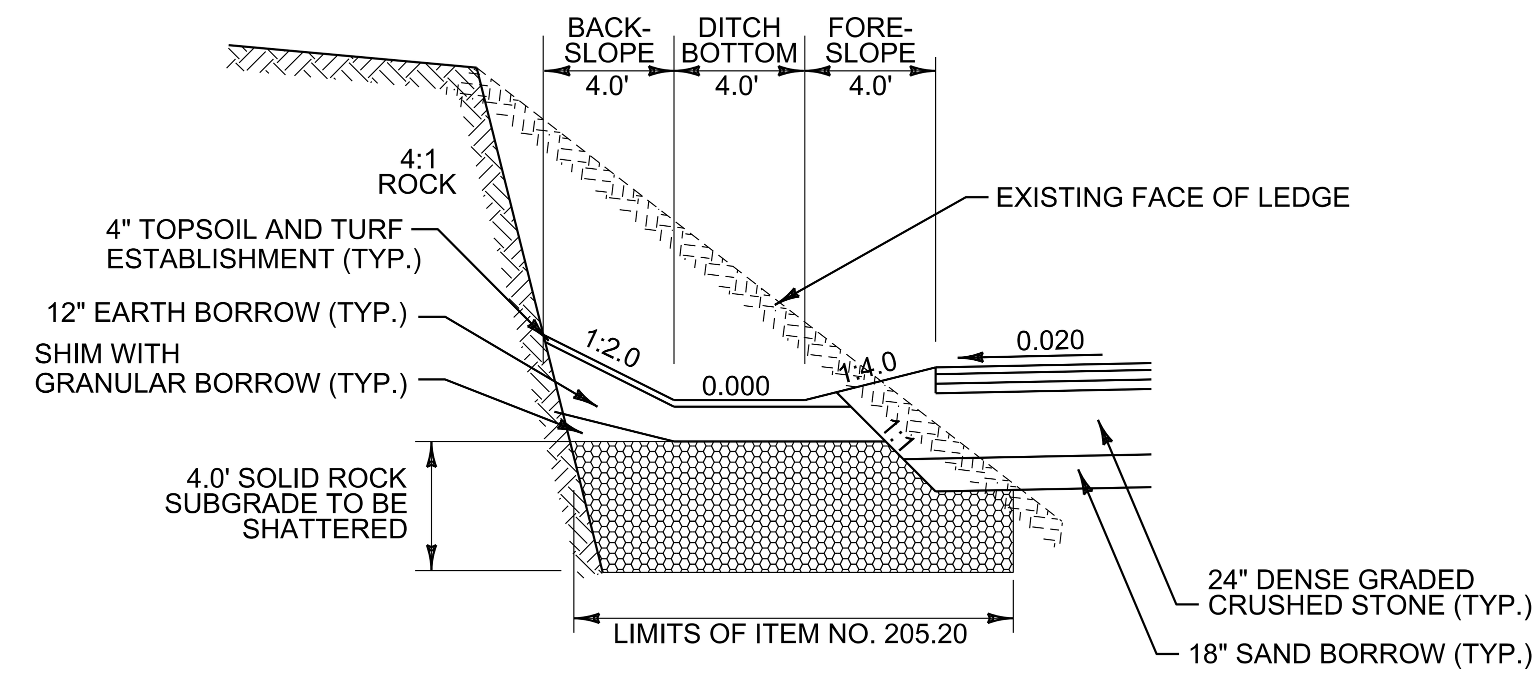
FILE NAME: eroAl2.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
EPSC - EXISTING CONDITIONS PLAN 12

PLOT DATE: 6/12/2015
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 25 OF 29



GRASS CHANNEL DETAIL

NOT TO SCALE



GRASS CHANNEL IN LEDGE CUT DETAIL

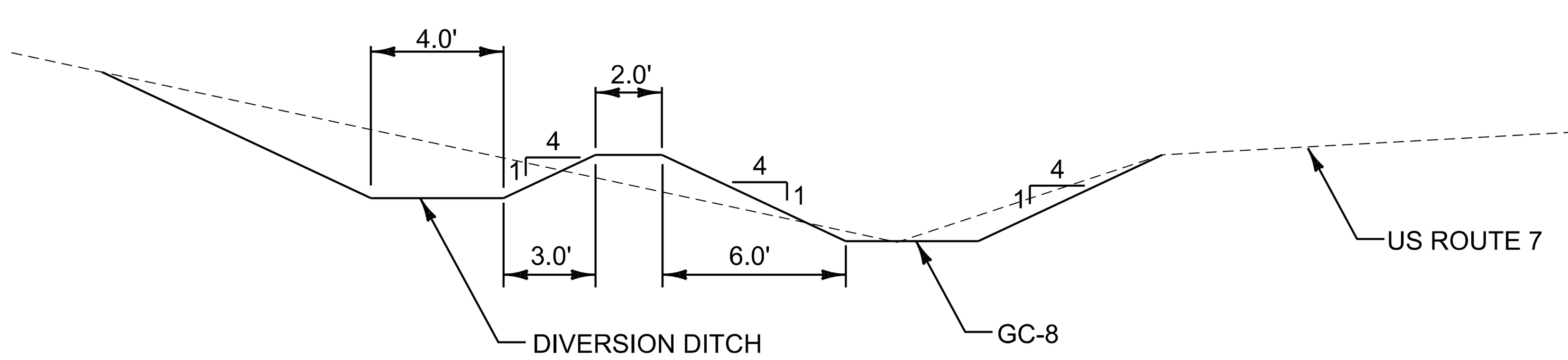
NOT TO SCALE

VAOT SAND & GRAVEL SITE CONSERVATION SEED MIX					
% WEIGHT	LBS/AC		NAME	GERM %	PURITY %
	BROADCAST	HYDROSEED			
32.00%	--	4	SWITCH GRASS	VARIES	VARIES
32.00%	--	4	BIG BLUESTEM	VARIES	VARIES
16.00%	--	2	LITTLE BLUESTEM	VARIES	VARIES
12.00%	--	2	SAND LOVEGRASS	VARIES	VARIES
8.00%	--	1	BLACKEYED SUSAN	VARIES	VARIES
100.00%	0	13			

CONSTRUCTION GUIDANCE

1. SEEDING SHALL BE COMPLETED BY THE USE OF A HYDROSEEDER AND DOZER COMBINATION.
2. USE DOZER TO TRACK THE SITE. SLOPES SHALL BE TRACKED UP AND DOWN, NOT SIDE TO SIDE.
3. ONLY CLEAN, WEED-FREE STRAW MULCH SHALL BE USED.
4. SEE TURF ESTABLISHMENT NOTES FOR MULCH, FERTILIZER AND LIMESTONE APPLICATION RATES.

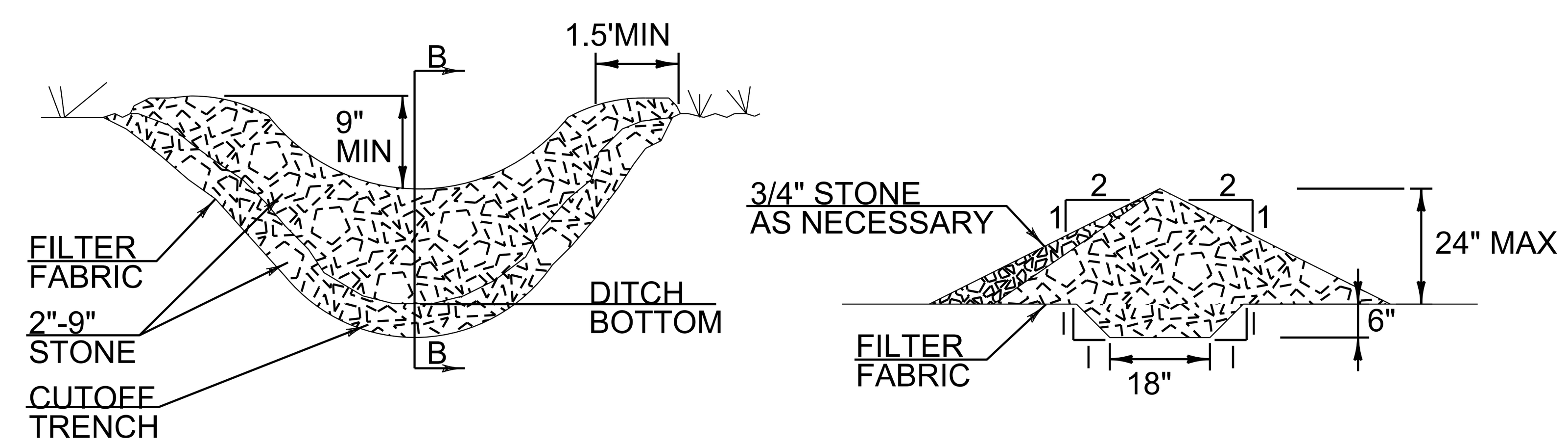
GRASS CHANNEL SEEDING



DIVERSION DITCH TYPICAL SECTION

NOT TO SCALE

STA. 34+40 - STA. 39+20, LT.

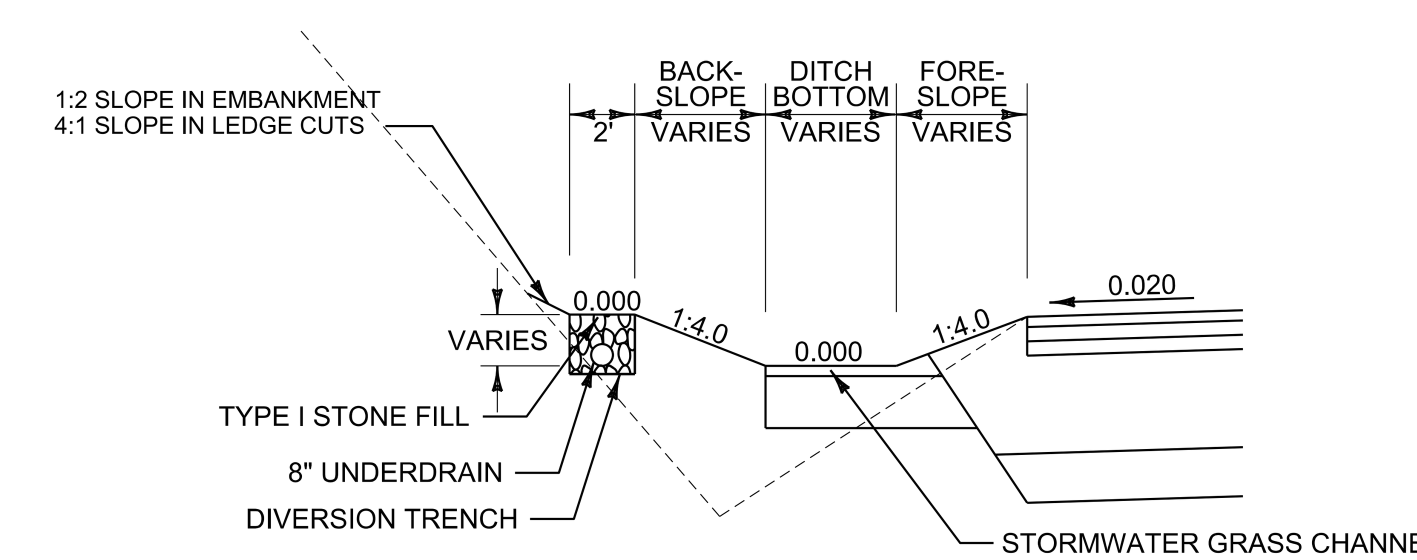


SECTION A-A

SECTION B-B

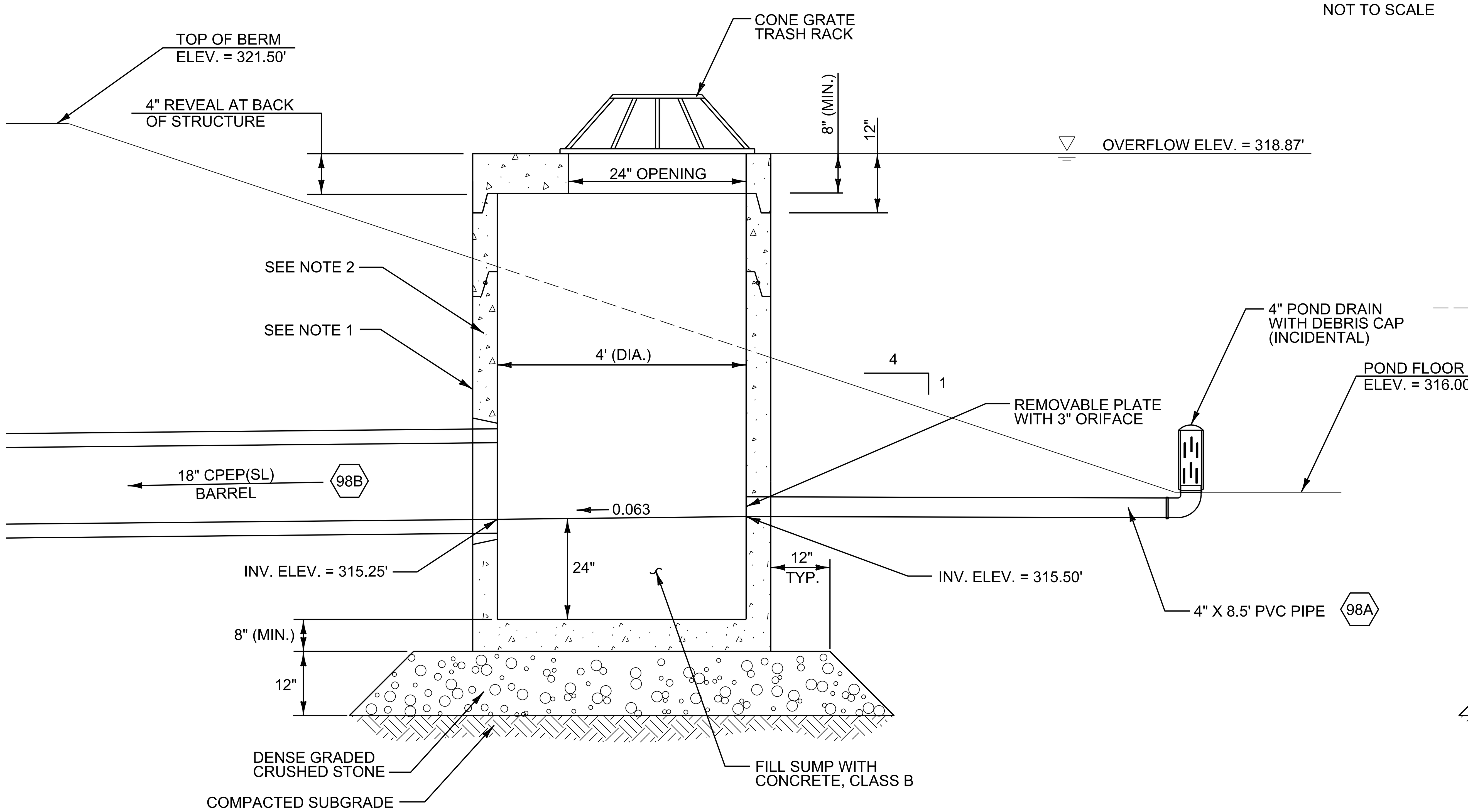
STONE CHECK DAM DETAIL

NOT TO SCALE



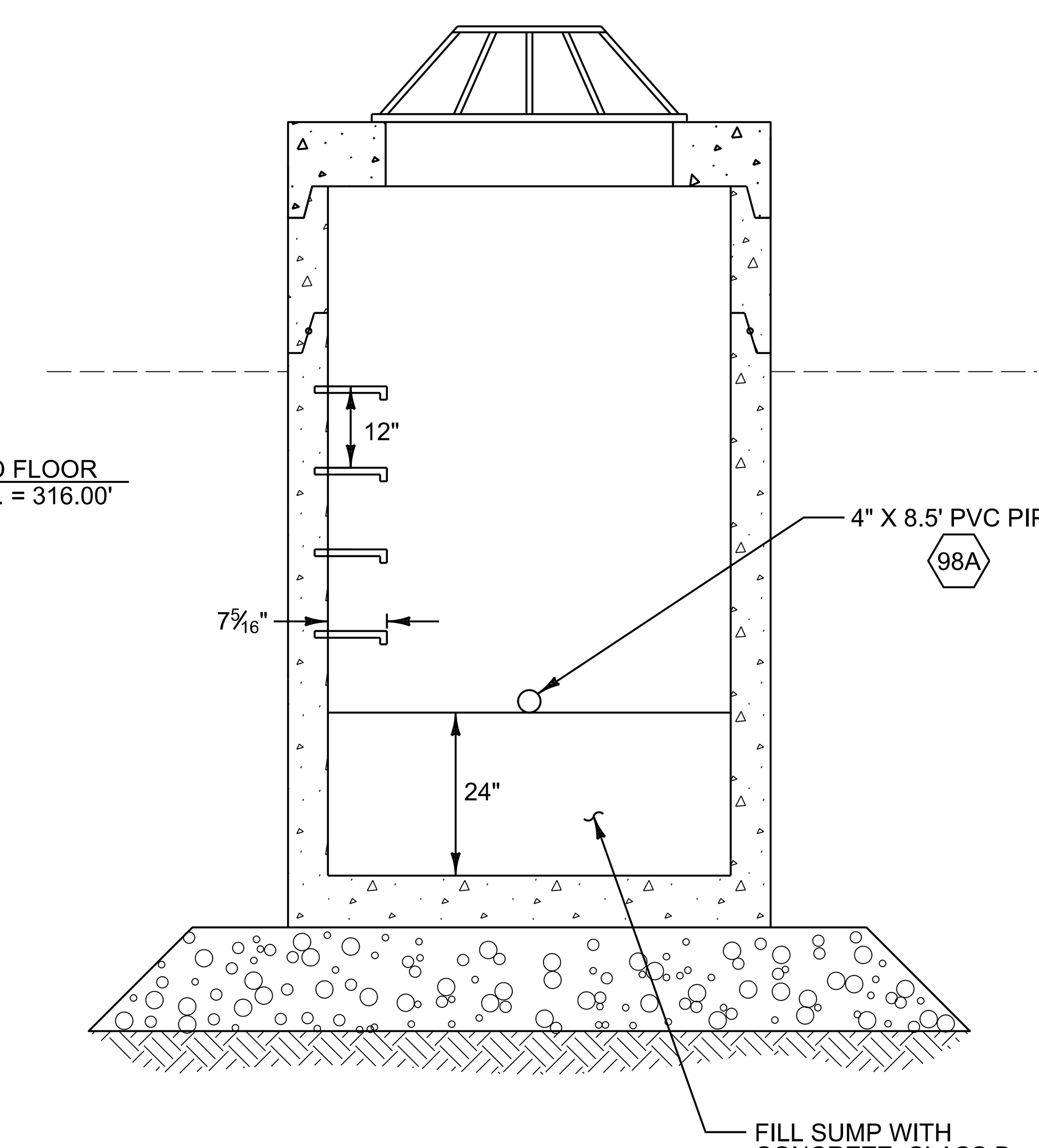
DIVERSION TRENCH DETAIL

NOT TO SCALE



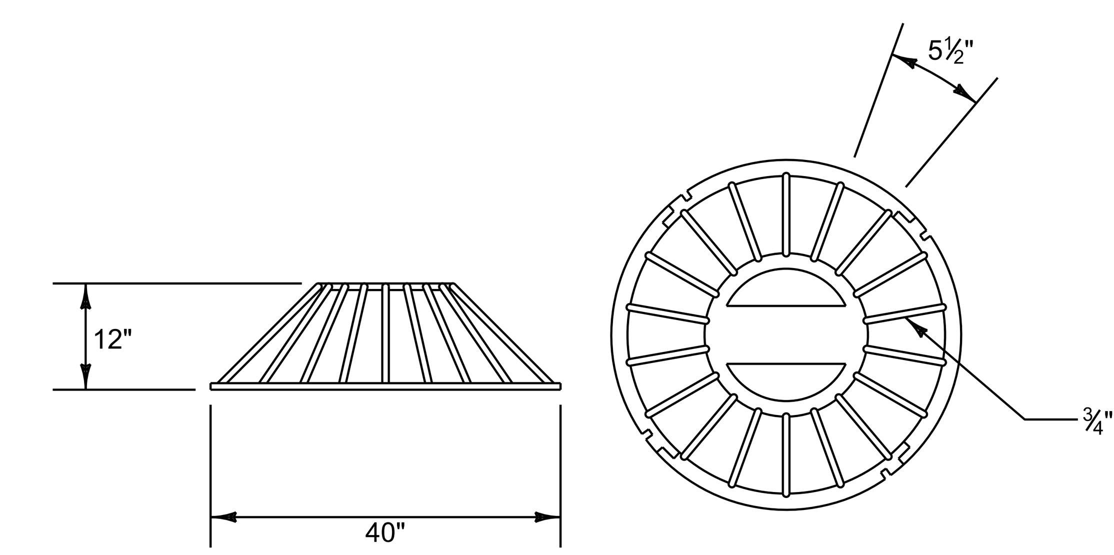
SPECIAL PROVISION (OVERFLOW CONTROL STRUCTURE) FOR DRY POND #4 ELEVATION VIEW

NOT TO SCALE



SPECIAL PROVISION (OVERFLOW CONTROL STRUCTURE) FOR DRY POND #4 FRONT VIEW

NOT TO SCALE



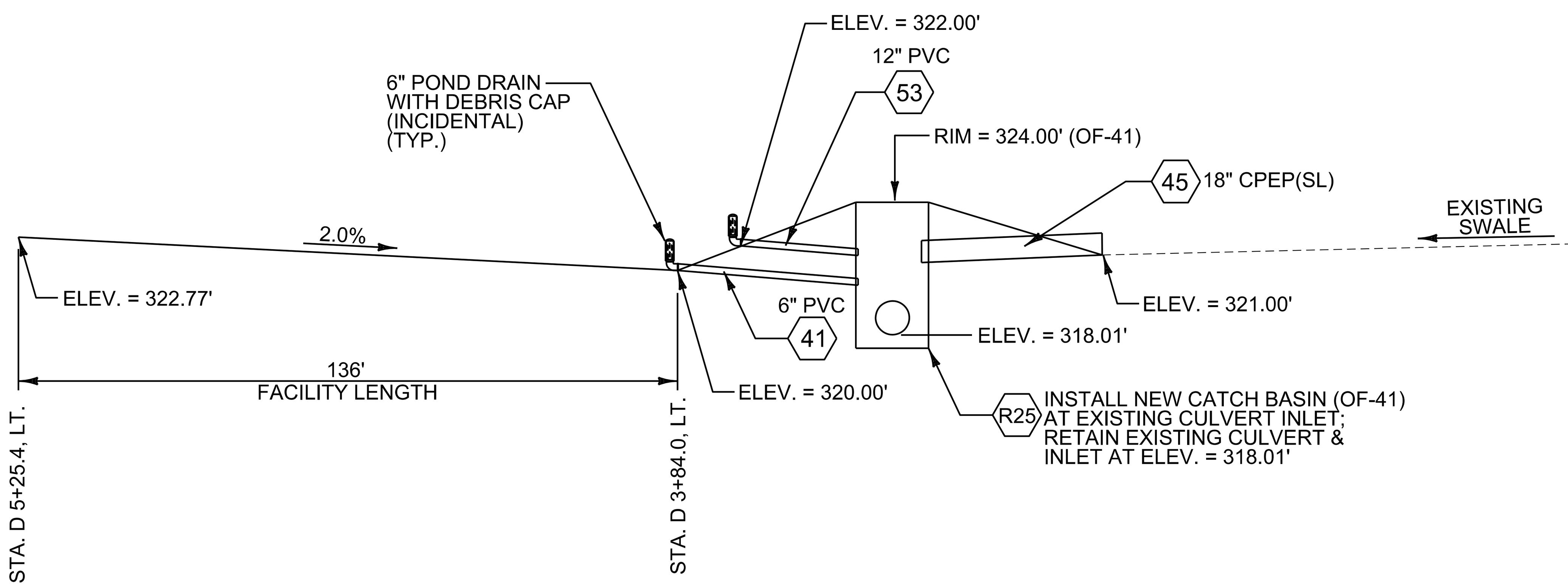
CONE GRATE TRASH RACK

NOT TO SCALE

NOTES:

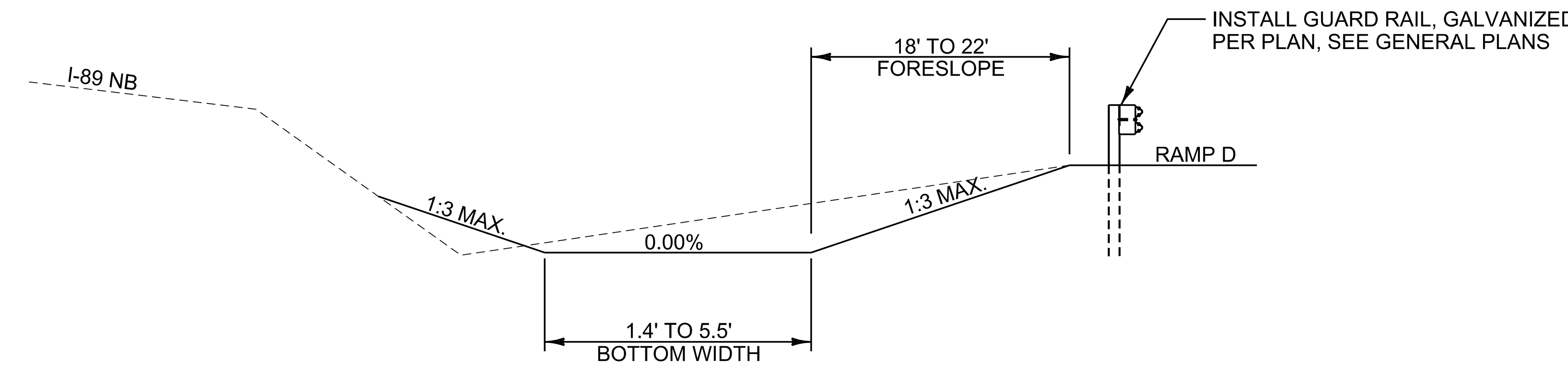
1. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
2. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.

PROJECT NAME: COLCHESTER	
PROJECT NUMBER: HES NH 5600(14)	
FILE NAME: swm_det01.dgn	PLOT DATE: 4/28/2016
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
STORMWATER MANAGEMENT DETAILS SHEET	SHEET 152 OF 394



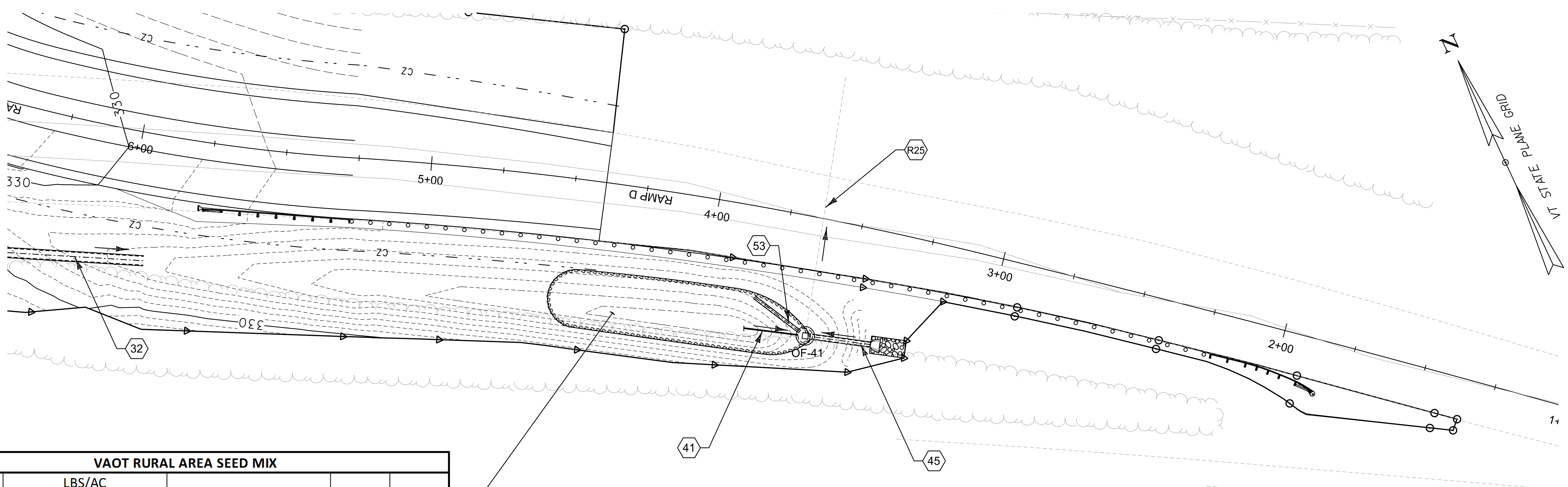
STORMWATER DRY POND PROFILE

NOT TO SCALE
STA. D 3+84 - STA. D 5+25, LT.



STORMWATER DRY POND TYPICAL SECTION

NOT TO SCALE
STA. D 3+84 - STA. D 5+25, LT.

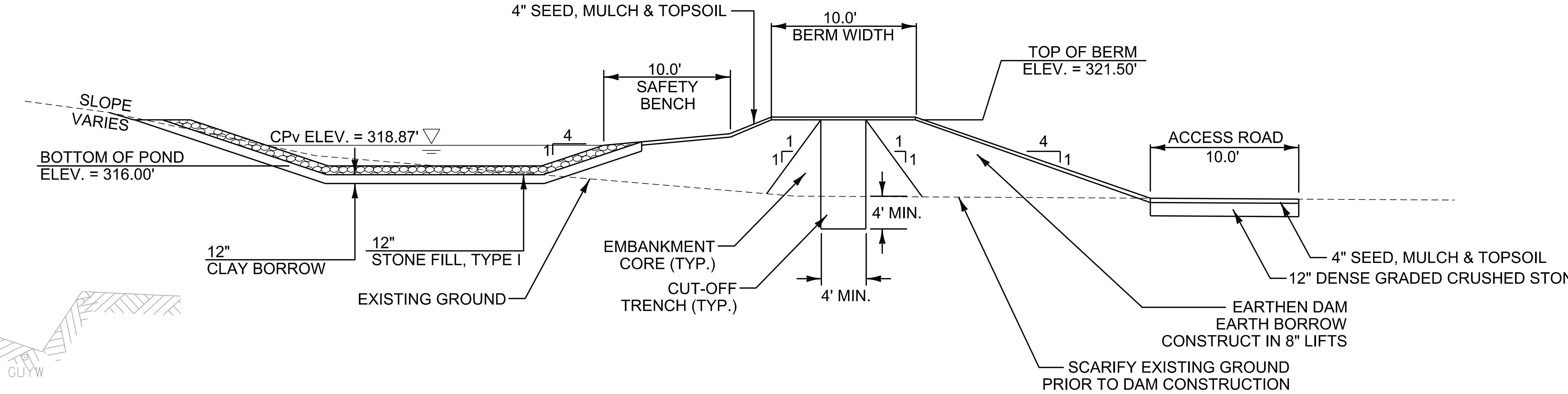


DRY POND #8 PLAN

VAOT RURAL AREA SEED MIX					
% WEIGHT	LBS/AC		NAME	GERM %	PURITY %
	BROADCAST	HYDROSEED			
37.50%	22.5	45	CREEPING RED FESCUE	85%	98%
37.50%	22.5	45	TALL FESCUE	90%	95%
5.00%	3	6	RED TOP	90%	95%
15.00%	9	18	BIRDSFOOT TREFOIL	85%	98%
5.00%	3	6	ANNUAL RYE GRASS	85%	95%
100.00%	60	120			

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

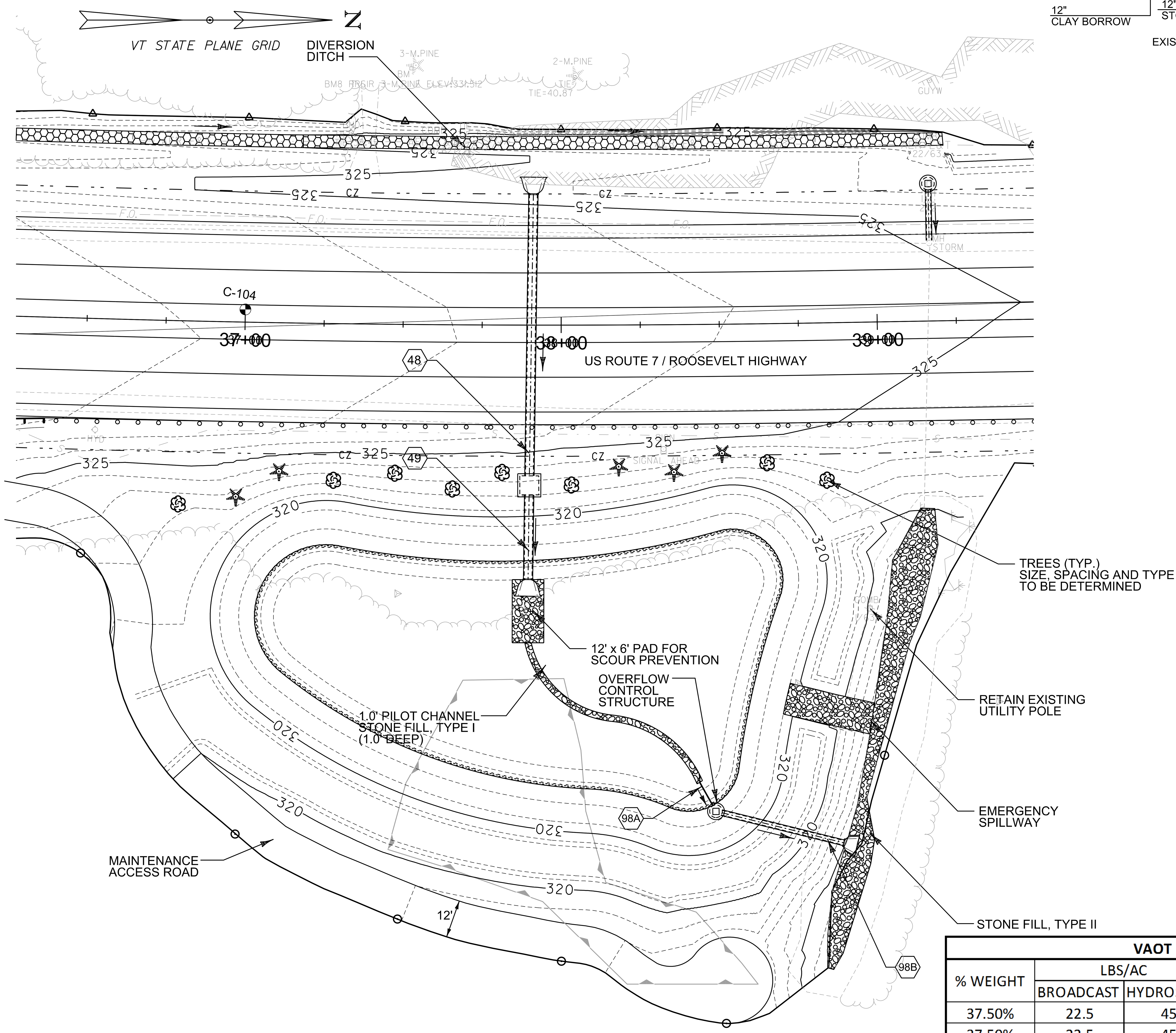
FILE NAME: swm_det02.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRY POND PLAN SHEET 2
PLOT DATE: 4/28/2016
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 153 OF 394



STORMWATER DRY POND TYPICAL SECTION

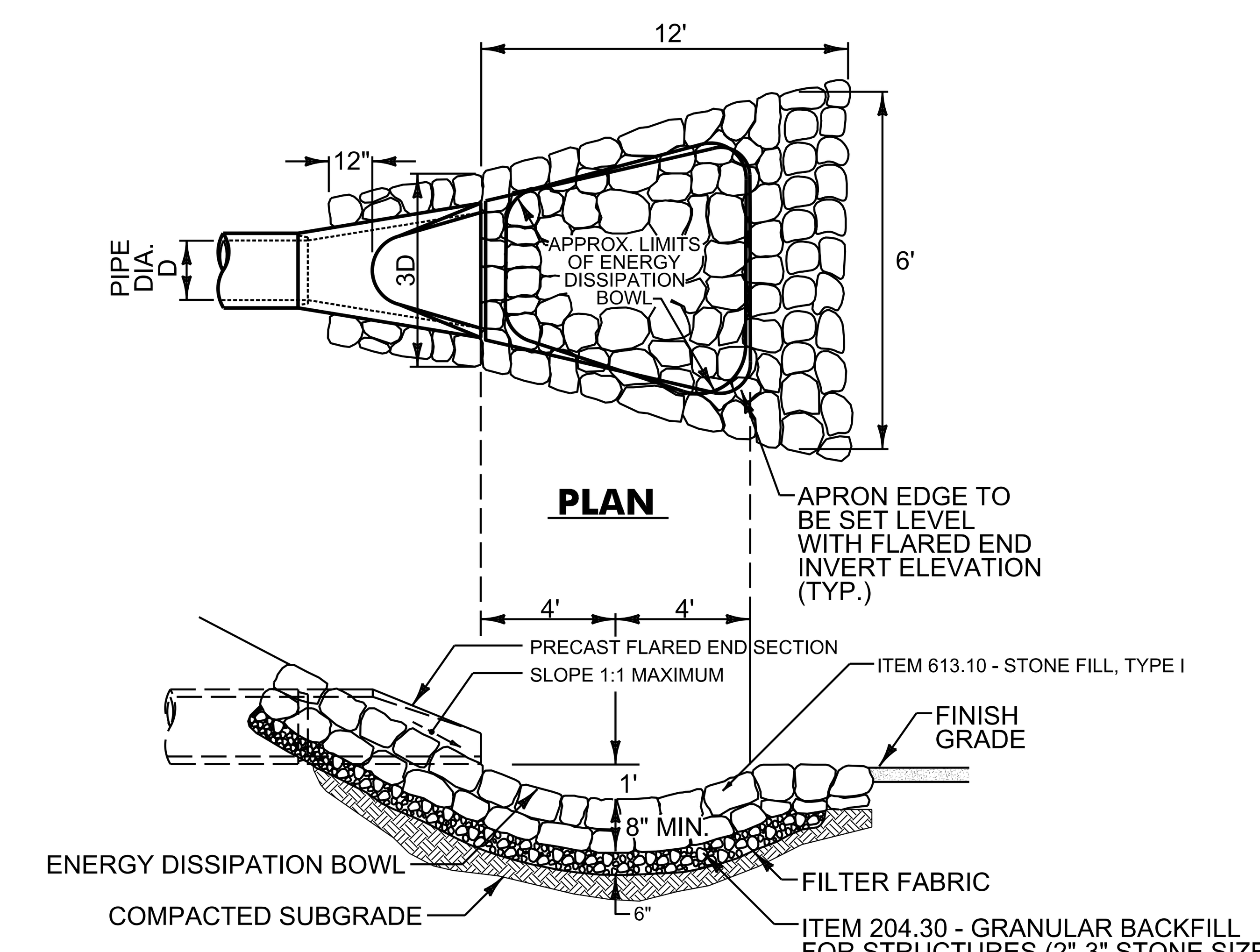
NOT TO SCALE
STA. 36+80 - STA. 38+90, RT.

MAKE SURE ALL TEXT AND ARROWHEADS MATCH REST OF DETAILS ON SHEET...



DRY POND #4 PLAN

0 20 40
SCALE IN FEET



SCOUR PROTECTION PAD DETAIL

NOT TO SCALE
STA. 37+90, RT.

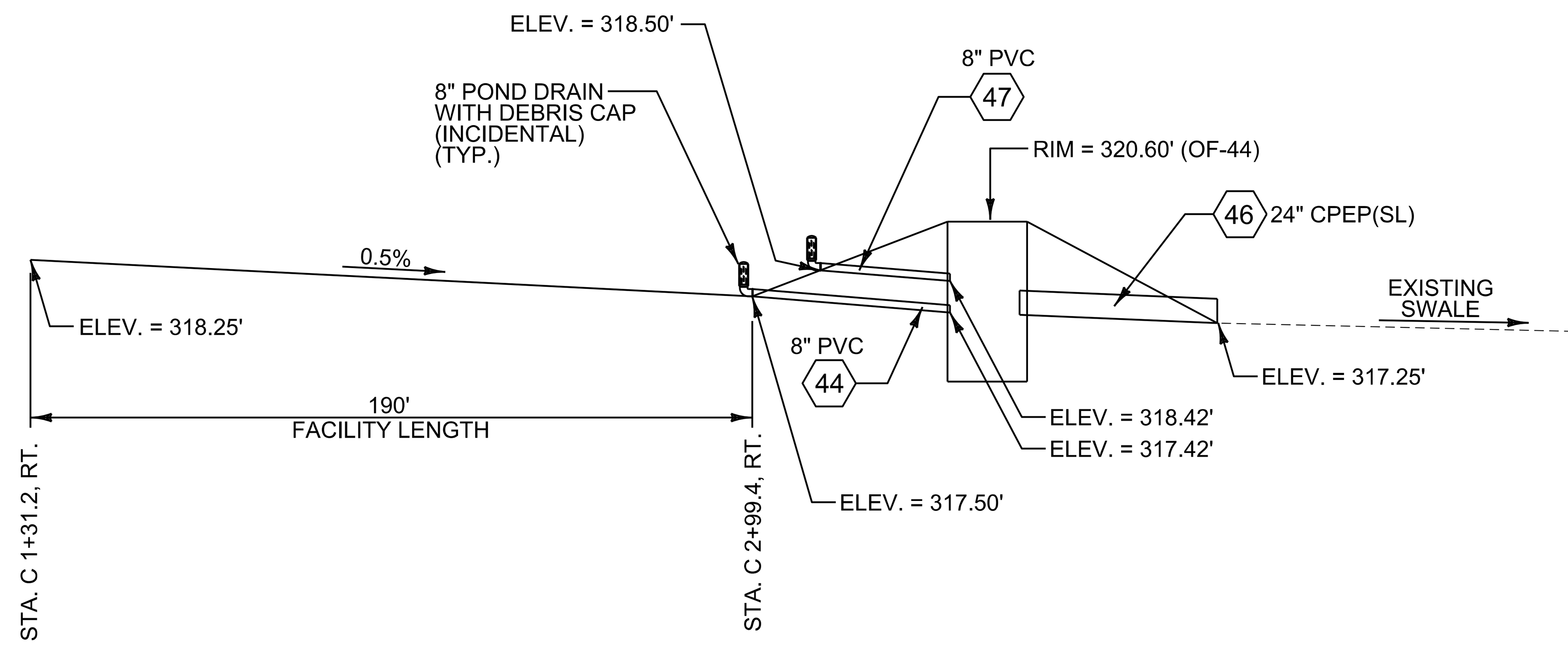
VAOT RURAL AREA SEED MIX

% WEIGHT	LBS/AC		NAME	GERM %	PURITY %
	BROADCAST	HYDROSEED			
37.50%	22.5	45	CREEPING RED FESCUE	85%	98%
37.50%	22.5	45	TALL FESCUE	90%	95%
5.00%	3	6	RED TOP	90%	95%
15.00%	9	18	BIRDSFOOT TREFOIL	85%	98%
5.00%	3	6	ANNUAL RYE GRASS	85%	95%
100.00%	60	120			

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

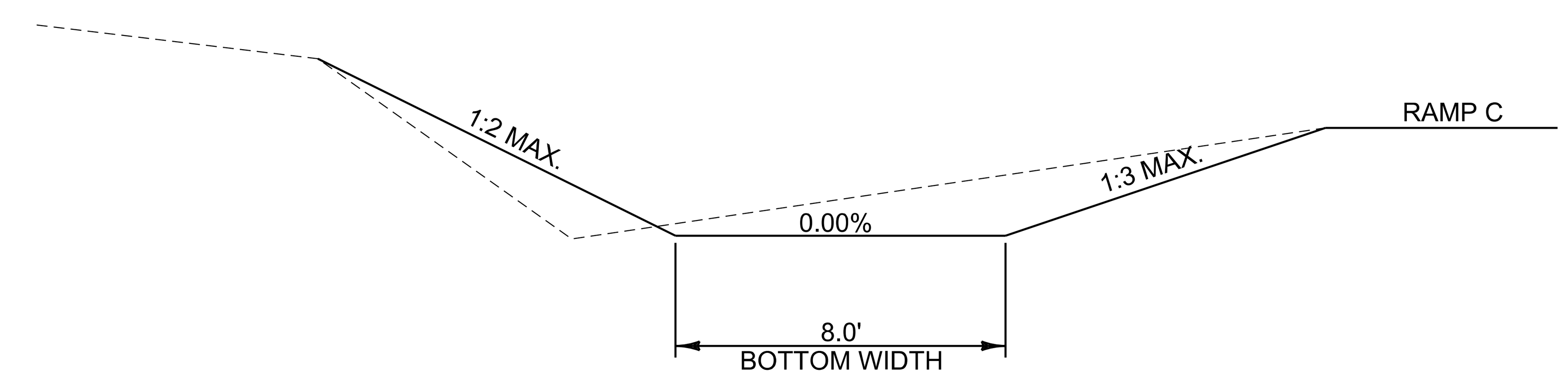
FILE NAME: swm_det03.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRY POND PLAN SHEET 1

PLOT DATE: 4/28/2016
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET 154 OF 394



STORMWATER DRY POND PROFILE

NOT TO SCALE
STA. C 1+31 - STA. C 2+99, RT.



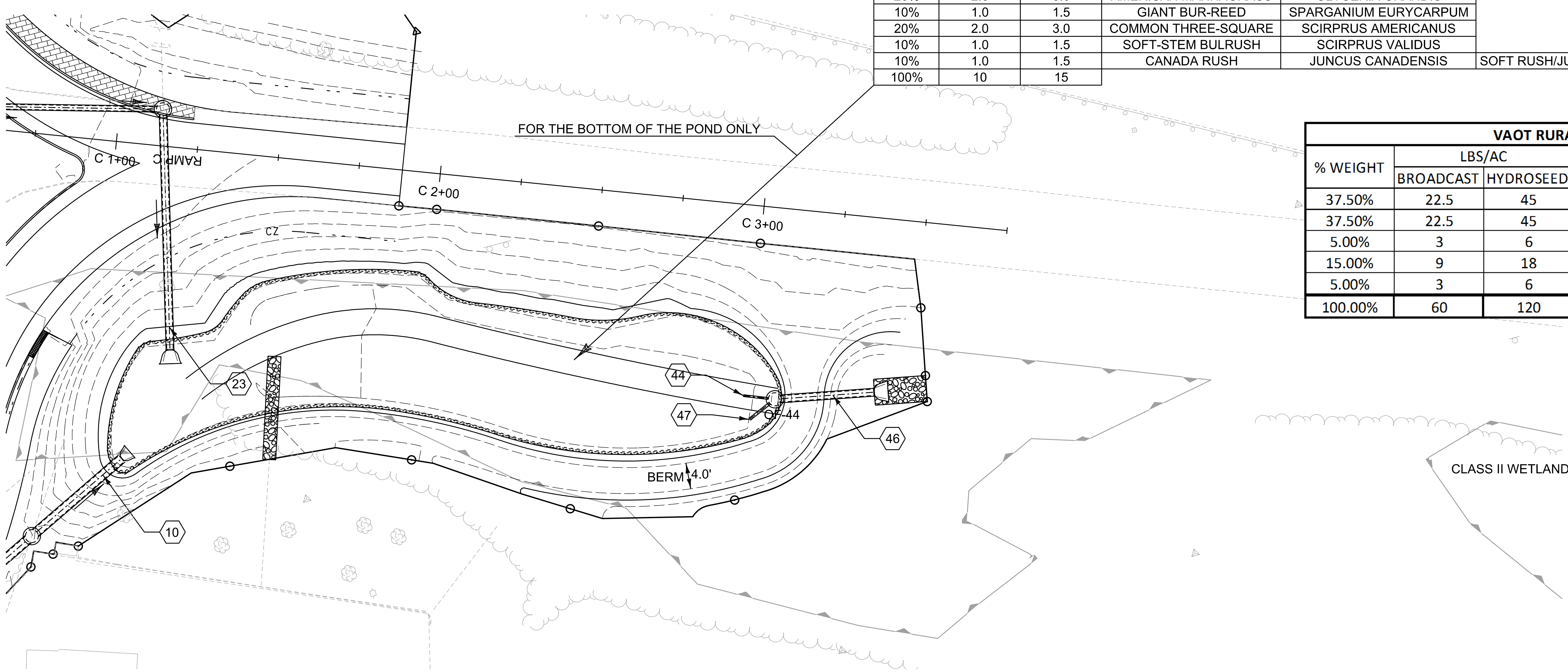
STORMWATER DRY POND TYPICAL SECTION

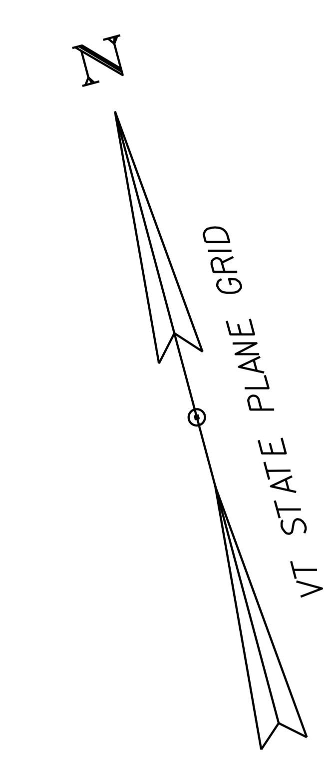
NOT TO SCALE
STA. C 1+31 - STA. C 2+99, RT.

WET AREA MIX					
LBS/AC			NAME		
WEIGHT	BROADCAST	HYDROSEED	COMMON	LATIN	
20%	2.0	3.0	VIRGINIA WILD RYE GRASS	ELYMUS VIRGINICUS	
10%	1.0	1.5	FOX SEDGE	CAREX VULPINOIDEA	FOWL BLUEGRASS/POA PALUSTRIS (NE AG) CAMBRIDGE JUNE 2014
20%	2.0	3.0	AMERICAN MANNAGRASS	GLYCERIA GRANDIS	
10%	1.0	1.5	GIANT BUR-REED	SPARGANIUM EURYCARPUM	
20%	2.0	3.0	COMMON THREE-SQUARE	SCIRPRUS AMERICANUS	
10%	1.0	1.5	SOFT-STEM BULRUSH	SCIRPRUS VALIDUS	
10%	1.0	1.5	CANADA RUSH	JUNCUS CANADENSIS	SOFT RUSH/JUNCUS EFFUSUS (NE AG) CAMBRIDGE JUNE 2014
100%	10	15			

FOR THE BOTTOM OF THE POND ONLY

VAOT RURAL AREA SEED MIX					
% WEIGHT	LBS/AC		NAME	GERM %	PURITY %
	BROADCAST	HYDROSEED			
37.50%	22.5	45	CREEPING RED FESCUE	85%	98%
37.50%	22.5	45	TALL FESCUE	90%	95%
5.00%	3	6	RED TOP	90%	95%
15.00%	9	18	BIRDSFOOT TREFOIL	85%	98%
5.00%	3	6	ANNUAL RYE GRASS	85%	95%
100.00%	60	120			





DRY POND #7 PLAN

0 20 40
SCALE IN FEET

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: swm_det04.dgn	PLOT DATE: 4/28/2016
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
DRY POND PLAN SHEET 3	SHEET 155 OF 394

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRAINAGE PLAN I

PLOT DATE: $$$$DATE$$$
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET $S"$ OF $T"$

PROJECT NAME:	COLCHESTER		
PROJECT NUMBER:	HES NH 5600(14)		
FILE NAME:	NAME$DGN	PLOT DATE:	$$$$DATE$$$
PROJECT LEADER:	P. COBURN	DRAWN BY:	M. LACROIX
DESIGNED BY:	M. LACROIX	CHECKED BY:	HSD
DRAINAGE PLAN 2A		SHEET	$S"$ OF $T"$

PROJECT NAME:	COLCHESTER		
PROJECT NUMBER:	HES NH 5600(14)		
FILE NAME:	NAME$DGN	PLOT DATE:	$$$$DATE$$$
PROJECT LEADER:	P. COBURN	DRAWN BY:	M. LACROIX
DESIGNED BY:	M. LACROIX	CHECKED BY:	HSD
DRAINAGE PLAN 3		SHEET	$S"$ OF $T"$

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRAINAGE PLAN 4

PLOT DATE: $$$$DATE$$$
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET $S"$ OF $T"$

0 20 40
SCALE IN FEET

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: NAME$DGN	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: P. COBURN	DRAWN BY: M. LACROIX
DESIGNED BY: M. LACROIX	CHECKED BY: HSD
DRAINAGE PLAN 5	SHEET $S"$ OF $T"$

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRAINAGE PLAN 6
PLOT DATE: $$$$DATE$$$
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET $S"$ OF $T"$

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRAINAGE PLAN 7

PLOT DATE: $$$$DATE$$$
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET $S"$ OF $T"$

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: NAME$DGN
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
DRAINAGE PLAN 8

PLOT DATE: $$$$DATE$$$
DRAWN BY: M. LACROIX
CHECKED BY: HSD
SHEET $S"$ OF $T"$

COLCHESTER
HES NH 5600(14)
PROJECT MAP

COLCHESTER
HES NH 5600(14)
PROJECT MAP

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME:	projectmap.dgn	PLOT DATE:	9/11/2014
PROJECT LEADER:	P. COBURN	DRAWN BY:	T. SISSON
DESIGNED BY:	M. LACROIX	CHECKED BY:	M. LACROIX
PROJECT MAP		SHEET 1 OF 1	

COLCHESTER
HES NH 5600(14)
SUNNYSIDE WATERSHED MAP

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

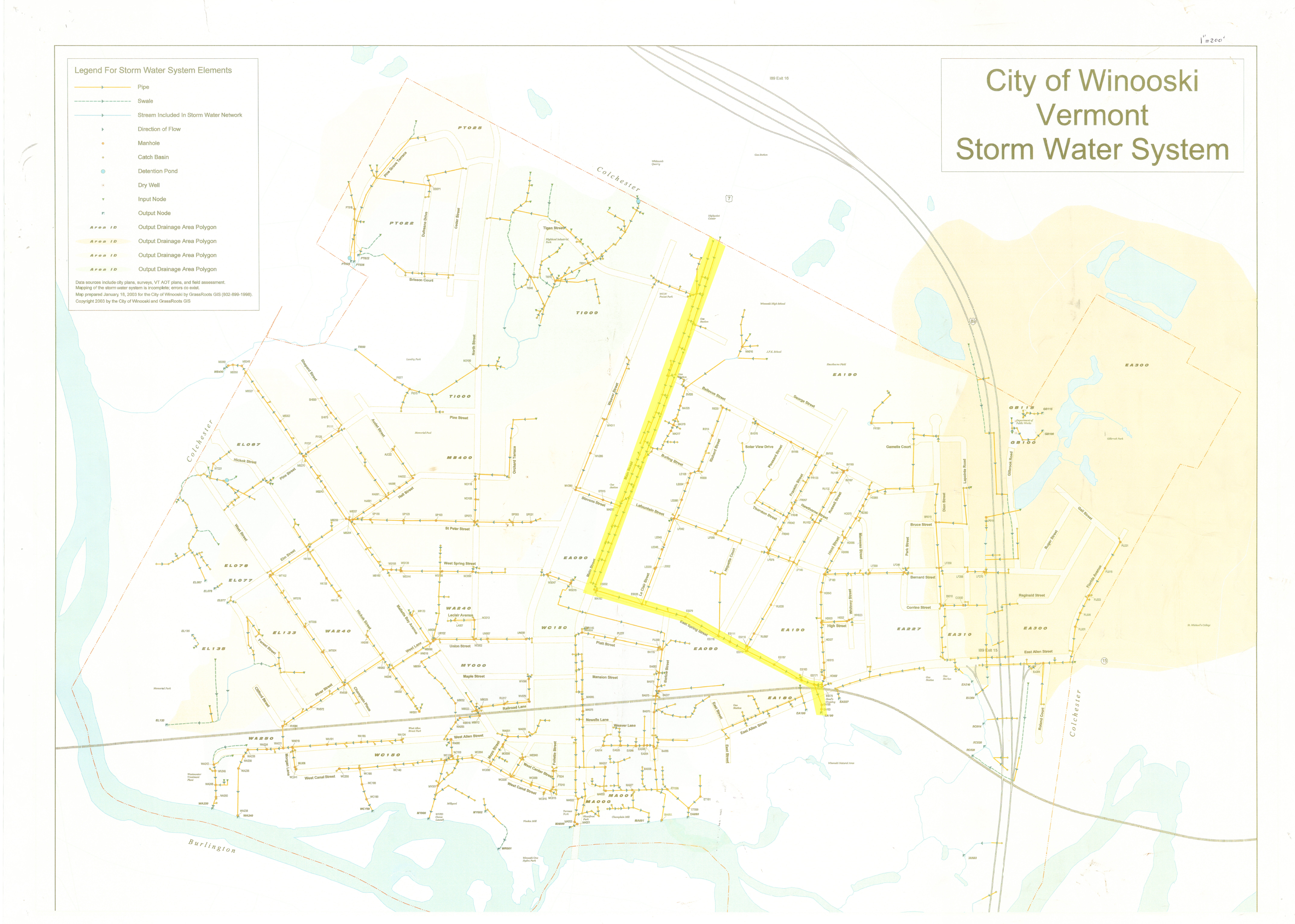
FILE NAME: watershed map.dgn	PLOT DATE: 9/11/2014
PROJECT LEADER: P. COBURN	DRAWN BY: T. SISSON
DESIGNED BY: M. LACROIX	CHECKED BY: M. LACROIX
WATERSHED MAP	SHEET 1 OF 1

COLCHESTER HES NH 5600(14) SUNNYSIDE WATERSHED MAP

PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: watershed map.dgn	PLOT DATE: 9/11/2014
PROJECT LEADER: P. COBURN	DRAWN BY: T. SISSON
DESIGNED BY: M. LACROIX	CHECKED BY: M. LACROIX
WATERSHED MAP	SHEET 1 OF 1


COLCHESTER
HES NH 5600(14)
WINOOSKI
WATERSHED MAP
PROJECT LOCATION
1,048 SQUARE MILES
0 400 800
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: watershed map.dgn
PROJECT LEADER: P. COBURN
DESIGNED BY: M. LACROIX
WATERSHED MAP
PLOT DATE: 9/11/2014
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET 1 OF 1



PROJECT NAME:	COLCHESTER
PROJECT NUMBER:	HES NH 5600(14)

FILE NAME: NAME$DGN	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: P. COBURN	DRAWN BY: T. SISSON
DESIGNED BY: M. LACROIX	CHECKED BY: M. LACROIX
WINOOSKI STORM SYSTEM	SHEET OF

Project: Colchester
HES NH 5600 (14)
Stormwater Management

Soils Data:

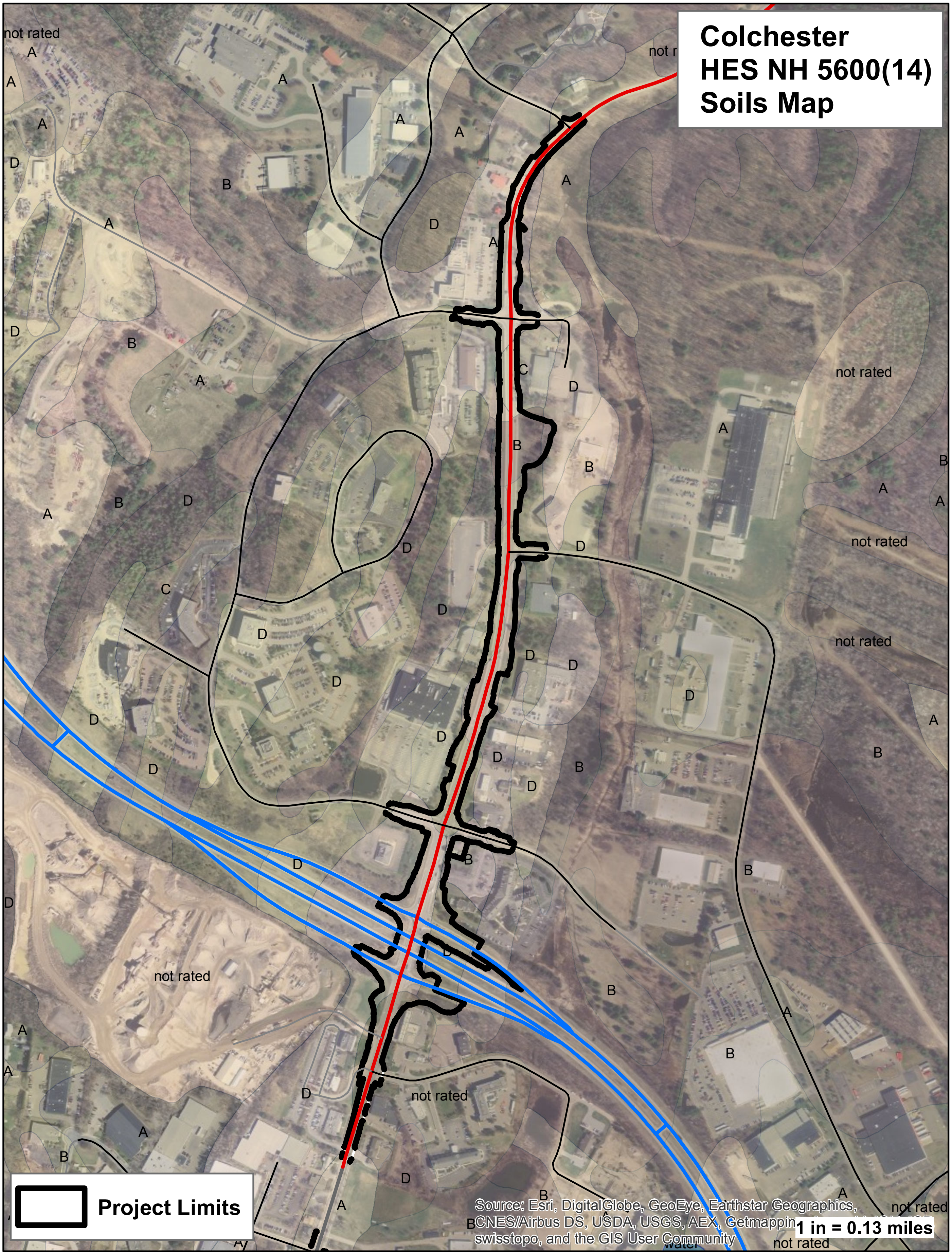
Soil Name	Hydrologic Soil Group	Area (%)
Fill Land	Not Rated	8.9
Farmington-Stockbridge Rocky Loam	D	35.1
Covington Silty Clay	D	13.8
Belgrade and Eldridge Soils	B	2.9
Farmington Extremely Rocky Loam	D	10.7
Au Grey Fine Sandy Loam	B	8.1
Adams and Windsor Loamy Sand	A	16.6
Enosburg and Whately Soils	C	3.9

Results:

Hydrologic Soil Group	Percent of Site
A	16.6%
B	11.1%
C	3.9%
D	59.5%
Not Rated	8.9%

Notes:

This soil information was obtained using the project's site limits and the Natural Resources Conservation Service (NRCS) Web Soil Survey 2.0. In all calculations where determining one and ten year storm flows using TR-55, hydrologic soil groups A, B, C and D were applied. Soils that are Not Rated were assumed hydrologic soil group D for all calculations to be conservative.


Colchester
HES NH 5600(14)
Soils Map
Project Limits
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmappin
swisstopo, and the GIS User Community
1 in = 0.13 miles
not rated

Project: Colchester
HES NH 5600 (14)
Stormwater Management

Water Quality Treatment Standard:

The water quality volumes (WQ_v) were calculated in accordance with the 2002 Vermont Stormwater Management Manual, Volumes I and II. To meet the Water Quality Treatment Standard 100 % of all new impervious area needs to be treated, and 20% of jurisdictional redeveloped area needs to be treated. The following table displays the amount of impervious area that must be collected and treated for the site. Grass Channels are modeled with and provide treatment for the full impervious tributary area; they collect and treat new impervious area, jurisdictional redeveloped area, and resurfaced area.

Water Quality Treatment Standard (Project)	
Rainfall (inches)	0.9
Site Areas (acres)	18.404
New Impervious Area: Expansion (acres)	1.576
Reconstructed Impervious Area: Redevelopment (acres)	3.203
Resurfacing (acres)	6.507
Existing Impervious Area (acres)	0.457
Total On-Site Impervious Area (acres)	11.286
New Impervious Area Requiring Treatment, 100% (acres)	1.576
Reconstruct. Impervious Area Requiring Treatment, 20% (acres)	0.641
Total Impervious Area Requiring Treatment (acres)	**2.217**
Total Impervious Area Treated (acres)	**2.569**
Total Calculated Water Quality Volume (cf)	**60,844**

Project: Colchester
HES NH 5600 (14)
Stormwater Treatment
Practice: Grass Channel 1
Sta. A -0+74.9 LT. - Sta. AL 1+85.2, LT.

Grass Channel Description: The Grass Channel is located from Station A -0+74.9 to Station AL 1+85.2 on the left side of the proposed I-89 Exit 16 southbound off ramp.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	53,370
Total Impervious Area (square feet)*:	15,116
Off-Site Impervious Area (square feet)*:	13,096
Runoff Coefficient:	0.305
Runoff Volume (inches):	0.274
Curve Number:	91
Initial Abstraction:	0.209
Initial Abstraction/Rainfall:	0.233
Time of Concentration (min.):	18.2
Unit Peak Discharge (csm/in):	650
Water Quality Volume (cf):	**1230**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 2,020 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	4’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	2.7%
Channel Depth:	1’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	0.341
Depth of Flow (inches):	1.97
Manning’s “n” Coefficient:	0.15
Cross Sectional Area (sf):	0.764
Velocity (ft/s):	0.4
Length required for 10 min. residence time (ft):	267

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.4 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 267 feet. This channel provides treatment over a length of 270 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 1.97 inches.

One-Year Storm Event for Grass Channel	
Curve Number:	85
Peak Discharge (cfs):	1.25
Depth of Flow (inches):	4.085
Velocity (ft/s):	0.7

Ten-Year Storm Event for Grass Channel	
Curve Number:	85
Peak Discharge (cfs):	2.44
Depth of Flow (inches):	5.43
Velocity (ft/s):	0.9

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.7 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 270 feet
- Impervious Area treated = 2,020 square feet
- Water Quality Volume = 1230 cf
- Water Quality Storm Velocity = 0.4 ft/s
- Length required for 10 minute residence time = 267 feet
- One-year Storm Velocity = 0.7 ft/s

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Grass Channel 4**
	Sta. 13+51.6, LT. - Sta. 403+07.5, LT.

Grass Channel Description: The Grass Channel is located from Station 13+51.6 to Station 403+07.5 on the left side of US Route 2 & 7 and the left side of Mountain View Road.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	1,027,207
Total Impervious Area (square feet)*:	588,048
Off-Site Impervious Area (square feet)*:	541,846
Runoff Coefficient:	0.104-0.717
Runoff Volume (inches):	Varies
Curve Number:	88-96
Water Quality Volume (cf):	43,658

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 43,853 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel. This grass channel includes a check dam to prevent scour from water that outlets from the closed drainage system directly to this channel.

Grass Channel Design Criteria	
Bottom Width:	5’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	3.8%
Channel Depth:	1.5’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	2.12
Depth of Flow (inches):	4.4
Manning’s “n” Coefficient:	0.144
Cross Sectional Area (sf):	2.371
Velocity (ft/s):	0.9
Length required for 10 min. residence time (ft):	536

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.9 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 536 feet. This channel provides treatment over a length of 625 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 4.4 inches. While the depth does exceed the guideline of four inches, it only exceeds it slightly and meets all of the other requirements for the Water Quality storm.

One-Year Storm Event for Grass Channel	
Curve Number:	81-93
Peak Discharge (cfs):	8.91
Depth of Flow (inches):	7.665
Velocity (ft/s):	1.8

Ten-Year Storm Event for Grass Channel	
Curve Number:	81-93
Peak Discharge (cfs):	22.44
Depth of Flow (inches):	9.985
Velocity (ft/s):	3.3

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 1.8 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 625 feet
- Impervious Area treated = 43,658 square feet
- Water Quality Storm Velocity = 0.9 ft/s
- Length required for 10 minute residence time = 536 feet
- One-year Storm Velocity = 1.8 ft/s

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Grass Channel 5**
	Sta. 18+55.5, LT.– Sta. 19+17.0, LT.

Grass Channel Description: The Grass Channel is located from Station 18+55.5 to Station 19+75.0 on the left side of US Route 2 & 7.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	5,032
Total Impervious Area (square feet)*:	2,349
Off-Site Impervious Area (square feet)*:	0
Runoff Coefficient:	0.47
Runoff Volume (inches):	0.423
Curve Number:	94
Initial Abstraction:	0.128
Initial Abstraction/Rainfall:	0.142
Time of Concentration (min.):	1.7
Unit Peak Discharge (csm/in):	1000
Water Quality Volume (cf):	**177**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 2,349 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	4’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	0.2%
Channel Depth:	1’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	0.076
Depth of Flow (inches):	1.755
Manning’s “n” Coefficient:	0.15
Cross Sectional Area (sf):	0.671
Velocity (ft/s):	0.1
Length required for 10 min. residence time (ft):	68

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.1 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 68 feet. This channel provides treatment over a length of 120 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 1.755 inches.

One-Year Storm Event for Grass Channel	
Curve Number:	88
Peak Discharge (cfs):	0.21
Depth of Flow (inches):	3.135
Velocity (ft/s):	0.2

Ten-Year Storm Event for Grass Channel	
Curve Number:	88
Peak Discharge (cfs):	0.40
Depth of Flow (inches):	4.39
Velocity (ft/s):	0.2

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.2 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 120 feet
- Impervious Area treated = 2,349 square feet
- Water Quality Volume = 177 cf
- Water Quality Storm Velocity = 0.1 ft/s
- Length required for 10 minute residence time = 68 feet
- One-year Storm Velocity = 0.2 ft/s

Project: Colchester
HES NH 5600 (14)
Stormwater Treatment
Practice: Grass Channel 6
Sta. 19+75.0, LT. - Sta. 22+93.3, LT.

Grass Channel Description: The Grass Channel is located from Station 19+75.0 to Station 22+93.3 on the left side of US Route 2 & 7.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	21,392
Total Impervious Area (square feet)*:	10,391
Off-Site Impervious Area (square feet)*:	0
Runoff Coefficient:	0.487
Runoff Volume (inches):	0.438
Curve Number:	94
Initial Abstraction:	0.121
Initial Abstraction/Rainfall:	0.134
Time of Concentration (min.):	1.7
Unit Peak Discharge (csm/in):	1000
Water Quality Volume (cf):	**783**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 10,391 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	4’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	0.7%
Channel Depth:	1’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	0.336
Depth of Flow (inches):	2.87
Manning’s “n” Coefficient:	0.15
Cross Sectional Area (sf):	1.185
Velocity (ft/s):	0.3
Length required for 10 min. residence time (ft):	170

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.3 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 170 feet. This channel provides treatment over a length of 318 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 2.87 inches.

One-Year Storm Event for Grass Channel	
Curve Number:	89
Peak Discharge (cfs):	0.91
Depth of Flow (inches):	4.775
Velocity (ft/s):	0.4

Ten-Year Storm Event for Grass Channel	
Curve Number:	89
Peak Discharge (cfs):	1.70
Depth of Flow (inches):	6.135
Velocity (ft/s):	0.6

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.4 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 318 feet
- Impervious Area treated = 10,391 square feet
- Water Quality Volume = 783 cf
- Water Quality Storm Velocity = 0.3 ft/s
- Length required for 10 minute residence time = 170 feet
- One-year Storm Velocity = 0.4 ft/s

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Grass Channel 7**
	Sta. 22+97.8, LT. - Sta. 26+28.1, LT.

Grass Channel Description: The Grass Channel is located from Station 22+97.8 to Station 26+28.1 on the left side of US Route 2 & 7.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	26,849
Total Impervious Area (square feet)*:	20,989
Off-Site Impervious Area (square feet)*:	0
Runoff Coefficient:	0.754
Runoff Volume (inches):	0.678
Curve Number:	98
Initial Abstraction:	0.045
Initial Abstraction/Rainfall:	0.05
Time of Concentration (min.):	2.5
Unit Peak Discharge (csm/in):	1000
Water Quality Volume (cf):	**1519**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 20,989 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	4’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	1.3%
Channel Depth:	2’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	0.653
Depth of Flow (inches):	3.505
Manning’s “n” Coefficient:	0.15
Cross Sectional Area (sf):	1.51
Velocity (ft/s):	0.4
Length required for 10 min. residence time (ft):	260

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.4 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 260 feet. This channel provides treatment over a length of 327 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 3.505 inches.

One-Year Storm Event for Grass Channel	
Curve Number:	94
Peak Discharge (cfs):	1.52
Depth of Flow (inches):	5.2
Velocity (ft/s):	0.6

Ten-Year Storm Event for Grass Channel	
Curve Number:	94
Peak Discharge (cfs):	2.45
Depth of Flow (inches):	6.265
Velocity (ft/s):	0.8

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.6 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 327 feet
- Impervious Area treated = 20,989 square feet
- Water Quality Volume = 1519 cf
- Water Quality Storm Velocity = 0.4 ft/s
- Length required for 10 minute residence time = 260 feet
- One-year Storm Velocity = 0.6 ft/s

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Grass Channel 8**
	Sta. 39+19.3, LT. - Sta. 43+67.4, LT.

Grass Channel Description: The Grass Channel is located from Station 39+19.3 to Station 43+67.4 on the left side of US Route 2 & 7.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	176,707
Total Impervious Area (square feet)*:	68,389
Off-Site Impervious Area (square feet)*:	56,150
Runoff Coefficient:	0.398
Runoff Volume (inches):	0.358
Curve Number:	93
Initial Abstraction:	0.158
Initial Abstraction/Rainfall:	0.176
Time of Concentration (min.):	19.1
Unit Peak Discharge (csm/in):	650
Water Quality Volume (cf):	**5,279**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 12,239 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	6’
Side Slope:	4:1
Back Slope:	2:1
Grass Channel Longitudinal Slope:	1.3%
Channel Depth:	2’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	1.477
Depth of Flow (inches):	4.49
Manning’s “n” Coefficient:	0.143
Cross Sectional Area (sf):	2.665
Velocity (ft/s):	0.6
Length required for 10 min. residence time (ft):	333

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.6 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 333 feet. This channel provides treatment over a length of 448 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 4.49 inches. This flow depth does exceed the flow depth that is suggested by the storm water manual. The reason for this is because of the large amount of off-site runoff that this channel collects. The flow depth should be acceptable based on the fact that the channel meets the criteria for velocity, length and 6" freeboard depth.

One-Year Storm Event for Grass Channel	
Curve Number:	71
Peak Discharge (cfs):	2.98
Depth of Flow (inches):	6.05
Velocity (ft/s):	0.8

Ten-Year Storm Event for Grass Channel	
Curve Number:	71
Peak Discharge (cfs):	4.72
Depth of Flow (inches):	7.18
Velocity (ft/s):	1.0

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.8 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 448 feet
- Impervious Area treated = 12,239 square feet
- Water Quality Volume = 5,279 cf
- Water Quality Storm Velocity = 0.6 ft/s
- Length required for 10 minute residence time = 333 feet
- One-year Storm Velocity = 0.8 ft/s

Project: **Colchester**
HES NH 5600 (14)
Stormwater Treatment
Practice: **Grass Channel 9**
Sta. 800+43.1, LT. - Sta. 802+85.0, LT.

Grass Channel Description: The Grass Channel is located from Station 800+43.1 to Station 802+85.0 on the left side of Rathe Rd.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	46,064
Total Impervious Area (square feet)*:	16,628
Off-Site Impervious Area (square feet)*:	8,722
Runoff Coefficient:	0.375
Runoff Volume (inches):	0.337
Curve Number:	92
Initial Abstraction:	0.17
Initial Abstraction/Rainfall:	0.189
Time of Concentration (min.):	26.0
Unit Peak Discharge (csm/in):	550
Water Quality Volume (cf):	**1,296**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 7,906 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	4’
Side Slope:	4:1
Back Slope:	4:1
Grass Channel Longitudinal Slope:	2.2%
Channel Depth:	1’

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	0.307
Depth of Flow (inches):	1.965
Manning’s “n” Coefficient:	0.15
Cross Sectional Area (sf):	0.762
Velocity (ft/s):	0.4
Length required for 10 min. residence time (ft):	242

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.4 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 242 feet. This channel provides treatment over a length of 250 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 1.965 inches.

One-Year Storm Event for Grass Channel	
Curve Number:	74
Peak Discharge (cfs):	0.62
Depth of Flow (inches):	2.94
Velocity (ft/s):	0.5

Ten-Year Storm Event for Grass Channel	
Curve Number:	74
Peak Discharge (cfs):	1.13
Depth of Flow (inches):	4.09
Velocity (ft/s):	0.6

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 0.5 ft/s and is below the maximum allowable velocity.

Results:
- Grass Channel length = 250 feet
- Impervious Area treated = 7,906 square feet
- Water Quality Volume = 1,296 cf
- Water Quality Storm Velocity = 0.4 ft/s
- Length required for 10 minute residence time = 242 feet
- One-year Storm Velocity = 0.5 ft/s

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Grass Channel 10**
	Sta. 44+77.2, LT. - Sta. 48+92.1, LT.

Grass Channel Description: The Grass Channel is located from Station 44+77.2 to Station 48+92.1 on the left side of US Route 7.

Water Quality Volume (Grass Channel)	
Rainfall (inches):	0.9
Channel Drainage Area (square feet)*:	146,747
Total Impervious Area (square feet)*:	94,131
Off-Site Impervious Area (square feet)*:	81,989
Runoff Coefficient:	0.627
Runoff Volume (inches):	0.565
Curve Number:	96
Initial Abstraction:	0.076
Initial Abstraction/Rainfall:	0.084
Time of Concentration (min.):	28.2
Unit Peak Discharge (csm/in):	550
Water Quality Volume (cf):	**6,902**

*Areas relate to grass channel, not project as a whole.

This value is based upon treatment of 100% of the water quality volume from the new and existing impervious area. This grass channel collects and treats 12,142 square feet of impervious area. These calculations use the entire drainage area that is collected and conveyed to the channel.

Grass Channel Design Criteria	
Bottom Width:	5’
Side Slope:	3:1
Back Slope:	3:1
Grass Channel Longitudinal Slope:	1.8%
Channel Depth:	varies

Water Quality Storm in Grass Channel	
Peak Discharge (cfs):	1.635
Depth of Flow (inches):	4.705
Manning’s “n” Coefficient:	0.139
Cross Sectional Area (sf):	2.422
Velocity (ft/s):	0.7
Length required for 10 min. residence time (ft):	405

The design requirement for the water quality storm focuses on velocity and residence time. The water quality storm velocity in the channel must not exceed 1 ft/s. The resulting velocity for this grass channel is 0.7 ft/s. The second criterion is that an average 10 minute residence time must be attained in the channel. The calculated length required to attain an average 10 minute residence time is 405 feet. This channel provides treatment over a length of 421 feet. The manual states as a guideline for the water quality storm, the depth in the channel generally should not exceed four inches. The depth of flow in this grass channel is 4.705 inches. This flow depth does exceed the flow depth that is suggested by the storm water manual. The reason for this is because of the large amount of off-site runoff that this channel collects. The flow depth should be acceptable based on the fact that the channel meets the criteria for velocity, length and 6” freeboard depth.

One-Year Storm Event for Grass Channel	
Curve Number:	77
Peak Discharge (cfs):	3.35
Depth of Flow (inches):	6.32
Velocity (ft/s):	1.0

Ten-Year Storm Event for Grass Channel	
Curve Number:	77
Peak Discharge (cfs):	5.20
Depth of Flow (inches):	7.405
Velocity (ft/s):	1.2

Another requirement states that when using a grass channel for treatment it must have the capacity to pass the one-year storm without producing erosive velocities. A velocity of 2.5 ft/s is considered erosive (Appendix D7, Vermont Stormwater Management Manual, Volume II). The resulting velocity within the channel for the one-year storm is 1.0 ft/s and is below the maximum allowable velocity.

Results:

- Grass Channel length = 421 feet
- Impervious Area treated = 12,142 square feet
- Water Quality Volume = 6,902 cf
- Water Quality Storm Velocity = 0.7 ft/s
- Length required for 10 minute residence time = 405 feet
- One-year Storm Velocity = 1.0 ft/s

Summary for Subcatchment GC 1: Grass Channel 1 Area

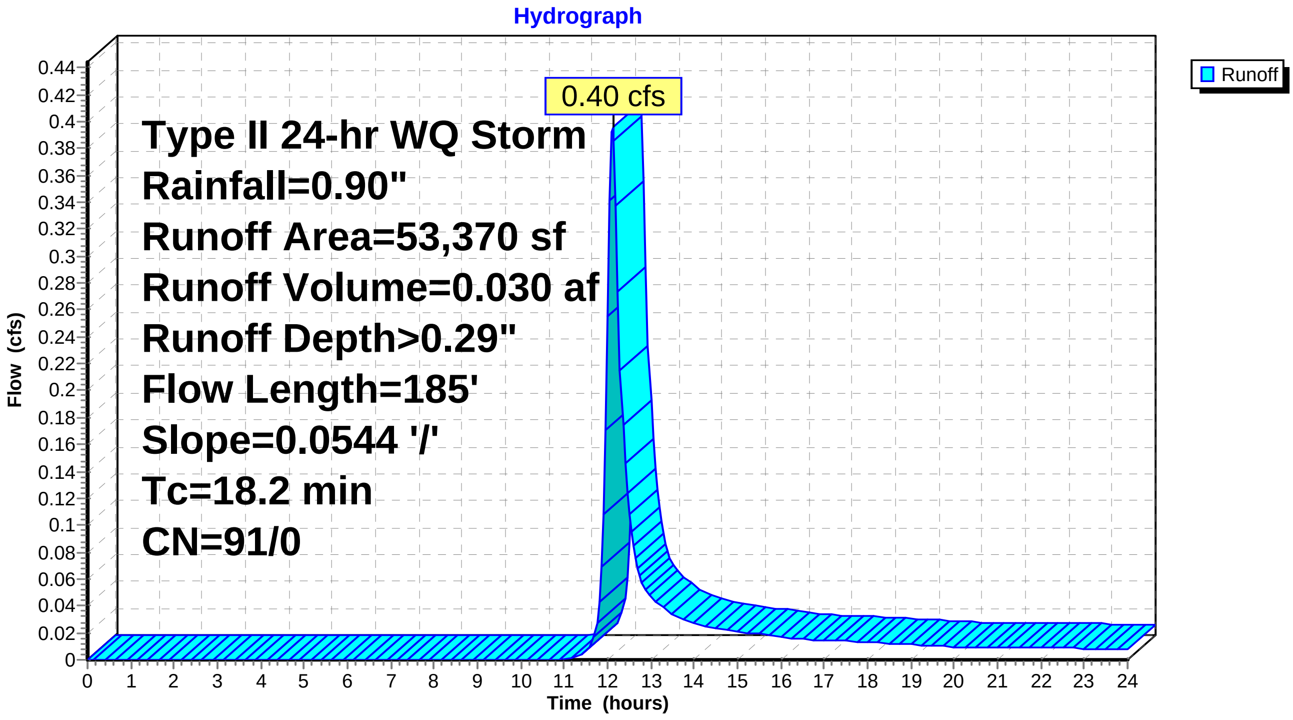
Runoff = 0.40 cfs @ 12.12 hrs, Volume= 0.030 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	53,370	91	
	53,370	91	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0544	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	85	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.2	185	Total			

Subcatchment GC 1: Grass Channel 1 Area



Summary for Reach 1R: Grass Channel 1

Inflow Area = 1.225 ac, 0.00% Impervious, Inflow Depth > 0.29" for WQ Storm event
Inflow = 0.40 cfs @ 12.12 hrs, Volume= 0.030 af
Outflow = 0.30 cfs @ 12.40 hrs, Volume= 0.029 af, Atten= 23%, Lag= 17.1 min

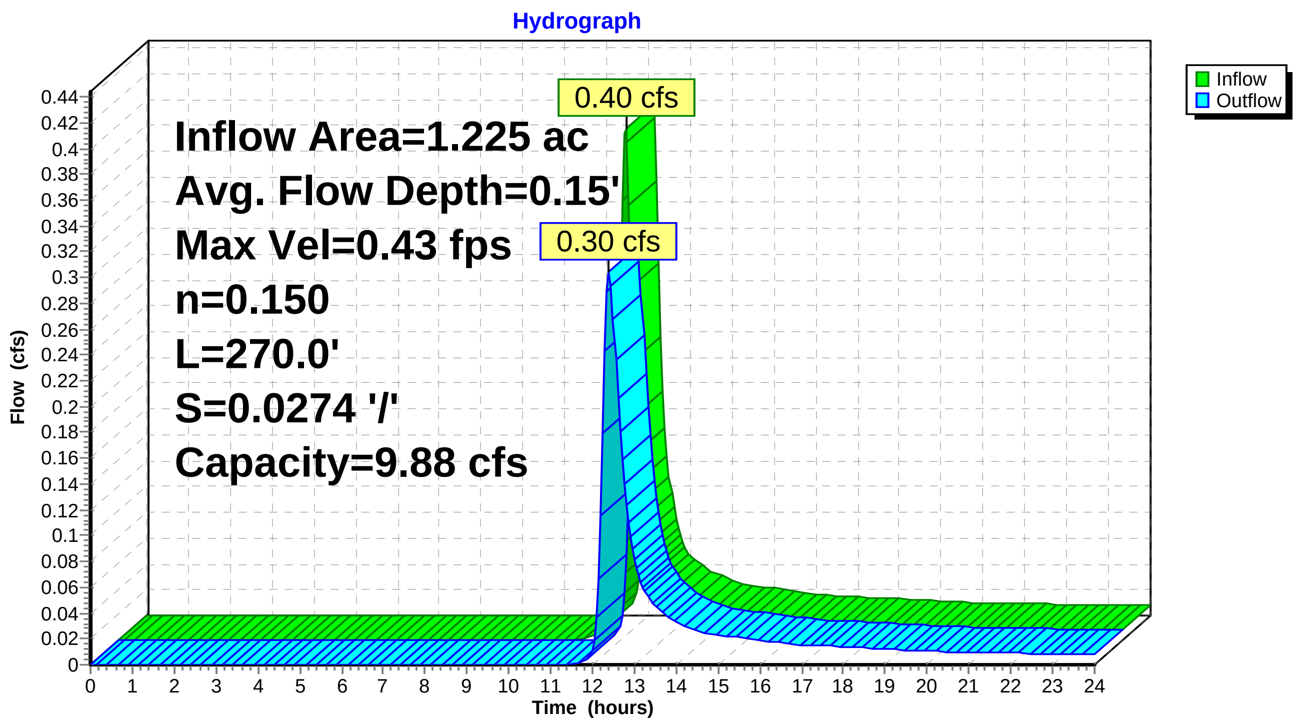
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.43 fps, Min. Travel Time= 10.5 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 29.4 min

Peak Storage= 192 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 9.88 cfs

4.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 270.0' Slope= 0.0274 '/'
Inlet Invert= 335.50', Outlet Invert= 328.10'

‡

Reach 1R: Grass Channel 1



Summary for Subcatchment GC 1: Grass Channel 1 Area

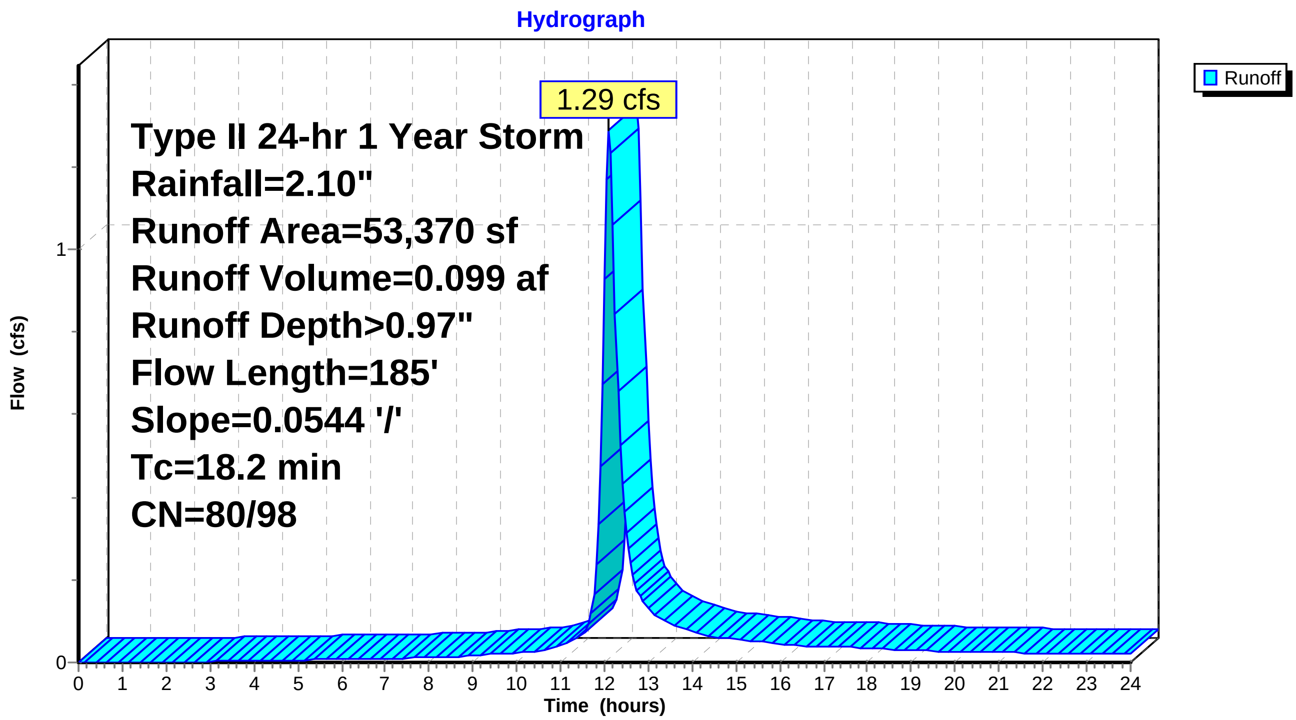
Runoff = 1.29 cfs @ 12.11 hrs, Volume= 0.099 af, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
38,254	80	>75% Grass cover, Good, HSG D
15,116	98	Paved roads w/curbs & sewers, HSG D
53,370	85	Weighted Average
38,254	80	71.68% Pervious Area
15,116	98	28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0544	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	85	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.2	185	Total			

Subcatchment GC 1: Grass Channel 1 Area



Summary for Reach 1R: Grass Channel 1

Inflow Area = 1.225 ac, 28.32% Impervious, Inflow Depth > 0.97" for 1 Year Storm event
Inflow = 1.29 cfs @ 12.11 hrs, Volume= 0.099 af
Outflow = 1.25 cfs @ 12.16 hrs, Volume= 0.099 af, Atten= 3%, Lag= 3.2 min

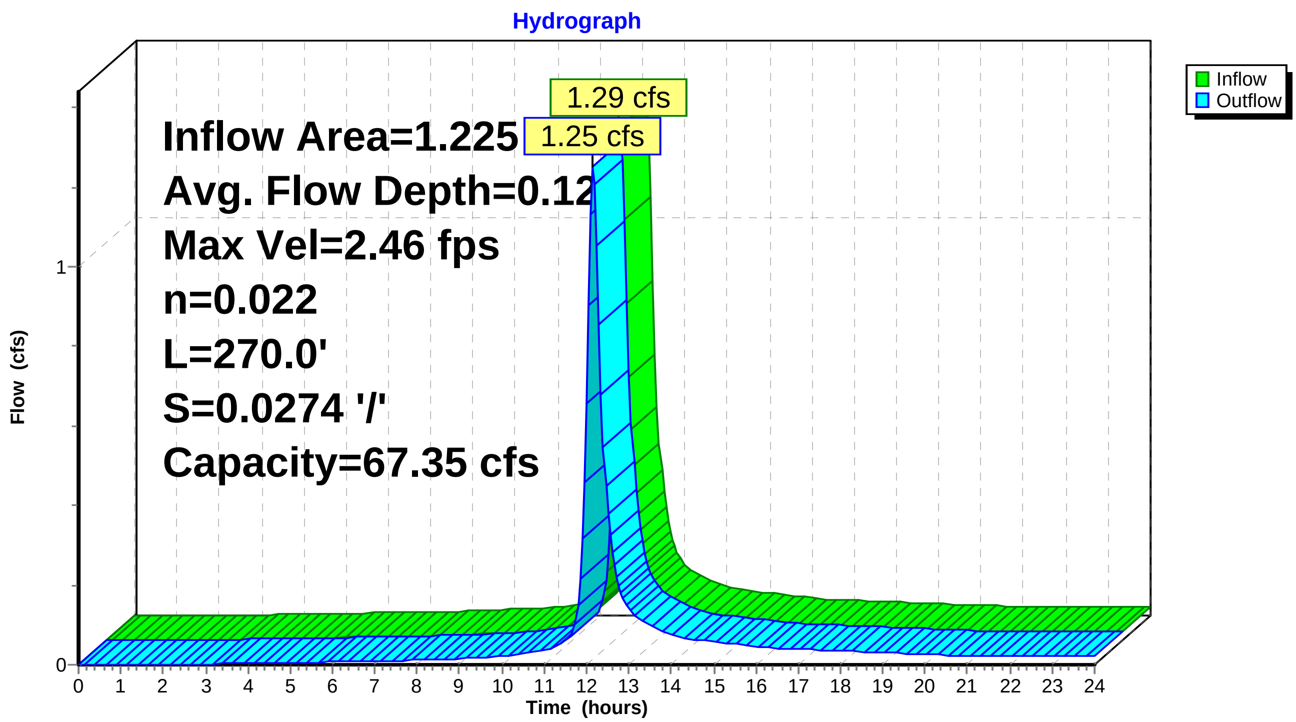
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.46 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 6.8 min

Peak Storage= 139 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 67.35 cfs

4.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 270.0' Slope= 0.0274 '/'
Inlet Invert= 335.50', Outlet Invert= 328.10'

‡

Reach 1R: Grass Channel 1



Summary for Subcatchment GC 1: Grass Channel 1 Area

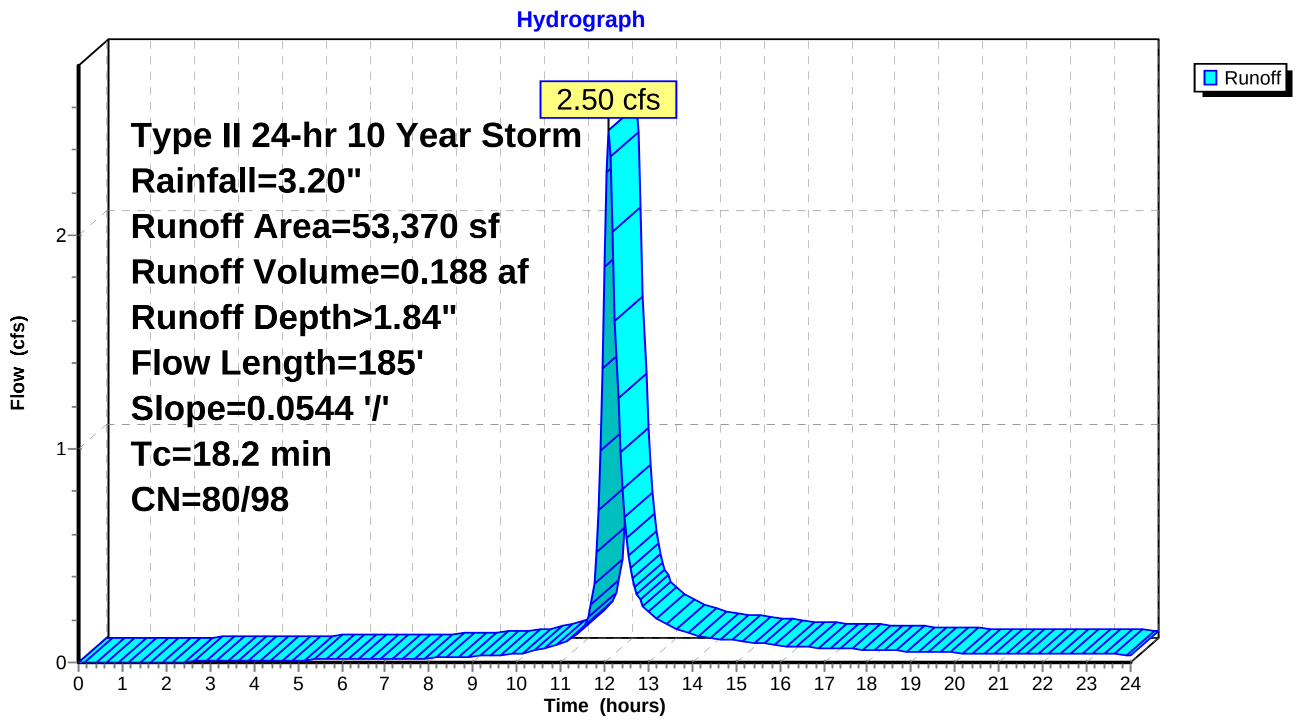
Runoff = 2.50 cfs @ 12.11 hrs, Volume= 0.188 af, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
38,254	80	>75% Grass cover, Good, HSG D
15,116	98	Paved roads w/curbs & sewers, HSG D
53,370	85	Weighted Average
38,254	80	71.68% Pervious Area
15,116	98	28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0544	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	85	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.2	185	Total			

Subcatchment GC 1: Grass Channel 1 Area



Summary for Reach 1R: Grass Channel 1

Inflow Area = 1.225 ac, 28.32% Impervious, Inflow Depth > 1.84" for 10 Year Storm event
Inflow = 2.50 cfs @ 12.11 hrs, Volume= 0.188 af
Outflow = 2.44 cfs @ 12.15 hrs, Volume= 0.187 af, Atten= 2%, Lag= 2.5 min

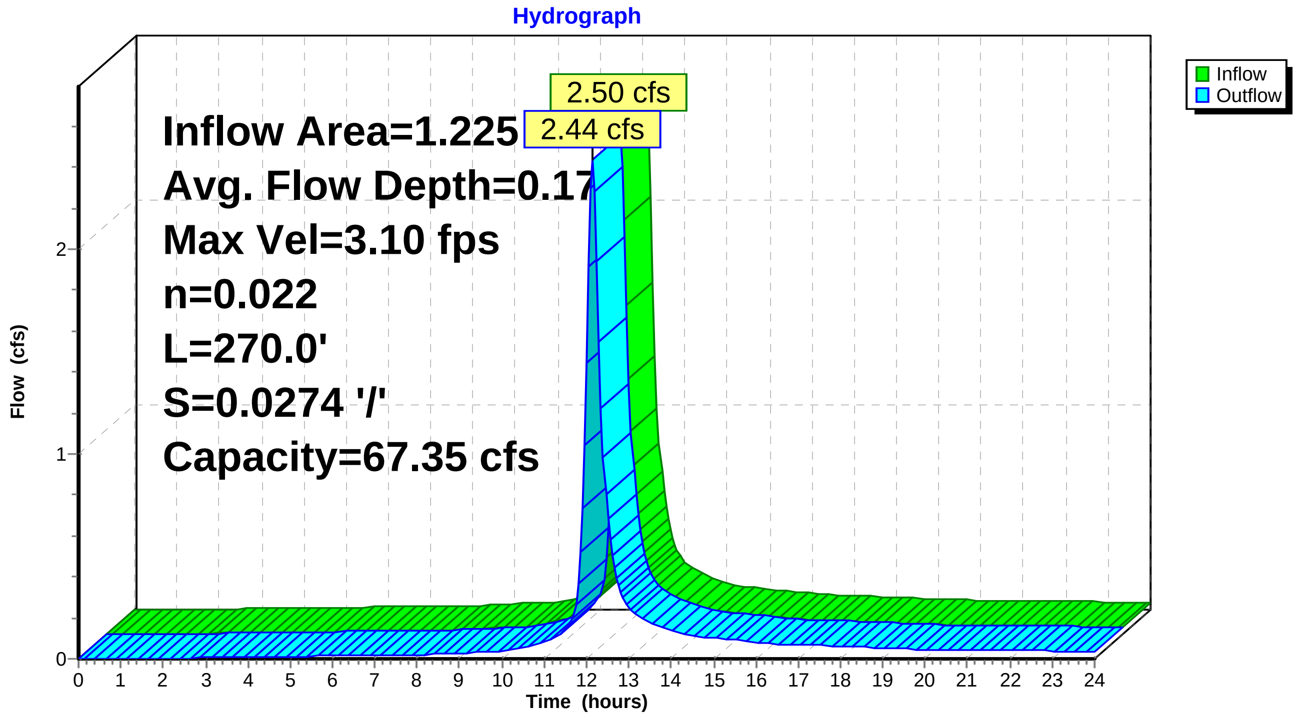
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.10 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 5.7 min

Peak Storage= 215 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 67.35 cfs

4.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 270.0' Slope= 0.0274 '/'
Inlet Invert= 335.50', Outlet Invert= 328.10'

‡

Reach 1R: Grass Channel 1



Summary for Subcatchment GC 4: Grass Channel 4 Area

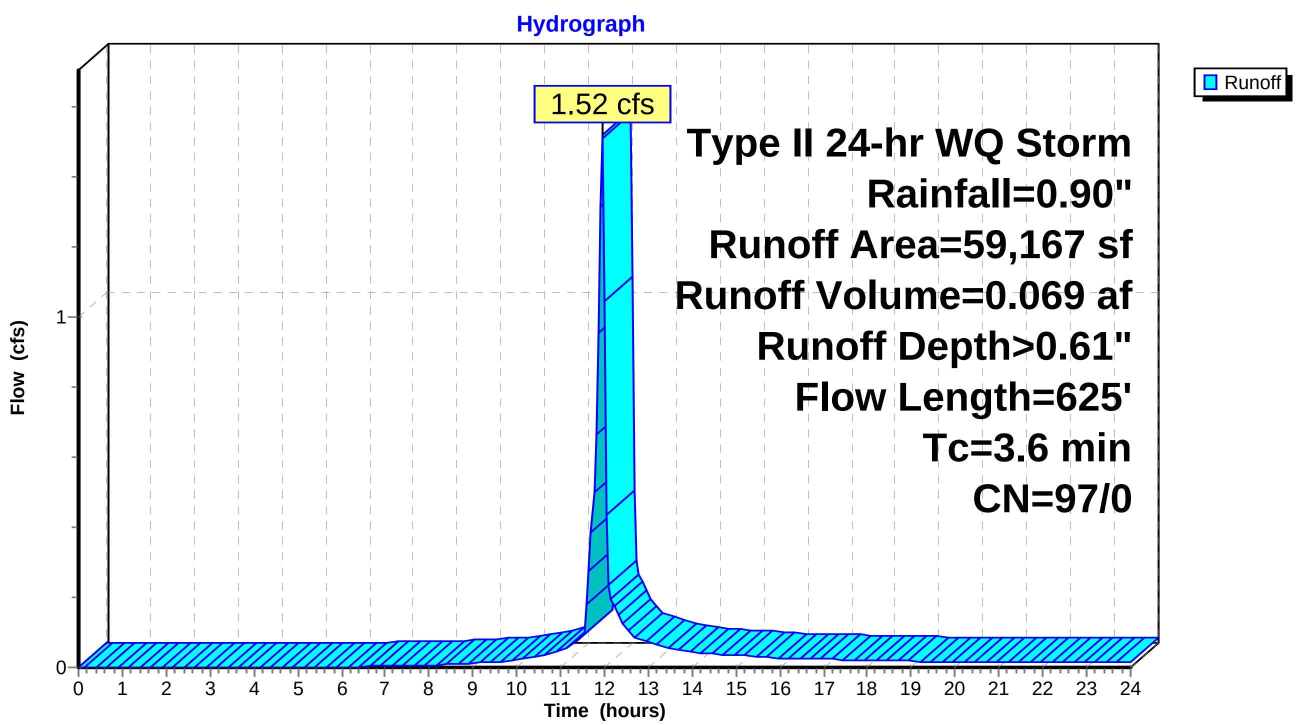
Runoff = 1.52 cfs @ 11.94 hrs, Volume= 0.069 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	59,167	97	CN
	59,167	97	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0730	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.5	5	0.3400	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	597	0.0390	3.55	5.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=0.25' Z= 3.0 '/' Top.W=6.50' n= 0.030 Earth, grassed & winding
3.6	625	Total			

Subcatchment GC 4: Grass Channel 4 Area



Summary for Subcatchment GC5: Grass Channel 5 Area

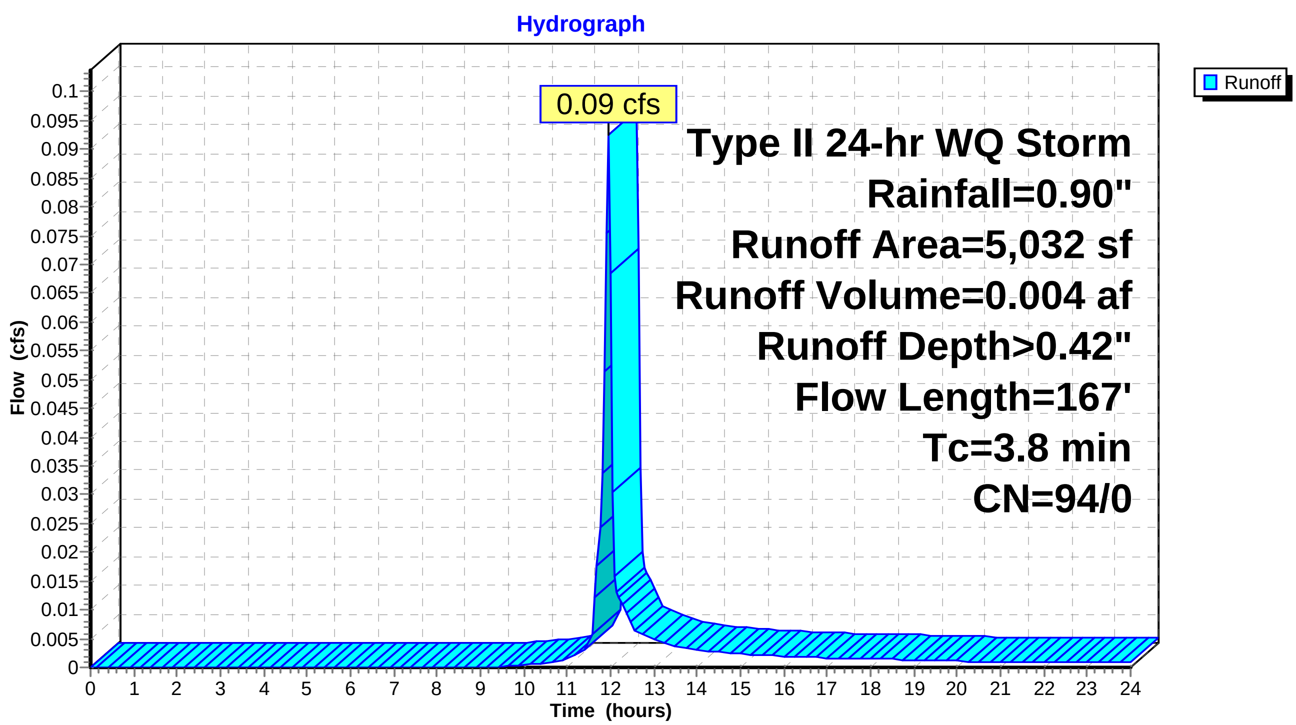
Runoff = 0.09 cfs @ 11.95 hrs, Volume= 0.004 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	5,032	94	CN
	5,032	94	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.1	120	0.0017	0.97	1.22	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.25' Z= 4.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
3.8	167	Total			

Subcatchment GC5: Grass Channel 5 Area



Summary for Subcatchment OS8a: (new Subcat)

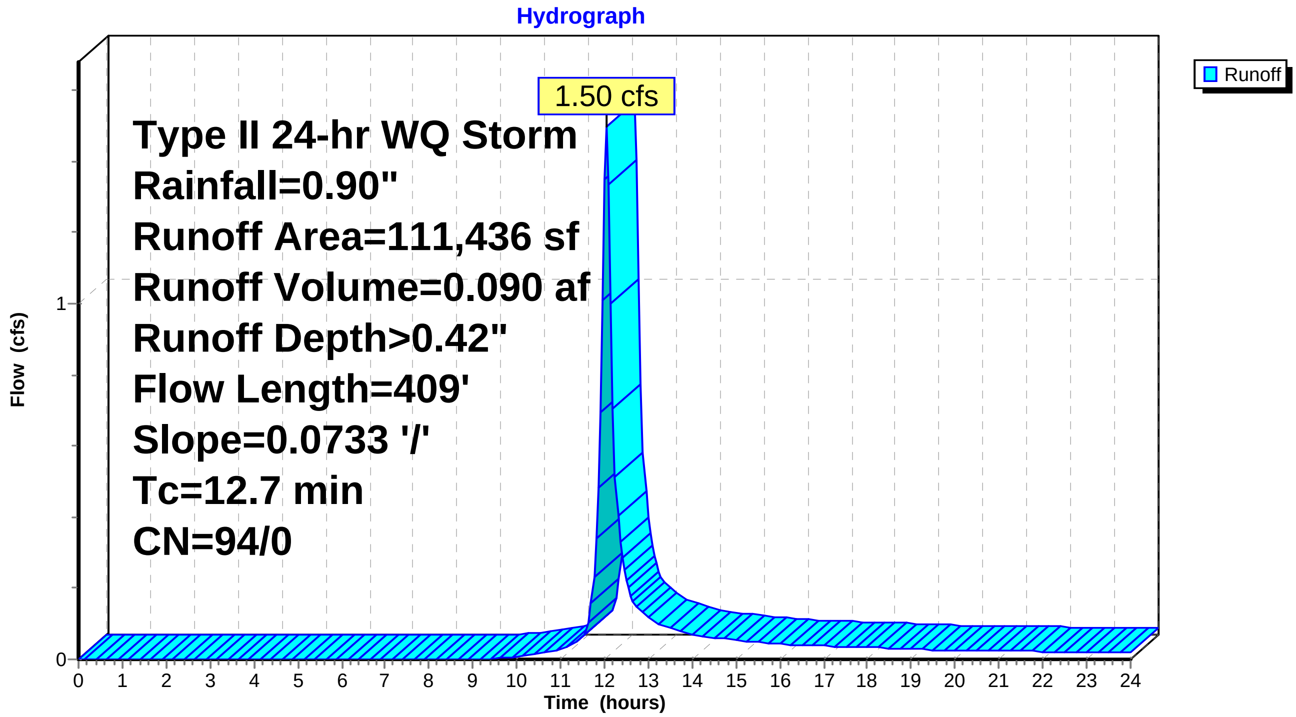
Runoff = 1.50 cfs @ 12.05 hrs, Volume= 0.090 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	111,436	94	CN
	111,436	94	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0733	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.7	309	0.0733	1.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	409	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

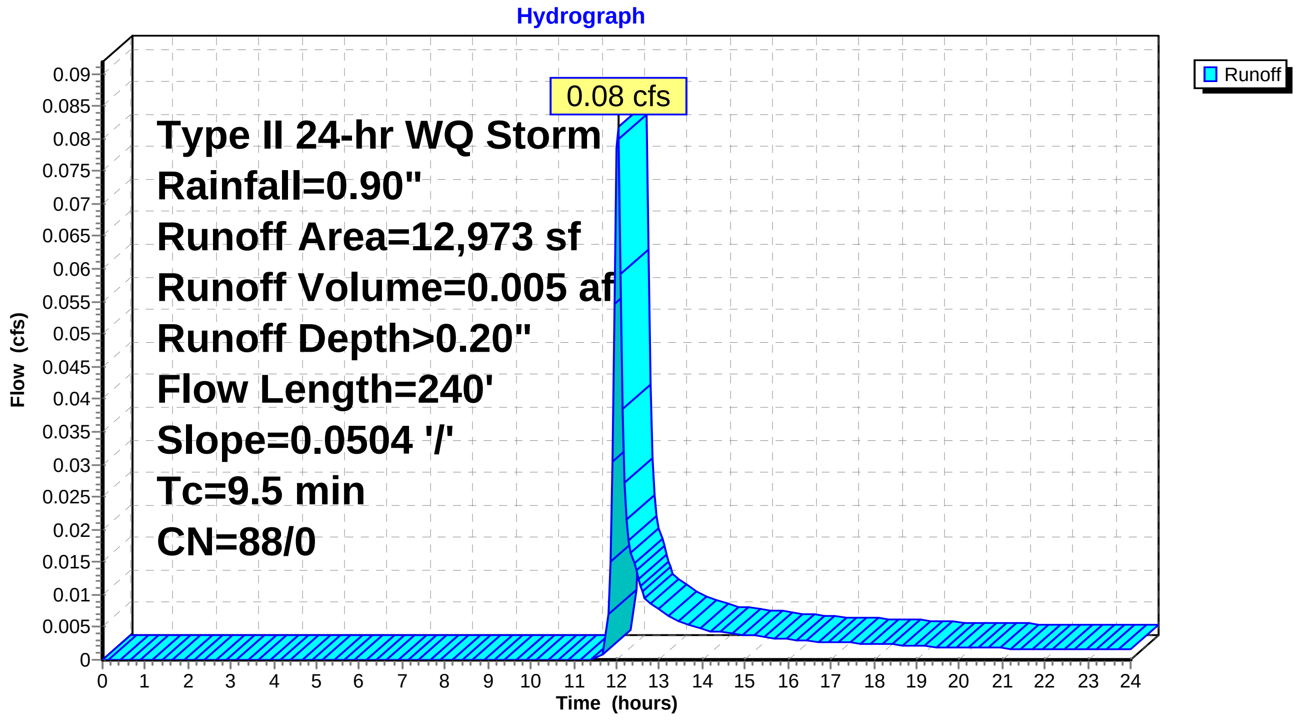
Runoff = 0.08 cfs @ 12.03 hrs, Volume= 0.005 af, Depth> 0.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	12,973	88	CN
	12,973	88	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	240	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

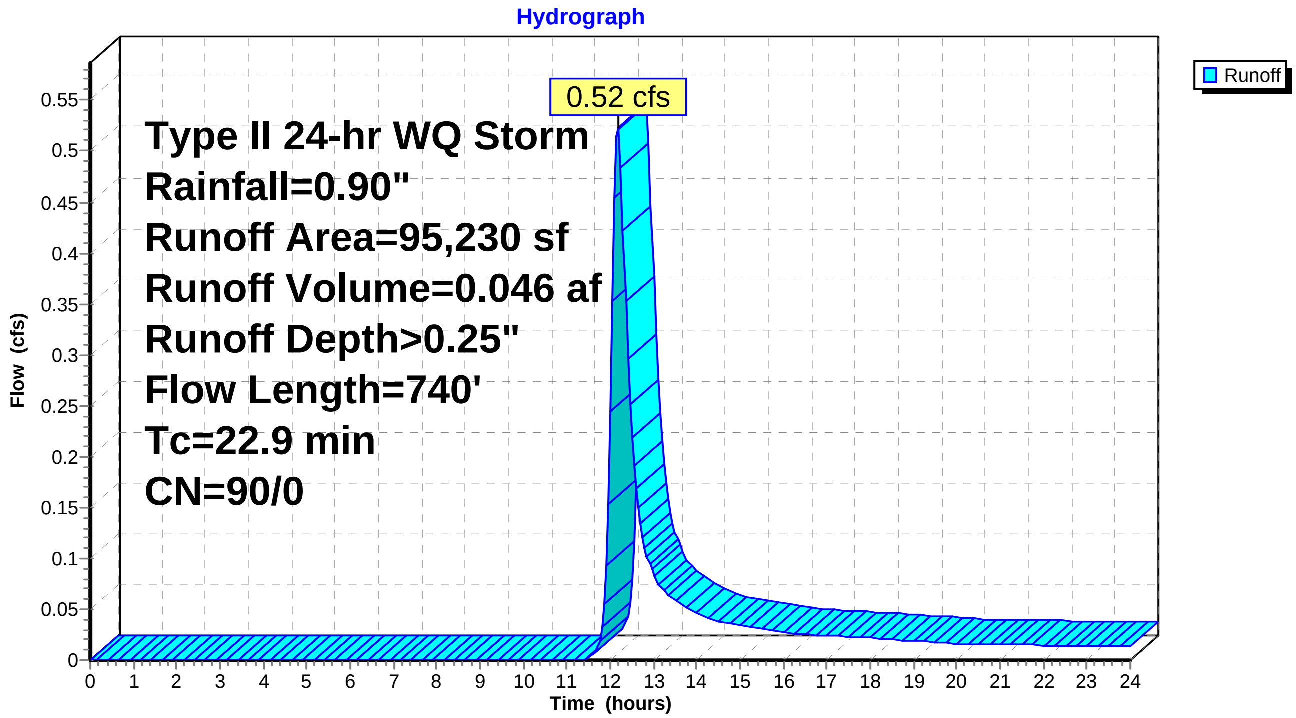
Runoff = 0.52 cfs @ 12.18 hrs, Volume= 0.046 af, Depth> 0.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	95,230	90	CN
	95,230	90	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8_5: (new Subcat)

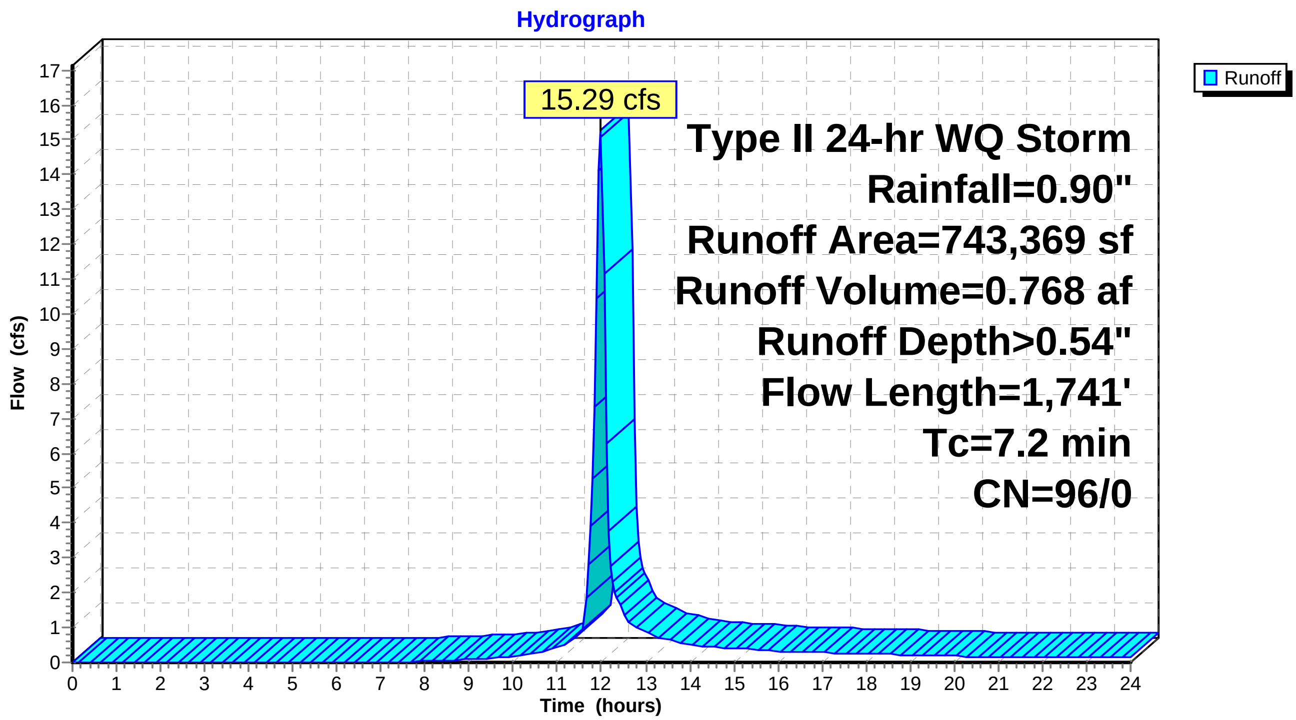
Runoff = 15.29 cfs @ 11.98 hrs, Volume= 0.768 af, Depth> 0.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	743,369	96	CN
	743,369	96	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



Summary for Reach 4R: Grass Channel 4

Inflow Area = 23.581 ac, 0.00% Impervious, Inflow Depth > 0.12" for WQ Storm event
Inflow = 2.88 cfs @ 11.97 hrs, Volume= 0.237 af
Outflow = 2.12 cfs @ 12.28 hrs, Volume= 0.231 af, Atten= 26%, Lag= 18.6 min

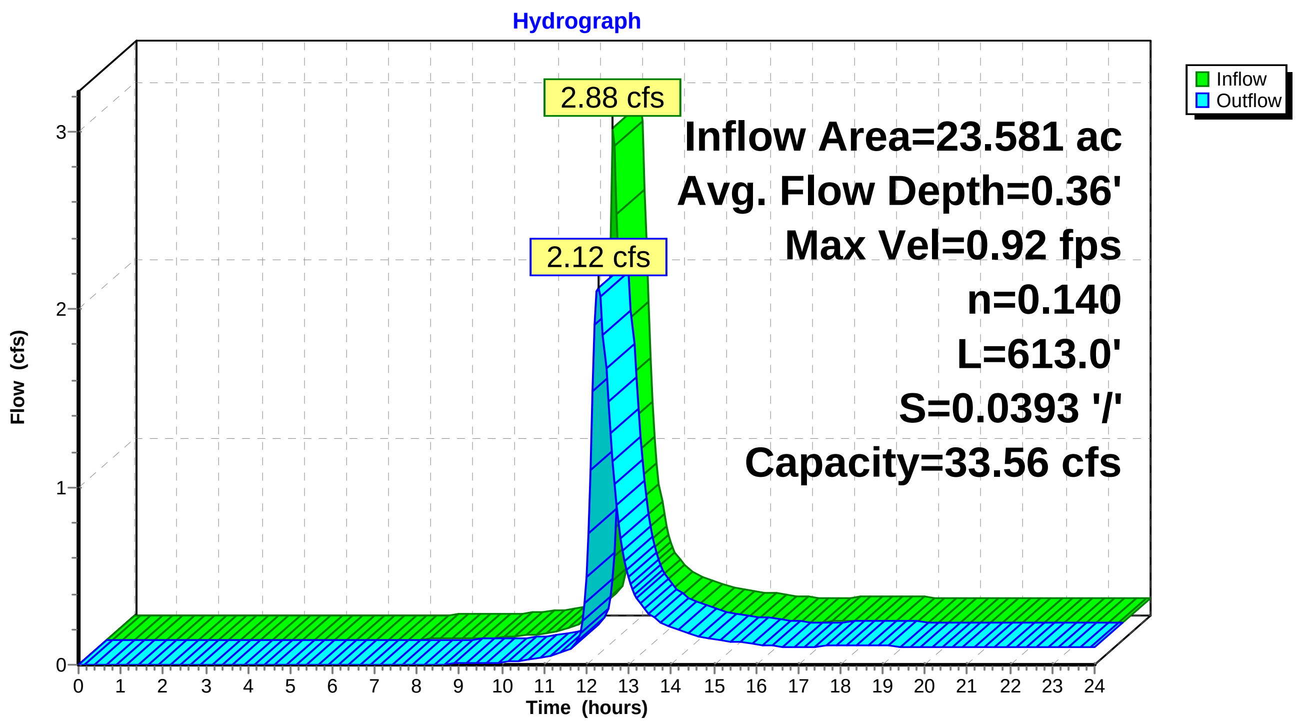
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.92 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 33.8 min

Peak Storage= 1,418 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 33.56 cfs

5.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 4.0 '/' Top Width= 17.00'
Length= 613.0' Slope= 0.0393 '/'
Inlet Invert= 357.60', Outlet Invert= 333.50'

‡

Reach 4R: Grass Channel 4



Summary for Pond P5: in Shaws Parking

Inflow Area = 17.065 ac, 0.00% Impervious, Inflow Depth > 0.54" for WQ Storm event
Inflow = 15.29 cfs @ 11.98 hrs, Volume= 0.768 af
Outflow = 0.05 cfs @ 24.00 hrs, Volume= 0.023 af, Atten= 100%, Lag= 720.9 min
Primary = 0.05 cfs @ 24.00 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 356.32' @ 24.00 hrs Surf.Area= 18,822 sf Storage= 32,461 cf

Plug-Flow detention time= 691.3 min calculated for 0.023 af (3% of inflow)
Center-of-Mass det. time= 438.8 min (1,254.4 - 815.7)

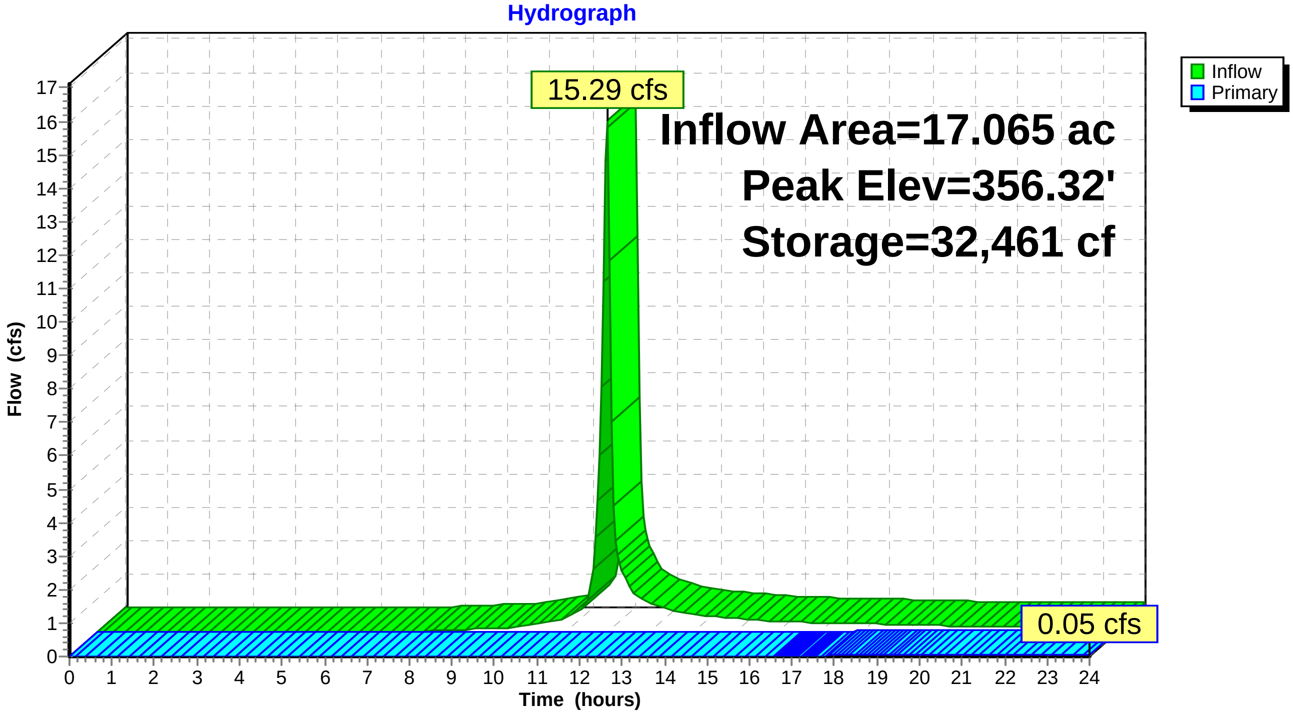
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 24.00 hrs HW=356.32' (Free Discharge)
1=2" ORIFICE/GRATE (Orifice Controls 0.05 cfs @ 2.28 fps)
2=6" HORIZONTAL ORIFICE/GRATE X9 (Controls 0.00 cfs)
3=18" HORIZONTAL ORIFICE/GRATE (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Subcatchment GC4: Grass Channel 4 On-site Area

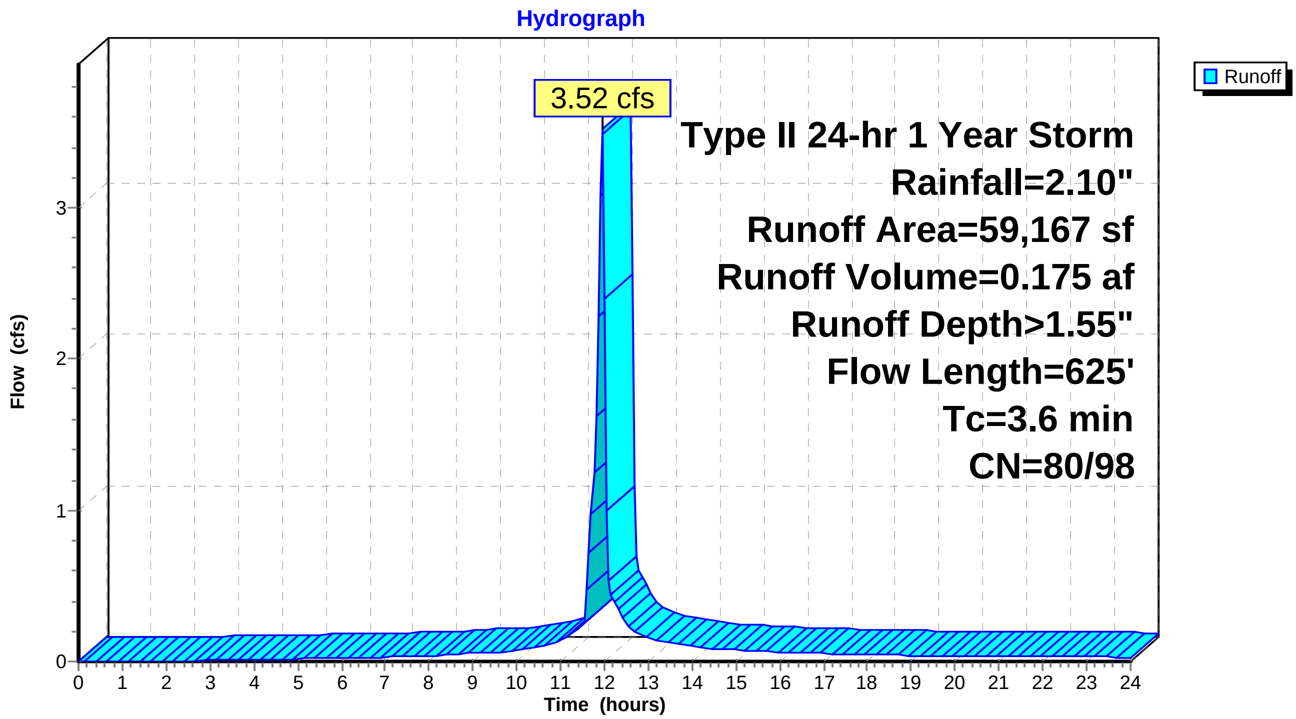
Runoff = 3.52 cfs @ 11.94 hrs, Volume= 0.175 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
43,853	98	Paved roads w/curbs & sewers, HSG D
15,314	80	>75% Grass cover, Good, HSG D
59,167	93	Weighted Average
15,314	80	25.88% Pervious Area
43,853	98	74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0730	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.5	5	0.3400	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	597	0.0390	3.55	5.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=0.25' Z= 3.0 '/' Top.W=6.50' n= 0.030 Earth, grassed & winding
3.6	625	Total			

Subcatchment GC4: Grass Channel 4 On-site Area



Summary for Subcatchment GC5: Grass Channel 5 Area

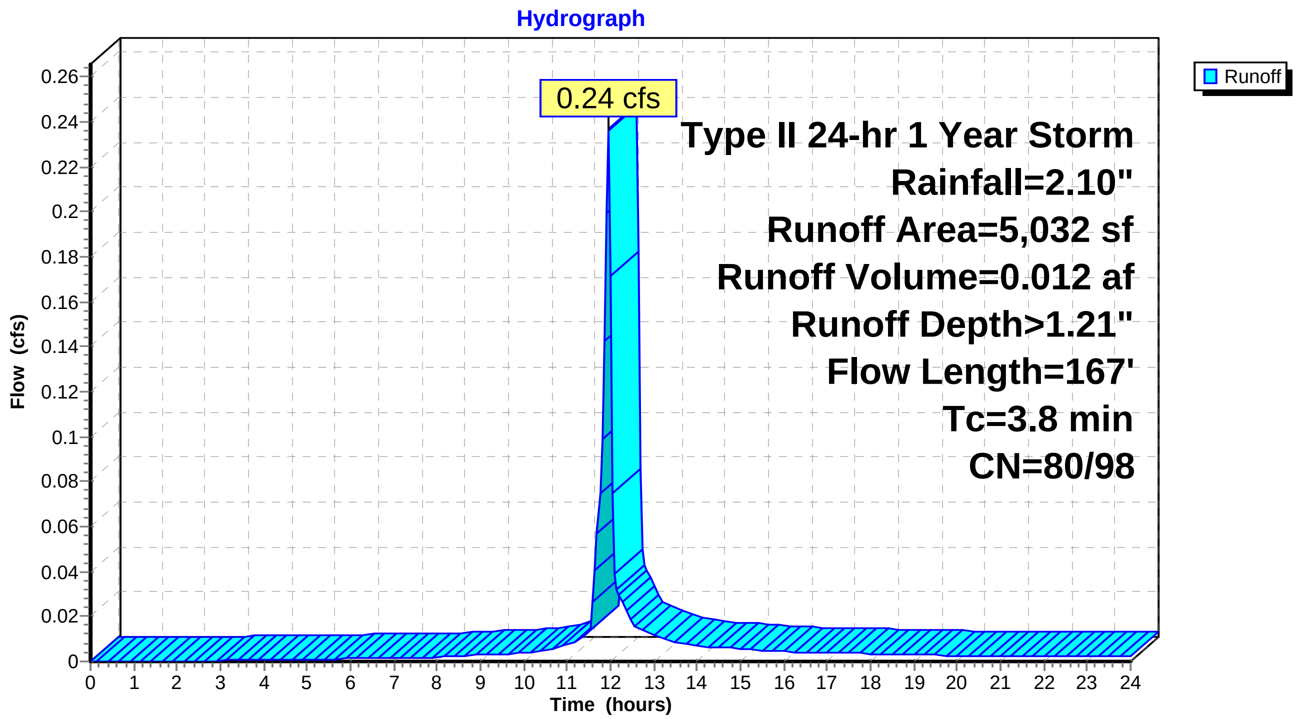
Runoff = 0.24 cfs @ 11.94 hrs, Volume= 0.012 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
2,349	98	Paved roads w/curbs & sewers, HSG D
2,683	80	>75% Grass cover, Good, HSG D
5,032	88	Weighted Average
2,683	80	53.32% Pervious Area
2,349	98	46.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.1	120	0.0017	0.97	1.22	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.25' Z= 4.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
3.8	167	Total			

Subcatchment GC5: Grass Channel 5 Area



Summary for Subcatchment OS8a: (new Subcat)

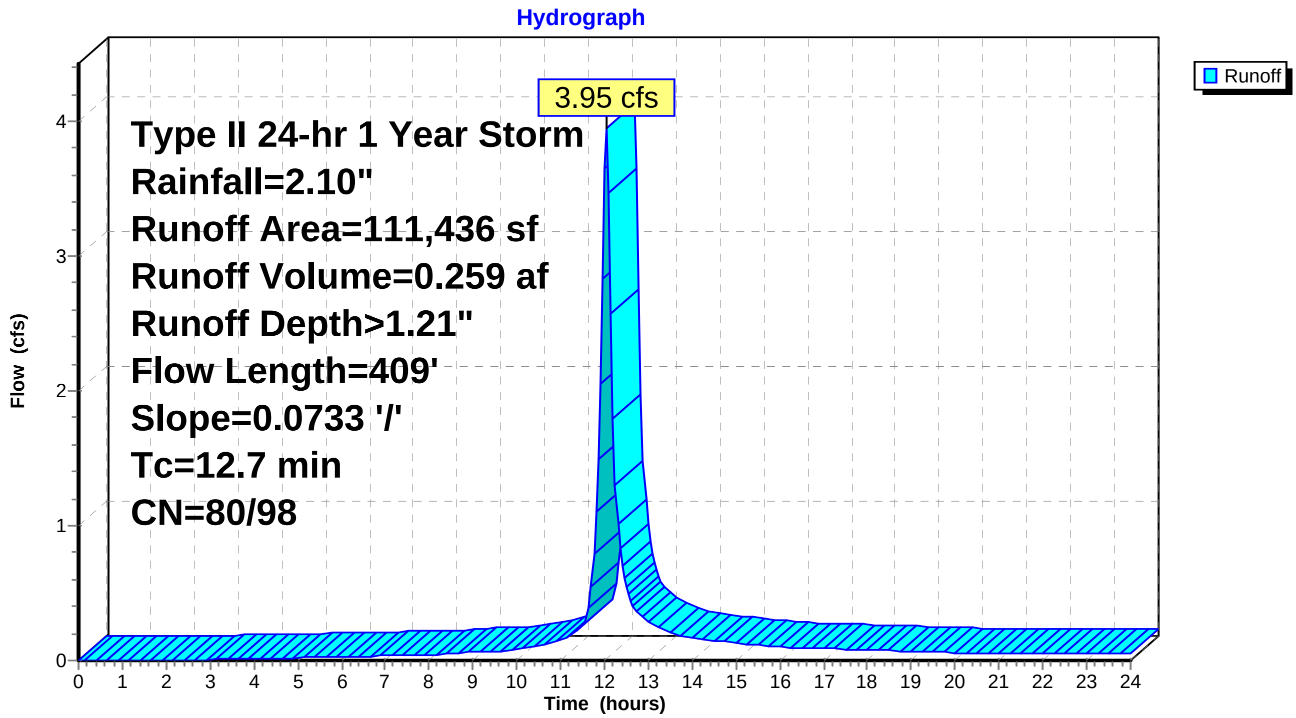
Runoff = 3.95 cfs @ 12.04 hrs, Volume= 0.259 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
58,467	80	>75% Grass cover, Good, HSG D
45,548	98	Paved parking, HSG D
7,421	98	Roofs, HSG D
111,436	89	Weighted Average
58,467	80	52.47% Pervious Area
52,969	98	47.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0733	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.7	309	0.0733	1.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	409	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

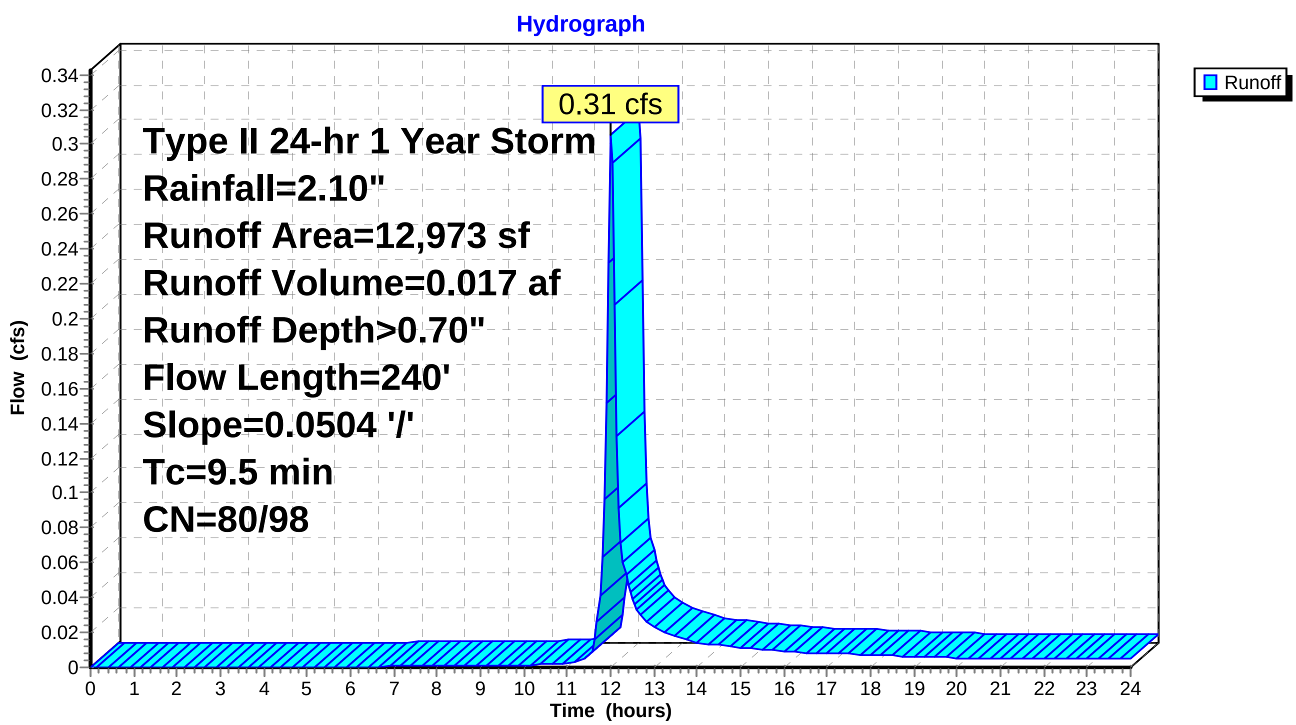
Runoff = 0.31 cfs @ 12.02 hrs, Volume= 0.017 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
12,191	80	>75% Grass cover, Good, HSG D
782	98	Paved roads w/curbs & sewers, HSG D
12,973	81	Weighted Average
12,191	80	93.97% Pervious Area
782	98	6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	240	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

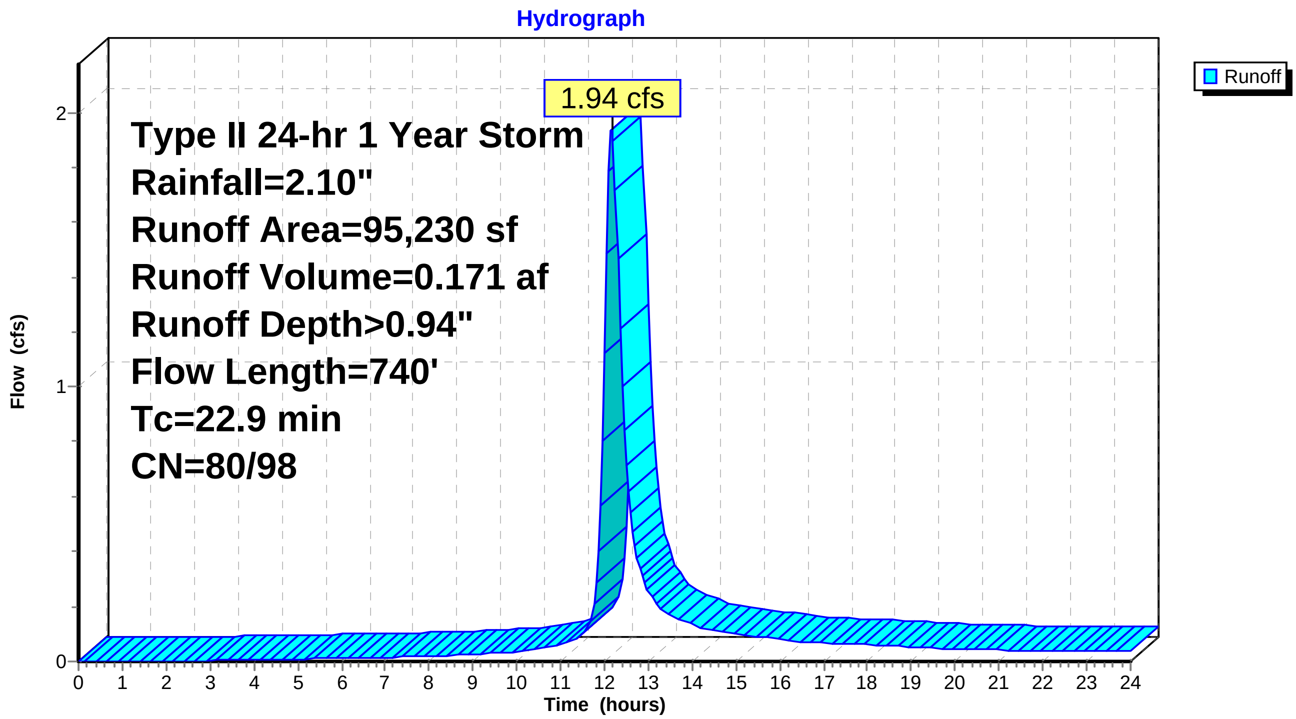
Runoff = 1.94 cfs @ 12.16 hrs, Volume= 0.171 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
24,055	98	Paved roads w/curbs & sewers, HSG D
70,880	80	>75% Grass cover, Good, HSG D
295	98	Unconnected roofs, HSG D
95,230	85	Weighted Average
70,880	80	74.43% Pervious Area
24,350	98	25.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8_5: (new Subcat)

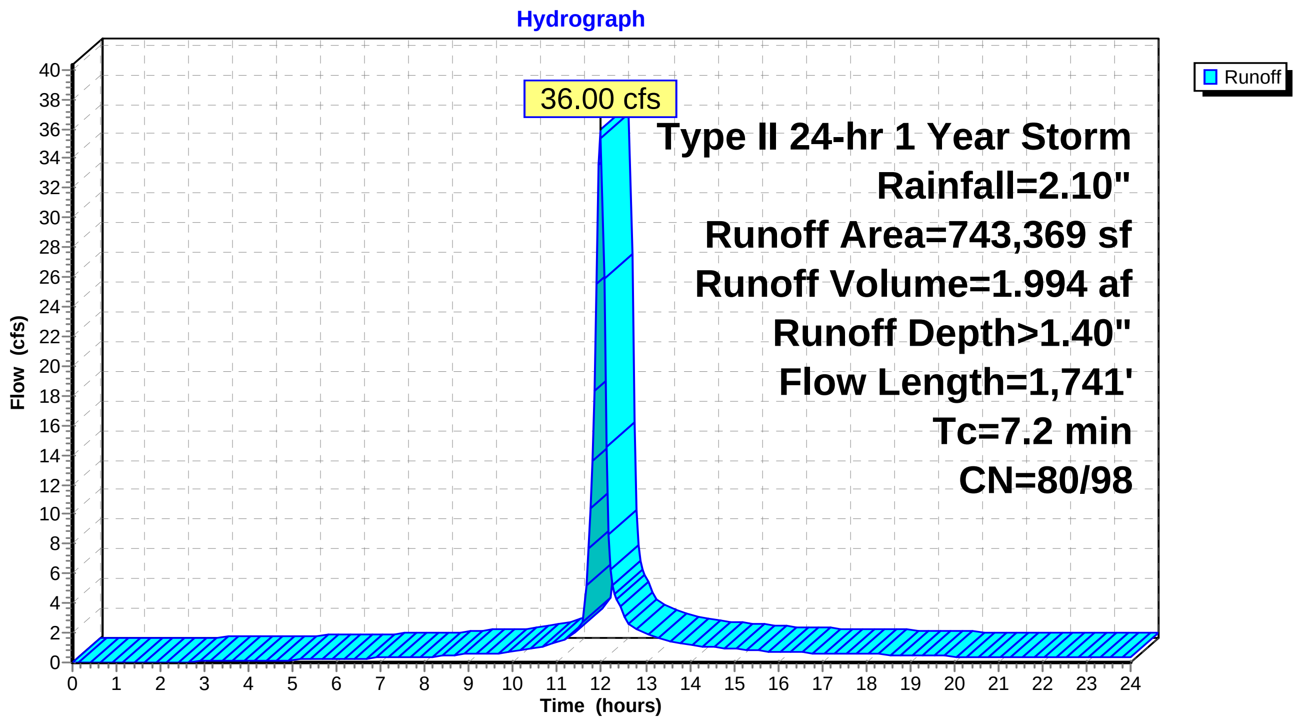
Runoff = 36.00 cfs @ 11.98 hrs, Volume= 1.994 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
279,624	80	>75% Grass cover, Good, HSG D
399,721	98	Paved parking, HSG D
45,396	98	Unconnected roofs, HSG D
18,628	98	Water Surface, HSG D
743,369	91	Weighted Average
279,624	80	37.62% Pervious Area
463,745	98	62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



Summary for Reach 4R: Grass Channel 4 + Pond

Inflow Area = 23.581 ac, 57.25% Impervious, Inflow Depth > 0.80" for 1 Year Storm event
Inflow = 9.17 cfs @ 12.15 hrs, Volume= 1.564 af
Outflow = 8.91 cfs @ 12.21 hrs, Volume= 1.559 af, Atten= 3%, Lag= 3.8 min

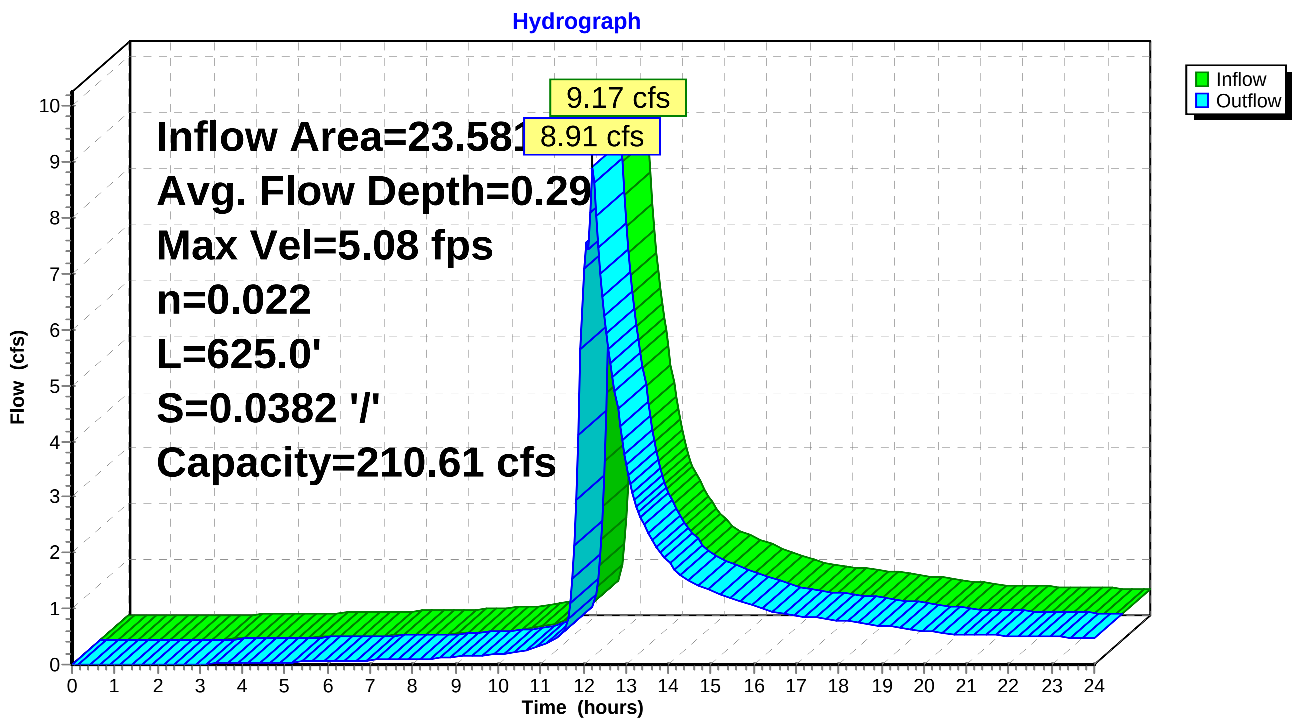
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.08 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.81 fps, Avg. Travel Time= 5.7 min

Peak Storage= 1,105 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 210.61 cfs

5.00' x 1.50' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 17.00'
Length= 625.0' Slope= 0.0382 '/'
Inlet Invert= 357.60', Outlet Invert= 333.70'

‡

Reach 4R: Grass Channel 4 + Pond



Summary for Pond P5: in Shaws Parking

Inflow Area = 17.065 ac, 62.38% Impervious, Inflow Depth > 1.40" for 1 Year Storm event
Inflow = 36.00 cfs @ 11.98 hrs, Volume= 1.994 af
Outflow = 4.47 cfs @ 12.32 hrs, Volume= 0.930 af, Atten= 88%, Lag= 20.4 min
Primary = 4.47 cfs @ 12.32 hrs, Volume= 0.930 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 357.26' @ 12.32 hrs Surf.Area= 20,221 sf Storage= 51,082 cf

Plug-Flow detention time= 278.2 min calculated for 0.930 af (47% of inflow)
Center-of-Mass det. time= 150.2 min (930.0 - 779.8)

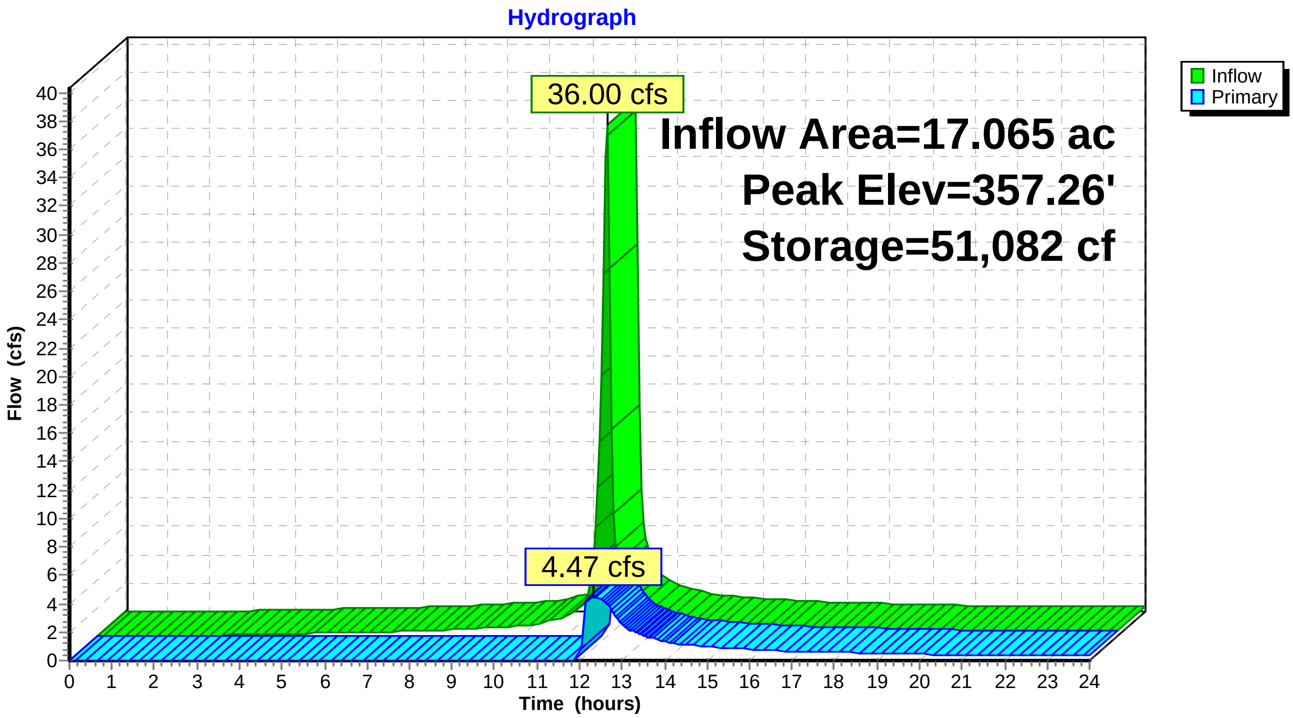
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.47 cfs @ 12.32 hrs HW=357.26' (Free Discharge)
1=2" ORIFICE/GRATE (Orifice Controls 0.11 cfs @ 5.19 fps)
2=6" HORIZONTAL ORIFICE/GRATE X9 (Orifice Controls 4.36 cfs @ 2.47 fps)
3=18" HORIZONTAL ORIFICE/GRATE (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Subcatchment GC4: Grass Channel 4 On-site Area

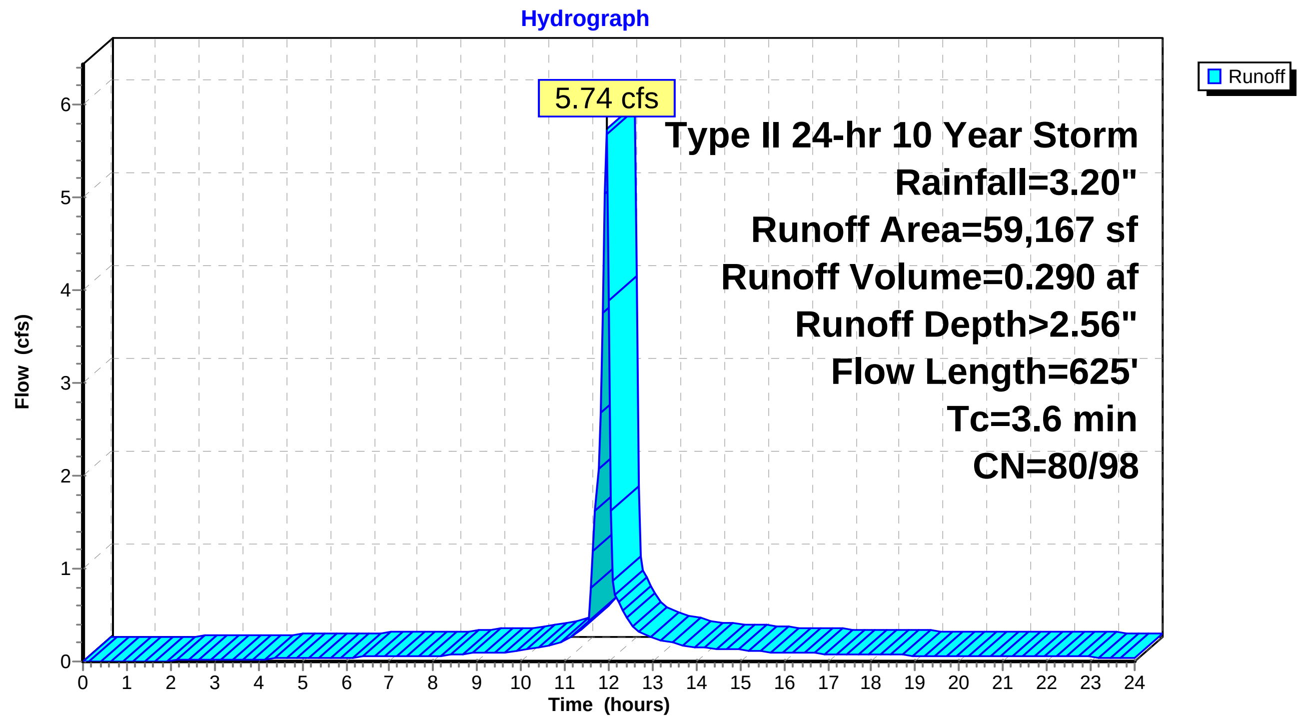
Runoff = 5.74 cfs @ 11.94 hrs, Volume= 0.290 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
43,853	98	Paved roads w/curbs & sewers, HSG D
15,314	80	>75% Grass cover, Good, HSG D
59,167	93	Weighted Average
15,314	80	25.88% Pervious Area
43,853	98	74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0730	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.5	5	0.3400	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	597	0.0390	3.55	5.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=0.25' Z= 3.0 '/' Top.W=6.50' n= 0.030 Earth, grassed & winding
3.6	625	Total			

Subcatchment GC4: Grass Channel 4 On-site Area



Summary for Subcatchment GC5: Grass Channel 5 Area

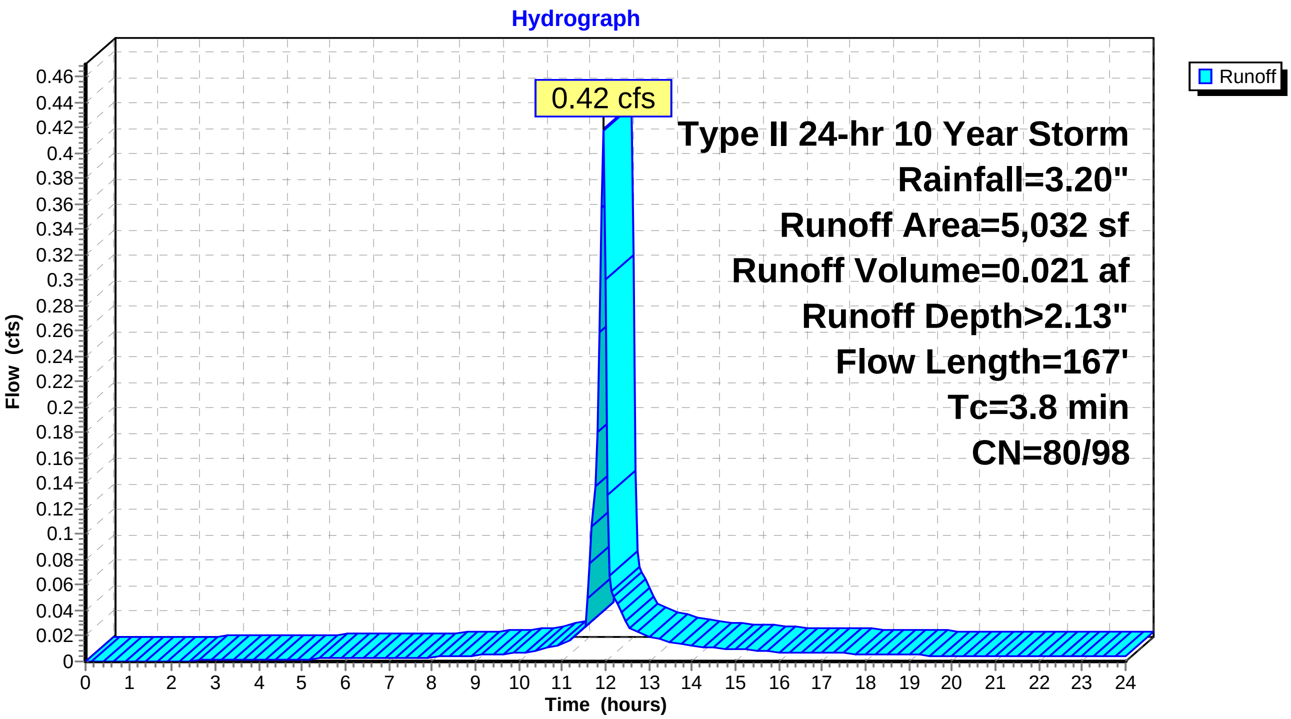
Runoff = 0.42 cfs @ 11.94 hrs, Volume= 0.021 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
2,349	98	Paved roads w/curbs & sewers, HSG D
2,683	80	>75% Grass cover, Good, HSG D
5,032	88	Weighted Average
2,683	80	53.32% Pervious Area
2,349	98	46.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.1	120	0.0017	0.97	1.22	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.25' Z= 4.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
3.8	167	Total			

Subcatchment GC5: Grass Channel 5 Area



Summary for Subcatchment OS8a: (new Subcat)

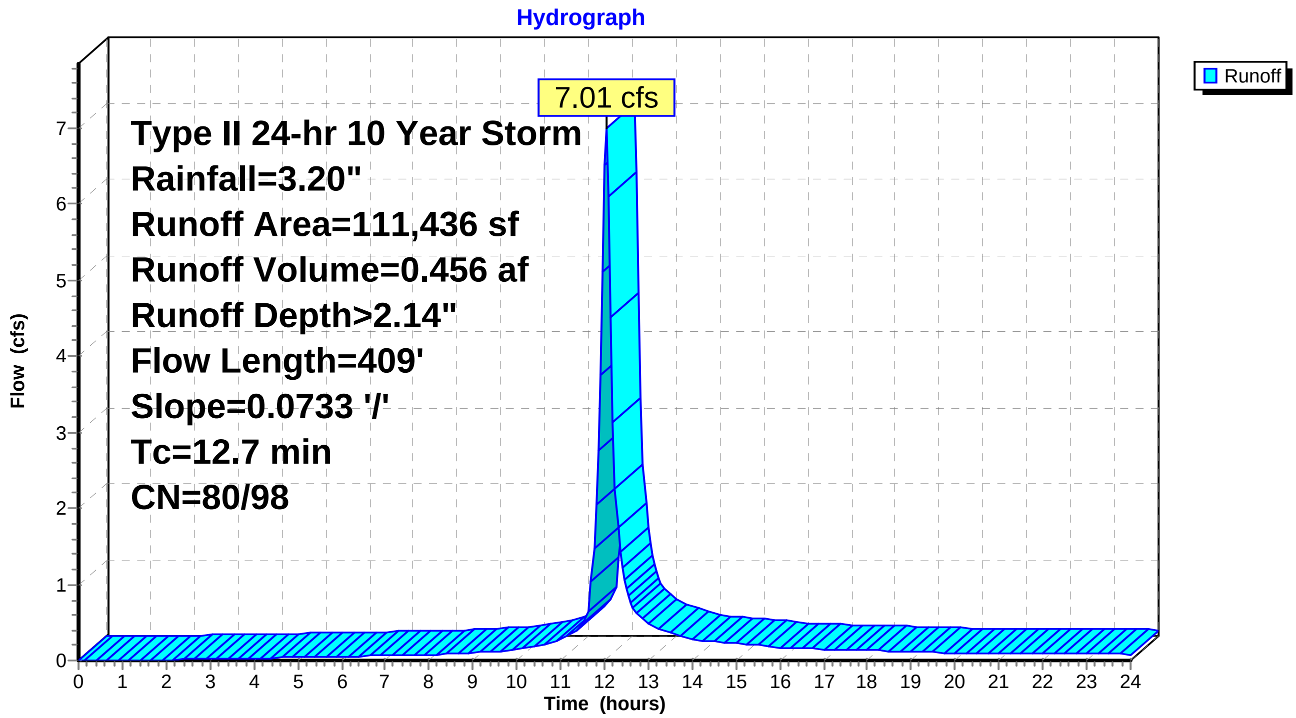
Runoff = 7.01 cfs @ 12.04 hrs, Volume= 0.456 af, Depth> 2.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
58,467	80	>75% Grass cover, Good, HSG D
45,548	98	Paved parking, HSG D
7,421	98	Roofs, HSG D
111,436	89	Weighted Average
58,467	80	52.47% Pervious Area
52,969	98	47.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0733	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.7	309	0.0733	1.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	409	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

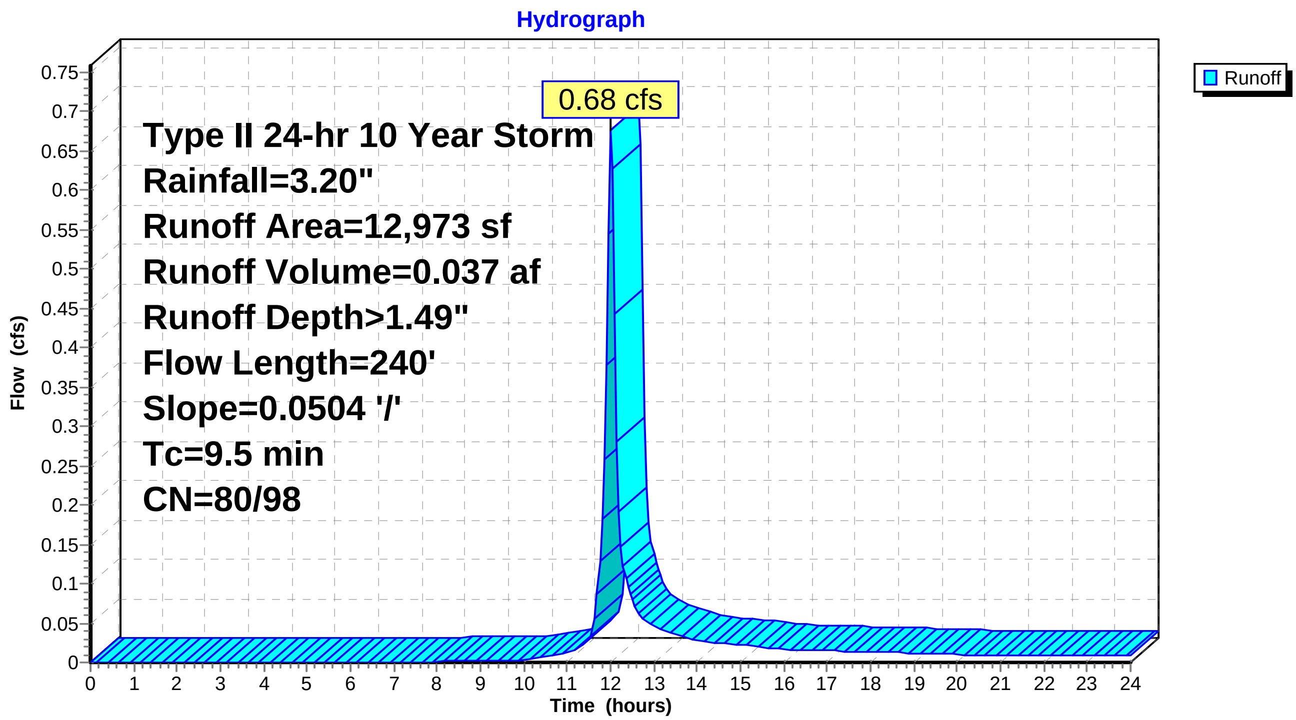
Runoff = 0.68 cfs @ 12.01 hrs, Volume= 0.037 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
12,191	80	>75% Grass cover, Good, HSG D
782	98	Paved roads w/curbs & sewers, HSG D
12,973	81	Weighted Average
12,191	80	93.97% Pervious Area
782	98	6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	240	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

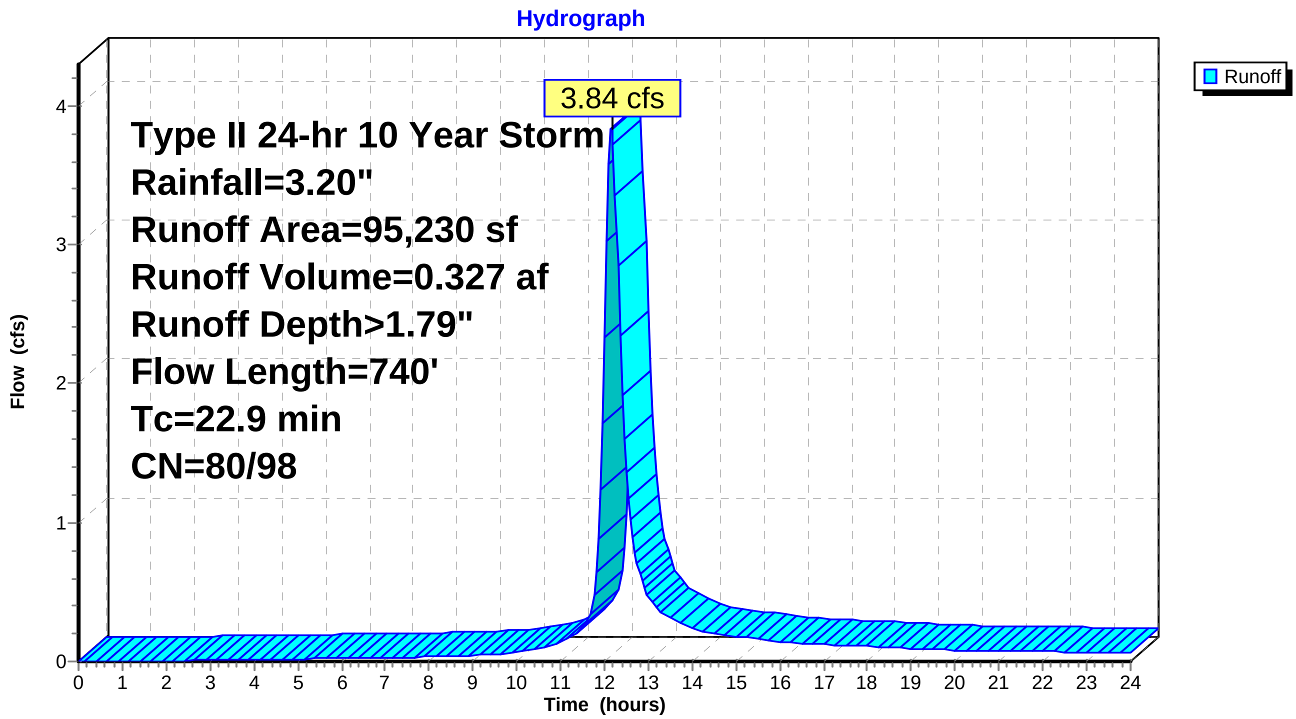
Runoff = 3.84 cfs @ 12.16 hrs, Volume= 0.327 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
24,055	98	Paved roads w/curbs & sewers, HSG D
70,880	80	>75% Grass cover, Good, HSG D
295	98	Unconnected roofs, HSG D
95,230	85	Weighted Average
70,880	80	74.43% Pervious Area
24,350	98	25.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8_5: (new Subcat)

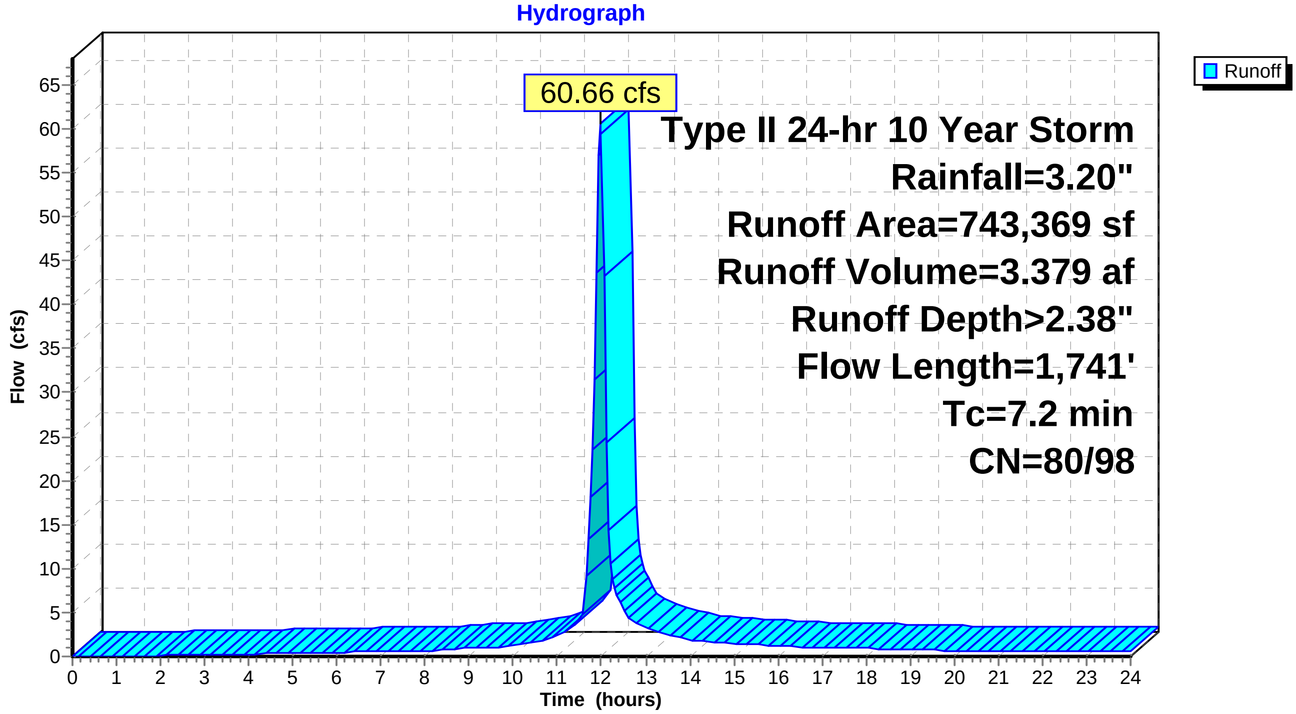
Runoff = 60.66 cfs @ 11.98 hrs, Volume= 3.379 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
279,624	80	>75% Grass cover, Good, HSG D
399,721	98	Paved parking, HSG D
45,396	98	Unconnected roofs, HSG D
18,628	98	Water Surface, HSG D
743,369	91	Weighted Average
279,624	80	37.62% Pervious Area
463,745	98	62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



Summary for Reach 4R: Grass Channel 4 + Pond

Inflow Area = 23.581 ac, 57.25% Impervious, Inflow Depth > 1.75" for 10 Year Storm event
Inflow = 22.84 cfs @ 12.02 hrs, Volume= 3.436 af
Outflow = 22.44 cfs @ 12.08 hrs, Volume= 3.429 af, Atten= 2%, Lag= 3.4 min

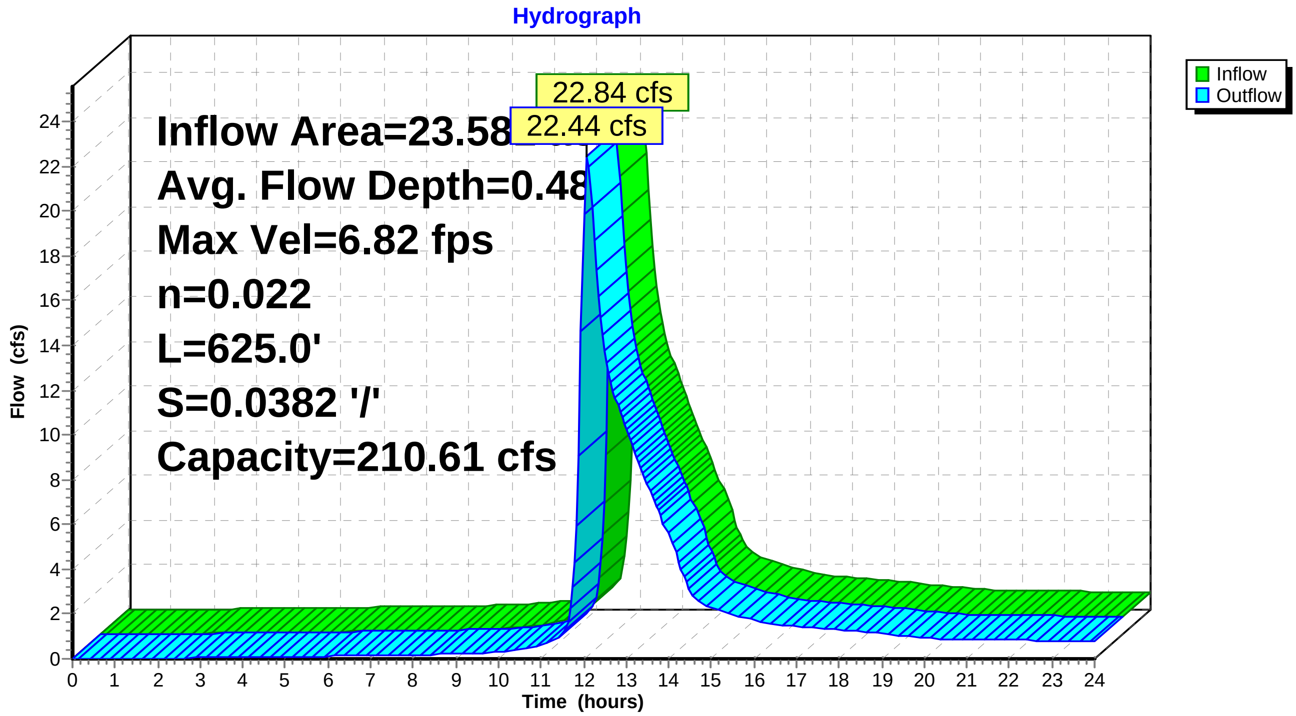
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.82 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 2.22 fps, Avg. Travel Time= 4.7 min

Peak Storage= 2,076 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 210.61 cfs

5.00' x 1.50' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 17.00'
Length= 625.0' Slope= 0.0382 '/'
Inlet Invert= 357.60', Outlet Invert= 333.70'

‡

Reach 4R: Grass Channel 4 + Pond



Summary for Pond P5: in Shaws Parking

Inflow Area =	17.065 ac, 62.38% Impervious, Inflow Depth > 2.38"	for 10 Year Storm event		
Inflow =	60.66 cfs @	11.98 hrs, Volume=	3.379 af	
Outflow =	11.05 cfs @	12.20 hrs, Volume=	2.305 af,	Atten= 82%, Lag= 13.1 min
Primary =	11.05 cfs @	12.20 hrs, Volume=	2.305 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 358.64' @ 12.20 hrs Surf.Area= 22,411 sf Storage= 80,324 cf

Plug-Flow detention time= 205.5 min calculated for 2.305 af (68% of inflow)
Center-of-Mass det. time= 103.8 min (875.9 - 772.1)

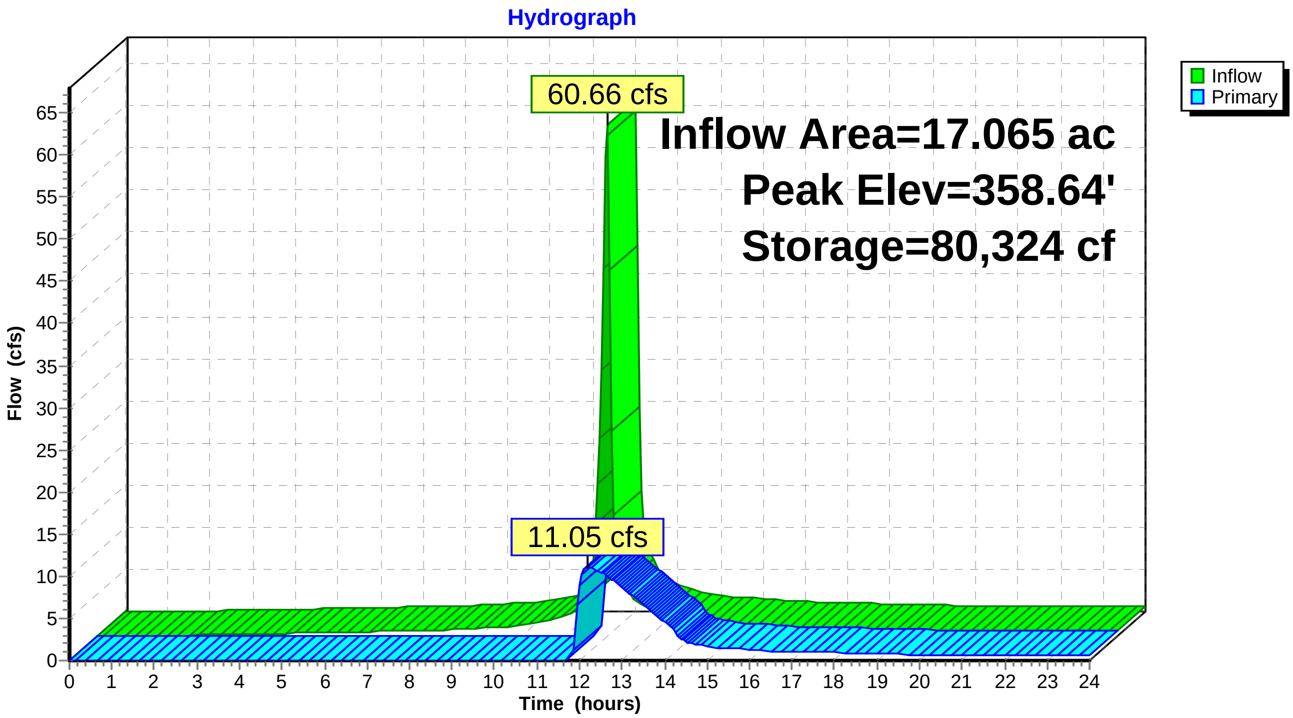
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.05 cfs @ 12.20 hrs HW=358.63' (Free Discharge)
—**1=2" ORIFICE/GRATE** (Orifice Controls 0.17 cfs @ 7.67 fps)
—**2=6" HORIZONTAL ORIFICE/GRATE X9** (Orifice Controls 10.88 cfs @ 6.16 fps)
—**3=18" HORIZONTAL ORIFICE/GRATE** (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Subcatchment GC 5: Grass Channel 5 Area

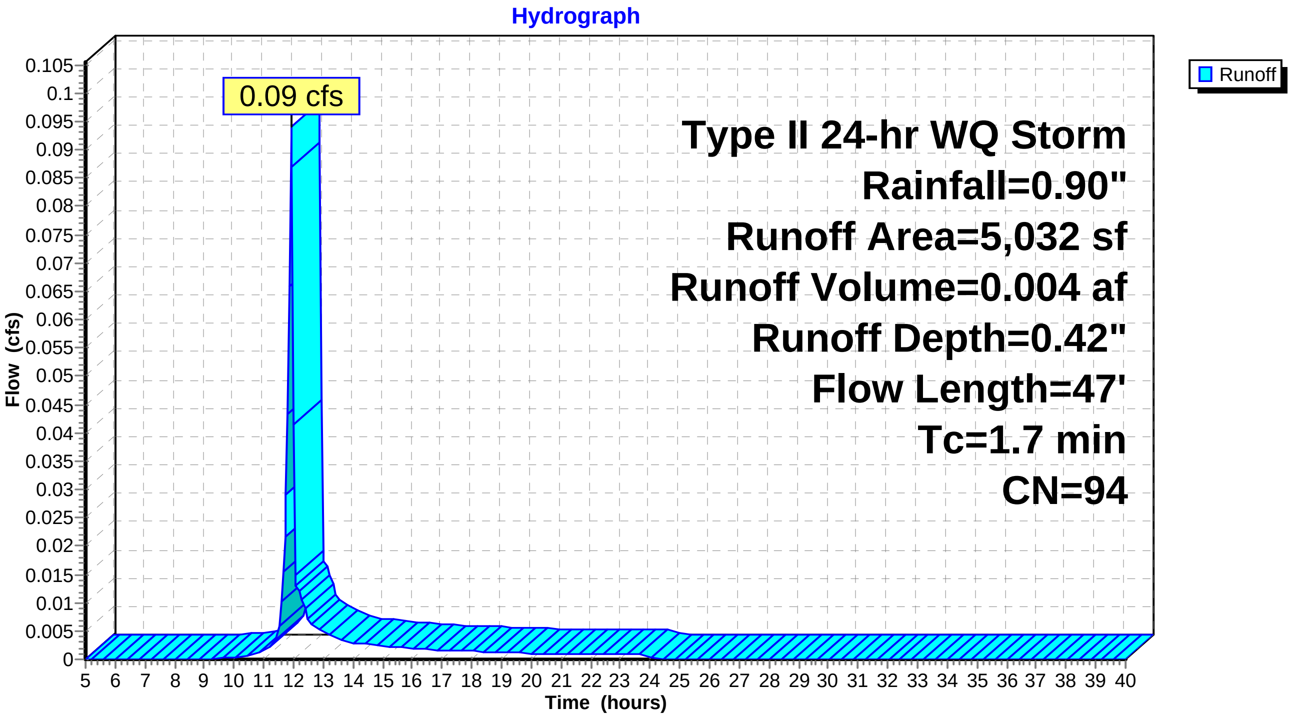
Runoff = 0.09 cfs @ 11.92 hrs, Volume= 0.004 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	5,032	94	Paved roads w/curbs & sewers, HSG D
	5,032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 5: Grass Channel 5 Area



Summary for Reach 5R: Grass Channel 5

Inflow Area = 0.116 ac, 0.00% Impervious, Inflow Depth = 0.42" for WQ Storm event
Inflow = 0.09 cfs @ 11.92 hrs, Volume= 0.004 af
Outflow = 0.04 cfs @ 12.41 hrs, Volume= 0.004 af, Atten= 58%, Lag= 29.4 min

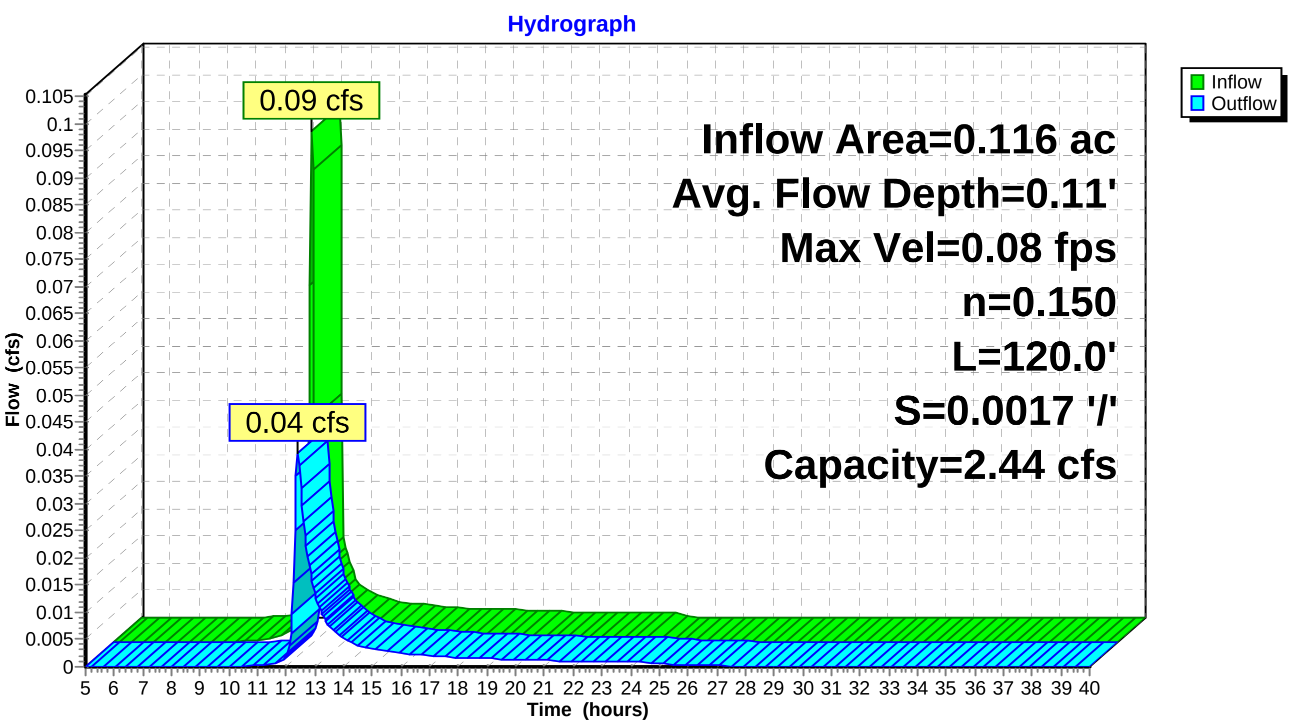
Routing by Stor-Ind+Trans method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.08 fps, Min. Travel Time= 23.6 min
Avg. Velocity = 0.02 fps, Avg. Travel Time= 81.6 min

Peak Storage= 56 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 2.44 cfs

4.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0017 '/'
Inlet Invert= 348.80', Outlet Invert= 348.60'

‡

Reach 5R: Grass Channel 5



Summary for Subcatchment GC 5: Grass Channel 5 Area

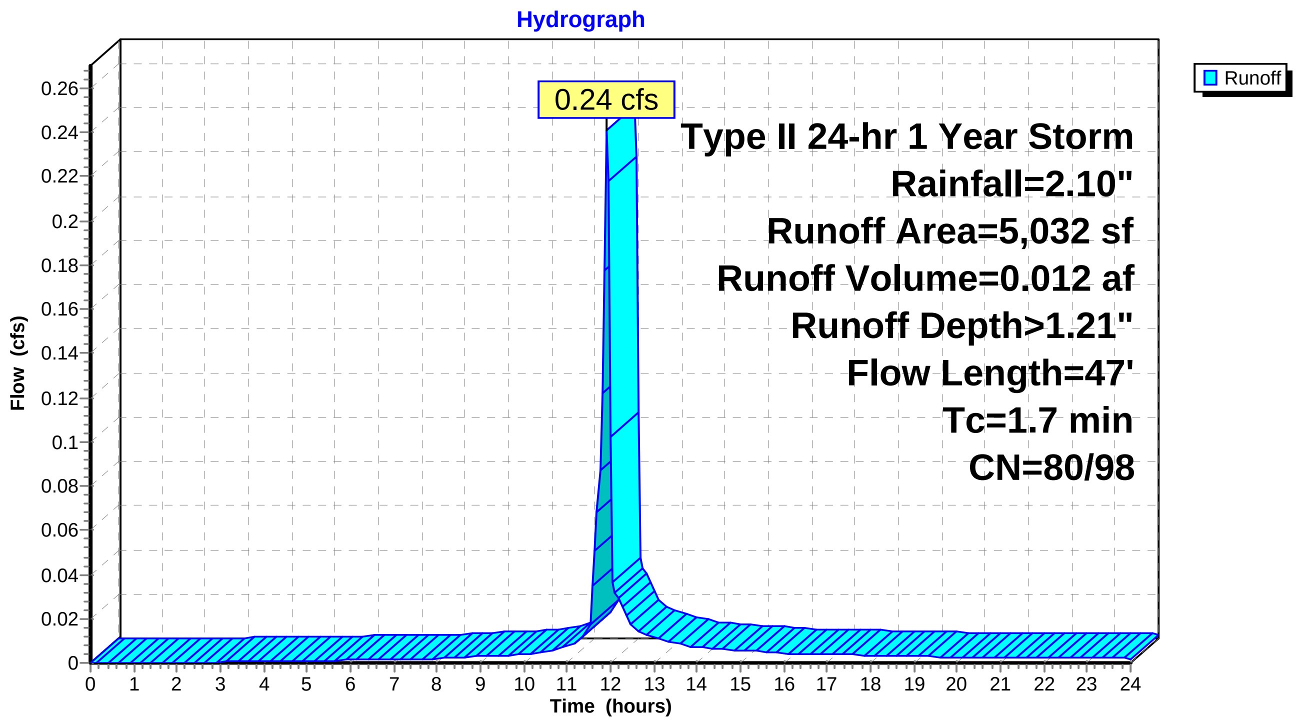
Runoff = 0.24 cfs @ 11.91 hrs, Volume= 0.012 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
2,349	98	Paved roads w/curbs & sewers, HSG D
2,683	80	>75% Grass cover, Good, HSG D
5,032	88	Weighted Average
2,683	80	53.32% Pervious Area
2,349	98	46.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 5: Grass Channel 5 Area



Summary for Reach 5R: Grass Channel 5

Inflow Area = 0.116 ac, 46.68% Impervious, Inflow Depth > 1.21" for 1 Year Storm event
Inflow = 0.24 cfs @ 11.91 hrs, Volume= 0.012 af
Outflow = 0.21 cfs @ 12.00 hrs, Volume= 0.012 af, Atten= 13%, Lag= 5.6 min

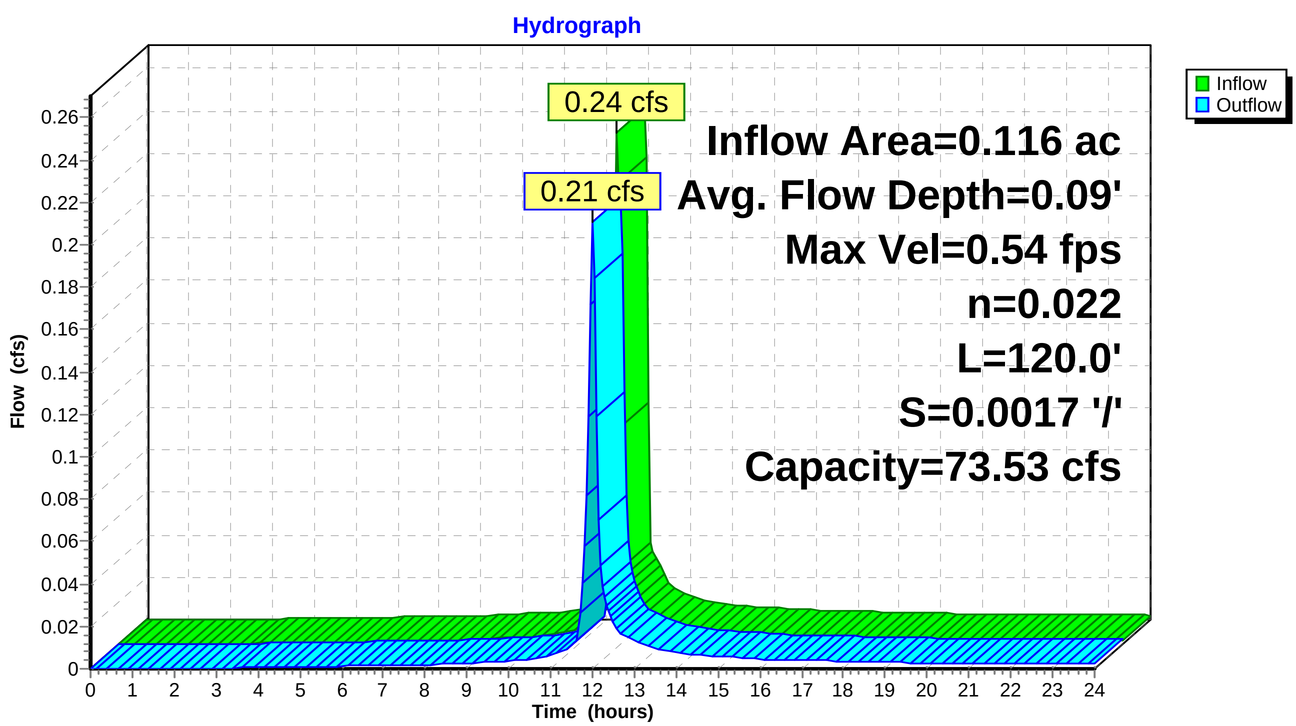
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.54 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 9.7 min

Peak Storage= 49 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 73.53 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 120.0' Slope= 0.0017 '/'
Inlet Invert= 348.80', Outlet Invert= 348.60'

‡

Reach 5R: Grass Channel 5



Summary for Subcatchment GC 5: Grass Channel 5 Area

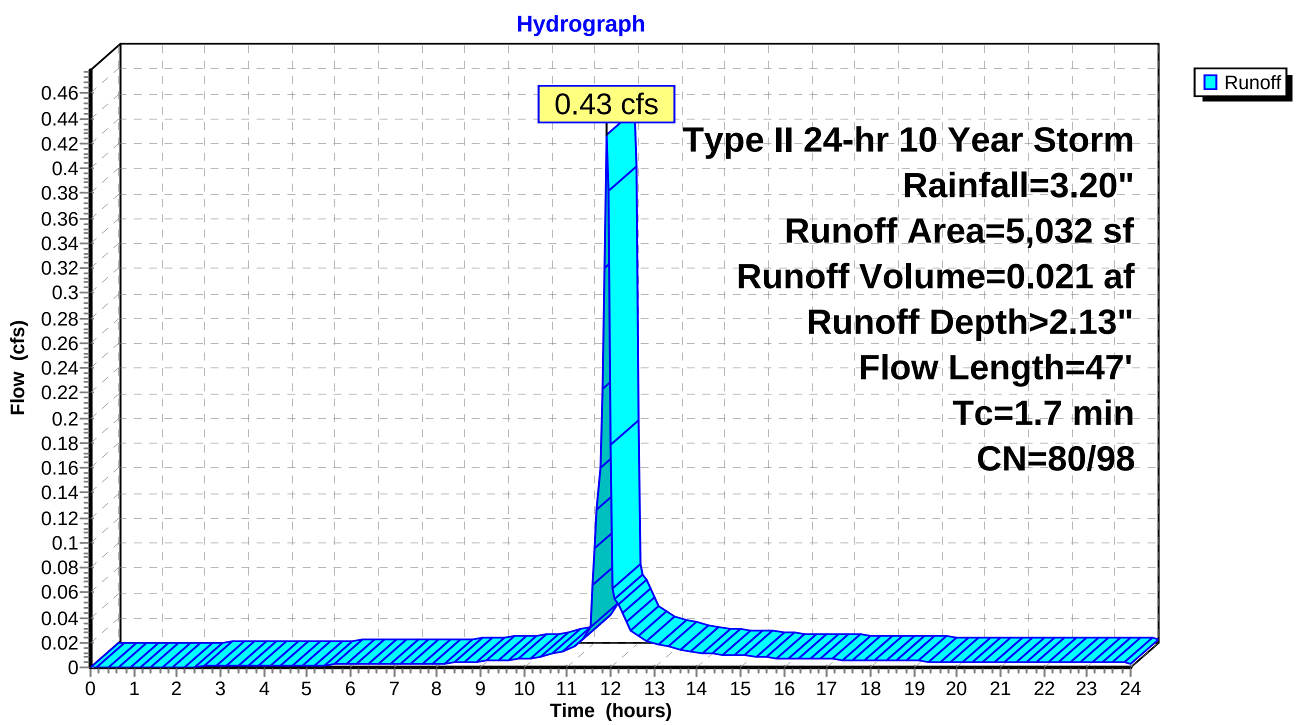
Runoff = 0.43 cfs @ 11.91 hrs, Volume= 0.021 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
2,349	98	Paved roads w/curbs & sewers, HSG D
2,683	80	>75% Grass cover, Good, HSG D
5,032	88	Weighted Average
2,683	80	53.32% Pervious Area
2,349	98	46.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 5: Grass Channel 5 Area



Summary for Reach 5R: Grass Channel 5

Inflow Area = 0.116 ac, 46.68% Impervious, Inflow Depth > 2.13" for 10 Year Storm event
Inflow = 0.43 cfs @ 11.91 hrs, Volume= 0.021 af
Outflow = 0.40 cfs @ 11.99 hrs, Volume= 0.020 af, Atten= 7%, Lag= 4.8 min

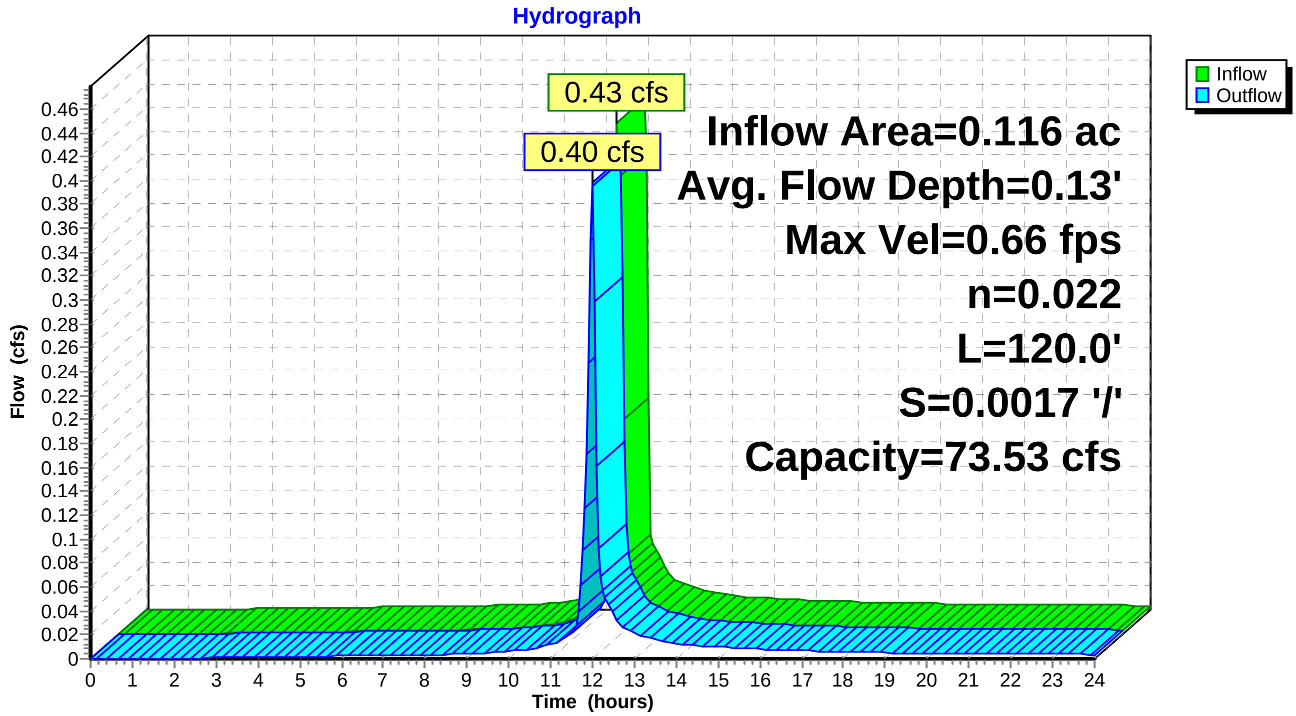
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.66 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 9.5 min

Peak Storage= 72 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 73.53 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 120.0' Slope= 0.0017 '/'
Inlet Invert= 348.80', Outlet Invert= 348.60'

‡

Reach 5R: Grass Channel 5



Summary for Subcatchment GC 6: Grass Channel 6 Area

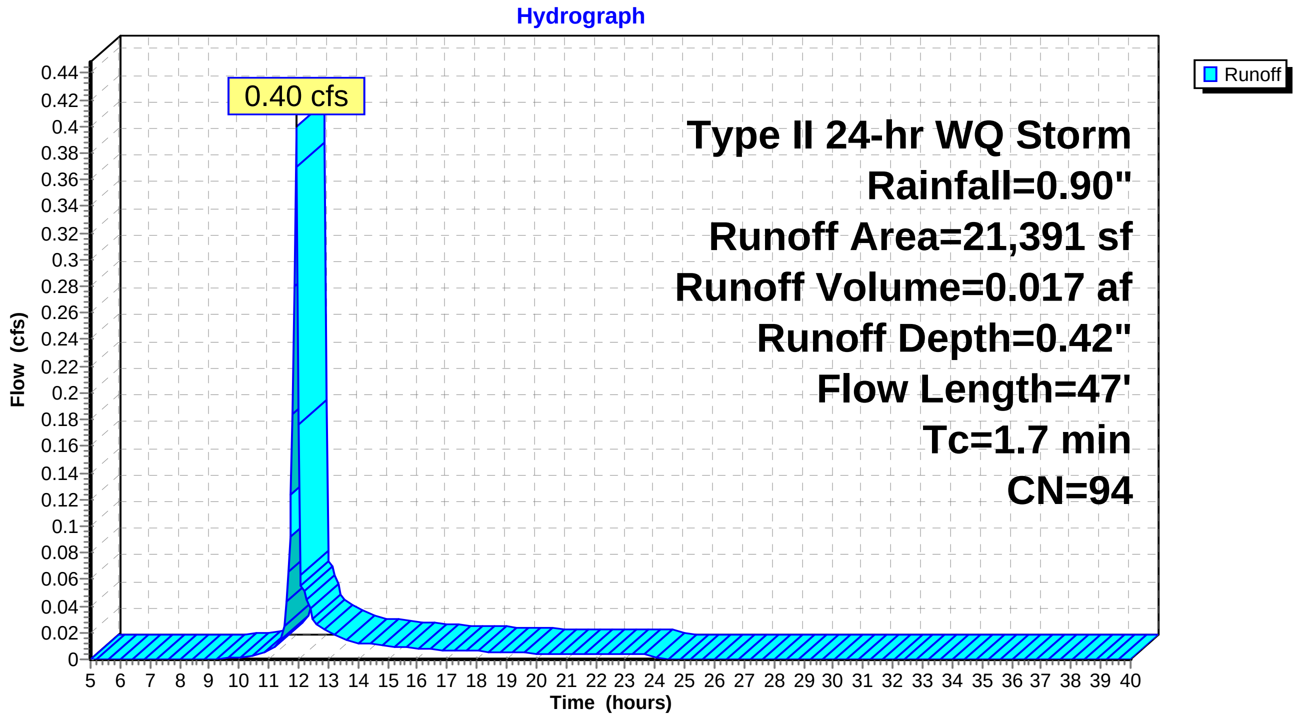
Runoff = 0.40 cfs @ 11.92 hrs, Volume= 0.017 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	21,391	94	
	21,391		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 6: Grass Channel 6 Area



Summary for Reach 6R: Grass Channel 6

Inflow Area = 0.491 ac, 0.00% Impervious, Inflow Depth = 0.42" for WQ Storm event
Inflow = 0.40 cfs @ 11.92 hrs, Volume= 0.017 af
Outflow = 0.17 cfs @ 12.41 hrs, Volume= 0.017 af, Atten= 58%, Lag= 29.6 min

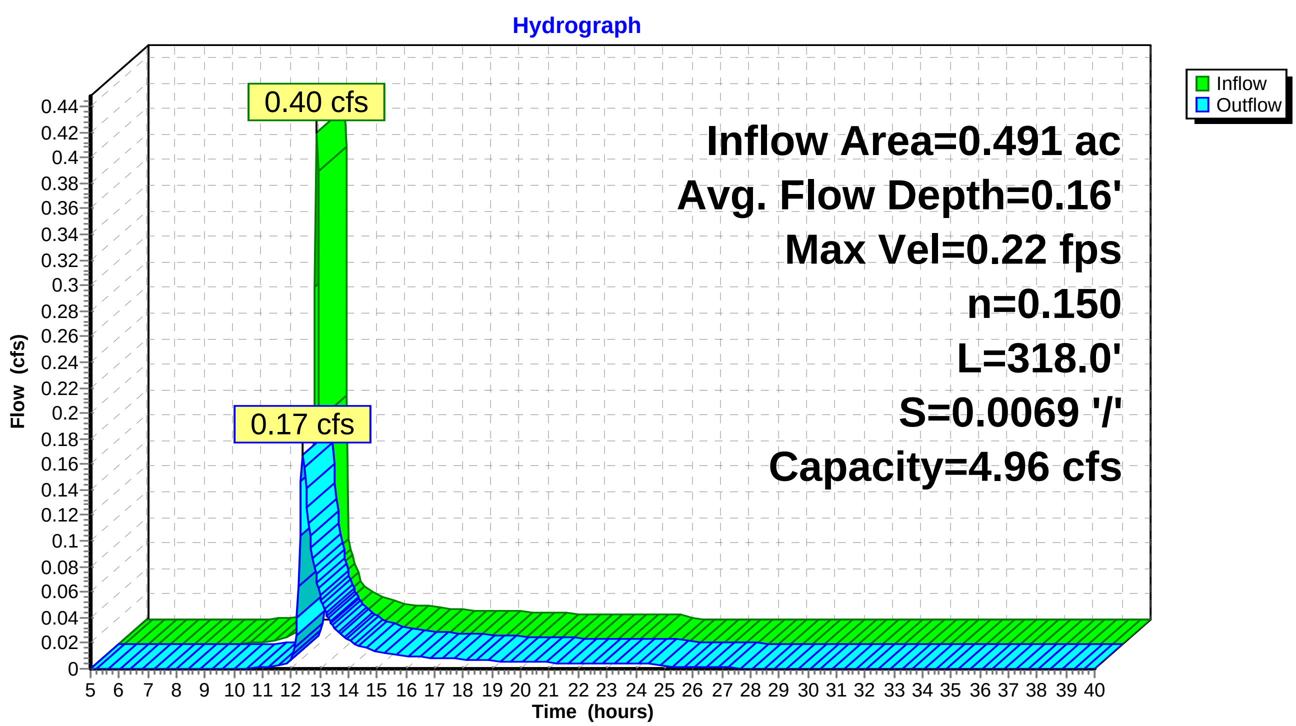
Routing by Stor-Ind+Trans method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.22 fps, Min. Travel Time= 23.8 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 93.1 min

Peak Storage= 239 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.96 cfs

4.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 318.0' Slope= 0.0069 '/'
Inlet Invert= 348.80', Outlet Invert= 346.60'

‡

Reach 6R: Grass Channel 6



Summary for Subcatchment GC 6: Grass Channel 6 Area

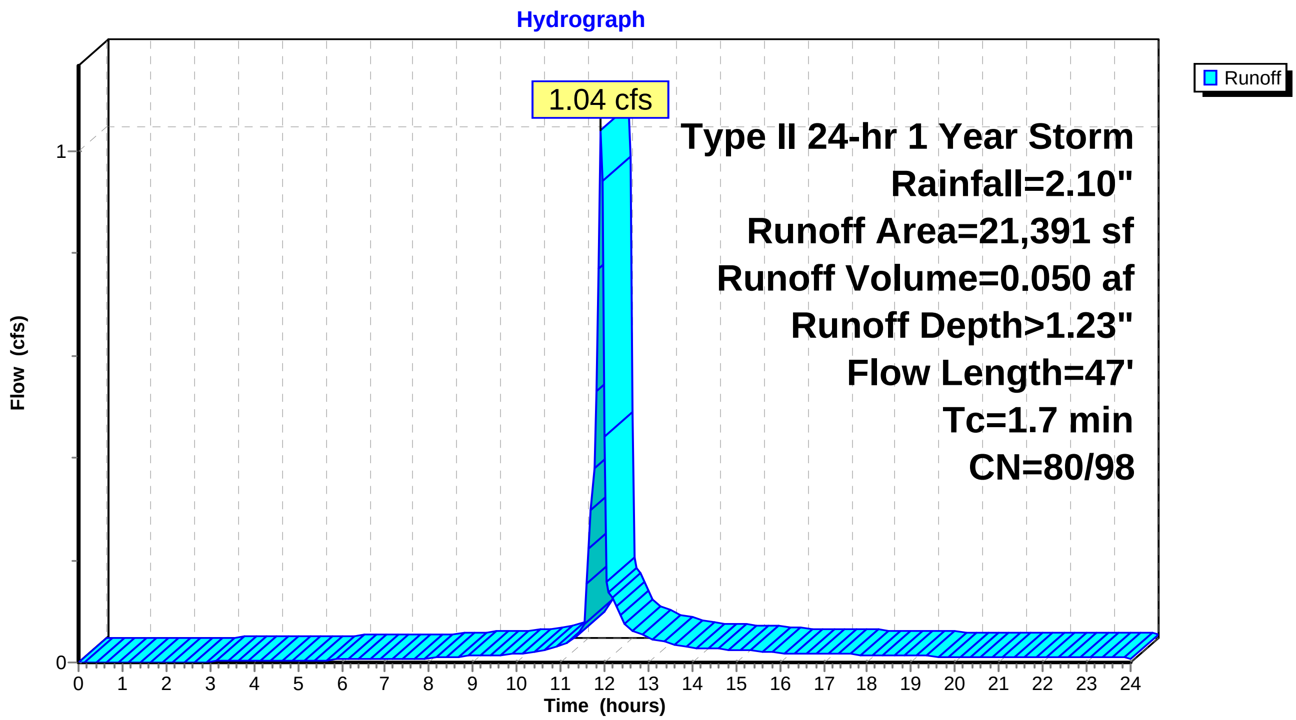
Runoff = 1.04 cfs @ 11.91 hrs, Volume= 0.050 af, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
11,001	80	>75% Grass cover, Good, HSG D
10,390	98	Paved roads w/curbs & sewers, HSG D
21,391	89	Weighted Average
11,001	80	51.43% Pervious Area
10,390	98	48.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 6: Grass Channel 6 Area



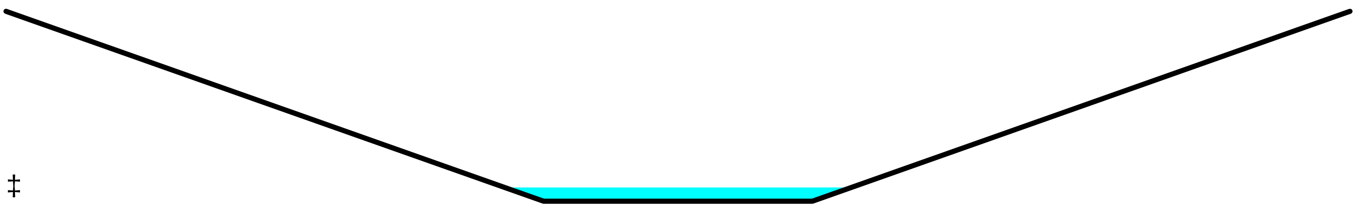
Summary for Reach 6R: Grass Channel 6

Inflow Area = 0.491 ac, 48.57% Impervious, Inflow Depth > 1.23" for 1 Year Storm event
Inflow = 1.04 cfs @ 11.91 hrs, Volume= 0.050 af
Outflow = 0.91 cfs @ 12.00 hrs, Volume= 0.050 af, Atten= 13%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.42 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 12.2 min

Peak Storage= 210 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 149.81 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 318.0' Slope= 0.0069 '/'
Inlet Invert= 348.80', Outlet Invert= 346.60'



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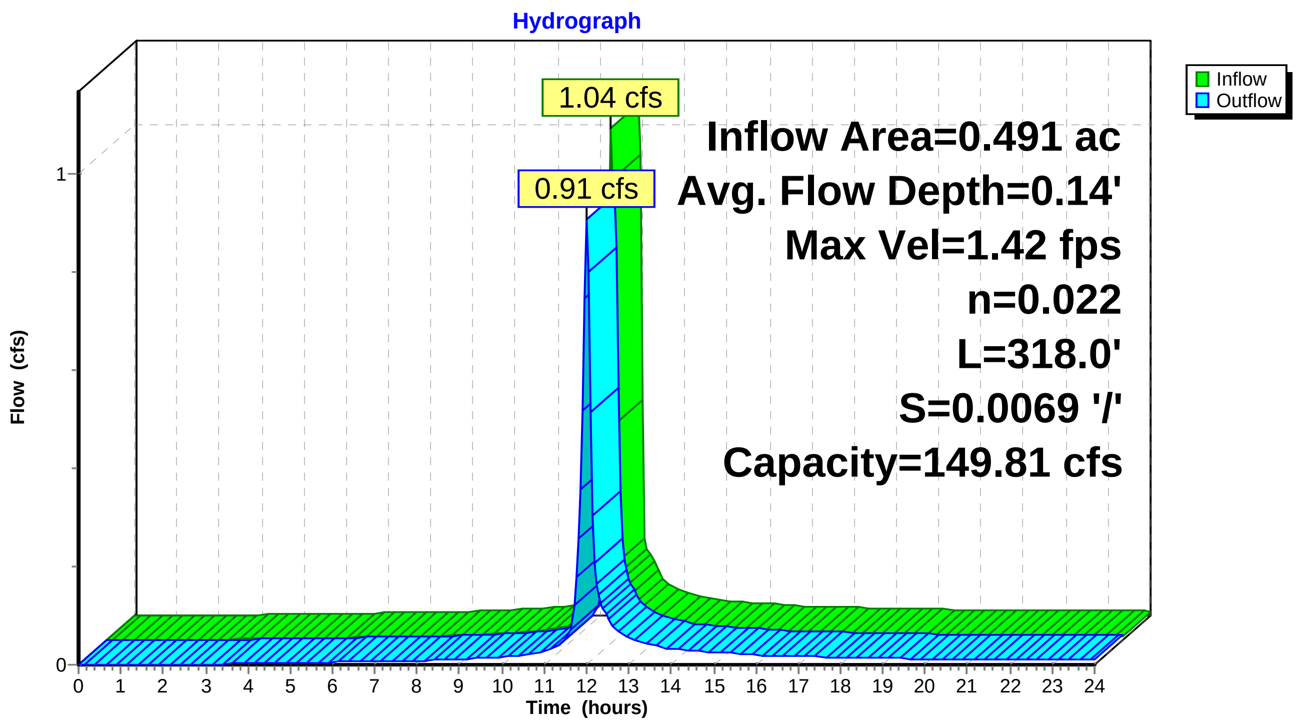
Reach 6R: Grass Channel 6



Summary for Subcatchment GC 6: Grass Channel 6 Area

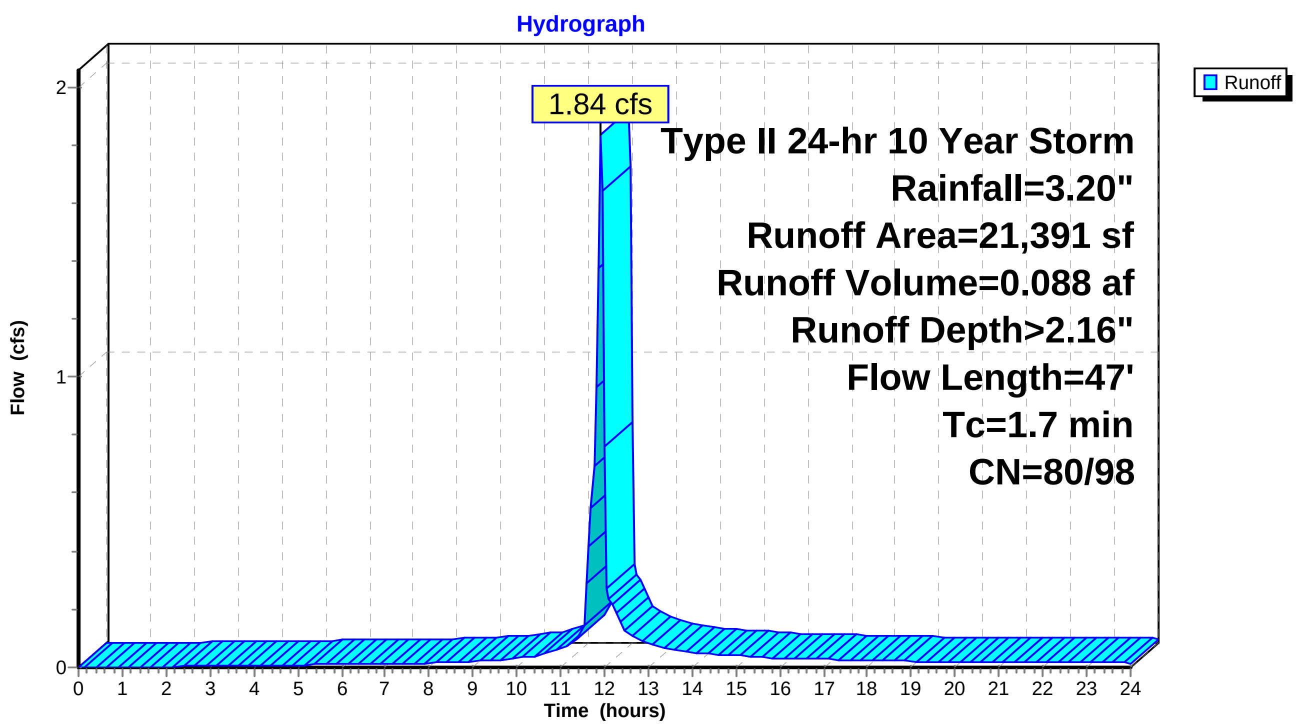
Runoff = 1.84 cfs @ 11.91 hrs, Volume= 0.088 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
11,001	80	>75% Grass cover, Good, HSG D
10,390	98	Paved roads w/curbs & sewers, HSG D
21,391	89	Weighted Average
11,001	80	51.43% Pervious Area
10,390	98	48.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	37	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	10	0.2040	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.7	47	Total			

Subcatchment GC 6: Grass Channel 6 Area



Summary for Reach 6R: Grass Channel 6

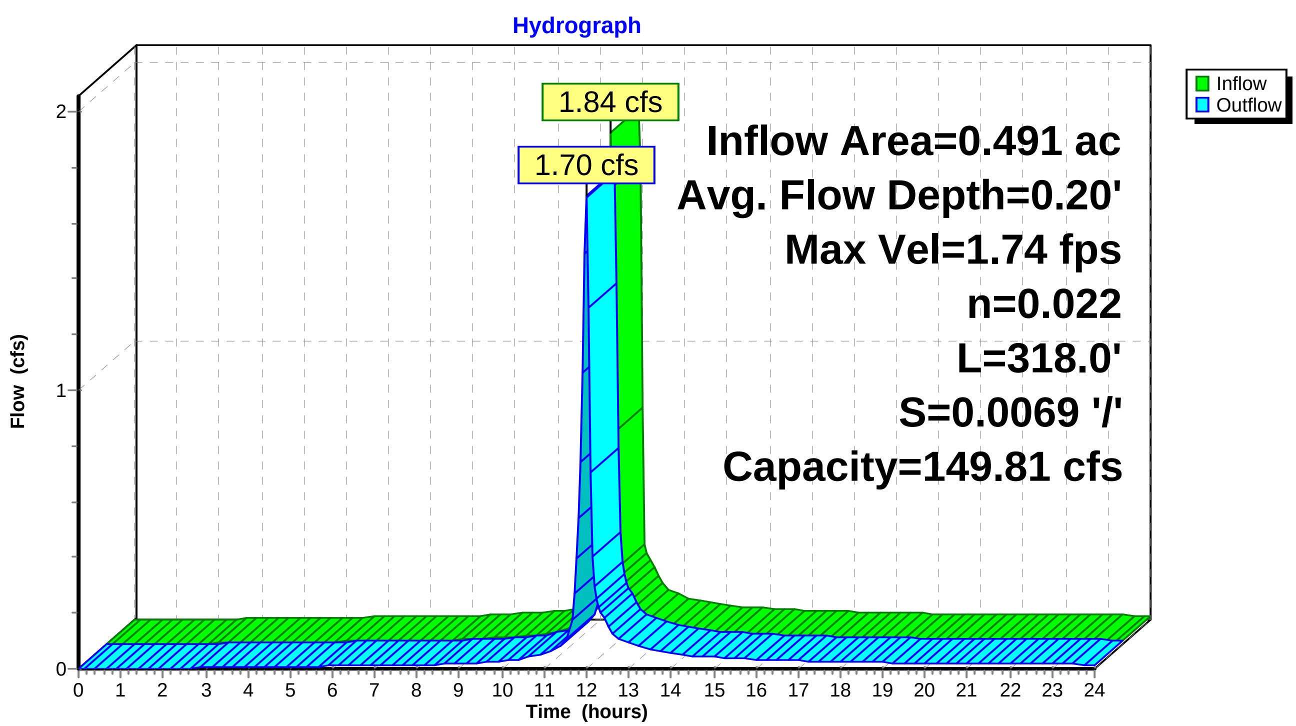
Inflow Area = 0.491 ac, 48.57% Impervious, Inflow Depth > 2.16" for 10 Year Storm event
Inflow = 1.84 cfs @ 11.91 hrs, Volume= 0.088 af
Outflow = 1.70 cfs @ 11.99 hrs, Volume= 0.088 af, Atten= 8%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.74 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 11.6 min

Peak Storage= 311 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 149.81 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 318.0' Slope= 0.0069 '/'
Inlet Invert= 348.80', Outlet Invert= 346.60'

Reach 6R: Grass Channel 6



Summary for Subcatchment GC 7: Grass Channel 7 Area

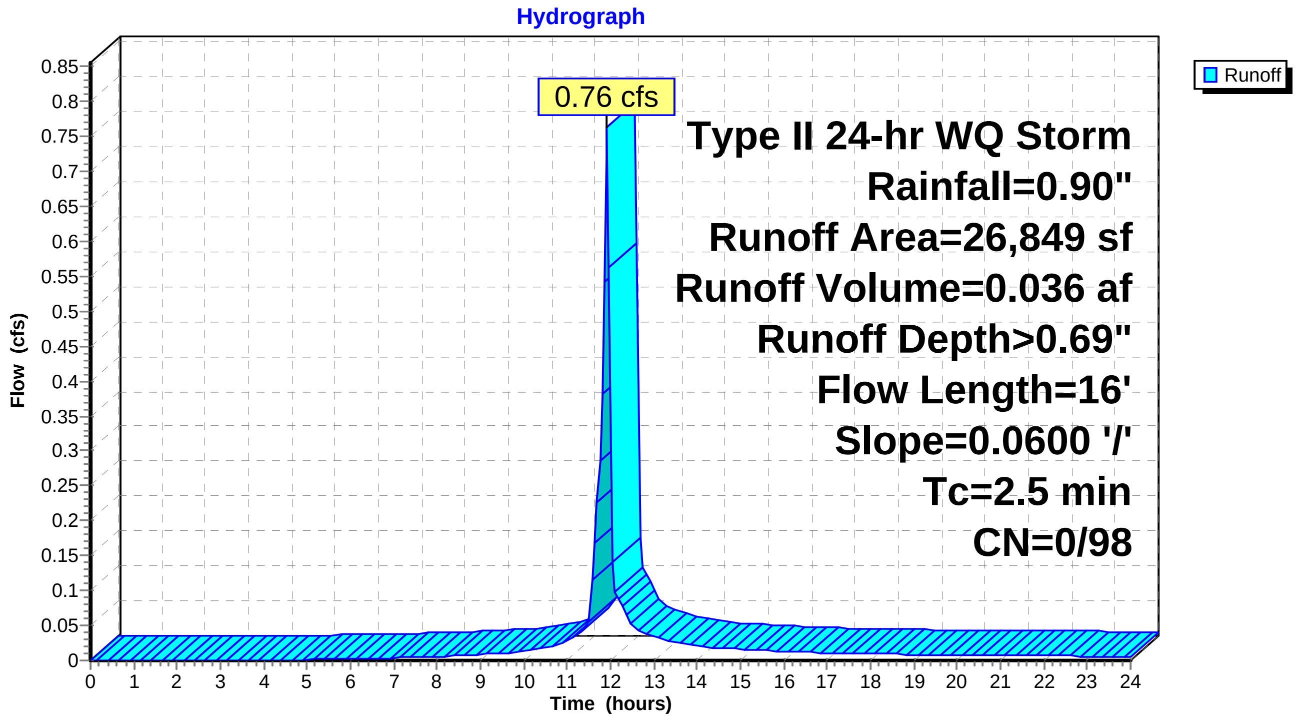
Runoff = 0.76 cfs @ 11.93 hrs, Volume= 0.036 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	26,849	98	
	26,849	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	16	0.0600	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Subcatchment GC 7: Grass Channel 7 Area



Summary for Reach 7R: Grass Channel 7

Inflow Area = 0.616 ac,100.00% Impervious, Inflow Depth > 0.69" for WQ Storm event
Inflow = 0.76 cfs @ 11.93 hrs, Volume= 0.036 af
Outflow = 0.45 cfs @ 12.23 hrs, Volume= 0.035 af, Atten= 41%, Lag= 18.2 min

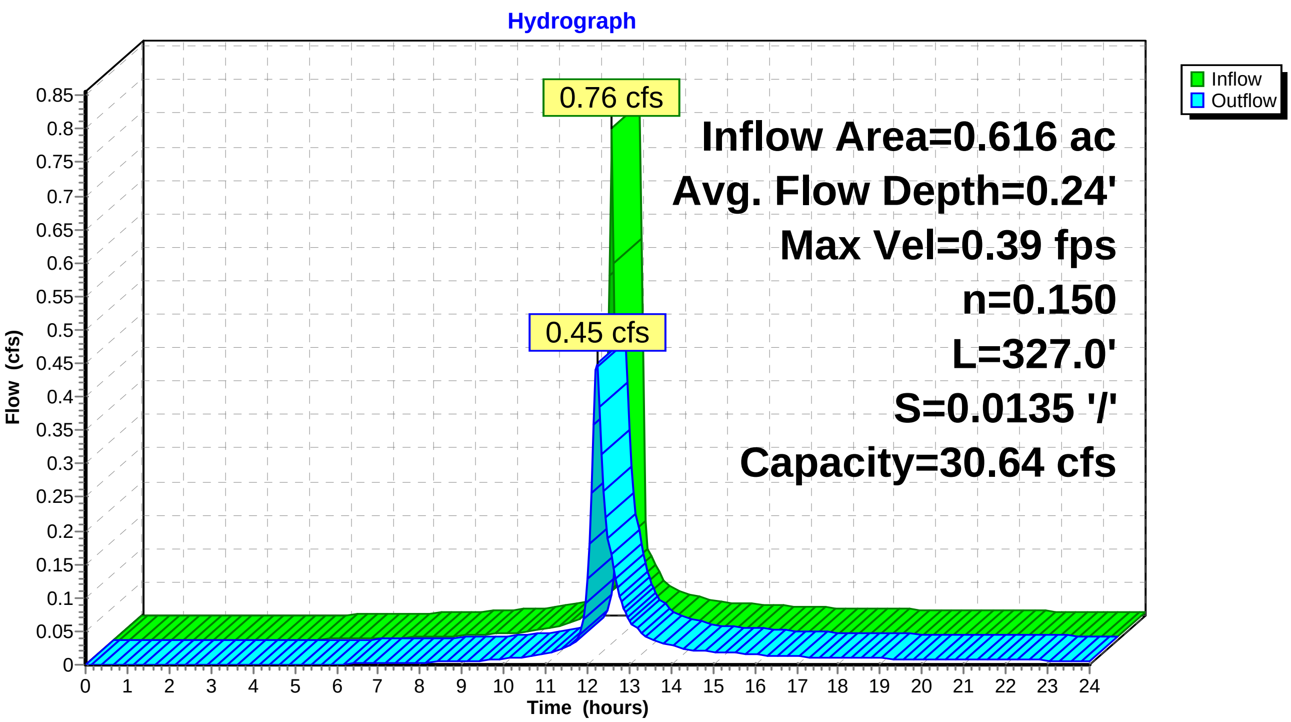
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 49.0 min

Peak Storage= 387 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 30.64 cfs

4.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 327.0' Slope= 0.0135 '/'
Inlet Invert= 346.60', Outlet Invert= 342.20'

‡

Reach 7R: Grass Channel 7



Summary for Subcatchment GC 7: Grass Channel 7 Area

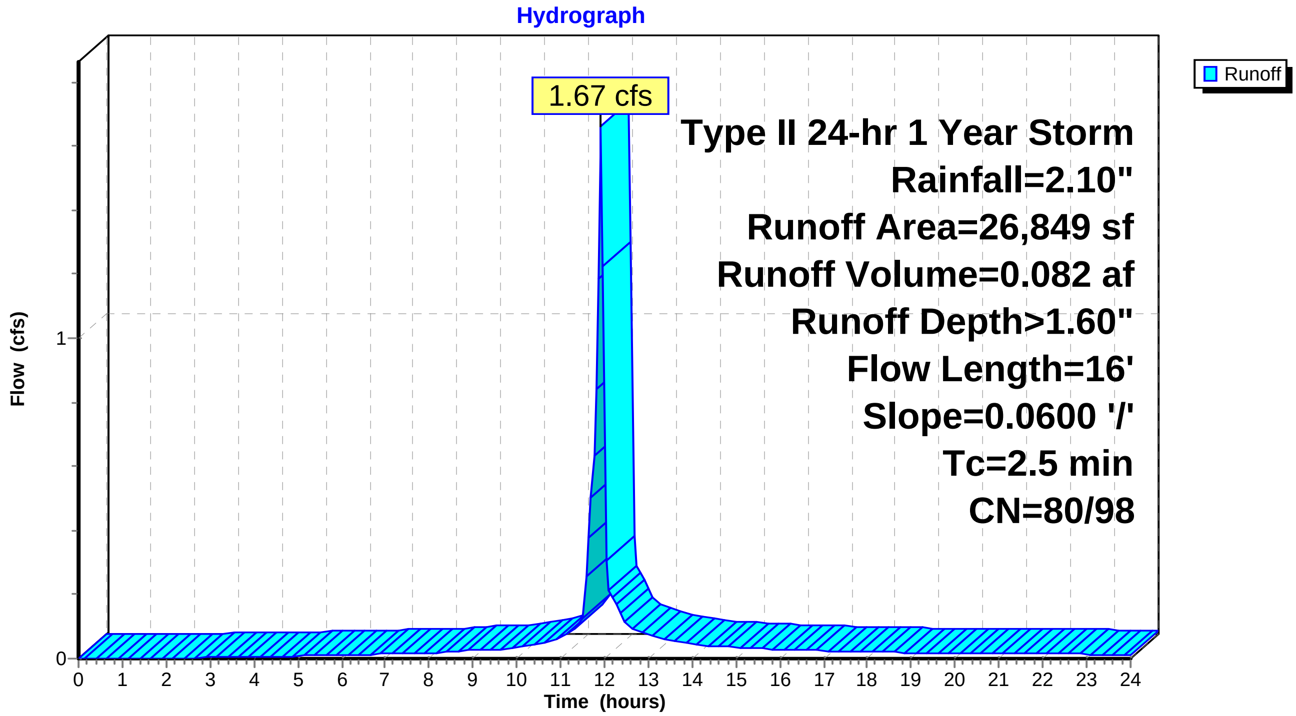
Runoff = 1.67 cfs @ 11.93 hrs, Volume= 0.082 af, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
5,860	80	>75% Grass cover, Good, HSG D
20,989	98	Paved roads w/curbs & sewers, HSG D
26,849	94	Weighted Average
5,860	80	21.83% Pervious Area
20,989	98	78.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	16	0.0600	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Subcatchment GC 7: Grass Channel 7 Area



Summary for Reach 7R: Grass Channel 7

Inflow Area = 0.616 ac, 78.17% Impervious, Inflow Depth > 1.60" for 1 Year Storm event
Inflow = 1.67 cfs @ 11.93 hrs, Volume= 0.082 af
Outflow = 1.52 cfs @ 11.99 hrs, Volume= 0.082 af, Atten= 8%, Lag= 3.9 min

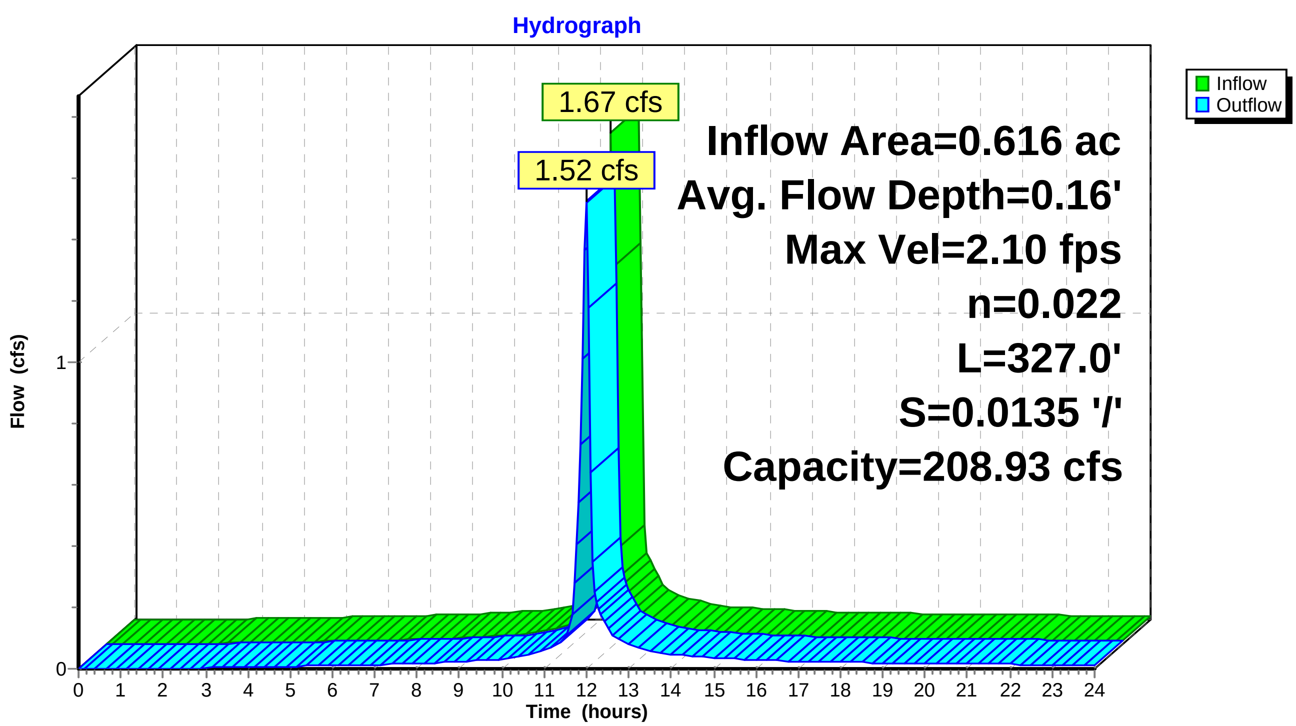
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.10 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 8.9 min

Peak Storage= 242 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 208.93 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 327.0' Slope= 0.0135 '/'
Inlet Invert= 346.60', Outlet Invert= 342.20'

‡

Reach 7R: Grass Channel 7



Summary for Subcatchment GC 7: Grass Channel 7 Area

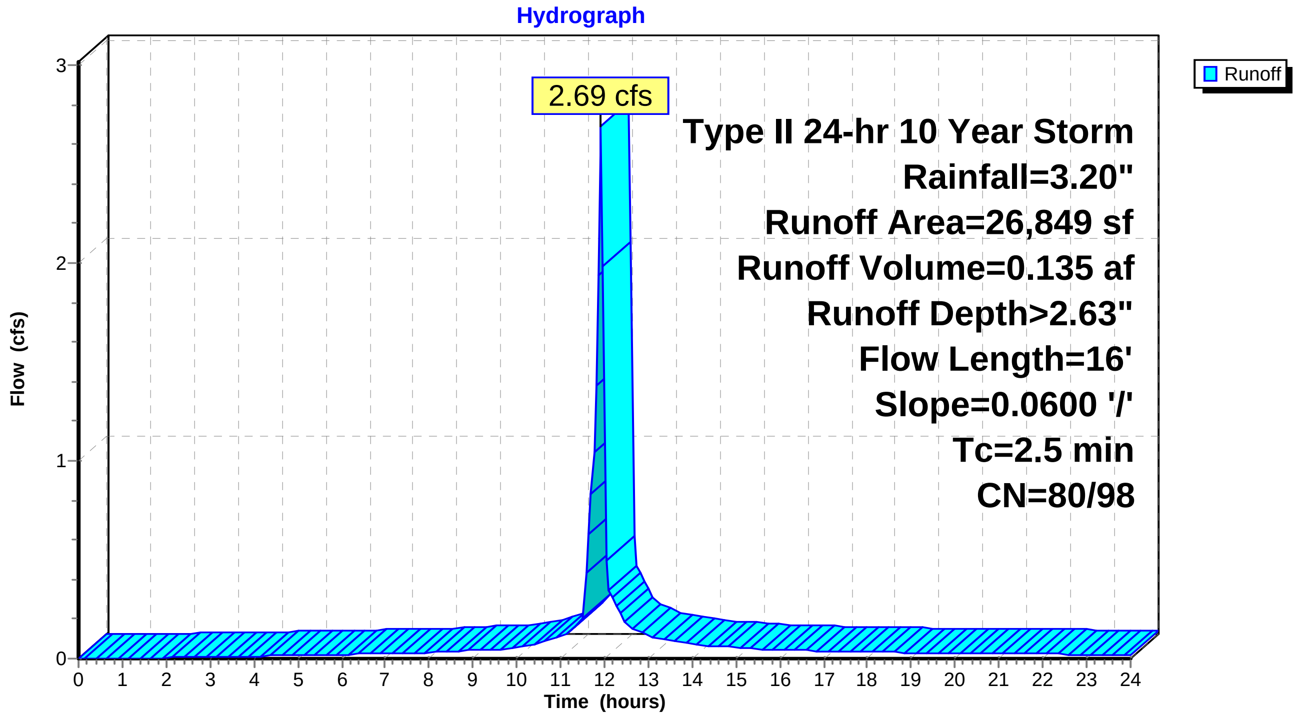
Runoff = 2.69 cfs @ 11.93 hrs, Volume= 0.135 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
5,860	80	>75% Grass cover, Good, HSG D
20,989	98	Paved roads w/curbs & sewers, HSG D
26,849	94	Weighted Average
5,860	80	21.83% Pervious Area
20,989	98	78.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	16	0.0600	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Subcatchment GC 7: Grass Channel 7 Area



Summary for Reach 7R: Grass Channel 7

Inflow Area = 0.616 ac, 78.17% Impervious, Inflow Depth > 2.63" for 10 Year Storm event
Inflow = 2.69 cfs @ 11.93 hrs, Volume= 0.135 af
Outflow = 2.45 cfs @ 11.98 hrs, Volume= 0.135 af, Atten= 9%, Lag= 3.3 min

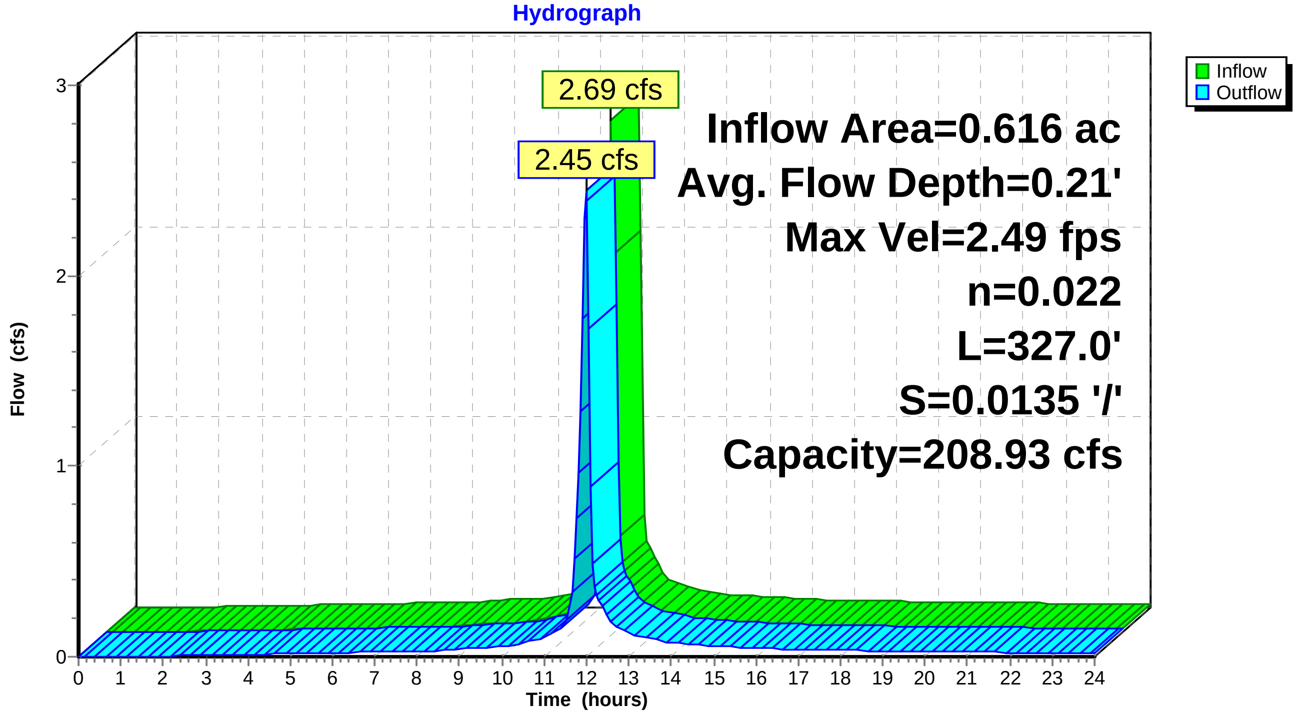
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 8.4 min

Peak Storage= 336 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 208.93 cfs

4.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 327.0' Slope= 0.0135 '/'
Inlet Invert= 346.60', Outlet Invert= 342.20'

‡

Reach 7R: Grass Channel 7



Summary for Subcatchment GC 8: Grass Channel 8 Area

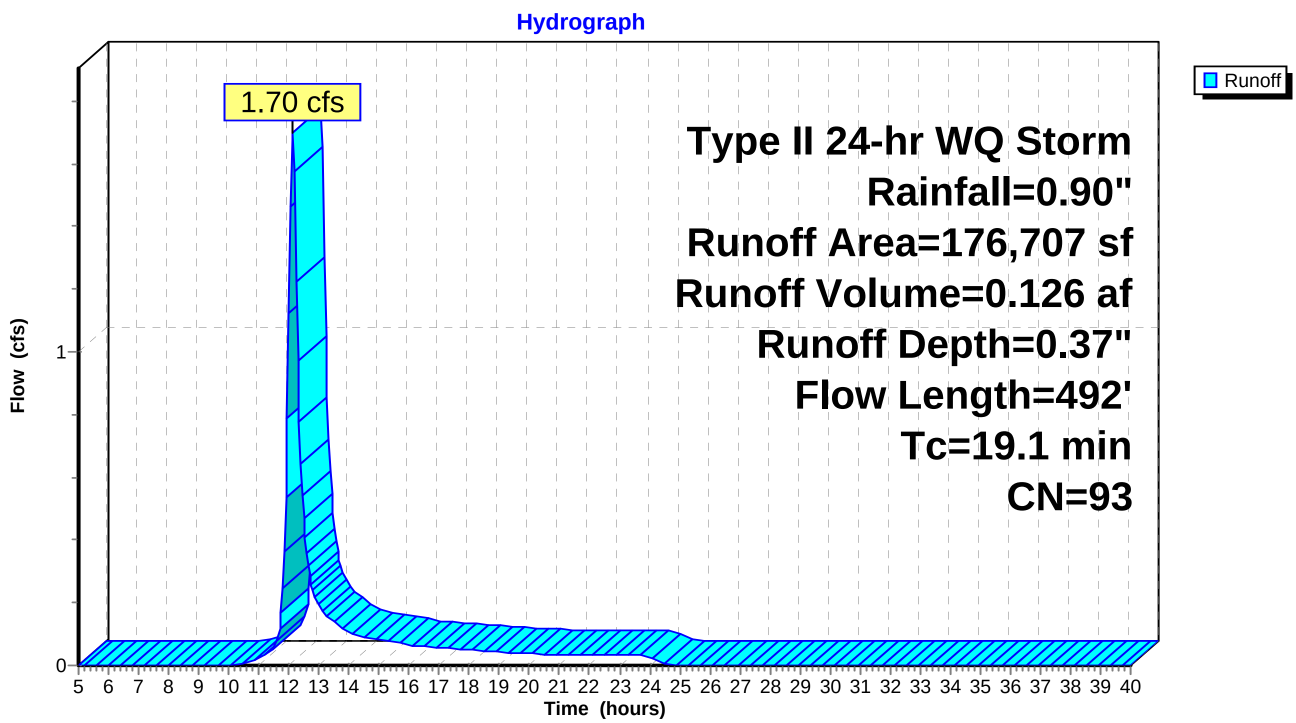
Runoff = 1.70 cfs @ 12.12 hrs, Volume= 0.126 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	176,707	93	
	176,707		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	160	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123	0.1800	8.61		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	109	0.0900	4.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.1	492	Total			

Subcatchment GC 8: Grass Channel 8 Area



Summary for Reach 8R: Grass Channel 8

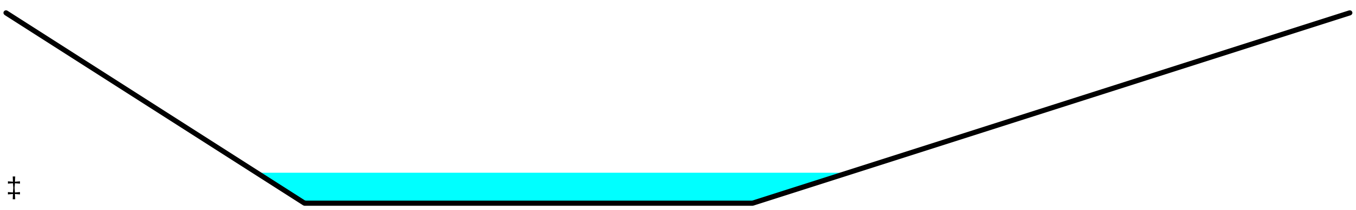
Inflow Area = 4.057 ac, 0.00% Impervious, Inflow Depth = 0.37" for WQ Storm event
Inflow = 1.70 cfs @ 12.12 hrs, Volume= 0.126 af
Outflow = 1.23 cfs @ 12.47 hrs, Volume= 0.126 af, Atten= 27%, Lag= 21.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.56 fps, Min. Travel Time= 13.4 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 48.8 min

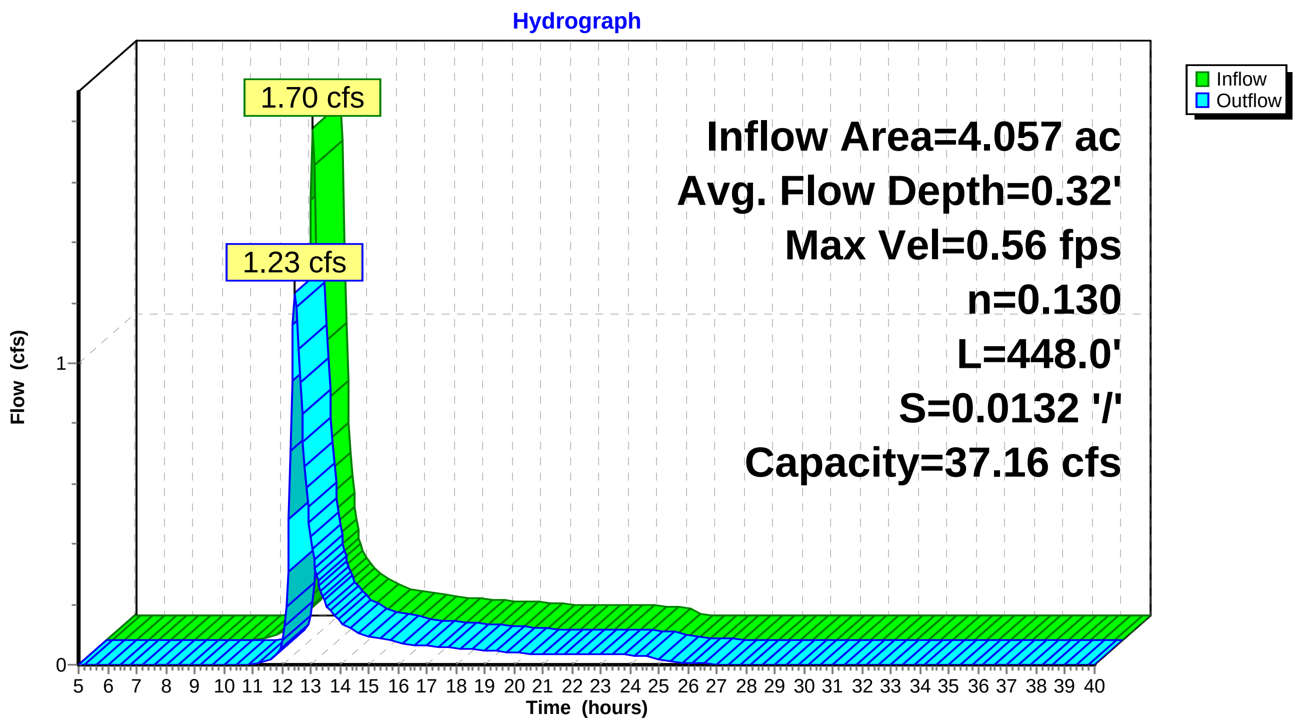
Peak Storage= 998 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 37.16 cfs

6.00' x 2.00' deep channel, n= 0.130
Side Slope Z-value= 2.0 4.0 '/' Top Width= 18.00'
Length= 448.0' Slope= 0.0132 '/'
Inlet Invert= 322.80', Outlet Invert= 316.90'

‡



Reach 8R: Grass Channel 8



Summary for Subcatchment GC 8: Grass Channel 8 Area

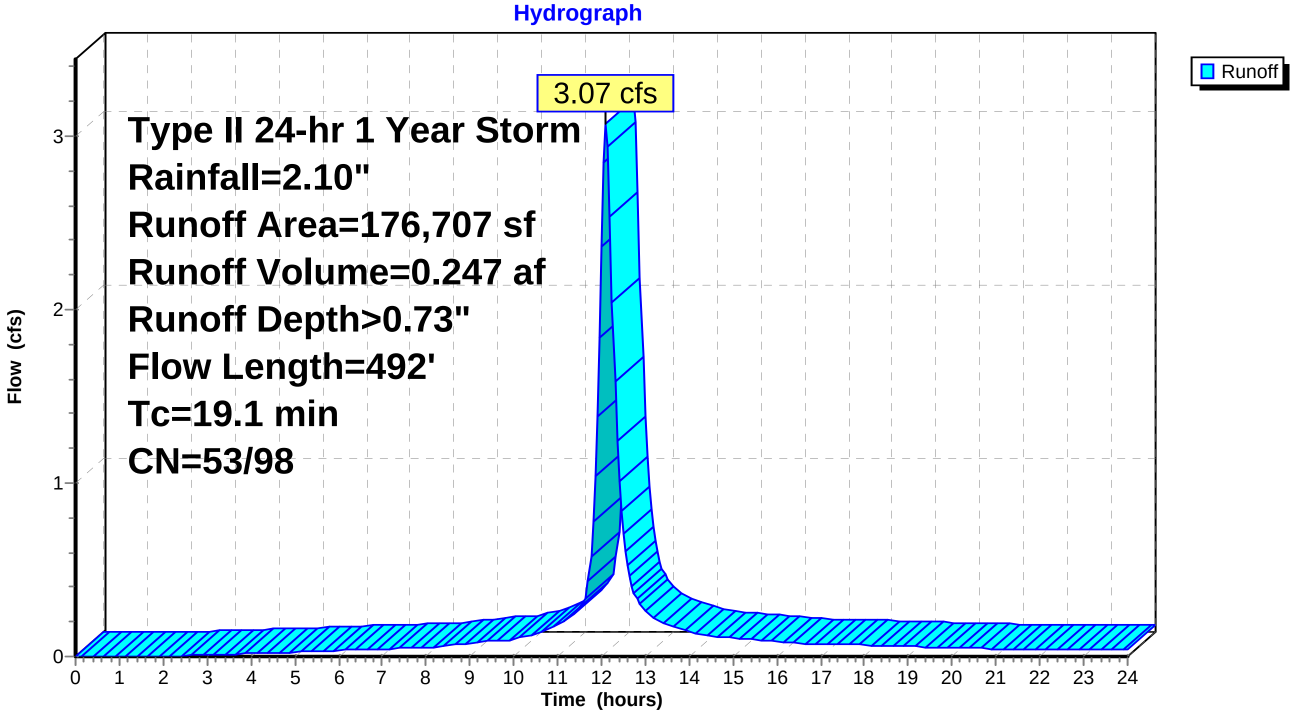
Runoff = 3.07 cfs @ 12.11 hrs, Volume= 0.247 af, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
14,905	98	Paved roads w/curbs & sewers, HSG D
32,918	77	Woods, Good, HSG D
3,937	80	>75% Grass cover, Good, HSG D
29,804	98	Paved roads w/curbs & sewers, HSG A
15,620	98	Roofs, HSG A
46,593	39	>75% Grass cover, Good, HSG A
16,315	30	Woods, Good, HSG A
21	98	Paved roads w/curbs & sewers, HSG B
8,039	98	Paved roads w/curbs & sewers, HSG C
8,555	74	>75% Grass cover, Good, HSG C
176,707	71	Weighted Average
108,318	53	61.30% Pervious Area
68,389	98	38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	160	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123	0.1800	8.61		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	109	0.0900	4.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.1	492	Total			

Subcatchment GC 8: Grass Channel 8 Area



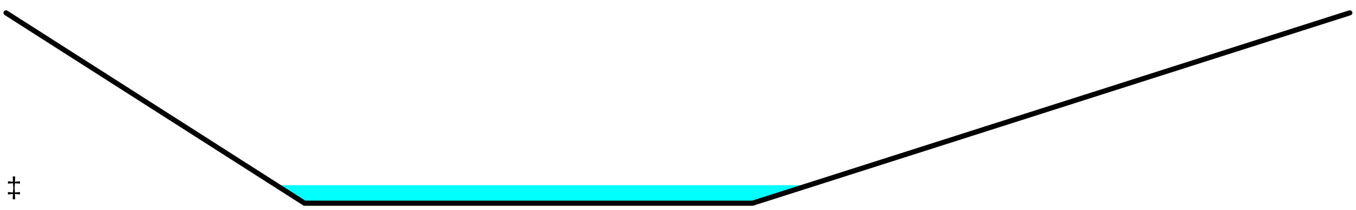
Summary for Reach 8R: Grass Channel 8

Inflow Area = 4.057 ac, 38.70% Impervious, Inflow Depth > 0.73" for 1 Year Storm event
Inflow = 3.07 cfs @ 12.11 hrs, Volume= 0.247 af
Outflow = 2.98 cfs @ 12.19 hrs, Volume= 0.246 af, Atten= 3%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 11.0 min

Peak Storage= 557 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 219.56 cfs

6.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 2.0 4.0 '/' Top Width= 18.00'
Length= 448.0' Slope= 0.0132 '/'
Inlet Invert= 322.80', Outlet Invert= 316.90'



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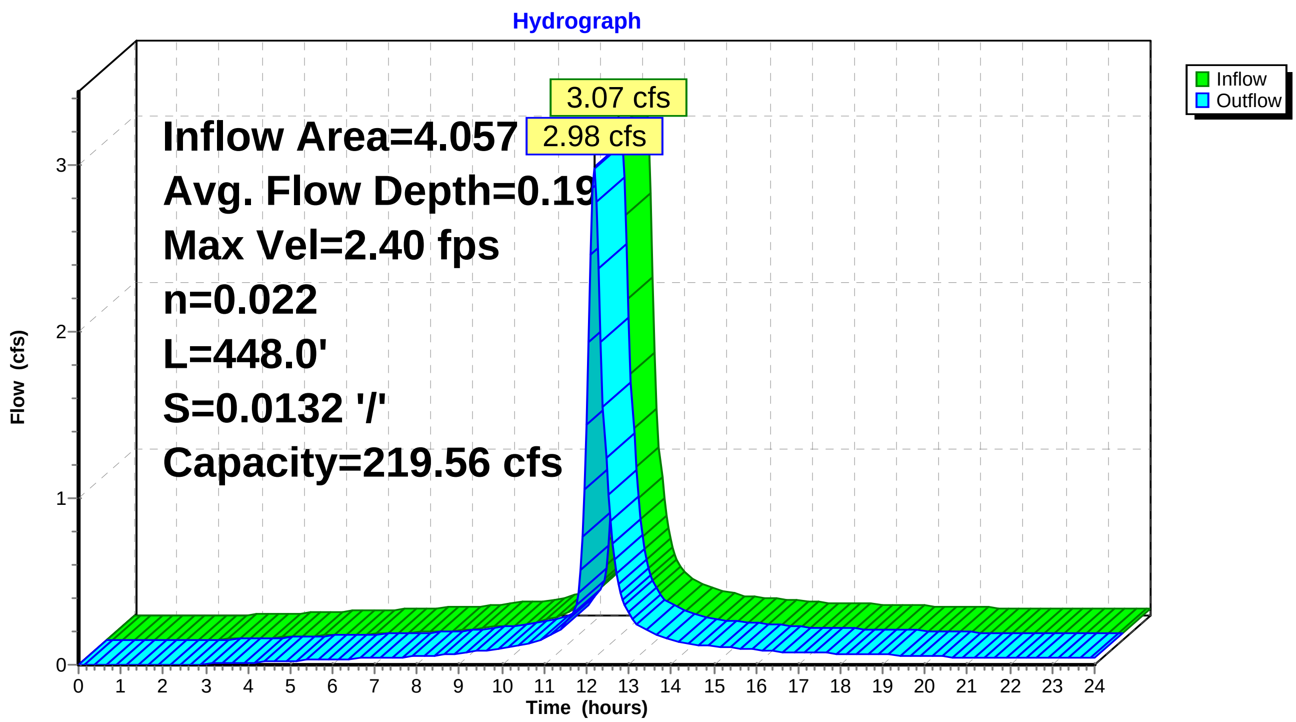
Reach 8R: Grass Channel 8



Summary for Subcatchment GC 8: Grass Channel 8 Area

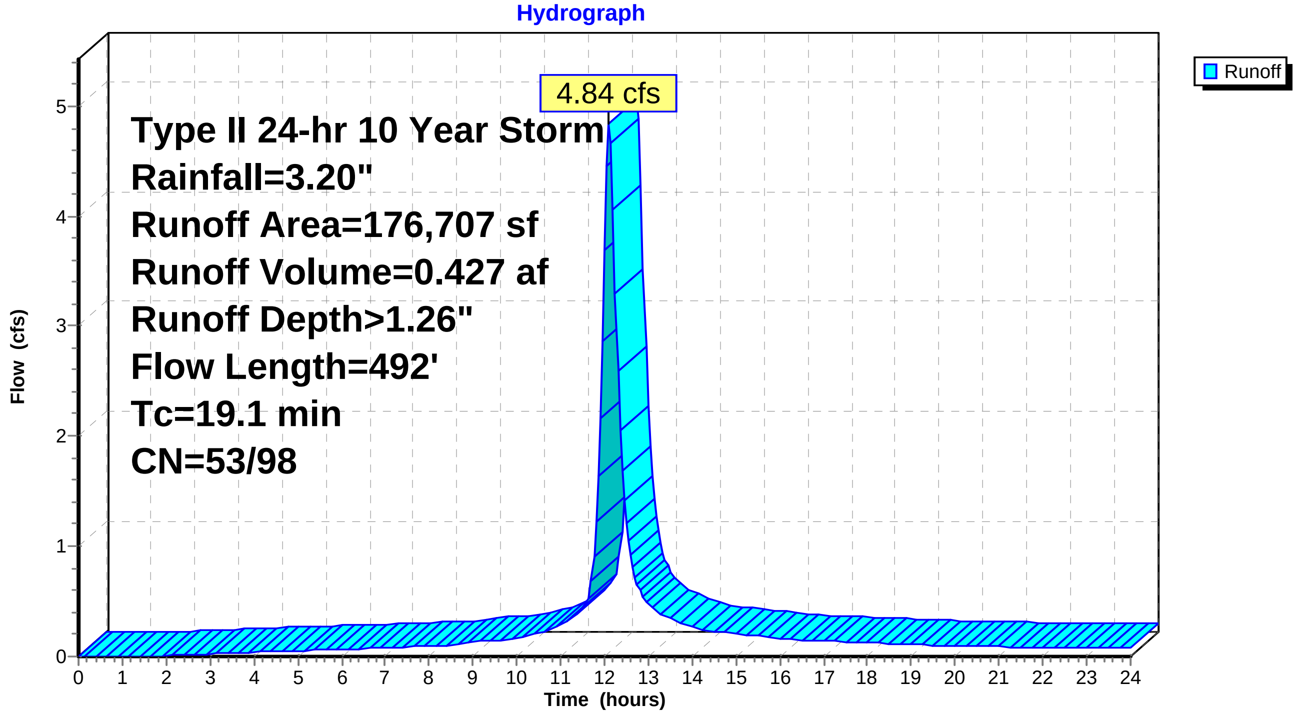
Runoff = 4.84 cfs @ 12.11 hrs, Volume= 0.427 af, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
14,905	98	Paved roads w/curbs & sewers, HSG D
32,918	77	Woods, Good, HSG D
3,937	80	>75% Grass cover, Good, HSG D
29,804	98	Paved roads w/curbs & sewers, HSG A
15,620	98	Roofs, HSG A
46,593	39	>75% Grass cover, Good, HSG A
16,315	30	Woods, Good, HSG A
21	98	Paved roads w/curbs & sewers, HSG B
8,039	98	Paved roads w/curbs & sewers, HSG C
8,555	74	>75% Grass cover, Good, HSG C
176,707	71	Weighted Average
108,318	53	61.30% Pervious Area
68,389	98	38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	160	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123	0.1800	8.61		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	109	0.0900	4.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.1	492	Total			

Subcatchment GC 8: Grass Channel 8 Area



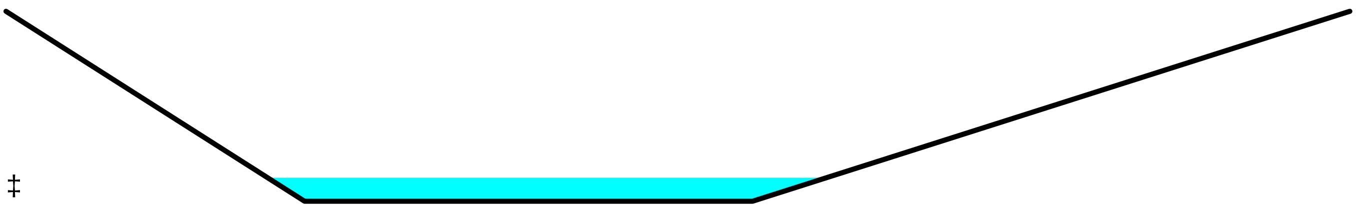
Summary for Reach 8R: Grass Channel 8

Inflow Area = 4.057 ac, 38.70% Impervious, Inflow Depth > 1.26" for 10 Year Storm event
Inflow = 4.84 cfs @ 12.11 hrs, Volume= 0.427 af
Outflow = 4.72 cfs @ 12.18 hrs, Volume= 0.426 af, Atten= 3%, Lag= 4.5 min

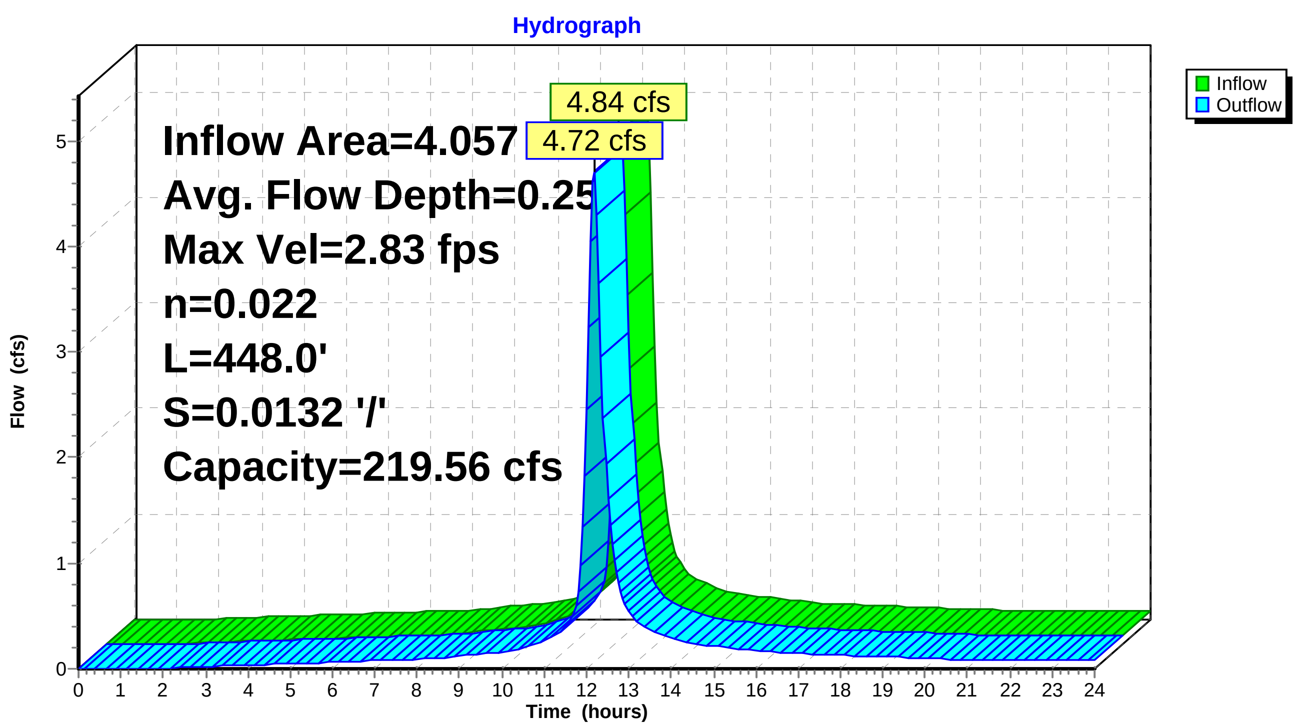
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 9.4 min

Peak Storage= 750 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 219.56 cfs

6.00' x 2.00' deep channel, n= 0.022
Side Slope Z-value= 2.0 4.0 '/' Top Width= 18.00'
Length= 448.0' Slope= 0.0132 '/'
Inlet Invert= 322.80', Outlet Invert= 316.90'



Reach 8R: Grass Channel 8



Summary for Subcatchment GC 9: Grass Channel 9 Area

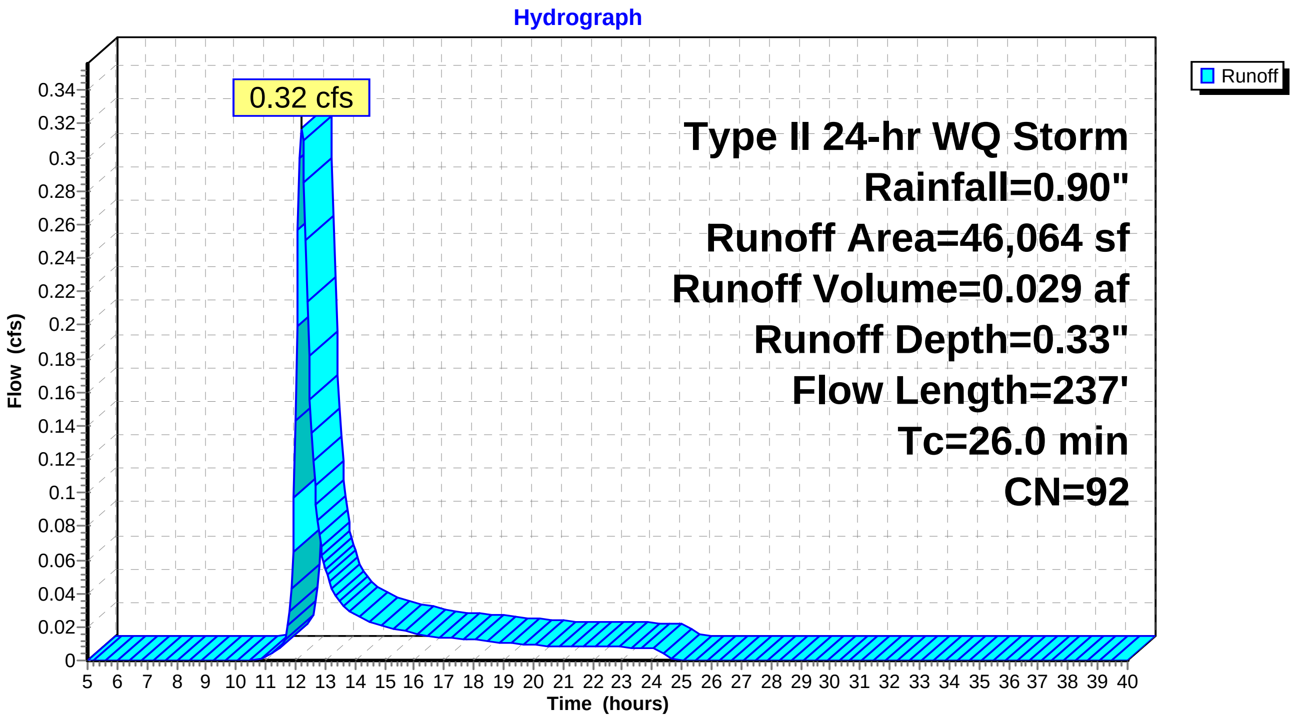
Runoff = 0.32 cfs @ 12.21 hrs, Volume= 0.029 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	46,064	92	
	46,064		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.0	2	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	61	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	74	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.0	237	Total			

Subcatchment GC 9: Grass Channel 9 Area



Summary for Reach 9R: Grass Channel 9

Inflow Area = 1.057 ac, 0.00% Impervious, Inflow Depth = 0.33" for WQ Storm event
Inflow = 0.32 cfs @ 12.21 hrs, Volume= 0.029 af
Outflow = 0.26 cfs @ 12.52 hrs, Volume= 0.029 af, Atten= 17%, Lag= 18.4 min

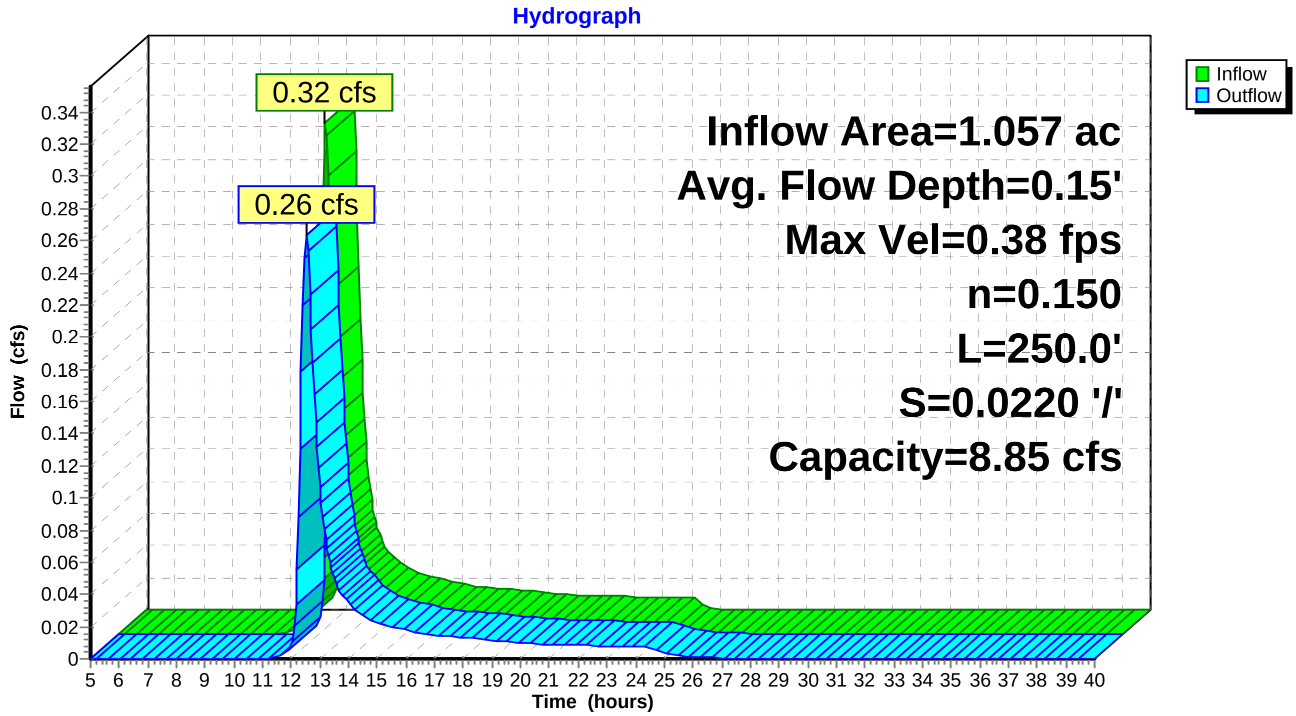
Routing by Stor-Ind+Trans method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 10.9 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 36.1 min

Peak Storage= 173 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.85 cfs

4.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.0220 '/'
Inlet Invert= 322.40', Outlet Invert= 316.90'

‡

Reach 9R: Grass Channel 9



Summary for Subcatchment GC 9: Grass Channel 9 Area

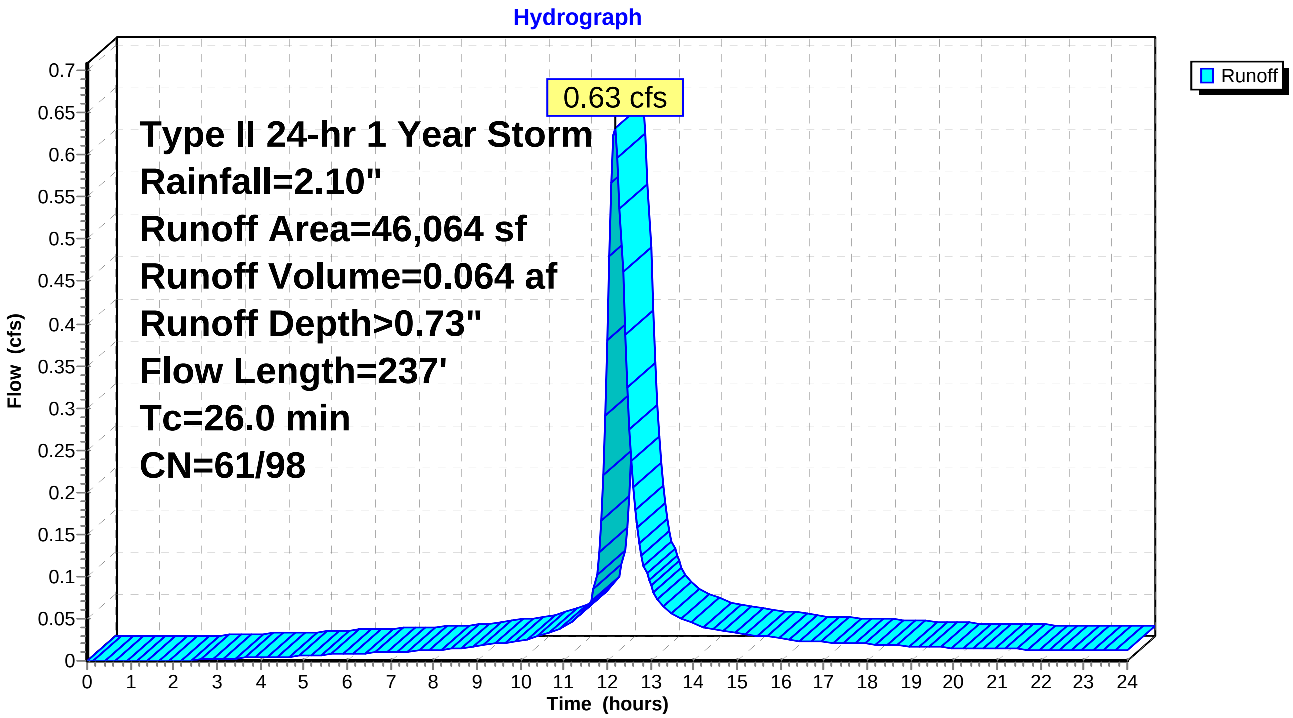
Runoff = 0.63 cfs @ 12.18 hrs, Volume= 0.064 af, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
7,905	98	Paved roads w/curbs & sewers, HSG A
12,115	77	Woods, Good, HSG D
4,370	80	>75% Grass cover, Good, HSG D
12,951	39	>75% Grass cover, Good, HSG A
8,723	98	Paved roads w/curbs & sewers, HSG D
46,064	74	Weighted Average
29,436	61	63.90% Pervious Area
16,628	98	36.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.0	2	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	61	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	74	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.0	237	Total			

Subcatchment GC 9: Grass Channel 9 Area



Summary for Reach 9R: Grass Channel 9

Inflow Area = 1.057 ac, 36.10% Impervious, Inflow Depth > 0.73" for 1 Year Storm event
Inflow = 0.63 cfs @ 12.18 hrs, Volume= 0.064 af
Outflow = 0.62 cfs @ 12.25 hrs, Volume= 0.064 af, Atten= 1%, Lag= 4.0 min

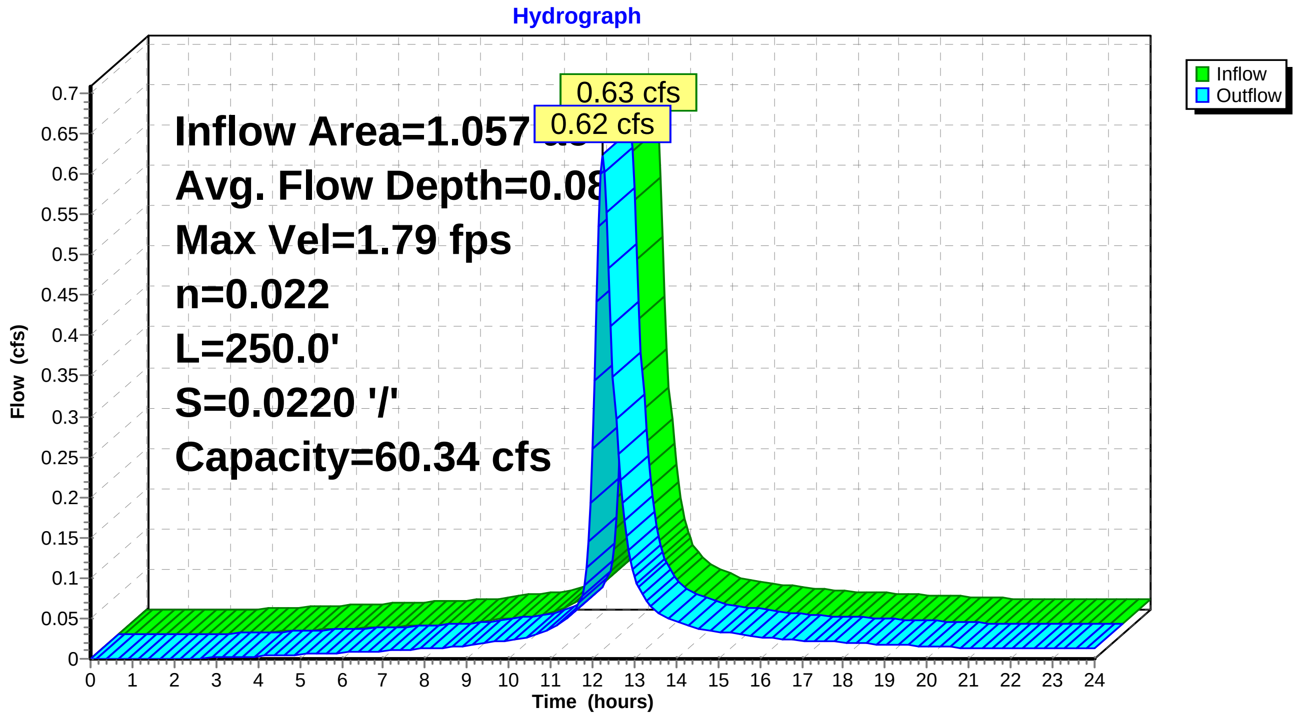
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.79 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 7.5 min

Peak Storage= 88 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 60.34 cfs

4.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.0220 '/'
Inlet Invert= 322.40', Outlet Invert= 316.90'

‡

Reach 9R: Grass Channel 9



Summary for Subcatchment GC 9: Grass Channel 9 Area

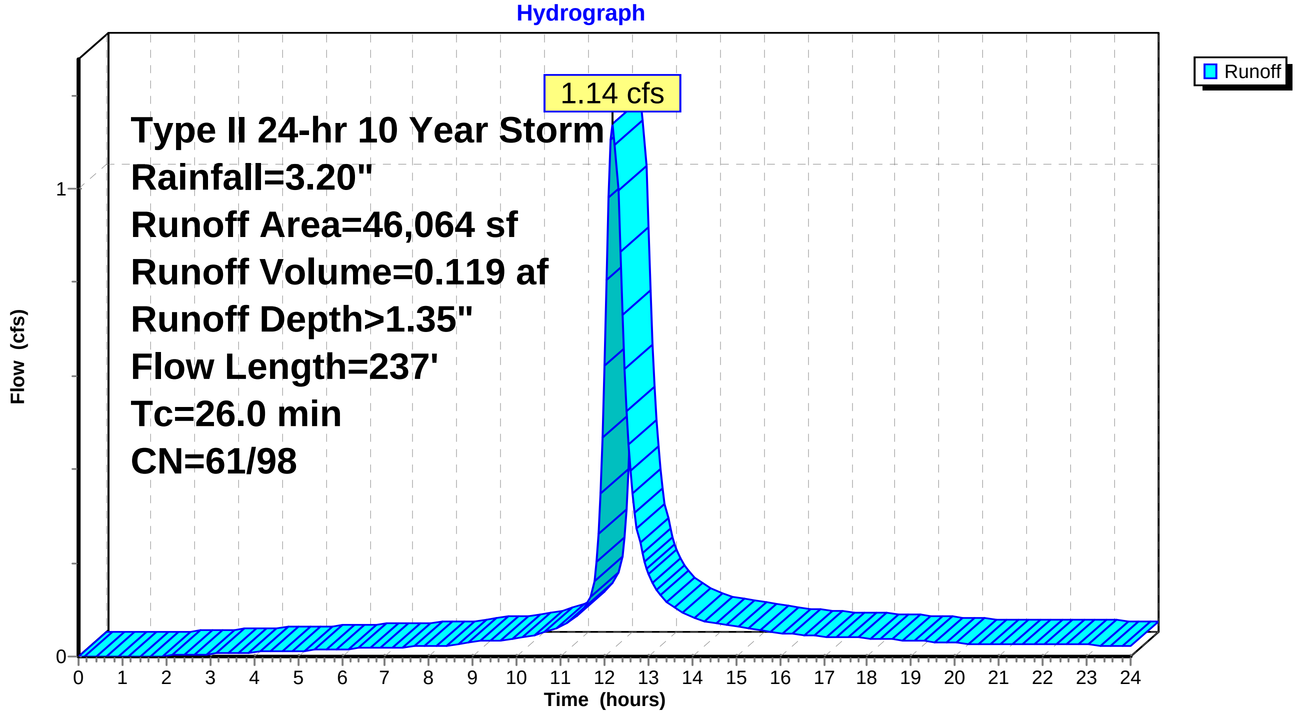
Runoff = 1.14 cfs @ 12.20 hrs, Volume= 0.119 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
7,905	98	Paved roads w/curbs & sewers, HSG A
12,115	77	Woods, Good, HSG D
4,370	80	>75% Grass cover, Good, HSG D
12,951	39	>75% Grass cover, Good, HSG A
8,723	98	Paved roads w/curbs & sewers, HSG D
46,064	74	Weighted Average
29,436	61	63.90% Pervious Area
16,628	98	36.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.0	2	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	61	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	74	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.0	237	Total			

Subcatchment GC 9: Grass Channel 9 Area



Summary for Reach 9R: Grass Channel 9

Inflow Area = 1.057 ac, 36.10% Impervious, Inflow Depth > 1.35" for 10 Year Storm event
Inflow = 1.14 cfs @ 12.20 hrs, Volume= 0.119 af
Outflow = 1.13 cfs @ 12.25 hrs, Volume= 0.118 af, Atten= 1%, Lag= 3.3 min

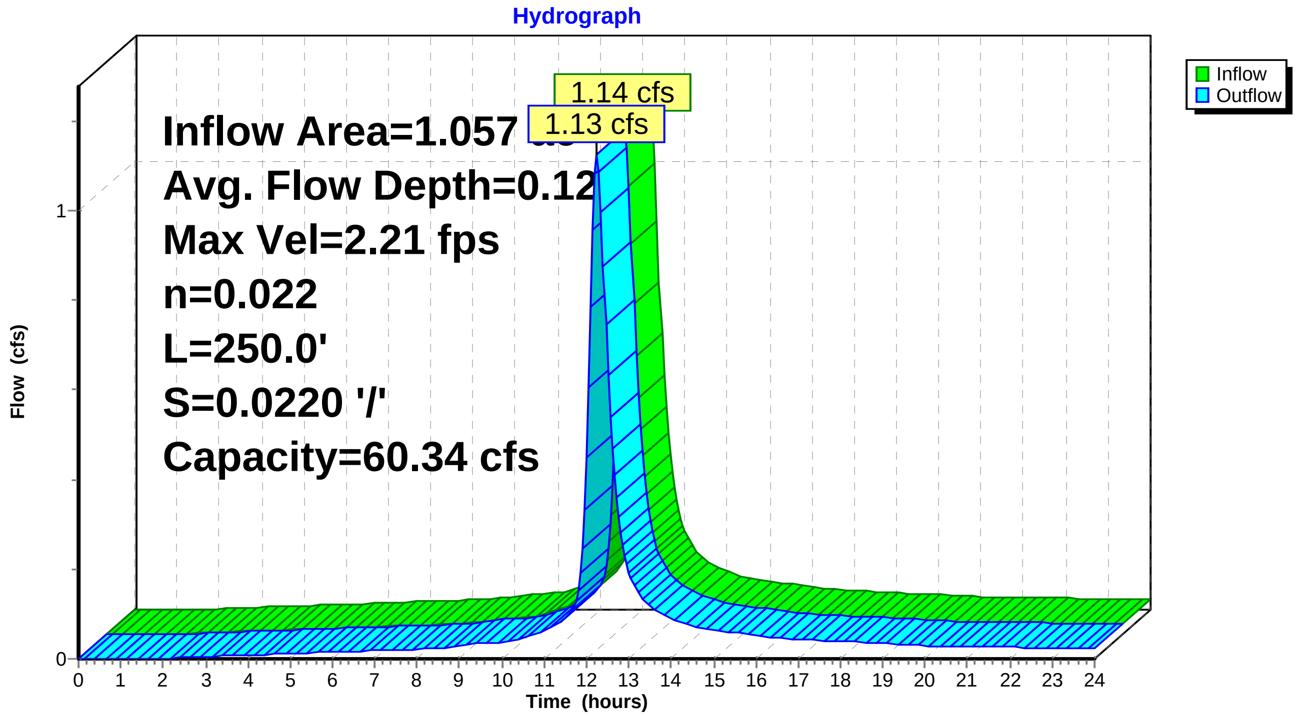
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 6.4 min

Peak Storage= 128 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 60.34 cfs

4.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.0220 '/'
Inlet Invert= 322.40', Outlet Invert= 316.90'

‡

Reach 9R: Grass Channel 9



Summary for Subcatchment GC 10: Grass Channel 10 Area

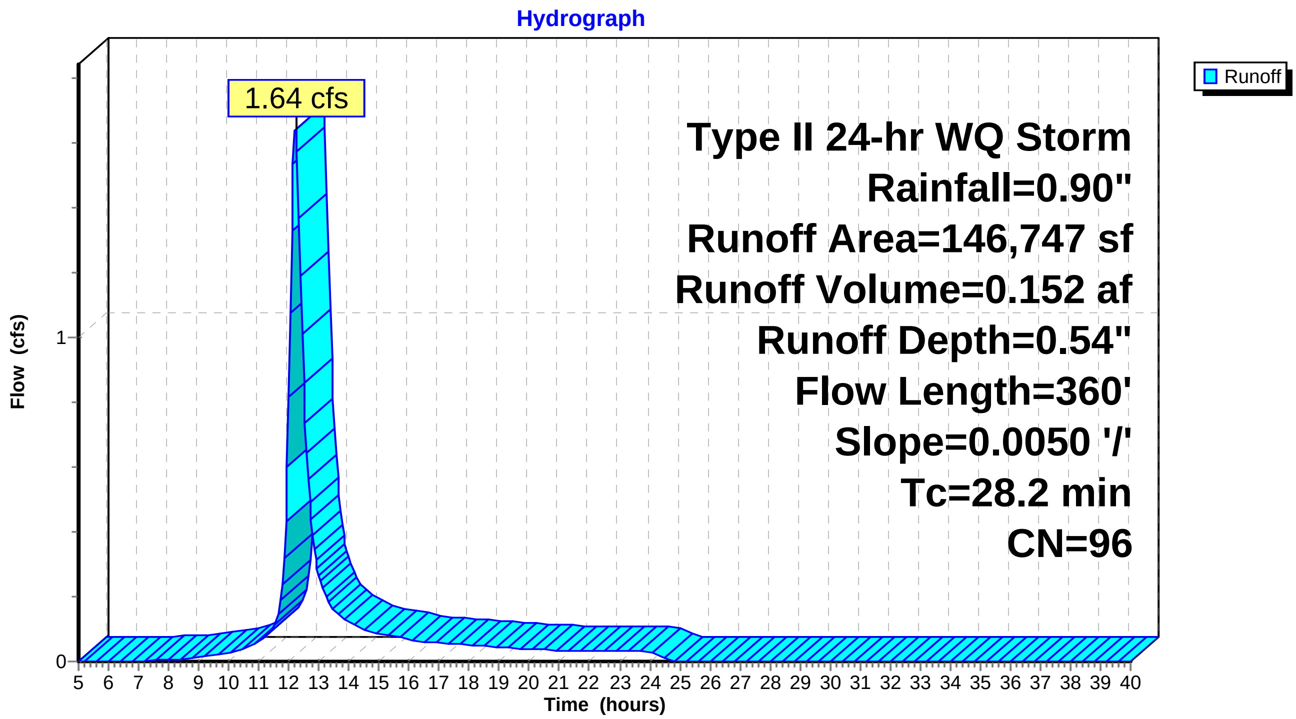
Runoff = 1.64 cfs @ 12.22 hrs, Volume= 0.152 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Storm Rainfall=0.90"

	Area (sf)	CN	Description
*	146,747	96	
	146,747		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	42	0.0050	0.56		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
19.0	58	0.0050	0.05		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	84	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	34	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	142	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.2	360	Total			

Subcatchment GC 10: Grass Channel 10 Area



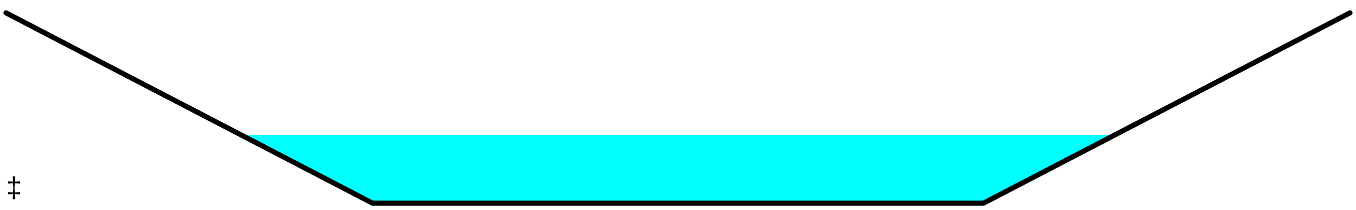
Summary for Reach 10R: Grass Channel 10

Inflow Area = 3.369 ac, 0.00% Impervious, Inflow Depth = 0.54" for WQ Storm event
Inflow = 1.64 cfs @ 12.22 hrs, Volume= 0.152 af
Outflow = 1.40 cfs @ 12.52 hrs, Volume= 0.152 af, Atten= 15%, Lag= 18.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.64 fps, Min. Travel Time= 10.9 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 47.5 min

Peak Storage= 919 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 9.12 cfs

5.00' x 1.00' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 421.0' Slope= 0.0183 '/'
Inlet Invert= 317.55', Outlet Invert= 309.83'



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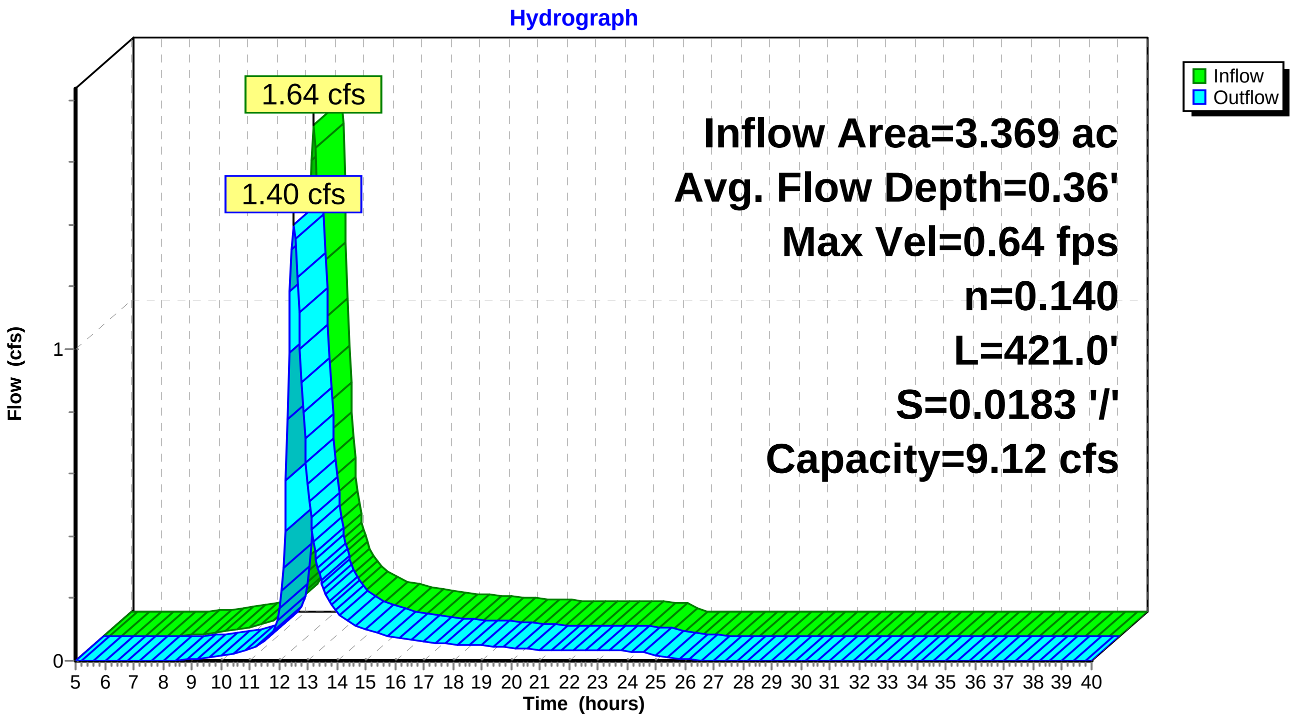
Reach 10R: Grass Channel 10



Summary for Subcatchment GC 10: Grass Channel 10 Area

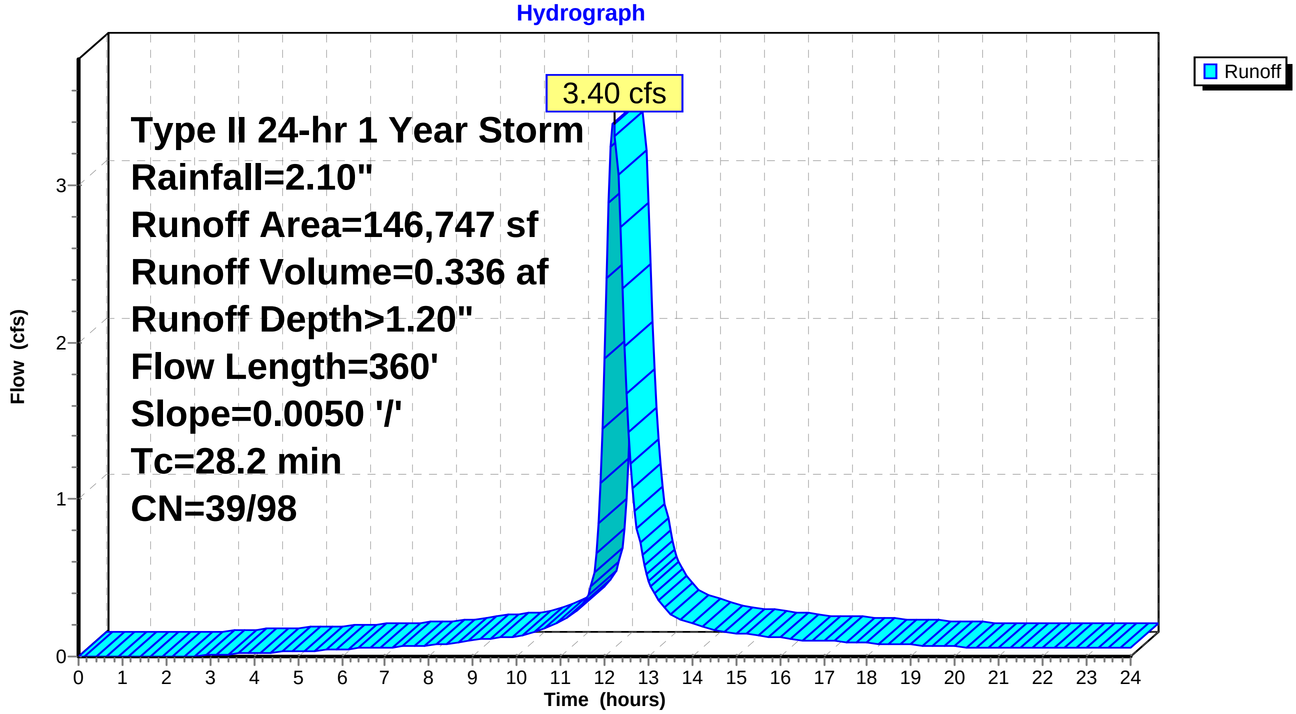
Runoff = 3.40 cfs @ 12.21 hrs, Volume= 0.336 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Storm Rainfall=2.10"

Area (sf)	CN	Description
201	98	Paved roads w/curbs & sewers, HSG D
11,941	98	Paved roads w/curbs & sewers, HSG A
22	80	>75% Grass cover, Good, HSG D
4,483	39	>75% Grass cover, Good, HSG A
1,426	80	>75% Grass cover, Good, HSG D
1,930	98	Paved roads w/curbs & sewers, HSG D
57,658	98	Paved roads w/curbs & sewers, HSG A
559	77	Woods, Good, HSG D
9,320	30	Woods, Good, HSG A
36,806	39	>75% Grass cover, Good, HSG A
22,401	98	Unconnected roofs, HSG A
146,747	77	Weighted Average
52,616	39	35.85% Pervious Area
94,131	98	64.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	42	0.0050	0.56		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
19.0	58	0.0050	0.05		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	84	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	34	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	142	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.2	360	Total			

Subcatchment GC 10: Grass Channel 10 Area



Summary for Reach 10R: Grass Channel 10

Inflow Area = 3.369 ac, 64.15% Impervious, Inflow Depth > 1.20" for 1 Year Storm event
Inflow = 3.40 cfs @ 12.21 hrs, Volume= 0.336 af
Outflow = 3.35 cfs @ 12.27 hrs, Volume= 0.335 af, Atten= 1%, Lag= 3.9 min

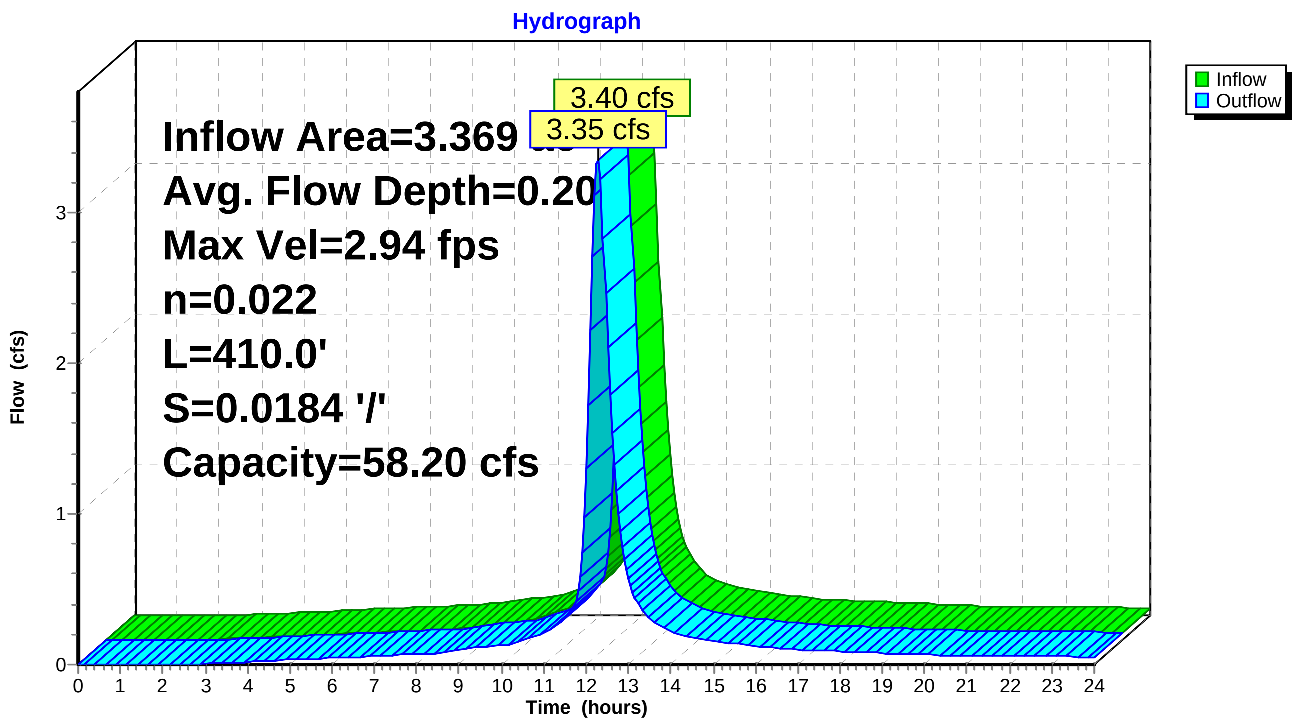
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 8.4 min

Peak Storage= 469 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 58.20 cfs

5.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 410.0' Slope= 0.0184 '/'
Inlet Invert= 317.39', Outlet Invert= 309.83'

‡

Reach 10R: Grass Channel 10



Summary for Subcatchment GC 10: Grass Channel 10 Area

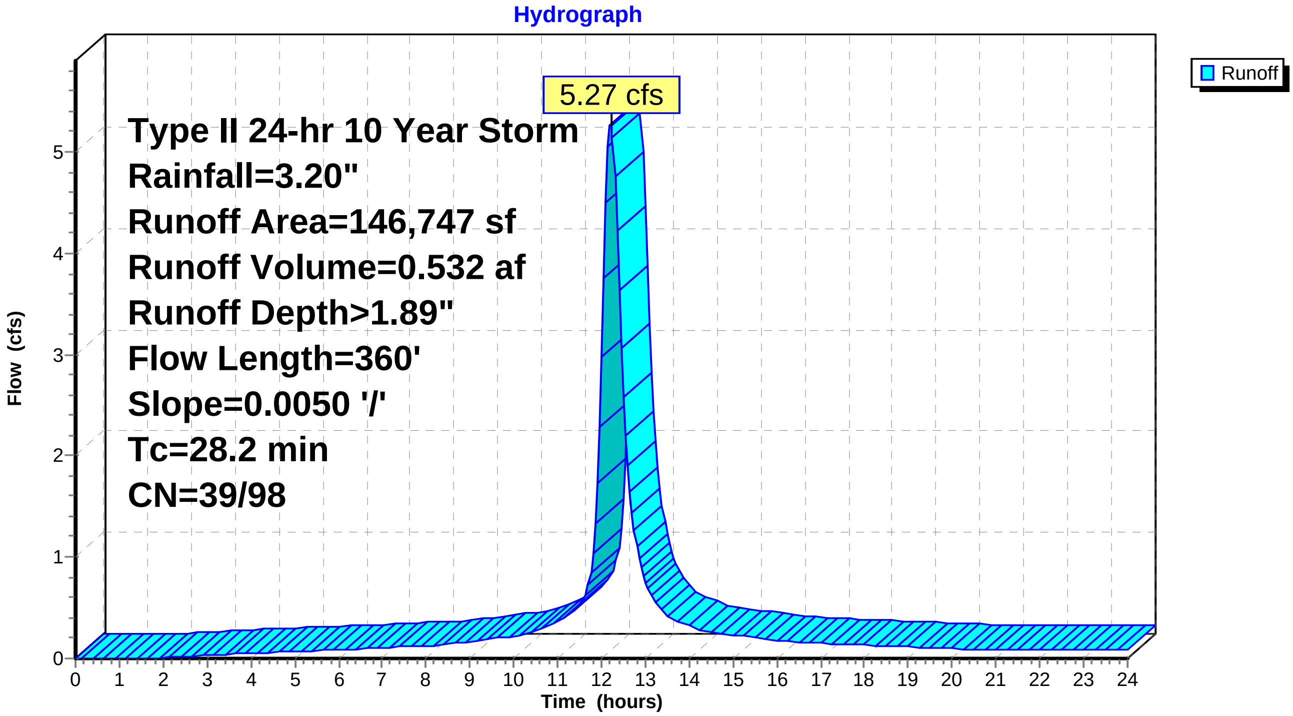
Runoff = 5.27 cfs @ 12.21 hrs, Volume= 0.532 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (sf)	CN	Description
201	98	Paved roads w/curbs & sewers, HSG D
11,941	98	Paved roads w/curbs & sewers, HSG A
22	80	>75% Grass cover, Good, HSG D
4,483	39	>75% Grass cover, Good, HSG A
1,426	80	>75% Grass cover, Good, HSG D
1,930	98	Paved roads w/curbs & sewers, HSG D
57,658	98	Paved roads w/curbs & sewers, HSG A
559	77	Woods, Good, HSG D
9,320	30	Woods, Good, HSG A
36,806	39	>75% Grass cover, Good, HSG A
22,401	98	Unconnected roofs, HSG A
146,747	77	Weighted Average
52,616	39	35.85% Pervious Area
94,131	98	64.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	42	0.0050	0.56		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
19.0	58	0.0050	0.05		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
2.8	84	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	34	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	142	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.2	360	Total			

Subcatchment GC 10: Grass Channel 10 Area



Summary for Reach 10R: Grass Channel 10

Inflow Area = 3.369 ac, 64.15% Impervious, Inflow Depth > 1.89" for 10 Year Storm event
Inflow = 5.27 cfs @ 12.21 hrs, Volume= 0.532 af
Outflow = 5.20 cfs @ 12.26 hrs, Volume= 0.531 af, Atten= 1%, Lag= 3.4 min

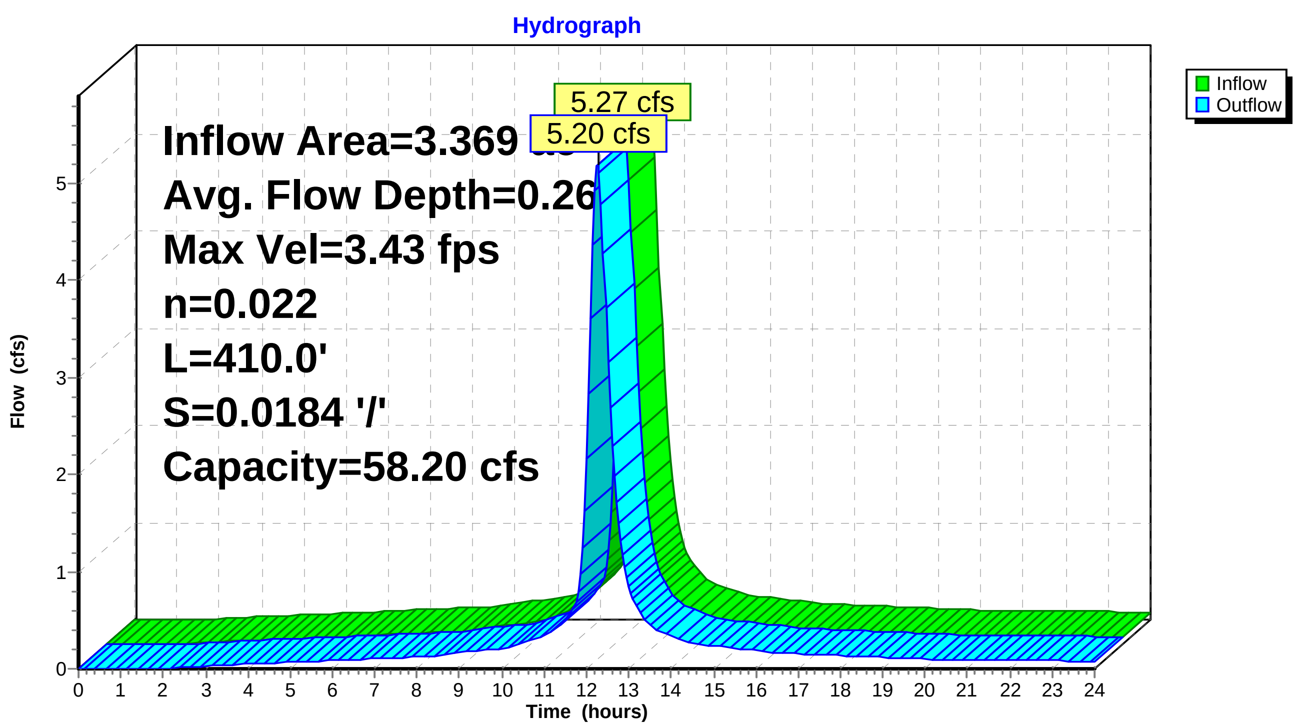
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.43 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 7.1 min

Peak Storage= 625 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 58.20 cfs

5.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 410.0' Slope= 0.0184 '/'
Inlet Invert= 317.39', Outlet Invert= 309.83'

‡

Reach 10R: Grass Channel 10



Grass Channel 1

Sta. A -0+74.9 LT. - Sta. AL1+85.2, LT.
Length: 270 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 2.7%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 53370\cdot sf = 1.914 \times 10^{-3}\cdot mi^2$

Impervious Area (sf) $A_I := 15116\cdot sf = 5.422 \times 10^{-4}\cdot mi^2$

Pervious Area (sf) $A_P := 38254\cdot sf = 1.372 \times 10^{-3}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 28.323$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_V := 0.05 + 0.009\cdot I = 0.305$

Water Quality Volume (cf) $WQv := P\cdot R_V\cdot A = 1.22 \times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_V = 0.274\cdot in$

$$Q_a := if\left(P\cdot R_V < 0.2in, 0.2in, P\cdot R_V\right) = 0.274\cdot in$$

Calculate Curve Number (CN)

Curve Number $CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 91$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.) $S := \left(\frac{1000in}{CN}\right) - 10in = 1.047 \cdot in$

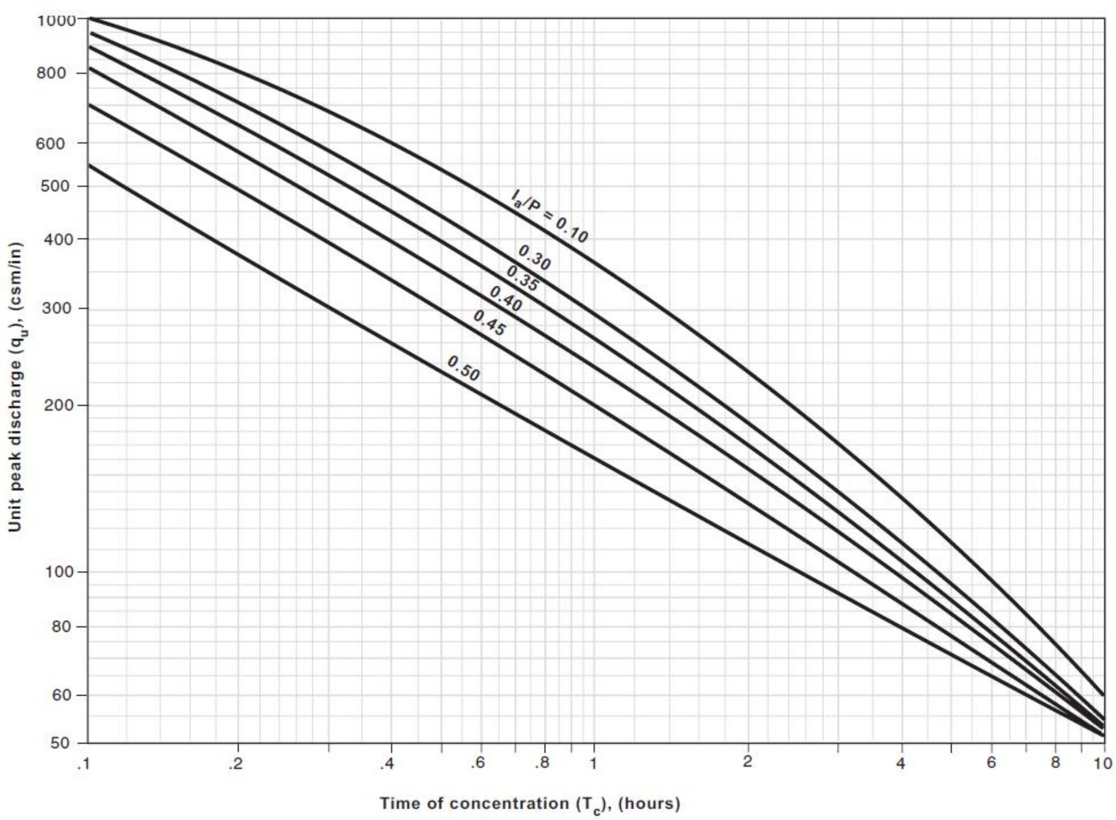
Initial Abstraction (in.) $I_a := 0.2 \cdot S = 0.209 \cdot in$

$$\frac{I_a}{P} = 0.233$$

Time of Concentration from HydroCAD (hr) $t_c := 18.2min = 0.303 \cdot hr$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi²/in) $q_u := 650 \frac{cfs}{mi^2 \cdot in}$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 0.341\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 1

STA. A -0+74.9,LT. - STA. AL 1+85.2, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	0.341	1.25	2.44	**cfs**
Bottom W	4	4	4	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	4	4	4	**1:X**
Long Slope	2.7	2.7	2.7	**%**
Length	270	270	270	**ft**

RESULTS

Depth (in):	1.97	4.085	5.43	**in**
"n":	0.15	0.148725	0.12855	
Area	0.764	1.825	2.629	**ft^2**
Velocity	0.4	0.7	0.9	**ft/s**

10 minute	267.637	**ft**
length required:	81.597	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 4

Sta. 13+51.6, LT. - Sta. 403+07.5, LT.
Length: 625 ft
Side Slopes: 1:4
Bottom Width: 5 ft
Long Slope: 3.8%

Calculate Water Quality Volume (WQv) - On-site Area

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 59167\cdot sf = 2.122\times10^{-3}\cdot mi^2$

Impervious Area (sf) $A_I := 43853\cdot sf = 1.573\times10^{-3}\cdot mi^2$

Pervious Area (sf) $A_P := 15314\cdot sf = 5.493\times10^{-4}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 74.117$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.717$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 3.182\times10^{3}\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.645\cdot in$

$$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.645\cdot in$$

Calculate Curve Number (CN)

Curve Number $CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 97$

Calculate Water Quality Volume (WQv) - On-site Area from GC 5

$sf := (1ft)\cdot(1ft)$

$cf := (1ft)\cdot(1ft)\cdot(1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf) $A := 5032\cdot sf = 1.805 \times 10^{-4}\cdot mi^2$

Impervious Area (sf) $A_I := 2349\cdot sf = 8.426 \times 10^{-5}\cdot mi^2$

Pervious Area (sf) $A_P := 2683\cdot sf = 9.624 \times 10^{-5}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 46.681$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.47$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 177.427\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.423\cdot in$

$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.423\cdot in$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 94$$

Calculate Water Quality Volume (WQv) - Off-site Area from OS8a

$sf := (1ft)\cdot(1ft)$

$cf := (1ft)\cdot(1ft)\cdot(1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf)	$A := 111436\cdot sf = 3.997\times10^{-3}\cdot mi^2$
Impervious Area (sf)	$A_I := 52969\cdot sf = 1.9\times10^{-3}\cdot mi^2$
Pervious Area (sf)	$A_P := 58467\cdot sf = 2.097\times10^{-3}\cdot mi^2$
% Impervious Area	$I := \left(\frac{A_I}{A}\right)\cdot 100 = 47.533$
90 % Rainfall event (in.)	$P := 0.9\cdot in$
Volumetric runoff coefficient	$R_v := 0.05 + 0.009\cdot I = 0.478$
Water Quality Volume (cf)	$WQv := P\cdot R_v\cdot A = 3.993\times10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.)

$Q_a := P\cdot R_v = 0.43\cdot in$

$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.43\cdot in$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 94$$

Calculate Water Quality Volume (WQv) - Off-site Area from OS8c

$sf := (1ft)\cdot(1ft)$

$cf := (1ft)\cdot(1ft)\cdot(1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf) $A := 12973\cdot sf = 4.653 \times 10^{-4}\cdot mi^2$

Impervious Area (sf) $A_I := 782\cdot sf = 2.805 \times 10^{-5}\cdot mi^2$

Pervious Area (sf) $A_P := 12191\cdot sf = 4.373 \times 10^{-4}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 6.028$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.104$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 101.434\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.094\cdot in$

$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.2\cdot in$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 88$$

Calculate Water Quality Volume (WQv) - Off-site Area from OS8d

$sf := (1ft)\cdot(1ft)$

$cf := (1ft)\cdot(1ft)\cdot(1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf)	$A := 95230\cdot sf = 3.416 \times 10^{-3}\cdot mi^2$
Impervious Area (sf)	$A_I := 24350\cdot sf = 8.734 \times 10^{-4}\cdot mi^2$
Pervious Area (sf)	$A_P := 70880\cdot sf = 2.542 \times 10^{-3}\cdot mi^2$
% Impervious Area	$I := \left(\frac{A_I}{A}\right)\cdot 100 = 25.57$
90 % Rainfall event (in.)	$P := 0.9\cdot in$
Volumetric runoff coefficient	$R_v := 0.05 + 0.009\cdot I = 0.28$
Water Quality Volume (cf)	$WQv := P\cdot R_v\cdot A = 2.001 \times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.)

$Q_a := P\cdot R_v = 0.252\cdot in$

$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.252\cdot in$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 90$$

Calculate Water Quality Volume (WQv) - Off-site Area from OS8_5

$sf := (1ft) \cdot (1ft)$

$cf := (1ft) \cdot (1ft) \cdot (1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf)	$A := 743369 \cdot sf = 0.027 \cdot mi^2$
Impervious Area (sf)	$A_I := 463745 \cdot sf = 0.017 \cdot mi^2$
Pervious Area (sf)	$A_P := 279624 \cdot sf = 0.01 \cdot mi^2$
% Impervious Area	$I := \left(\frac{A_I}{A}\right) \cdot 100 = 62.384$
90 % Rainfall event (in.)	$P := 0.9 \cdot in$
Volumetric runoff coefficient	$R_v := 0.05 + 0.009 \cdot I = 0.611$
Water Quality Volume (cf)	$WQv := P \cdot R_v \cdot A = 3.409 \times 10^4 \cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P \cdot R_v = 0.55 \cdot in$

$Q_a := \text{if}\left(P \cdot R_v < 0.2in, 0.2in, P \cdot R_v\right) = 0.55 \cdot in$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000 \cdot in}{\left[10 \cdot in + 5 \cdot P + 10 \cdot Q_a - 10\left(Q_a^{\ 2} + 1.25 \cdot Q_a \cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 96$$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 4

STA. 13+51.6, LT. - STA. 403+07.5, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	2.12	8.91	22.44	**cfs**
Bottom W	5	5	5	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	4	4	4	**1:X**
Long Slope	3.8	3.8	3.8	**%**
Length	625	625	625	**ft**

RESULTS

Depth (in):	4.4	7.665	9.895	**in**
"n":	0.144	0.095025	0.061575	
Area	2.371	4.826	6.843	**ft^2**
Velocity	0.9	1.8	3.3	**ft/s**

10 minute	536.457	**ft**
length required:	163.554	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 5

Sta. 18+55.5, LT. - Sta. 19+75.0, LT.
Length: 120 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 0.2%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 5032\cdot sf = 1.805\times 10^{-4}\cdot mi^2$

Impervious Area (sf) $A_I := 2349\cdot sf = 8.426\times 10^{-5}\cdot mi^2$

Pervious Area (sf) $A_P := 2683\cdot sf = 9.624\times 10^{-5}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 46.681$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.47$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 177.427\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.423\cdot in$

$$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.423\cdot in$$

Calculate Curve Number (CN)

Curve Number $CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 94$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.)

$$S := \left(\frac{1000in}{CN}\right) - 10in = 0.638 \cdot in$$

Initial Abstraction (in.)

$$I_a := 0.2 \cdot S = 0.128 \cdot in$$

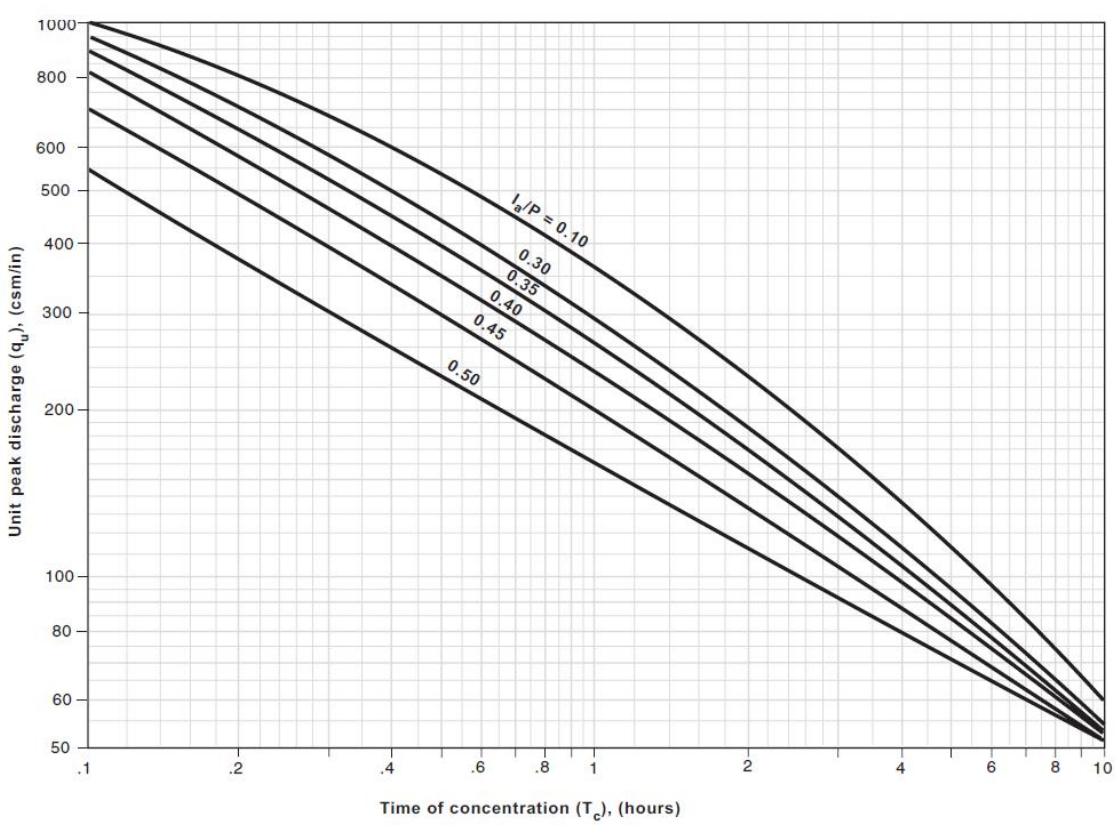
$$\frac{I_a}{P} = 0.142$$

Time of Concentration from HydroCAD (hr)

$$t_c := 1.7min = 0.028 \cdot hr$$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi^2/in)

$$q_u := 1000 \frac{cfs}{mi^2 \cdot in}$$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u) \cdot (A) \cdot (Q_a) = 0.076 \cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 5

STA. 18+55.5, LT. - STA. 19+75.0, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	0.076	0.21	0.4	**cfs**
Bottom W	4	4	4	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	4	4	4	**1:X**
Long Slope	0.2	0.2	0.2	**%**
Length	120	120	120	**ft**

RESULTS

	WQv	1 Yr	10 Yr	
Depth (in):	1.755	3.135	4.39	**in**
"n":	0.15	0.15	0.14415	
Area	0.671	1.318	1.999	**ft^2**
Velocity	0.1	0.2	0.2	**ft/s**

10 minute length required:	68.003	**ft**
	20.733	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 6

Sta. 19+75.0, LT. - Sta. 22+93.3, LT.
Length: 318 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 0.7%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 21392\cdot sf = 7.673 \times 10^{-4}\cdot mi^2$

Impervious Area (sf) $A_I := 10391\cdot sf = 3.727 \times 10^{-4}\cdot mi^2$

Pervious Area (sf) $A_P := 11001\cdot sf = 3.946 \times 10^{-4}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 48.574$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.487$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 781.612\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.438\cdot in$

$$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.438\cdot in$$

Calculate Curve Number (CN)

Curve Number $CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\ 2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 94$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.)
$$S := \left(\frac{1000in}{CN}\right) - 10in = 0.605 \cdot in$$

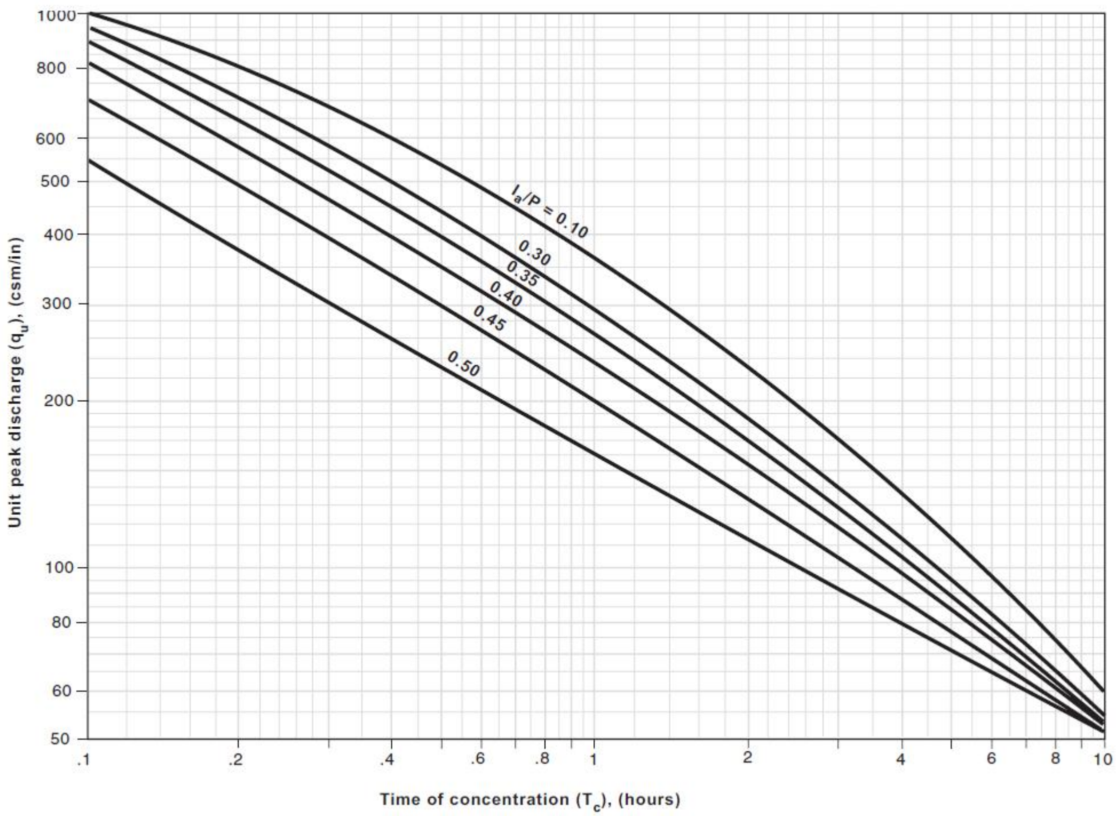
Initial Abstraction (in.)
$$I_a := 0.2 \cdot S = 0.121 \cdot in$$

$$\frac{I_a}{P} = 0.134$$

Time of Concentration from HydroCAD (hr)
$$t_c := 1.7min = 0.028 \cdot hr$$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi2/in)
$$q_u := 1000 \frac{cfs}{mi^2 \cdot in}$$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 0.336\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD) :

Trapezoidal Channel Calculations - Grass Channel 6

	STA. 19+75.0, LT. - STA. 22+93.3, LT.			
	WQv	**1 Yr**	**10 Yr**	
Peak Discharge	0.336	0.91	1.7	**cfs**
Bottom W	4	4	4	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	4	4	4	**1:X**
Long Slope	0.7	0.7	0.7	**%**
Length	318	318	318	**ft**

RESULTS				
Depth (in):	2.87	4.775	6.135	**in**
"n":	0.15	0.138375	0.117975	
Area	1.185	2.225	3.091	**ft^2**
Velocity	0.3	0.4	0.6	**ft/s**

10 minute length required:	170.059	**ft**
	51.847	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 7

Sta. 22+97.8, LT. - Sta. 26+28.1, LT.
Length: 327 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 1.3%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 26849\cdot sf = 9.631\times 10^{-4}\cdot mi^2$

Impervious Area (sf) $A_I := 20989\cdot sf = 7.529\times 10^{-4}\cdot mi^2$

Pervious Area (sf) $A_P := 5860\cdot sf = 2.102\times 10^{-4}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 78.174$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.754$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 1.517\times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.678\cdot in$

$$Q_a := \mathrm{if}\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.678\cdot in$$

Calculate Curve Number (CN)

Curve Number $CN := \dfrac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 98$

Mathcad Calculations

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.)

$$S := \left(\frac{1000\,in}{CN}\right) - 10\,in = 0.223 \cdot in$$

Initial Abstraction (in.)

$$I_a := 0.2 \cdot S = 0.045 \cdot in$$

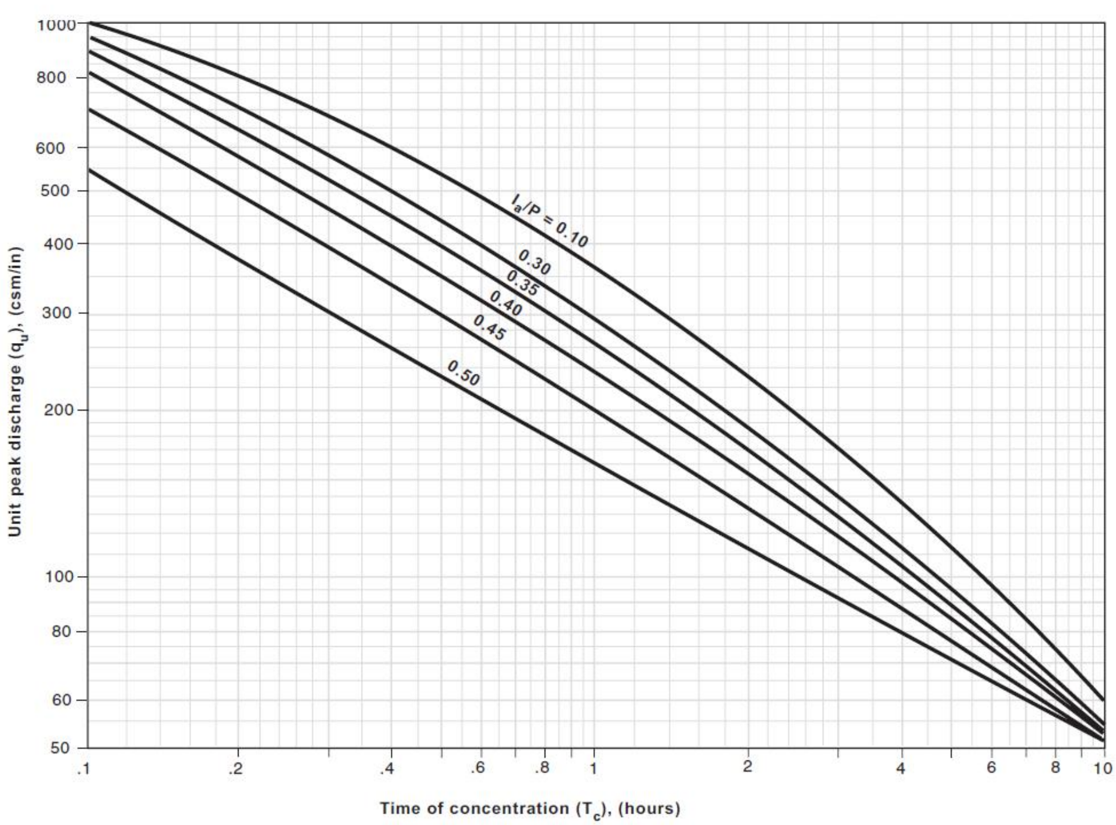
$$\frac{I_a}{P} = 0.05$$

Time of Concentration from HydroCAD (hr)

$$t_c := 2.5\,min = 0.042 \cdot hr$$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi²/in)

$$q_u := 1000 \frac{cfs}{mi^2 \cdot in}$$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 0.653\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 7				
	STA. 22+97.8, LT. - STA. 26+28.1, LT.			
	WQv	1 Yr	10 Yr	
Peak Discharge	0.653	1.52	2.45	cfs
Bottom W	4	4	4	ft
Side Slope	4	4	4	1:X
Back Slope	4	4	4	1:X
Long Slope	1.3	1.3	1.3	%
Length	327	327	327	ft
RESULTS				
Depth (in):	3.505	5.2	6.265	in
"n":	0.15	0.132	0.116025	
Area	1.510	2.484	3.179	ft^2
Velocity	0.4	0.6	0.8	ft/s
10 minute length required:	259.542	ft		
	79.129	m		

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 8

Sta. 39+19.3, LT. - Sta. 43+67.4, LT.
Length: 448 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 1.3%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 176707\cdot sf = 6.338 \times 10^{-3}\cdot mi^2$

Impervious Area (sf) $A_I := 68389\cdot sf = 2.453 \times 10^{-3}\cdot mi^2$

Pervious Area (sf) $A_P := 108318\cdot sf = 3.885 \times 10^{-3}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 38.702$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.398$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 5.279 \times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.358\cdot in$

$$Q_a := \mathrm{if}\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.358\cdot in$$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 93$$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.) $S := \left(\frac{1000in}{CN}\right) - 10in = 0.792 \cdot in$

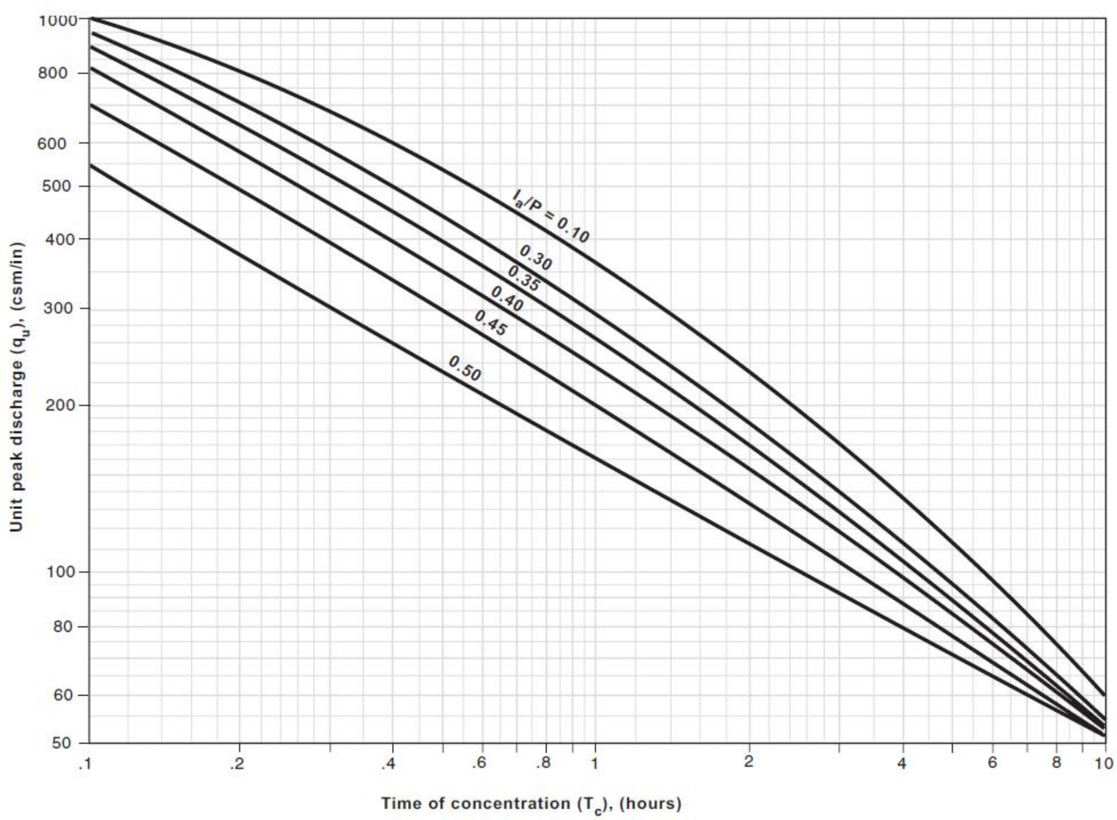
Initial Abstraction (in.) $I_a := 0.2 \cdot S = 0.158 \cdot in$

$$\frac{I_a}{P} = 0.176$$

Time of Concentration from HydroCAD (hr) $t_c := 19.1min = 0.318 \cdot hr$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi²/in) $q_u := 650 \frac{cfs}{mi^2 \cdot in}$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 1.477\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 8

STA. 39+19.3, LT. - STA. 43+67.4, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	1.477	2.98	4.72	**cfs**
Bottom W	6	6	6	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	2	2	2	**1:X**
Long Slope	1.3	1.3	1.3	**%**
Length	448	448	448	**ft**

RESULTS

Depth (in):	4.49	6.05	7.18	**in**
"n":	0.14265	0.11925	0.1023	
Area	2.665002083	3.787552	4.664008333	**ft^2**
Velocity	0.6	0.8	1.0	**ft/s**

10 minute	332.533	**ft**
length required:	101.382	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 9

Sta. 800+43.1, LT. - Sta. 802+85.0, LT.
Length: 250 ft
Side Slopes: 1:4
Bottom Width: 4 ft
Long Slope: 2.2%

Calculate Water Quality Volume (WQv)

$sf := (1ft)\cdot(1ft)$

$cf := (1ft)\cdot(1ft)\cdot(1ft)$

$cfs := \frac{(1cf)}{(1s)}$

Drainage Area (sf) $A := 46064\cdot sf = 1.652 \times 10^{-3}\cdot mi^2$

Impervious Area (sf) $A_I := 16628\cdot sf = 5.964 \times 10^{-4}\cdot mi^2$

Pervious Area (sf) $A_P := 29436\cdot sf = 1.056 \times 10^{-3}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 36.098$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.375$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 1.295 \times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.337\cdot in$

$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.337\cdot in$

Calculate Curve Number (CN)

Curve Number $CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 92$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.) $S := \left(\frac{1000in}{CN}\right) - 10in = 0.85 \cdot in$

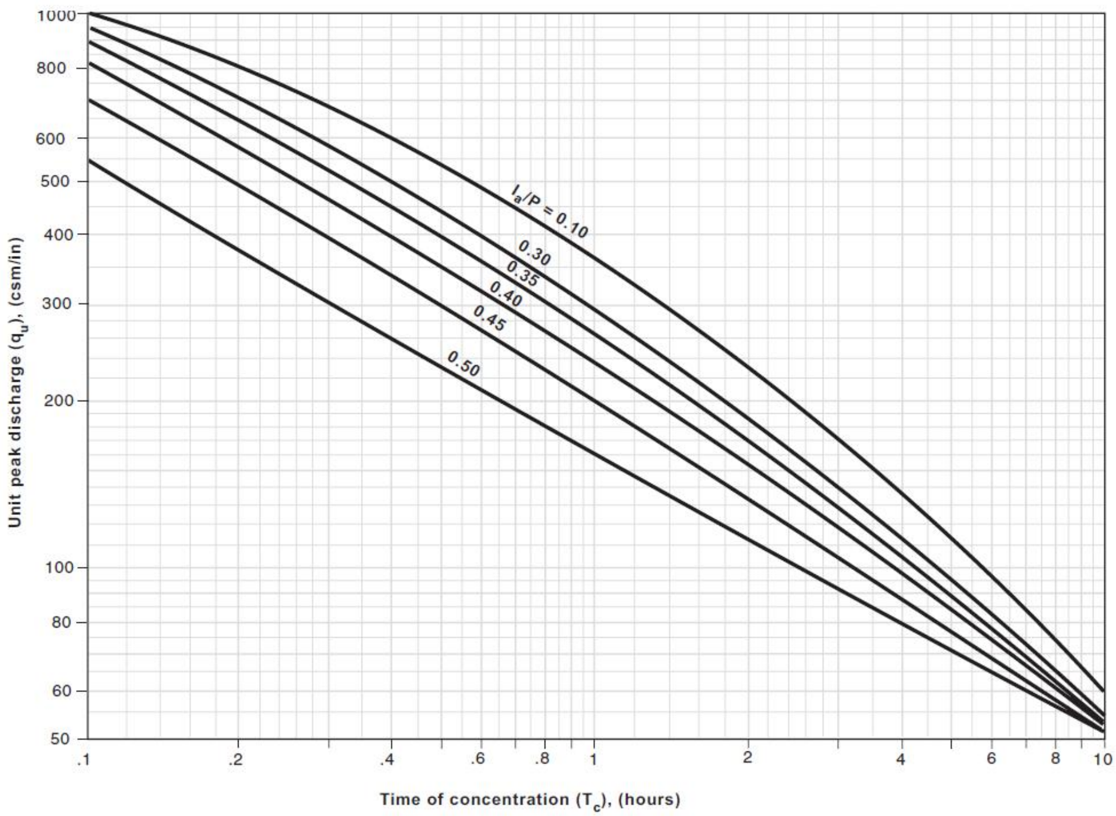
Initial Abstraction (in.) $I_a := 0.2 \cdot S = 0.17 \cdot in$

$$\frac{I_a}{P} = 0.189$$

Time of Concentration from HydroCAD (hr) $t_c := 26min = 0.433 \cdot hr$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi^2/in) $q_u := 550 \frac{cfs}{mi^2 \cdot in}$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 0.307\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 9

STA. 800+43.1, LT. - STA. 802+85.0, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	0.307	0.62	1.13	**cfs**
Bottom W	4	4	4	**ft**
Side Slope	4	4	4	**1:X**
Back Slope	4	4	4	**1:X**
Long Slope	2.2	2.2	2.2	**%**
Length	250	250	250	**ft**

RESULTS

Depth (in):	1.965	2.94	4.09	**in**
"n":	0.15	0.15	0.14865	
Area	0.762	1.220	1.828	**ft^2**
Velocity	0.4	0.5	0.6	**ft/s**

10 minute length required:	241.651	**ft**
	73.674	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

Grass Channel 10

Sta. 44+77.2, LT. - Sta. 48+92.1, LT.
Length: 421 ft
Side Slopes: 1:3
Bottom Width: 5 ft
Long Slope: 1.8%

Calculate Water Quality Volume (WQv)

$$sf := (1ft)\cdot(1ft)$$

$$cf := (1ft)\cdot(1ft)\cdot(1ft)$$

$$cfs := \frac{(1cf)}{(1s)}$$

Drainage Area (sf) $A := 146747\cdot sf = 5.264 \times 10^{-3}\cdot mi^2$

Impervious Area (sf) $A_I := 94131\cdot sf = 3.376 \times 10^{-3}\cdot mi^2$

Pervious Area (sf) $A_P := 52616\cdot sf = 1.887 \times 10^{-3}\cdot mi^2$

% Impervious Area $I := \left(\frac{A_I}{A}\right)\cdot 100 = 64.145$

90 % Rainfall event (in.) $P := 0.9\cdot in$

Volumetric runoff coefficient $R_v := 0.05 + 0.009\cdot I = 0.627$

Water Quality Volume (cf) $WQv := P\cdot R_v\cdot A = 6.904 \times 10^3\cdot cf$

Calculate Runoff Volume (Q_a)

Runoff Volume (in.) $Q_a := P\cdot R_v = 0.565\cdot in$

$$Q_a := if\left(P\cdot R_v < 0.2in, 0.2in, P\cdot R_v\right) = 0.565\cdot in$$

Calculate Curve Number (CN)

Curve Number

$$CN := \frac{1000\cdot in}{\left[10\cdot in + 5\cdot P + 10\cdot Q_a - 10\left(Q_a^{\,2} + 1.25\cdot Q_a\cdot P\right)^{\left(\frac{1}{2}\right)}\right]} = 96$$

Calculate Initial Abstraction (I_a)

Potential Maximum Soil Moisture Retention (in.)
$$S := \left(\frac{1000in}{CN}\right) - 10in = 0.379 \cdot in$$

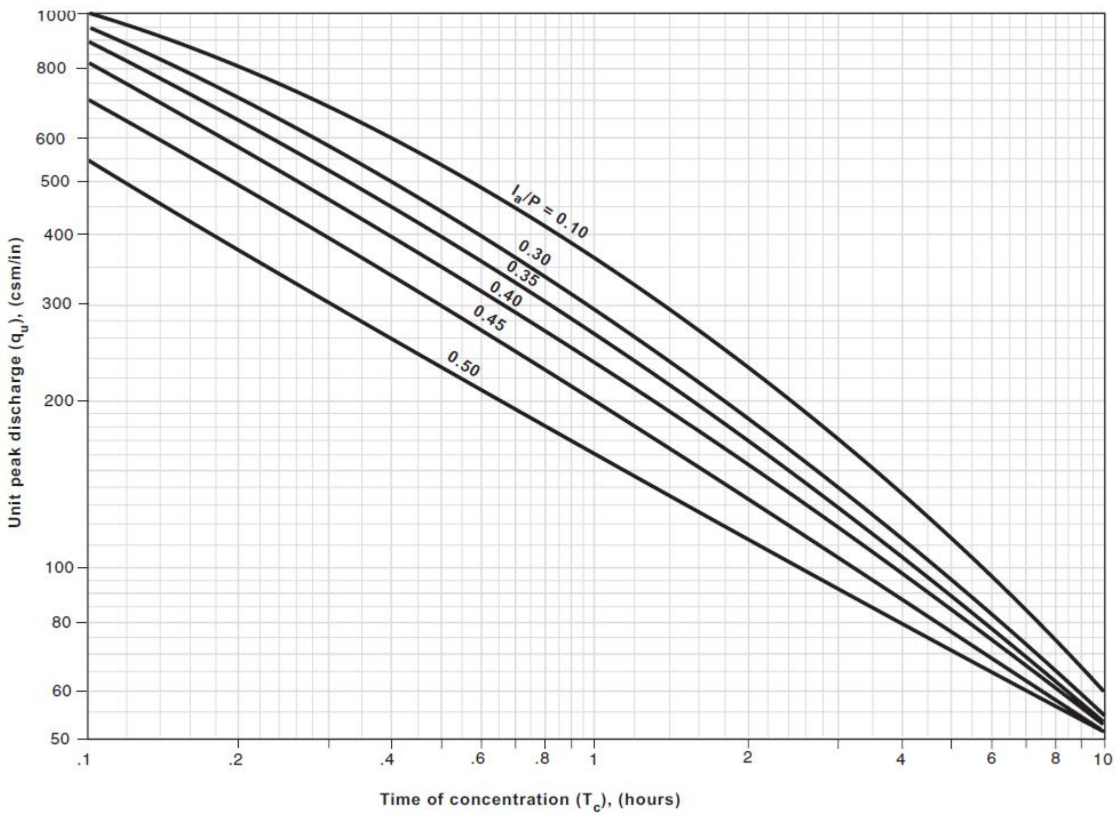
Initial Abstraction (in.)
$$I_a := 0.2 \cdot S = 0.076 \cdot in$$

$$\frac{I_a}{P} = 0.084$$

Time of Concentration from HydroCAD (hr)
$$t_c := 28.2min = 0.47 \cdot hr$$

Use I_a/P and t_c to determine Unit Peak Discharge from the graph below:

Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



Unit Peak Discharge (cfs/mi²/in)
$$q_u := 550 \frac{cfs}{mi^2 \cdot in}$$

Calculate Peak Discharge (Q_{wq})

Peak Discharge (cfs) $Q_{wq} := (q_u)\cdot(A)\cdot(Q_a) = 1.635\cdot cfs$

Input Peak Discharge and channel characteristics to find depth, velocity, and required channel length (peak discharge for 1 and 10 yr storms comes from HydroCAD):

Trapezoidal Channel Calculations - Grass Channel 10

STA. 44+77.2, LT. - STA. 48+92.1, LT.

	WQv	1 Yr	10 Yr	
Peak Discharge	1.635	3.35	5.2	**cfs**
Bottom W	5	5	5	**ft**
Side Slope	3	3	3	**1:X**
Back Slope	3	3	3	**1:X**
Long Slope	1.8	1.8	1.8	**%**
Length	421	421	421	**ft**

RESULTS

Depth (in):	4.705	6.32	7.405	**in**
"n":	0.139425	0.1152	0.098925	
Area	2.422	3.465	4.228	**ft^2**
Velocity	0.7	1.0	1.2	**ft/s**

10 minute length required:	405.103	**ft**
	123.507	**m**

Results are generated from a tabulated Manning's Equation based on the Peak Discharge and channel dimensions.

N
VT STATE PLANE GRID
GC1
ON-SITE IMPERVIOUS = 0.05 ACRES
ON-SITE PERVIOUS = 0.15 ACRES
OFF-SITE IMPERVIOUS = 0.30 ACRES
OFF-SITE PERVIOUS = 0.73 ACRES
0 20 40
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 1
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 1 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$


N
VT STATE PLANE GRID
GC4
ON-SITE IMPERVIOUS = 1.06 ACRES
ON-SITE PERVIOUS = 0.41 ACRES
OFF-SITE IMPERVIOUS = 10.28 ACRES
OFF-SITE ROOFS = 1.73 ACRES
OFF-SITE POND = 0.43 ACRES
OFF-SITE PERVIOUS = 9.67 ACRES
0 80 160
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 4
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 4 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S#$ OF $T#$


N
VT STATE PLANE GRID
GC5
ON-SITE IMPERVIOUS = 0.05 ACRES
ON-SITE PERVIOUS = 0.06 ACRES
OFF-SITE IMPERVIOUS = 0.00 ACRES
OFF-SITE PERVIOUS = 0.00 ACRES
0 10 20
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 5
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 5 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$

ON-SITE IMPERVIOUS = 0.24 ACRES

ON-SITE PERVIOUS =0.25 ACRES

OFF-SITE IMPERVIOUS = 0.00 ACRES

OFF-SITE PERVIOUS = 0.00 ACRES

PROJECT NAME: COLCHESTER	
PROJECT NUMBER: HES NH 5600(14)	
FILE NAME: CHANNEL 6	PLOT DATE: $$$$DATE$$$
PROJECT LEADER: M. LACROIX	DRAWN BY: T. SISSON
DESIGNED BY: T. SISSON	CHECKED BY: M. LACROIX
CHANNEL 6 AREA	SHEET $S"$ OF $T"$


N
VT STATE PLANE GRID
GC7
ON-SITE IMPERVIOUS = 0.48 ACRES
ON-SITE PERVIOUS = 0.13 ACRES
OFF-SITE IMPERVIOUS = 0.00 ACRES
OFF-SITE PERVIOUS = 0.00 ACRES
0 20 40
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 7
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 7 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: CHANNEL 8
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 8 AREA

PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$


N
VT STATE PLANE GRID
GC9
ON-SITE IMPERVIOUS = 0.18 ACRES
ON-SITE PERVIOUS = 0.10 ACRES
OFF-SITE IMPERVIOUS = 0.20 ACRES
OFF-SITE PERVIOUS = 0.30 ACRES
OFF-SITE WOODS = 0.28 ACRES
0 30 60
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 9
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 9 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$


N
VT STATE PLANE GRID
GC10
ON-SITE IMPERVIOUS = 0.28 ACRES
ON-SITE PERVIOUS = 0.10 ACRES
OFF-SITE IMPERVIOUS = 1.37 ACRES
OFF-SITE ROOFS = 0.51 ACRES
OFF-SITE PERVIOUS = 0.88 ACRES
OFF-SITE WOODS = 0.23 ACRES
0 30 60
SCALE IN FEET
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: CHANNEL 10
PROJECT LEADER: M. LACROIX
DESIGNED BY: T. SISSON
CHANNEL 10 AREA
PLOT DATE: $$$$DATE$$$
DRAWN BY: T. SISSON
CHECKED BY: M. LACROIX
SHEET $S"$ OF $T"$

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Dry Pond**
	Sta. 36+80.00 – Sta. 38+90.00, RT.

Dry Pond Description: The pond is located from Station 36+80 to Station 38+90 on the right side of US Route 7 between Hercules Drive and Champlain Drive.

Channel Protection Volume	
One-Year Storm (inches):	2.1
Pond Drainage Area (acres):	11.159
Curve Number:	87
Required Channel Protection Volume (ac-ft):	**0.904**
Required Channel Protection Volume (cf):	**39,378**
Req'd 12-Hour Extended Release Discharge Rate (cfs):	**0.897**

The design requirement for the channel protection standard focuses on storage volume and discharge release rate (flow). As summarized in the tables below, the dry pond as designed meets the required volume and flows of the one-year storm event.

Dry Pond Design Criteria	
Pond Bottom Elevation:	316.00'
Pond Side Slopes:	4:1
Primary Discharge Elevation:	316.00'
Overflow Structure Elevation (CPv):	317.99'
Emergency Spillway Elevation:	319.00'
Top of Berm:	321.50'

One-Year Storm in Dry Pond	
Discharge at Primary Low Flow Outlet (cfs):	0.32
Storage in Pond (ac-ft):	**0.466**
Storage in Pond (cf):	**20,312**

10-Year Storm in Dry Pond	
Peak Elevation in Pond:	**319.00'**
Storage in Pond (ac-ft):	**0.796**
Storage in Pond (cf):	**34,654**

100-Year Storm in Dry Pond	
Peak Elevation in Pond:	**319.79’**
Storage in Pond (ac-ft):	**1.091**
Storage in Pond (cf):	**47,535**

All discharge velocities are anticipated to be well below the 9.2 ft/s velocity threshold for a Type II stone channel as per the VTrans Hydraulics Manual. Type II Stone, per the Vermont Agency of Transportation Standard Specification for Constructions, is required to be between 2 and 36 inches in length and at least 50 percent of the volume of stone in place shall have a least dimension of 12 inches.

The calculated one-year storm in the barrel is velocity is 2.15 ft/s; the 10-year storm in the barrel is 3.94 ft/s and the 100-year storm is 8.52 ft/s. The velocities were calculated using the critical depth of the barrel during these storm events. The flow velocities of the spillway were calculated to be 0.22 ft/s for the 10-year storm and 3.04 ft/s for the 100-year storm.

All storm events up to and including the 100-year event will have at minimum 1.0’ of freeboard measured from the peak pond elevation from the event to the top of the pond berm.

The pond has a hazard classification of “A” due to its storage height product, the volume in acre-feet below the spillway multiplied by the pond depth, being less than 3,000. Soil Conservation District small pond approval is not required due to the embankment height of less than 6 feet and the storage volume below the emergency spillway of less than 40,000 cubic feet.

A stone lined pilot channel will be constructed in the bottom of the pond to guide stormwater to the during low flow conditions.

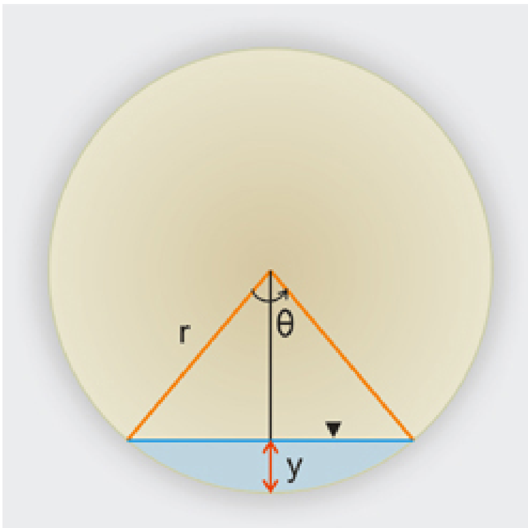
The inlet to the pond will have scour protection at its outlet for 10-year storm.

The pond’s drain was designed so that a less than 24-hour drawdown time of the volume will occur.

In the area near the pond, ledge is estimated to be approximately 13 feet below existing grade. This depth was interpolated from nearby roadway boring information. No geotechnical investigation occurred at the pond proper.

A maintenance road was designed to accommodate a vehicle to access the outlet areas of the pond. This road will be 12’ wide and will have enough area at the end of it for a vehicle to turn around.

onlinechannel07.php: Critical depth in a circular culvert or pipe



Formulas

$\theta = 2 \cos^{-1}[1 - 2(y/D)]$

$A = (D^2/8)\ (\theta - \sin\theta)$

$T = D \sin(\theta/2)$

$V = Q/A$

$(Q^2T)/(gA^3) = 1$

INPUT DATA:

Select:
SI units (metric)
U.S. Customary units

Pipe diameter D :
1.5 ft

Discharge Q :
0.32 cfs

INTERMEDIATE CALCS:

Relative depth y_c / D: 0.139

Angle θ: 87.58°

Flow area A: 0.148 ft^2

Top width T: 1.038 ft

Froude number F: 1.000

OUTPUT:

Critical depth y_c: 0.208 ft

Critical velocity v_c: 2.148 fps

1-Year Storm

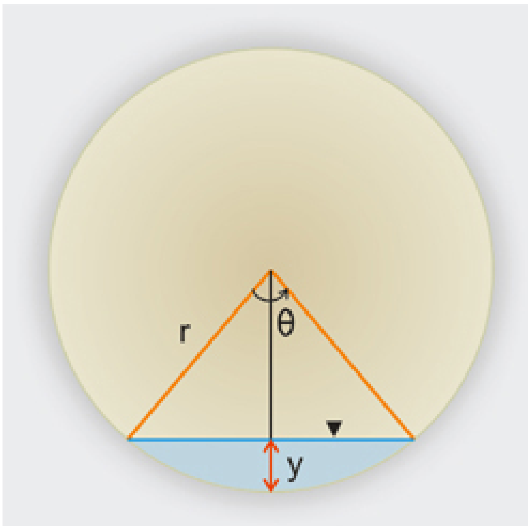
Calculate Reset

Your request was processed at 06:43:07 pm on May 9th, 2016 [160509 18:43:07].

Thank you for running onlinechannel_07. Please call again. [140618]

020972

onlinechannel07.php: Critical depth in a circular culvert or pipe



Formulas

$\theta = 2\cos^{-1}[1 - 2(y/D)]$

$A = (D^2/8)\ (\theta - \sin\theta)$

$T = D\ \sin(\theta/2)$

$V = Q/A$

$(Q^2 T)/(gA^3) = 1$

INPUT DATA:

Select:
SI units (metric)
U.S. Customary units

Pipe diameter D : 1.5 ft

Discharge Q : 2.82 cfs

INTERMEDIATE CALCS:

Relative depth y_c / D: 0.425

Angle θ: 162.7°

Flow area A: 0.715 ft^2

Top width T: 1.483 ft

Froude number F: 1.000

OUTPUT:

Critical depth y_c: 0.637 ft

Critical velocity v_c: 3.940 fps

10-Year Storm

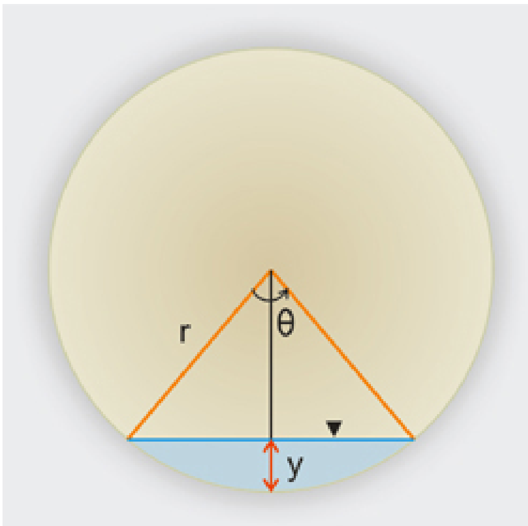
Calculate Reset

Your request was processed at 06:44:06 pm on May 9th, 2016 [160509 18:44:06].

Thank you for running onlinechannel_07. Please call again. [140618]

020972

onlinechannel07.php: Critical depth in a circular culvert or pipe



Formulas

$\theta = 2 \cos^{-1}[1 - 2(y/D)]$

$A = (D^2/8)\ (\theta - \sin\theta)$

$T = D \sin(\theta/2)$

$V = Q/A$

$(Q^2T)/(gA^3) = 1$

INPUT DATA:

Select:
SI units (metric)
U.S. Customary units

Pipe diameter D :
1.5 ft

Discharge Q :
14.61 cfs

INTERMEDIATE CALCS:

Relative depth y_c / D: 0.931

Angle θ: 299.1°

Flow area A: 1.714 ft^2

Top width T: 0.759 ft

Froude number F: 1.000

OUTPUT:

Critical depth y_c: 1.396 ft

Critical velocity v_c: 8.523 fps

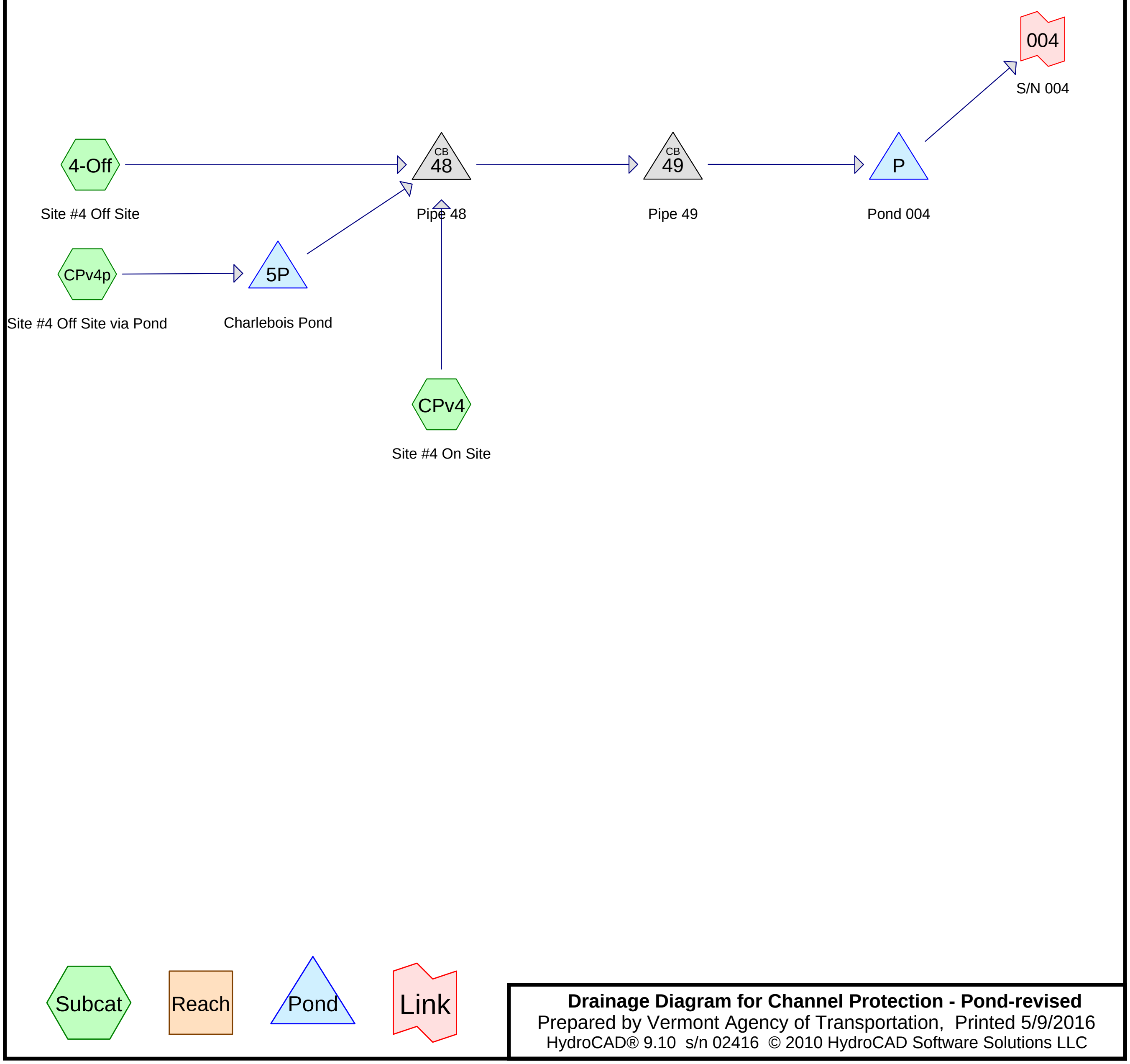
100-Year Storm

Calculate Reset

Your request was processed at 06:45:59 pm on May 9th, 2016 [160509 18:45:59].

Thank you for running onlinechannel_07. Please call again. [140618]

020972



Drainage Diagram for Channel Protection - Pond-revised
Prepared by Vermont Agency of Transportation, Printed 5/9/2016
HydroCAD® 9.10 s/n 02416 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.022	39	>75% Grass cover, Good, HSG A (CPv4)
0.562	61	>75% Grass cover, Good, HSG B (CPv4)
3.832	79	Woods, Fair, HSG D (4-Off)
0.692	80	>75% Grass cover, Good, HSG D (CPv4)
0.717	84	50-75% Grass cover, Fair, HSG D (4-Off)
2.838	98	Paved parking, HSG D (4-Off, CPv4p)
0.026	98	Paved roads w/curbs & sewers, HSG A (CPv4)
0.475	98	Paved roads w/curbs & sewers, HSG B (CPv4)
0.004	98	Paved roads w/curbs & sewers, HSG C (CPv4)
1.169	98	Paved roads w/curbs & sewers, HSG D (CPv4)
0.357	98	Roofs, HSG D (4-Off)
0.465	98	Water Surface, HSG A (CPv4, CPv4p)
11.159		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.513	HSG A	CPv4, CPv4p
1.037	HSG B	CPv4
0.004	HSG C	CPv4
9.605	HSG D	4-Off, CPv4, CPv4p
0.000	Other	
11.159		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	CPv4	0.00	0.00	61.0	0.0311	0.025	18.0	0.0	0.0
2	CPv4	0.00	0.00	125.0	0.0649	0.025	18.0	0.0	0.0
3	5P	331.00	330.00	45.5	0.0220	0.012	15.0	0.0	0.0
4	48	322.75	320.05	75.0	0.0360	0.013	30.0	0.0	0.0
5	49	319.00	316.00	28.0	0.1071	0.013	30.0	0.0	0.0
6	P	315.25	315.00	39.0	0.0064	0.013	18.0	0.0	0.0

Time span=0.00-360.00 hrs, dt=0.02 hrs, 18001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4-Off: Site #4 Off Site Runoff Area=256,290 sf 22.68% Impervious Runoff Depth=0.82"
Flow Length=1,296' Tc=13.3 min CN=84 Runoff=6.49 cfs 0.400 af

Subcatchment CPv4: Site #4 On Site Runoff Area=139,067 sf 60.03% Impervious Runoff Depth=0.98"
Flow Length=1,397' Tc=5.3 min CN=87 Runoff=5.76 cfs 0.262 af

Subcatchment CPv4p: Site #4 Off Site via Runoff Area=90,708 sf 100.00% Impervious Runoff Depth=1.87"
Flow Length=467' Slope=0.0200 '/' Tc=2.7 min CN=98 Runoff=6.73 cfs 0.325 af

Pond 5P: Charlebois Pond Peak Elev=333.11' Storage=0.245 af Inflow=6.73 cfs 0.325 af
Outflow=0.11 cfs 0.243 af

Pond 48: Pipe 48 Peak Elev=324.11' Inflow=10.81 cfs 0.904 af
30.0" Round Culvert n=0.013 L=75.0' S=0.0360 '/' Outflow=10.81 cfs 0.904 af

Pond 49: Pipe 49 Peak Elev=320.36' Inflow=10.81 cfs 0.904 af
30.0" Round Culvert n=0.013 L=28.0' S=0.1071 '/' Outflow=10.81 cfs 0.904 af

Pond P: Pond 004 Peak Elev=317.99' Storage=20,312 cf Inflow=10.81 cfs 0.904 af
Outflow=0.32 cfs 0.904 af

Link 004: S/N 004 Inflow=0.32 cfs 0.904 af
Primary=0.32 cfs 0.904 af

Total Runoff Area = 11.159 ac Runoff Volume = 0.987 af Average Runoff Depth = 1.06"
52.20% Pervious = 5.825 ac 47.80% Impervious = 5.333 ac

Summary for Subcatchment 4-Off: Site #4 Off Site

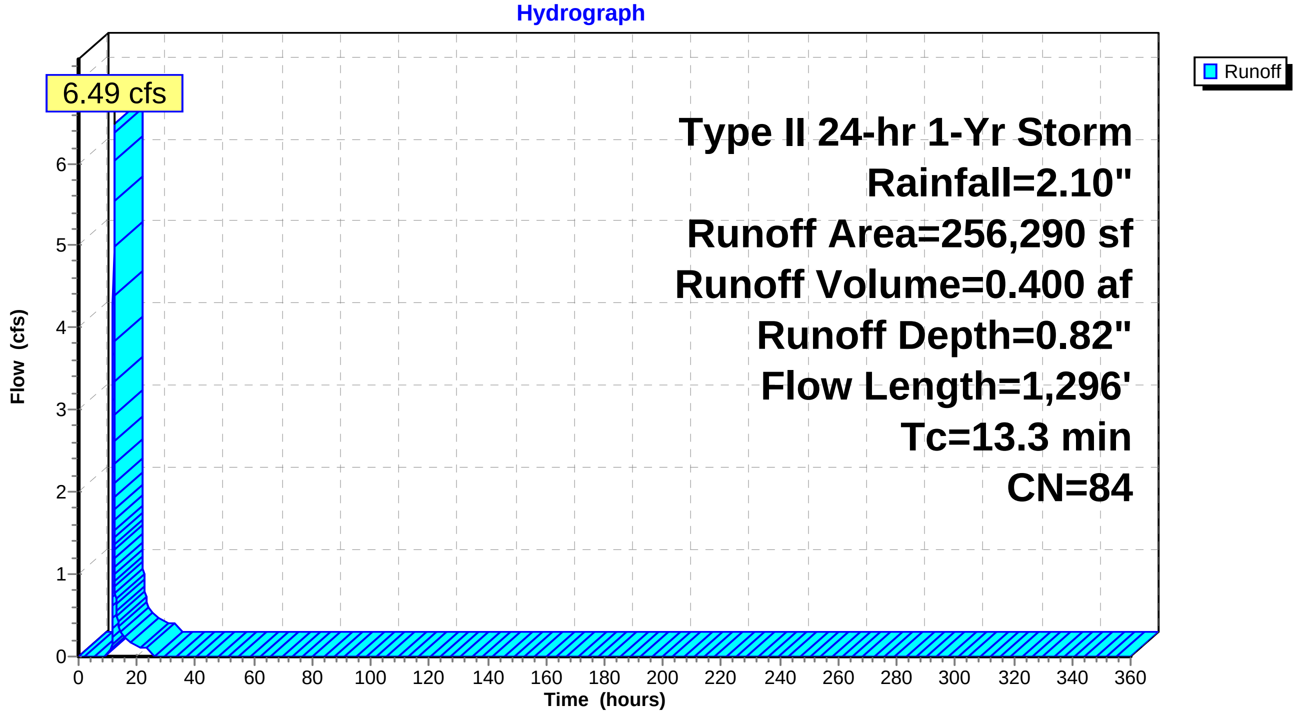
Runoff = 6.49 cfs @ 12.06 hrs, Volume= 0.400 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Type II 24-hr 1-Yr Storm Rainfall=2.10"

Area (sf)	CN	Description
166,925	79	Woods, Fair, HSG D
15,537	98	Roofs, HSG D
31,236	84	50-75% Grass cover, Fair, HSG D
42,592	98	Paved parking, HSG D
256,290	84	Weighted Average
198,161		77.32% Pervious Area
58,129		22.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	58	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	92	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	85	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	114	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	61	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	109	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	44	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	442	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.8	291	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.3	1,296	Total			

Subcatchment 4-Off: Site #4 Off Site



Summary for Subcatchment CPv4: Site #4 On Site

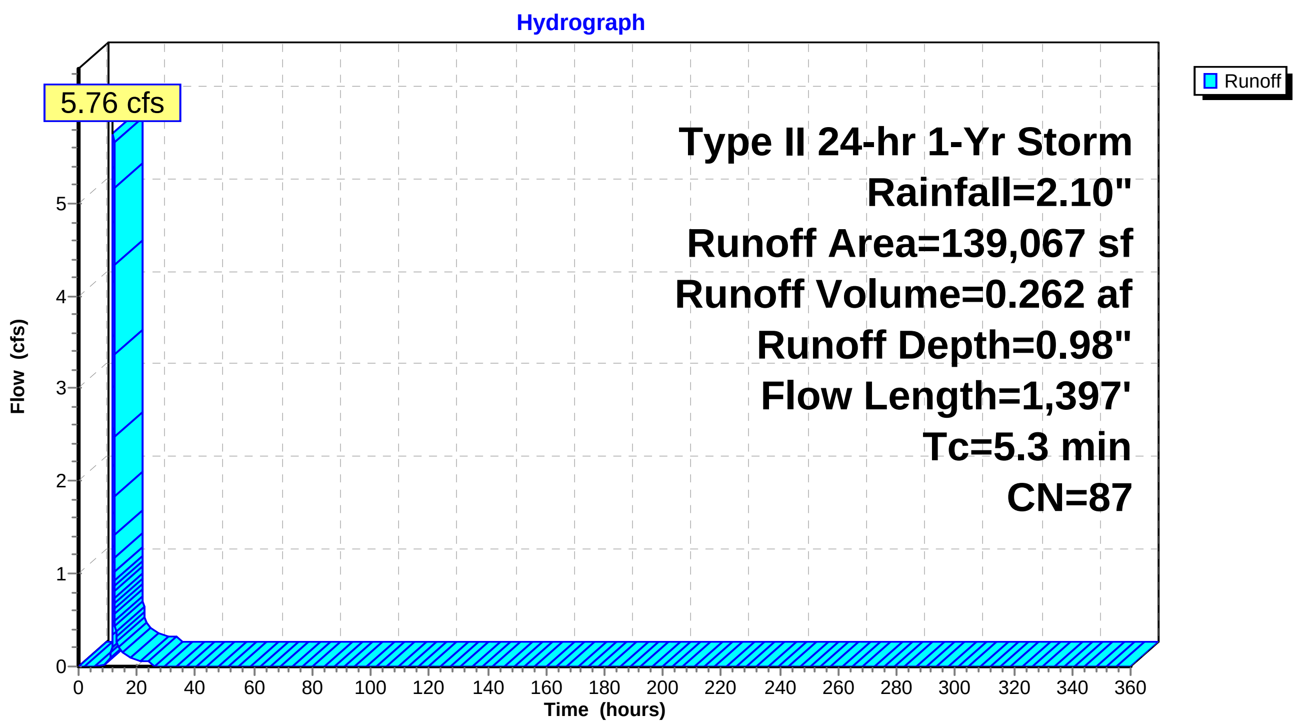
Runoff = 5.76 cfs @ 11.97 hrs, Volume= 0.262 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Type II 24-hr 1-Yr Storm Rainfall=2.10"

Area (sf)	CN	Description
30,144	80	>75% Grass cover, Good, HSG D
50,922	98	Paved roads w/curbs & sewers, HSG D
0	74	>75% Grass cover, Good, HSG C
174	98	Paved roads w/curbs & sewers, HSG C
24,481	61	>75% Grass cover, Good, HSG B
20,691	98	Paved roads w/curbs & sewers, HSG B
958	39	>75% Grass cover, Good, HSG A
1,133	98	Paved roads w/curbs & sewers, HSG A
10,564	98	Water Surface, 0% imp, HSG A
139,067	87	Weighted Average
66,147		47.56% Pervious Area
72,920		52.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	67	0.0147	0.91		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.10"
0.3	68	0.0413	4.13		**Shallow Concentrated Flow, Shallow Pave 1** Paved Kv= 20.3 fps
1.5	444	0.0091	4.86	38.91	**Channel Flow, Grass Channel 1** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.2	61	0.0311	5.45	9.63	**Pipe Channel, Culvert 1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
1.8	632	0.0131	5.84	46.68	**Channel Flow, Channel 2** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.3	125	0.0649	7.87	13.92	**Pipe Channel, Culvert 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
5.3	1,397	Total			

Subcatchment CPv4: Site #4 On Site



Summary for Subcatchment CPv4p: Site #4 Off Site via Pond

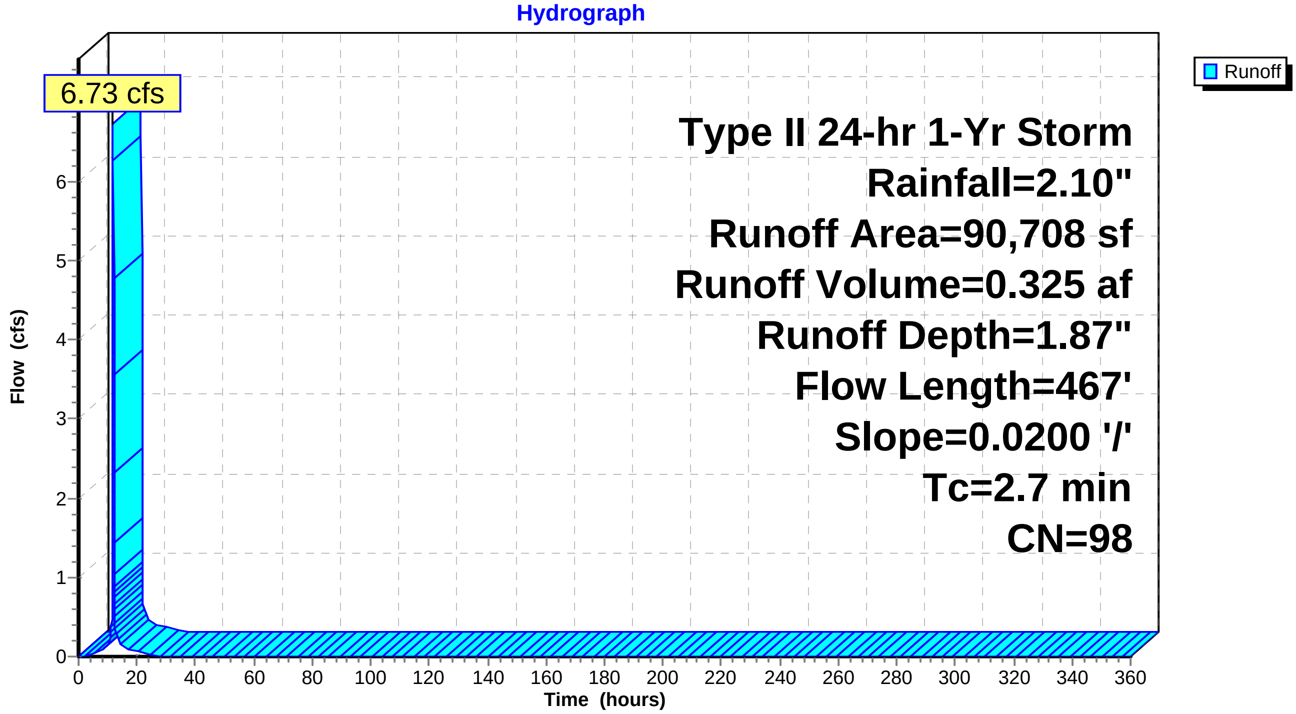
Runoff = 6.73 cfs @ 11.93 hrs, Volume= 0.325 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Type II 24-hr 1-Yr Storm Rainfall=2.10"

Area (sf)	CN	Description
81,022	98	Paved parking, HSG D
9,686	98	Water Surface, HSG A
90,708	98	Weighted Average
90,708		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	467	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment CPv4p: Site #4 Off Site via Pond



Summary for Pond 5P: Charlebois Pond

Inflow Area = 2.082 ac,100.00% Impervious, Inflow Depth = 1.87" for 1-Yr Storm event
Inflow = 6.73 cfs @ 11.93 hrs, Volume= 0.325 af
Outflow = 0.11 cfs @ 15.78 hrs, Volume= 0.243 af, Atten= 98%, Lag= 230.9 min
Primary = 0.11 cfs @ 15.78 hrs, Volume= 0.243 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 333.11' @ 15.78 hrs Surf.Area= 0.105 ac Storage= 0.245 af

Plug-Flow detention time= 975.5 min calculated for 0.243 af (75% of inflow)
Center-of-Mass det. time= 886.1 min (1,645.5 - 759.4)

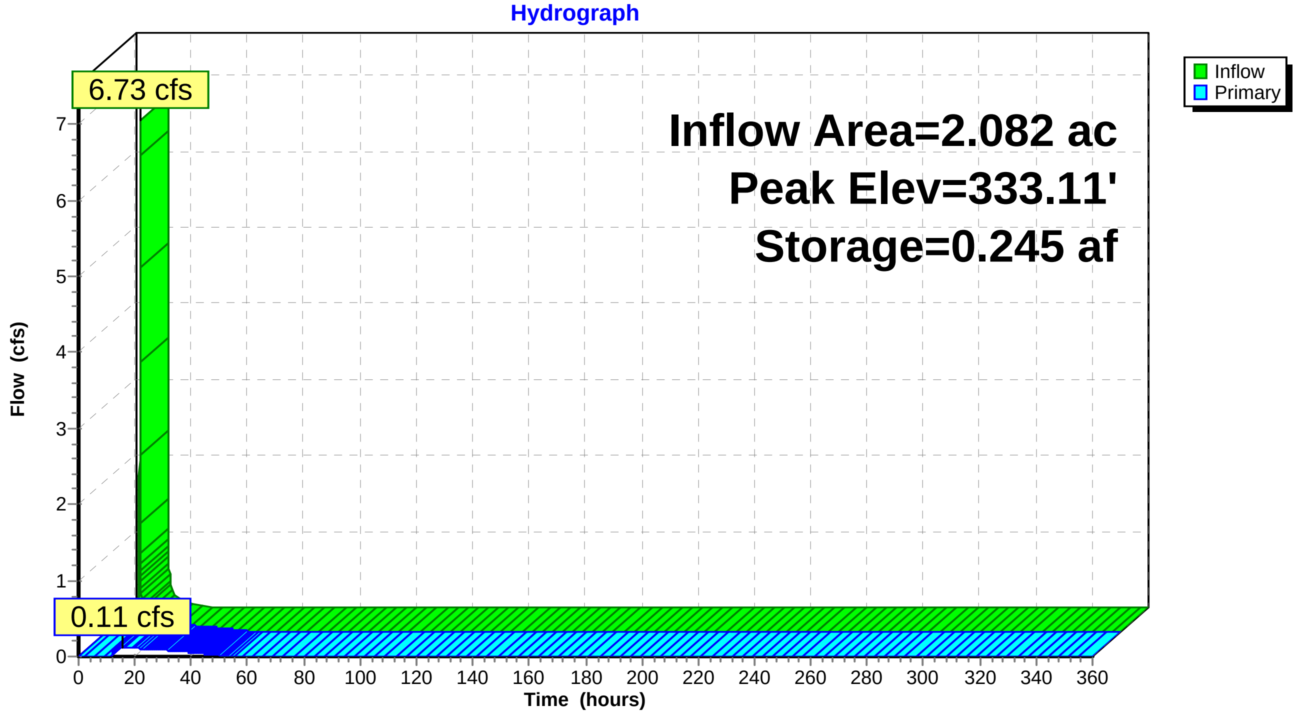
Volume	Invert	Avail.Storage	Storage Description
#1	327.00'	0.351 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
327.00	0.003	0.000	0.000
328.00	0.009	0.006	0.006
329.00	0.018	0.014	0.020
330.00	0.029	0.024	0.043
331.00	0.050	0.039	0.082
332.00	0.075	0.062	0.145
333.00	0.102	0.088	0.233
334.00	0.132	0.117	0.351

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	**15.0" Round Culvert** L= 45.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 331.00' / 330.00' S= 0.0220 '/' Cc= 0.900 n= 0.012 Steel, smooth
#2	Device 1	331.00'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Primary	333.50'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 15.78 hrs HW=333.11' TW=323.01' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.11 cfs of 7.20 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.11 cfs @ 6.88 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 5P: Charlebois Pond



Summary for Pond 48: Pipe 48

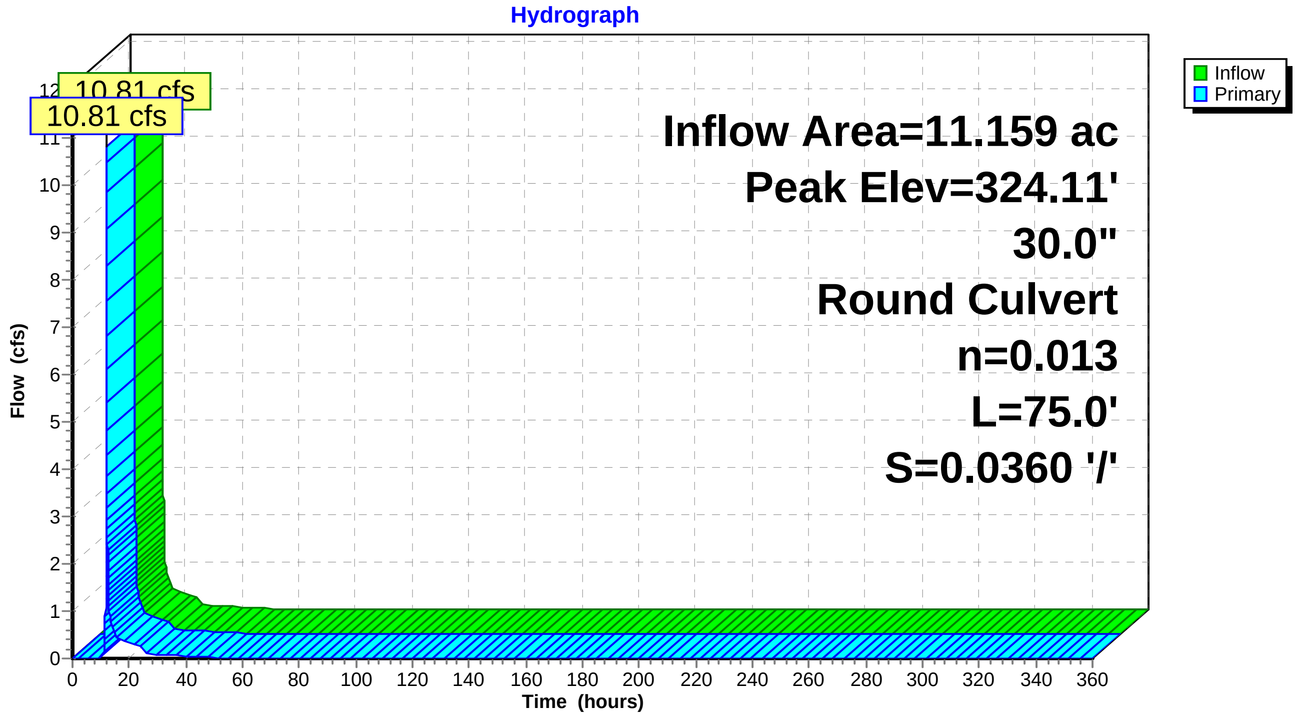
Inflow Area =	11.159 ac, 47.80% Impervious,	Inflow Depth = 0.97"	for 1-Yr Storm event
Inflow =	10.81 cfs @ 12.00 hrs,	Volume=	0.904 af
Outflow =	10.81 cfs @ 12.00 hrs,	Volume=	0.904 af, Atten= 0%, Lag= 0.0 min
Primary =	10.81 cfs @ 12.00 hrs,	Volume=	0.904 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 324.11' @ 12.00 hrs
Flood Elev= 326.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	322.75'	**30.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 322.75' / 320.05' S= 0.0360 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=10.78 cfs @ 12.00 hrs HW=324.11' TW=320.36' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 10.78 cfs @ 3.96 fps)

Pond 48: Pipe 48



Summary for Pond 49: Pipe 49

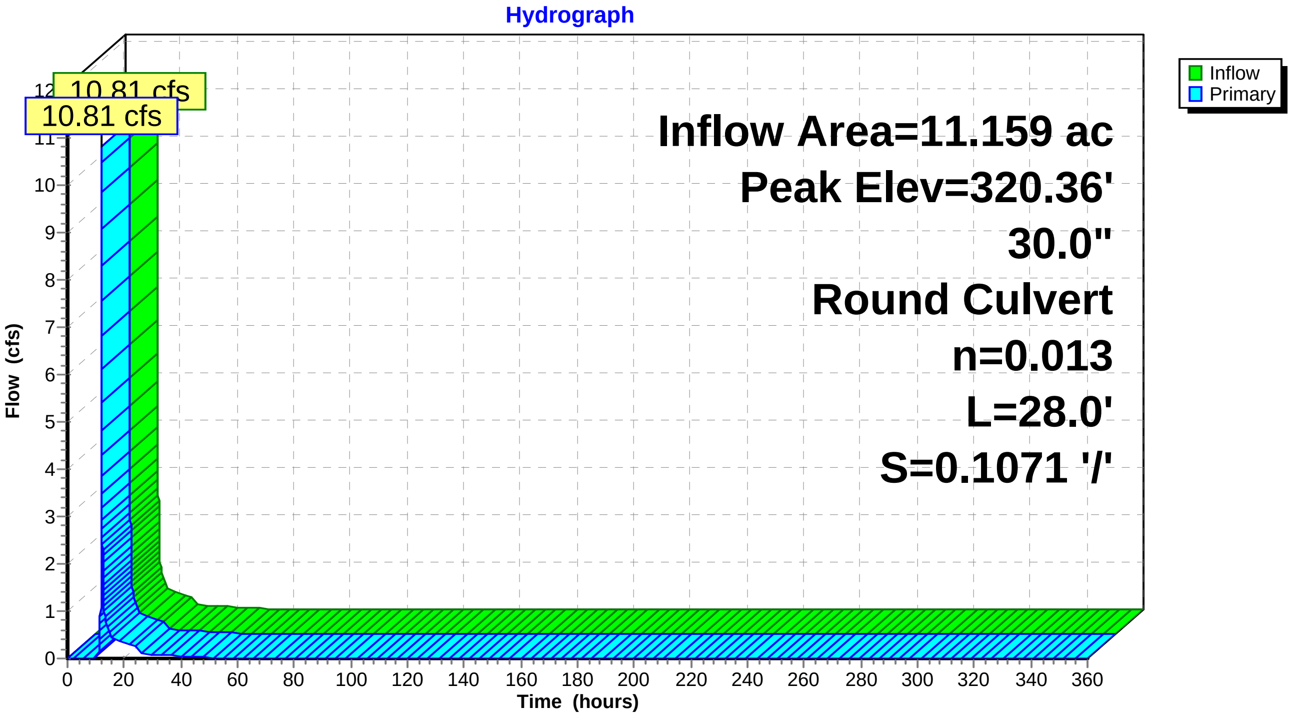
Inflow Area =	11.159 ac,	47.80% Impervious,	Inflow Depth = 0.97"	for 1-Yr Storm event
Inflow =	10.81 cfs @	12.00 hrs, Volume=	0.904 af	
Outflow =	10.81 cfs @	12.00 hrs, Volume=	0.904 af, Atten= 0%, Lag= 0.0 min	
Primary =	10.81 cfs @	12.00 hrs, Volume=	0.904 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 320.36' @ 12.00 hrs
Flood Elev= 324.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**30.0" Round Culvert** L= 28.0' Ke= 0.500 Inlet / Outlet Invert= 319.00' / 316.00' S= 0.1071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=10.78 cfs @ 12.00 hrs HW=320.36' TW=316.77' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 10.78 cfs @ 3.96 fps)

Pond 49: Pipe 49



Summary for Pond P: Pond 004

Inflow Area = 11.159 ac, 47.80% Impervious, Inflow Depth = 0.97" for 1-Yr Storm event
Inflow = 10.81 cfs @ 12.00 hrs, Volume= 0.904 af
Outflow = 0.32 cfs @ 19.18 hrs, Volume= 0.904 af, Atten= 97%, Lag= 431.3 min
Primary = 0.32 cfs @ 19.18 hrs, Volume= 0.904 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 317.99' @ 19.18 hrs Surf.Area= 0 sf Storage= 20,312 cf

Plug-Flow detention time= 858.4 min calculated for 0.904 af (100% of inflow)
Center-of-Mass det. time= 853.5 min (1,914.2 - 1,060.7)

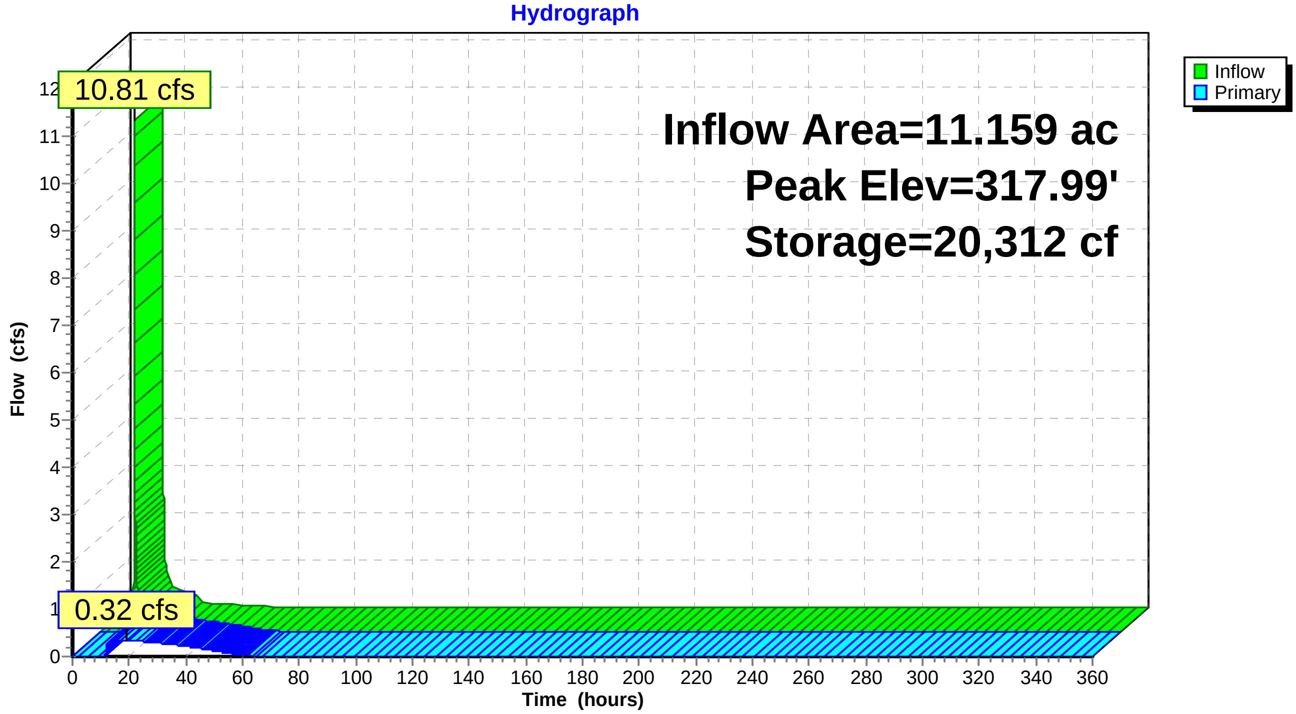
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	87,679 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
316.00	0
317.00	8,893
317.50	13,961
318.50	26,849
319.00	34,580
320.00	51,060
321.00	68,835
322.00	87,679

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**10.0' long Spillway** 2 End Contraction(s) 2.0' Crest Height
#2	Device 4	318.80'	**24.0" x 24.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads
#3	Device 4	316.00'	**3.0" Vert. Low Flow** C= 0.600
#4	Primary	315.25'	**18.0" Round Culvert** L= 39.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 315.25' / 315.00' S= 0.0064 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.32 cfs @ 19.18 hrs HW=317.99' TW=0.00' (Dynamic Tailwater)
- **1=Spillway** (Controls 0.00 cfs)
- **4=Culvert** (Passes 0.32 cfs of 10.60 cfs potential flow)
  - **2=Overflow** (Controls 0.00 cfs)
  - **3=Low Flow** (Orifice Controls 0.32 cfs @ 6.58 fps)

Pond P: Pond 004



Summary for Pond P: Pond 004

Inflow Area = 11.159 ac, 47.80% Impervious, Inflow Depth = 1.90" for 10-Yr Storm event
Inflow = 24.21 cfs @ 12.01 hrs, Volume= 1.767 af
Outflow = 2.83 cfs @ 12.64 hrs, Volume= 1.766 af, Atten= 88%, Lag= 38.1 min
Primary = 2.83 cfs @ 12.64 hrs, Volume= 1.766 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 319.00' @ 12.64 hrs Surf.Area= 0 sf Storage= 34,654 cf

Plug-Flow detention time= 804.0 min calculated for 1.766 af (100% of inflow)
Center-of-Mass det. time= 802.1 min (1,792.9 - 990.9)

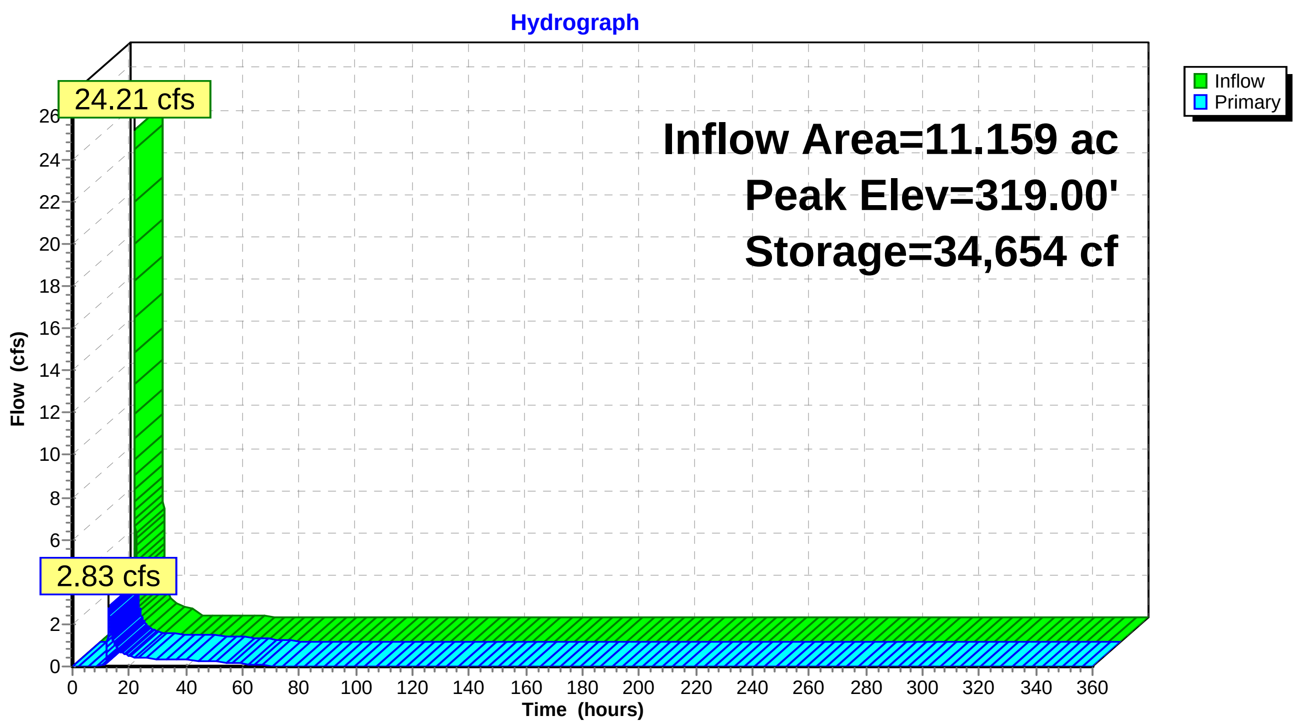
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	87,679 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
316.00	0
317.00	8,893
317.50	13,961
318.50	26,849
319.00	34,580
320.00	51,060
321.00	68,835
322.00	87,679

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**10.0' long Spillway** 2 End Contraction(s) 2.0' Crest Height
#2	Device 4	318.80'	**24.0" x 24.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads
#3	Device 4	316.00'	**3.0" Vert. Low Flow** C= 0.600
#4	Primary	315.25'	**18.0" Round Culvert** L= 39.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 315.25' / 315.00' S= 0.0064 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.83 cfs @ 12.64 hrs HW=319.00' TW=0.00' (Dynamic Tailwater)
- **1=Spillway** (Weir Controls 0.01 cfs @ 0.22 fps)
- **4=Culvert** (Passes 2.82 cfs of 13.01 cfs potential flow)
  - **2=Overflow** (Weir Controls 2.42 cfs @ 1.48 fps)
  - **3=Low Flow** (Orifice Controls 0.40 cfs @ 8.17 fps)

Pond P: Pond 004



Summary for Pond P: Pond 004

Inflow Area = 11.159 ac, 47.80% Impervious, Inflow Depth = 3.73" for 100-Yr Storm event
Inflow = 56.60 cfs @ 11.98 hrs, Volume= 3.471 af
Outflow = 38.12 cfs @ 12.08 hrs, Volume= 3.471 af, Atten= 33%, Lag= 5.9 min
Primary = 38.12 cfs @ 12.08 hrs, Volume= 3.471 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.02 hrs
Peak Elev= 319.79' @ 12.08 hrs Surf.Area= 0 sf Storage= 47,535 cf

Plug-Flow detention time= 431.4 min calculated for 3.471 af (100% of inflow)
Center-of-Mass det. time= 429.9 min (1,326.6 - 896.7)

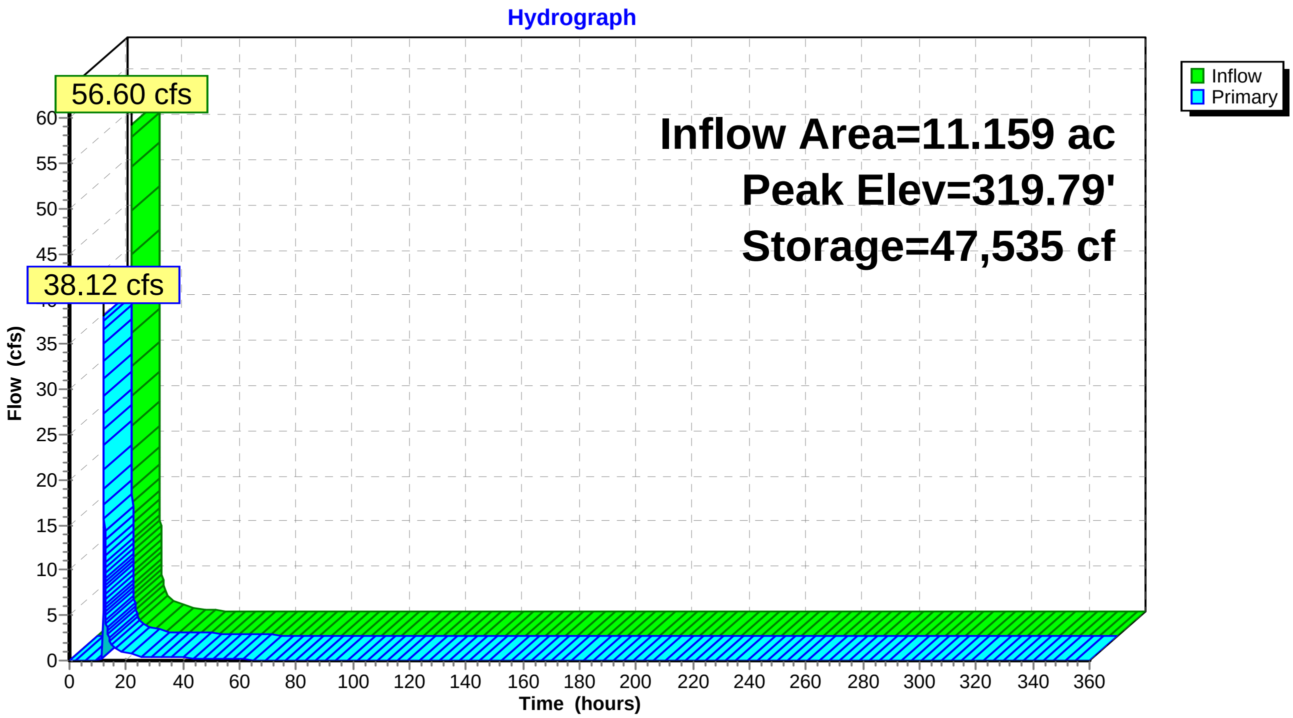
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	87,679 cf	**Custom Stage Data** Listed below

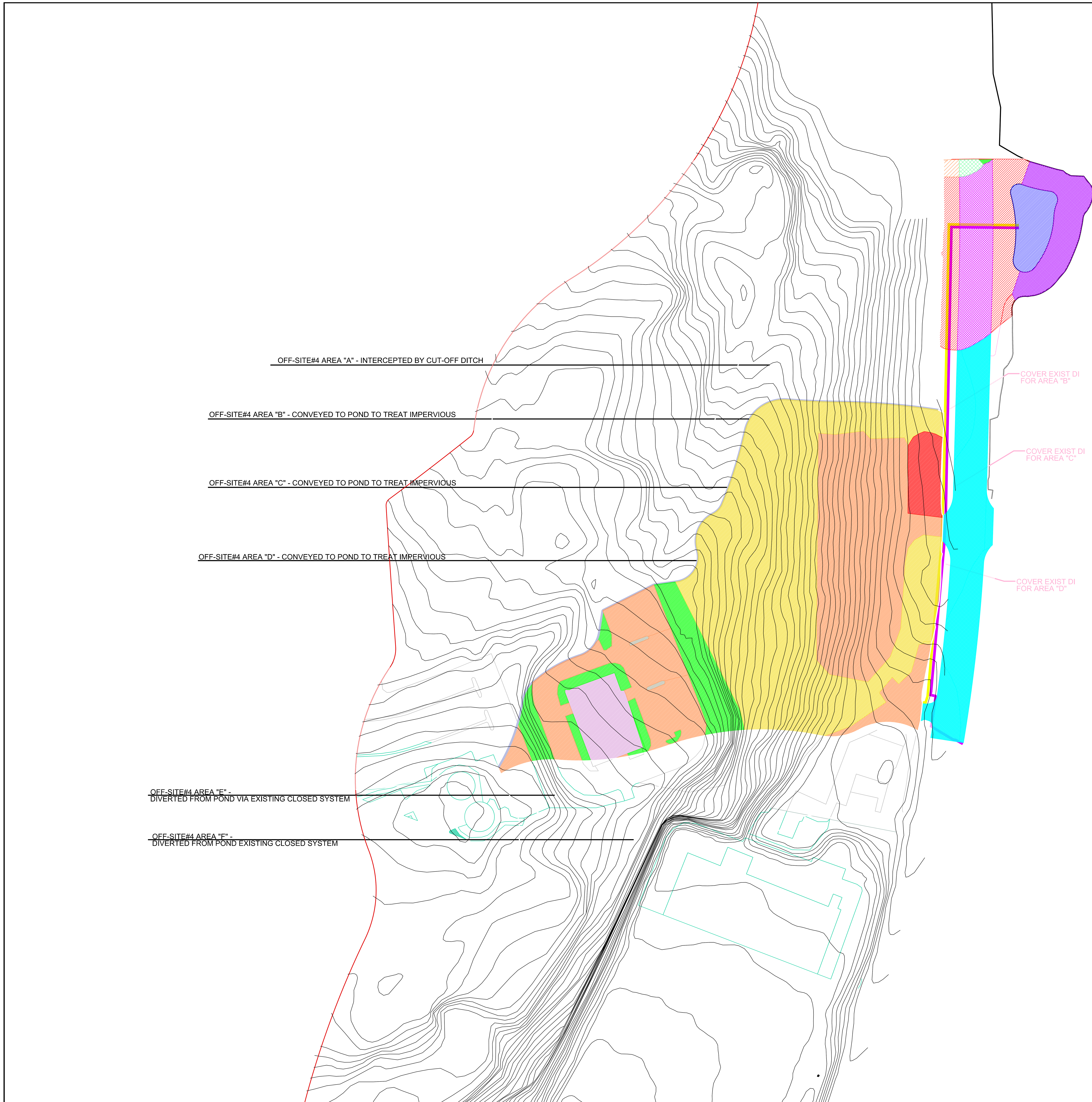
Elevation (feet)	Cum.Store (cubic-feet)
316.00	0
317.00	8,893
317.50	13,961
318.50	26,849
319.00	34,580
320.00	51,060
321.00	68,835
322.00	87,679

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**10.0' long Spillway** 2 End Contraction(s) 2.0' Crest Height
#2	Device 4	318.80'	**24.0" x 24.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads
#3	Device 4	316.00'	**3.0" Vert. Low Flow** C= 0.600
#4	Primary	315.25'	**18.0" Round Culvert** L= 39.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 315.25' / 315.00' S= 0.0064 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=38.11 cfs @ 12.08 hrs HW=319.79' TW=0.00' (Dynamic Tailwater)
1=Spillway (Weir Controls 23.50 cfs @ 3.04 fps)
4=Culvert (Inlet Controls 14.61 cfs @ 8.27 fps)
2=Overflow (Passes < 19.12 cfs potential flow)
3=Low Flow (Passes < 0.45 cfs potential flow)

Pond P: Pond 004





#4 ON-SITE POND ANALYSIS

PERVIOUS, D SOIL	30,144 SF
IMPERVIOUS, D SOIL	50,922 SF
PERVIOUS, C SOIL	0 SF
IMPERVIOUS, C SOIL	174 SF
PERVIOUS, B SOIL	24,481 SF
IMPERVIOUS, B SOIL	20,691 SF
PERVIOUS, A SOIL	958 SF
IMPERVIOUS, A SOIL	1,133 SF
	128,503 SF

On-Site #4 Area not to pond
16,952 SF

On-Site #4 Pond Area
10,564 SF

#4 OFF-SITE POND ANALYSIS

OFF-SITE WOODS, D SOIL	166,925 SF
OFF-SITE ROOFS, D SOIL	15,537 SF
OFF-SITE GRASS, D SOIL	31,236 SF
OFF-SITE PAVED, D SOIL	42,592 SF

via EXISTING POND

OFF-SITE POND, D SOIL	9,686 SF
OFF-SITE PAVED, D SOIL	81,022 SF
	346,998 SF

PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)

FILE NAME: ChannelProtection-Pond.dgn
PROJECT LEADER: PAC
DESIGNED BY: MBL
ChannelProtection Cover Types
PLOT DATE: $$$$DATE$$$
DRAWN BY: MBL
CHECKED BY: HSD
SHEET $S"$ OF $T"$

#4 ON-SITE POND ANALYSIS
PERVIOUS, D SOIL 30,144 SF
IMPERVIOUS, D SOIL 50,922 SF
PERVIOUS, C SOIL 0 SF
IMPERVIOUS, C SOIL 174 SF
PERVIOUS, B SOIL 24,481 SF
IMPERVIOUS, B SOIL 20,691 SF
PERVIOUS, A SOIL 958 SF
IMPERVIOUS, A SOIL 1,133 SF
128,503 SF
On-Site #4 Area not to pond 16,952 SF
On-Site #4 Pond Area 10,564 SF
OFF-SITE#4 AREA "A" - INTERCEPTED BY CUT-OFF DITCH
OFF-SITE#4 AREA "B" - CONVEYED TO POND TO TREAT IMPERVIOUS
OFF-SITE#4 AREA "C" - CONVEYED TO POND TO TREAT IMPERVIOUS
OFF-SITE#4 AREA "D" - CONVEYED TO POND TO TREAT IMPERVIOUS
COVER EXIST DI FOR AREA "B"
COVER EXIST DI FOR AREA "C"
COVER EXIST DI FOR AREA "D"
HERCULES DR.
#4 OFF-SITE POND ANALYSIS
OFF-SITE WOODS, D SOIL 166,925 SF
OFF-SITE ROOFS, D SOIL 15,537 SF
OFF-SITE GRASS, D SOIL 31,236 SF
OFF-SITE PAVED, D SOIL 42,592 SF
via EXISTING POND
OFF-SITE POND, D SOIL 9,686 SF
OFF-SITE PAVED, D SOIL 81,022 SF
346,998 SF
OFF-SITE#4 AREA "E" - DIVERTED FROM POND VIA EXISTING CLOSED SYSTEM
OFF-SITE#4 AREA "F" - DIVERTED FROM POND EXISTING CLOSED SYSTEM
PROJECT NAME: COLCHESTER
PROJECT NUMBER: HES NH 5600(14)
FILE NAME: ChannelProtection-Pond.dgn
PLOT DATE: $$$$DATE$$$
PROJECT LEADER: PAC
DRAWN BY: MBL
DESIGNED BY: MBL
CHECKED BY: HSD
ChannelProtection Cover Types
SHEET $S"$ OF $T"$

Project:	**Colchester**
	HES NH 5600 (14)
	Stormwater Treatment
Practice:	**Dry Pond #7**
	Sta. C 1+31 – Sta. C 2+99, RT.

Dry Pond Description: The pond is located from Station C 1+31 to Station C 2+99 on the southern side of the I-89 Exit 16 SB On-Ramp.

Overbank Flood Protection	
10-Year Pre-Development Storm at S/N 007 (cfs):	16.7
10-Year Post-Development Storm at S/N 007 (cfs):	31.4
10-Year Post-Development Storm at S/N 007 with Dry Pond (cfs):	17.4
Net flow at S/N 007 (cfs):	**+4.0%**

Dry Pond Design Criteria	
Pond Bottom Elevation:	317.50’
Pond Side Slopes:	2:1 Max.
Low Flow Orifice #1 (8”) Elevation:	317.50’
Low Flow Orifice #2 (8”) Elevation:	318.50
Overflow Structure Elevation:	320.60’
Top of Berm Elevation:	322.00’

10-Year Storm in Dry Pond	
Peak Elevation in Pond:	319.38’
Storage in Pond (ac-ft):	0.236
Storage in Pond (cf):	10,285

The calculated 10-year storm velocity at the outlet is 4.15 fps. This is below the threshold for a Type I stone channel per the VTrans Hydraulics Manual and as such, Type I stone fill will be installed at the outlet location.

In the area of the pond, ledge was not encountered during geotechnical investigation. The investigation included drilling cylindrical shaft borings near the road side to a depth at least 15 feet below existing grades.

The following downstream analysis shows in greater detail all of the on-site and off-site contributing areas and flows to the discharge point via this dry pond.

Project: Colchester
HES NH 5600 (14)
Stormwater Treatment
Practice: Dry Pond #8
Sta. D 3+84 – Sta. D 5+25, LT.

Dry Pond Description: The pond is located from Station D 3+84 to Station D 5+25 on the southern side of the I-89 Exit 16 NB Off-Ramp.

Overbank Flood Protection	
10-Year Pre-Development Storm at S/N 008 (cfs):	40.1
10-Year Post-Development Storm at S/N 008 (cfs):	40.3
10-Year Post-Development Storm at S/N 008 with Dry Pond (cfs):	37.9
Net flow at S/N 008 (cfs):	**-5.5%**

Dry Pond Design Criteria	
Pond Bottom Elevation:	320.00’
Pond Side Slopes:	3:1 Max.
Low Flow Orifice #1 (6”) Elevation:	320.00’
Low Flow Orifice #2 (12”) Elevation:	322.00’
Overflow Structure Elevation:	324.00’
Top of Berm Elevation:	326.50’

10-Year Storm in Dry Pond	
Peak Elevation in Pond:	324.00’
Storage in Pond (ac-ft):	0.111
Storage in Pond (cf):	4,819

The calculated 10-year storm velocity at the outlet is 5.23 fps. This is below the threshold of 5.3 fps for a Type I stone channel per the VTrans Hydraulics Manual and as such, Type I Stone Fill will be installed at the outlet location.

In the area of the pond, ledge was not encountered during geotechnical investigation. The investigation included drilling cylindrical shaft borings near the road side to a depth at least 15 feet below existing grades.

The following downstream analysis shows in greater detail all of the on-site and off-site contributing areas and flows to the discharge point via this dry pond.

Memorandum

To: Colchester HES NH 5600(14)
Project File

Date: January 12, 2015
Revised May 10, 2016

Project #: 57699.00

From: Marla Keene, P.E.

Re: Downstream Analysis

Introduction

The Colchester Diverging Diamond Interchange ("DDI") project proposed by the Vermont Agency of Transportation ("VTrans") seeks to make improvements to the Interstate 89 Exit 16 Interchange with U.S. Routes 2 and 7 in Colchester, Vermont (the "Project"). As presented in the Vermont Individual Stormwater Discharge Permit ("INDS") Application, of which this memorandum is a component, which was submitted to the Vermont Department of Environmental Conservation ("DEC") on October 3, 2014, this Project involves a Project Area of approximately 18.4 acres, 1.6 acres of which are new impervious surfaces for a total Project impervious of 11.3 acres. The total jurisdictional area of the Project is approximately 5.2 acres, which is used as the definition of the Site in this analysis in accordance with the Vermont Stormwater Treatment Standards, and is tabulated on a discharge point by discharge point basis on Page 6 of the INDS narrative.

Because this Project involves greater than 1 acre of impervious area, the Project requires permit coverage under the Environmental Protection Rules, Chapter 18 (DEC, 2011) and as such must comply with the Vermont Stormwater Treatment Standards. All new and redeveloped impervious surfaces within the Project discharge to Sunnyside Brook in Colchester, Vermont, a tributary to Sunderland Brook. Discharges to waters of the state are proposed at eight locations along Sunnyside Brook, designated as S/N 001 through S/N 008 and shown on Figure 1 of the Attachment. These locations are described fully in the INDS application materials.

This memorandum presents the results of a Downstream Analysis of the Project to assess peak flow rates in Sunnyside Brook at each point of stormwater discharge, both with and without proposed operational phase stormwater treatment practices ("STPs"). This memorandum has been updated to reflect the addition of 8.0 acres of off-site tributary in the vicinity of the Interstate 89 interchange based on public comments received in response to the draft stormwater discharge permit 6946-INDS issued by the DEC on February 19, 2016. VHB and VTrans reviewed the watershed delineation in the vicinity of Interstate 89 using field observations, aerial imagery and Chittenden County two-foot LIDAR generated contours and made adjustments to watersheds within the area tributary to the Project's two upstream-most discharge points. The analysis has been performed in accordance with Section 1.2 of the Vermont Stormwater Management Manual ("VSMM")(ANR, 2002). The results presented herein without proposed stormwater management practices supports the downstream analysis waiver applied for by VTrans, for the required overbank flood protection stormwater treatment standard. The analysis with proposed STPs represents the actual anticipated conditions that will occur at the discharge points during the modeled storm events.

Model Setup and Assumptions

In order to evaluate the net resulting change of the Project on flows in Sunnyside Brook, VHB constructed a model using Urban Hydrology for Small Watersheds TR-55 ("TR-55")(NRCS, 1999) as applied using HydroCAD, which is appropriate for watersheds with a time of concentration between 0.1 and 10 hours and a curve number greater than 40. Provided below is a listing and description of input data as well as associated assumptions. Figure 1 of the

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Memorandum

Attachment shows each off-site watershed used in support of this analysis. On-site watersheds are shown in Section 4 of the INDS. As described further below, the time of concentration and curve number for each of the watersheds evaluated in this analysis is appropriate for evaluation in TR-55.

Watershed Delineation Assumptions

Watersheds to each discharge point are shown in Figure 1 of the Attachment. Provided below is a narrative describing how the watersheds were determined, including a description of data sources considered. No changes to the Project watersheds have been made since the October 19, 2015 submission.

VHB evaluated off-site flows tributary to each discharge point using as a starting point watersheds delineated by the Vermont StreamStats program. StreamStats provides a very coarse watershed approximation, so VHB conducted a field visit to confirm or modify as necessary the tributary area to each discharge point. As proscribed in the downstream analysis guidance document (WMD, 2006), VHB removed the portions of the automatically delineated watersheds coincident with the on-site Project Area from the StreamStats watershed for separate analysis.

Where StreamStats delineated watersheds overlapped the Vermont Agency of Natural Resources ("ANR") Sunderland Brook Watershed (ANR, 2006), the ANR Sunderland Brook Watershed was assumed to be more accurate and used as the boundary of the off-site tributary area.

For off-site watersheds 6, 7 and 8, the StreamStats delineated boundary did not accurately represent the flow patterns resulting from current development, and therefore VHB modified the boundaries accordingly. For this submission, watershed 7 was expanded to include areas south of Interstate 89 and west of Route 7 based on field observation and topographic data, and those areas were routed via Route 7 drainage infrastructure. Two areas south of Interstate 89, which are tributary to discharge point S/N 009 under existing conditions and to discharge point S/N 007 under proposed conditions due to the reconfigured drainage infrastructure within the Project limits, were added to the proposed conditions model only. Watersheds west of Route 7 and situated between Interstate 89 and Mountain View Drive were adjusted based on field observations, review of record drawings and topographic data.

For the area to Pond 9, the pond across U.S. Route 7 from Hercules Drive, designated as off-site watershed 4a, VHB assumed the tributary area and land use described in permit 4146-9015 is accurate.

VHB slightly adjusted the StreamStats delineated boundary line between off-site watershed 5 and off-site watershed 4 to correspond to the off-site boundary used in the INDS dry pond supporting computations, included as Appendix F of the INDS. Given the available topographic data, VHB believes the boundary used for the dry pond analysis to be more accurate than the StreamStats boundary.

To reflect changes made to the dry pond supporting computations for this submission, VHB updated the modeling of off-site watershed 4 at the boundary with off-site watershed 3 and at the internal boundary differentiating the area to S/N 004 routed via Pond 4 and the area routed directly to S/N 004. The changes to this boundary line are a result of field observations undertaken in response to public comments received in response to draft stormwater discharge permit 6946-INDS. The off-site watersheds to S/N 004 remain separated by area west of U.S. Route 7 and area east of U.S. Route 7. Details of the west and east subwatersheds can be found in the supporting HydroCAD computations, located in the Attachment. Both west and east subwatersheds discharge to Sunnyside Brook at S/N 004.

For StreamStats off-site watershed 5, a large area of mixed land cover including Camp Johnson was included. Field observations indicated that the area including and east of Camp Johnson flows south to the Upper Winooski Reservoir and not to Sunnyside Brook, therefore this area was removed from the analysis.

Downstream of off-site watershed 4, VHB found the StreamStats watersheds generally agree with Chittenden County 2-foot LIDAR generated contour data and field observations and therefore, in the absence of pipe network data, VHB did not further refine the off-site watershed boundaries as defined by StreamStats. Figure 1 of the Attachment shows the final off-site watersheds used in this analysis.

With the exceptions of the off-site areas tributary to S/N 009 under existing conditions and tributary to S/N 007 under proposed conditions, off-site tributary watershed delineations remain unchanged in this existing and proposed conditions analysis. Therefore VHB concluded that the above assumptions would not have a significant impact on analysis results. At all discharge points, the resulting off-site watershed was equal to or greater than ten times larger than on-site tributary area at the corresponding discharge point, thereby meeting the "10-percent rule" for downstream analysis. Table 1 below shows the individual and cumulative areas tributary to each discharge point, listed in order from upstream to downstream.

Table 1: Summary of On- and Off-Site Areas

Discharge Point (S/N)	Off-Site Area (ac)	Cumulative Off-Site Area (ac)	On-Site Area Contributing (ac)	Cumulative On-Site Area (ac)	Cumulative Total Area (ac)
007	47.9	47.9	3.5	3.5	51.4
008	32.4	80.3	3.8	7.3	87.6
006	21.5	21.5	0.9	0.9	22.4
005	158.6	180.0	0.3	1.2	181.2
004	40.3	220.3	5.7	6.9	227.2
003	20.9	241.2	1.0	7.9	249.2
002	13.4	254.7	1.7	9.6	264.3
001	15.0	269.7	1.0	10.6	280.3

Note: Approximately 0.6 acres, described in the INDS Section 2, are included in the total Project Area of 18.4 acres but discharge to the Winooski River and are therefore not included in this analysis.

Resulting tributary watersheds described in Table 1 above are nested from upstream to downstream. The columns labeled "Off-" and "On-Site Area (ac)" represent the additional off- and on-site area tributary at each subsequent downstream discharge point respectively under proposed conditions, while the columns labeled "Cumulative Off-" and "Cumulative On-Site Area (ac)" represent the total off- and on-site area tributary at each discharge point respectively.

Land Use/Land Cover Assumptions

VHB used aerial-imagery derived land use/land cover mapping and NRCS Hydrologic Soil Group ("HSG") (NRCS, 2014) mapping to determine composite curve numbers for each off-site watershed. A/D soils and C/D soils use average curve number for 2 soil groups. A matrix showing curve numbers for each land use and HSG within the evaluated area is included as Table 2 below. Some soil map units, namely Qd (quarries) and Br (borrow pits) do not have hydrologic soil groups assigned. VHB approximated map unit Qd as HSG D and Br as HSG B.

Table 2: Curve Number by Land Use/Land Cover and Hydrologic Soil Group

LULC Description	TR55 Description	A	A/D	B	C	C/D	D	W
Field	Meadow	30	54	58	71	74.5	78	98
Forest	Woods, good	30	53.5	55	70	73.5	77	98
Impervious	Paved	98	98	98	98	98	98	98
Lawn	Open Space, good	39	59.5	61	74	77	80	98
Wetland	Ponds classified as pervious	98	98	98	98	98	98	98

For on-site watersheds, VHB used the existing and proposed land use/land cover and soil types as delineated by VTrans.

Time of Concentration Assumptions

TR-55 allows calculation of time of concentration ("TC") by summing the travel time for all consecutive flow segments within a given watershed. VHB used Chittenden County two-foot LIDAR generated contours to determine TC flow path and slopes with the following assumptions about time of concentration flow segment characteristics.

VHB assumed a maximum sheet flow length of 150 feet on pervious surfaces and 50 feet on paved surfaces. For segments of TC flow paths through developed areas, as determined by visual inspection of aerial imagery, pipe or ditch flow was assumed. Ditch flow was assumed for developed flow segments with vegetated buffers adjacent to the roadway. For all other locations, pipe flow was assumed. For segments of TC flow paths through undeveloped areas without obvious flow channels, shallow concentrated flow was assumed.

For steep pipe flow segments, VHB assumed a minimum pipe size of 18-inches, which is the minimum size that VTrans uses. Though the very upstream end of pipe segments may be 12-inches, for this analysis VHB grouped steep pipe flow segments together. For flat pipe flow segments, VHB assumed a minimum pipe size of 24-inches. These general pipe size assumptions do not have a significant impact on times of concentration.

Ditch and stream channel geometry was measured using aerial imagery and Chittenden County two-foot LIDAR generated contours in GIS, including bottom width and side slopes, except within off-site watershed 5 where field measured ditch and stream channel geometry replaced GIS-measured data. Ditches were assumed to be flowing at six-inches deep for TC calculations, a typical VTrans design depth. A ditch roughness coefficient of 0.025 (Manning "n" value) was assumed based on stony/vegetated bottoms. Stream channels were assumed to be flowing at two-feet deep and were assigned a roughness value of 0.035 based on sluggish and weedy bottoms.

VHB also reviewed the original construction plans for the Interstate 89 project (Project I-89-3(15)) and survey plans for this project for culvert and ditch geometry. Construction plans are included as Figures 2 through 5 in the Attachment. Where available, geometry from construction plans or survey plans was used in lieu of aerial imagery measurements. This data was predominantly used for off-site Watersheds 7 and 8 and for downstream segments of off-site Watersheds 1 through 4.

With the exception of the off-site areas tributary to S/N 009 under existing conditions and tributary to S/N 007 under proposed conditions, off-site flow patterns will remain unchanged in this pre- and post-development analysis, therefore VHB concluded that further refinement of the above assumptions would not have a significant impact on analysis results.

For on-site areas, TC computations were completed based on presence of grassed channels for both existing and proposed conditions analyses. Exact geometry of existing channels is not known but they are present and the routing is unchanged when compared to proposed conditions. Geometry of channels in on-site TC calculations was based on proposed geometry.

Figure 1 of the Attachment shows each off-site watershed, TC flow path, and off-site ponding areas. Table 3 below summarizes each off-site watershed, its total area, its composite curve number, and its total time of concentration.

Memorandum

Table 3: Off-Site Tributary Area Characteristic Summary					
Discharge Point (S/N)	**Description**	**HydroCAD ID**	**Off-Site Area (ac)**	**Weighted Curve Number**	**Time of Concentration (min)**
007	Athens Diner	OS9b	1.3	94	7.6
007	Highpoint Center	OS9a	1.2	87	1.8
007	Whitcomb's Frontage	OS7b	1.5	81	6.1
007	Interstate and Southbound Off-Ramp	OS7a	1.9	86	26.3
007	to Pond 4	OS7_4	12.4	74	33.5
007	to Ponds 2/3	OS7_2	21.5	77	6.1
007	to Pond 1	OS7_1	8.2	70	33.6
008	Northbound On-Ramp	OS8e	4.7	84	20.9
008	South of Hercules Drive	OS8d	2.2	84	22.9
008	North of Hercules Drive	OS8c	0.3	84	9.5
008	Interstate south of Route 7	OS8b	5.5	83	20.3
008	CVS & Vicinity	OS8a	2.6	88	12.7
008	to Pond 5	OS8_5	17.1	91	7.2
006	Upstream of Hercules Drive	OS6	21.5	75	18.7
005	Direct to Sunnyside	OS5b	71.3	71	207.9
005	Across from Costco	OS5a	10.3	82	98.7
005	to Pond 8	OS5_8	66.9	74	40.1
005	to Pond 7	OS5_7	2.7	65	49.1
005	to Pond 6	OS5_6	7.3	83	6.1
004	West of Route 7	OS4w[1]	20.5	86	21.8
004	to Channel Protection Pond	OS4p[1]	5.0	84	7.4

Memorandum

Table 3: Off-Site Tributary Area Characteristic Summary					
Discharge Point (S/N)	**Description**	**HydroCAD ID**	**Off-Site Area (ac)**	**Weighted Curve Number**	**Time of Concentration (min)**
004	West of Route 7	OS4wb[1]	15.6	86	21.8
004	East of Route 7	OS4e	16.7	73	38.8
004	Charlebois Pond	OS4a1	1.9	93	5.8
004	Charlebois Bypass	OS4a2	1.1	80	1.5
003	to S/N 003	OS3	20.9	74	28.9
002	to S/N 002	OS2	13.4	56	32.9
001	to S/N 001	OS1	15.0	46	24.5
Note 1. OS4w represents off-site area west of Route 7 to S/N 007 under existing conditions. Under proposed conditions, off-site area west of Route 7 to S/N 007 is broken into two watersheds, OS4p and OS4wb					

Methodology and Results

As described above under the Land Cover/Land Use Assumptions section of this memorandum, off-site watersheds are broken out by additional area tributary to each discharge point – the watershed to S/N 008 does not include the area tributary to S/N 007, the watershed to S/N 006 does not include the area tributary to S/N 008 or S/N 007, and so on. See Figure 1 of the Attachment and Table 3 for a description of each off-site watershed.

For each discharge point, VHB computed the runoff from each off-site watershed using HydroCAD, with the above described assumptions regarding time of concentration and curve number.

On-site existing and proposed conditions watershed boundaries and curve numbers were computed by VTrans based on actual areas for each land use and hydrologic soil group within the Project area. On-site watershed areas are shown in Section 4 of the INDS and described in Section 2 of the INDS. On-site TCs were computed using existing flow patterns through swales and closed drainage and will remain relatively unchanged between existing and proposed conditions. VHB computed runoff from the existing and proposed on-site watersheds using HydroCAD with the watershed boundary, land use and time of concentration calculated by VTrans.

The watersheds were routed individually to each discharge point rather than cumulatively to represent the fact that each watershed discharges to Sunnyside Brook at a different location. Reaches representing Sunnyside Brook between each discharge point were included as trapezoidal channels or ponds in the model. Reach geometry was measured using aerial imagery and Chittenden County two-foot LIDAR generated contours, including bottom width and side slopes. Stream channel segments were assumed to be flowing at two-feet deep and to have a roughness of 0.035 based on sluggish and weedy bottom conditions.

Memorandum

VHB performed field measurements of the relative slopes, material, condition and dimensions of the existing Town road culvert conveying the wetland east of Hercules Drive using a laser level and rod on March 27, 2015. VHB also procured Button Professional Land Surveyors' services to perform ground survey of the inverts, material and dimensions of the existing Town road culverts conveying Sunnyside Brook at Lower Mountain View Drive and Hercules Drive and the existing Interstate 89 culvert tributary to Sunnyside Brook at the Exit 16 interchange on September 16, 2015. The Sunnyside Brook crossing at Lower Mountain View Drive is a 24-inch corrugated metal pipe ("CMP"). The Sunnyside Brook crossing at Hercules Drive is twin 36-inch CMPs. The tributary crossing at Interstate 89 is a 22 by 36 inch asphalt coated corrugated galvanized metal pipe arch, though it was modeled as a 24 by 35 inch pipe arch as that represents the nearest available standard size. The tributary crossing at Hercules Drive is a 12-inch smooth interior plastic pipe. VHB then fit the measured culverts to the HydroCAD model using Chittenden County two-foot LIDAR-generated contours and aerial imagery. VHB modeled the reaches upstream of the culverts as ponds to allow representation of backwater that would occur at the culverts. Pond and roadway overtopping geometry is also based on the LIDAR-generated contours and aerial imagery. The pond representing the wetland east of Hercules Drive was assigned a low-flow thalweg based on observed reach geometry. Geometry of each culvert included in the model is summarized in Table 4 below. At the Interstate 89 culvert where peak ponding elevation exceeded the upstream culvert invert, VHB assigned a dynamic tailwater representing the peak downstream elevation at Lower Mountain View Drive on an hourly increment basis. VHB did not consider a shorter timestep necessary based on the anticipated travel time through this reach and the small difference between hourly elevations and peak modeled elevations.

Table 4: Culverts included in Downstream Analysis Model						
Culvert Location	**Source of Data**	**Dimensions**	**Upstream Invert (ft)[1]**	**Length (ft)**	**Slope (ft/ft)**	**Approximate Roadway Overtopping Elevation (ft)[1]**
Interstate 89 (Downstream of S/N 007)	Interstate 89 Record Drawings & Survey	36"W x 22"H Arch Culvert	308.84	216	0.005	316[2]
Lower Mountain View Drive (Downstream of S/N 006)	Survey	24" Corrugated Metal Pipe	305.81	102	0.011	316.13
Hercules Drive (at wetland outlet)	Field Measurements	12" Smooth Plastic Pipe with Inverted Sump and Riser	306.6	50	0.002	312.3
Hercules Drive (Downstream of S/N 005)	Field Measurements	2 x 36" Corrugated Metal Pipes	300.01/299.72	76	0.007/-0.005	309.16
1. Elevations from ground survey except Hercules Drive at wetland outlet, which were estimated using Chittenden County 2-foot LIDAR generated contours.						
2. Flows towards Winooski River at approximately Elev 313, prior to roadway overtopping at approximately Elev 316						

For the analysis with proposed STPs, VHB used the watershed and STP geometry data prepared by VTrans for the proposed dry ponds within Site 7, 8 and 4, as included in Appendix F of the INDS. The proposed dry pond within Site 4 captures approximately 9.2 acres of off-site area in addition to the on-site areas captured. Therefore, for the analysis with proposed STPs, the west Off-site area 4 watershed composite curve number and acreage was adjusted to reflect flows directed to the proposed dry pond.

See the HydroCAD output in the Attachment for detailed model configuration.

Modeled rainfall events include the following 24-hour Type II distribution shown in Table 5.

Table 5: Modeled Rainfall Event		
Name	**Total Rainfall Depth**	**Description**
10-year Storm	3.2-inches	Used for evaluating the Overbank Flood Protection Standard

VHB performed three model scenarios. The first scenario represents existing conditions, the second scenario represents proposed conditions without the proposed dry ponds tributary to S/N 007, 008 and 004, and the third scenario represents proposed conditions with the proposed dry ponds tributary to S/N 007, 008 and 004. The third model scenario does not take into account the grass swales proposed for water quality treatment because swales provide minimal flow attenuation and would not have a significant impact on results.

Peak modeled flow rates, and the percent increase over existing conditions at each discharge point, for each of the rainfall events for each scenario are summarized in Tables 6 and 7 below.

Table 6: 10-year Storm Model Results

Discharge Point (S/N in order from upstream to down)	Scenario 1: Existing Peak Flow (cfs)	Scenario 2: Proposed Peak Flow (cfs, without STP)	Proposed without STP Change From Existing	Scenario 3: Proposed Peak Flow (cfs, with STP)	Proposed with STP Change From Existing
007	16.7	31.4	+88%	17.4	+4%
008	40.1	40.3	0%	37.9	-5%
006	66.5	66.7	0%	64.2	-3%
005	31.9	32.0	0%	31.9	0%
004	59.6	55.3	-7%	41.4	-31%
003	74.7	66.1	-11%	58.2	-22%
002	75.7	67.2	-11%	59.5	-21%
001	75.3	67.3	-11%	59.3	-21%

Modeled flows in some instances decrease from upstream to downstream, such as between S/N 005 and S/N 006. This is due to a combination of the stream channel (modeled as reaches) attenuating flows from upstream to downstream, and times of concentration between tributary watersheds being such that peak flows are not necessarily coincident.

Complete HydroCAD model data and results are included in the Attachment. The percent flow rate increase is less than five-percent at each discharge point for each modeled scenario during the 10-year event with the proposed dry ponds. The only projected increase is at S/N 007, which represent only a four-percent increase over existing conditions during the 10-year storm event. Based on the minimal peak rate increase, a similarly minimal increase in velocities within the affected reaches could also be anticipated. Figure 6 shows the maximum 10-year extent of inundation predicted behind each of the Interstate 89, Lower Mountain View Drive and Hercules Drive culverts under existing conditions and under proposed conditions with STPs installed. The peak predicted elevation at each culvert and associated inundation areas are within 0.13 feet from existing to proposed conditions with STPs installed. The only increased flood depth is predicted to occur upstream of Interstate 89, by 0.13 feet, representing storage of an additional 0.37 acre-feet of water. As shown on Figure 6, this represents a minimal increase in inundation extents. The Interstate 89 culvert is not submerged under existing or proposed conditions. Supporting documentation is included in the HydroCAD modeling results in the Attachment.

The VSMM criterion for waiver of the Overbank Flood Protection standard is that the site is smaller than 5 acres and the flow rates and velocities with the proposed detention facility increase by less than five-percent from the predeveloped condition and no existing structures are impacted. As described in the introduction, the total jurisdictional area of the Project is approximately 5.2 acres. The total site area increases from upstream to downstream, such that the cumulative site area is only greater than 5 acres at discharge point 001, as shown in Table 7 below.

Table 7: Cumulative Jurisdictional Site Area by Discharge Point

Discharge Point (S/N)	Cumulative Jurisdictional Site Area
007	1.89
008	3.57
006	3.90
005	3.92
004	4.62
003	4.76
002	4.99
001	5.24

Therefore the Project is eligible for waiver of the Overbank Flood Protection standard at all discharge points except S/N 001. The proposed conditions peak flow rate actually decreases slightly or remains the same at each discharge point downstream of the proposed dry pond in Site 7. At S/N 001, the Project does not meet the “less than 5 acre” portion of the criteria for waiver of the Overbank Flood Protection standard. However, at S/N 001, the Project reduces 10-year peak flows from existing conditions, therefore meeting the requirements of the Overbank Flood Protection standard.

Conclusion

In accordance with Section 1.2 of VSMM, a downstream analysis has been completed by VHB to assess flow rates and velocities for the overbank (Qp10) storm event. The results of the analysis show that both with the STPs considered, there would be an increase of less than five-percent from the pre-developed condition at all discharge points, and there are no existing structures whose functionality would be impacted by the project. The criteria of Section 1.2 of VSMM regarding downstream analyses are therefore met and no additional controls are needed, and the Project is eligible for waiver of the overbank flood protection standard.

Attachment

Figure 1: Off-Site Watersheds and Times of Concentration Flowpaths

Figure 2: Interstate 89 Record Plan Sheet 13

Figure 3: Interstate 89 Record Plan Sheet 14

Figure 4: Interstate 89 Record Plan Sheet 15

Figure 5: Interstate 89 Record Plan Sheet 16

Figure 6: 10-Year Inundation Extents Map

Existing Conditions Models

- Existing Conditions Downstream Analysis HydroCAD Model
- On-Site 7 Existing Conditions HydroCAD Model

Proposed Conditions without STPs models

- Proposed Land Cover Downstream Analysis without STPs HydroCAD Model
- On-Site 7 Proposed Conditions without STPs HydroCAD Model

Proposed Conditions Models

- Proposed Land Cover Downstream Analysis with STPs HydroCAD Model
- On-Site 7 Proposed Conditions HydroCAD Model

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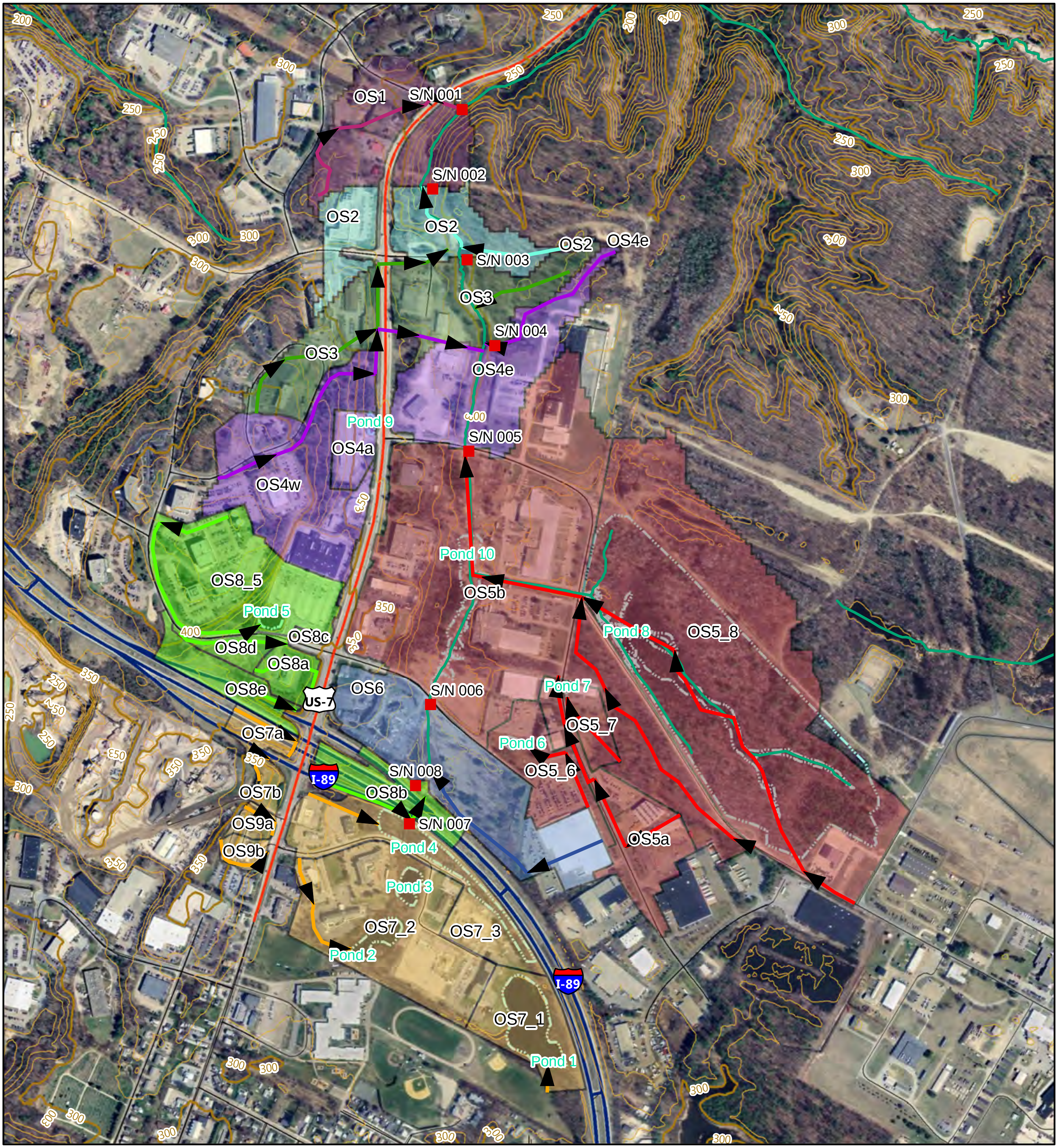
Watershed Management Division (WMD) 2006. Downstream Analysis Guidance, of Vermont Agency of Natural Resources. Waterbury, Vermont. May 19, 2006.

ATTACHMENT



Design Point
Time of Concentration
StreamCenterlines
PondTakeoffs
Interstate
US Highway
State Highway
Town Road

Figure 1: Vermont Agency of Transportation (VTrans)
Colchester DDI Downstream Analysis
Colchester, VT
Off-Site Watersheds and
Times of Concentration Flowpaths

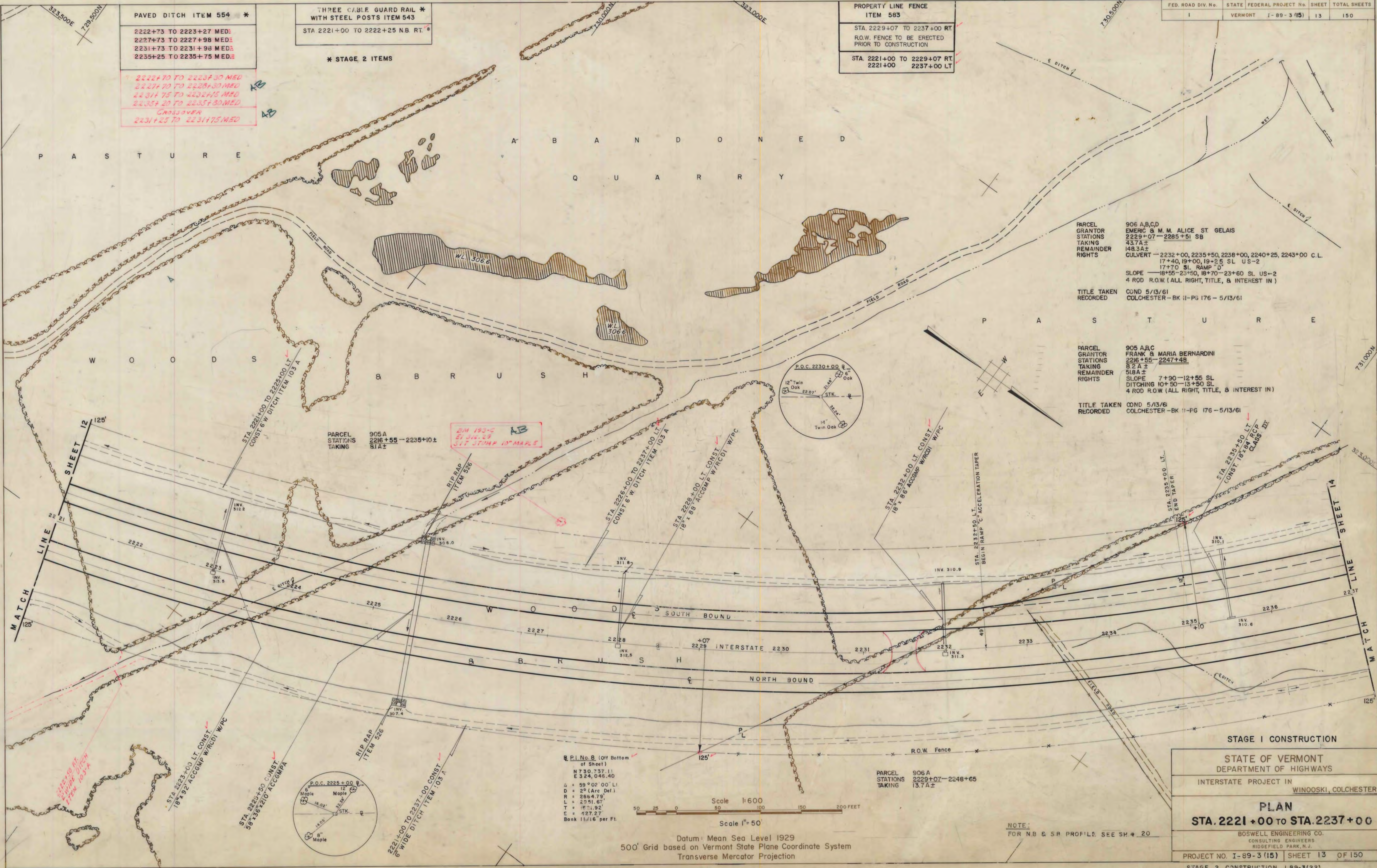
January 8, 2015
Revised April 26, 2016

Sources: Background - ArcGIS Online Basemap Imagery (2011); Stream Centerlines downloaded from VCGI (2010); Design Points, Time of Concentrations prepared by VHB (2015, updated 2016); Contours downloaded from VCGI (2012)

N

0 400 800 Feet

\\VTSBDATA\projects\57699.00 Colchester Act 250\GIS\Project\DownstreamAnalysis.mxd, Prepared by: Jtherrien



PAVED DITCH ITEM 554 *
2222+73 TO 2223+27 MED.
2227+73 TO 2227+98 MED.
2231+73 TO 2231+98 MED.
2235+25 TO 2235+75 MED.
2222+70 TO 2223+30 MED
2227+70 TO 2228+30 MED
2231+75 TO 2232+15 MED
2235+20 TO 2235+80 MED.
CROSSOVER
2231+25 TO 2231+75 MED

AB

AB

THREE CABLE GUARD RAIL * WITH STEEL POSTS ITEM 543
STA 2221+00 TO 2222+25 N.B. RT.

* STAGE 2 ITEMS

PROPERTY LINE FENCE ITEM 583
STA. 2229+07 TO 2237+00 RT.
R.O.W. FENCE TO BE ERECTED PRIOR TO CONSTRUCTION
STA. 2221+00 TO 2229+07 RT. 2221+00 2237+00 LT.

FED. ROAD DIV. No.	STATE	FEDERAL PROJECT No.	SHEET	TOTAL SHEETS
1	VERMONT	I-89-3(15)	13	150

PLAN	SURVEYED	PLOTTED	ALIGN CHECKED	RT. OF WAY CHECKED	TRACED
NOTE BOOK					
NO.					
BY					
DATE					

PARCEL 906 A,B,C,D
GRANTOR EMERIC & M. M. ALICE ST. GELAIS
STATIONS 2229+07 — 2285+51 SB
TAKING 43.7 A±
REMAINDER 148.3 A±
RIGHTS CULVERT — 2232+00, 2235+50, 2238+00, 2240+25, 2243+00 C.L.
17+40, 19+00, 19+25 SL US-2
17+70 SL RAMP "D"
SLOPE — 18+55 — 23+50, 18+70 — 23+60 SL US-2
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST IN)
TITLE TAKEN COND 5/13/61
RECORDED COLCHESTER - BK 11 - PG 176 - 5/13/61

PARCEL 905 A,B,C
GRANTOR FRANK & MARIA BERNARDINI
STATIONS 2216+55 — 2247+48
TAKING 8.2 A±
REMAINDER 51.8 A±
RIGHTS SLOPE 7+90 — 12+55 SL
DITCHING 10+50 — 13+50 SL
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST IN)
TITLE TAKEN COND 5/13/61
RECORDED COLCHESTER - BK 11 - PG 176 - 5/13/61

P.I. No. 8 (Off Bottom of Sheet)
N 730,737.11
E 324,045.40
Δ = 59° 02' 00" Lt.
D = 2° (Arc Def.)
R = 2864.79'
L = 2951.67'
T = 1621.92'
E = 427.27
Bank 11/16" per Ft.

Scale 1:600
50 25 0 50 100 150 200 FEET
Scale 1" = 50'

Datum: Mean Sea Level 1929
500' Grid based on Vermont State Plane Coordinate System
Transverse Mercator Projection

NOTE:
FOR N.B. & S.B. PROFILE SEE SH. # 20

STAGE I CONSTRUCTION

STATE OF VERMONT
DEPARTMENT OF HIGHWAYS
INTERSTATE PROJECT IN WINOOSKI, COLCHESTER

PLAN
STA. 2221+00 TO STA. 2237+00

BOSWELL ENGINEERING CO.
CONSULTING ENGINEERS
RIDGEFIELD PARK, N.J.

PROJECT NO. I-89-3(15) SHEET 13 OF 150

STAGE 2 CONSTRUCTION I 89-3(22)
SHEET 11 OF 65

FED. ROAD DIV. No.	STATE	FEDERAL PROJECT No.	SHEET	TOTAL SHEETS
1	VERMONT	I - 89 - 3 (15)	14	150

STATE OF VERMONT
DEPARTMENT OF HIGHWAYS

INTERSTATE PROJECT IN WINOOSKI, COLCHESTER

PLAN
STA. 2237+00 to STA 2251+00

BOSWELL ENGINEERING CO.
CONSULTING ENGINEERS
RIDGEFIELD PARK, N.J.

PROJECT NO. I-89-3 (15) | SHEET 14 OF 150

STAGE 2 CONSTRUCTION (89-3(22))
SHEET 12 OF 85

FED. ROAD DIV. No.	STATE	FEDERAL PROJECT No.	SHEET	TOTAL SHEETS
	VERMONT	I-89-3(15)	15	150

DRILLING & BLASTING OF SOLID ROCK SUBGRADE – ITEM 114 MOD.
STA. 2251+00 TO 2267+00

PLANTING TREES, SHRUBS AND VINES – ITEM 631
SEE SHADED AREAS AND QUANTITY SHEET

CLEARING & TRIMMING ITEM 601
SEE NOTES "SAVE"

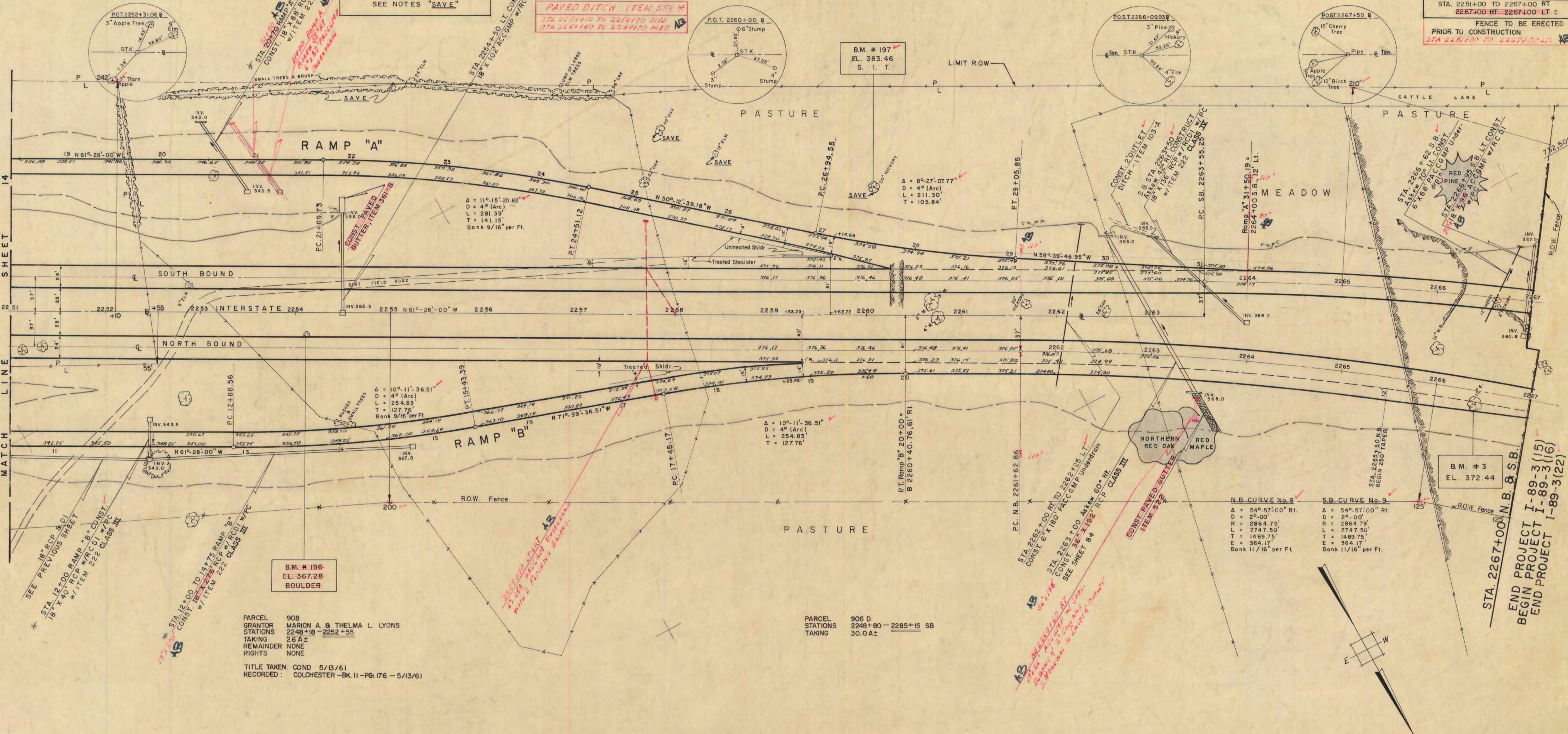
PAVED DITCH ITEM 554 *
RAMP "A" STA. 20+94 TO 21+19 RT.
RAMP "B" STA. 12+02 TO 12+27 LT. & RT.
STA. 2254+52 TO 2254+77 MED.
STA. 2263+73 TO 2263+98 MED.
STA. 2266+68 TO 2266+93 MED.

GRANITE SLOPE EDGING ITEM 556-A *
RAMP "A" BULLNOSE

THREE CABLE GUARD RAIL WITH STEEL POSTS ITEM-543 *
STA. 2251+00 TO 2254+70 S.B. LT.
STA. 2254+75 TO 2256+51 N.B. RT.
~~STA. 2251+00 TO 2254+40 N.B. RT.~~ AB

* STAGE 2 ITEMS

PROPERTY LINE FENCE ITEM 583
STA. 2251+00 TO 2267+00 RT
~~2267+00 RT~~ 2267+00 LT ±
FENCE TO BE ERECTED PRIOR TO CONSTRUCTION
~~STA. 2251+00 TO 2267+00 LT.~~ AB



PARCEL 908
GRANTOR MARION A. & THELMA L. LYONS
STATIONS 2248+18 – 2252+55
TAKING 2.6 A±
REMAINDER NONE
RIGHTS NONE

TITLE TAKEN: COND 5/13/61
RECORDED: COLCHESTER – BK. 11 – PG. 176 – 5/13/61

PARCEL 906 D
STATIONS 2248+80 – 2285+15 SB
TAKING 30.0 A±

NOTE:
FOR N.B. & S.B. PROFILE SEE SHEET # 21

STAGE 2 CONSTRUCTION
STAGE 1 CONSTRUCTION

STATE OF VERMONT
DEPARTMENT OF HIGHWAYS
INTERSTATE PROJECT IN WINOOSKI, COLCHESTER

PLAN
STA. 2251+00 TO STA. 2267+00

BOSWELL ENGINEERING CO. RIDGEFIELD PARK, N.J.
DRAWN BY V.R.K. CHECKED BY E.P.C. | IN CHARGE R.K. DATE | SCALE 1 IN. = 50 FT.
PROJECT NO. I-89-3(15) SHEET 15 OF 150

STAGE 2 CONSTRUCTION I 89-3(22)
SHEET 13 OF 85

CONSTRUCT DRIVES

STA. 4+40 LT.
STA. 4+70 RT.
STA. 5+35 RT.
STA. 6+01 RT.
STA. 6+55 RT.
STA. 7+30 RT.
STA. 8+23 RT.
STA. 9+07 RT.
STA. 10+51 LT.

GRANITE CURB ITEM 556-B

STA. 4+63	TO	10+31 LT.
STA. 10+71	TO	11+85 LT.
STA. 4+15	TO	4+50 RT.
STA. 4+90	TO	5+15 RT.
STA. 5+55	TO	5+81 RT.
STA. 6+21	TO	6+35 RT.
STA. 6+75	TO	7+10 RT.
STA. 7+50	TO	8+03 RT.
STA. 8+43	TO	8+87 RT.
STA. 9+27	TO	11+85 RT.

PAVED DITCH ITEM 361-B

STA. 5+52 TO 5+77 LT.
STA. 11+17 TO 11+42 LT.

DEMOLITION & REMOVAL OF BUILDINGS -(SIGN BASE) ITEM 586

NO. 3 STA. 5+65 LT. RTE. 2 & 7

EXCAVATION & REMOVAL OF EXISTING CEMENT CONC. PAVEMENT ITEM 101 B

4+15 TO 11+85

SEEDING (LAWNS) ITEM 611

STA. 5+50 TO 10+25 LT.

PARCEL 911 A,B
GRANTOR LEONARD J. & ROLANDE M. BISSONNETTE
STATIONS
TAKING NONE
REMAINDER
RIGHTS SLOPE 4+15 – 4+90 SL (1400 SQ FT±)
4+15 – 10+50 SL (0.2 A±)
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST)

TITLE TAKEN: COND 5/13/61
RECORDED: COLCHESTER - BK. 11 - PG 176 - 5/13/61

PARCEL 911 B
TAKING NONE
RIGHTS SLOPE 4+15 – 10+50 SL (0.2 A±)

PARCEL 911 A
TAKING NONE
RIGHTS SLOPE 4+15 – 4+90 SL (1400 SQ FT±)

PARCEL 910
GRANTOR THEODORE J. & GERTRUDE E. NIQUETTE
STATIONS
TAKING NONE
REMAINDER
RIGHTS SLOPE 4+85 – 6+24 SL (650 SQ FT±)
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST IN)

TITLE TAKEN: COND 5/13/61
RECORDED: COLCHESTER - BK. 11 - PG 176 - 5/13/61

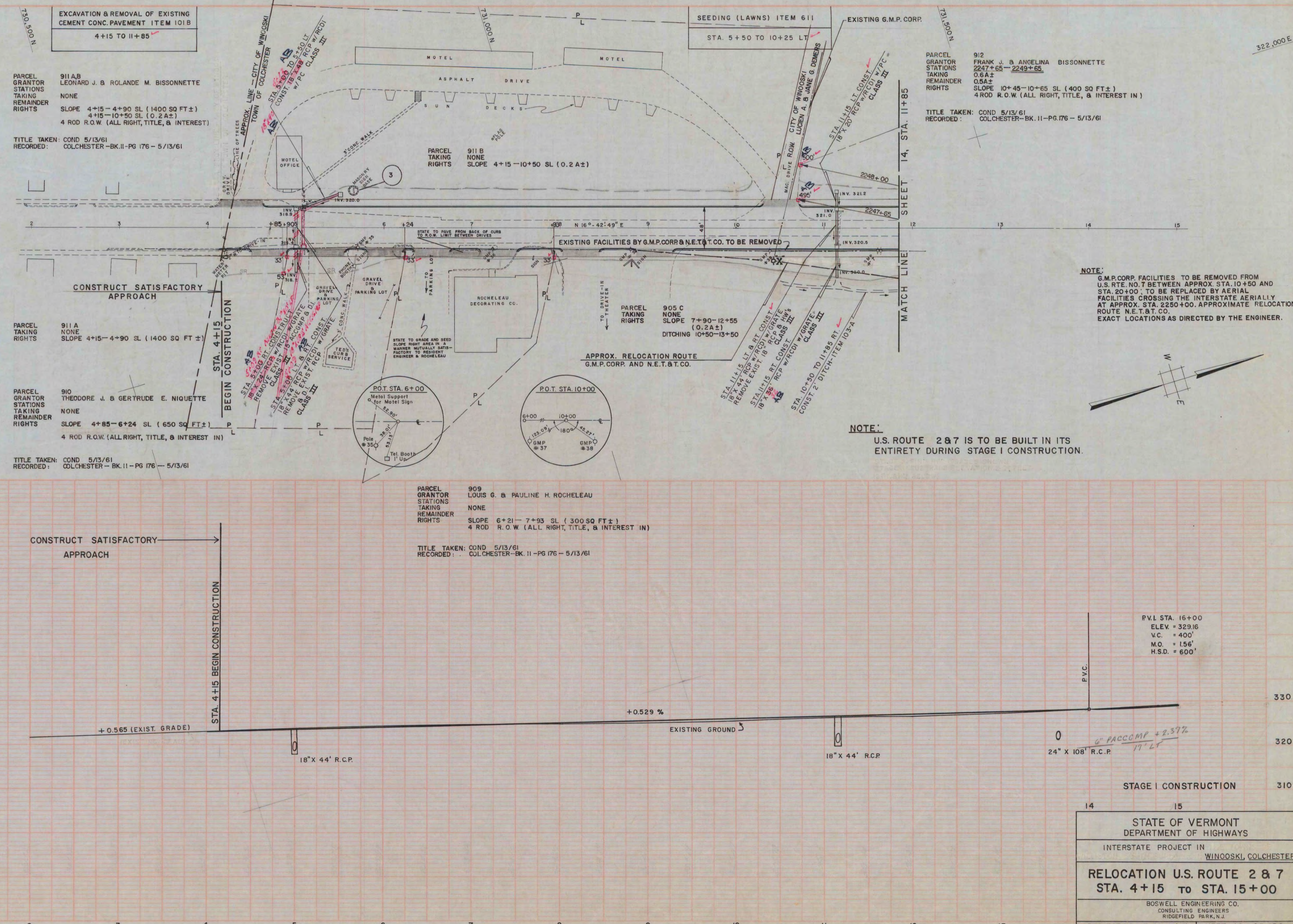
PARCEL 909
GRANTOR LOUIS G. & PAULINE H. ROCHELEAU
STATIONS
TAKING NONE
REMAINDER
RIGHTS SLOPE 6+21 – 7+93 SL (300 SQ FT±)
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST IN)

TITLE TAKEN: COND 5/13/61
RECORDED: COLCHESTER - BK. 11 - PG 176 - 5/13/61

PARCEL 905 C
TAKING NONE
RIGHTS SLOPE 7+90 – 12+55 (0.2 A±)
DITCHING 10+50 – 13+50

PARCEL 912
GRANTOR FRANK J. & ANGELINA BISSONNETTE
STATIONS 2247+65 – 2249+65
TAKING 0.6 A±
REMAINDER 0.5 A±
RIGHTS SLOPE 10+45 – 10+65 SL (400 SQ FT±)
4 ROD R.O.W. (ALL RIGHT, TITLE, & INTEREST IN)

TITLE TAKEN: COND 5/13/61
RECORDED: COLCHESTER - BK. 11 - PG 176 - 5/13/61



NOTE:
G.M.P. CORP. FACILITIES TO BE REMOVED FROM U.S. RTE. NO. 7 BETWEEN APPROX. STA. 10+50 AND STA. 20+00, TO BE REPLACED BY AERIAL FACILITIES CROSSING THE INTERSTATE AERIALLY AT APPROX. STA. 2250+00. APPROXIMATE RELOCATION ROUTE N.E.T.&T. CO.
EXACT LOCATIONS AS DIRECTED BY THE ENGINEER.

NOTE:
U.S. ROUTE 2 & 7 IS TO BE BUILT IN ITS ENTIRETY DURING STAGE I CONSTRUCTION.

STAGE I CONSTRUCTION

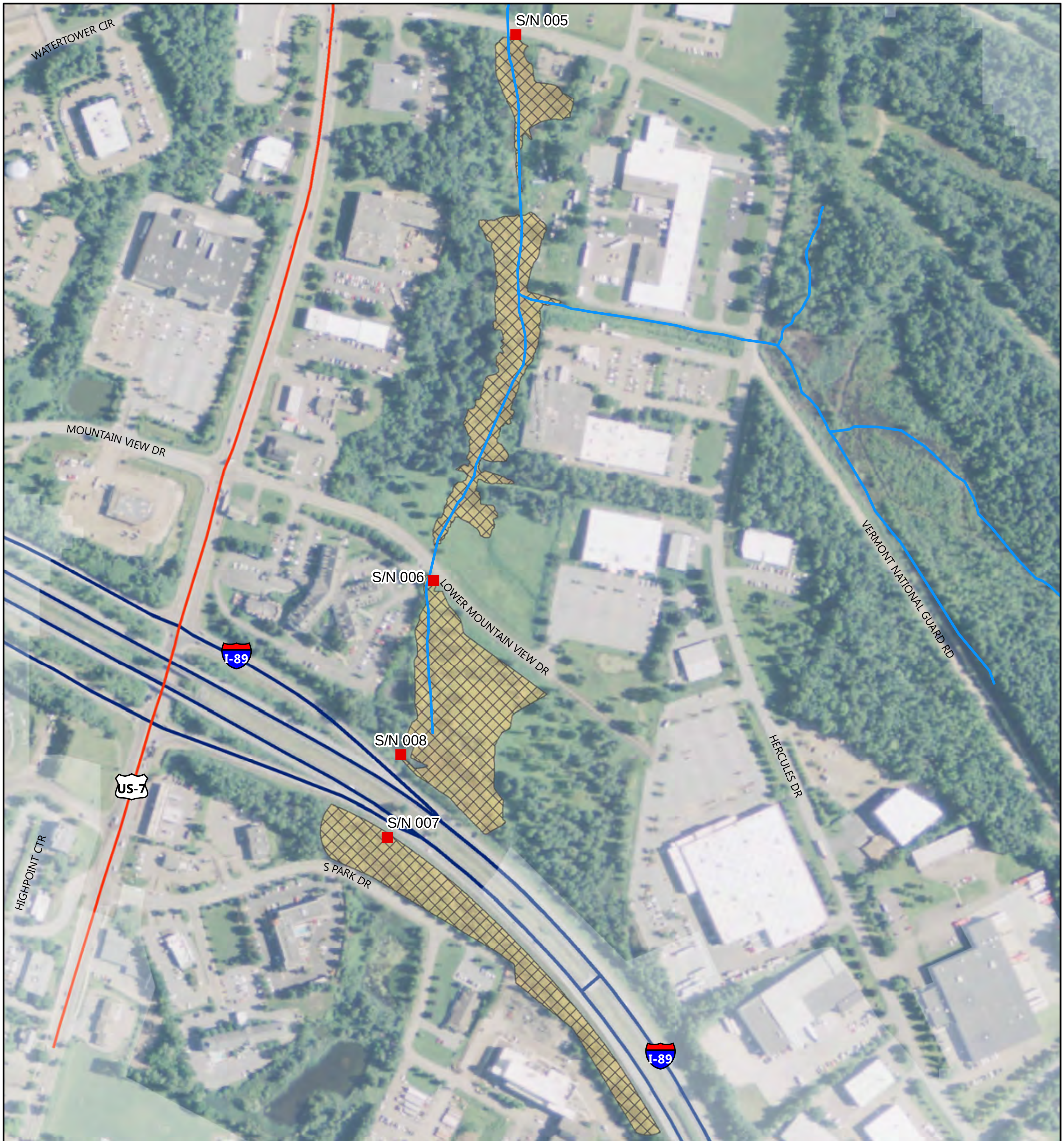
STATE OF VERMONT
DEPARTMENT OF HIGHWAYS

INTERSTATE PROJECT IN WINOOSKI, COLCHESTER

RELOCATION U.S. ROUTE 2 & 7
STA. 4+15 TO STA. 15+00

BOSWELL ENGINEERING CO.
CONSULTING ENGINEERS
RIDGEFIELD PARK, N.J.

PROJECT NO. I-89-3(15) | SHEET 16 OF 150



- Design Point
- Stream
- Interstate
- US Highway
- State Highway
- Town Road

10-Year Inundation Extents

- Existing Conditions
- Proposed Conditions

Figure 6: Vermont Agency of Transportation (VTrans)
Colchester DDI Downstream Analysis
Colchester, VT
Inundation Map

October 16, 2015
Revised April 26, 2016

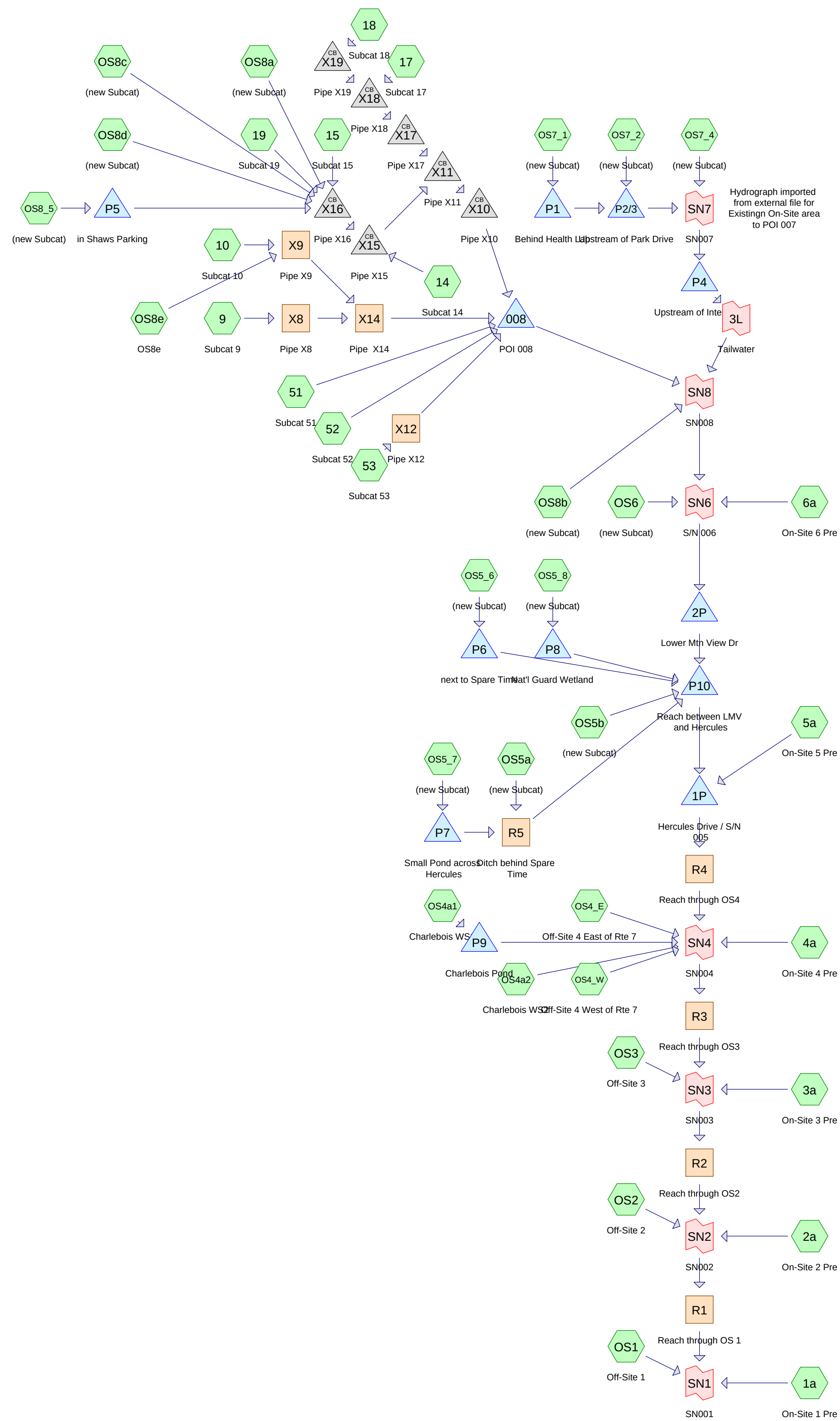
N

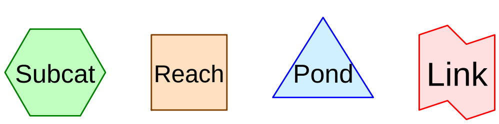
400 200 0 400 Feet

Sources: Background - NAIP Imagery by USDA (2014); Streams from VCGI (2010); Design Points and Inundation Extents prepared by VHB (2016).

vhb

\\VTSBDATA\projects\57699.00 Colchester Act 250\GIS\Project\InundationFigure.mxd, Prepared by: Jtherrien





Routing Diagram for DSAnalysis Pre
Prepared by VHB, Printed 4/27/2016
HydroCAD® 10.00 s/n 01038 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1a: On-Site 1 Pre Runoff Area=0.996 ac 37.40% Impervious Runoff Depth=1.27"
Flow Length=744' Tc=4.1 min CN=55/98 Runoff=1.89 cfs 0.105 af

Subcatchment 2a: On-Site 2 Pre Runoff Area=1.668 ac 27.34% Impervious Runoff Depth=0.88"
Flow Length=727' Tc=5.8 min CN=48/98 Runoff=2.08 cfs 0.122 af

Subcatchment 3a: On-Site 3 Pre Runoff Area=1.013 ac 61.40% Impervious Runoff Depth=1.90"
Flow Length=457' Slope=0.0240 '/' Tc=16.2 min CN=53/98 Runoff=2.07 cfs 0.160 af

Subcatchment 4a: On-Site 4 Pre Runoff Area=5.698 ac 50.60% Impervious Runoff Depth=1.96"
Flow Length=1,961' Tc=14.2 min CN=72/98 Runoff=13.32 cfs 0.931 af

Subcatchment 5a: On-Site 5 Pre Runoff Area=0.302 ac 57.28% Impervious Runoff Depth=2.30"
Flow Length=231' Tc=1.7 min CN=80/98 Runoff=1.27 cfs 0.058 af

Subcatchment 6a: On-Site 6 Pre Runoff Area=0.853 ac 62.25% Impervious Runoff Depth=2.14"
Flow Length=349' Tc=2.7 min CN=69/98 Runoff=3.15 cfs 0.152 af

Subcatchment 9: Subcat 9 Runoff Area=0.139 ac 33.81% Impervious Runoff Depth=1.93"
Flow Length=154' Slope=0.1493 '/' Tc=0.9 min CN=80/98 Runoff=0.53 cfs 0.022 af

Subcatchment 10: Subcat 10 Runoff Area=0.606 ac 40.92% Impervious Runoff Depth=2.04"
Flow Length=700' Tc=3.5 min CN=80/98 Runoff=2.20 cfs 0.103 af

Subcatchment 14: Subcat 14 Runoff Area=0.456 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=451' Slope=0.0216 '/' Tc=2.5 min CN=0/98 Runoff=2.30 cfs 0.113 af

Subcatchment 15: Subcat 15 Runoff Area=0.365 ac 38.90% Impervious Runoff Depth=2.01"
Flow Length=436' Tc=2.3 min CN=80/98 Runoff=1.36 cfs 0.061 af

Subcatchment 17: Subcat 17 Runoff Area=0.116 ac 80.17% Impervious Runoff Depth=2.50"
Flow Length=122' Tc=1.0 min CN=65/98 Runoff=0.52 cfs 0.024 af

Subcatchment 18: Subcat 18 Runoff Area=0.008 ac 87.50% Impervious Runoff Depth=2.77"
Flow Length=43' Tc=0.3 min CN=80/98 Runoff=0.04 cfs 0.002 af

Subcatchment 19: Subcat 19 Runoff Area=0.274 ac 36.13% Impervious Runoff Depth=1.97"
Flow Length=320' Tc=2.4 min CN=80/98 Runoff=1.00 cfs 0.045 af

Subcatchment 51: Subcat 51 Runoff Area=0.608 ac 38.49% Impervious Runoff Depth=2.00"
Flow Length=452' Tc=4.5 min CN=80/98 Runoff=2.10 cfs 0.102 af

Subcatchment 52: Subcat 52 Runoff Area=0.899 ac 47.16% Impervious Runoff Depth=2.14"
Flow Length=544' Tc=5.2 min CN=80/98 Runoff=3.19 cfs 0.160 af

Subcatchment 53: Subcat 53 Runoff Area=0.258 ac 63.95% Impervious Runoff Depth=2.16"
Flow Length=313' Tc=1.6 min CN=68/98 Runoff=0.99 cfs 0.046 af

Subcatchment OS1: Off-Site 1 Runoff Area=15.016 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=1,440' Tc=24.5 min CN=46/0 Runoff=0.09 cfs 0.072 af

Subcatchment OS2: Off-Site 2 Runoff Area=13.610 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=1,300' Tc=32.9 min CN=56/0 Runoff=1.34 cfs 0.317 af

Subcatchment OS3: Off-Site 3 Runoff Area=20.942 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=668' Slope=0.0210 '/' Tc=28.9 min CN=74/0 Runoff=18.01 cfs 1.811 af

Subcatchment OS4a1: Charlebois WS1 Runoff Area=1.860 ac 0.00% Impervious Runoff Depth=2.45"
Tc=5.8 min CN=93/0 Runoff=7.66 cfs 0.379 af

Subcatchment OS4a2: Charlebois WS2 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=1.40"
Tc=1.5 min CN=80/0 Runoff=3.33 cfs 0.131 af

Subcatchment OS4_E: Off-Site 4 East of Runoff Area=16.737 ac 0.00% Impervious Runoff Depth=0.98"
Flow Length=1,140' Slope=0.0114 '/' Tc=38.8 min CN=73/0 Runoff=10.96 cfs 1.371 af

Subcatchment OS4_W: Off-Site 4 West of Runoff Area=20.542 ac 0.00% Impervious Runoff Depth=1.84"
Flow Length=2,060' Tc=21.8 min CN=86/0 Runoff=39.94 cfs 3.141 af

Subcatchment OS5a: (new Subcat) Runoff Area=19.687 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,356' Slope=0.0012 '/' Tc=98.7 min CN=70/0 Runoff=5.16 cfs 1.359 af

Subcatchment OS5b: (new Subcat) Runoff Area=61.972 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=3,643' Tc=207.9 min CN=74/0 Runoff=12.08 cfs 5.358 af

Subcatchment OS5_6: (new Subcat) Runoff Area=7.318 ac 0.00% Impervious Runoff Depth=1.61"
Flow Length=660' Tc=6.1 min CN=83/0 Runoff=20.95 cfs 0.981 af

Subcatchment OS5_7: (new Subcat) Runoff Area=2.744 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=556' Slope=0.0010 '/' Tc=49.1 min CN=65/0 Runoff=0.76 cfs 0.137 af

Subcatchment OS5_8: (new Subcat) Runoff Area=66.948 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=2,163' Tc=40.1 min CN=74/0 Runoff=45.62 cfs 5.788 af

Subcatchment OS6: (new Subcat) Runoff Area=21.459 ac 0.00% Impervious Runoff Depth=1.09"
Flow Length=1,476' Tc=18.7 min CN=75/0 Runoff=26.04 cfs 1.956 af

Subcatchment OS7_1: (new Subcat) Runoff Area=8.195 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=136' Slope=0.0108 '/' Tc=33.6 min CN=70/0 Runoff=4.73 cfs 0.566 af

Subcatchment OS7_2: (new Subcat) Runoff Area=21.469 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=779' Tc=6.1 min CN=77/0 Runoff=46.37 cfs 2.168 af

Subcatchment OS7_4: (new Subcat) Runoff Area=12.807 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=503' Slope=0.0219 '/' Tc=33.5 min CN=74/0 Runoff=9.96 cfs 1.107 af

Subcatchment OS8a: (new Subcat) Runoff Area=2.557 ac 0.00% Impervious Runoff Depth=2.00"
Flow Length=1,659' Tc=15.7 min CN=88/0 Runoff=6.43 cfs 0.426 af

Subcatchment OS8b: (new Subcat) Runoff Area=5.517 ac 0.00% Impervious Runoff Depth=1.54"
Flow Length=799' Tc=20.3 min CN=82/0 Runoff=9.32 cfs 0.707 af

Subcatchment OS8c: (new Subcat) Runoff Area=0.298 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=480' Tc=11.2 min CN=84/0 Runoff=0.74 cfs 0.042 af

Subcatchment OS8d: (new Subcat) Runoff Area=2.208 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=740' Tc=22.9 min CN=84/0 Runoff=3.81 cfs 0.310 af

Subcatchment OS8e: OS8e Runoff Area=4.725 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=370' Slope=0.0538 '/' Tc=20.9 min CN=84/0 Runoff=8.63 cfs 0.662 af

Subcatchment OS8_5: (new Subcat) Runoff Area=17.067 ac 0.00% Impervious Runoff Depth=2.26"
Flow Length=1,741' Tc=7.2 min CN=91/0 Runoff=63.26 cfs 3.212 af

Reach R1: Reach through OS 1 Avg. Flow Depth=0.56' Max Vel=4.12 fps Inflow=75.67 cfs 32.416 af
n=0.035 L=590.0' S=0.0220 '/' Capacity=2,282.34 cfs Outflow=75.07 cfs 32.404 af

Reach R2: Reach through OS2 Avg. Flow Depth=0.86' Max Vel=7.00 fps Inflow=74.68 cfs 31.982 af
n=0.035 L=580.0' S=0.0500 '/' Capacity=1,850.26 cfs Outflow=74.47 cfs 31.977 af

Reach R3: Reach through OS3 Avg. Flow Depth=0.51' Max Vel=1.56 fps Inflow=59.61 cfs 30.038 af
n=0.040 L=580.0' S=0.0052 '/' Capacity=2,787.67 cfs Outflow=55.71 cfs 30.012 af

Reach R4: Reach through OS4 Avg. Flow Depth=0.39' Max Vel=0.99 fps Inflow=31.86 cfs 24.150 af
n=0.035 L=750.0' S=0.0020 '/' Capacity=1,717.01 cfs Outflow=31.81 cfs 24.107 af

Reach R5: Ditch behind Spare Time Avg. Flow Depth=0.79' Max Vel=1.26 fps Inflow=5.16 cfs 1.411 af
n=0.025 L=325.0' S=0.0012 '/' Capacity=43.39 cfs Outflow=5.13 cfs 1.411 af

Reach X12: Pipe X12 Avg. Flow Depth=0.18' Max Vel=8.21 fps Inflow=0.99 cfs 0.046 af
18.0" Round Pipe n=0.011 L=88.0' S=0.0673 '/' Capacity=32.20 cfs Outflow=0.99 cfs 0.046 af

Reach X14: Pipe X14 Avg. Flow Depth=0.97' Max Vel=5.92 fps Inflow=8.97 cfs 0.788 af
24.0" Round Pipe n=0.011 L=145.0' S=0.0050 '/' Capacity=18.84 cfs Outflow=8.96 cfs 0.788 af

Reach X8: Pipe X8 Avg. Flow Depth=0.17' Max Vel=4.21 fps Inflow=0.53 cfs 0.022 af
24.0" Round Pipe n=0.011 L=43.6' S=0.0193 '/' Capacity=37.11 cfs Outflow=0.52 cfs 0.022 af

Reach X9: Pipe X9 Avg. Flow Depth=0.97' Max Vel=5.93 fps Inflow=8.91 cfs 0.766 af
24.0" Round Pipe n=0.011 L=20.0' S=0.0050 '/' Capacity=18.90 cfs Outflow=8.91 cfs 0.766 af

Pond 1P: Hercules Drive / S/N 005 Peak Elev=302.19' Storage=31,202 cf Inflow=32.44 cfs 24.158 af
Outflow=31.86 cfs 24.150 af

Pond 2P: Lower Mtn View Dr Peak Elev=309.98' Storage=94,287 cf Inflow=66.51 cfs 10.984 af
Outflow=14.01 cfs 10.980 af

Pond 008: POI 008 Inflow=30.63 cfs 4.443 af
Primary=30.63 cfs 4.443 af

Pond P1: Behind Health Lab Peak Elev=310.17' Storage=24,634 cf Inflow=4.73 cfs 0.566 af
Outflow=0.00 cfs 0.000 af

Pond P10: Reach between LMV and Peak Elev=308.04' Storage=54,645 cf Inflow=32.62 cfs 24.266 af
Outflow=32.41 cfs 24.100 af

Pond P2/3: Upstream of Park Drive Peak Elev=310.77' Storage=57,533 cf Inflow=46.37 cfs 2.168 af
12.0" Round Culvert n=0.013 L=100.0' S=0.0025 '/' Outflow=1.21 cfs 1.790 af

Pond P4: Upstream of Interstate Peak Elev=309.61' Storage=78,154 cf Inflow=16.73 cfs 3.872 af
35.0" x 24.0", R=17.9"/55.1" Pipe Arch Culvert n=0.013 L=216.0' S=0.0053 '/' Outflow=3.63 cfs 3.726 af

Pond P5: in Shaws Parking Peak Elev=358.34' Storage=73,625 cf Inflow=63.26 cfs 3.212 af
Outflow=10.02 cfs 2.325 af

Pond P6: next to Spare Time Peak Elev=310.49' Storage=28,585 cf Inflow=20.95 cfs 0.981 af
Outflow=0.41 cfs 0.887 af

Pond P7: Small Pond across Hercules Peak Elev=313.51' Storage=3,714 cf Inflow=0.76 cfs 0.137 af
Outflow=0.11 cfs 0.053 af

Pond P8: Nat'l Guard Wetland Peak Elev=309.65' Storage=123,647 cf Inflow=45.62 cfs 5.788 af
Outflow=4.80 cfs 5.629 af

Pond P9: Charlebois Pond Peak Elev=333.57' Storage=0.296 af Inflow=7.66 cfs 0.379 af
Outflow=0.80 cfs 0.357 af

Pond X10: Pipe X10 Peak Elev=338.79' Inflow=20.74 cfs 3.346 af
18.0" Round Culvert n=0.011 L=100.0' S=0.0752 '/' Outflow=20.74 cfs 3.346 af

Pond X11: Pipe X11 Peak Elev=344.73' Inflow=20.74 cfs 3.346 af
18.0" Round Culvert n=0.011 L=77.0' S=0.0336 '/' Outflow=20.74 cfs 3.346 af

Pond X15: Pipe X15 Peak Elev=350.62' Inflow=20.68 cfs 3.320 af
18.0" Round Culvert n=0.011 L=75.0' S=0.0055 '/' Outflow=20.68 cfs 3.320 af

Pond X16: Pipe X16 Peak Elev=356.32' Inflow=20.41 cfs 3.208 af
18.0" Round Culvert n=0.011 L=8.0' S=0.0100 '/' Outflow=20.41 cfs 3.208 af

Pond X17: Pipe X17 Peak Elev=344.73' Inflow=0.56 cfs 0.026 af
18.0" Round Culvert n=0.011 L=186.0' S=0.0269 '/' Outflow=0.56 cfs 0.026 af

Pond X18: Pipe X18 Peak Elev=344.73' Inflow=0.56 cfs 0.026 af
18.0" Round Culvert n=0.011 L=11.0' S=0.0136 '/' Outflow=0.56 cfs 0.026 af

Pond X19: Pipe X19 Peak Elev=344.73' Inflow=0.04 cfs 0.002 af
18.0" Round Culvert n=0.011 L=97.0' S=0.0155 '/' Outflow=0.04 cfs 0.002 af

Link 3L: Tailwater Inflow=3.63 cfs 3.726 af
Primary=3.63 cfs 3.726 af

Link SN1: SN001 Inflow=75.30 cfs 32.581 af
Primary=75.30 cfs 32.581 af

Link SN2: SN002 Inflow=75.67 cfs 32.416 af
Primary=75.67 cfs 32.416 af

Link SN3: SN003 Inflow=74.68 cfs 31.982 af
Primary=74.68 cfs 31.982 af

Link SN4: SN004 Inflow=59.61 cfs 30.038 af
Primary=59.61 cfs 30.038 af

Link SN6: S/N 006 Inflow=66.51 cfs 10.984 af
Primary=66.51 cfs 10.984 af

Link ts\57699.00 Colchester Act 250\tech\Stormwater\VTrans HydroCAD\On-Site 7 EX~Pond DP007.hce Inflow=16.73 cfs 3.872 af
Area= 6.326 ac 20.88% Imperv. Primary=16.73 cfs 3.872 af

Link SN8: SN008 Inflow=40.09 cfs 8.876 af
Primary=40.09 cfs 8.876 af

Total Runoff Area = 359.057 ac Runoff Volume = 34.208 af Average Runoff Depth = 1.14"
98.06% Pervious = 352.104 ac 1.94% Impervious = 6.952 ac

Summary for Subcatchment 1a: On-Site 1 Pre

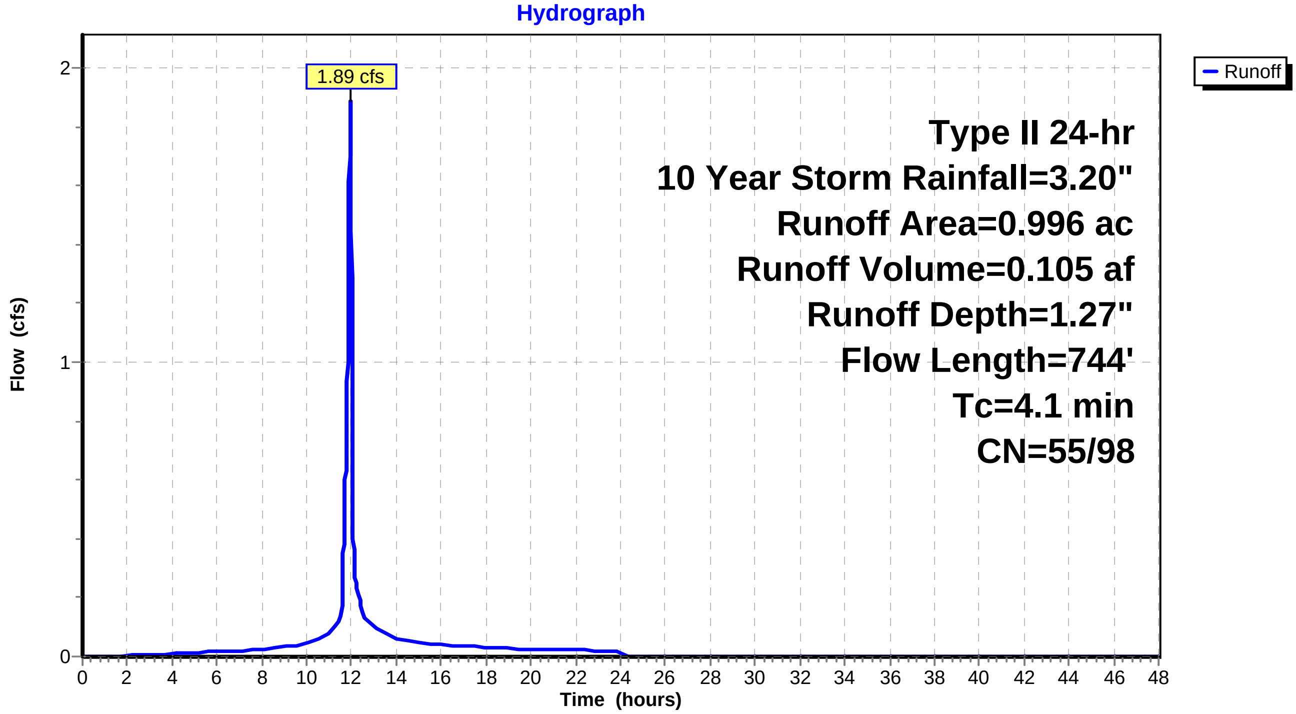
Runoff = 1.89 cfs @ 11.95 hrs, Volume= 0.105 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.745	83	Paved roads w/open ditches, 50% imp, HSG A
0.116	39	>75% Grass cover, Good, HSG A
0.135	32	Woods/grass comb., Good, HSG A
0.996	71	Weighted Average
0.624	55	62.60% Pervious Area
0.372	98	37.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0370	1.49		**Sheet Flow, Sheet 1** Smooth surfaces n= 0.011 P2= 2.30"
0.4	89	0.0370	3.90		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
1.8	436	0.0573	4.14	5.38	**Channel Flow, Channel 1** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.8	119	0.1424	2.64		**Shallow Concentrated Flow, Shallow 1b** Short Grass Pasture Kv= 7.0 fps
4.1	744	Total			

Subcatchment 1a: On-Site 1 Pre



Summary for Subcatchment 2a: On-Site 2 Pre

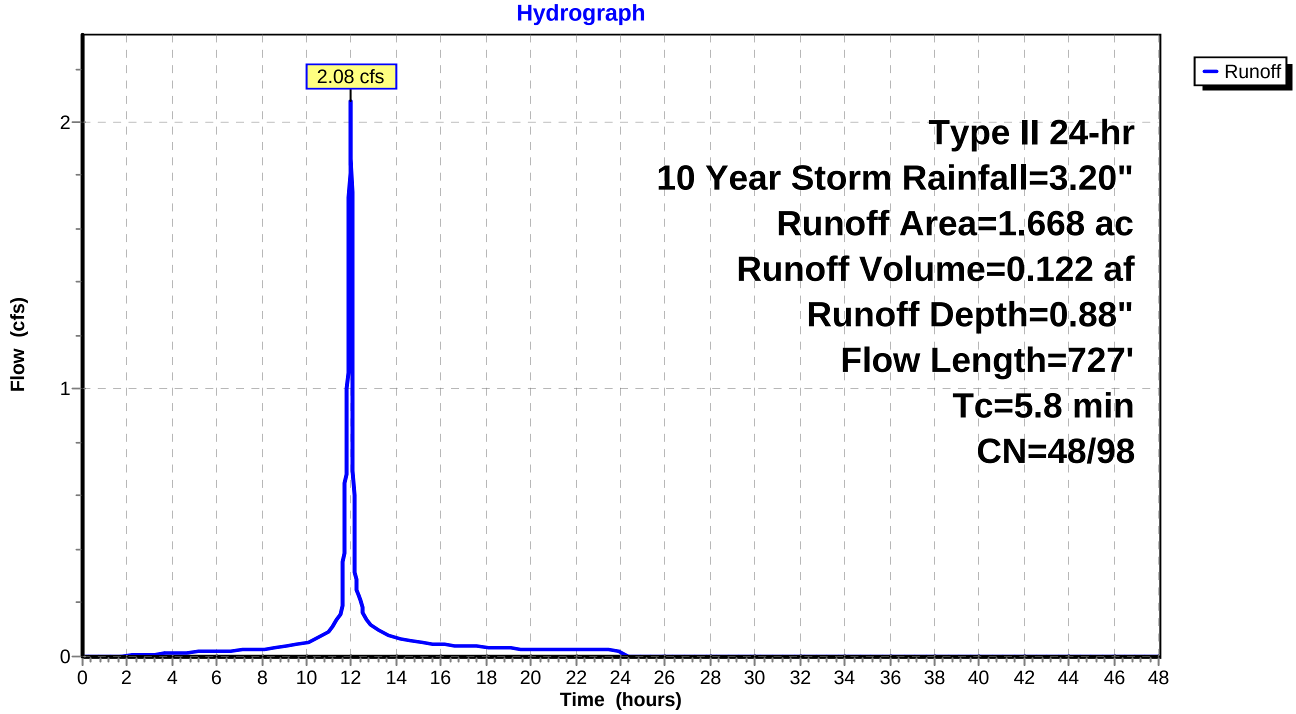
Runoff = 2.08 cfs @ 11.97 hrs, Volume= 0.122 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.912	83	Paved roads w/open ditches, 50% imp, HSG A
0.497	39	>75% Grass cover, Good, HSG A
0.259	32	Woods/grass comb., Good, HSG A
1.668	62	Weighted Average
1.212	48	72.66% Pervious Area
0.456	98	27.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0144	1.02		**Sheet Flow, Sheet 2** Smooth surfaces n= 0.011 P2= 2.30"
4.1	595	0.0144	2.44		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
0.1	25	0.0792	4.87	6.33	**Channel Flow, Channel 2** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.0	7	0.5368	5.13		**Shallow Concentrated Flow, Shallow 2b** Short Grass Pasture Kv= 7.0 fps
5.8	727	Total			

Subcatchment 2a: On-Site 2 Pre



Summary for Subcatchment 3a: On-Site 3 Pre

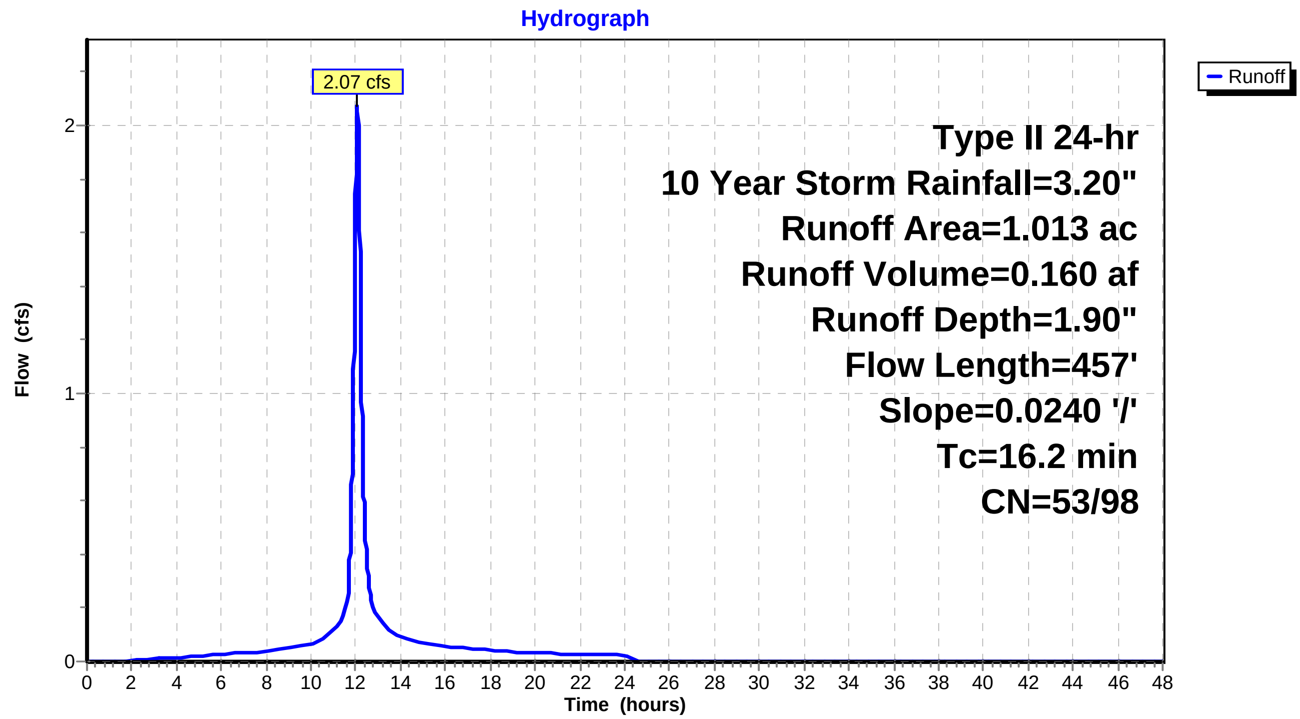
Runoff = 2.07 cfs @ 12.08 hrs, Volume= 0.160 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.152	39	>75% Grass cover, Good, HSG A
0.223	61	>75% Grass cover, Good, HSG B
0.016	74	>75% Grass cover, Good, HSG C
0.142	98	Paved roads w/curbs & sewers, HSG A
0.480	98	Paved roads w/curbs & sewers, HSG B
1.013	81	Weighted Average
0.391	53	38.60% Pervious Area
0.622	98	61.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	357	0.0240	1.08		**Shallow Concentrated Flow, Shallow 3** Short Grass Pasture Kv= 7.0 fps
10.7	100	0.0240	0.16		**Sheet Flow, Sheet 3** Grass: Short n= 0.150 P2= 2.30"
16.2	457	Total			

Subcatchment 3a: On-Site 3 Pre



Summary for Subcatchment 4a: On-Site 4 Pre

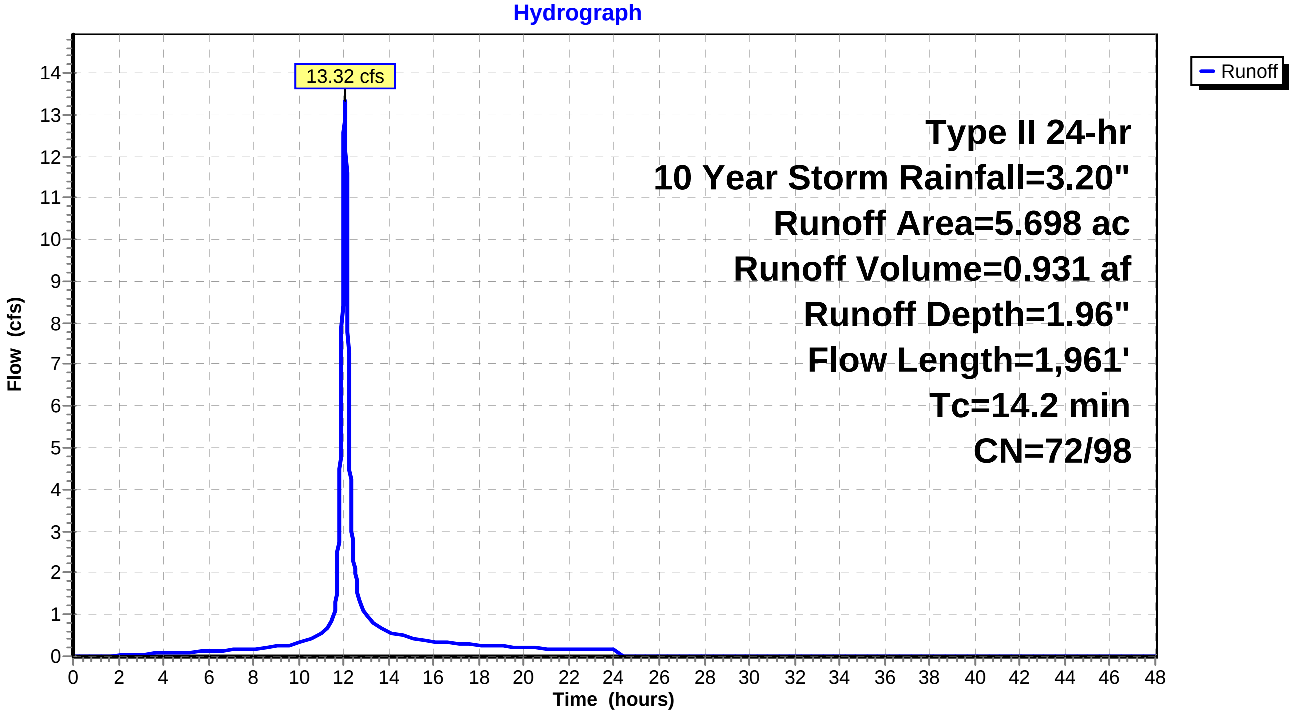
Runoff = 13.32 cfs @ 12.06 hrs, Volume= 0.931 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.023	98	Paved parking, HSG A
0.454	98	Paved parking, HSG B
0.003	98	Paved parking, HSG C
2.403	98	Paved parking, HSG D
0.025	39	>75% Grass cover, Good, HSG A
1.201	61	>75% Grass cover, Good, HSG B
1.589	80	>75% Grass cover, Good, HSG D
5.698	85	Weighted Average
2.815	72	49.40% Pervious Area
2.883	98	50.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	93	0.1637	2.83		**Shallow Concentrated Flow, Shallow 4a** Short Grass Pasture Kv= 7.0 fps
10.4	1,537	0.0147	2.46		**Shallow Concentrated Flow, Shallow 4b** Paved Kv= 20.3 fps
1.6	100	0.0147	1.03		**Sheet Flow, Sheet 4** Smooth surfaces n= 0.011 P2= 2.30"
1.2	180	0.0222	2.58	3.35	**Channel Flow, Channel 4** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.0	7	0.1520	2.73		**Shallow Concentrated Flow, Shallow 4c** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0650	1.27		**Shallow Concentrated Flow, Shallow 4d** Woodland Kv= 5.0 fps
0.3	29	0.1040	1.61		**Shallow Concentrated Flow, Shallow 4e** Woodland Kv= 5.0 fps
14.2	1,961	Total			

Subcatchment 4a: On-Site 4 Pre



Summary for Subcatchment 5a: On-Site 5 Pre

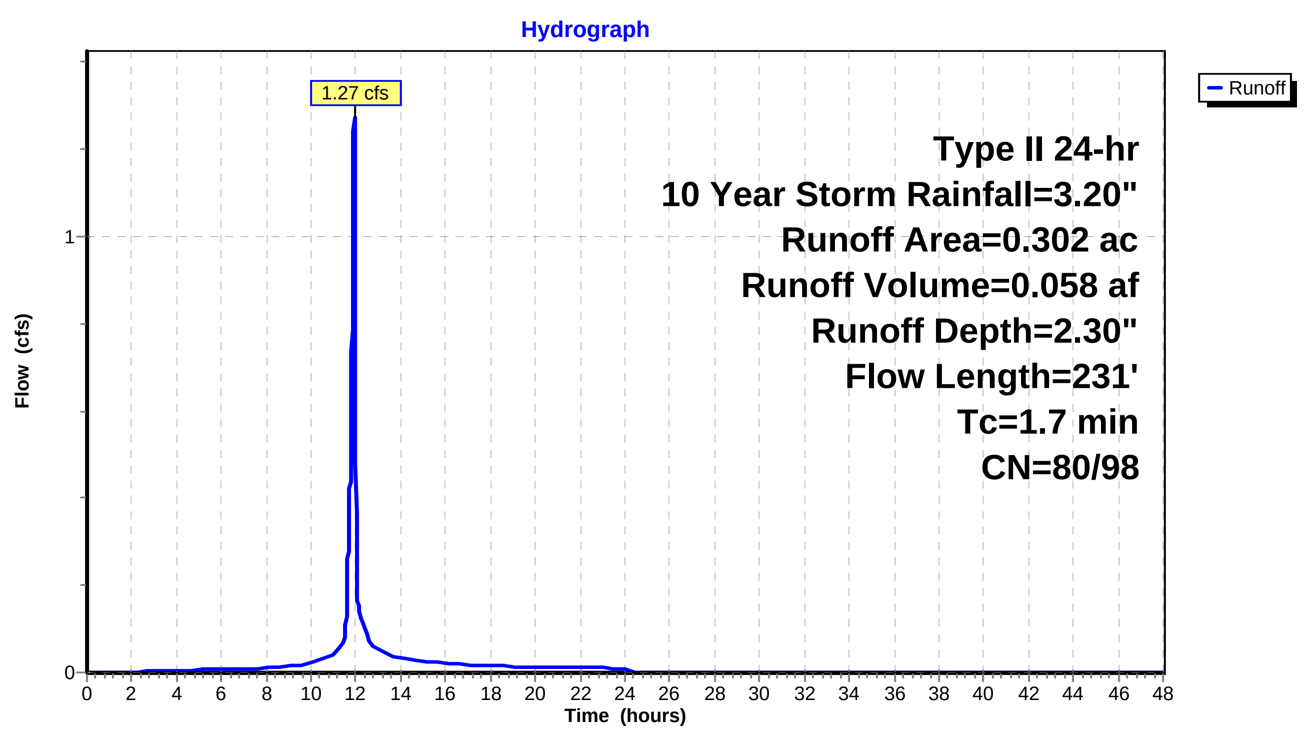
Runoff = 1.27 cfs @ 11.92 hrs, Volume= 0.058 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.173	98	Paved roads w/curbs & sewers, HSG D
0.129	80	Pasture/grassland/range, Good, HSG D
0.302	90	Weighted Average
0.129	80	42.72% Pervious Area
0.173	98	57.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0351	1.46		**Sheet Flow, Sheet 5** Smooth surfaces n= 0.011 P2= 2.30"
0.4	99	0.0351	3.80		**Shallow Concentrated Flow, Shallow 5a** Paved Kv= 20.3 fps
0.2	32	0.1243	2.47		**Shallow Concentrated Flow, Shallow 5b** Short Grass Pasture Kv= 7.0 fps
1.7	231	Total			

Subcatchment 5a: On-Site 5 Pre



Summary for Subcatchment 6a: On-Site 6 Pre

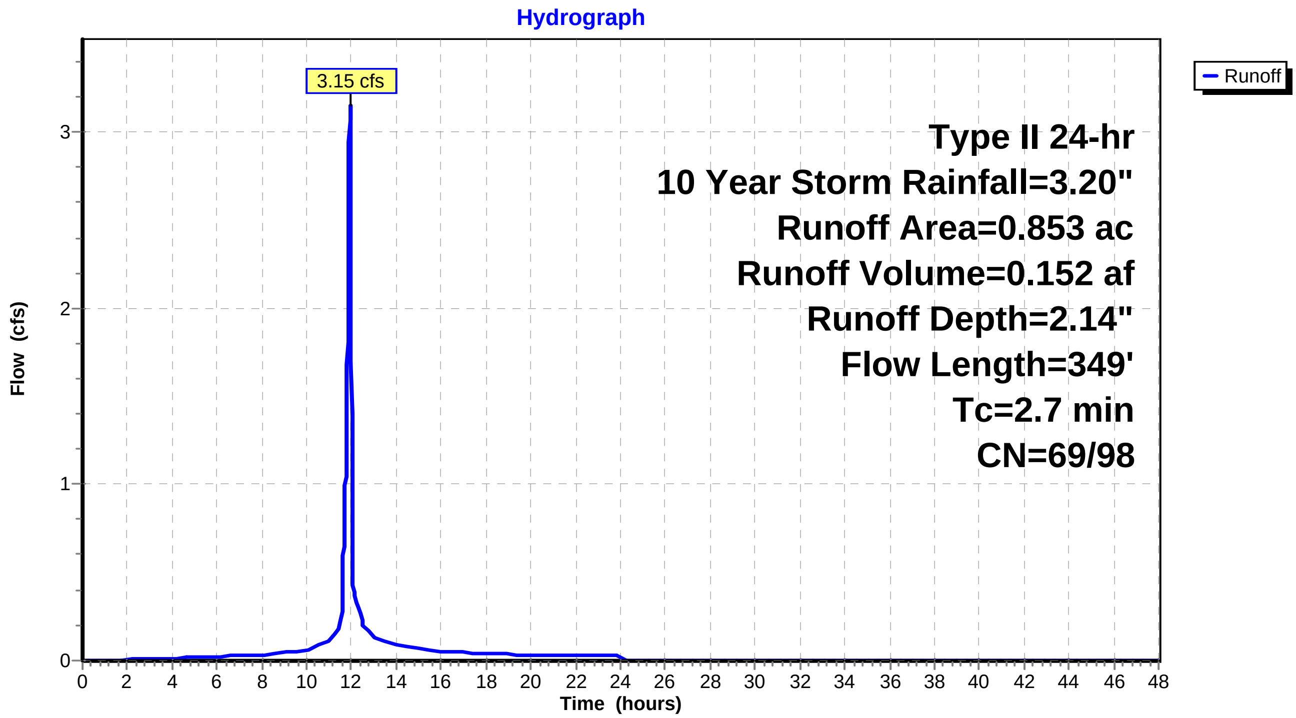
Runoff = 3.15 cfs @ 11.93 hrs, Volume= 0.152 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.248	98	Paved roads w/curbs & sewers, HSG B
0.188	61	>75% Grass cover, Good, HSG B
0.283	98	Paved roads w/curbs & sewers, HSG D
0.134	80	>75% Grass cover, Good, HSG D
0.853	87	Weighted Average
0.322	69	37.75% Pervious Area
0.531	98	62.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	130	0.0115	2.53	3.29	**Channel Flow, Channel 6a** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
1.1	100	0.0418	1.57		**Sheet Flow, Sheet 6** Smooth surfaces n= 0.011 P2= 2.30"
0.1	20	0.0418	4.15		**Shallow Concentrated Flow, Shallow 6a** Paved Kv= 20.3 fps
0.1	32	0.0630	5.92	7.70	**Channel Flow, Channel 6b** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
0.5	67	0.1194	2.42		**Shallow Concentrated Flow, Shallow 6b** Short Grass Pasture Kv= 7.0 fps
2.7	349	Total			

Subcatchment 6a: On-Site 6 Pre



Summary for Subcatchment 9: Subcat 9

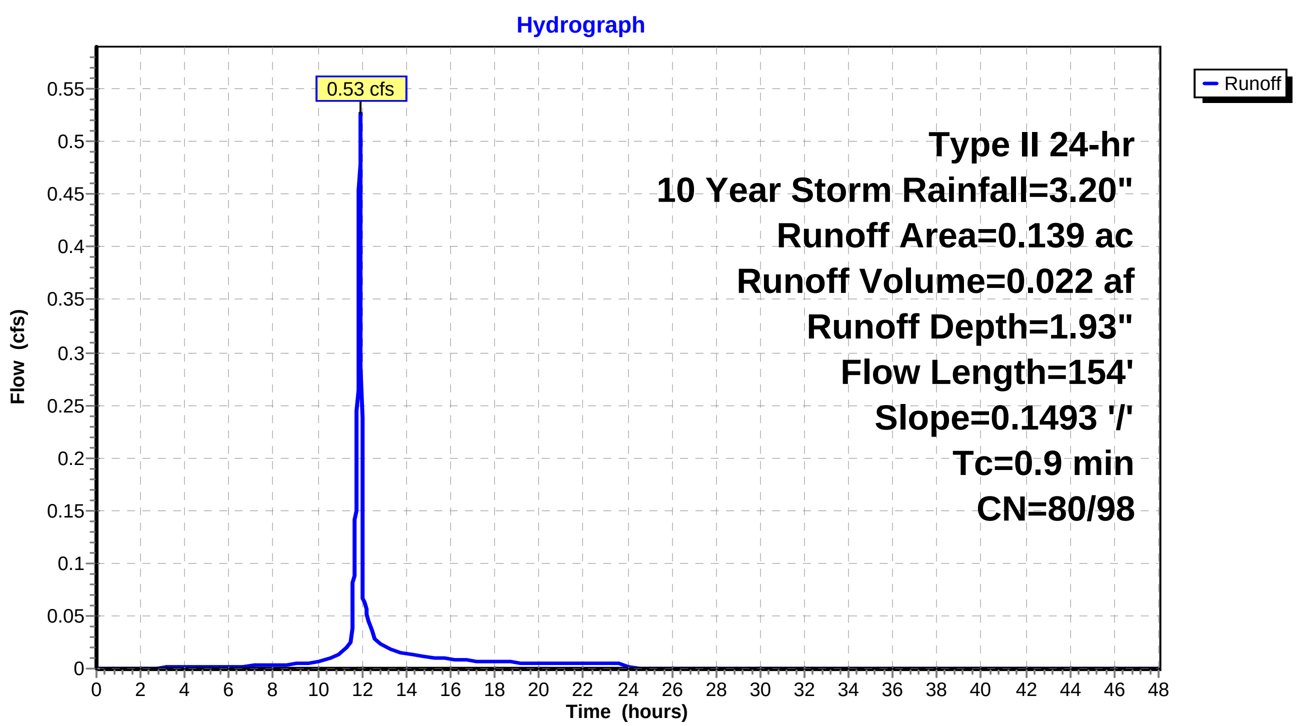
Runoff = 0.53 cfs @ 11.91 hrs, Volume= 0.022 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.047	98	Paved roads w/curbs & sewers, HSG D
0.092	80	>75% Grass cover, Good, HSG D
0.139	86	Weighted Average
0.092	80	66.19% Pervious Area
0.047	98	33.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	154	0.1493	2.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 9: Subcat 9



Summary for Subcatchment 10: Subcat 10

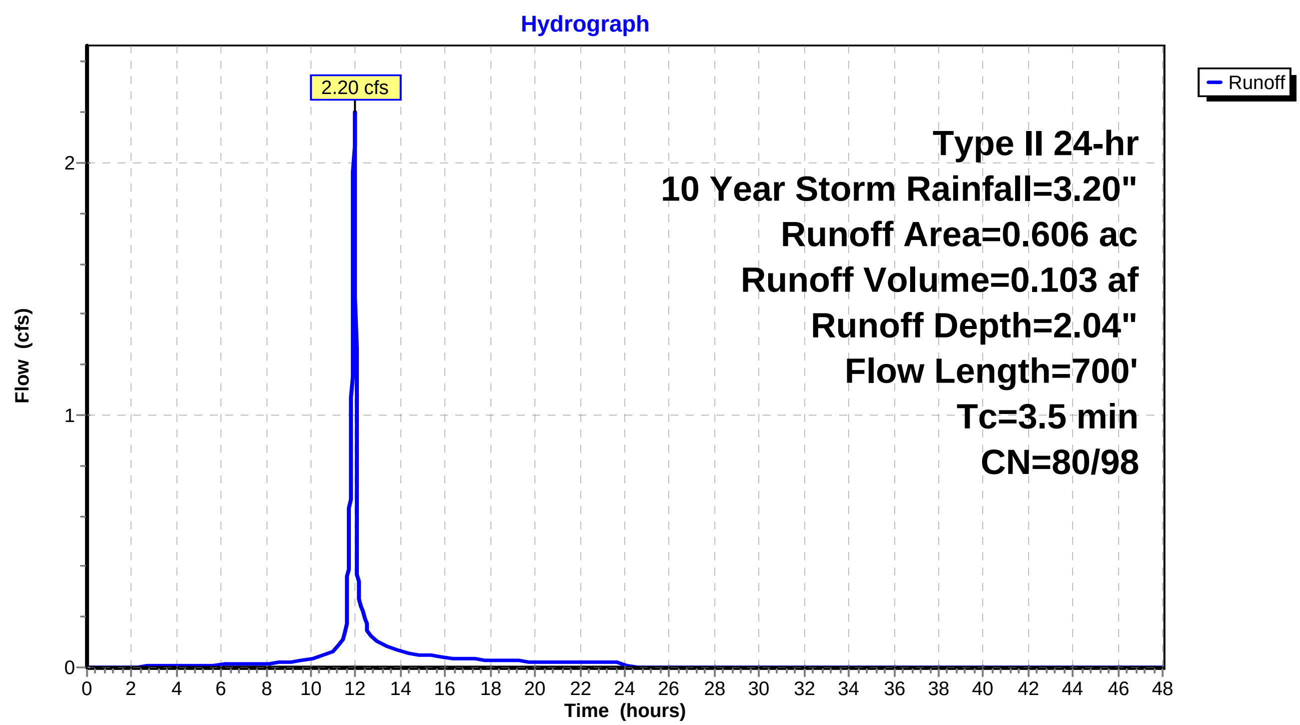
Runoff = 2.20 cfs @ 11.94 hrs, Volume= 0.103 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.248	98	Paved roads w/curbs & sewers, HSG D
0.358	80	>75% Grass cover, Good, HSG D
0.606	87	Weighted Average
0.358	80	59.08% Pervious Area
0.248	98	40.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	685	0.0267	3.32		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	15	0.1156	2.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	700	Total			

Subcatchment 10: Subcat 10



Summary for Subcatchment 14: Subcat 14

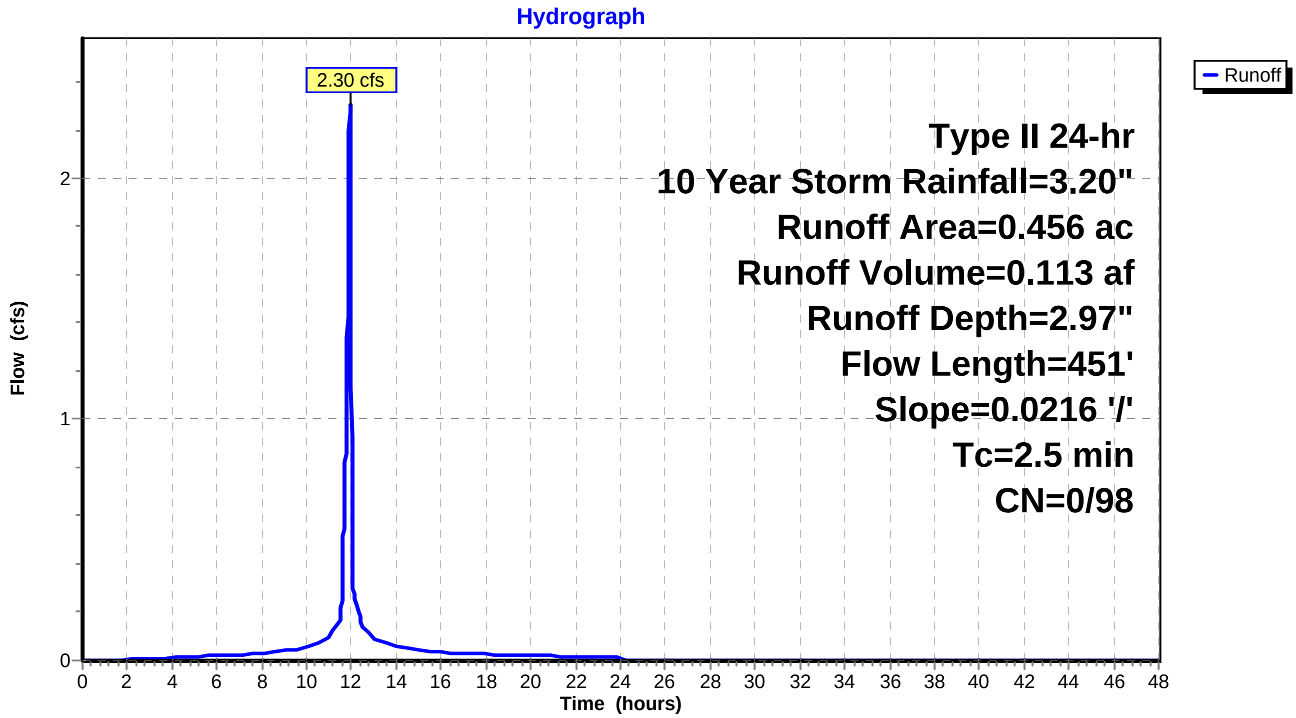
Runoff = 2.30 cfs @ 11.93 hrs, Volume= 0.113 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.456	98	Paved roads w/curbs & sewers, HSG D
0.456	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	451	0.0216	2.98		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 14: Subcat 14



Summary for Subcatchment 15: Subcat 15

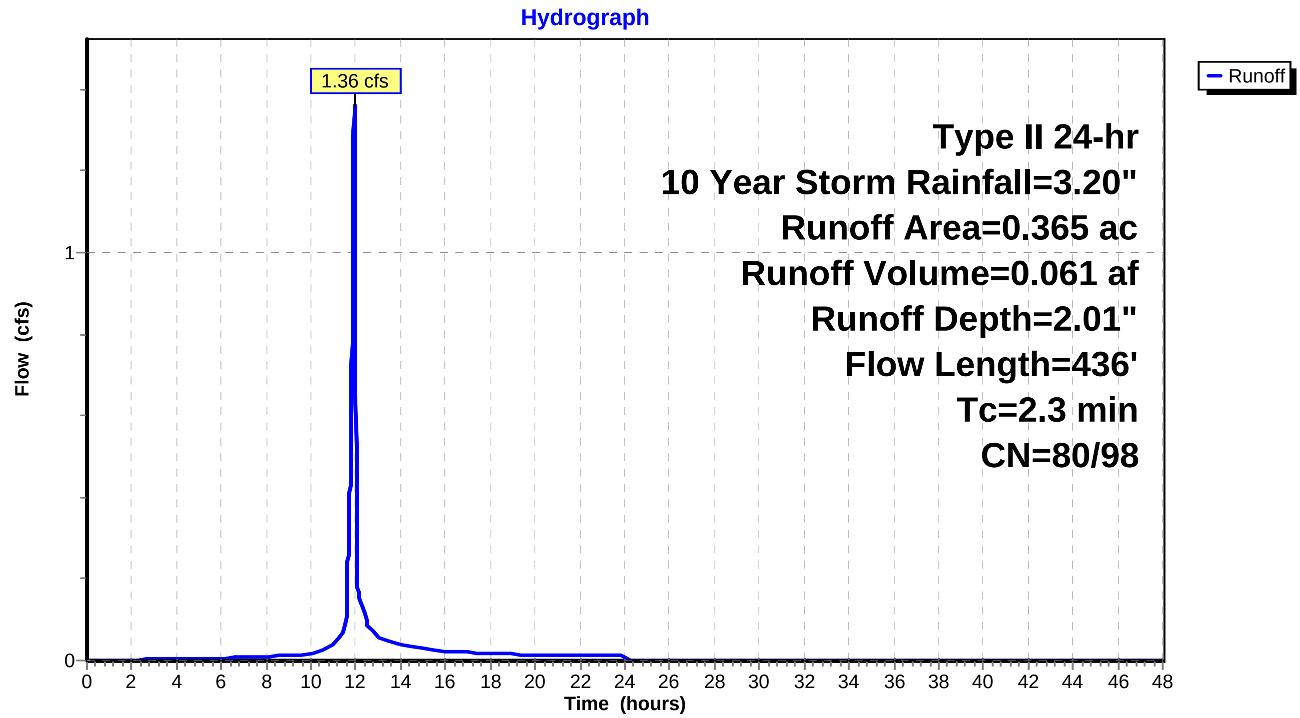
Runoff = 1.36 cfs @ 11.93 hrs, Volume= 0.061 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.123	80	>75% Grass cover, Good, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.142	98	Paved roads w/curbs & sewers, HSG D
0.365	87	Weighted Average
0.223	80	61.10% Pervious Area
0.142	98	38.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	26	0.0477	4.43		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.2	410	0.0417	3.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.3	436	Total			

Subcatchment 15: Subcat 15



Summary for Subcatchment 17: Subcat 17

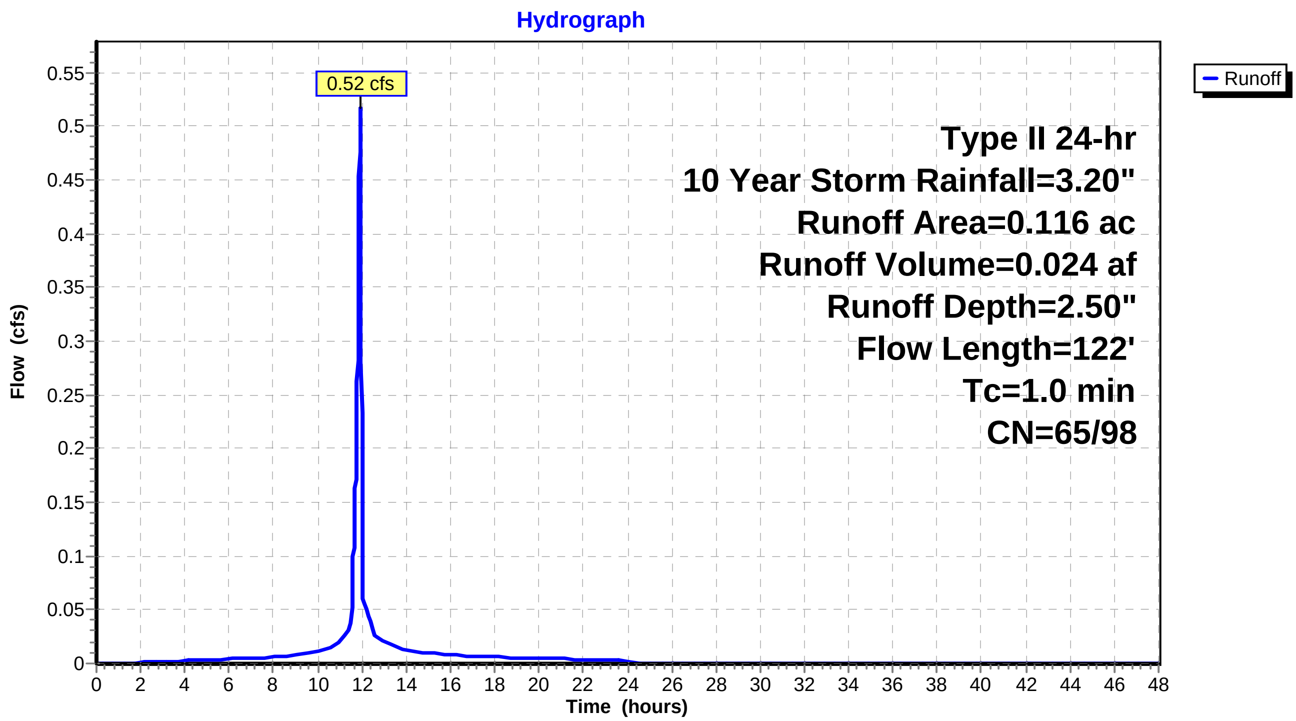
Runoff = 0.52 cfs @ 11.91 hrs, Volume= 0.024 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.089	98	Paved roads w/curbs & sewers, HSG D
0.004	98	Paved roads w/curbs & sewers, HSG B
0.005	80	>75% Grass cover, Good, HSG D
0.018	61	>75% Grass cover, Good, HSG B
0.116	91	Weighted Average
0.023	65	19.83% Pervious Area
0.093	98	80.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	78	0.0217	2.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	44	0.0330	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	122	Total			

Subcatchment 17: Subcat 17



Summary for Subcatchment 18: Subcat 18

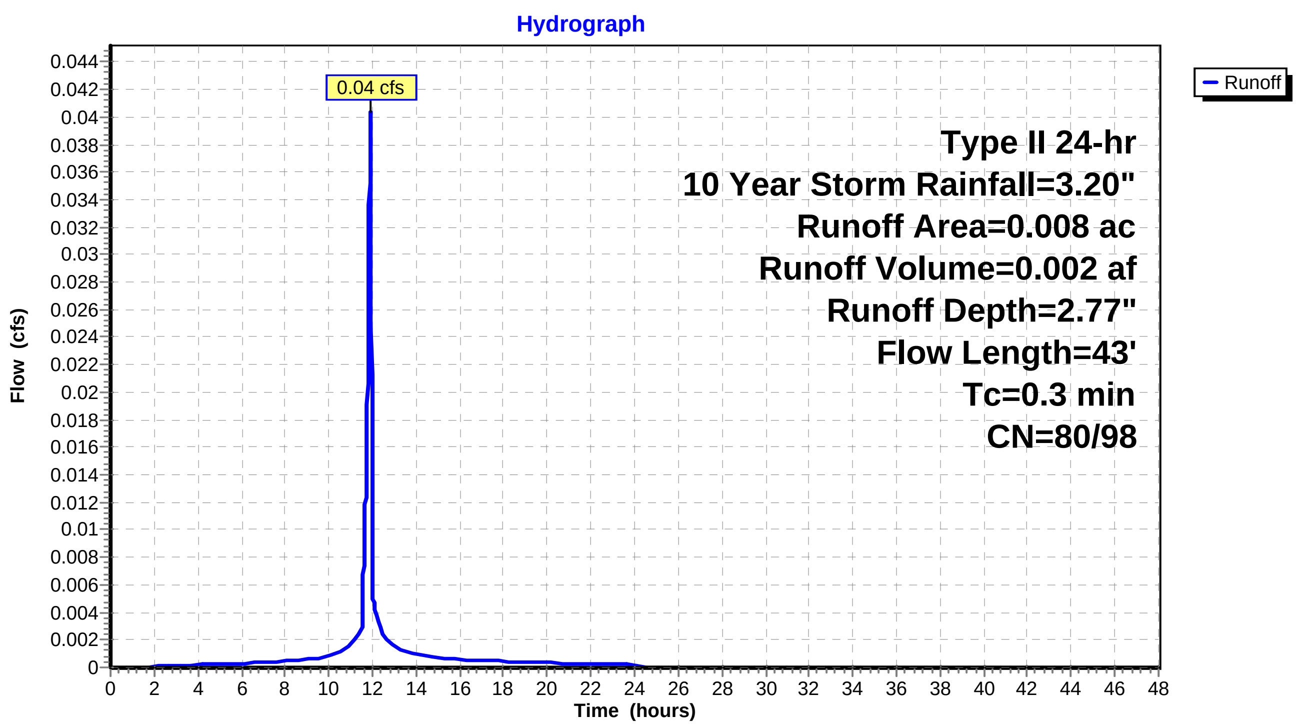
Runoff = 0.04 cfs @ 11.90 hrs, Volume= 0.002 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.007	98	Paved roads w/curbs & sewers, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.008	96	Weighted Average
0.001	80	12.50% Pervious Area
0.007	98	87.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	36	0.0256	3.25		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	7	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	43	Total			

Subcatchment 18: Subcat 18



Summary for Subcatchment 19: Subcat 19

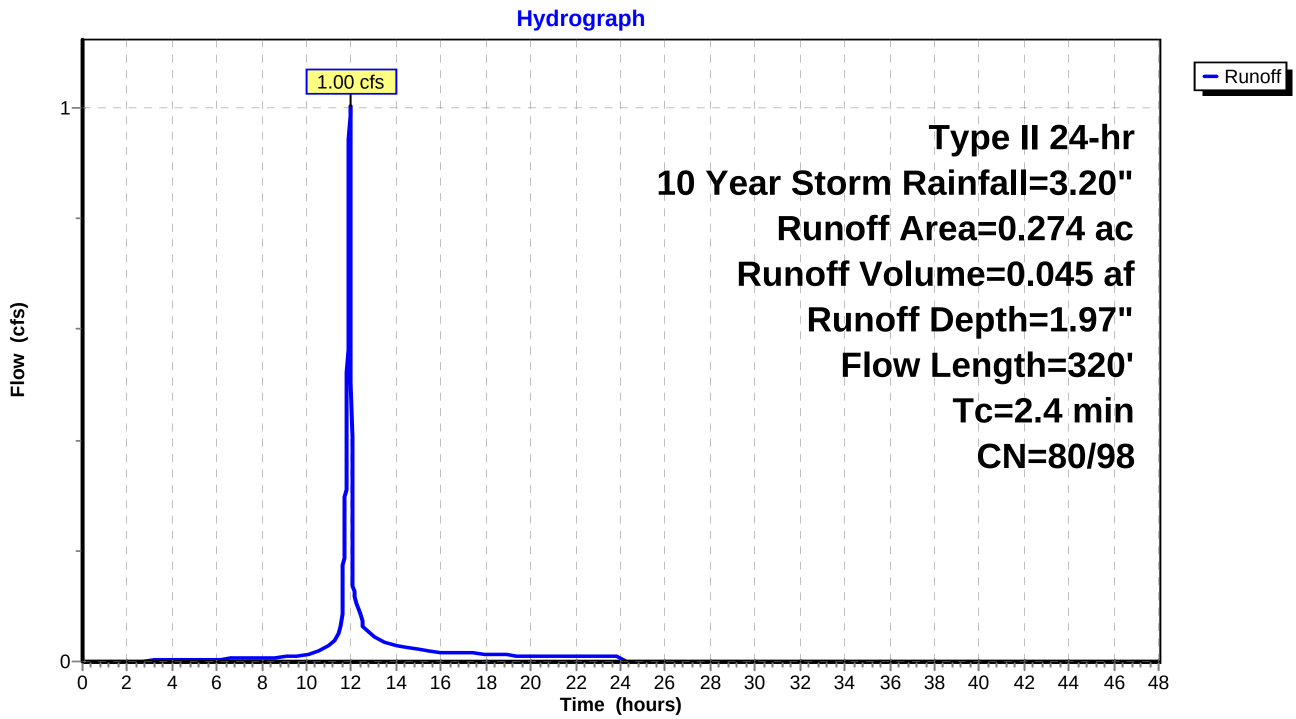
Runoff = 1.00 cfs @ 11.93 hrs, Volume= 0.045 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.175	80	>75% Grass cover, Good, HSG D
0.099	98	Paved roads w/curbs & sewers, HSG D
0.274	87	Weighted Average
0.175	80	63.87% Pervious Area
0.099	98	36.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	37	0.0465	4.38		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	212	0.0590	1.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	71	0.0058	4.74	5.81	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
2.4	320	Total			

Subcatchment 19: Subcat 19



Summary for Subcatchment 51: Subcat 51

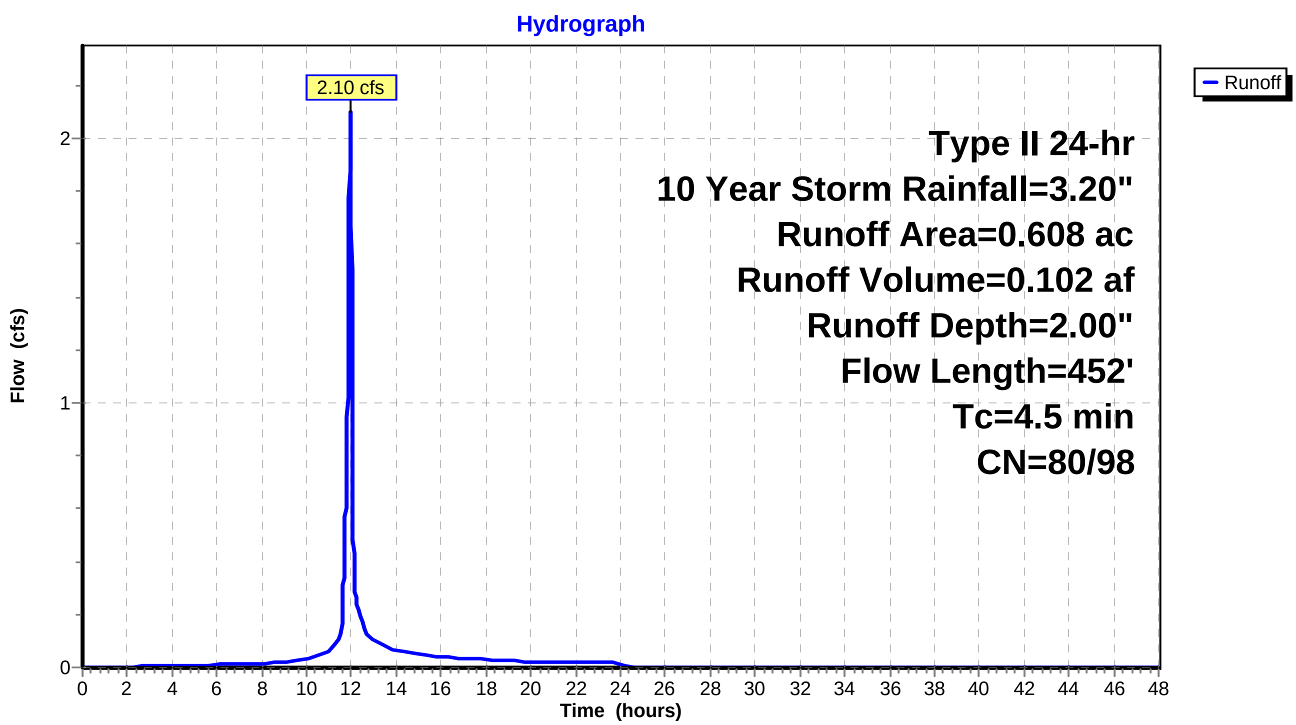
Runoff = 2.10 cfs @ 11.95 hrs, Volume= 0.102 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.374	80	>75% Grass cover, Good, HSG D
0.234	98	Paved roads w/curbs & sewers, HSG D
0.608	87	Weighted Average
0.374	80	61.51% Pervious Area
0.234	98	38.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	207	0.0283	3.41		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.5	245	0.0276	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	452	Total			

Subcatchment 51: Subcat 51



Summary for Subcatchment 52: Subcat 52

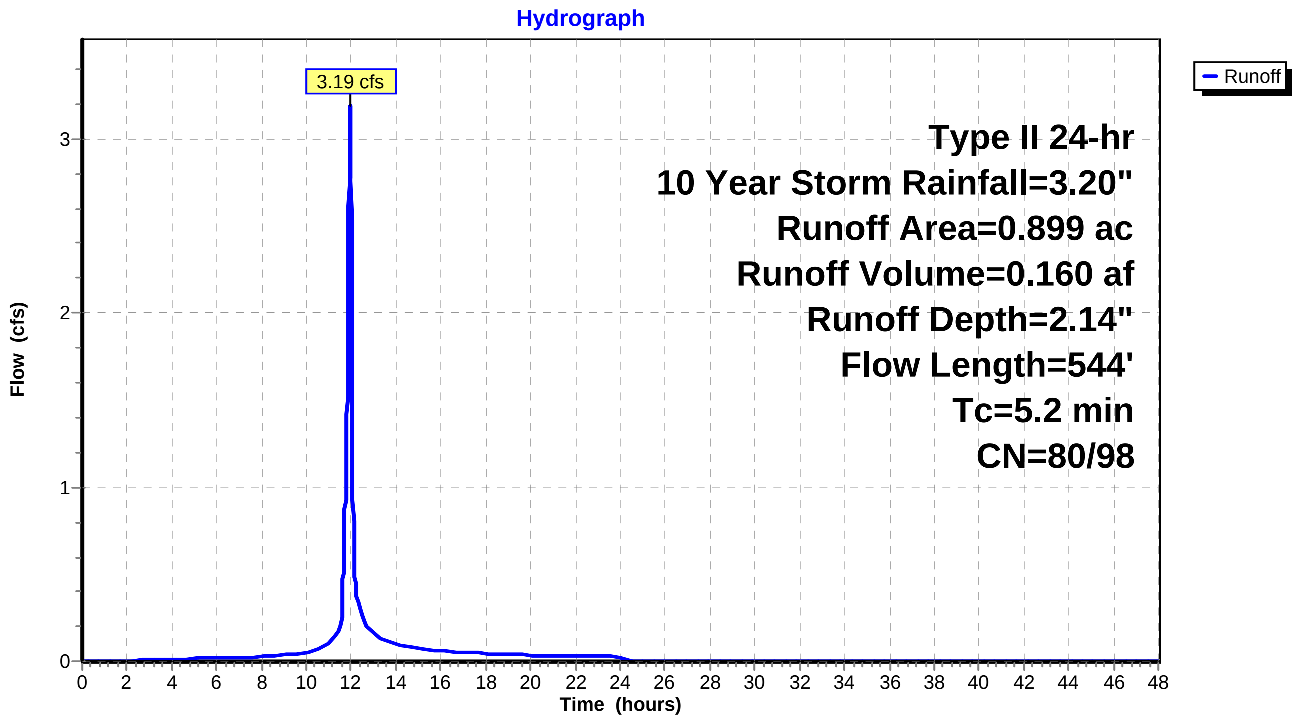
Runoff = 3.19 cfs @ 11.96 hrs, Volume= 0.160 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.332	98	Paved roads w/curbs & sewers, HSG D
0.092	98	Paved parking, HSG D
0.349	80	>75% Grass cover, Good, HSG D
0.103	80	>75% Grass cover, Good, HSG D
0.023	80	>75% Grass cover, Good, HSG D
0.899	88	Weighted Average
0.475	80	52.84% Pervious Area
0.424	98	47.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	116	0.0412	4.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	428	0.0462	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.2	544	Total			

Subcatchment 52: Subcat 52



Summary for Subcatchment 53: Subcat 53

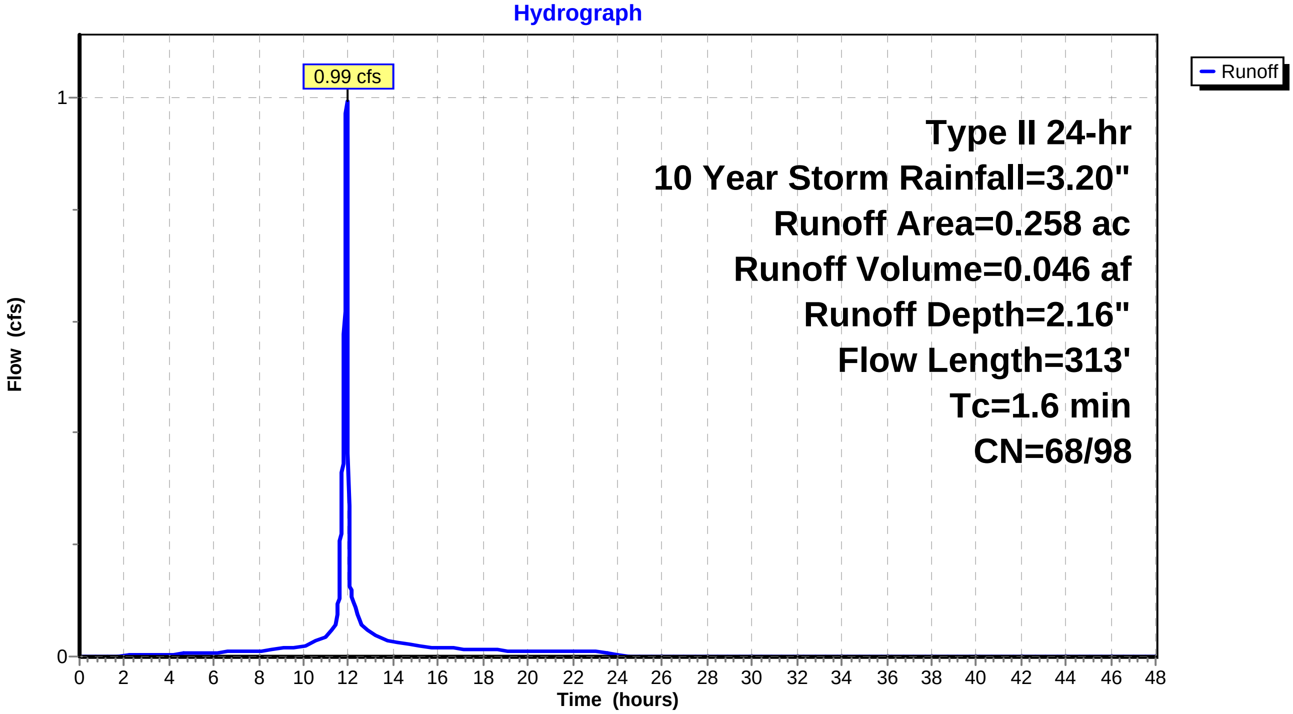
Runoff = 0.99 cfs @ 11.92 hrs, Volume= 0.046 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.008	98	Paved parking, HSG D
0.133	98	Paved roads w/curbs & sewers, HSG D
0.017	98	Paved parking, HSG B
0.007	98	Roofs, HSG B
0.059	61	>75% Grass cover, Good, HSG B
0.034	80	>75% Grass cover, Good, HSG D
0.258	87	Weighted Average
0.093	68	36.05% Pervious Area
0.165	98	63.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	176	0.0327	3.67		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	57	0.0877	2.07		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0451	4.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	313	Total			

Subcatchment 53: Subcat 53



Summary for Subcatchment OS1: Off-Site 1

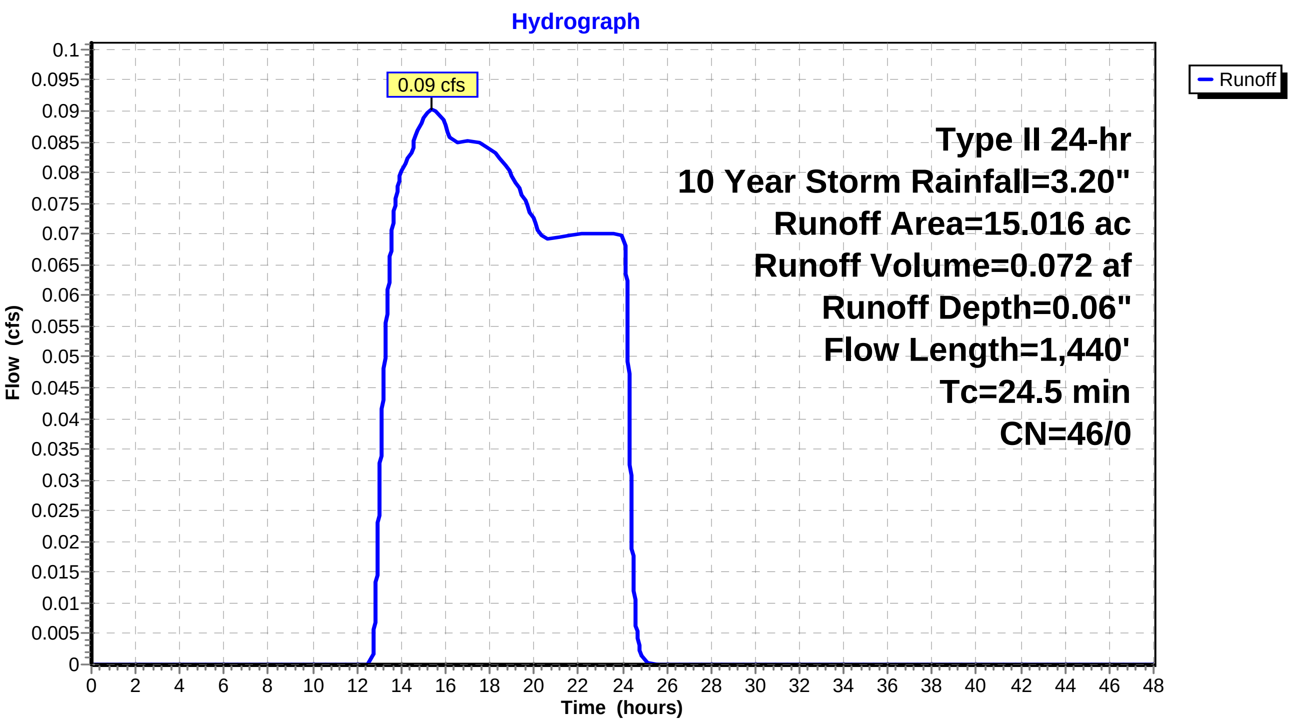
Runoff = 0.09 cfs @ 15.38 hrs, Volume= 0.072 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	15.016	46	Composite CN
	15.016	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	100	0.0426	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	464	0.0426	3.32		**Shallow Concentrated Flow, woods segment** Unpaved Kv= 16.1 fps
2.9	586	0.0427	3.33		**Shallow Concentrated Flow, grass segment** Unpaved Kv= 16.1 fps
0.1	156	0.1731	29.96	94.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	134	0.0746	4.10		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
24.5	1,440	Total			

Subcatchment OS1: Off-Site 1



Summary for Subcatchment OS2: Off-Site 2

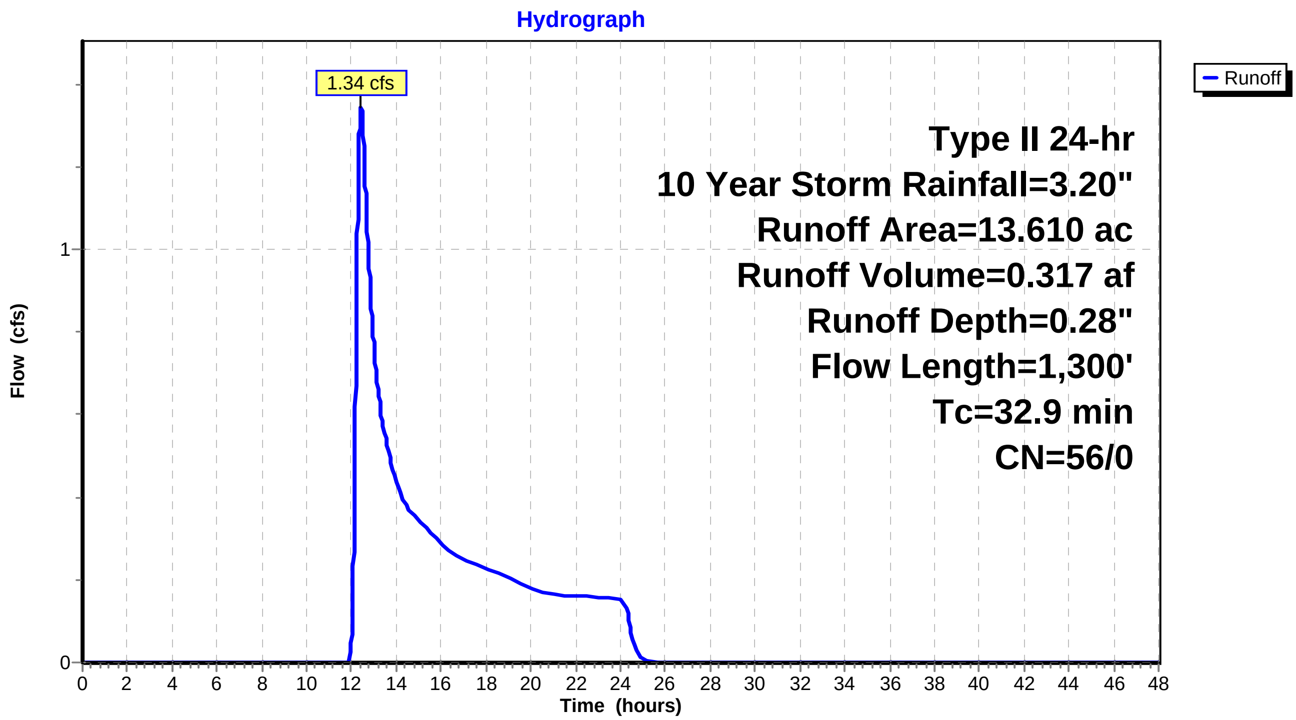
Runoff = 1.34 cfs @ 12.43 hrs, Volume= 0.317 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	13.610	56	Composite CN
	13.610	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.7	100	0.0176	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
5.4	690	0.0176	2.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	510	0.0585	10.87	41.30	**Trap/Vee/Rect Channel Flow, channel** Bot.W=2.50' D=1.00' Z= 1.3 '/' Top.W=5.10' n= 0.025
32.9	1,300	Total			

Subcatchment OS2: Off-Site 2



Summary for Subcatchment OS3: Off-Site 3

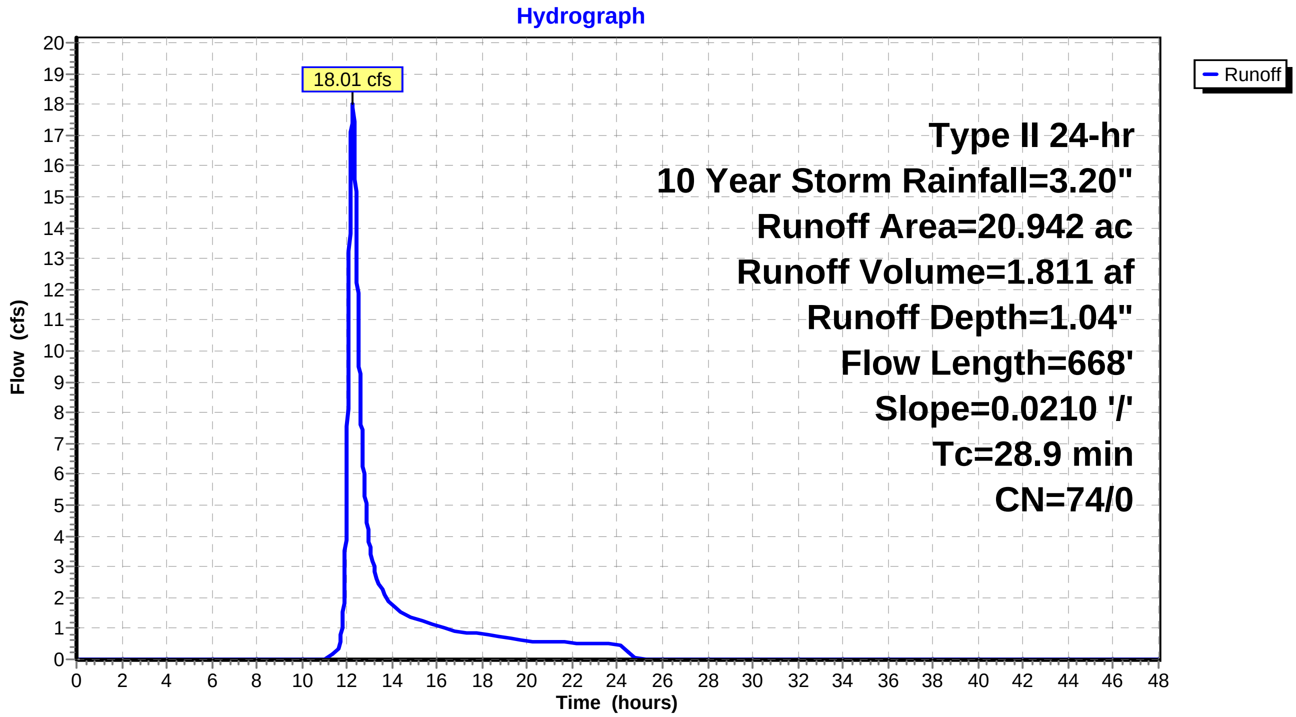
Runoff = 18.01 cfs @ 12.24 hrs, Volume= 1.811 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	20.942	74	Composite CN
	20.942	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	100	0.0210	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
4.1	568	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28.9	668	Total			

Subcatchment OS3: Off-Site 3



Summary for Subcatchment OS4a1: Charlebois WS1

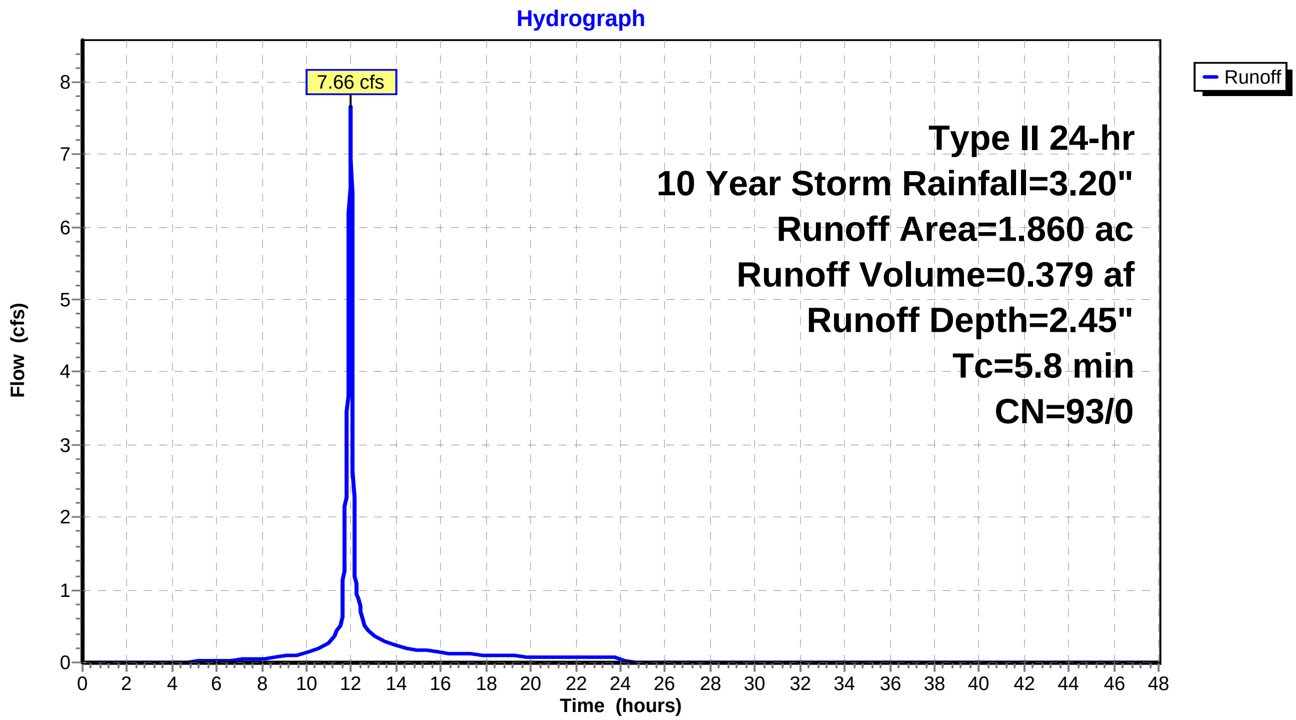
Runoff = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.860	93	From 2005 Permit Application
	1.860	93	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8					**Direct Entry, from 2005 permit application**

Subcatchment OS4a1: Charlebois WS1



Summary for Subcatchment OS4a2: Charlebois WS2

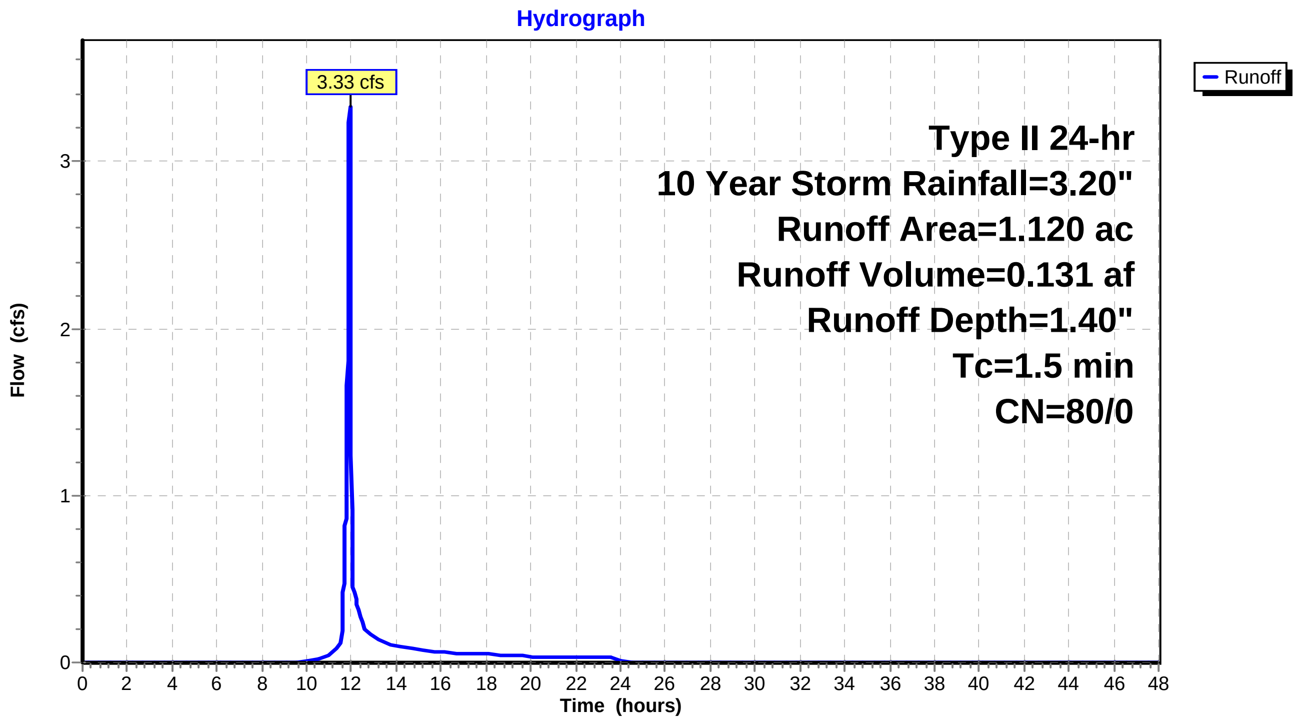
Runoff = 3.33 cfs @ 11.92 hrs, Volume= 0.131 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.120	80	from 2005 Permit Application
	1.120	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5					**Direct Entry, from 2005 Permit Application**

Subcatchment OS4a2: Charlebois WS2



Summary for Subcatchment OS4_E: Off-Site 4 East of Rte 7

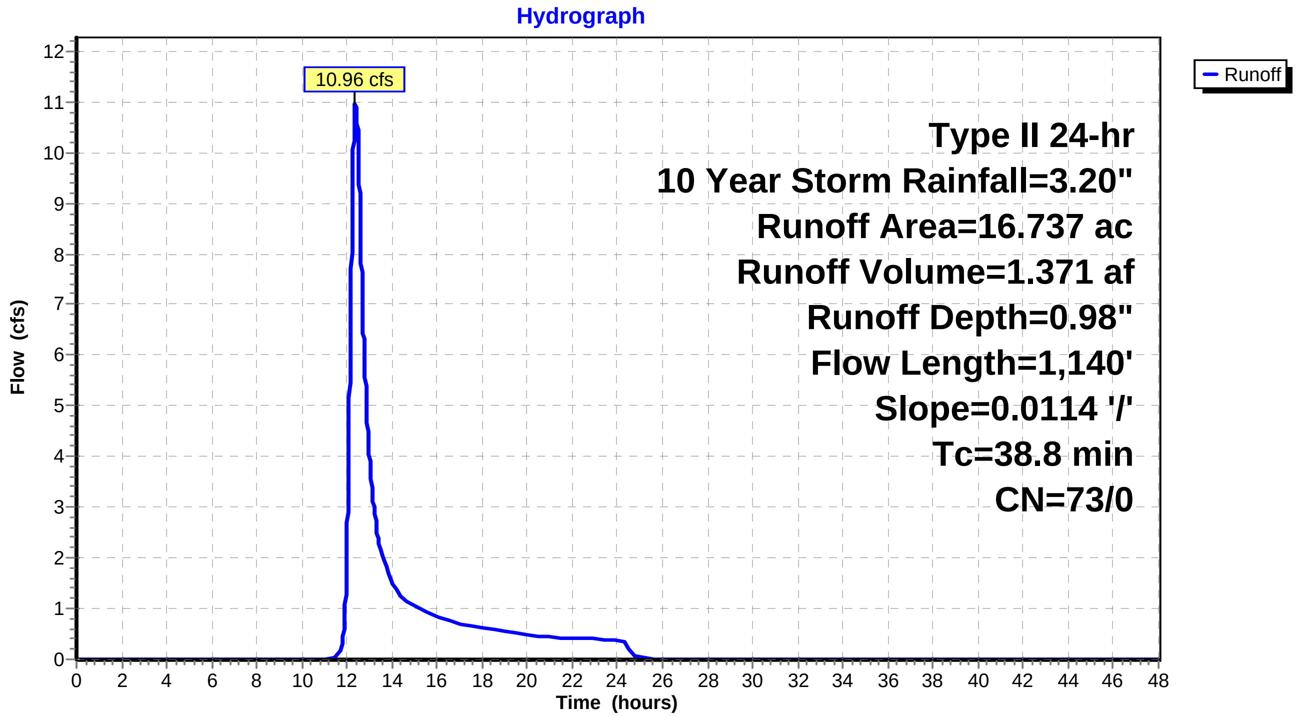
Runoff = 10.96 cfs @ 12.37 hrs, Volume= 1.371 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	16.737	73	composite
	16.737	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0114	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
9.6	990	0.0114	1.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.8	1,140	Total			

Subcatchment OS4_E: Off-Site 4 East of Rte 7



Summary for Subcatchment OS4_W: Off-Site 4 West of Rte 7

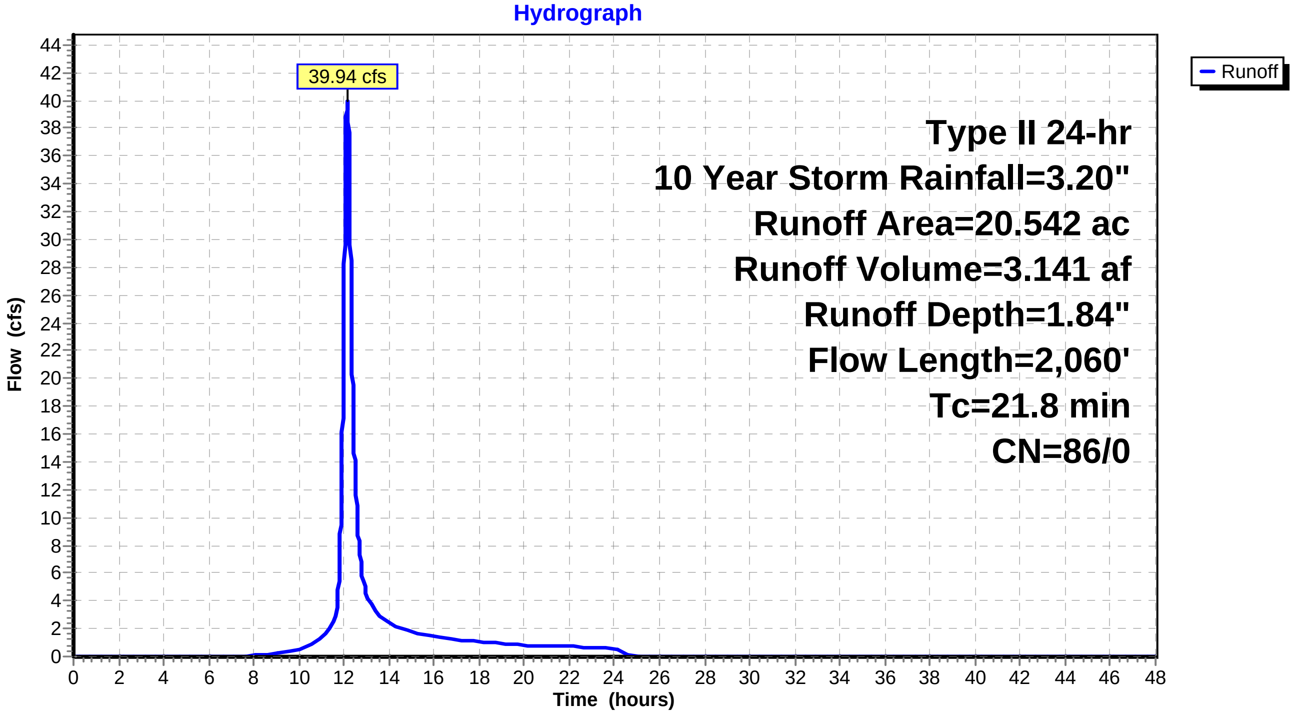
Runoff = 39.94 cfs @ 12.14 hrs, Volume= 3.141 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	20.542	86	composite CN
	20.542	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0312	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.9	320	0.0312	2.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	940	0.0137	3.55	7.98	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=0.50' Z= 4.0 & 2.0 '/' Top.W=6.00' n= 0.025
0.1	110	0.0357	13.61	42.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	160	0.0123	5.10	214.24	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=2.00' Z= 8.0 '/' Top.W=37.00' n= 0.035
0.4	320	0.0402	14.44	45.36	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	110	0.0826	4.31		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
21.8	2,060	Total			

Subcatchment OS4_W: Off-Site 4 West of Rte 7



Summary for Subcatchment OS5a: (new Subcat)

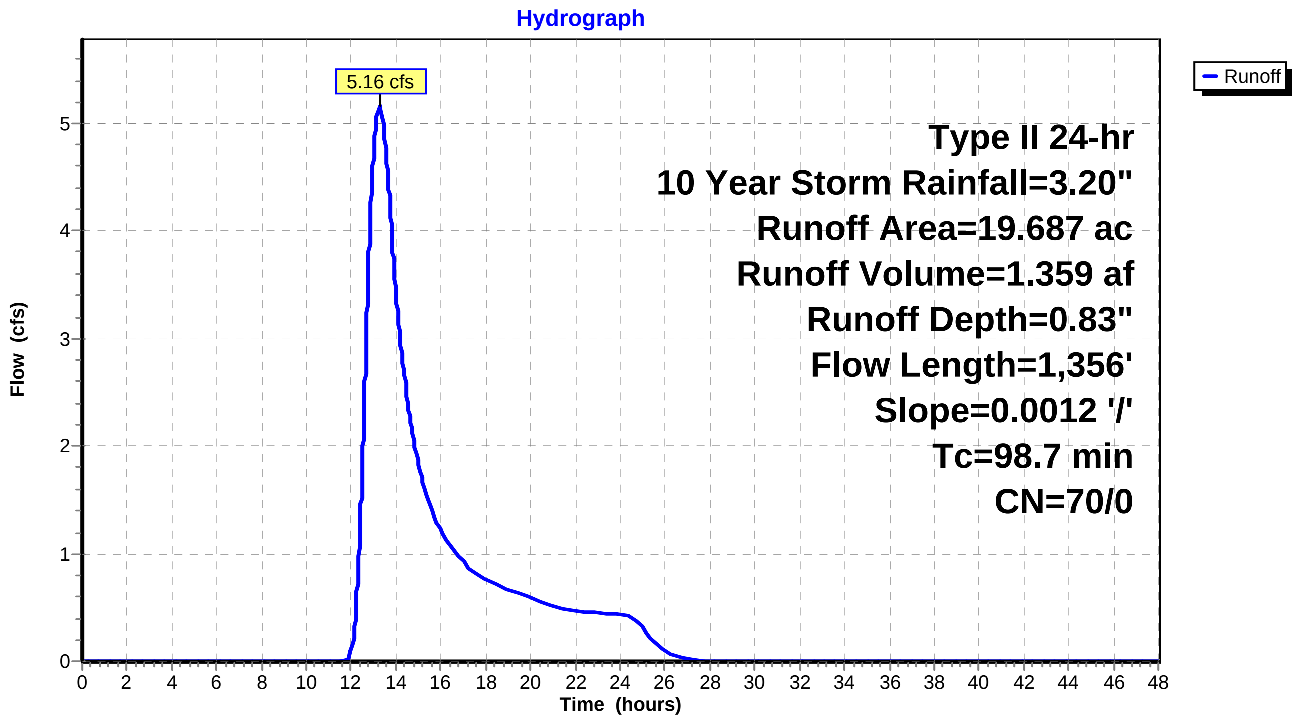
Runoff = 5.16 cfs @ 13.27 hrs, Volume= 1.359 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	19.687	70	weighted CN
	19.687	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
78.0	100	0.0012	0.02		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.4	313	0.0012	0.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	489	0.0012	0.98	1.95	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.025
3.0	454	0.0012	2.49	7.84	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
98.7	1,356	Total			

Subcatchment OS5a: (new Subcat)



Summary for Subcatchment OS5b: (new Subcat)

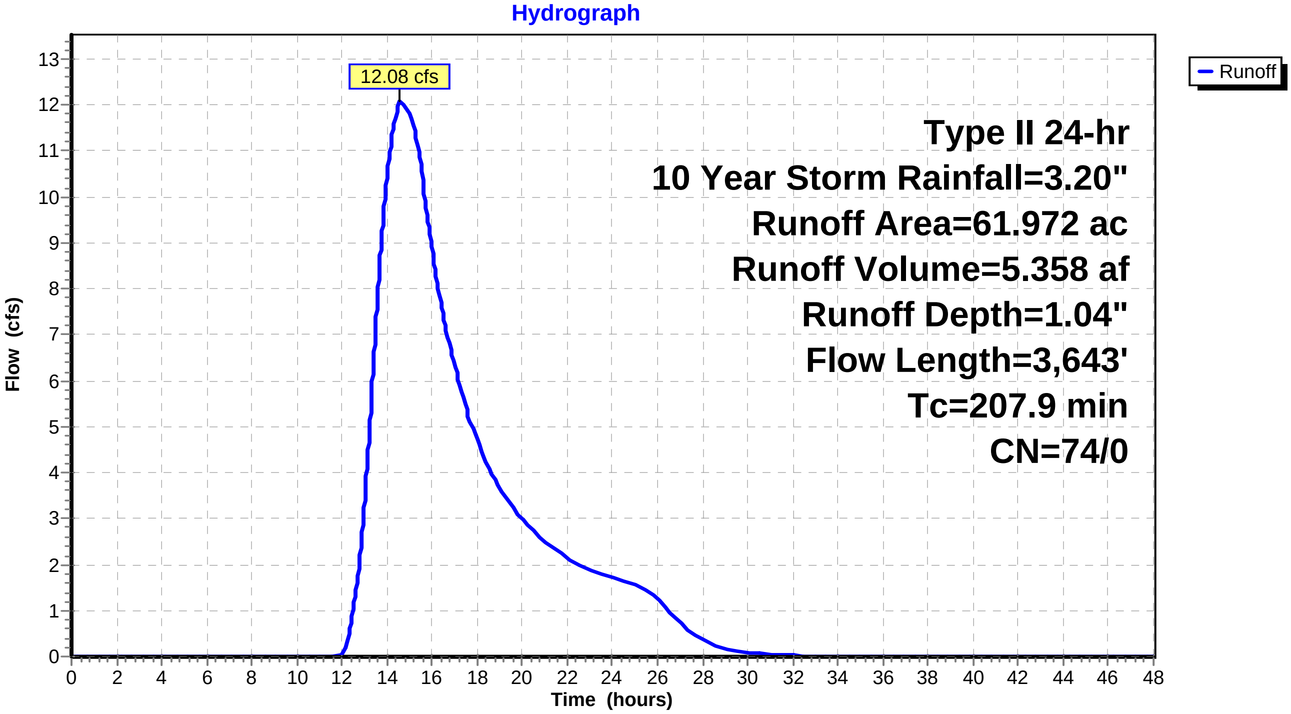
Runoff = 12.08 cfs @ 14.56 hrs, Volume= 5.358 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	61.972	74	weighted CN
	61.972	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.4	100	0.0015	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.4	50	0.0015	0.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
113.4	1,318	0.0015	0.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	670	0.0081	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	666	0.0009	1.08	3.25	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.025
10.7	839	0.0048	1.31	8.19	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
207.9	3,643	Total			

Subcatchment OS5b: (new Subcat)



Summary for Subcatchment OS5_6: (new Subcat)

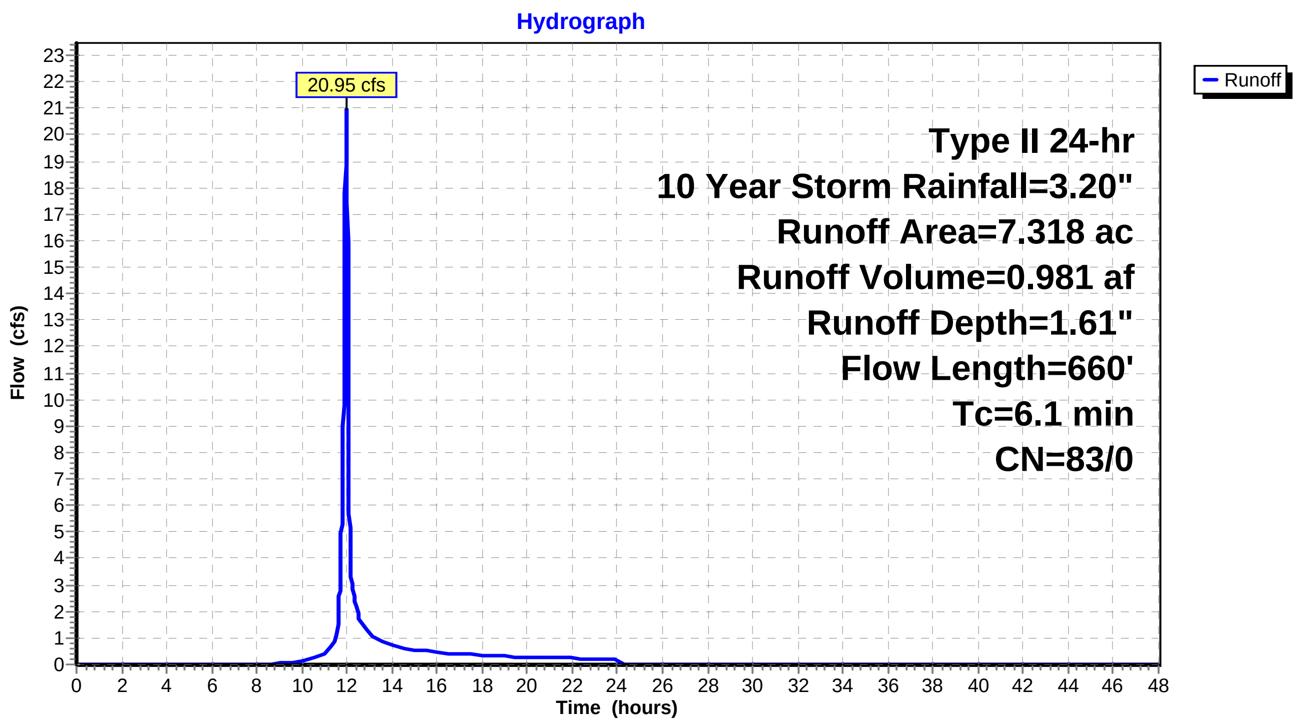
Runoff = 20.95 cfs @ 11.98 hrs, Volume= 0.981 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	7.318	83	weighted CN
	7.318	83	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	50	0.0130	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.4	340	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	270	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.1	660	Total			

Subcatchment OS5_6: (new Subcat)



Summary for Subcatchment OS5_7: (new Subcat)

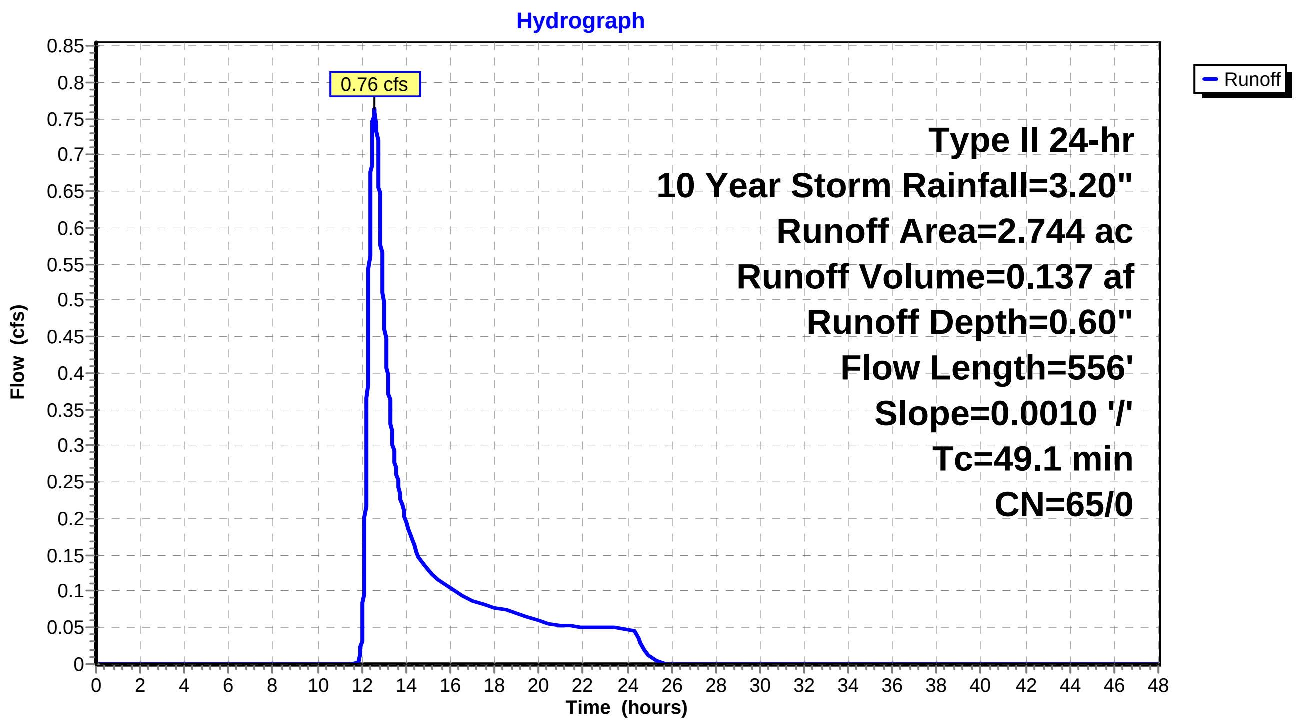
Runoff = 0.76 cfs @ 12.60 hrs, Volume= 0.137 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.744	65	weighted CN
	2.744	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.2	100	0.0010	0.05		**Sheet Flow,** Range n= 0.130 P2= 2.30"
14.9	456	0.0010	0.51		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
49.1	556	Total			

Subcatchment OS5_7: (new Subcat)



Summary for Subcatchment OS5_8: (new Subcat)

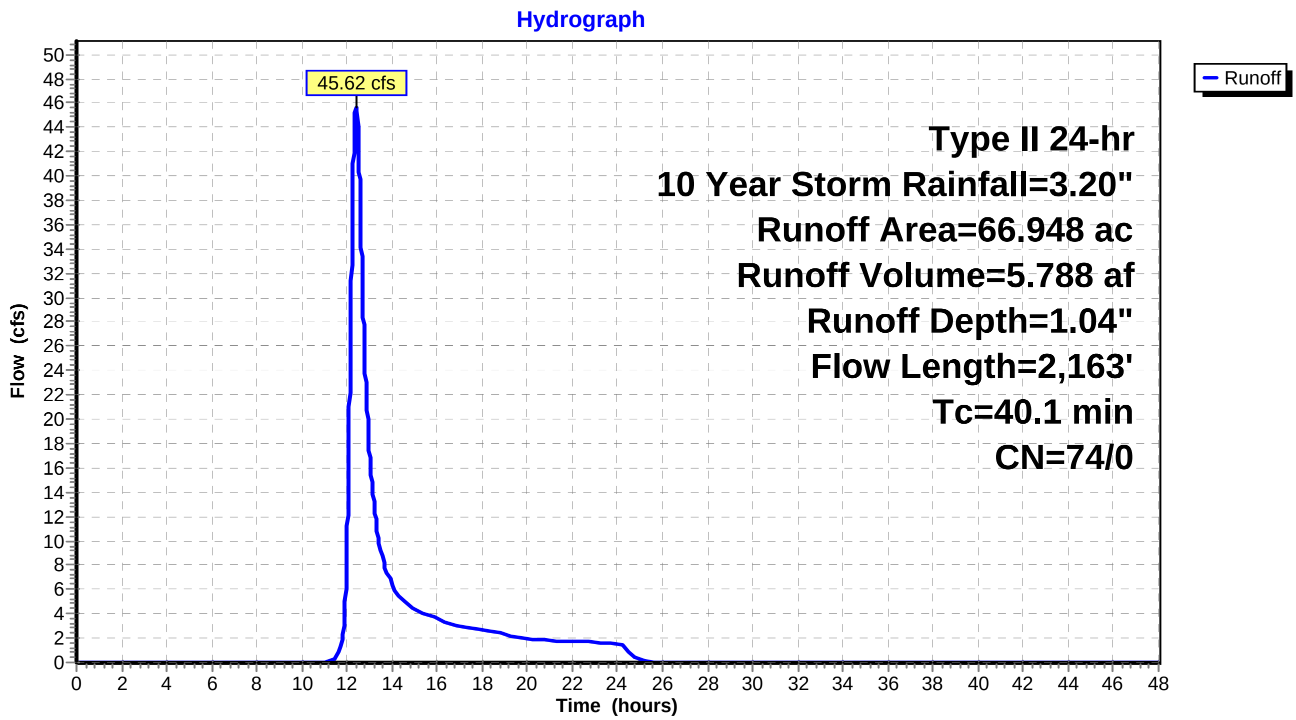
Runoff = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	66.948	74	weighted CN
	66.948	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.0025	0.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
5.7	345	0.0025	1.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
32.5	1,768	0.0023	0.91	5.67	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
40.1	2,163	Total			

Subcatchment OS5_8: (new Subcat)



Summary for Subcatchment OS6: (new Subcat)

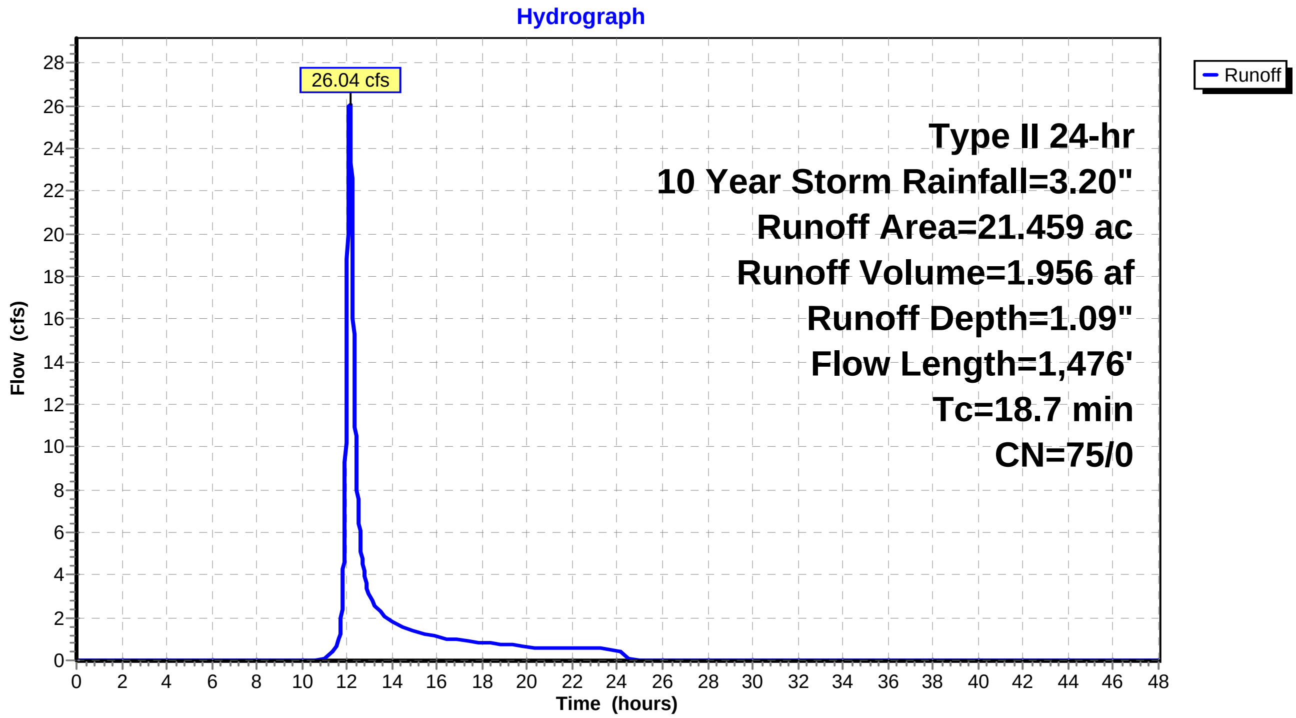
Runoff = 26.04 cfs @ 12.12 hrs, Volume= 1.956 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.459	75	weighted CN
	21.459	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.7	488	0.0930	4.91		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.9	938	0.0043	0.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.7	1,476	Total			

Subcatchment OS6: (new Subcat)



Summary for Subcatchment OS7_1: (new Subcat)

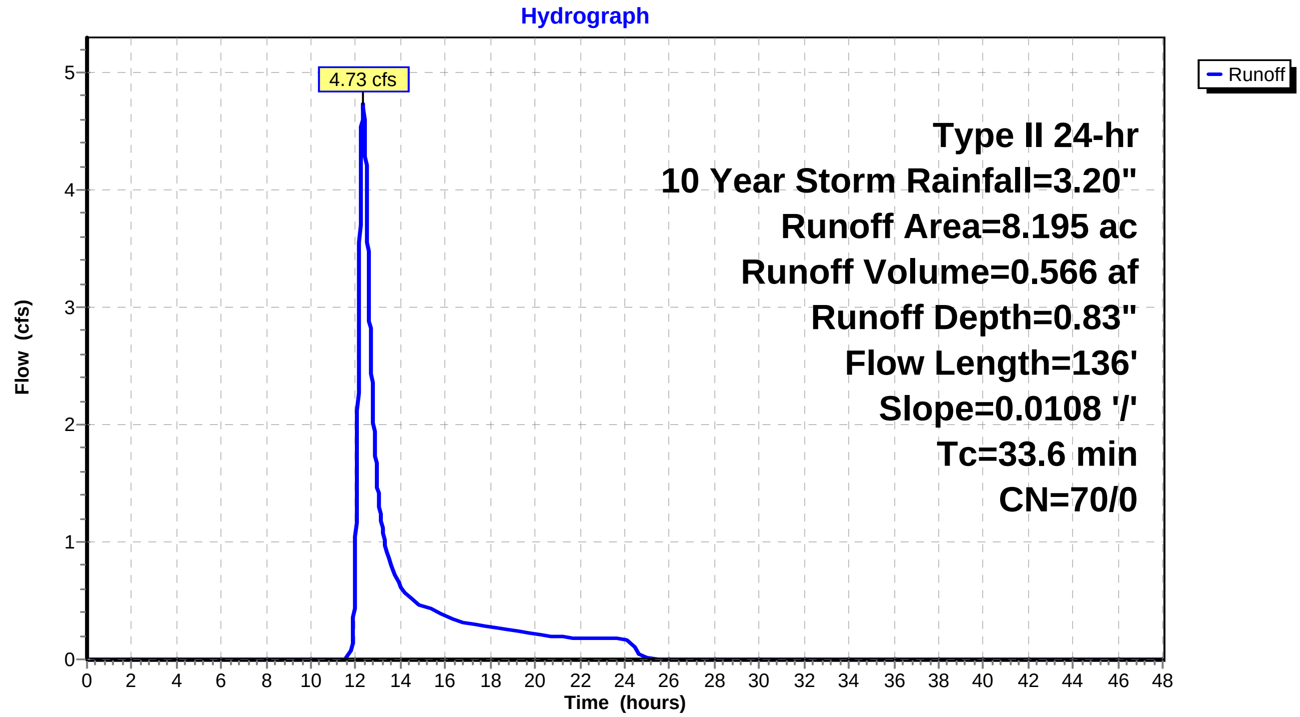
Runoff = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	8.195	70	weighted CN
	8.195	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	100	0.0108	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	36	0.0108	0.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.6	136	Total			

Subcatchment OS7_1: (new Subcat)



Summary for Subcatchment OS7_2: (new Subcat)

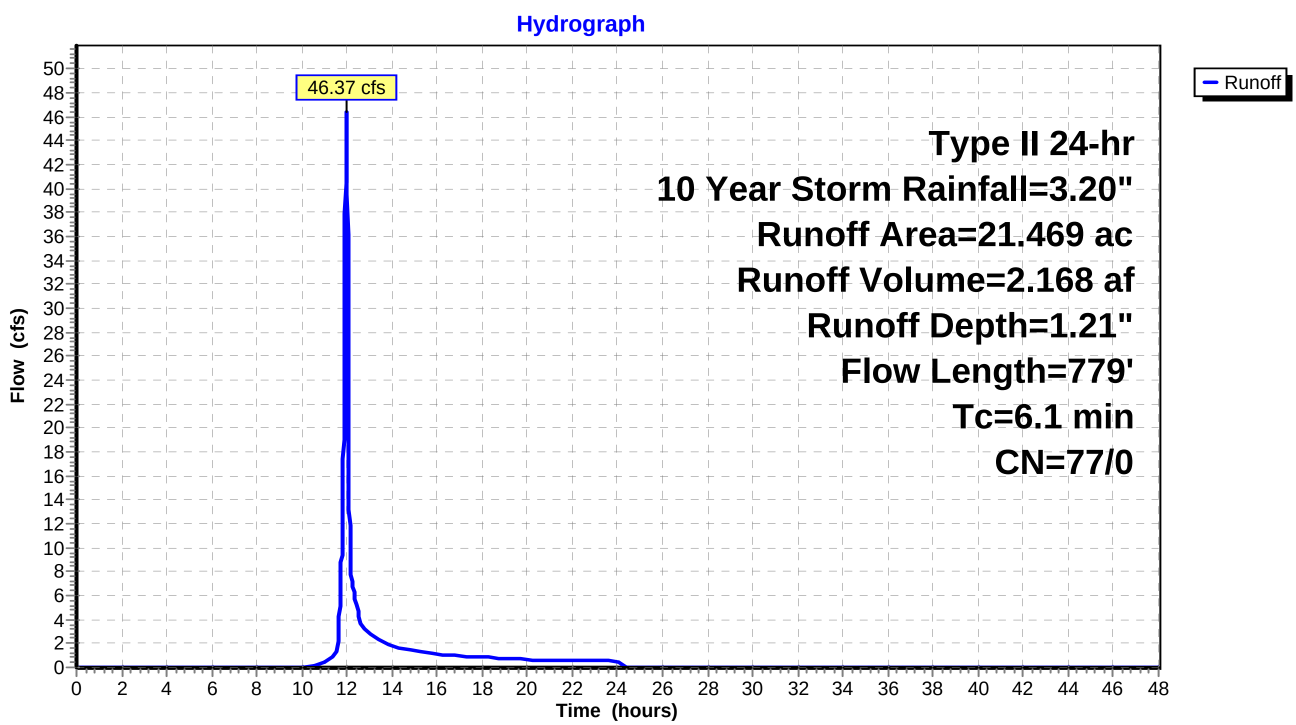
Runoff = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.469	77	weighted CN
	21.469	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.3	273	0.0093	1.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	456	0.0175	2.81	4.22	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.035
6.1	779	Total			

Subcatchment OS7_2: (new Subcat)



Summary for Subcatchment OS7_4: (new Subcat)

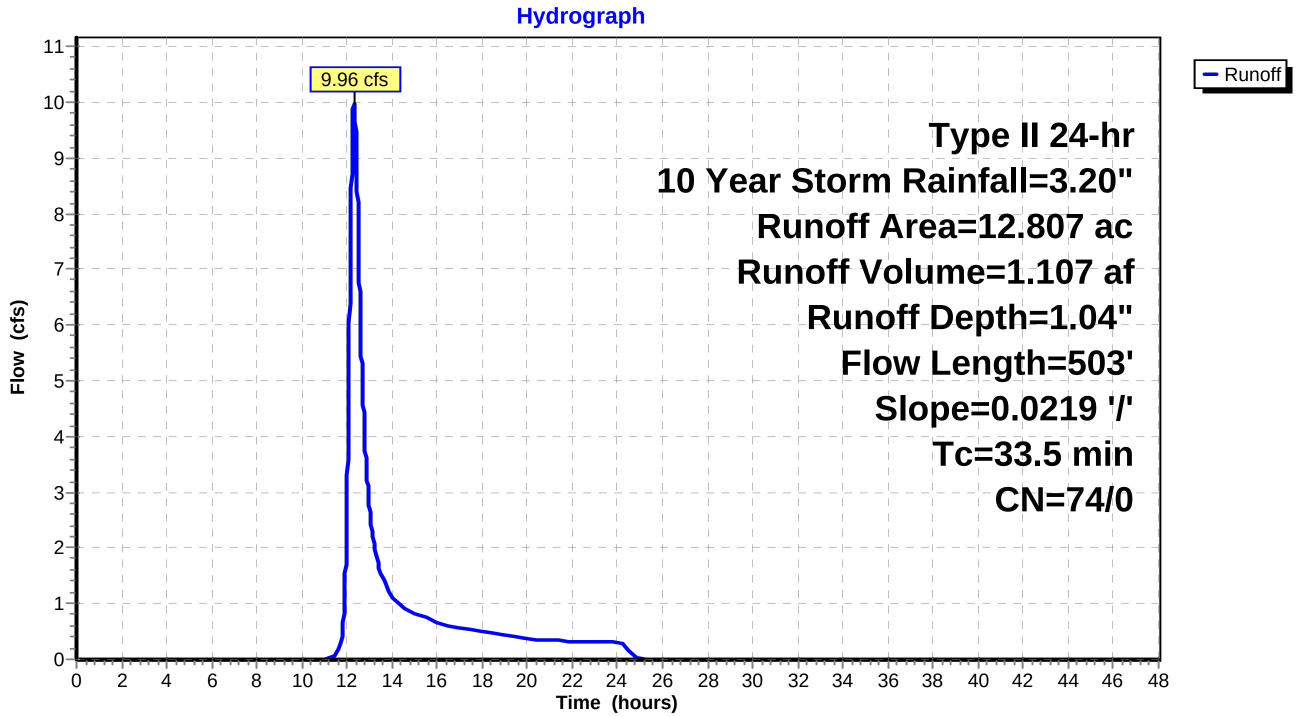
Runoff = 9.96 cfs @ 12.32 hrs, Volume= 1.107 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	12.807	74	weighted CN
	12.807	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.4	100	0.0219	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.1	403	0.0219	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.5	503	Total			

Subcatchment OS7_4: (new Subcat)



Summary for Subcatchment OS8a: (new Subcat)

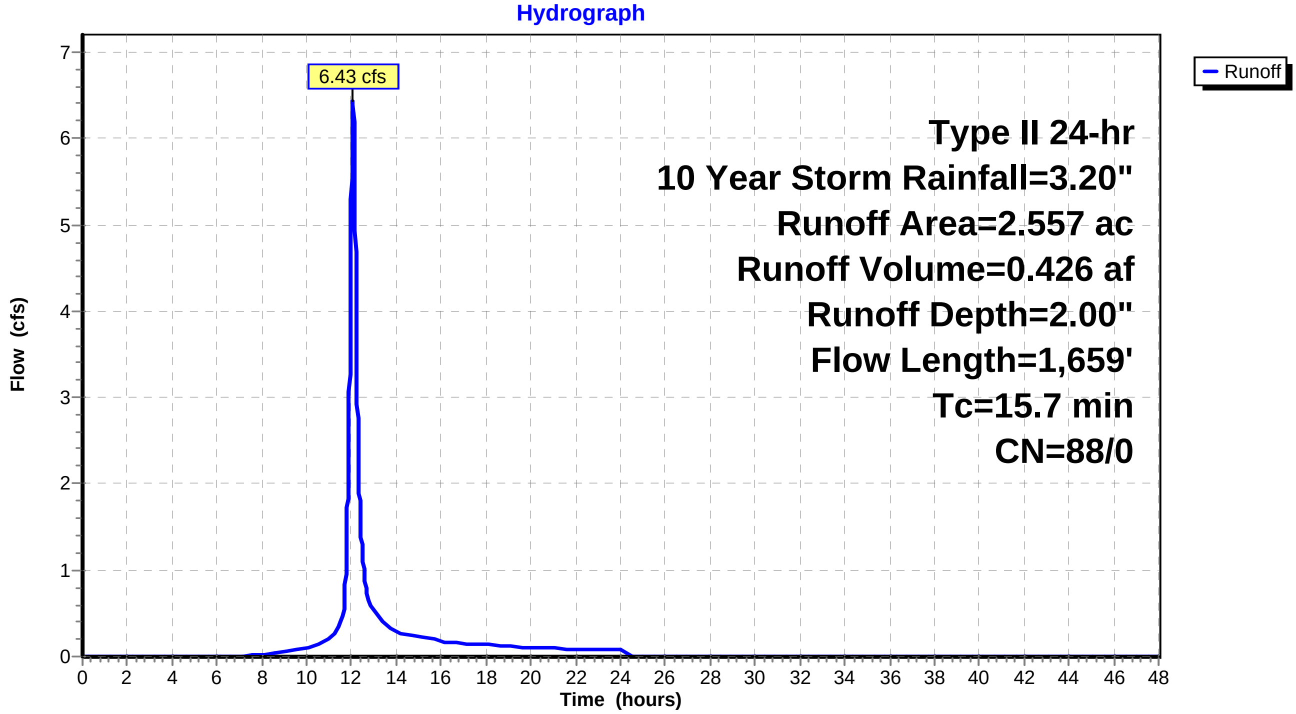
Runoff = 6.43 cfs @ 12.08 hrs, Volume= 0.426 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.557	88	weighted CN
	2.557	88	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	60	0.1228	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	290	0.0103	2.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	90	0.1319	2.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	240	0.0243	2.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	130	0.1053	19.29	34.09	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
2.9	849	0.0259	4.92	14.77	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 4.0 '/' Top.W=8.00' n= 0.025
15.7	1,659	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8b: (new Subcat)

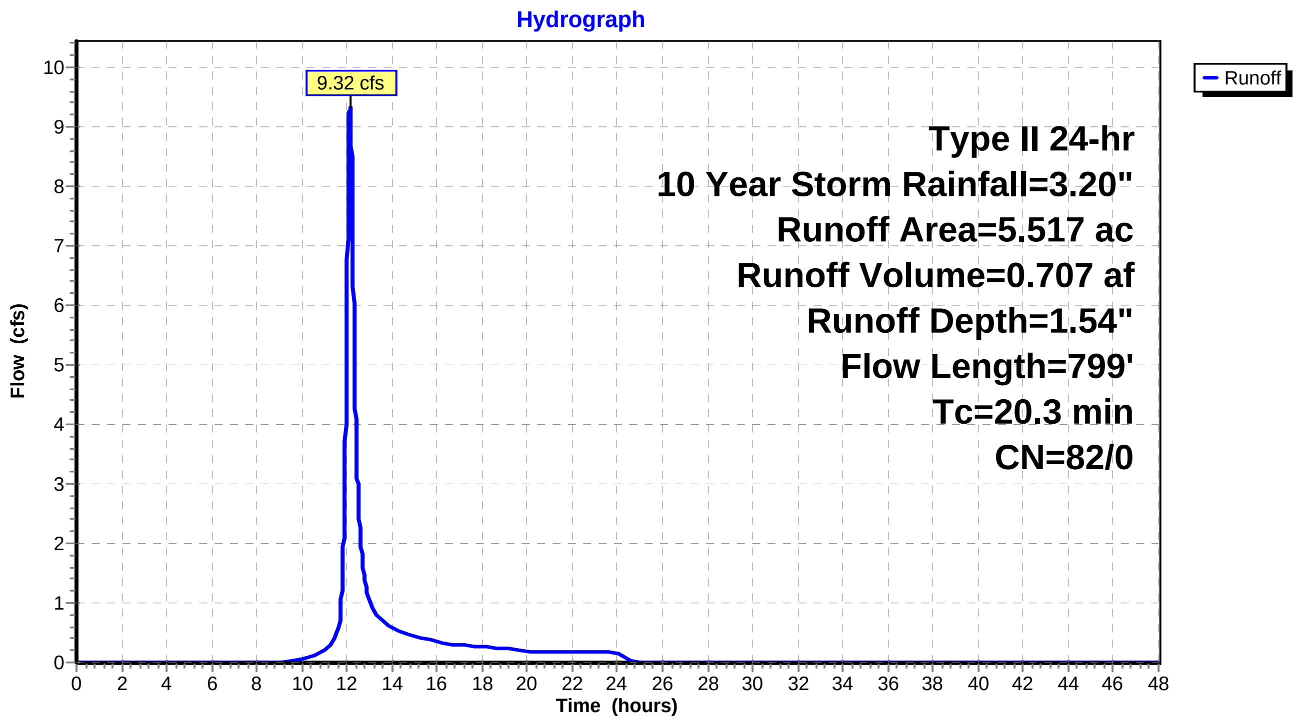
Runoff = 9.32 cfs @ 12.13 hrs, Volume= 0.707 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	5.517	82	weighted CN
	5.517	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0032	0.17		**Sheet Flow, roadside channel** Fallow n= 0.050 P2= 2.30"
9.5	518	0.0032	0.91		**Shallow Concentrated Flow, roadside channel** Unpaved Kv= 16.1 fps
0.8	181	0.0055	3.86	17.89	**Pipe Channel, CMP_Arch_1/2 35x24** 35.0" x 24.0", R=17.9"/55.1" Pipe Arch Area= 4.6 sf Perim= 7.9' r= n= 0.020 Corrugated PE, corrugated interior
20.3	799	Total			

Subcatchment OS8b: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

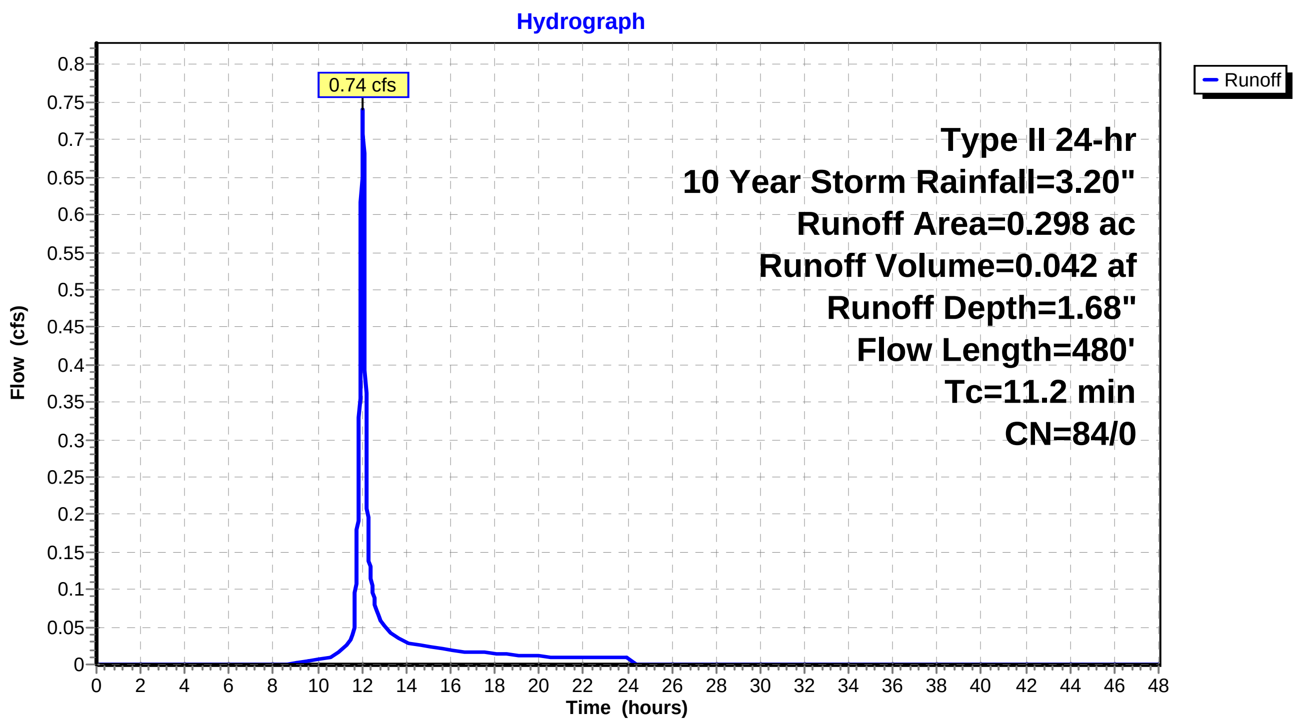
Runoff = 0.74 cfs @ 12.03 hrs, Volume= 0.042 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	0.298	84	weighted CN
	0.298	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	240	0.0243	2.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
11.2	480	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

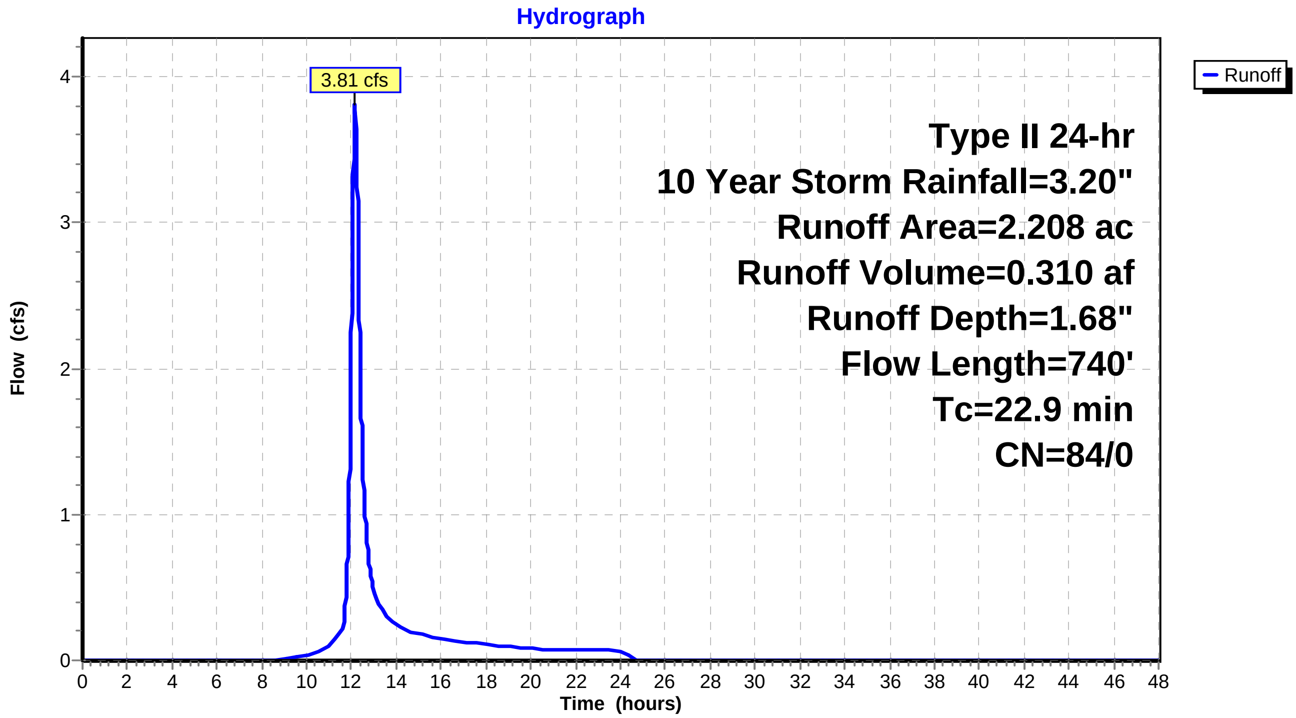
Runoff = 3.81 cfs @ 12.16 hrs, Volume= 0.310 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.208	84	weighted CN
	2.208	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8e: OS8e

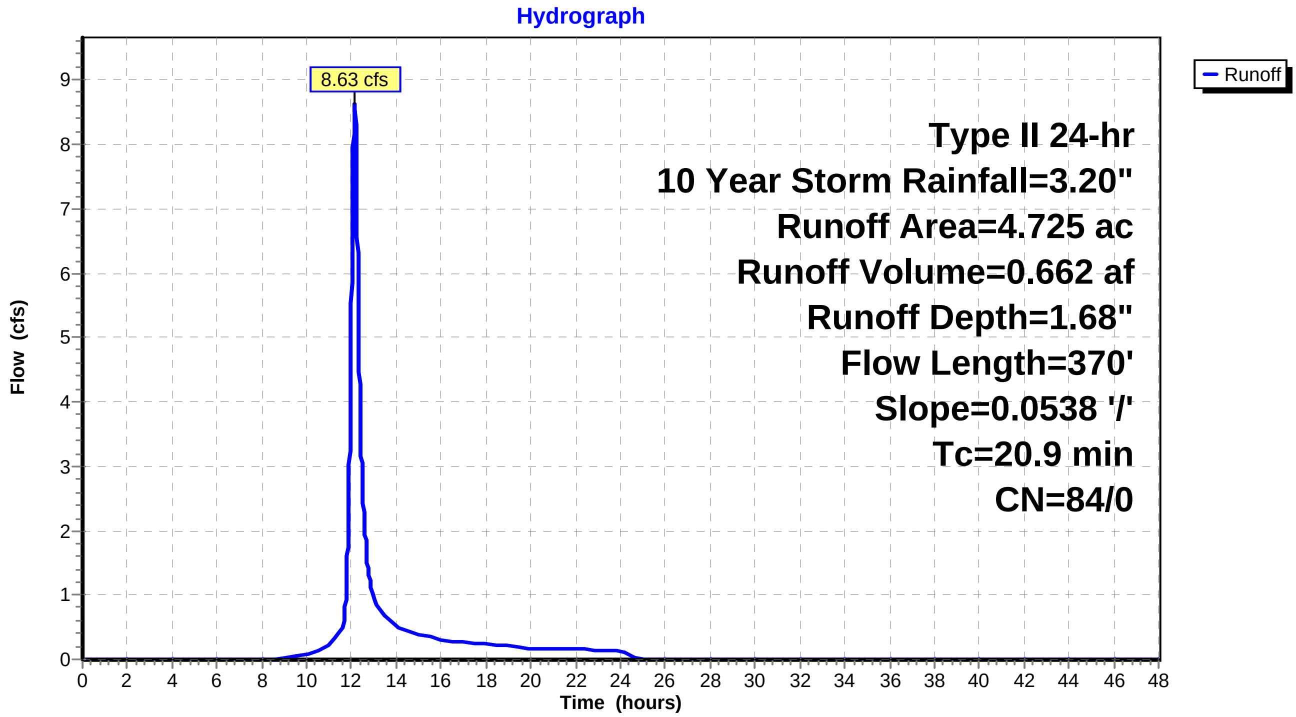
Runoff = 8.63 cfs @ 12.14 hrs, Volume= 0.662 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	4.725	84	weighted CN
	4.725	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0538	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
3.9	270	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	370	Total			

Subcatchment OS8e: OS8e



Summary for Subcatchment OS8_5: (new Subcat)

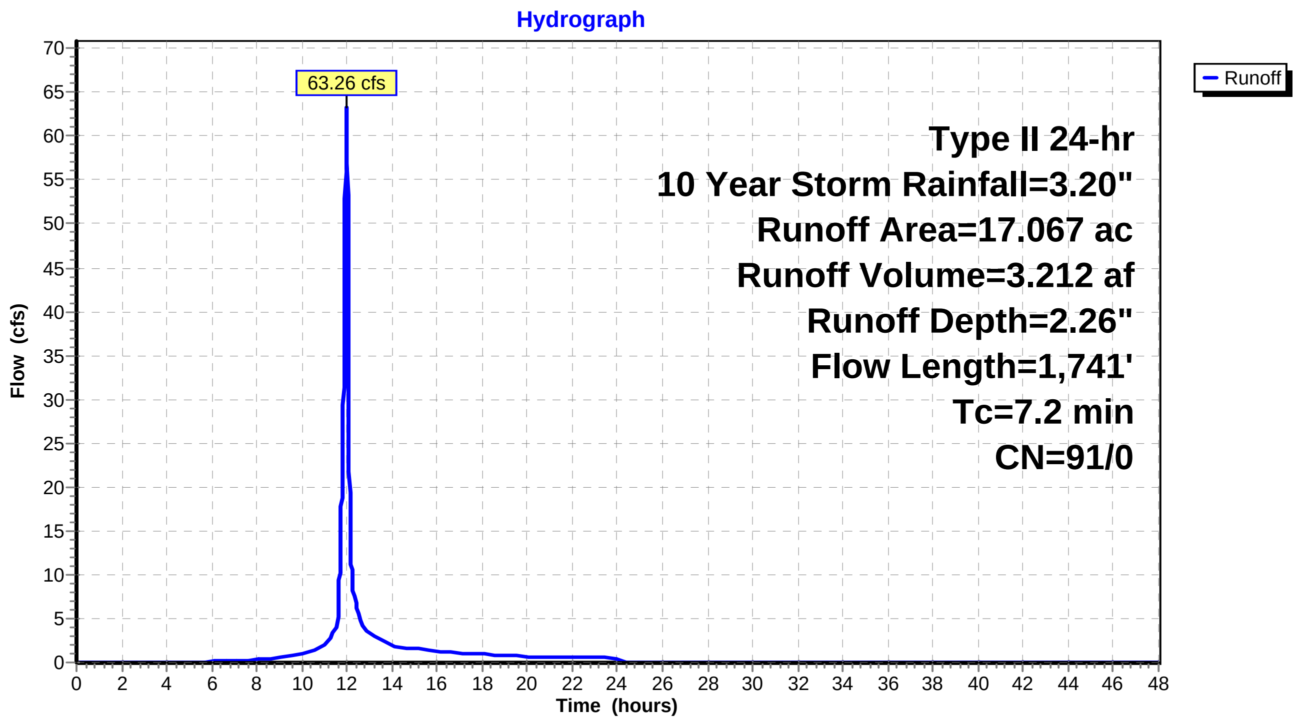
Runoff = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	17.067	91	weighted CN
	17.067	91	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



Summary for Reach R1: Reach through OS 1

Inflow Area = 349.371 ac, 2.26% Impervious, Inflow Depth > 1.11" for 10 Year Storm event
Inflow = 75.67 cfs @ 12.24 hrs, Volume= 32.416 af
Outflow = 75.07 cfs @ 12.27 hrs, Volume= 32.404 af, Atten= 1%, Lag= 1.6 min

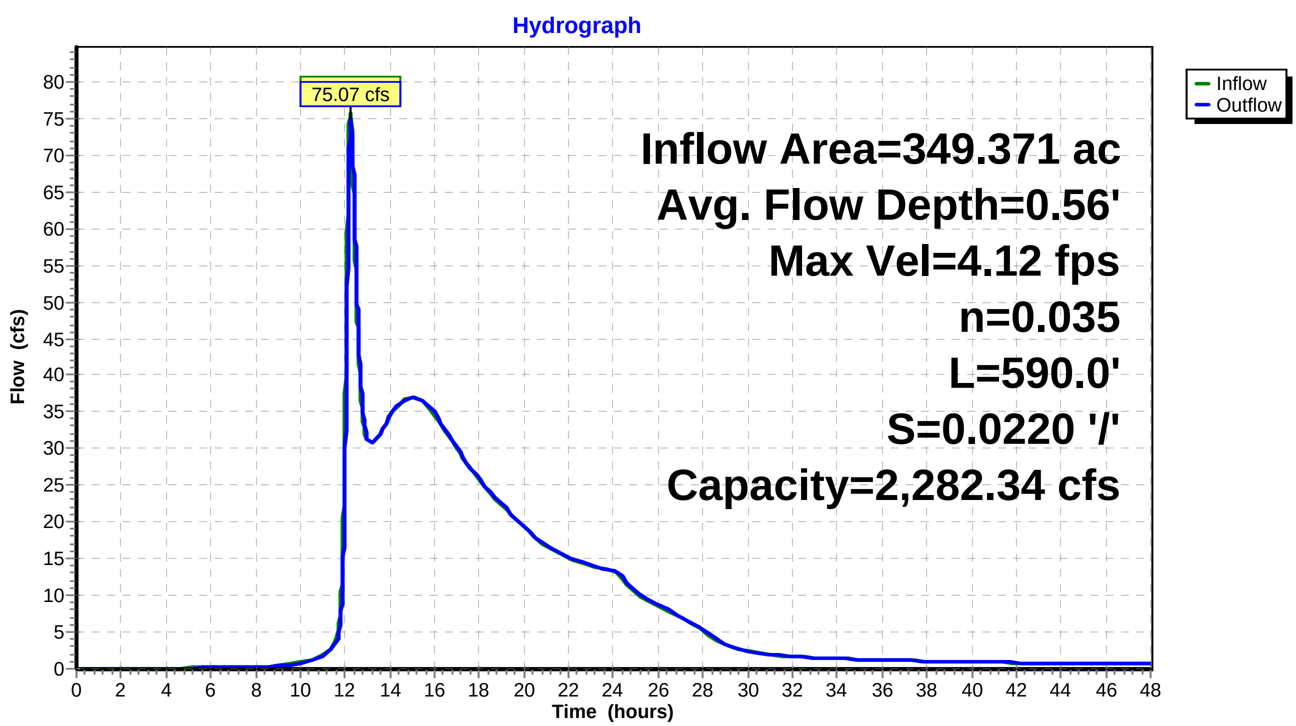
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 7.0 min

Peak Storage= 10,757 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 4.00' Flow Area= 172.0 sf, Capacity= 2,282.34 cfs

31.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 55.00'
Length= 590.0' Slope= 0.0220 '/'
Inlet Invert= 266.00', Outlet Invert= 253.00'

‡

Reach R1: Reach through OS 1



Summary for Reach R2: Reach through OS2

Inflow Area = 334.093 ac, 2.23% Impervious, Inflow Depth > 1.15" for 10 Year Storm event
Inflow = 74.68 cfs @ 12.22 hrs, Volume= 31.982 af
Outflow = 74.47 cfs @ 12.24 hrs, Volume= 31.977 af, Atten= 0%, Lag= 0.9 min

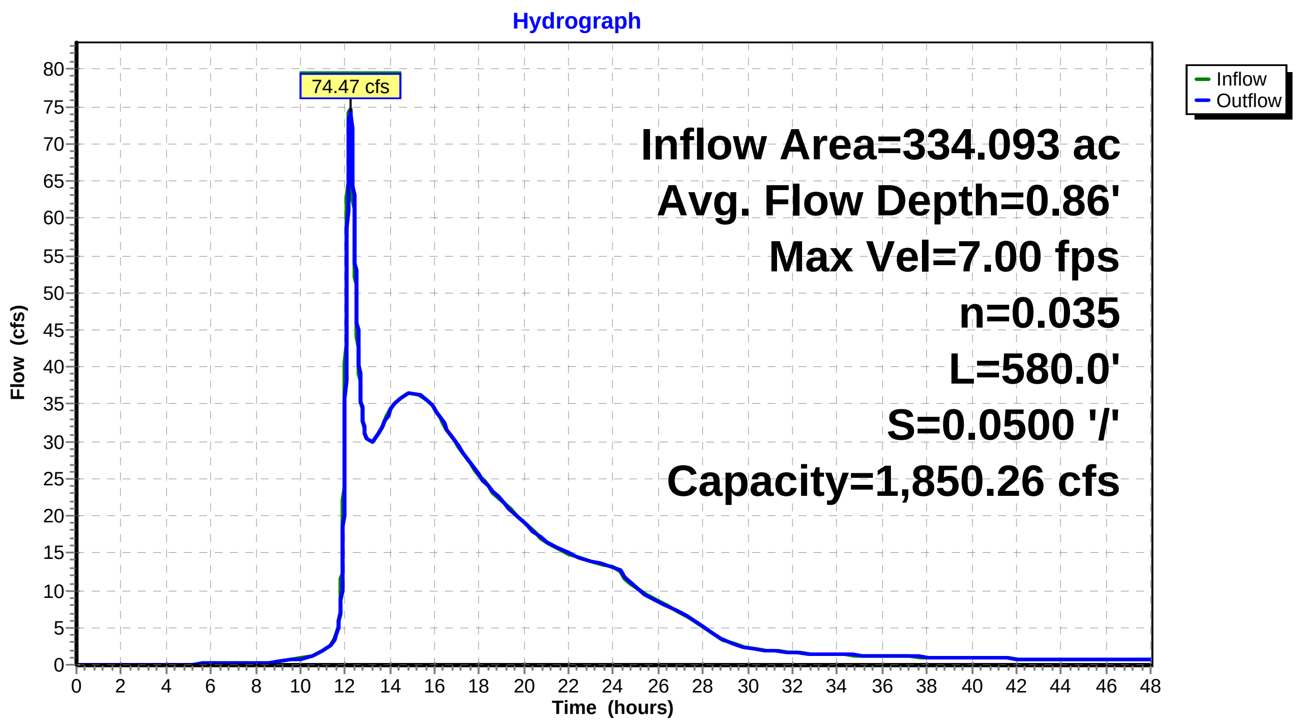
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.00 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 3.6 min

Peak Storage= 6,170 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.86'
Bank-Full Depth= 4.00' Flow Area= 112.0 sf, Capacity= 1,850.26 cfs

8.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 48.00'
Length= 580.0' Slope= 0.0500 '/'
Inlet Invert= 295.00', Outlet Invert= 266.00'

‡

Reach R2: Reach through OS2



Summary for Reach R3: Reach through OS3

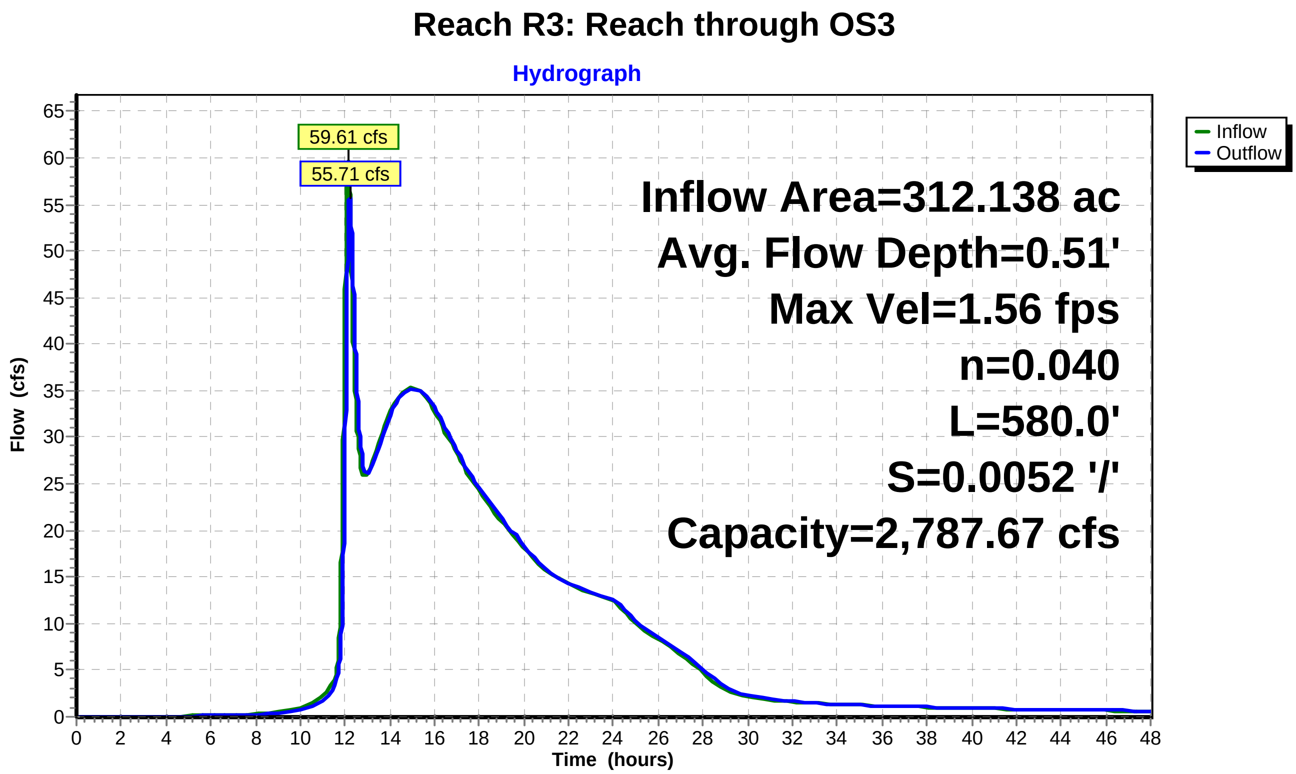
Inflow Area = 312.138 ac, 2.19% Impervious, Inflow Depth > 1.15" for 10 Year Storm event
Inflow = 59.61 cfs @ 12.14 hrs, Volume= 30.038 af
Outflow = 55.71 cfs @ 12.21 hrs, Volume= 30.012 af, Atten= 7%, Lag= 4.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.56 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 15.9 min

Peak Storage= 20,744 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 4.00' Flow Area= 560.0 sf, Capacity= 2,787.67 cfs

60.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 20.0 '/' Top Width= 220.00'
Length= 580.0' Slope= 0.0052 '/'
Inlet Invert= 298.00', Outlet Invert= 295.00'

‡



Summary for Reach R4: Reach through OS4

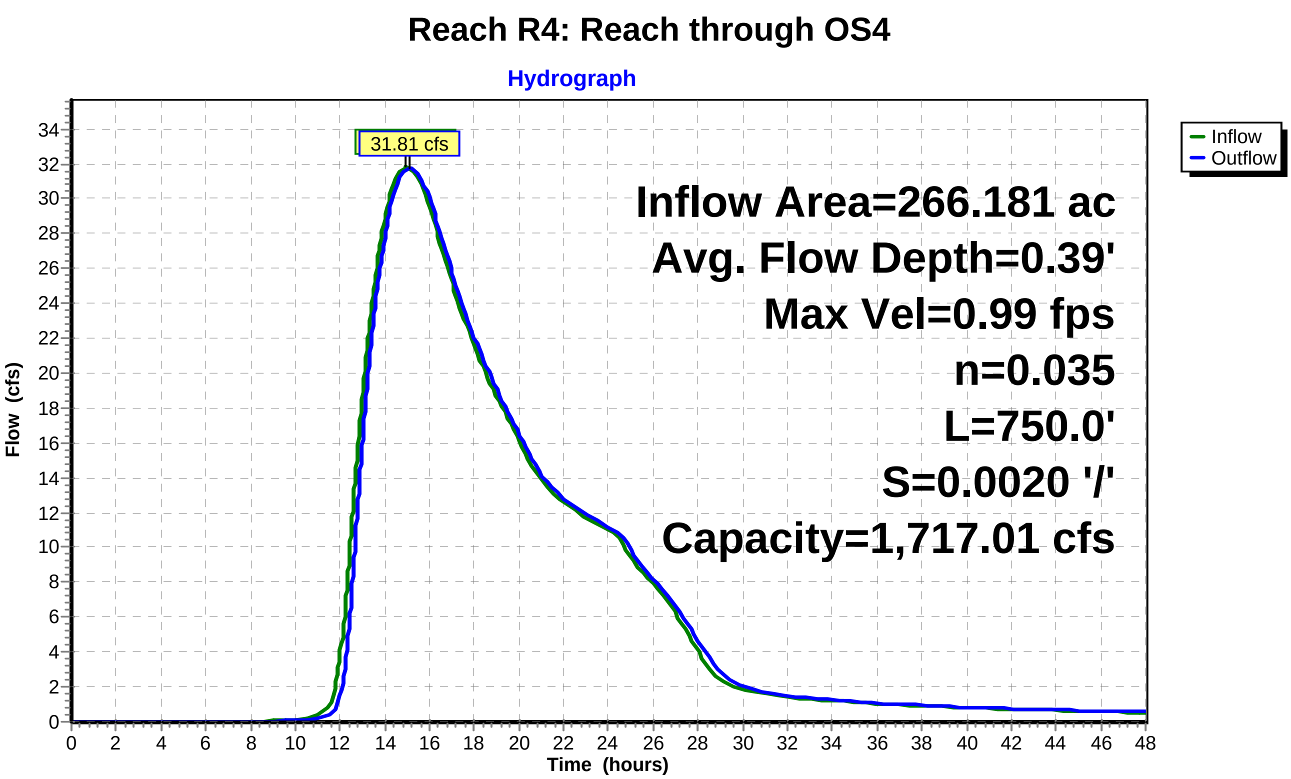
Inflow Area = 266.181 ac, 1.48% Impervious, Inflow Depth > 1.09" for 10 Year Storm event
Inflow = 31.86 cfs @ 14.97 hrs, Volume= 24.150 af
Outflow = 31.81 cfs @ 15.10 hrs, Volume= 24.107 af, Atten= 0%, Lag= 8.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.99 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 29.2 min

Peak Storage= 23,989 cf @ 15.10 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 4.00' Flow Area= 412.0 sf, Capacity= 1,717.01 cfs

80.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 6.5 '/' Top Width= 126.00'
Length= 750.0' Slope= 0.0020 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'

‡



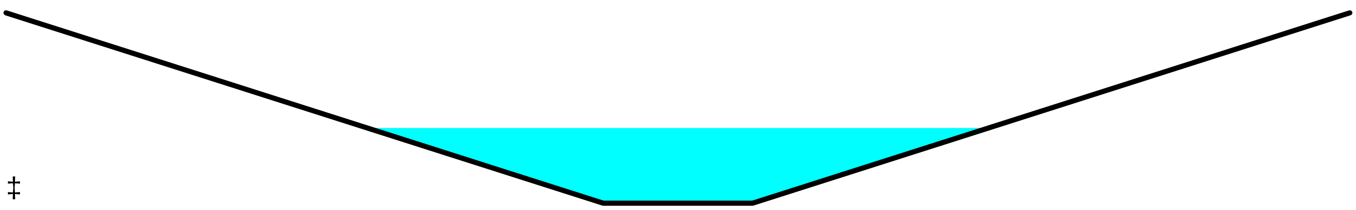
Summary for Reach R5: Ditch behind Spare Time

Inflow Area = 22.431 ac, 0.00% Impervious, Inflow Depth = 0.75" for 10 Year Storm event
Inflow = 5.16 cfs @ 13.27 hrs, Volume= 1.411 af
Outflow = 5.13 cfs @ 13.31 hrs, Volume= 1.411 af, Atten= 1%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 9.1 min

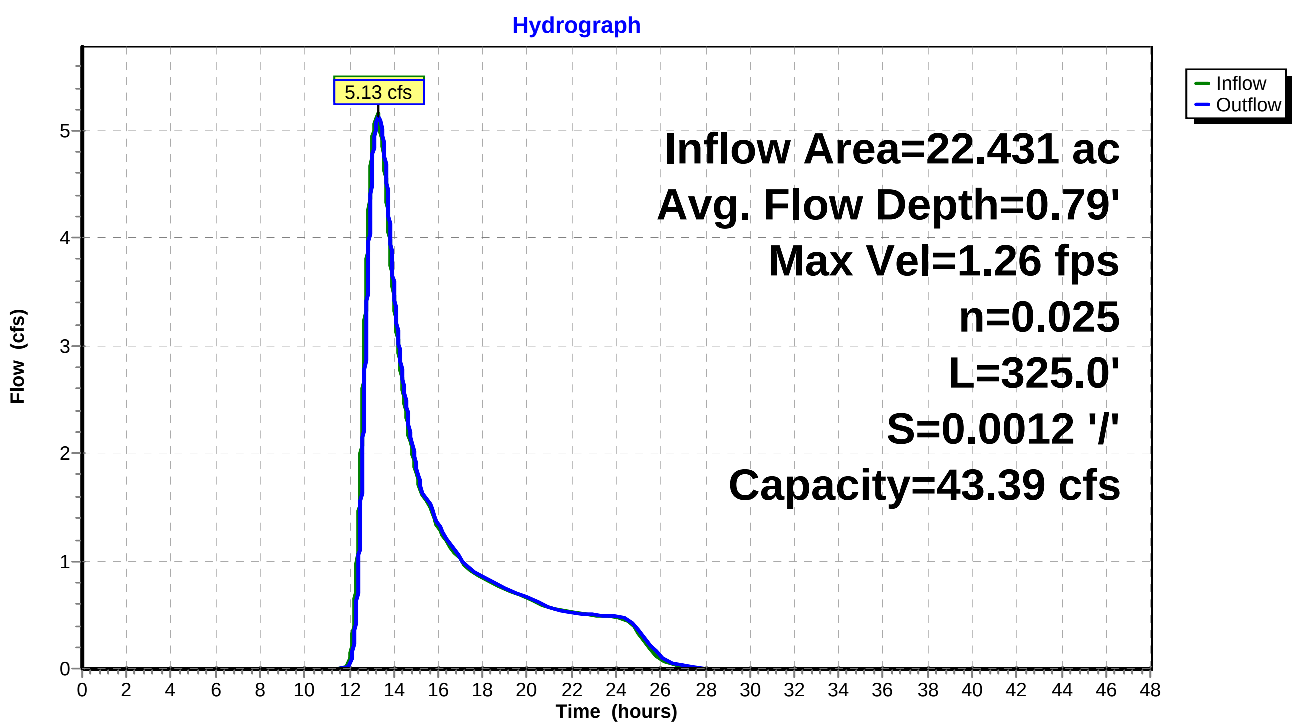
Peak Storage= 1,324 cf @ 13.31 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 43.39 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 325.0' Slope= 0.0012 '/'
Inlet Invert= 312.00', Outlet Invert= 311.61'



‡

Reach R5: Ditch behind Spare Time



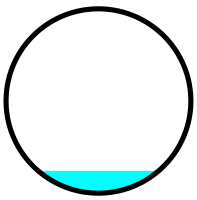
Summary for Reach X12: Pipe X12

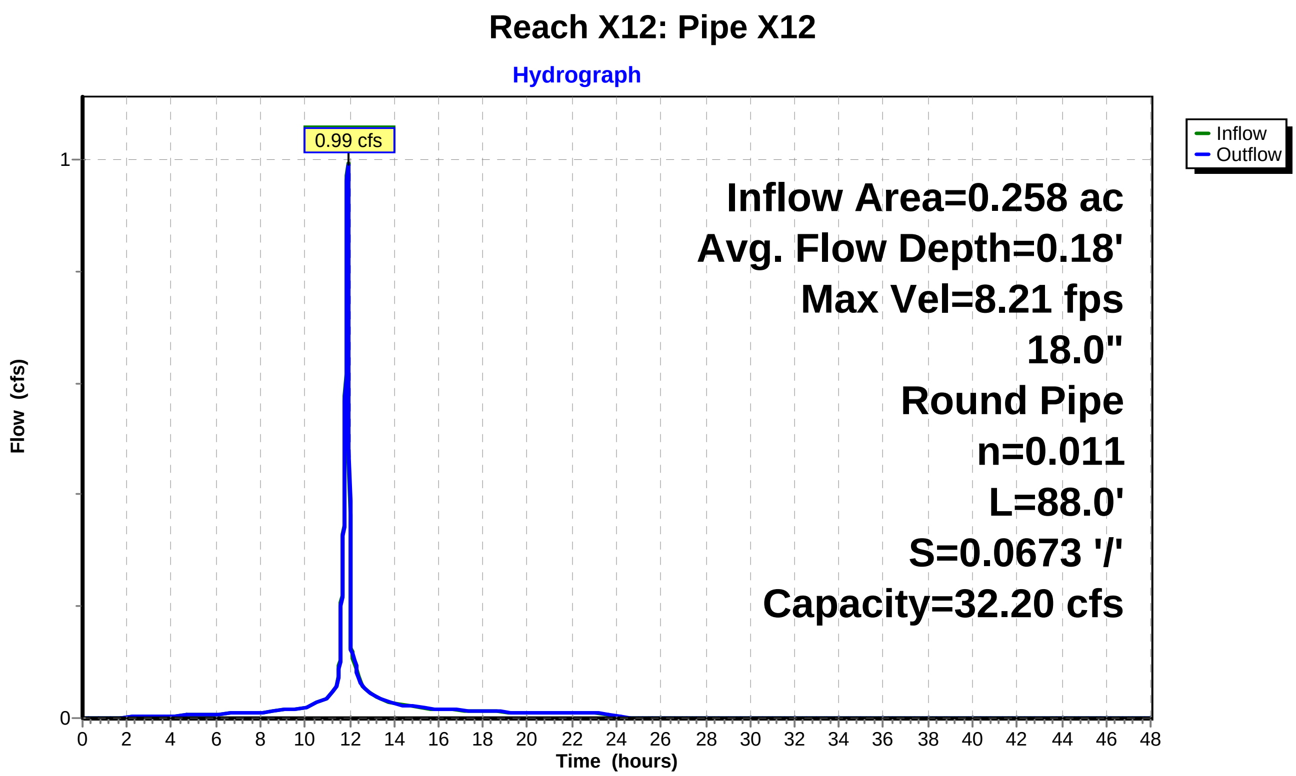
Inflow Area = 0.258 ac, 63.95% Impervious, Inflow Depth = 2.16" for 10 Year Storm event
Inflow = 0.99 cfs @ 11.92 hrs, Volume= 0.046 af
Outflow = 0.99 cfs @ 11.92 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.21 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.6 min

Peak Storage= 11 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 32.20 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 88.0' Slope= 0.0673 '/'
Inlet Invert= 330.50', Outlet Invert= 324.58'





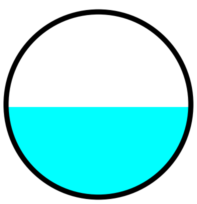
Summary for Reach X14: Pipe X14

Inflow Area = 5.470 ac, 5.39% Impervious, Inflow Depth = 1.73" for 10 Year Storm event
Inflow = 8.97 cfs @ 12.14 hrs, Volume= 0.788 af
Outflow = 8.96 cfs @ 12.14 hrs, Volume= 0.788 af, Atten= 0%, Lag= 0.3 min

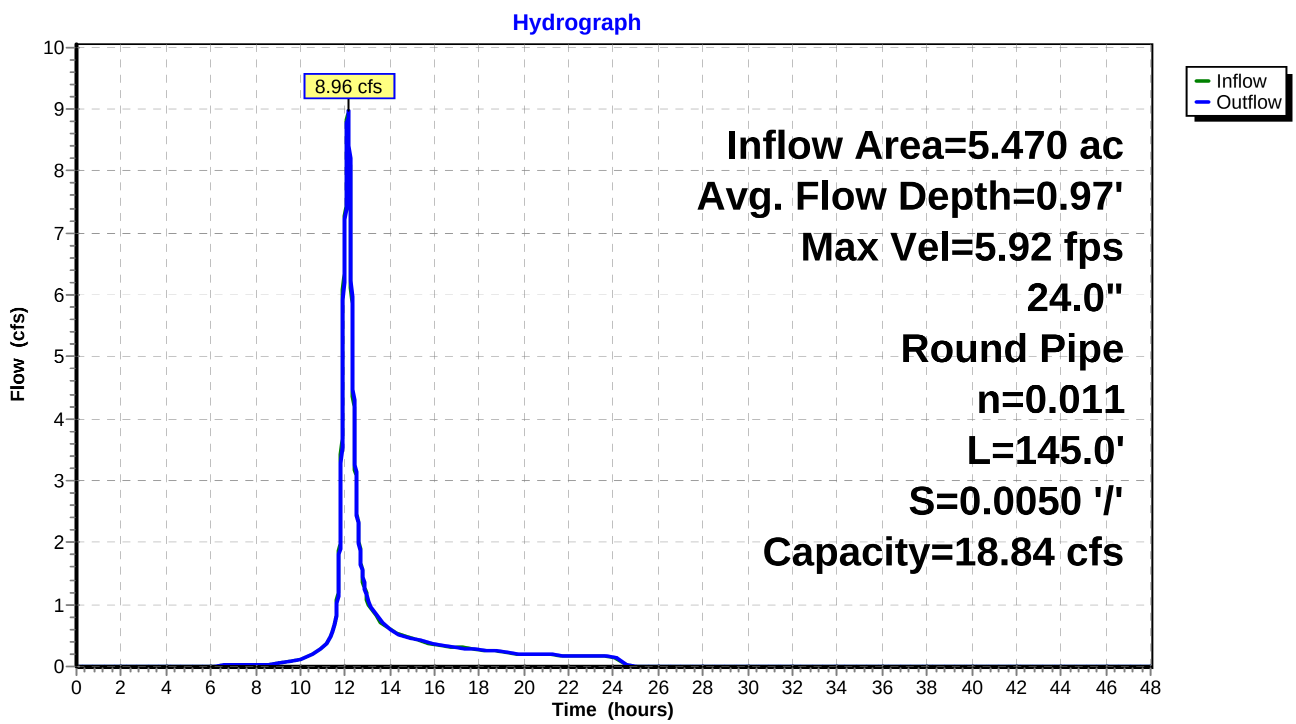
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.92 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 1.4 min

Peak Storage= 219 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.97'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 18.84 cfs

24.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 145.0' Slope= 0.0050 '/'
Inlet Invert= 324.02', Outlet Invert= 323.30'



Reach X14: Pipe X14



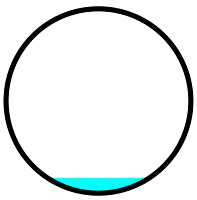
Summary for Reach X8: Pipe X8

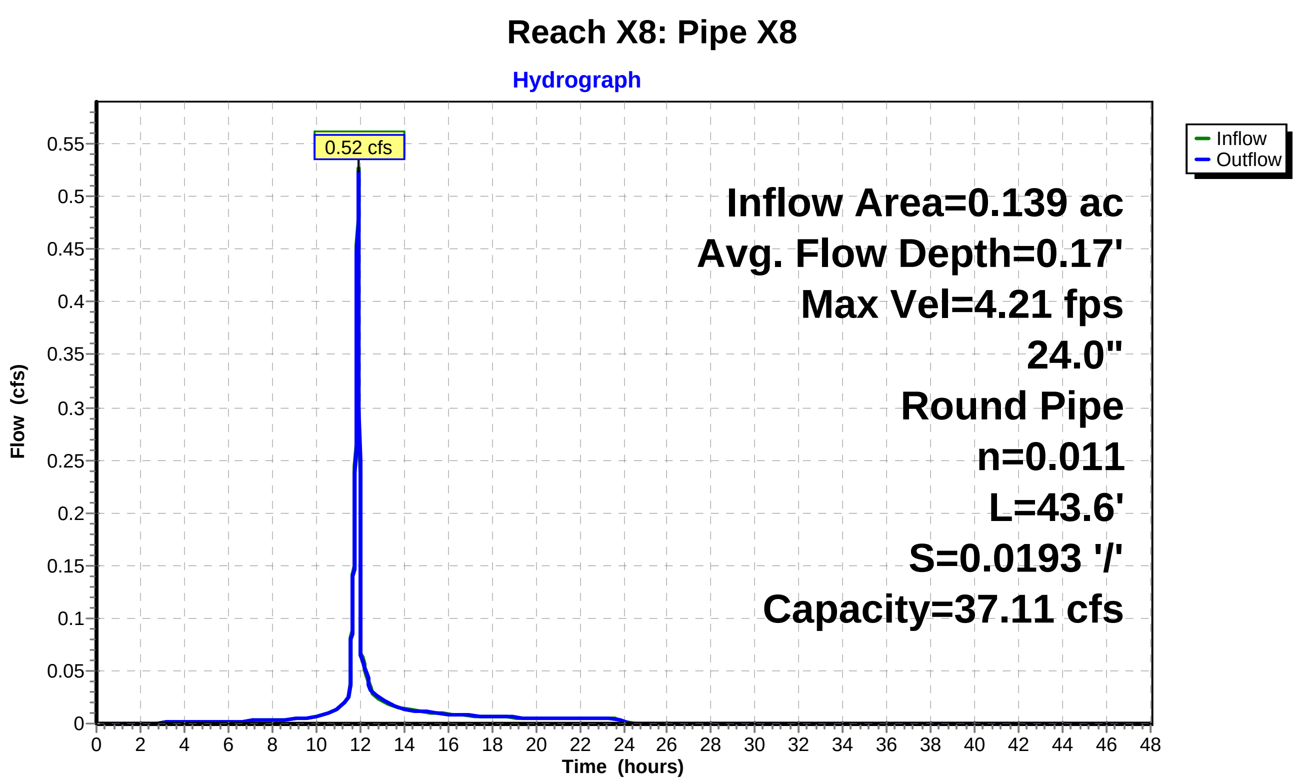
Inflow Area = 0.139 ac, 33.81% Impervious, Inflow Depth = 1.93" for 10 Year Storm event
Inflow = 0.53 cfs @ 11.91 hrs, Volume= 0.022 af
Outflow = 0.52 cfs @ 11.91 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.21 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 0.6 min

Peak Storage= 5 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 37.11 cfs

24.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 43.6' Slope= 0.0193 '/'
Inlet Invert= 327.35', Outlet Invert= 326.51'





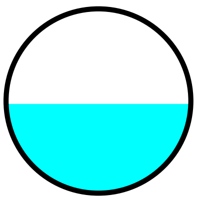
Summary for Reach X9: Pipe X9

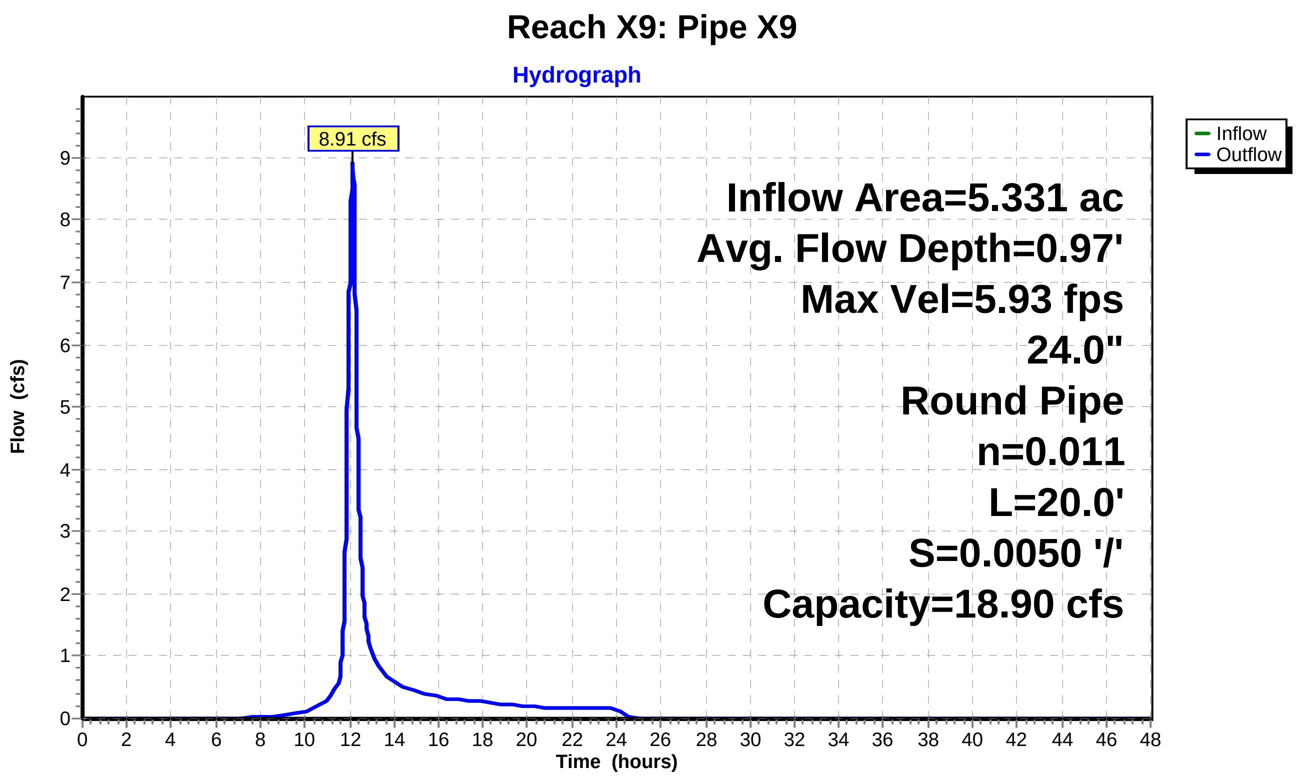
Inflow Area = 5.331 ac, 4.65% Impervious, Inflow Depth = 1.72" for 10 Year Storm event
Inflow = 8.91 cfs @ 12.14 hrs, Volume= 0.766 af
Outflow = 8.91 cfs @ 12.14 hrs, Volume= 0.766 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.93 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 0.2 min

Peak Storage= 30 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.97'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 18.90 cfs

24.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 20.0' Slope= 0.0050 '/'
Inlet Invert= 327.02', Outlet Invert= 326.92'





Summary for Pond 1P: Hercules Drive / S/N 005

Upstream end of Hercules Drive culvert represents S/N 005

Inflow Area = 266.181 ac, 1.48% Impervious, Inflow Depth > 1.09" for 10 Year Storm event
Inflow = 32.44 cfs @ 14.55 hrs, Volume= 24.158 af
Outflow = 31.86 cfs @ 14.97 hrs, Volume= 24.150 af, Atten= 2%, Lag= 24.7 min
Primary = 31.86 cfs @ 14.97 hrs, Volume= 24.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 300.01' Surf.Area= 698 sf Storage= 262 cf
Peak Elev= 302.19' @ 14.97 hrs Surf.Area= 37,631 sf Storage= 31,202 cf (30,940 cf above start)

Plug-Flow detention time= 12.7 min calculated for 24.144 af (100% of inflow)
Center-of-Mass det. time= 11.5 min (1,170.9 - 1,159.3)

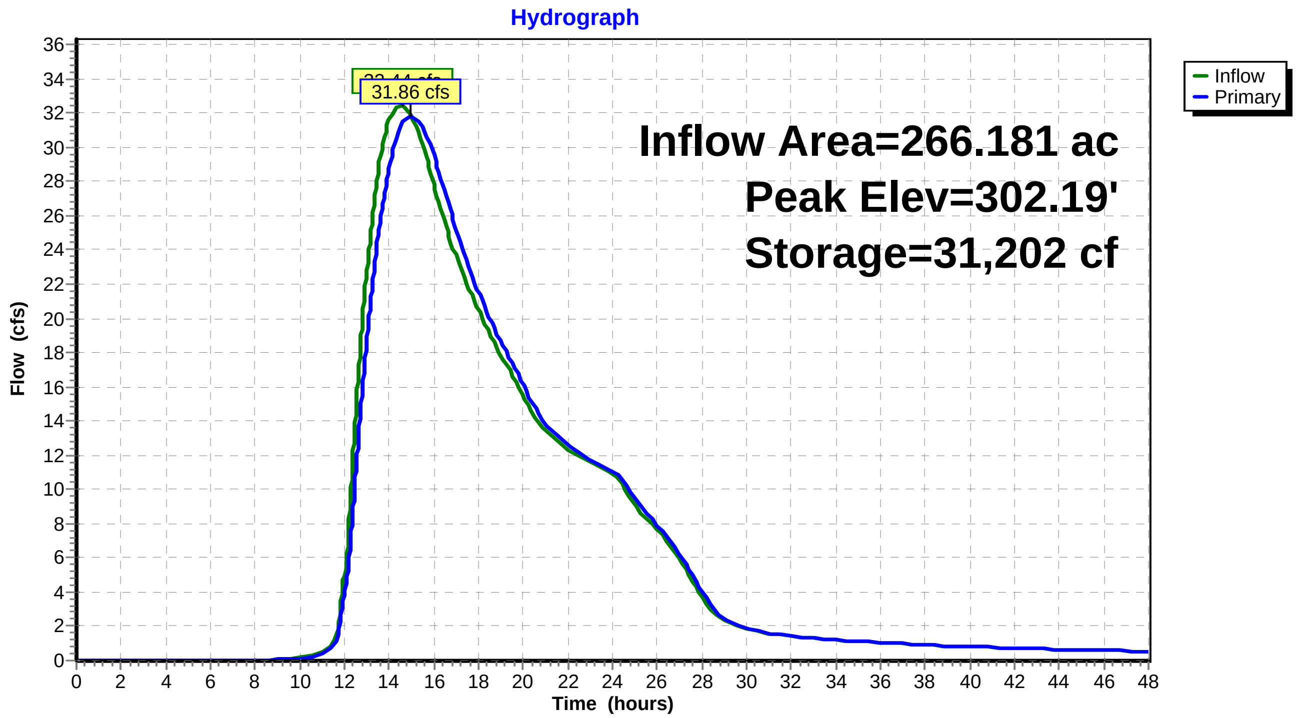
Volume	Invert	Avail.Storage	Storage Description
#1	299.00'	289,977 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
299.00	12	38.0	0	0	12
300.00	664	524.0	255	255	21,749
301.00	8,419	934.0	3,816	4,071	69,324
302.00	34,889	1,232.0	20,149	24,220	120,701
303.00	50,252	1,311.0	42,338	66,557	136,738
304.00	63,333	1,347.0	56,667	123,224	144,468
306.00	105,180	1,900.0	166,753	289,977	287,393

Device	Routing	Invert	Outlet Devices
#1	Primary	300.01'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.01' / 299.50' S= 0.0067 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf
#2	Primary	300.07'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 299.72' / 300.07' S= -0.0046 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf

Primary OutFlow Max=31.85 cfs @ 14.97 hrs HW=302.19' TW=299.89' (Dynamic Tailwater)
1=Culvert (Barrel Controls 16.68 cfs @ 4.23 fps)
2=Culvert (Barrel Controls 15.17 cfs @ 3.31 fps)

Pond 1P: Hercules Drive / S/N 005



Summary for Pond 2P: Lower Mtn View Dr

Inflow Area =	107.210 ac,	3.51% Impervious, Inflow Depth > 1.23"	for 10 Year Storm event	
Inflow =	66.51 cfs @	12.12 hrs, Volume=	10.984 af	
Outflow =	14.01 cfs @	12.72 hrs, Volume=	10.980 af,	Atten= 79%, Lag= 36.3 min
Primary =	14.01 cfs @	12.72 hrs, Volume=	10.980 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 1,916 sf Storage= 898 cf
Peak Elev= 309.98' @ 13.10 hrs Surf.Area= 97,209 sf Storage= 94,287 cf (93,389 cf above start)

Plug-Flow detention time= 50.8 min calculated for 10.958 af (100% of inflow)
Center-of-Mass det. time= 45.2 min (1,129.2 - 1,084.0)

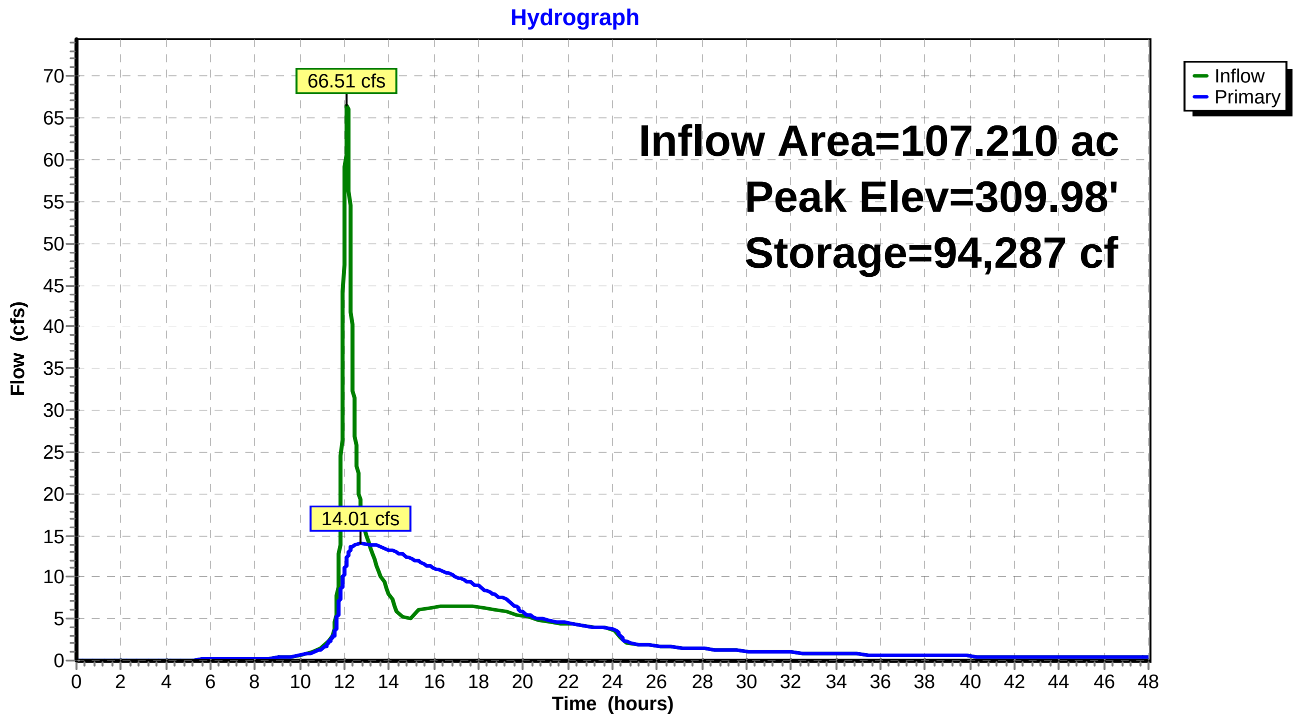
Volume	Invert	Avail.Storage	Storage Description
#1	305.81'	2,697,851 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.81	0	20.0	0	0	0
306.00	86	86.0	5	5	557
307.00	523	295.0	274	279	6,896
308.00	3,791	669.0	1,907	2,187	35,591
309.00	48,653	2,441.0	22,008	24,195	474,139
310.00	98,391	2,208.0	72,077	96,272	560,370
312.00	463,287	3,621.0	516,787	613,059	1,215,826
316.50	463,287	3,621.0	2,084,792	2,697,851	1,232,120

Device	Routing	Invert	Outlet Devices
#1	Primary	305.81'	**24.0" Round Culvert** L= 102.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 305.81' / 304.74' S= 0.0105 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Primary	316.13'	**190.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=14.01 cfs @ 12.72 hrs HW=309.95' TW=307.91' (Dynamic Tailwater)
1=Culvert (Outlet Controls 14.01 cfs @ 4.46 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: Lower Mtn View Dr

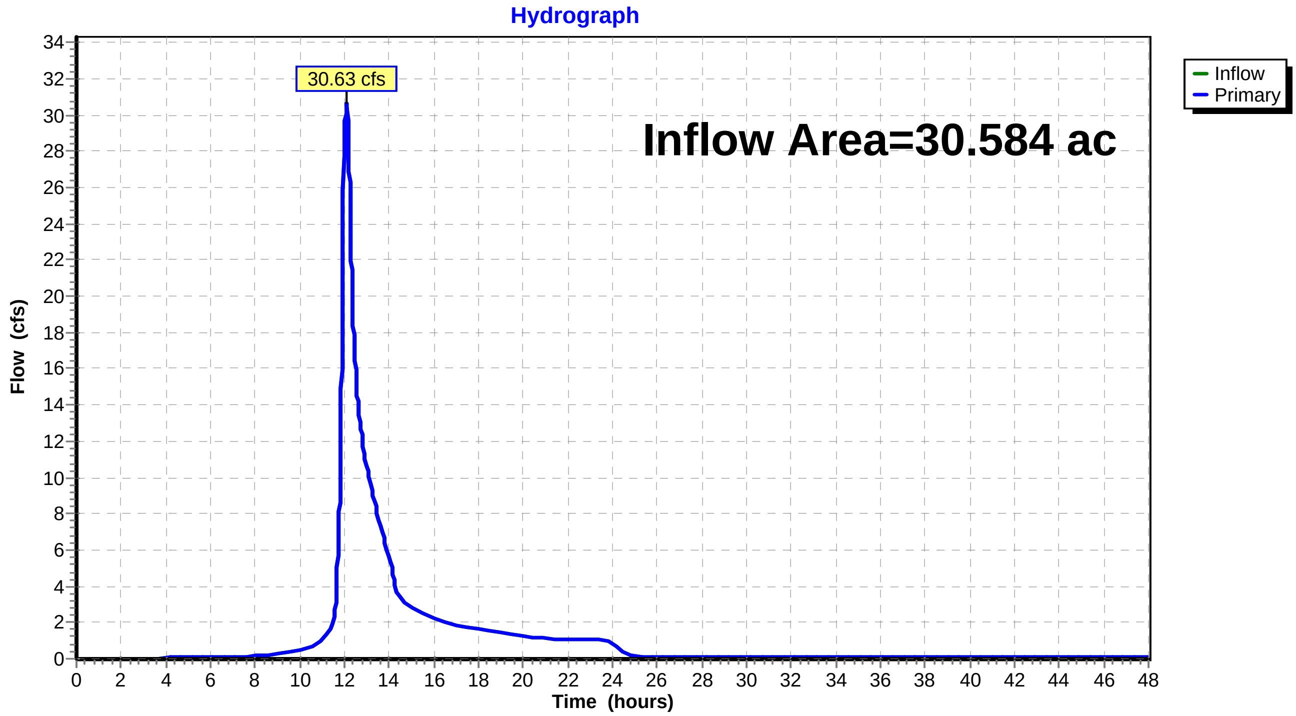


Summary for Pond 008: POI 008

Inflow Area = 30.584 ac, 6.26% Impervious, Inflow Depth > 1.74" for 10 Year Storm event
Inflow = 30.63 cfs @ 12.11 hrs, Volume= 4.443 af
Primary = 30.63 cfs @ 12.11 hrs, Volume= 4.443 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Pond 008: POI 008



Summary for Pond P1: Behind Health Lab

Inflow Area = 8.195 ac, 0.00% Impervious, Inflow Depth = 0.83" for 10 Year Storm event
Inflow = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af
Outflow = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.17' @ 25.92 hrs Surf.Area= 141,660 sf Storage= 24,634 cf

Plug-Flow detention time= 3.3 min calculated for 0.000 af (0% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

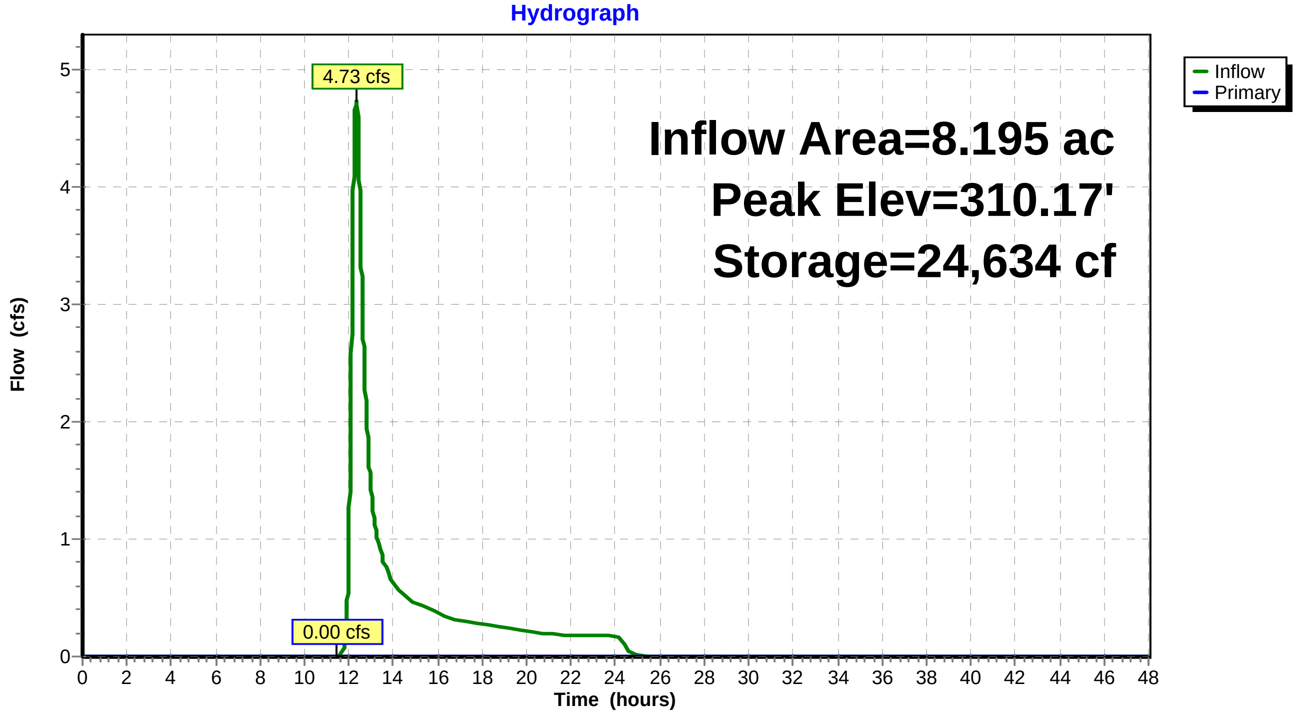
Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	372,741 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	140,477	1,706.0	0	0	140,477
312.50	157,885	1,775.0	372,741	372,741	160,080

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 3.00 9.00

Primary OutFlow Max=0.00 cfs @ 11.47 hrs HW=310.00' TW=310.03' (Dynamic Tailwater)
└─**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond P1: Behind Health Lab



Summary for Pond P10: Reach between LMV and Hercules

Inflow Area =	265.879 ac,	1.42% Impervious, Inflow Depth > 1.10"	for 10 Year Storm event	
Inflow =	32.62 cfs @	14.10 hrs, Volume=	24.266 af	
Outflow =	32.41 cfs @	14.56 hrs, Volume=	24.100 af,	Atten= 1%, Lag= 27.3 min
Primary =	32.41 cfs @	14.56 hrs, Volume=	24.100 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 88,869 sf Storage= 3,516 cf
Peak Elev= 308.04' @ 14.56 hrs Surf.Area= 115,526 sf Storage= 54,645 cf (51,129 cf above start)

Plug-Flow detention time= 49.4 min calculated for 24.020 af (99% of inflow)
Center-of-Mass det. time= 31.4 min (1,160.3 - 1,128.9)

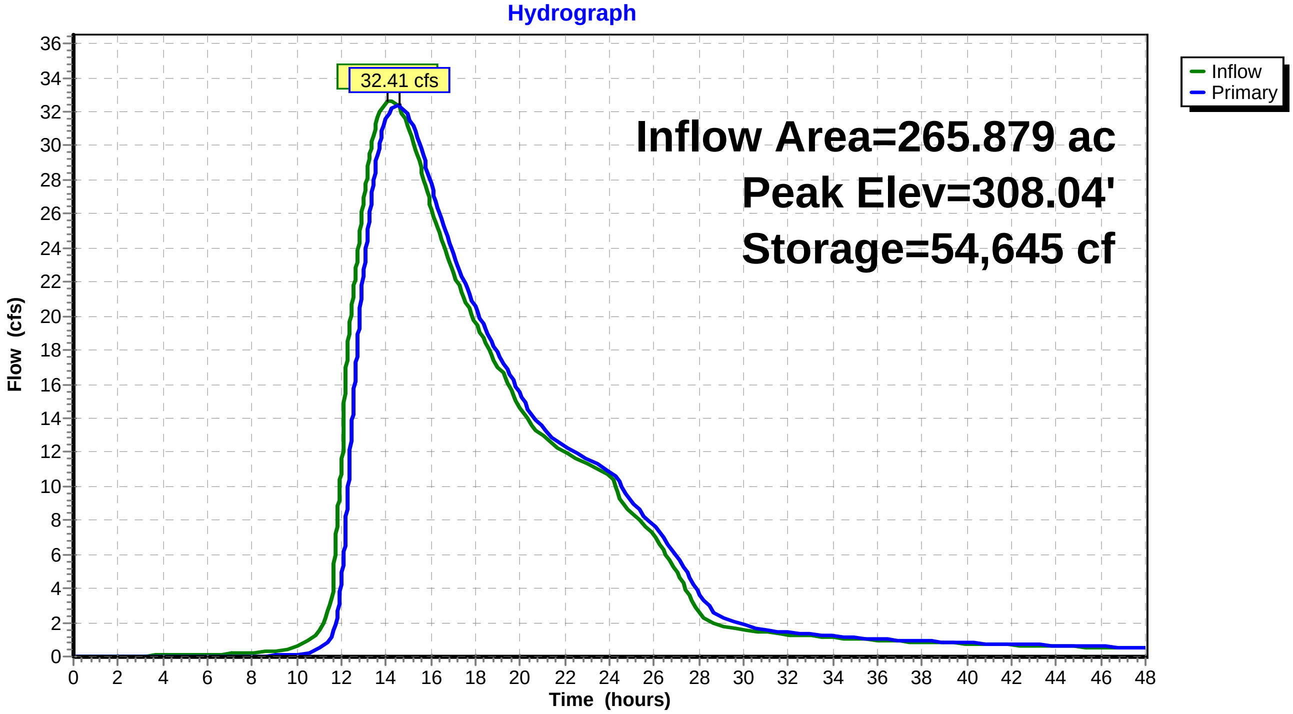
Volume	Invert	Avail.Storage	Storage Description
#1	307.50'	114,777 cf	**Storage 1066' DS of LMV (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
307.50	86,932	3,099.0	0	0	86,932
308.00	112,678	3,270.0	49,764	49,764	173,614
308.50	148,186	3,641.0	65,014	114,777	377,657

Device	Routing	Invert	Outlet Devices
#1	Primary	307.54'	**Asymmetrical Weir, C= 3.27** Offset (feet) -143.00 -133.00 -52.00 -41.00 -21.00 -11.00 0.00 21.00 38.00 60.00 88.00 Elev. (feet) 310.00 309.18 309.07 309.34 308.76 307.71 307.54 307.67 308.66 309.24 310.00

Primary OutFlow Max=32.41 cfs @ 14.56 hrs HW=308.04' TW=302.17' (Dynamic Tailwater)
↑—**1=Asymmetrical Weir** (Weir Controls 32.41 cfs @ 1.66 fps)

Pond P10: Reach between LMV and Hercules



Summary for Pond P2/3: Upstream of Park Drive

Inflow Area = 29.664 ac, 0.00% Impervious, Inflow Depth = 0.88" for 10 Year Storm event
Inflow = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af
Outflow = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af, Atten= 97%, Lag= 219.0 min
Primary = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.77' @ 15.63 hrs Surf.Area= 84,106 sf Storage= 57,533 cf

Plug-Flow detention time= 647.0 min calculated for 1.790 af (83% of inflow)
Center-of-Mass det. time= 568.5 min (1,417.6 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	128,517 cf	**Pond 2 (Irregular)** Listed below (Recalc)
#2	310.00'	83,492 cf	**Pond 3 (Irregular)** Listed below (Recalc)
		212,008 cf	Total Available Storage

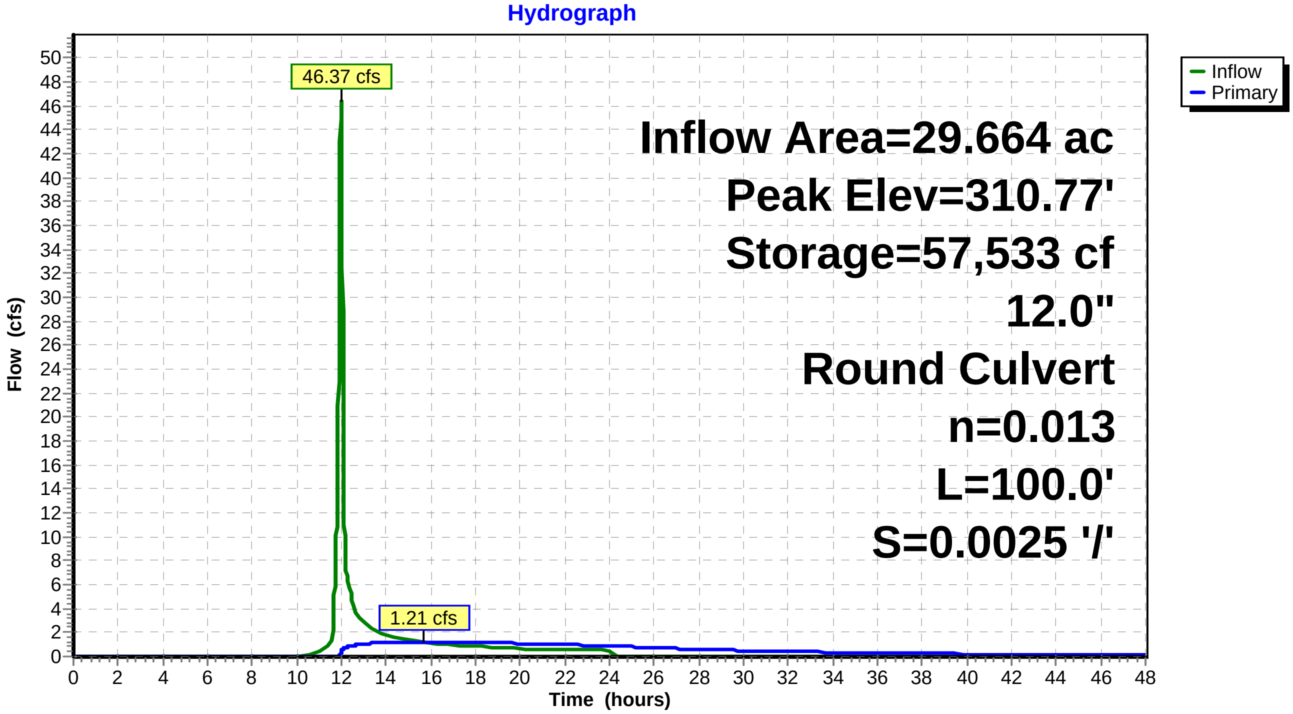
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	39,781	975.0	0	0	39,781
312.25	76,433	1,197.0	128,517	128,517	78,230

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	25,767	687.0	0	0	25,767
312.25	49,751	855.0	83,492	83,492	46,455

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**12.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 310.00' / 309.75' S= 0.0025 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 15.63 hrs HW=310.77' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.21 cfs @ 2.57 fps)

Pond P2/3: Upstream of Park Drive



Summary for Pond P4: Upstream of Interstate

Inflow Area = 48.797 ac, 2.71% Impervious, Inflow Depth > 0.95" for 10 Year Storm event
Inflow = 16.73 cfs @ 11.96 hrs, Volume= 3.872 af
Outflow = 3.63 cfs @ 18.39 hrs, Volume= 3.726 af, Atten= 78%, Lag= 385.7 min
Primary = 3.63 cfs @ 18.39 hrs, Volume= 3.726 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.61' @ 15.70 hrs Surf.Area= 122,812 sf Storage= 78,154 cf

Plug-Flow detention time= 412.5 min calculated for 3.726 af (96% of inflow)
Center-of-Mass det. time= 356.0 min (1,469.3 - 1,113.3)

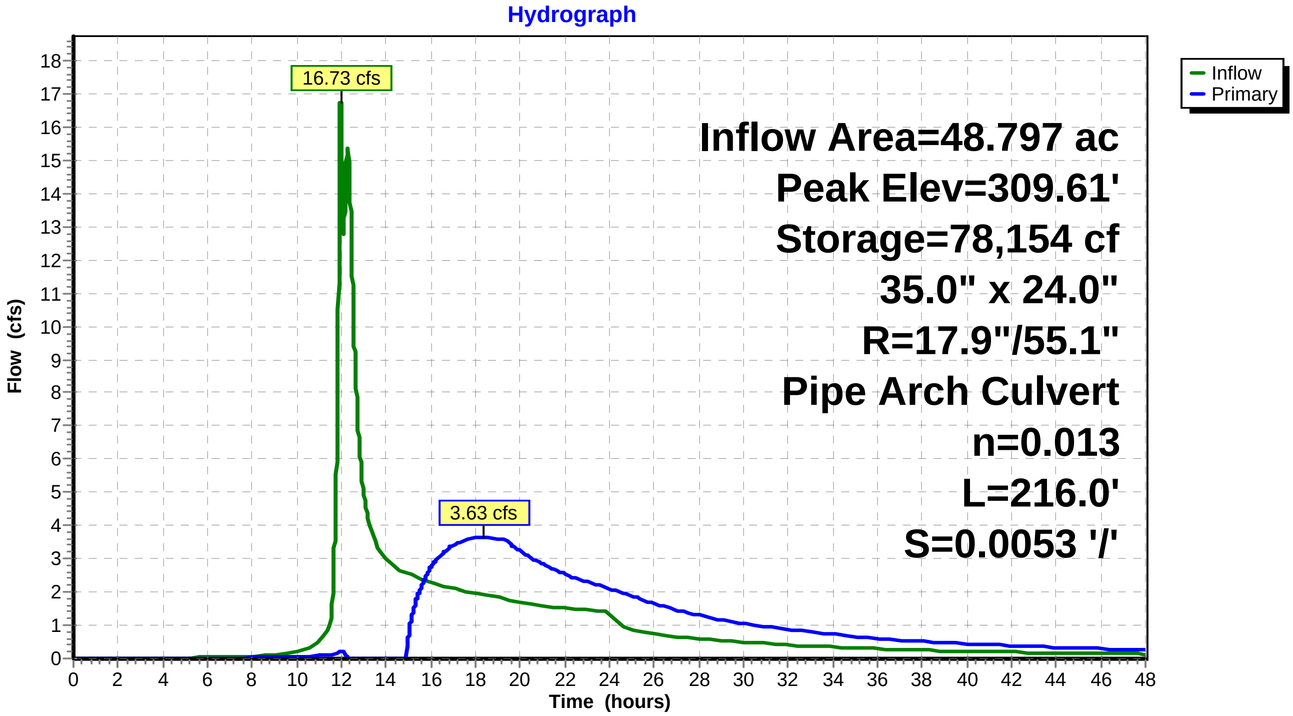
Volume	Invert	Avail.Storage	Storage Description
#1	308.84'	264,873 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.84	100	40.0	0	0	100
309.00	113,232	2,956.0	6,224	6,224	695,316
311.00	146,115	3,003.0	258,649	264,873	718,386

Device	Routing	Invert	Outlet Devices
#1	Primary	308.84'	**35.0" W x 24.0" H, R=17.9"/55.1" Pipe Arch CMP_Arch_1/2 35x24** L= 216.0' Ke= 0.500 Inlet / Outlet Invert= 308.84' / 307.69' S= 0.0053 '/' Cc= 0.900 n= 0.013 Asphalt, smooth, Flow Area= 4.63 sf

Primary OutFlow Max=3.64 cfs @ 18.39 hrs HW=309.52' TW=308.65' (Dynamic Tailwater)
└─**1=CMP_Arch_1/2 35x24** (Outlet Controls 3.64 cfs @ 3.15 fps)

Pond P4: Upstream of Interstate



Summary for Pond P5: in Shaws Parking

Data from Champlain Consulting Engineers 8 SEP 00

Inflow Area = 17.067 ac, 0.00% Impervious, Inflow Depth = 2.26" for 10 Year Storm event
Inflow = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af
Outflow = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af, Atten= 84%, Lag= 14.0 min
Primary = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 358.34' @ 12.22 hrs Surf.Area= 21,910 sf Storage= 73,625 cf

Plug-Flow detention time= 279.0 min calculated for 2.324 af (72% of inflow)
Center-of-Mass det. time= 185.0 min (985.5 - 800.5)

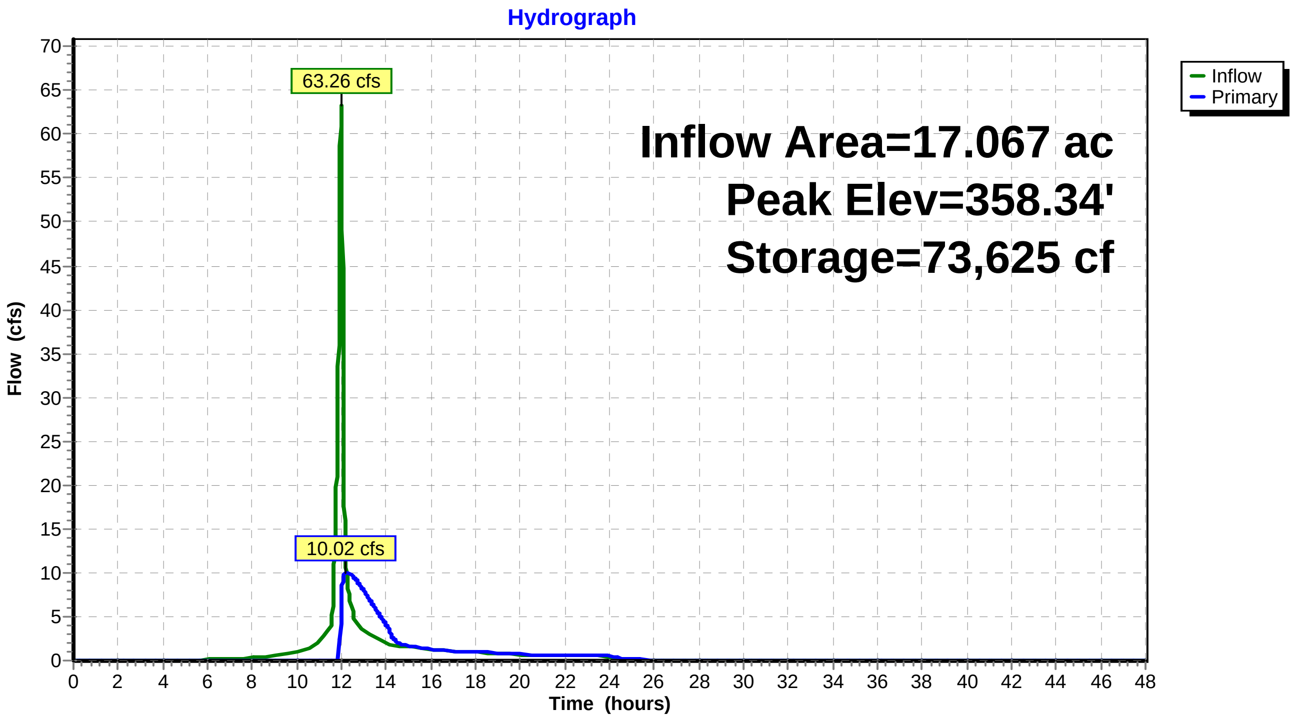
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.02 cfs @ 12.22 hrs HW=358.34' TW=351.98' (Dynamic Tailwater)
—**1=2" ORIFICE/GRATE** (Orifice Controls 0.16 cfs @ 7.21 fps)
—**2=6" HORIZONTAL ORIFICE/GRATE X9** (Orifice Controls 9.87 cfs @ 5.58 fps)
—**3=18" HORIZONTAL ORIFICE/GRATE** (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Pond P6: next to Spare Time

Inflow Area =	7.318 ac,	0.00% Impervious, Inflow Depth = 1.61"	for 10 Year Storm event	
Inflow =	20.95 cfs @	11.98 hrs, Volume=	0.981 af	
Outflow =	0.41 cfs @	16.49 hrs, Volume=	0.887 af,	Atten= 98%, Lag= 270.9 min
Primary =	0.41 cfs @	16.49 hrs, Volume=	0.887 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.49' @ 16.49 hrs Surf.Area= 14,614 sf Storage= 28,585 cf

Plug-Flow detention time= 844.7 min calculated for 0.887 af (90% of inflow)
Center-of-Mass det. time= 795.3 min (1,625.2 - 829.8)

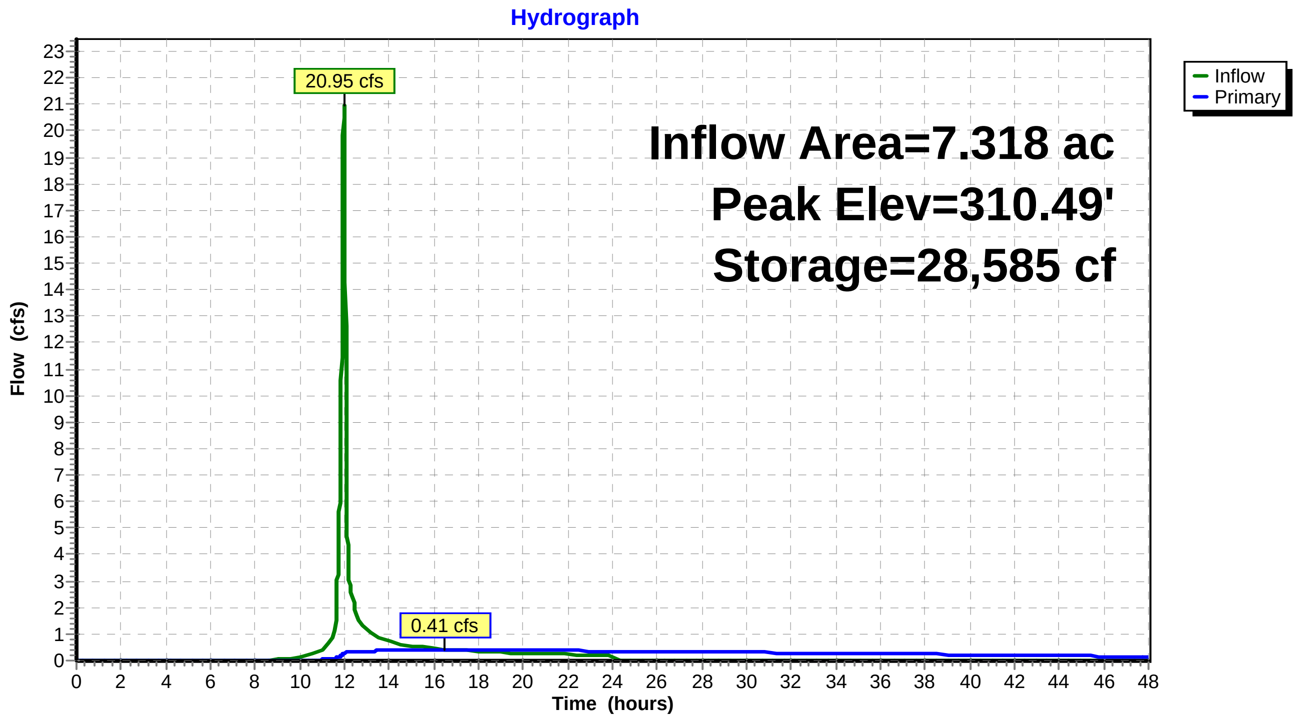
Volume	Invert	Avail.Storage	Storage Description
#1	308.00'	52,935 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.00	8,207	459.0	0	0	8,207
310.00	13,684	465.0	21,659	21,659	9,231
312.00	17,677	465.0	31,276	52,935	10,161

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	310.14'	**18.0" Round Culvert** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 310.14' / 310.09' S= 0.0015 '/' Cc= 0.900 n= 0.120, Flow Area= 1.77 sf

Primary OutFlow Max=0.41 cfs @ 16.49 hrs HW=310.49' TW=307.98' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 0.36 cfs @ 7.40 fps)
2=Culvert (Barrel Controls 0.05 cfs @ 0.23 fps)

Pond P6: next to Spare Time



Summary for Pond P7: Small Pond across Hercules

Inflow Area = 2.744 ac, 0.00% Impervious, Inflow Depth = 0.60" for 10 Year Storm event
Inflow = 0.76 cfs @ 12.60 hrs, Volume= 0.137 af
Outflow = 0.11 cfs @ 15.57 hrs, Volume= 0.053 af, Atten= 85%, Lag= 178.6 min
Primary = 0.11 cfs @ 15.57 hrs, Volume= 0.053 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 313.51' @ 15.57 hrs Surf.Area= 3,312 sf Storage= 3,714 cf

Plug-Flow detention time= 402.5 min calculated for 0.053 af (38% of inflow)
Center-of-Mass det. time= 230.1 min (1,163.1 - 932.9)

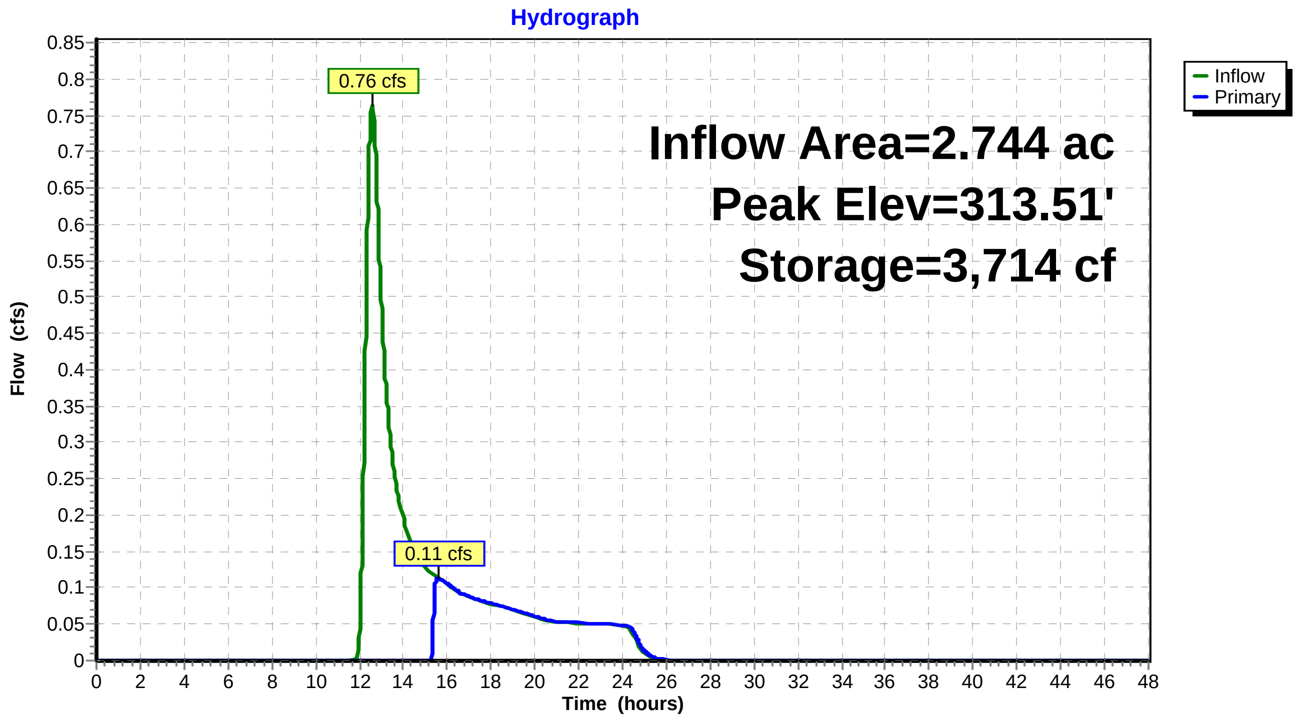
Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	5,495 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
312.00	1,699	250.0	0	0	1,699
314.00	3,952	313.0	5,495	5,495	4,577

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**50.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.11 cfs @ 15.57 hrs HW=313.51' TW=312.45' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.25 fps)

Pond P7: Small Pond across Hercules



Summary for Pond P8: Nat'l Guard Wetland

Inflow Area = 66.948 ac, 0.00% Impervious, Inflow Depth = 1.04" for 10 Year Storm event
Inflow = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af
Outflow = 4.80 cfs @ 16.96 hrs, Volume= 5.629 af, Atten= 89%, Lag= 273.8 min
Primary = 4.80 cfs @ 16.96 hrs, Volume= 5.629 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.65' @ 14.69 hrs Surf.Area= 209,303 sf Storage= 123,647 cf

Plug-Flow detention time= 294.8 min calculated for 5.629 af (97% of inflow)
Center-of-Mass det. time= 279.2 min (1,169.5 - 890.4)

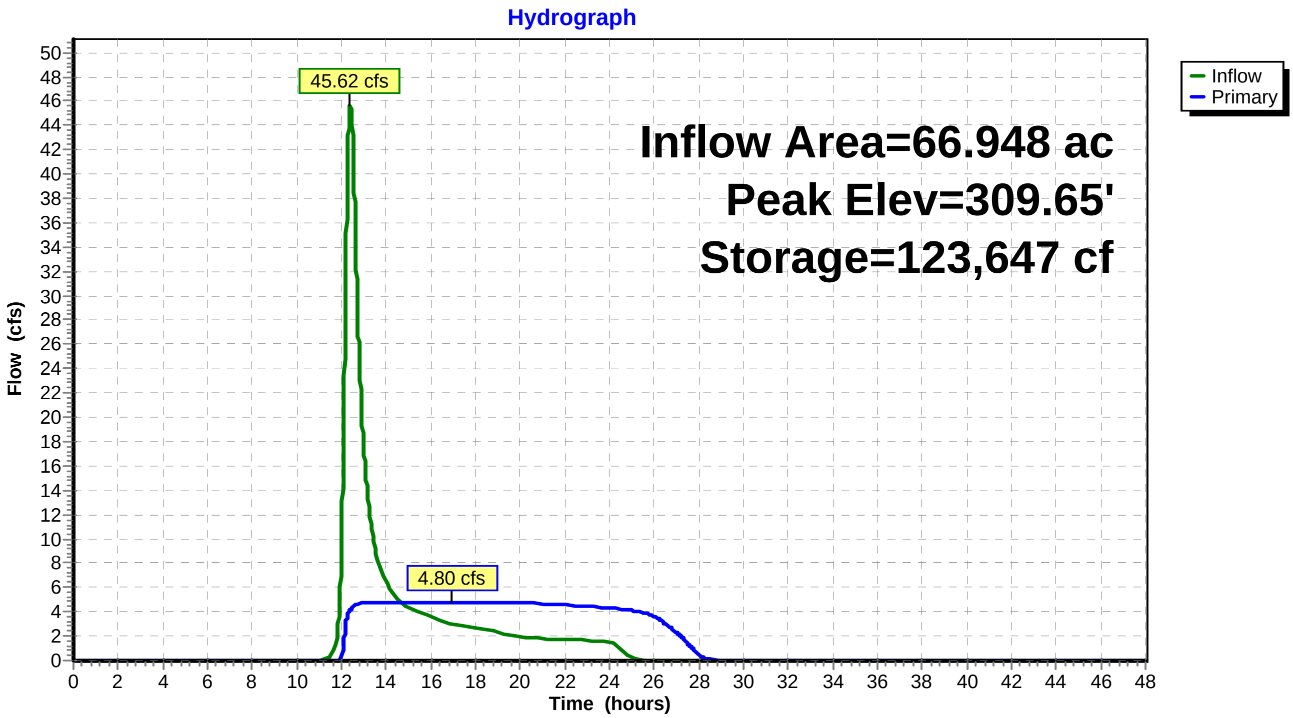
Volume	Invert	Avail.Storage	Storage Description
#1	306.60'	2,725,483 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
306.60	3,900	2,500.0	0	0	3,900
308.60	19,200	7,100.0	21,169	21,169	3,518,054
312.60	1,822,000	6,500.0	2,704,314	2,725,483	4,167,976

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 306.60' / 306.50' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	312.30'	**60.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.80 cfs @ 16.96 hrs HW=309.61' TW=307.97' (Dynamic Tailwater)
1=Culvert (Outlet Controls 4.80 cfs @ 6.11 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P8: Nat'l Guard Wetland



Summary for Pond P9: Charlebois Pond

Inflow Area = 1.860 ac, 0.00% Impervious, Inflow Depth = 2.45" for 10 Year Storm event
Inflow = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af
Outflow = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af, Atten= 90%, Lag= 22.4 min
Primary = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 331.00' Surf.Area= 0.050 ac Storage= 0.082 af
Peak Elev= 333.57' @ 12.34 hrs Surf.Area= 0.119 ac Storage= 0.296 af (0.214 af above start)

Plug-Flow detention time= 979.3 min calculated for 0.274 af (72% of inflow)
Center-of-Mass det. time= 670.0 min (1,459.3 - 789.3)

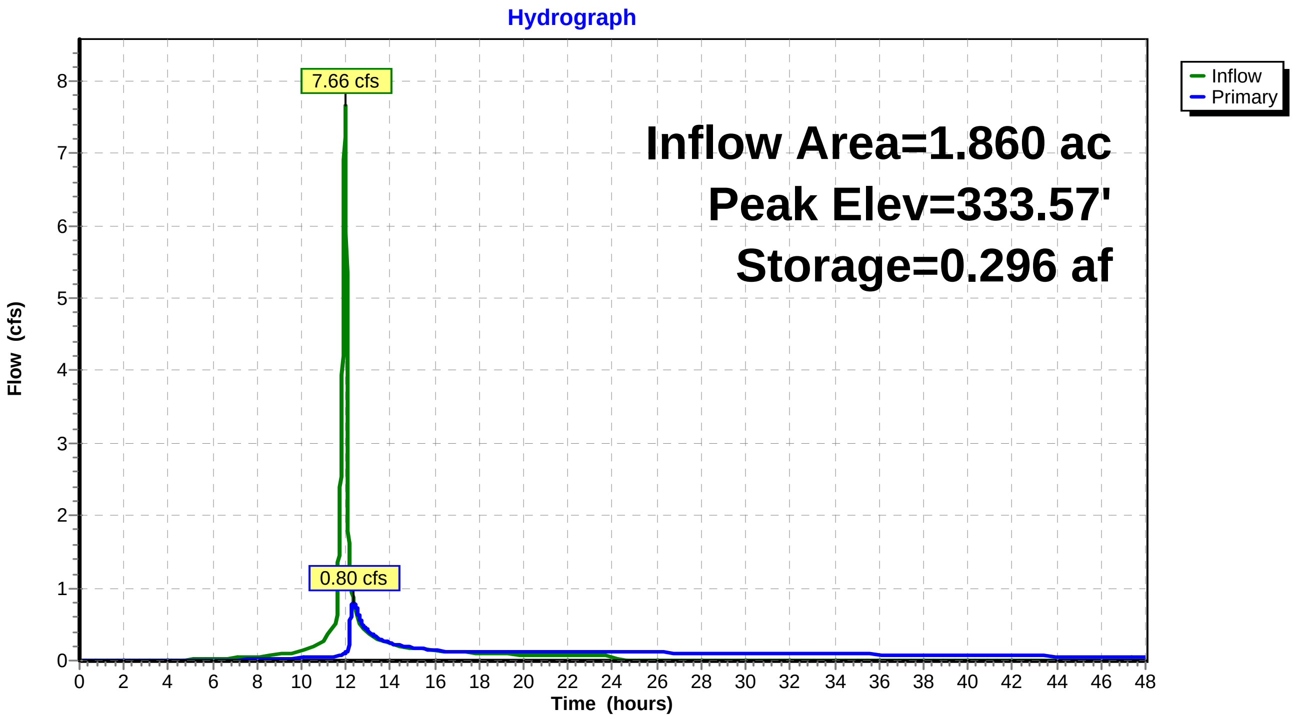
Volume	Invert	Avail.Storage	Storage Description
#1	327.00'	0.351 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
327.00	0.003	0.000	0.000
328.00	0.009	0.006	0.006
329.00	0.018	0.014	0.020
330.00	0.029	0.024	0.043
331.00	0.050	0.039	0.082
332.00	0.075	0.062	0.145
333.00	0.102	0.088	0.233
334.00	0.132	0.117	0.351

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	**15.0" Round Culvert** L= 45.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 331.00' / 330.00' S= 0.0220 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	331.00'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Primary	333.50'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 12.34 hrs HW=333.57' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.12 cfs of 8.23 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.12 cfs @ 7.61 fps)
└─**3=Orifice/Grate** (Weir Controls 0.68 cfs @ 0.85 fps)

Pond P9: Charlebois Pond



Summary for Pond X10: Pipe X10

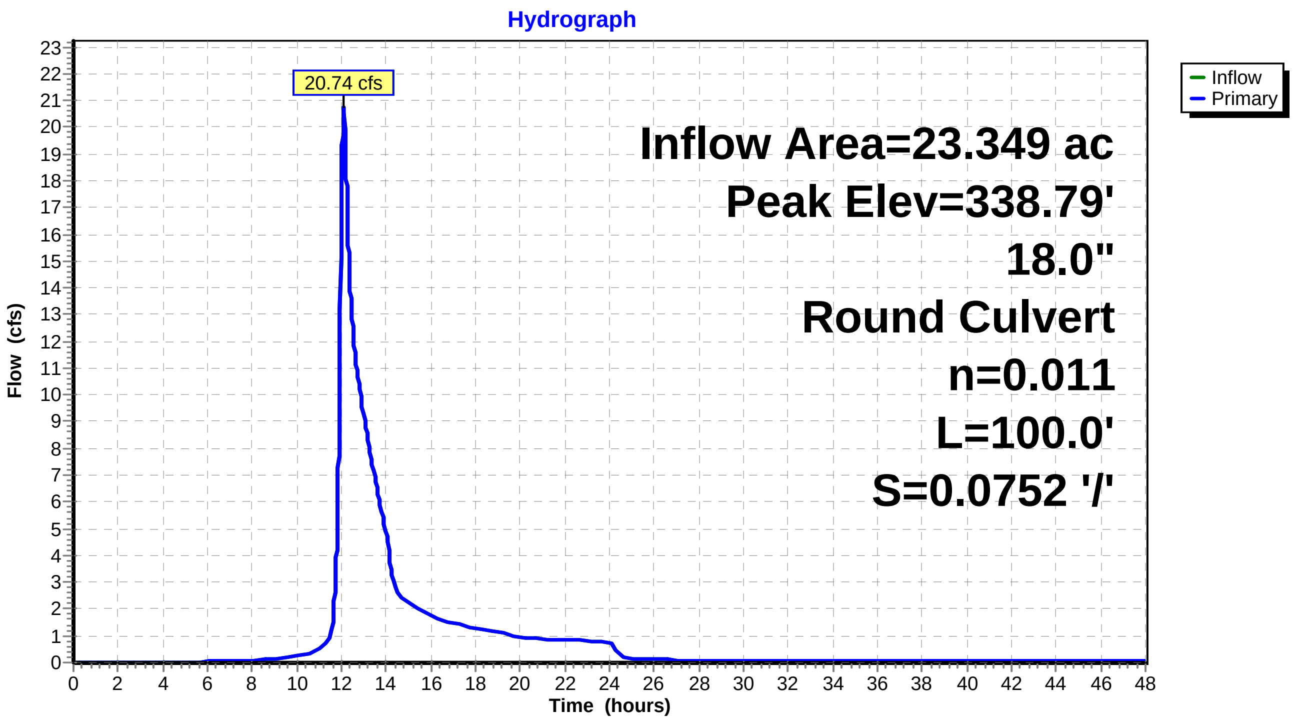
Inflow Area = 23.349 ac, 3.41% Impervious, Inflow Depth > 1.72" for 10 Year Storm event
Inflow = 20.74 cfs @ 12.11 hrs, Volume= 3.346 af
Outflow = 20.74 cfs @ 12.11 hrs, Volume= 3.346 af, Atten= 0%, Lag= 0.0 min
Primary = 20.74 cfs @ 12.11 hrs, Volume= 3.346 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 338.79' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	332.10'	**18.0" Round Culvert** L= 100.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 332.10' / 324.58' S= 0.0752 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=20.74 cfs @ 12.11 hrs HW=338.79' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 20.74 cfs @ 11.73 fps)

Pond X10: Pipe X10



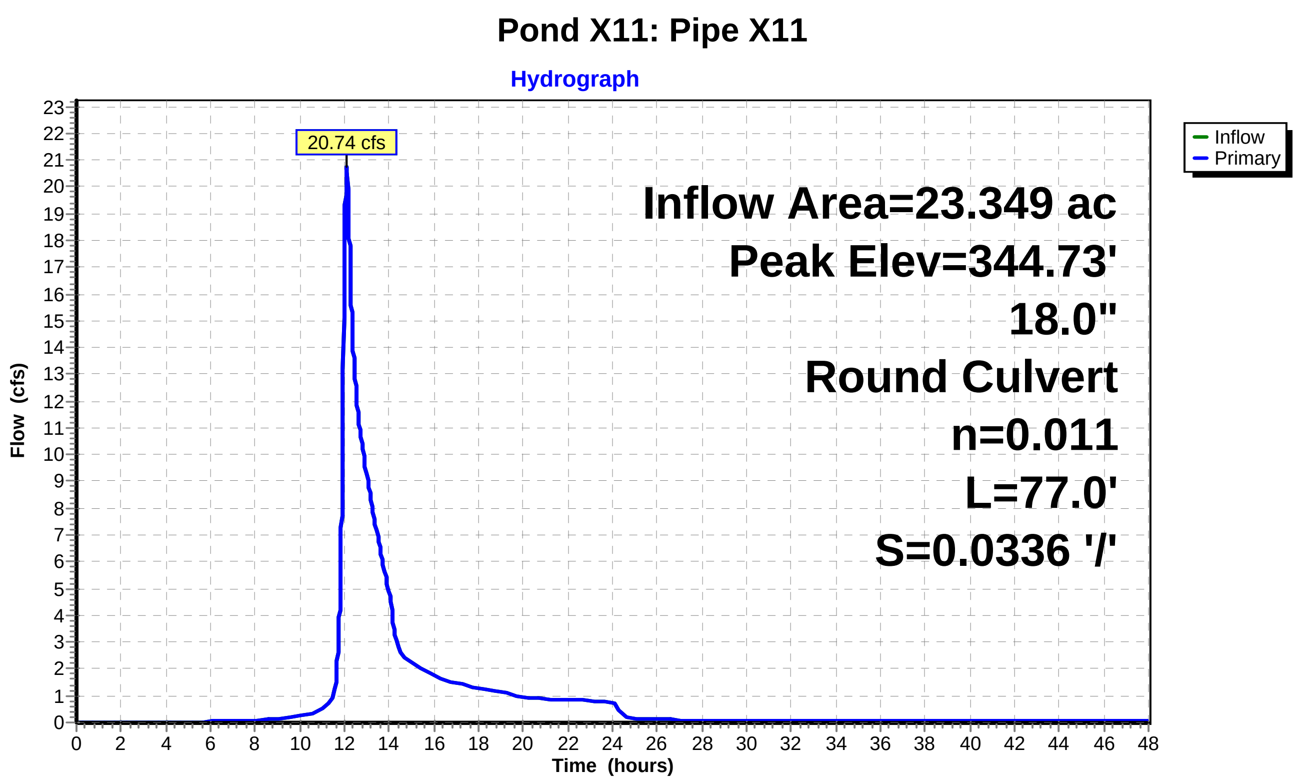
Summary for Pond X11: Pipe X11

Inflow Area =	23.349 ac,	3.41% Impervious,	Inflow Depth > 1.72"	for 10 Year Storm event	
Inflow =	20.74 cfs @	12.11 hrs,	Volume=	3.346 af	
Outflow =	20.74 cfs @	12.11 hrs,	Volume=	3.346 af,	Atten= 0%, Lag= 0.0 min
Primary =	20.74 cfs @	12.11 hrs,	Volume=	3.346 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 344.73' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	335.10'	**18.0" Round Culvert** L= 77.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 335.10' / 332.51' S= 0.0336 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=20.71 cfs @ 12.11 hrs HW=344.71' TW=338.79' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 20.71 cfs @ 11.72 fps)



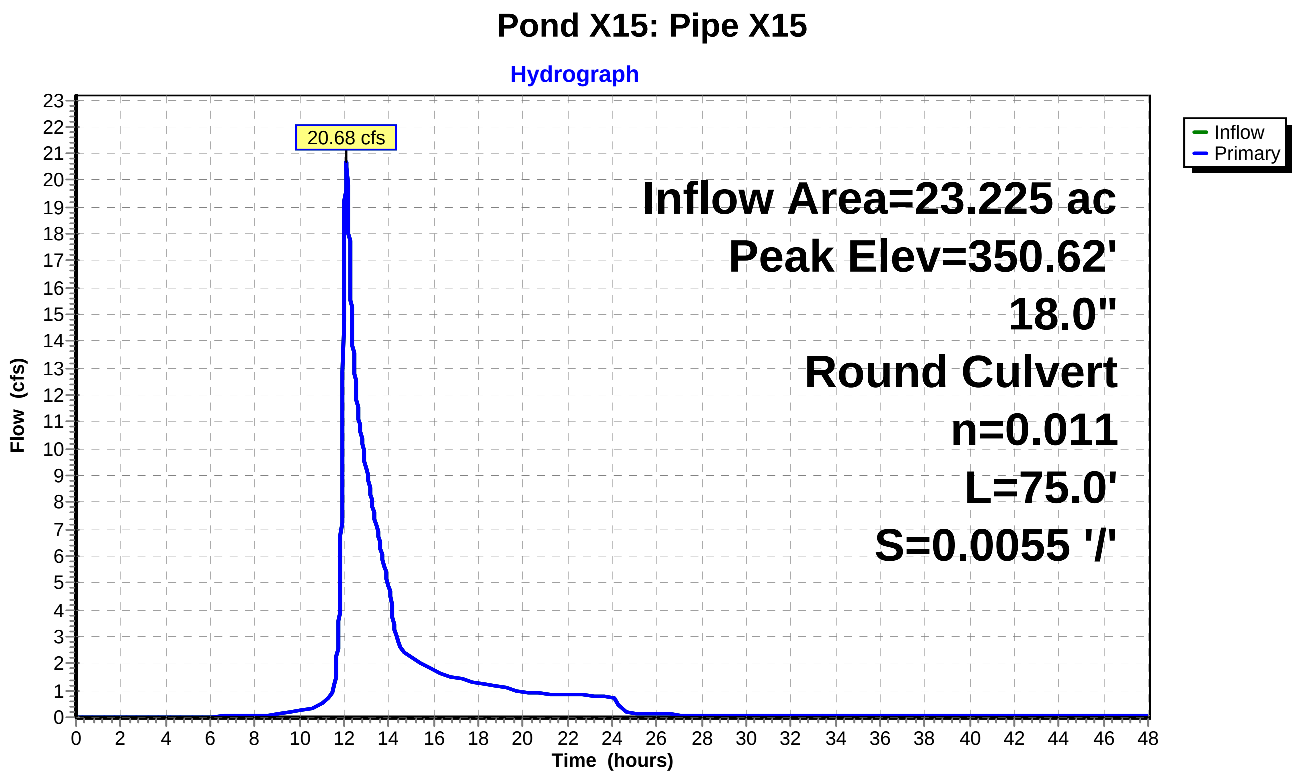
Summary for Pond X15: Pipe X15

Inflow Area = 23.225 ac, 3.00% Impervious, Inflow Depth > 1.72" for 10 Year Storm event
Inflow = 20.68 cfs @ 12.11 hrs, Volume= 3.320 af
Outflow = 20.68 cfs @ 12.11 hrs, Volume= 3.320 af, Atten= 0%, Lag= 0.0 min
Primary = 20.68 cfs @ 12.11 hrs, Volume= 3.320 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 350.62' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	336.00'	**18.0" Round Culvert** L= 75.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 336.00' / 335.59' S= 0.0055 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=20.56 cfs @ 12.11 hrs HW=350.55' TW=344.72' (Dynamic Tailwater)
1=Culvert (Inlet Controls 20.56 cfs @ 11.63 fps)



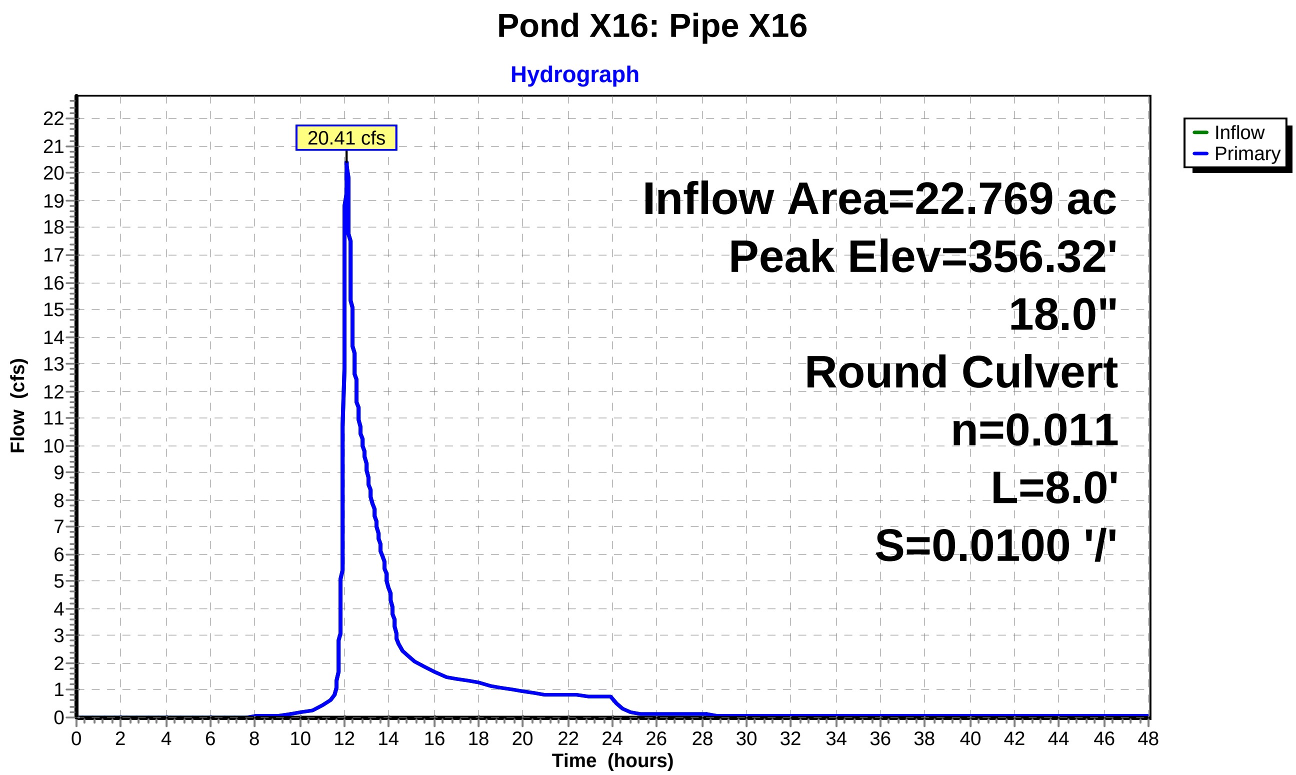
Summary for Pond X16: Pipe X16

Inflow Area =	22.769 ac,	1.06% Impervious, Inflow Depth >	1.69"	for 10 Year Storm event
Inflow =	20.41 cfs @	12.11 hrs, Volume=	3.208 af	
Outflow =	20.41 cfs @	12.11 hrs, Volume=	3.208 af, Atten= 0%, Lag= 0.0 min	
Primary =	20.41 cfs @	12.11 hrs, Volume=	3.208 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 356.32' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	336.64'	**18.0" Round Culvert** L= 8.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 336.64' / 336.56' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=20.11 cfs @ 12.11 hrs HW=356.15' TW=350.56' (Dynamic Tailwater)
1=Culvert (Inlet Controls 20.11 cfs @ 11.38 fps)



Summary for Pond X17: Pipe X17

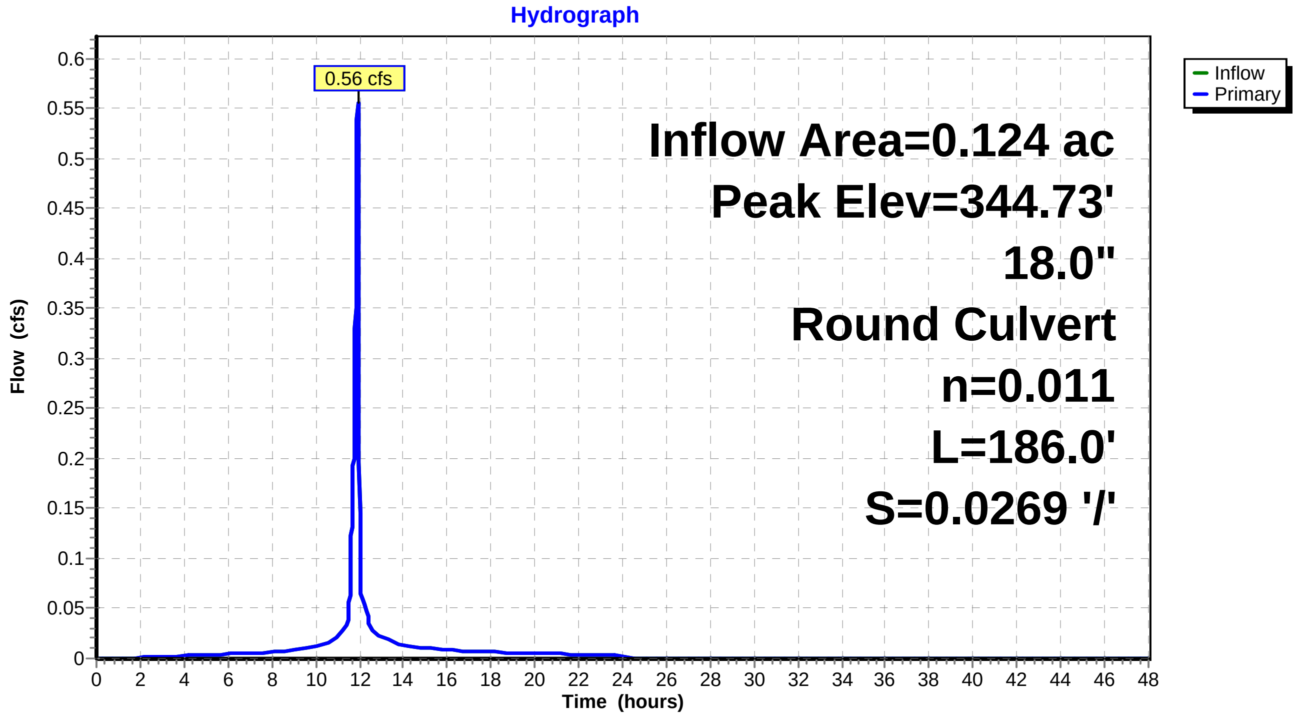
Inflow Area =	0.124 ac,	80.65% Impervious,	Inflow Depth = 2.52"	for 10 Year Storm event
Inflow =	0.56 cfs @	11.91 hrs, Volume=	0.026 af	
Outflow =	0.56 cfs @	11.91 hrs, Volume=	0.026 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.56 cfs @	11.91 hrs, Volume=	0.026 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 344.73' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	341.50'	**18.0" Round Culvert** L= 186.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 341.50' / 336.50' S= 0.0269 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=0.56 cfs @ 11.91 hrs HW=341.83' TW=337.17' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.56 cfs @ 1.95 fps)

Pond X17: Pipe X17



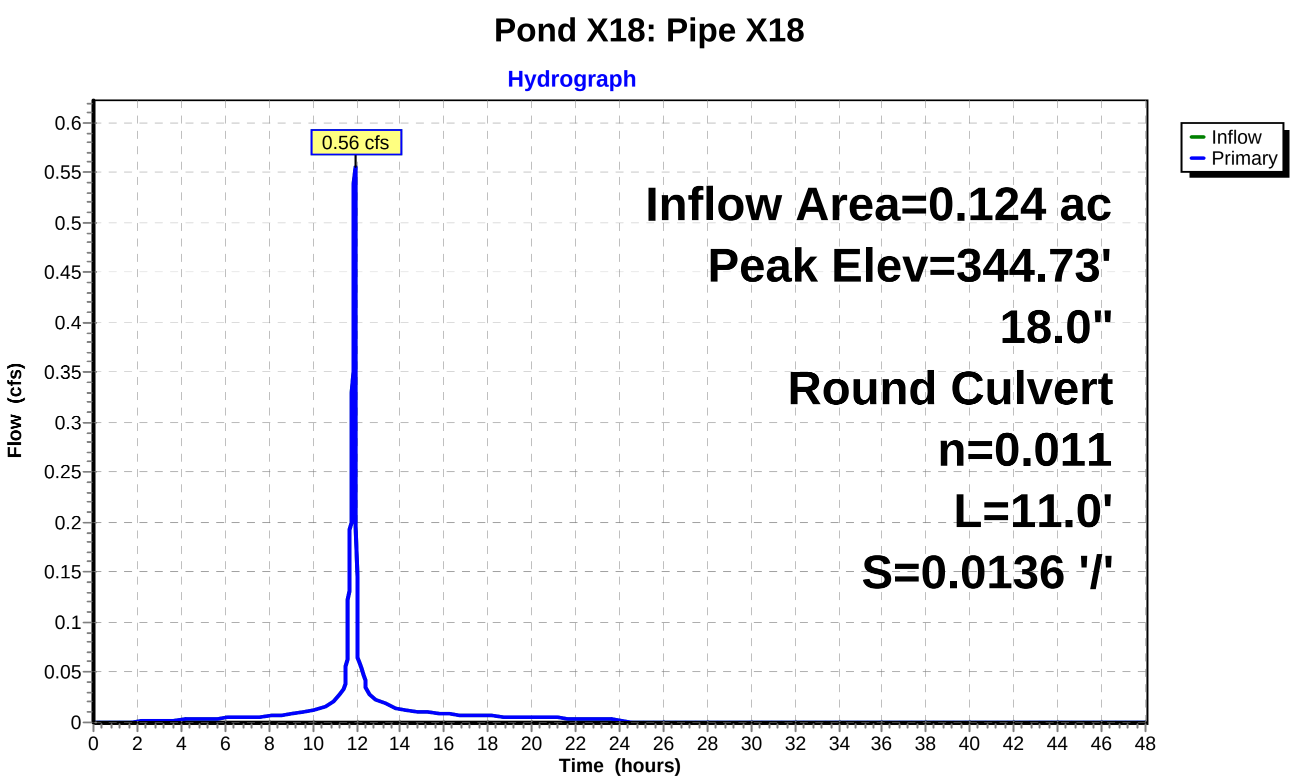
Summary for Pond X18: Pipe X18

Inflow Area =	0.124 ac,	80.65% Impervious,	Inflow Depth = 2.52"	for 10 Year Storm event
Inflow =	0.56 cfs @	11.91 hrs, Volume=	0.026 af	
Outflow =	0.56 cfs @	11.91 hrs, Volume=	0.026 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.56 cfs @	11.91 hrs, Volume=	0.026 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 344.73' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	341.75'	**18.0" Round Culvert** L= 11.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 341.75' / 341.60' S= 0.0136 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=0.56 cfs @ 11.91 hrs HW=342.09' TW=341.83' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.56 cfs @ 2.78 fps)



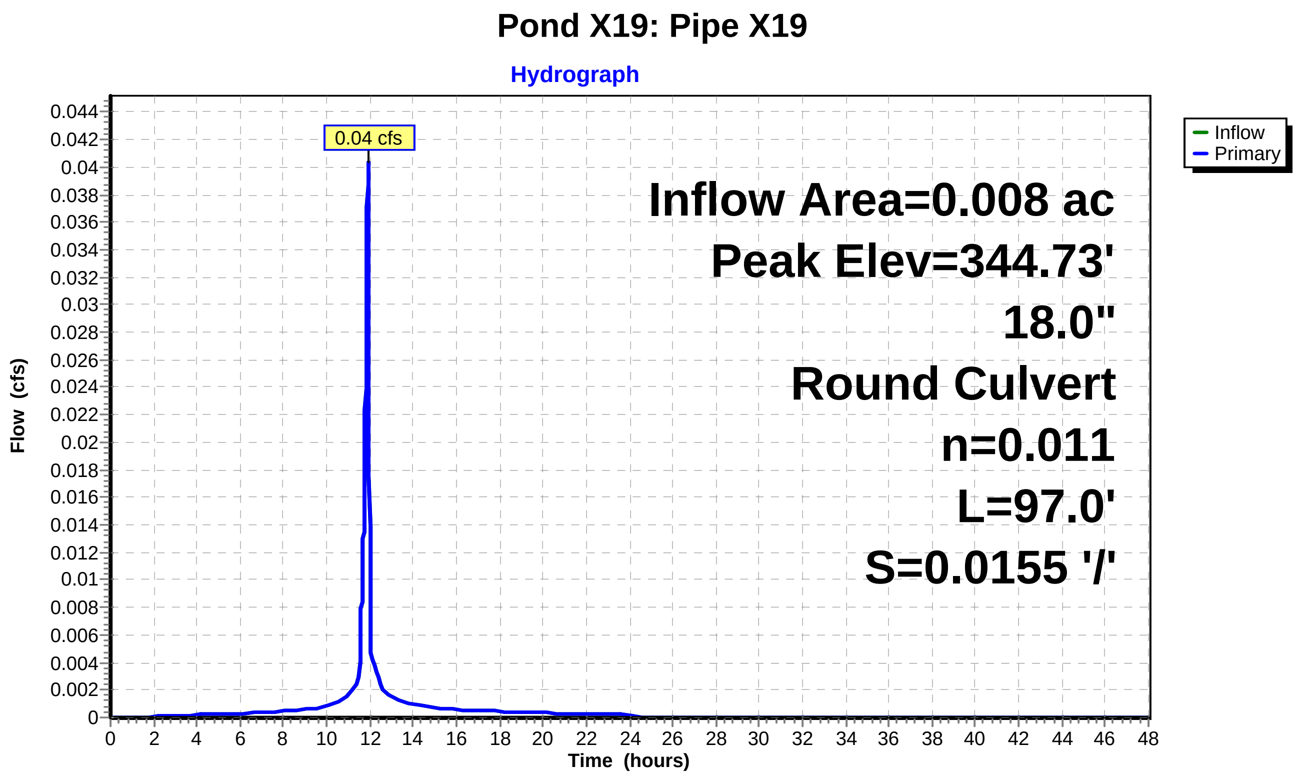
Summary for Pond X19: Pipe X19

Inflow Area = 0.008 ac, 87.50% Impervious, Inflow Depth = 2.77" for 10 Year Storm event
Inflow = 0.04 cfs @ 11.90 hrs, Volume= 0.002 af
Outflow = 0.04 cfs @ 11.90 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 11.90 hrs, Volume= 0.002 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 344.73' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	343.00'	**18.0" Round Culvert** L= 97.0' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 343.00' / 341.50' S= 0.0155 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=0.04 cfs @ 11.90 hrs HW=343.09' TW=342.09' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.04 cfs @ 1.00 fps)



Summary for Link 3L: Tailwater

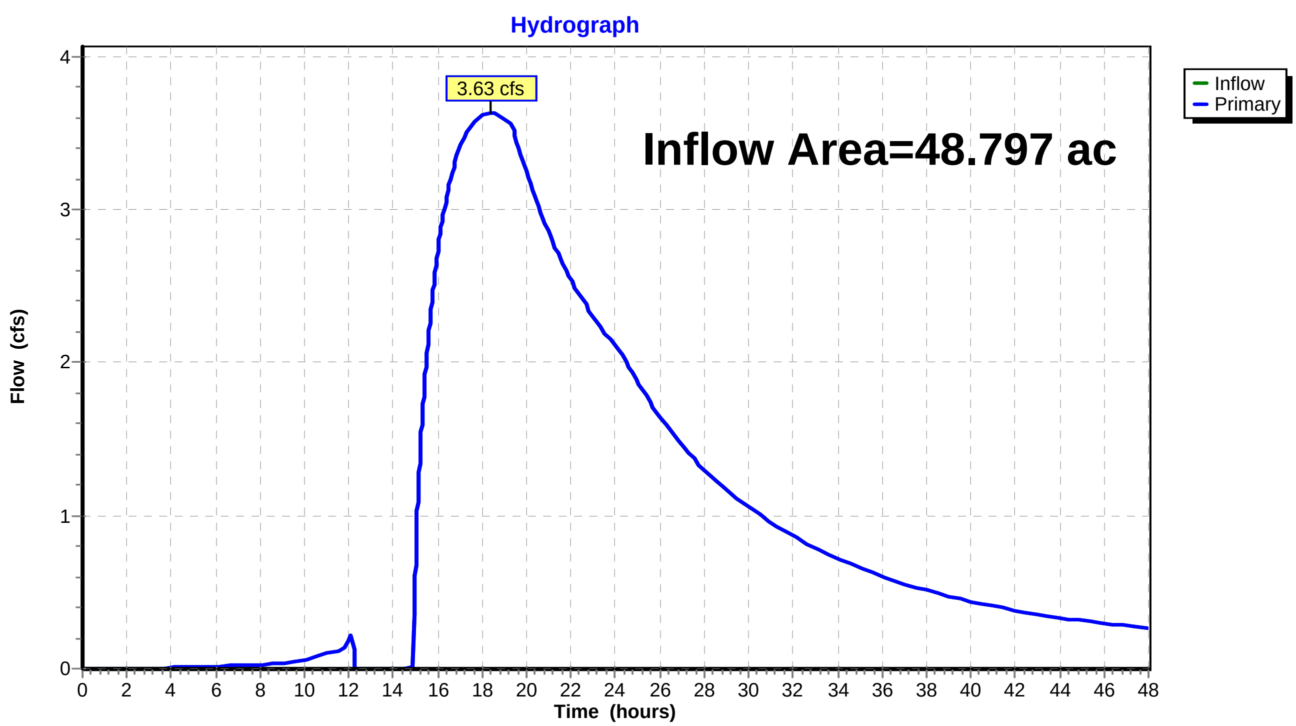
Inflow Area = 48.797 ac, 2.71% Impervious, Inflow Depth > 0.92" for 10 Year Storm event
Inflow = 3.63 cfs @ 18.39 hrs, Volume= 3.726 af
Primary = 3.63 cfs @ 18.39 hrs, Volume= 3.726 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

49 Point manual elevation table, To= 0.00 hrs, dt= 1.00 hrs, feet =

307.54	307.54	307.54	307.54	307.54	307.55	307.55	307.56	307.56
307.57	307.59	307.65	308.94	309.98	309.88	309.57	309.28	309.01
308.75	308.48	308.21	308.11	308.06	308.02	307.99	307.86	307.82
307.79	307.75	307.71	307.69	307.68	307.67	307.67	307.66	307.66
307.65	307.65	307.64	307.64	307.64	307.64	307.63	307.63	307.63
307.63	307.63	307.62	307.62					

Link 3L: Tailwater

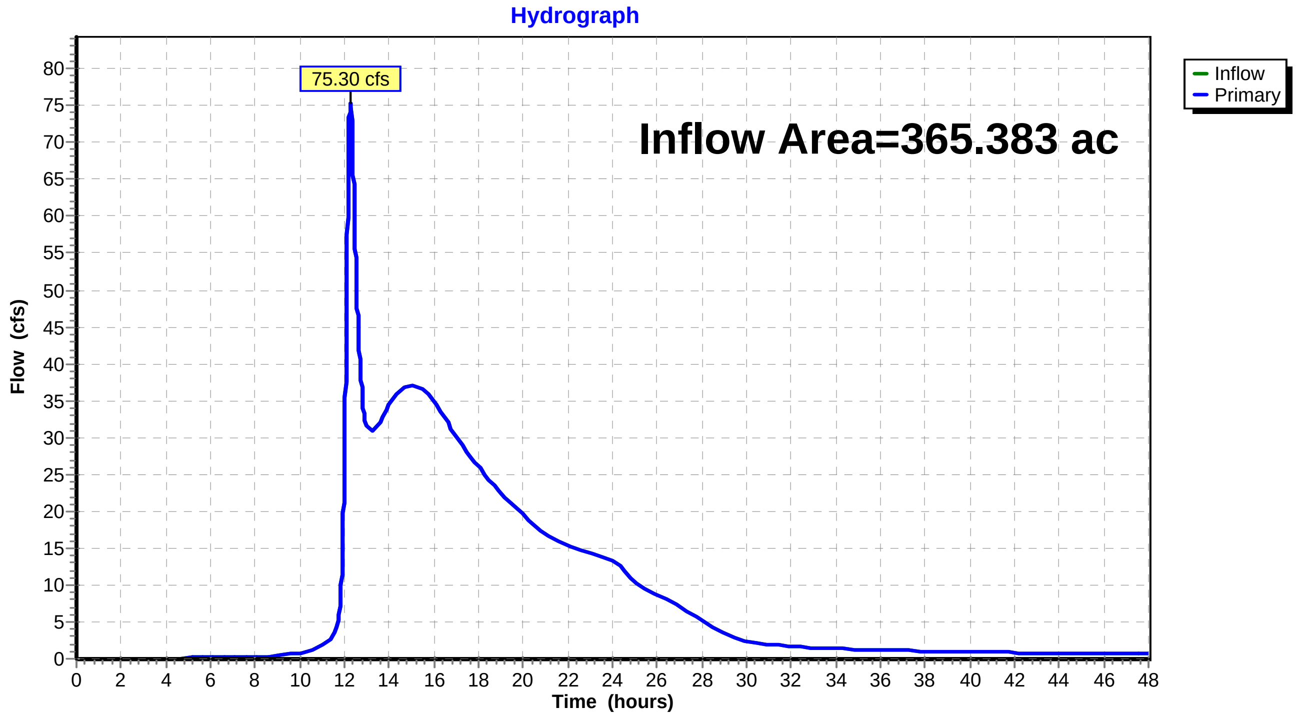


Summary for Link SN1: SN001

Inflow Area = 365.383 ac, 2.26% Impervious, Inflow Depth > 1.07" for 10 Year Storm event
Inflow = 75.30 cfs @ 12.27 hrs, Volume= 32.581 af
Primary = 75.30 cfs @ 12.27 hrs, Volume= 32.581 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN1: SN001

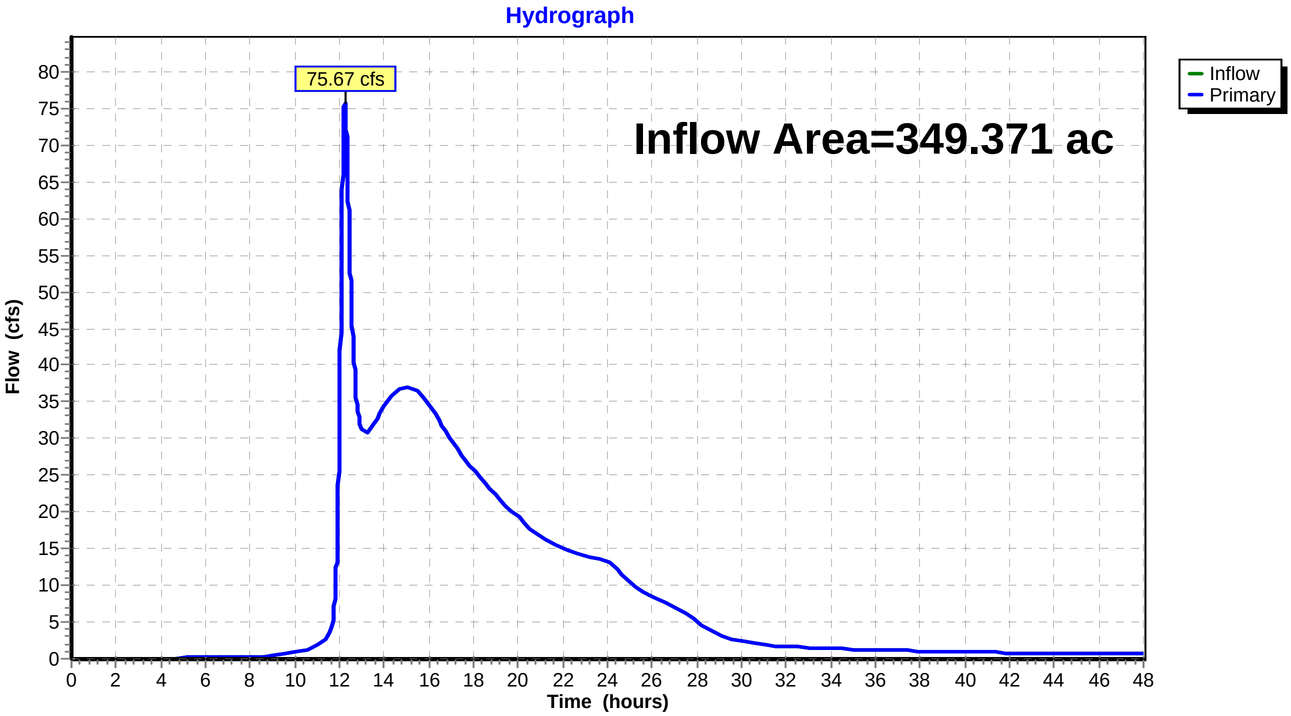


Summary for Link SN2: SN002

Inflow Area =	349.371 ac,	2.26% Impervious, Inflow Depth > 1.11"	for 10 Year Storm event
Inflow =	75.67 cfs @	12.24 hrs, Volume=	32.416 af
Primary =	75.67 cfs @	12.24 hrs, Volume=	32.416 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN2: SN002

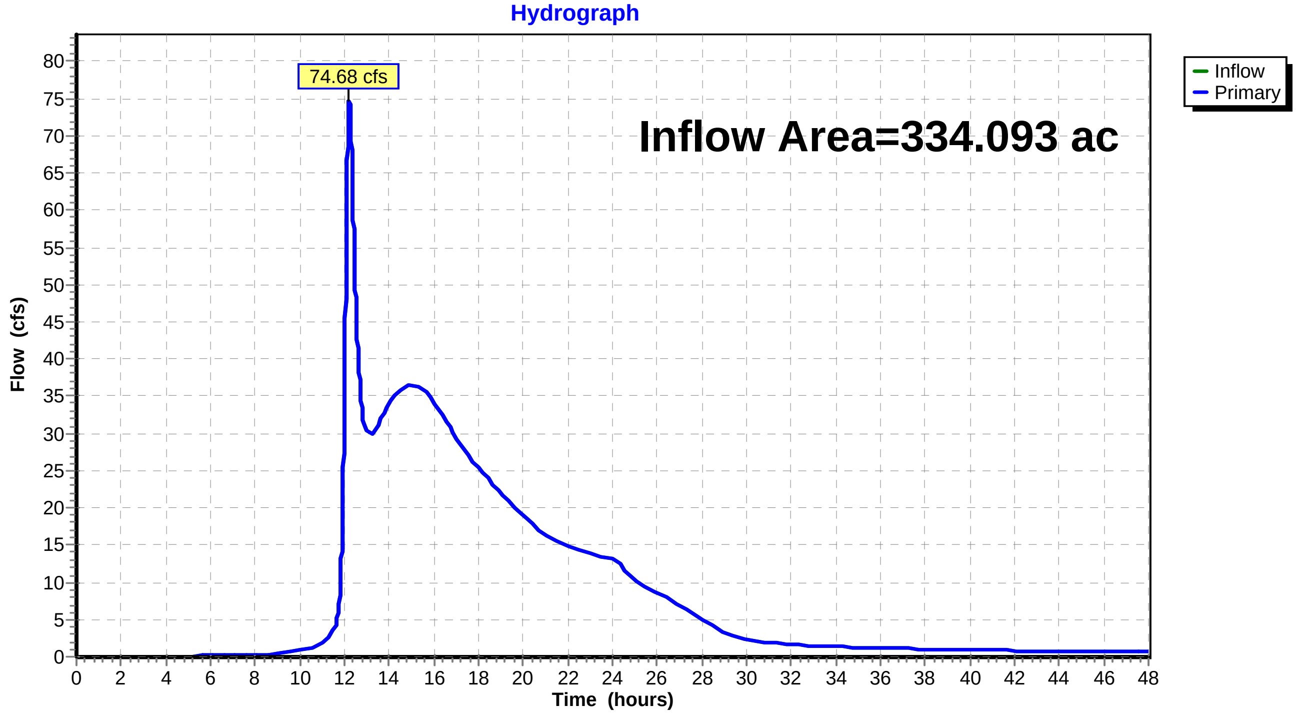


Summary for Link SN3: SN003

Inflow Area =	334.093 ac,	2.23% Impervious, Inflow Depth > 1.15"	for 10 Year Storm event
Inflow =	74.68 cfs @	12.22 hrs, Volume=	31.982 af
Primary =	74.68 cfs @	12.22 hrs, Volume=	31.982 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN3: SN003

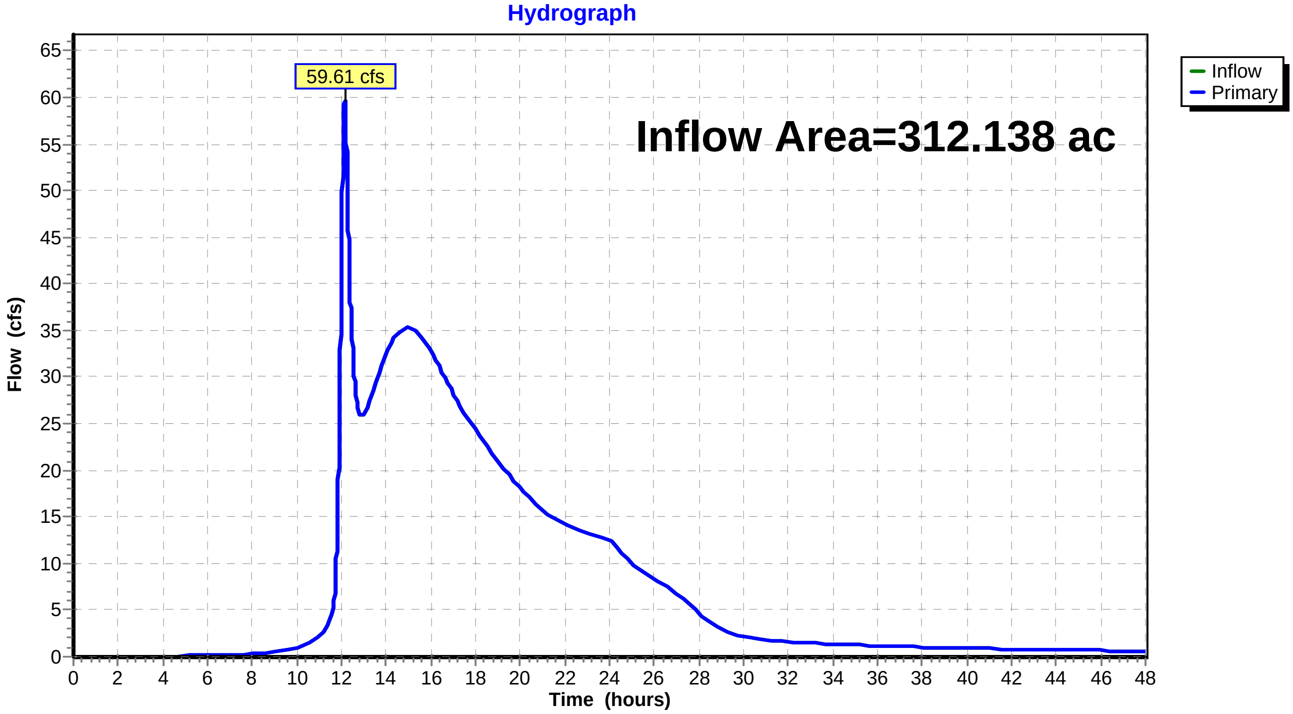


Summary for Link SN4: SN004

Inflow Area =	312.138 ac,	2.19% Impervious,	Inflow Depth > 1.15"	for 10 Year Storm event	
Inflow =	59.61 cfs @	12.14 hrs,	Volume=	30.038 af	
Primary =	59.61 cfs @	12.14 hrs,	Volume=	30.038 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

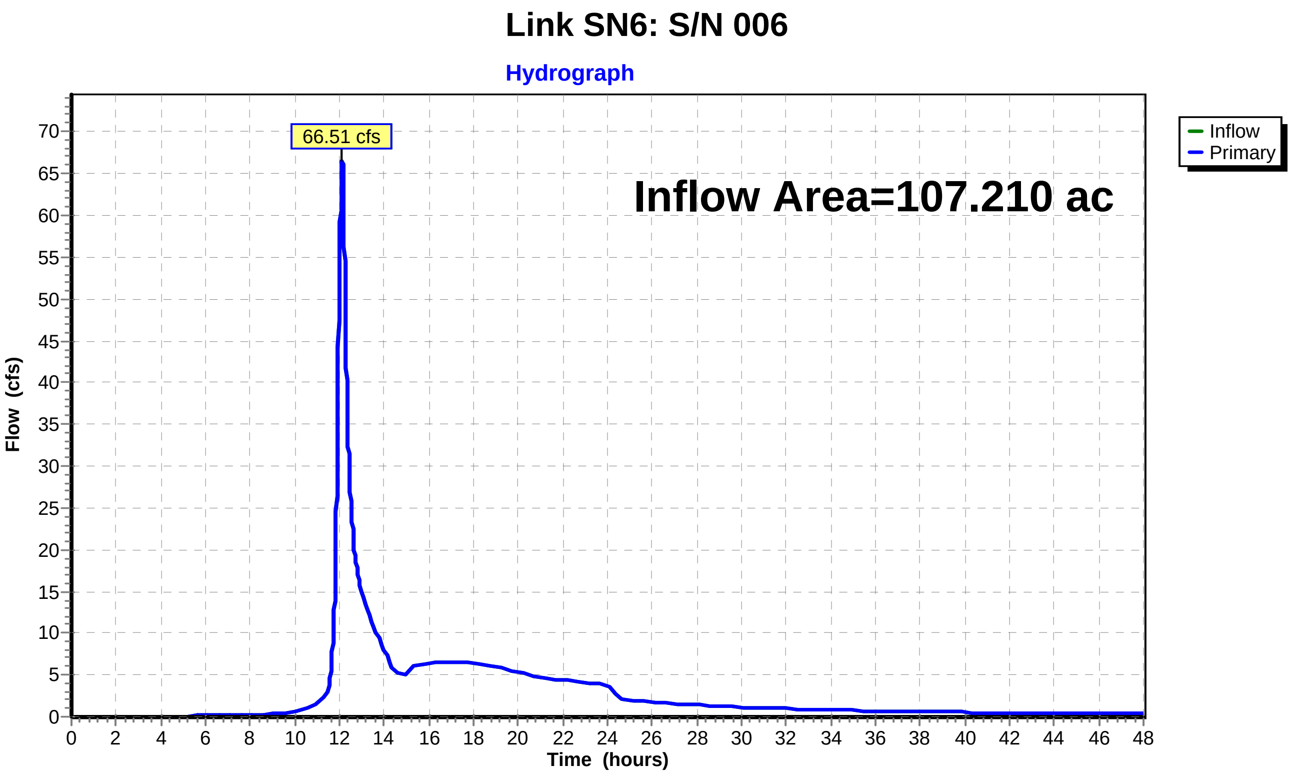
Link SN4: SN004



Summary for Link SN6: S/N 006

Inflow Area = 107.210 ac, 3.51% Impervious, Inflow Depth > 1.23" for 10 Year Storm event
Inflow = 66.51 cfs @ 12.12 hrs, Volume= 10.984 af
Primary = 66.51 cfs @ 12.12 hrs, Volume= 10.984 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



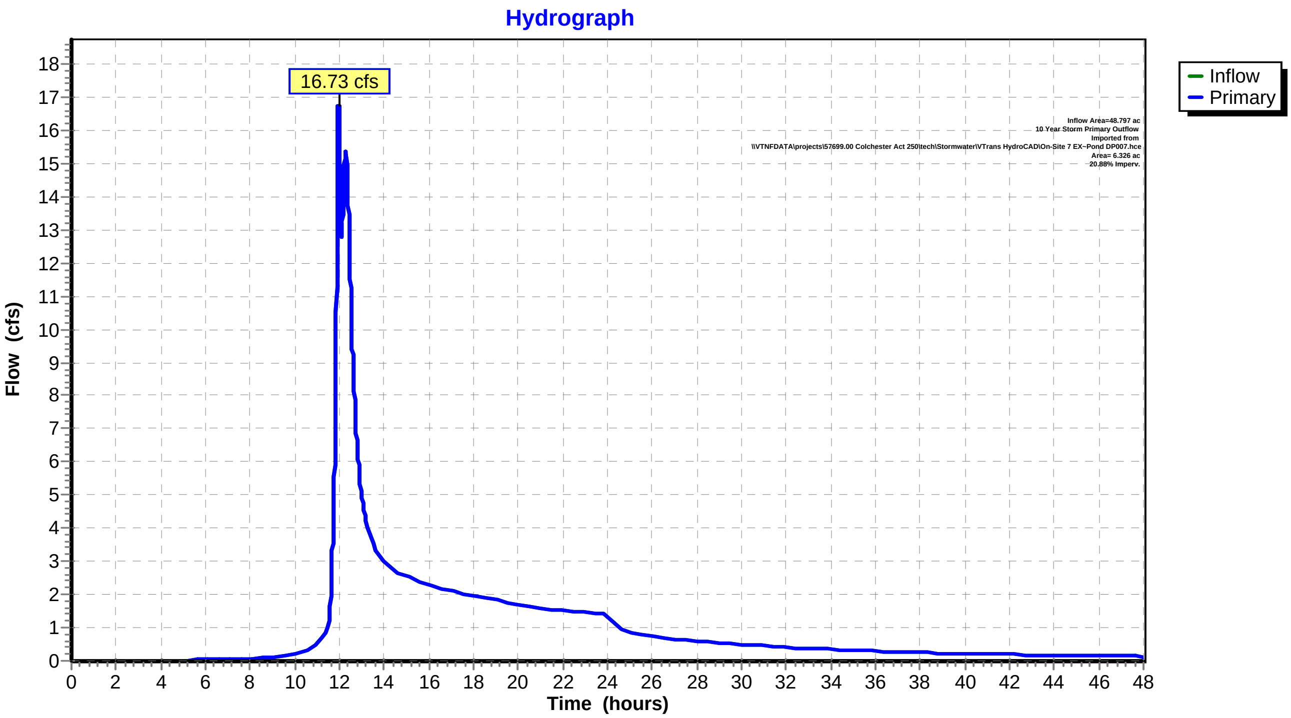
Summary for Link SN7: SN007

Inflow Area = 48.797 ac, 2.71% Impervious, Inflow Depth > 0.95" for 10 Year Storm event
Inflow = 16.73 cfs @ 11.96 hrs, Volume= 3.872 af
Primary = 16.73 cfs @ 11.96 hrs, Volume= 3.872 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

10 Year Storm Primary Outflow Imported from \\VTNFDATA\projects\57699.00 Colchester Act 250\tech\Stormwater\V

Link SN7: SN007

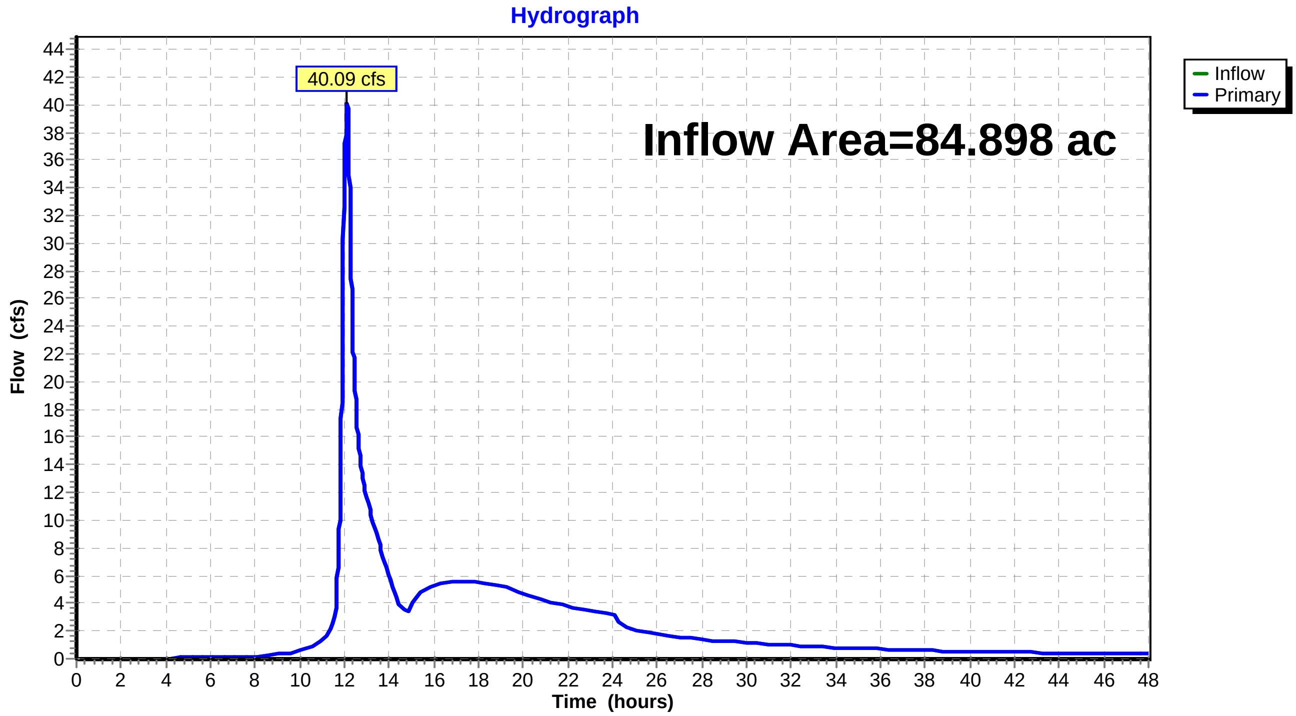


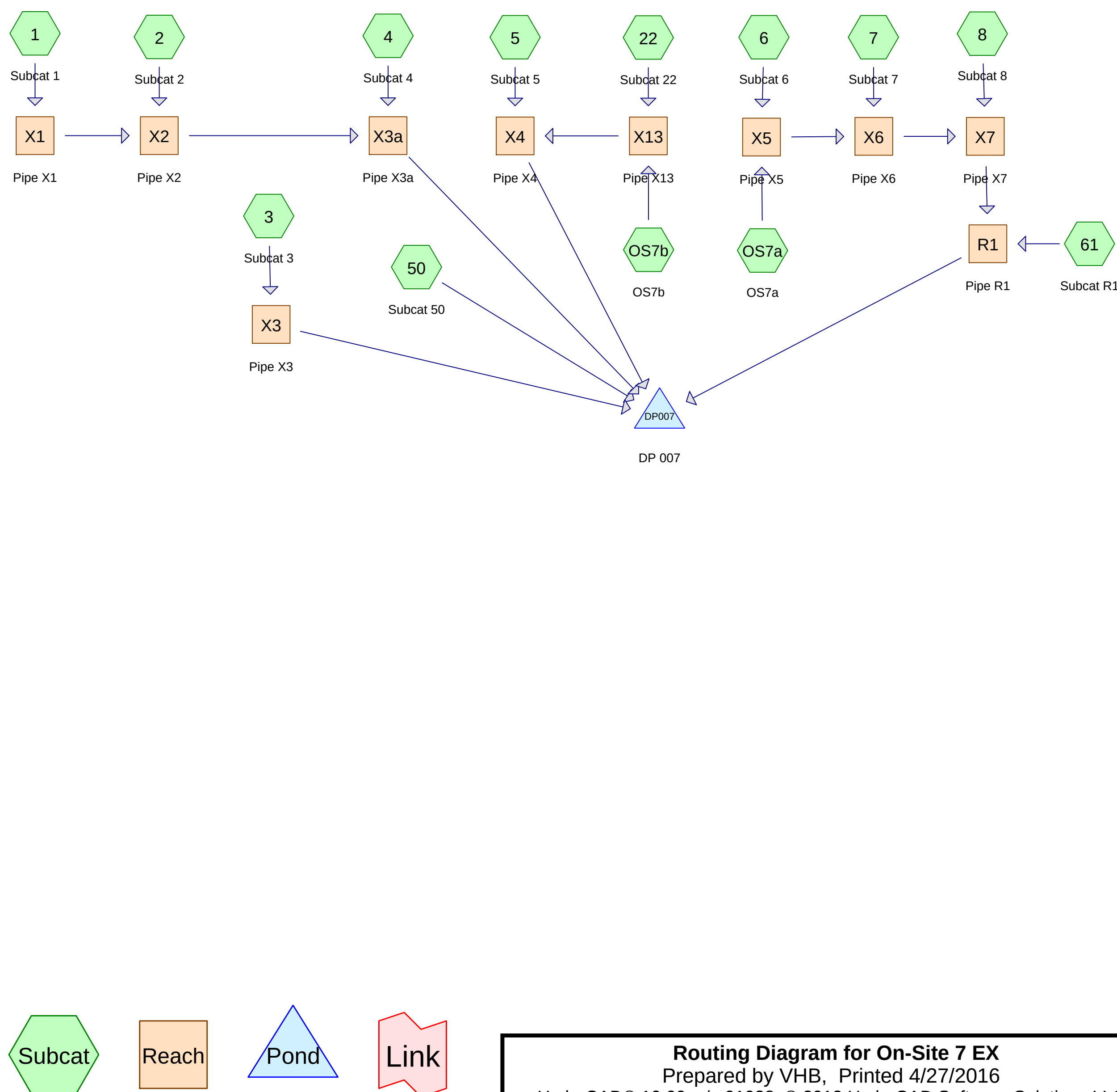
Summary for Link SN8: SN008

Inflow Area =	84.898 ac,	3.81% Impervious,	Inflow Depth > 1.25"	for 10 Year Storm event	
Inflow =	40.09 cfs @	12.12 hrs,	Volume=	8.876 af	
Primary =	40.09 cfs @	12.12 hrs,	Volume=	8.876 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN8: SN008





Routing Diagram for On-Site 7 EX
Prepared by VHB, Printed 4/27/2016
HydroCAD® 10.00 s/n 01038 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=0.206 ac 98.06% Impervious Runoff Depth>2.97"
Flow Length=290' Slope=0.0077 '/' Tc=2.7 min CN=98 Runoff=1.03 cfs 0.051 af

Subcatchment 2: Subcat 2 Runoff Area=0.068 ac 95.59% Impervious Runoff Depth>2.86"
Flow Length=116' Slope=0.0104 '/' Tc=0.9 min CN=97 Runoff=0.36 cfs 0.016 af

Subcatchment 3: Subcat 3 Runoff Area=0.059 ac 89.83% Impervious Runoff Depth>2.75"
Flow Length=85' Slope=0.0175 '/' Tc=0.5 min CN=96 Runoff=0.31 cfs 0.014 af

Subcatchment 4: Subcat 4 Runoff Area=0.059 ac 100.00% Impervious Runoff Depth>2.97"
Flow Length=103' Slope=0.0108 '/' Tc=0.8 min CN=98 Runoff=0.31 cfs 0.015 af

Subcatchment 5: Subcat 5 Runoff Area=0.074 ac 100.00% Impervious Runoff Depth>2.97"
Flow Length=113' Slope=0.0104 '/' Tc=0.9 min CN=98 Runoff=0.39 cfs 0.018 af

Subcatchment 6: Subcat 6 Runoff Area=0.284 ac 38.03% Impervious Runoff Depth>1.91"
Flow Length=173' Tc=5.7 min CN=87 Runoff=0.97 cfs 0.045 af

Subcatchment 7: Subcat 7 Runoff Area=0.461 ac 64.86% Impervious Runoff Depth>2.35"
Flow Length=397' Slope=0.0239 '/' Tc=2.1 min CN=92 Runoff=2.08 cfs 0.090 af

Subcatchment 8: Subcat 8 Runoff Area=0.195 ac 100.00% Impervious Runoff Depth>2.97"
Flow Length=277' Slope=0.0203 '/' Tc=1.6 min CN=98 Runoff=1.01 cfs 0.048 af

Subcatchment 22: Subcat 22 Runoff Area=0.484 ac 10.95% Impervious Runoff Depth>1.54"
Flow Length=214' Tc=1.7 min CN=82 Runoff=1.56 cfs 0.062 af

Subcatchment 50: Subcat 50 Runoff Area=0.840 ac 25.36% Impervious Runoff Depth>1.75"
Flow Length=450' Tc=8.0 min CN=85 Runoff=2.44 cfs 0.123 af

Subcatchment 61: Subcat R1 Runoff Area=0.258 ac 0.00% Impervious Runoff Depth>1.40"
Flow Length=253' Slope=0.0877 '/' Tc=2.0 min CN=80 Runoff=0.75 cfs 0.030 af

Subcatchment OS7a: OS7a Runoff Area=1.853 ac 0.00% Impervious Runoff Depth>1.82"
Flow Length=598' Tc=26.3 min CN=86 Runoff=3.22 cfs 0.281 af

Subcatchment OS7b: OS7b Runoff Area=1.485 ac 0.00% Impervious Runoff Depth>1.47"
Flow Length=260' Slope=0.1483 '/' Tc=6.1 min CN=81 Runoff=3.89 cfs 0.181 af

Reach R1: Pipe R1 Avg. Flow Depth=0.53' Max Vel=10.24 fps Inflow=5.69 cfs 0.495 af
18.0" Round Pipe n=0.011 L=74.5' S=0.0298 '/' Capacity=21.43 cfs Outflow=5.69 cfs 0.495 af

Reach X1: Pipe X1 Avg. Flow Depth=0.35' Max Vel=3.31 fps Inflow=1.03 cfs 0.051 af
18.0" Round Pipe n=0.011 L=69.0' S=0.0049 '/' Capacity=8.71 cfs Outflow=1.03 cfs 0.051 af

Reach X13: Pipe X13 Avg. Flow Depth=0.81' Max Vel=5.16 fps Inflow=5.02 cfs 0.243 af
18.0" Round Pipe n=0.011 L=65.1' S=0.0051 '/' Capacity=8.84 cfs Outflow=5.01 cfs 0.243 af

Reach X2: Pipe X2 Avg. Flow Depth=0.40' Max Vel=3.58 fps Inflow=1.34 cfs 0.067 af
18.0" Round Pipe n=0.011 L=137.0' S=0.0050 '/' Capacity=8.75 cfs Outflow=1.34 cfs 0.067 af

Reach X3: Pipe X3 Avg. Flow Depth=0.23' Max Vel=1.75 fps Inflow=0.31 cfs 0.014 af
18.0" Round Pipe n=0.011 L=101.0' S=0.0023 '/' Capacity=5.92 cfs Outflow=0.30 cfs 0.014 af

Reach X3a: Pipe X3a Avg. Flow Depth=0.28' Max Vel=6.97 fps Inflow=1.62 cfs 0.082 af
18.0" Round Pipe n=0.011 L=61.6' S=0.0279 '/' Capacity=20.74 cfs Outflow=1.62 cfs 0.082 af

Reach X4: Pipe X4 Avg. Flow Depth=0.69' Max Vel=6.57 fps Inflow=5.26 cfs 0.262 af
18.0" Round Pipe n=0.011 L=104.6' S=0.0094 '/' Capacity=12.02 cfs Outflow=5.26 cfs 0.262 af

Reach X5: Pipe X5 Avg. Flow Depth=0.41' Max Vel=8.61 fps Inflow=3.36 cfs 0.327 af
18.0" Round Pipe n=0.011 L=36.0' S=0.0278 '/' Capacity=20.69 cfs Outflow=3.36 cfs 0.327 af

Reach X6: Pipe X6 Avg. Flow Depth=0.64' Max Vel=5.55 fps Inflow=4.02 cfs 0.417 af
18.0" Round Pipe n=0.011 L=69.7' S=0.0072 '/' Capacity=10.51 cfs Outflow=4.02 cfs 0.417 af

Reach X7: Pipe X7 Avg. Flow Depth=0.68' Max Vel=6.35 fps Inflow=4.95 cfs 0.465 af
18.0" Round Pipe n=0.011 L=33.6' S=0.0089 '/' Capacity=11.73 cfs Outflow=4.94 cfs 0.465 af

Pond DP007: DP 007 Inflow=14.70 cfs 0.975 af
Primary=14.70 cfs 0.975 af

Total Runoff Area = 6.326 ac Runoff Volume = 0.975 af Average Runoff Depth = 1.85"
79.12% Pervious = 5.005 ac 20.88% Impervious = 1.321 ac

Summary for Subcatchment 1: Subcat 1

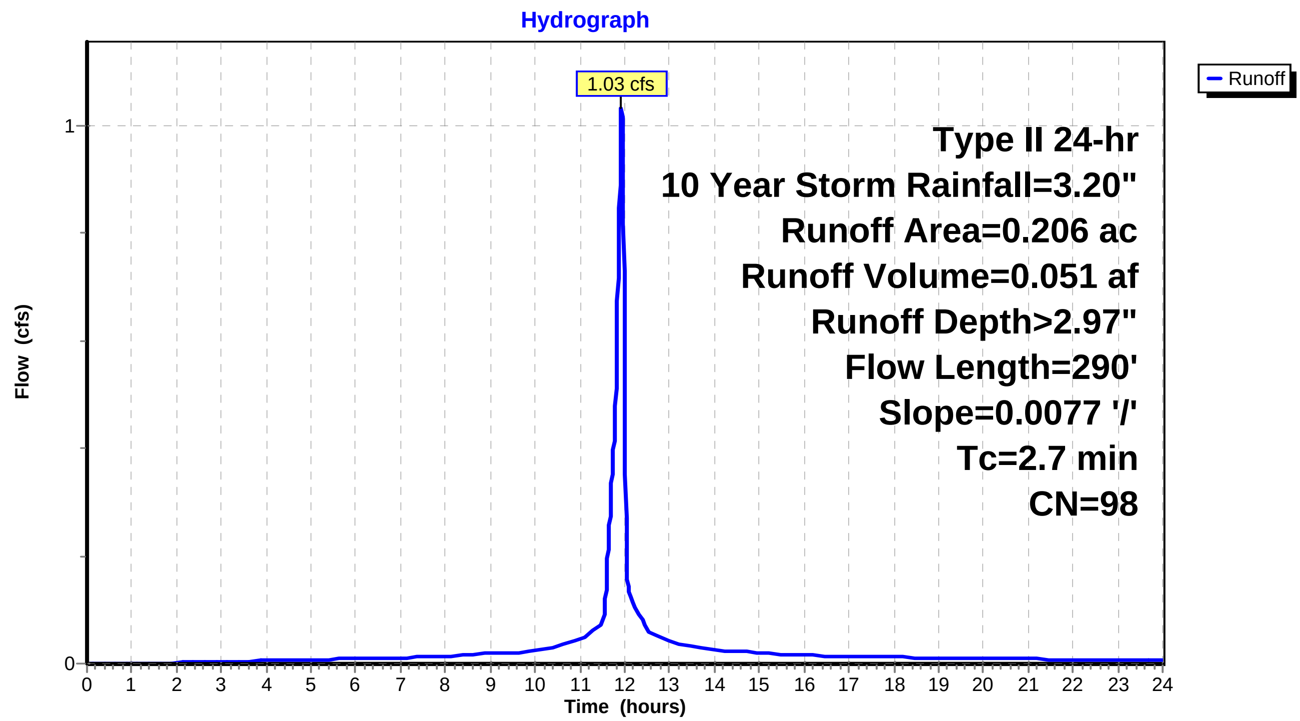
Runoff = 1.03 cfs @ 11.93 hrs, Volume= 0.051 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.202	98	Paved roads w/curbs & sewers, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.206	98	Weighted Average
0.004		1.94% Pervious Area
0.202		98.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	290	0.0077	1.78		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

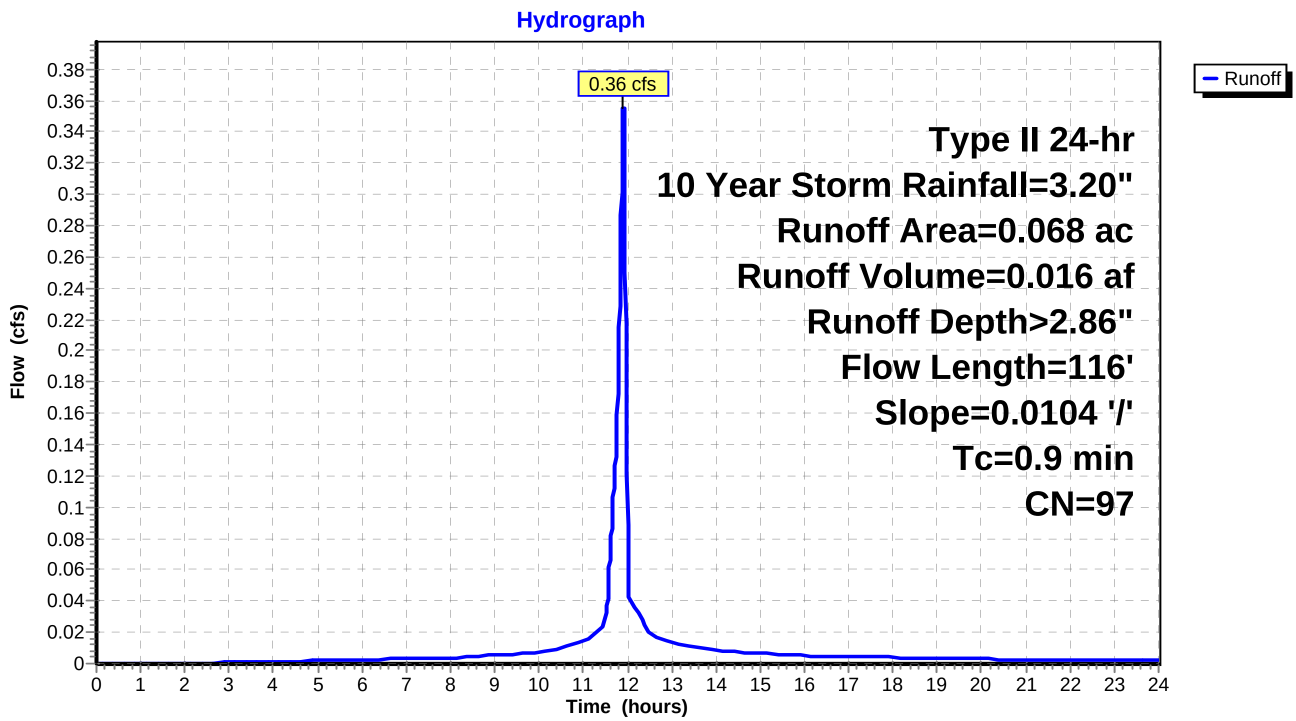
Runoff = 0.36 cfs @ 11.91 hrs, Volume= 0.016 af, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.065	98	Paved roads w/curbs & sewers, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.068	97	Weighted Average
0.003		4.41% Pervious Area
0.065		95.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	116	0.0104	2.07		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

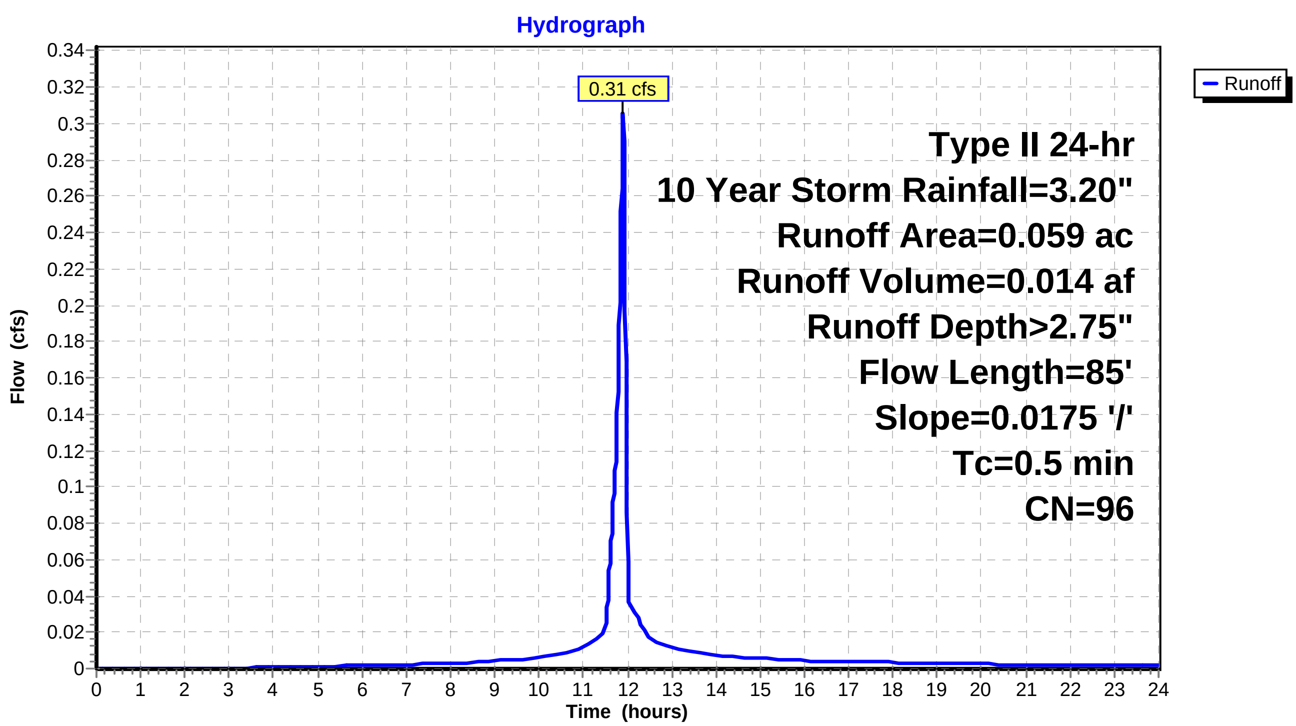
Runoff = 0.31 cfs @ 11.91 hrs, Volume= 0.014 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.053	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.059	96	Weighted Average
0.006		10.17% Pervious Area
0.053		89.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	85	0.0175	2.69		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Subcat 4

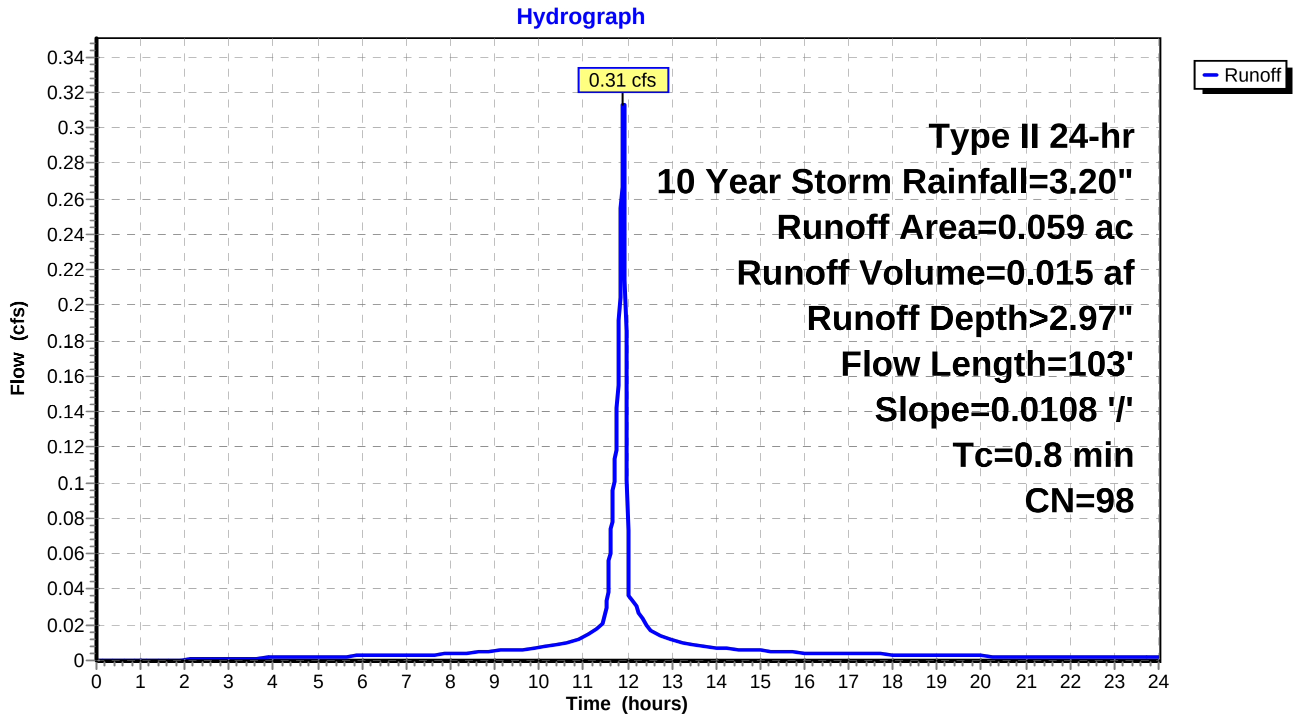
Runoff = 0.31 cfs @ 11.91 hrs, Volume= 0.015 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.059	98	Paved roads w/curbs & sewers, HSG D
0.059		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	103	0.0108	2.11		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 4: Subcat 4



Summary for Subcatchment 5: Subcat 5

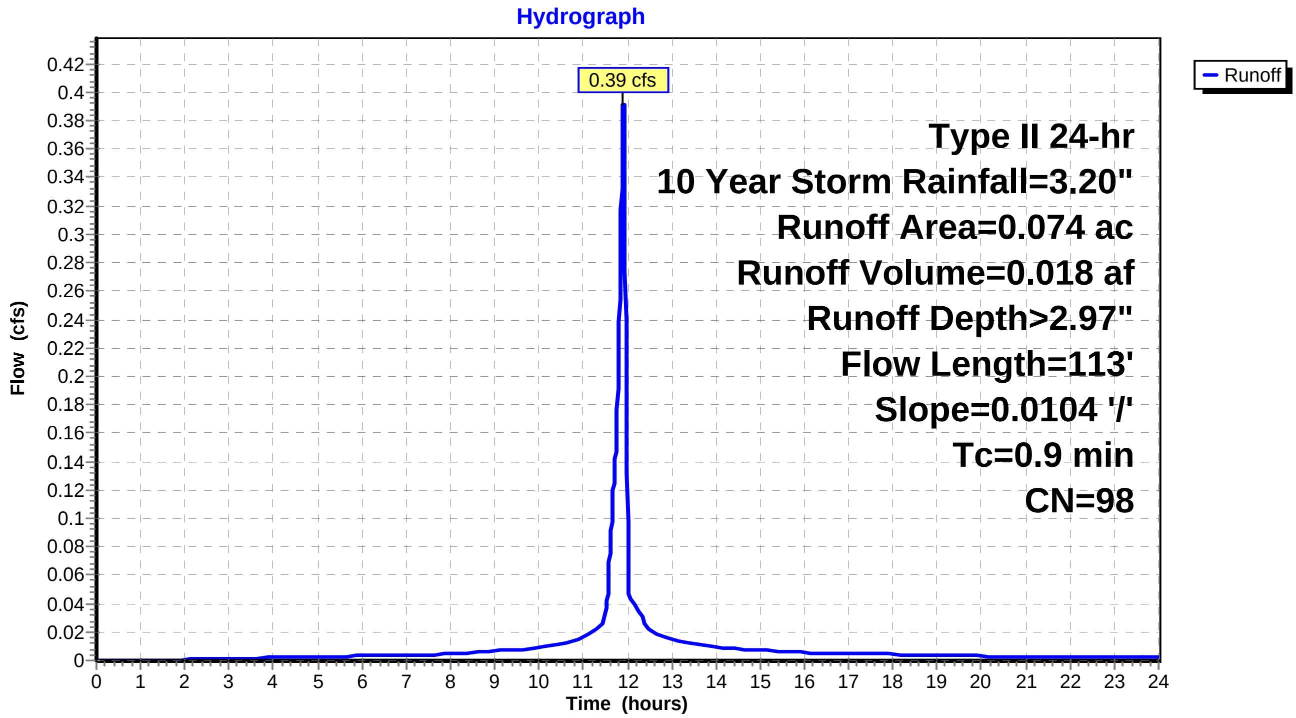
Runoff = 0.39 cfs @ 11.91 hrs, Volume= 0.018 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.074	98	Paved roads w/curbs & sewers, HSG D
0.074		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	113	0.0104	2.07		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

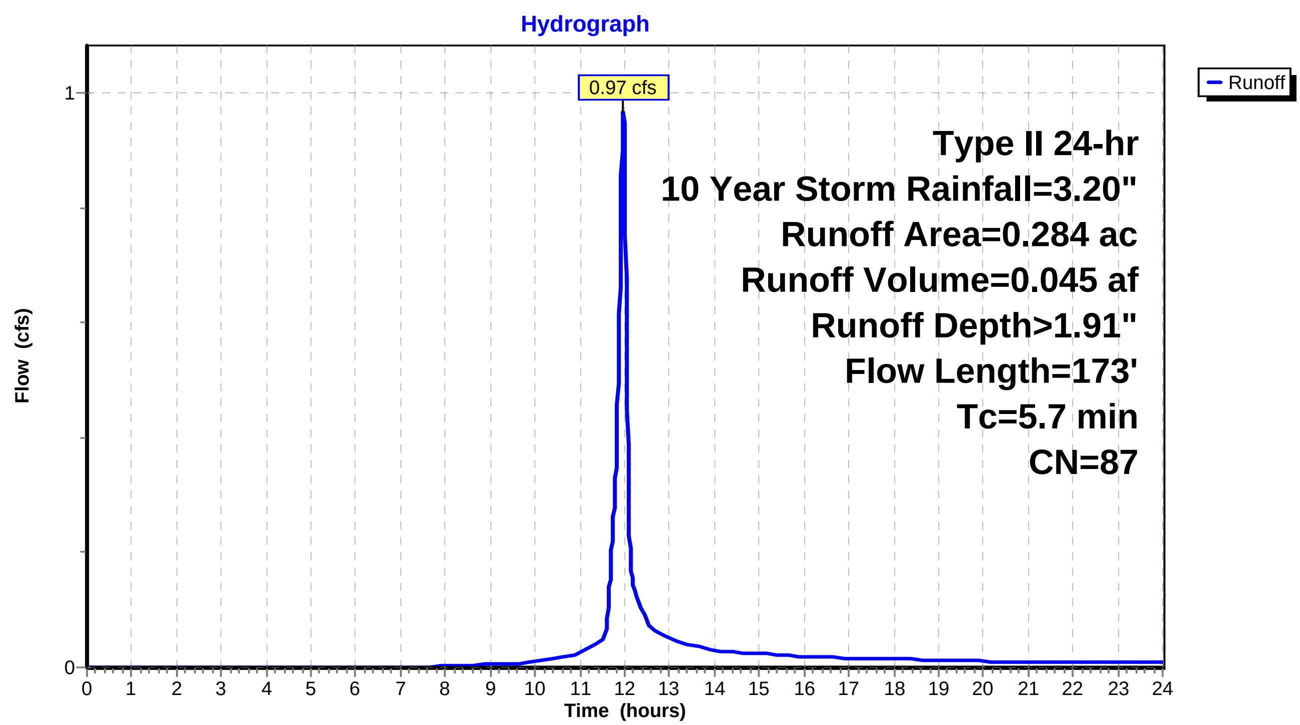
Runoff = 0.97 cfs @ 11.97 hrs, Volume= 0.045 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.176	80	>75% Grass cover, Good, HSG D
0.108	98	Paved roads w/curbs & sewers, HSG D
0.284	87	Weighted Average
0.176		61.97% Pervious Area
0.108		38.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	106	0.0456	4.33		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.3	67	0.0009	0.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.7	173	Total			

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

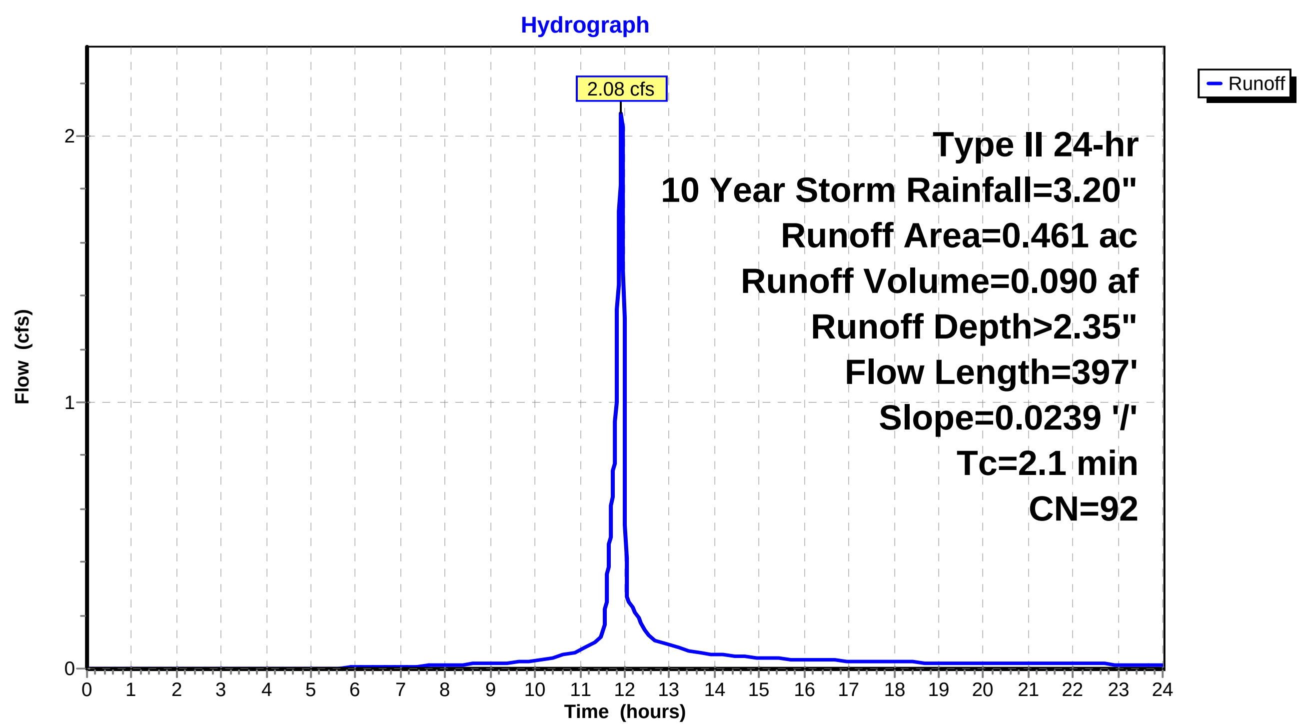
Runoff = 2.08 cfs @ 11.92 hrs, Volume= 0.090 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.299	98	Paved roads w/curbs & sewers, HSG D
0.162	80	>75% Grass cover, Good, HSG D
0.461	92	Weighted Average
0.162		35.14% Pervious Area
0.299		64.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	397	0.0239	3.14		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

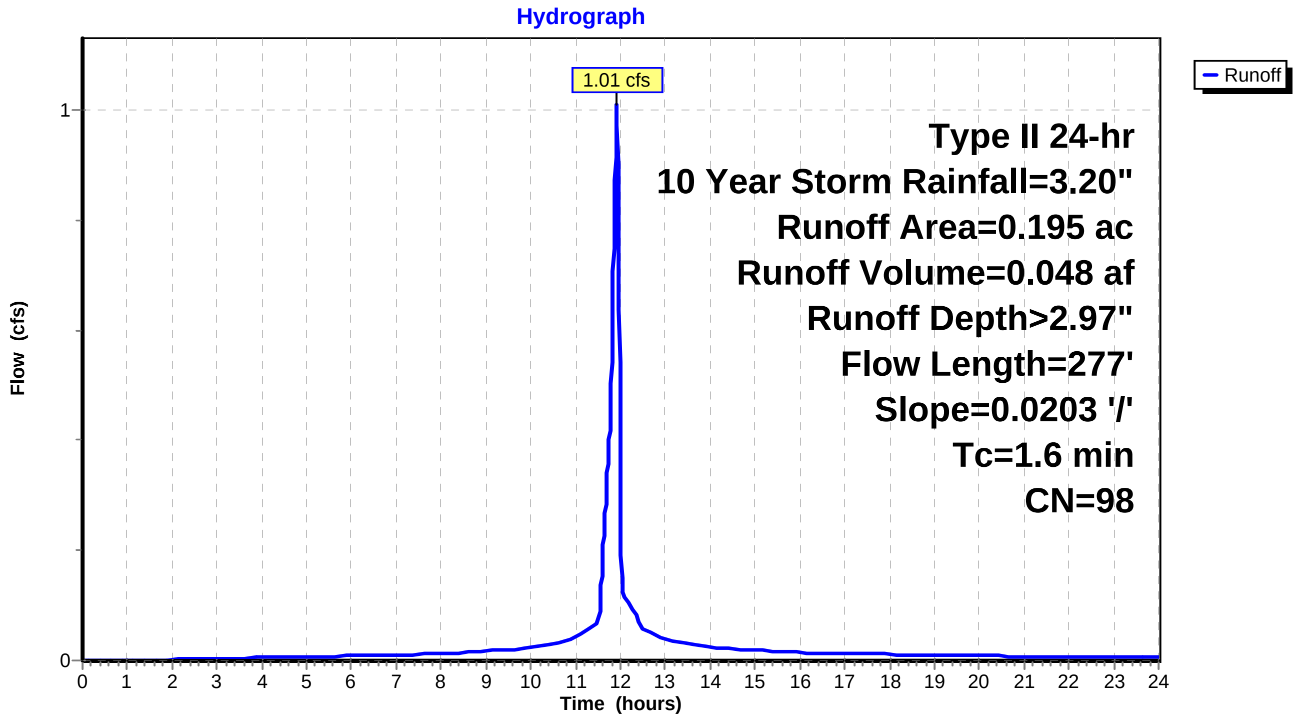
Runoff = 1.01 cfs @ 11.92 hrs, Volume= 0.048 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.195	98	Paved roads w/curbs & sewers, HSG D
0.195		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	277	0.0203	2.89		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 8: Subcat 8



Summary for Subcatchment 22: Subcat 22

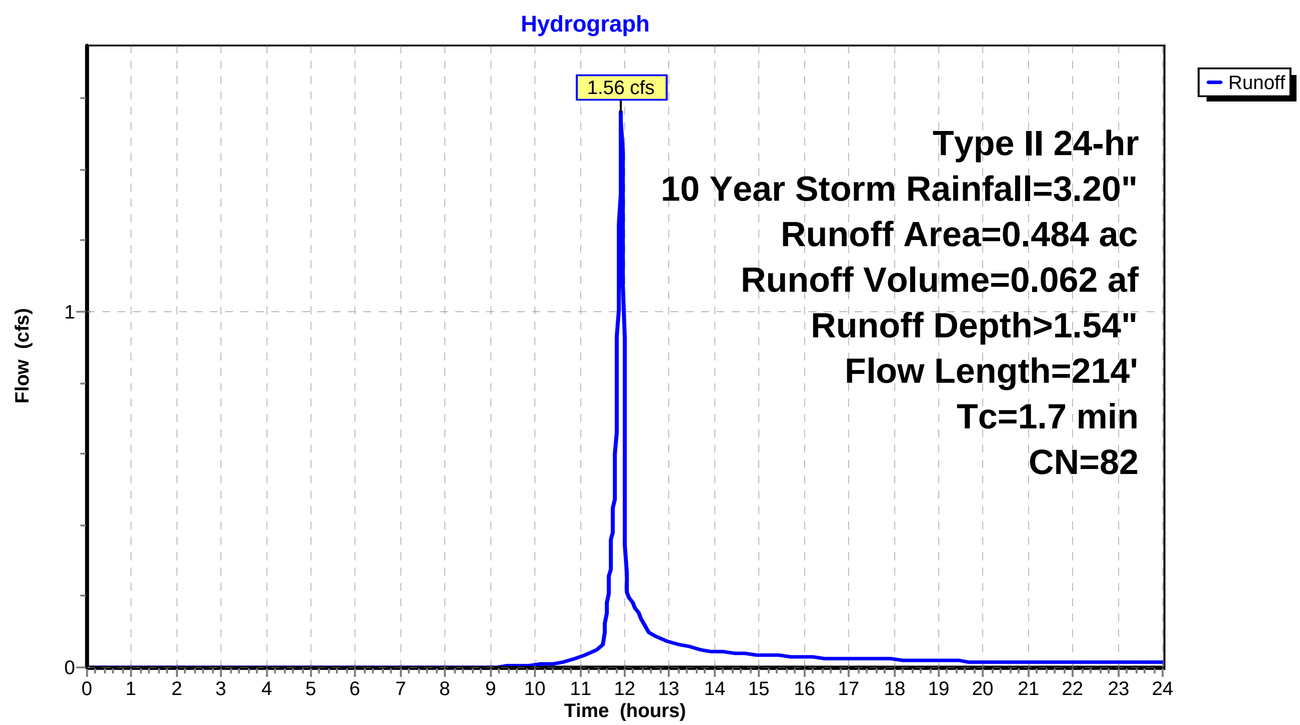
Runoff = 1.56 cfs @ 11.92 hrs, Volume= 0.062 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.431	80	>75% Grass cover, Good, HSG D
0.053	98	Paved roads w/curbs & sewers, HSG D
0.484	82	Weighted Average
0.431		89.05% Pervious Area
0.053		10.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	63	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	151	0.0560	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	214	Total			

Subcatchment 22: Subcat 22



Summary for Subcatchment 50: Subcat 50

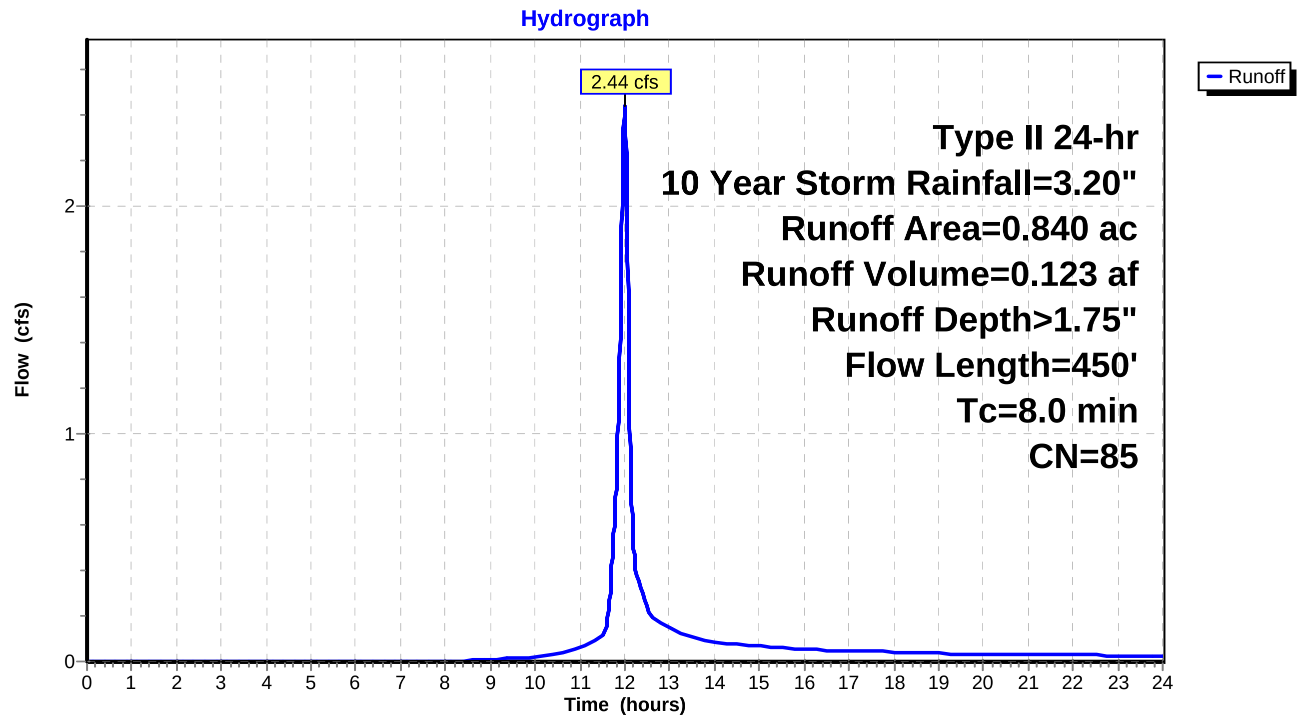
Runoff = 2.44 cfs @ 11.99 hrs, Volume= 0.123 af, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.212	98	Paved roads w/curbs & sewers, HSG D
0.001	98	Paved parking, HSG D
0.200	80	>75% Grass cover, Good, HSG D
0.052	80	>75% Grass cover, Good, HSG D
0.375	80	>75% Grass cover, Good, HSG D
0.840	85	Weighted Average
0.627		74.64% Pervious Area
0.213		25.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	253	0.0513	1.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	197	0.0077	0.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.0	450	Total			

Subcatchment 50: Subcat 50



Summary for Subcatchment 61: Subcat R1

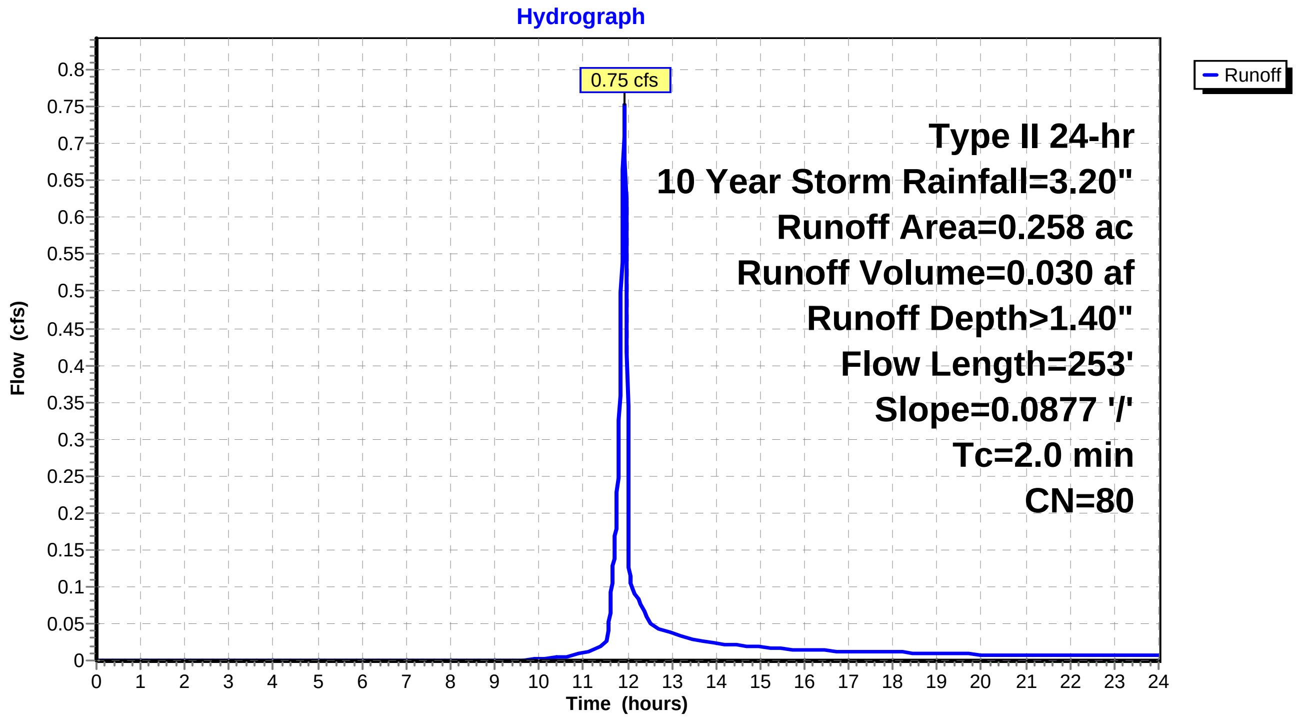
Runoff = 0.75 cfs @ 11.93 hrs, Volume= 0.030 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.258	80	>75% Grass cover, Good, HSG D
0.258		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	253	0.0877	2.07		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 61: Subcat R1



Summary for Subcatchment OS7a: OS7a

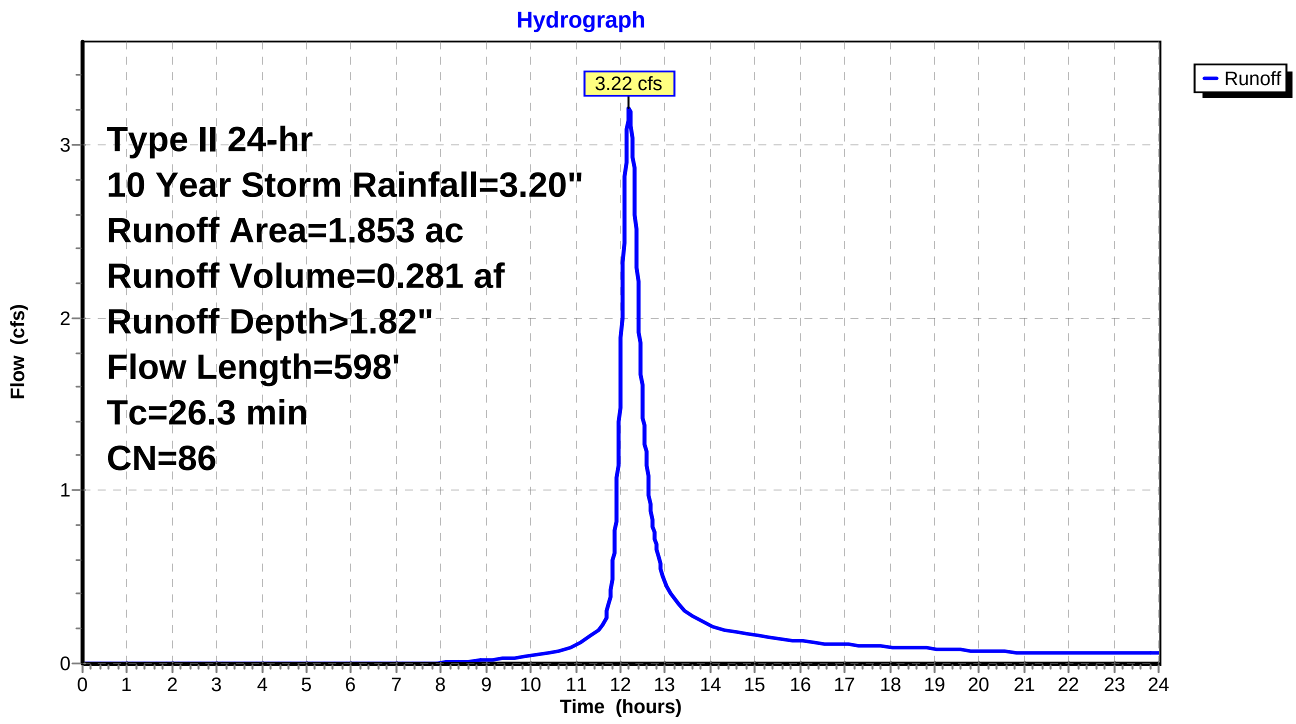
Runoff = 3.22 cfs @ 12.19 hrs, Volume= 0.281 af, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.853	86	weighted CN
	1.853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	50	0.0132	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.30"
8.5	410	0.0132	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	78	0.0256	9.51	16.81	**Pipe Channel, CMP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	60	0.1455	5.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.3	598	Total			

Subcatchment OS7a: OS7a



Summary for Subcatchment OS7b: OS7b

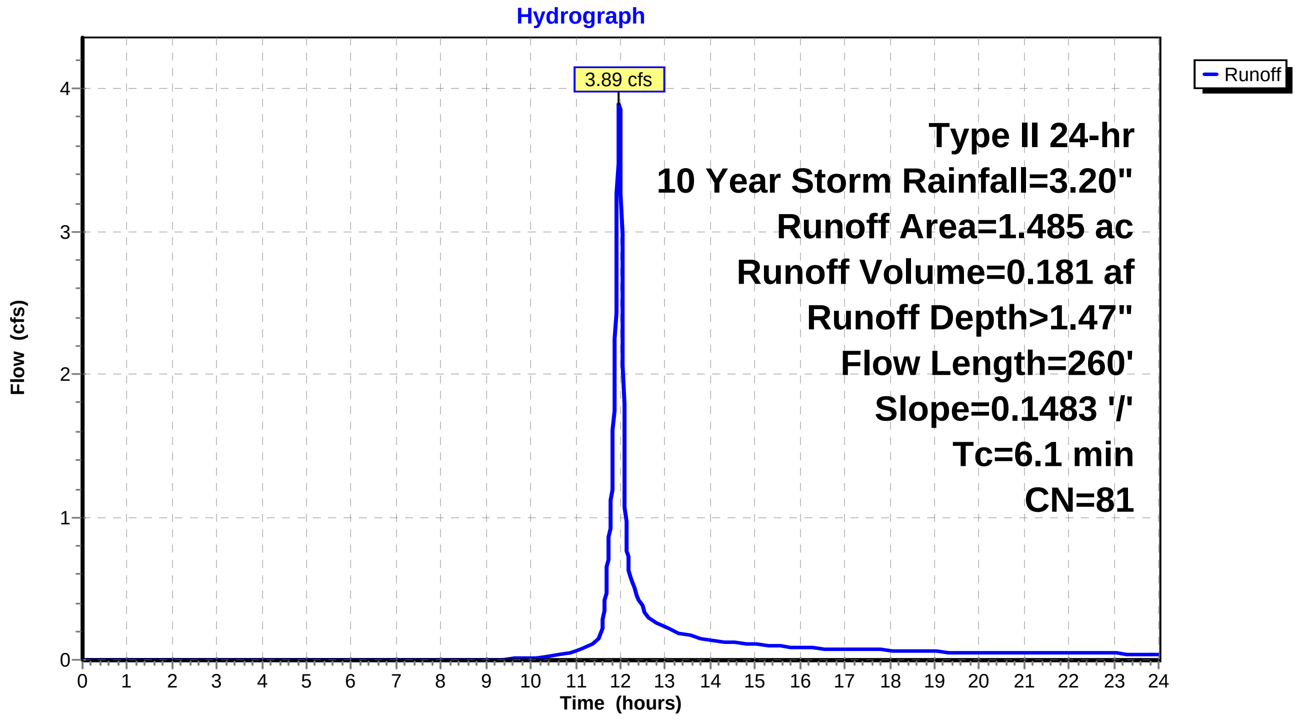
Runoff = 3.89 cfs @ 11.98 hrs, Volume= 0.181 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.485	81	weighted CN
	1.485		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.1483	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.8	210	0.1483	1.93		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.1	260	Total			

Subcatchment OS7b: OS7b



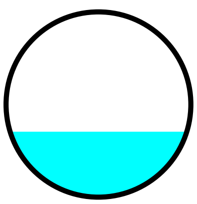
Summary for Reach R1: Pipe R1

Inflow Area = 3.051 ac, 19.73% Impervious, Inflow Depth > 1.95" for 10 Year Storm event
Inflow = 5.69 cfs @ 11.93 hrs, Volume= 0.495 af
Outflow = 5.69 cfs @ 11.93 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.1 min

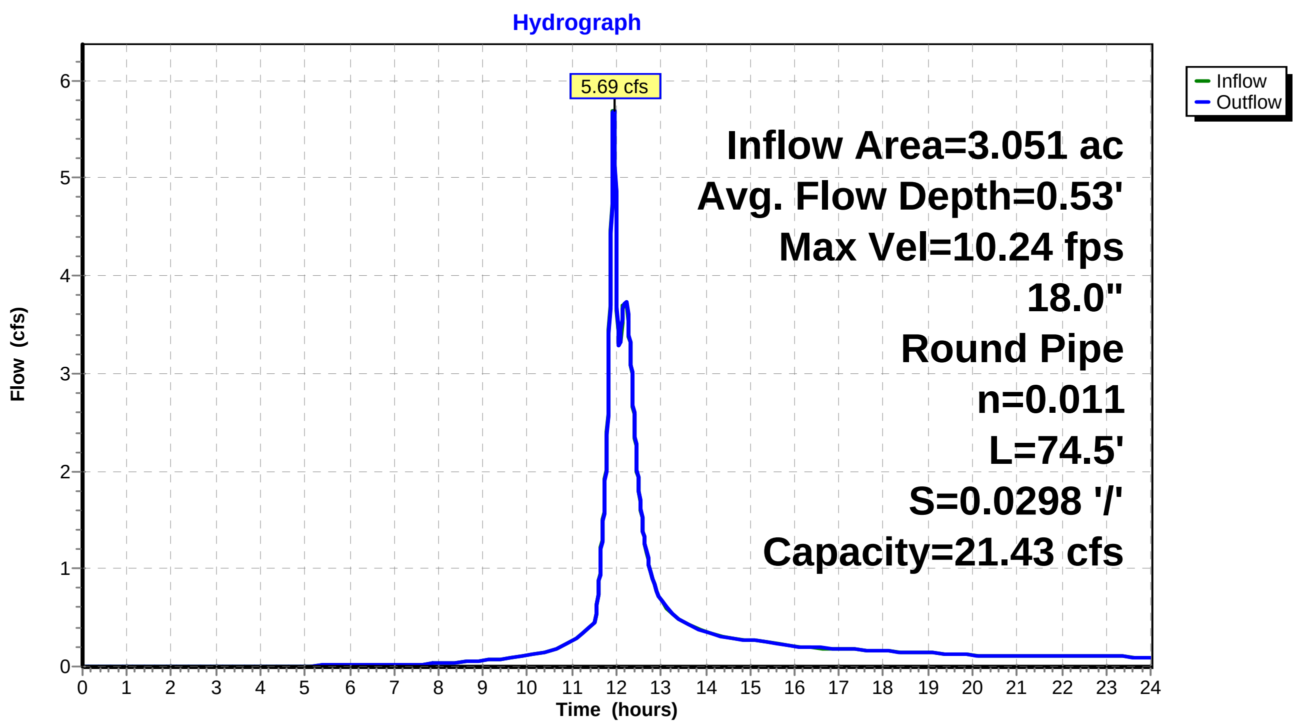
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.24 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.4 min

Peak Storage= 41 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 21.43 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 74.5' Slope= 0.0298 '/'
Inlet Invert= 320.27', Outlet Invert= 318.05'



Reach R1: Pipe R1



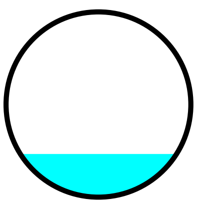
Summary for Reach X1: Pipe X1

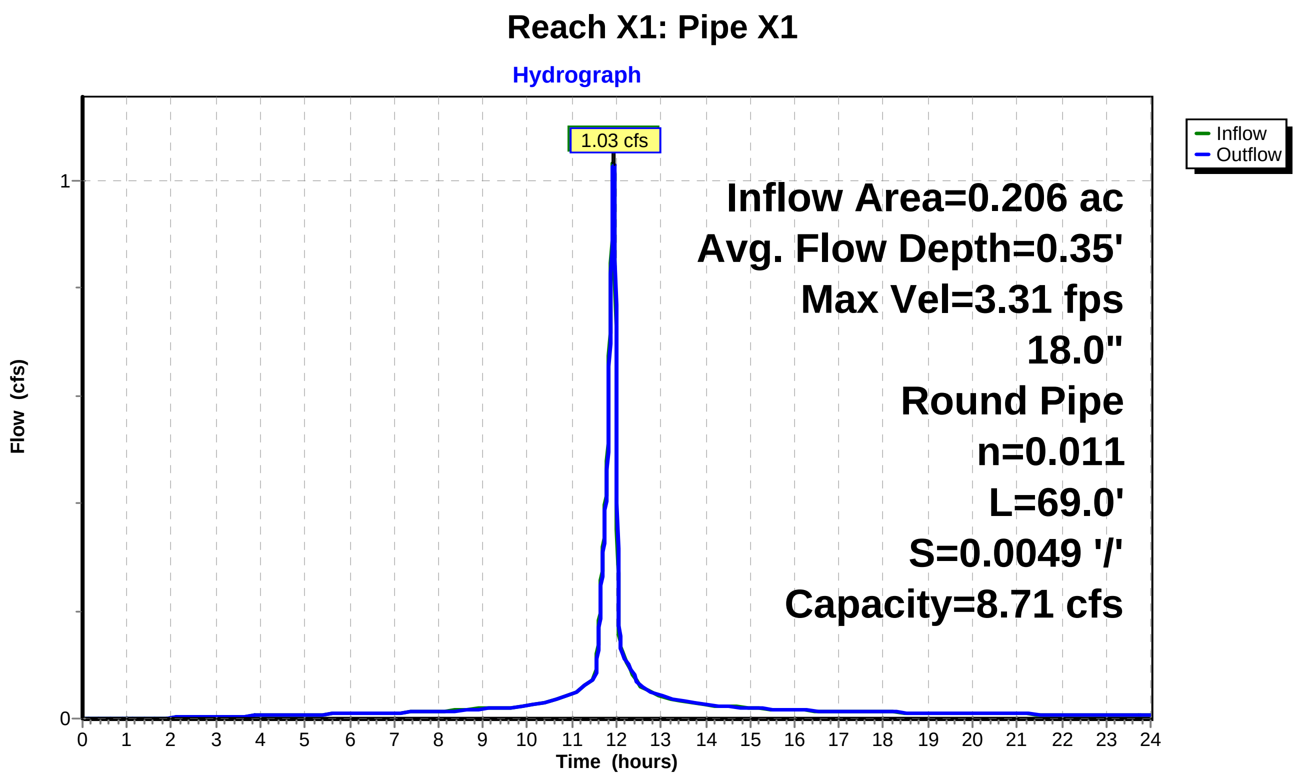
Inflow Area = 0.206 ac, 98.06% Impervious, Inflow Depth > 2.97" for 10 Year Storm event
Inflow = 1.03 cfs @ 11.93 hrs, Volume= 0.051 af
Outflow = 1.03 cfs @ 11.93 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 1.2 min

Peak Storage= 21 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.71 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 69.0' Slope= 0.0049 '/'
Inlet Invert= 323.19', Outlet Invert= 322.85'





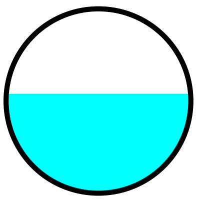
Summary for Reach X13: Pipe X13

Inflow Area = 1.969 ac, 2.69% Impervious, Inflow Depth > 1.48" for 10 Year Storm event
Inflow = 5.02 cfs @ 11.96 hrs, Volume= 0.243 af
Outflow = 5.01 cfs @ 11.96 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.2 min

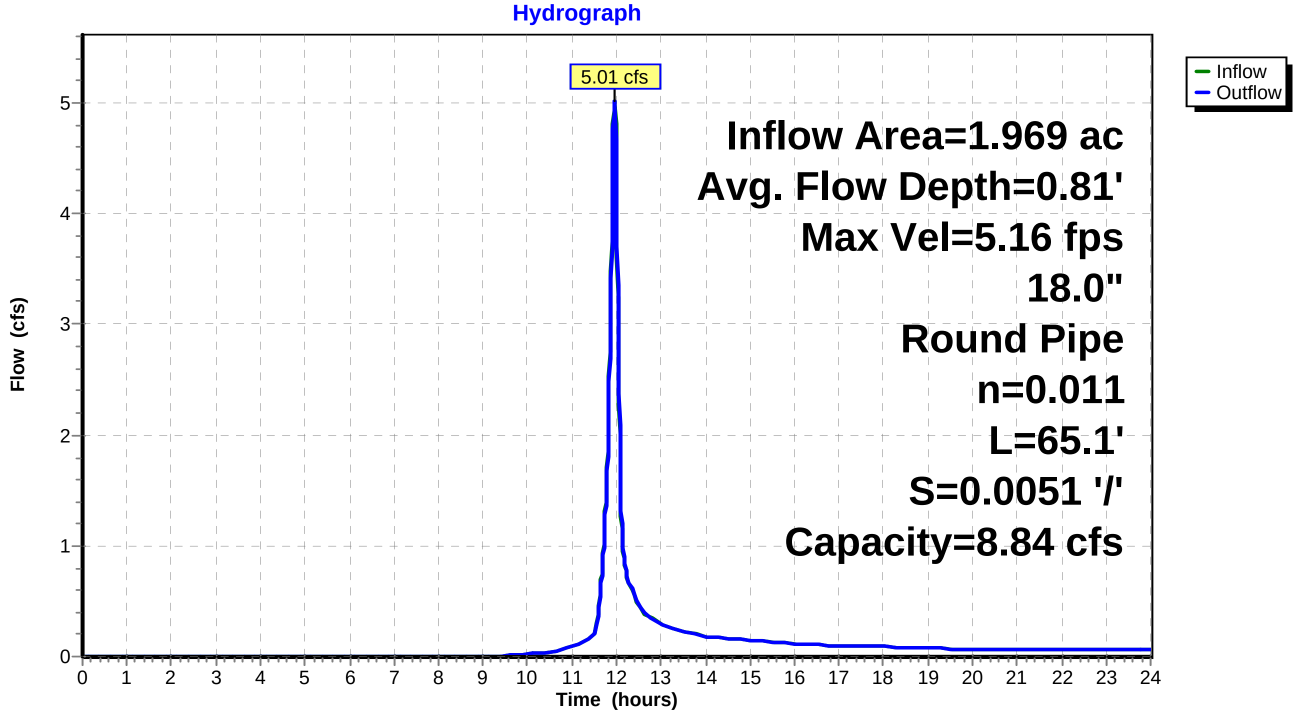
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.16 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 0.6 min

Peak Storage= 63 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.84 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 65.1' Slope= 0.0051 '/'
Inlet Invert= 321.60', Outlet Invert= 321.27'



Reach X13: Pipe X13



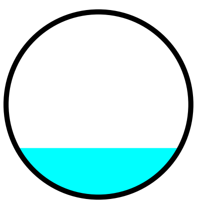
Summary for Reach X2: Pipe X2

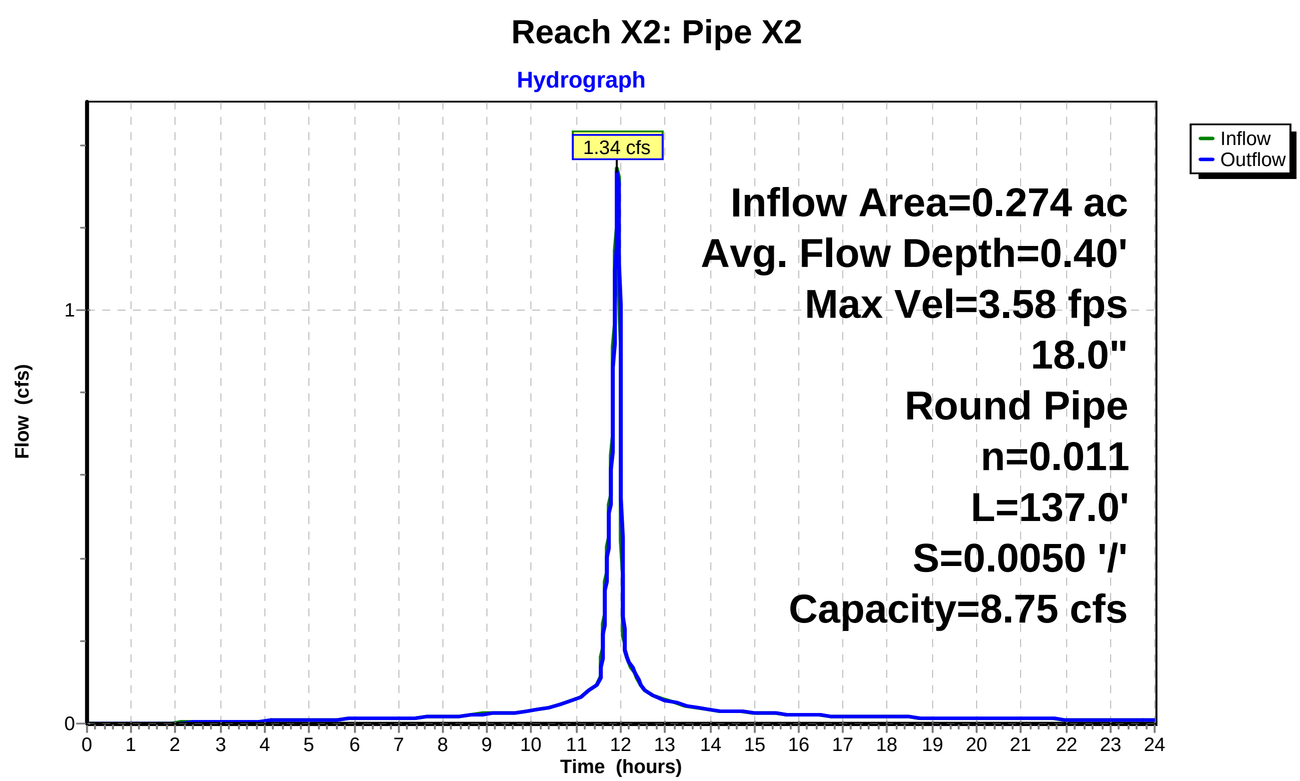
Inflow Area = 0.274 ac, 97.45% Impervious, Inflow Depth > 2.94" for 10 Year Storm event
Inflow = 1.34 cfs @ 11.92 hrs, Volume= 0.067 af
Outflow = 1.34 cfs @ 11.93 hrs, Volume= 0.067 af, Atten= 1%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.58 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 2.3 min

Peak Storage= 51 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.75 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 137.0' Slope= 0.0050 '/'
Inlet Invert= 322.76', Outlet Invert= 322.08'





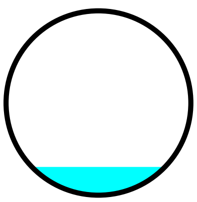
Summary for Reach X3: Pipe X3

Inflow Area = 0.059 ac, 89.83% Impervious, Inflow Depth > 2.75" for 10 Year Storm event
Inflow = 0.31 cfs @ 11.91 hrs, Volume= 0.014 af
Outflow = 0.30 cfs @ 11.91 hrs, Volume= 0.014 af, Atten= 3%, Lag= 0.4 min

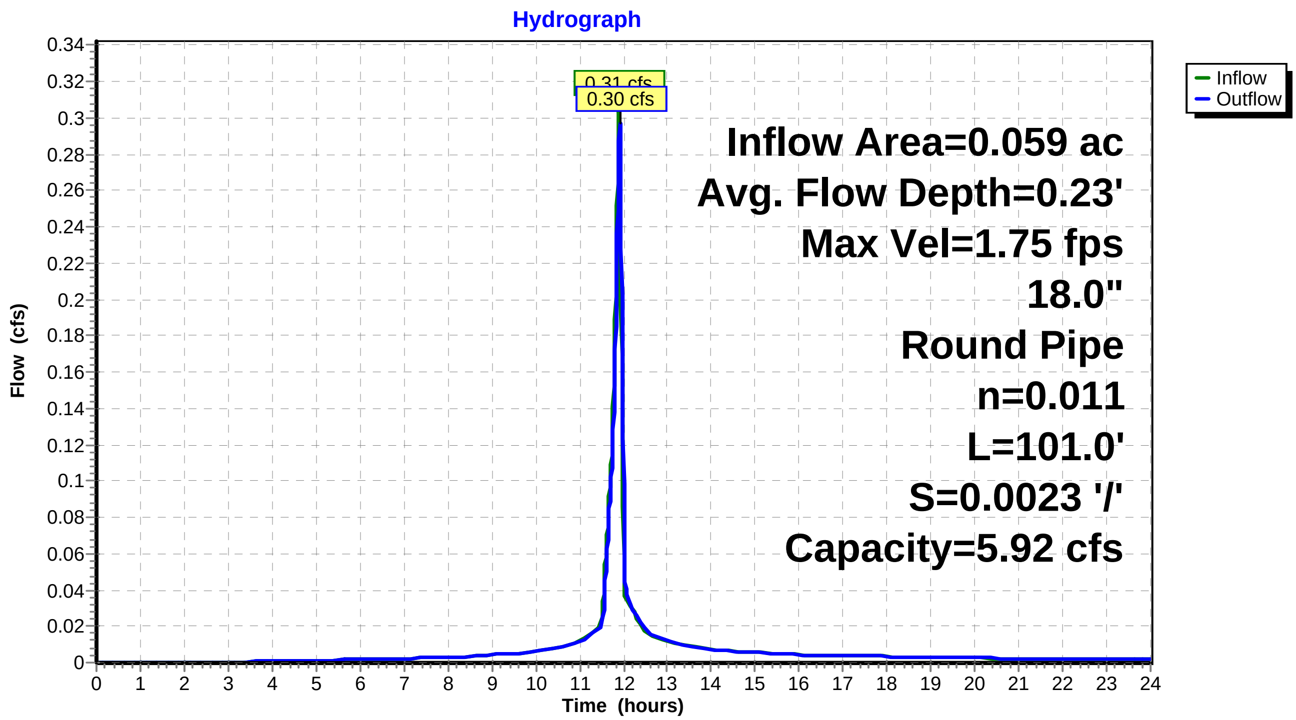
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 3.5 min

Peak Storage= 17 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.92 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 101.0' Slope= 0.0023 '/'
Inlet Invert= 318.96', Outlet Invert= 318.73'



Reach X3: Pipe X3



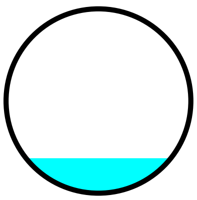
Summary for Reach X3a: Pipe X3a

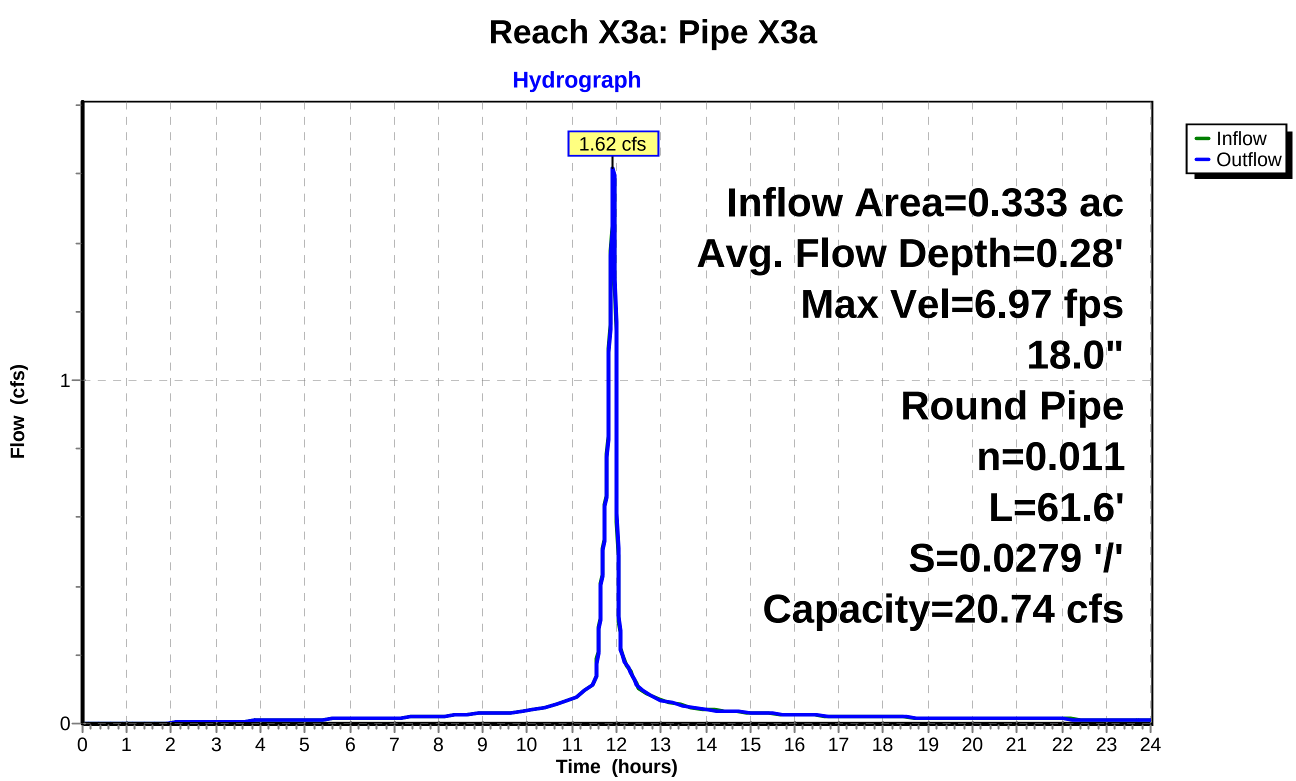
Inflow Area = 0.333 ac, 97.90% Impervious, Inflow Depth > 2.94" for 10 Year Storm event
Inflow = 1.62 cfs @ 11.92 hrs, Volume= 0.082 af
Outflow = 1.62 cfs @ 11.92 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.97 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.97 fps, Avg. Travel Time= 0.5 min

Peak Storage= 14 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 20.74 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 61.6' Slope= 0.0279 '/'
Inlet Invert= 321.71', Outlet Invert= 319.99'





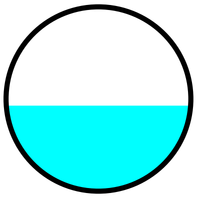
Summary for Reach X4: Pipe X4

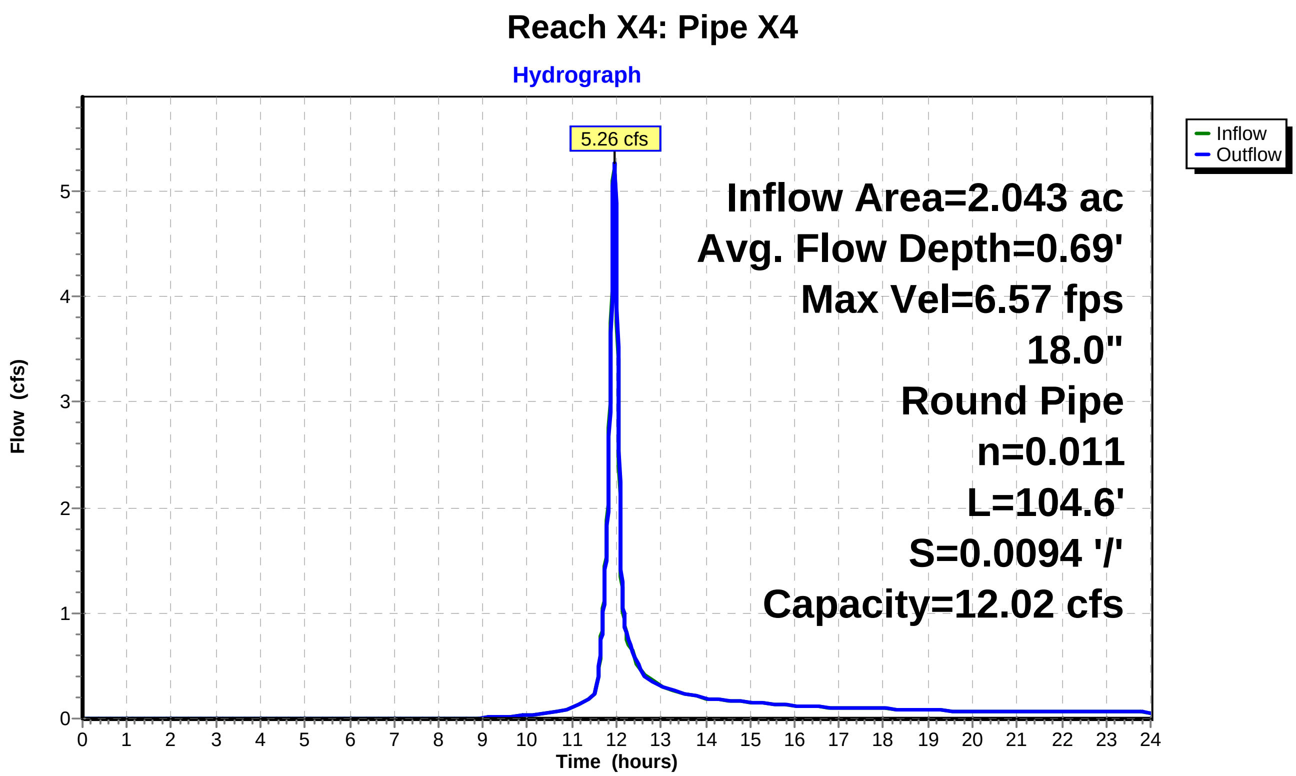
Inflow Area = 2.043 ac, 6.22% Impervious, Inflow Depth > 1.54" for 10 Year Storm event
Inflow = 5.26 cfs @ 11.95 hrs, Volume= 0.262 af
Outflow = 5.26 cfs @ 11.96 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.57 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 1.0 min

Peak Storage= 84 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.02 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 104.6' Slope= 0.0094 '/'
Inlet Invert= 321.22', Outlet Invert= 320.24'





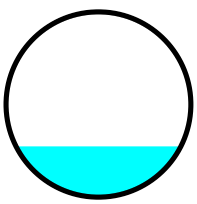
Summary for Reach X5: Pipe X5

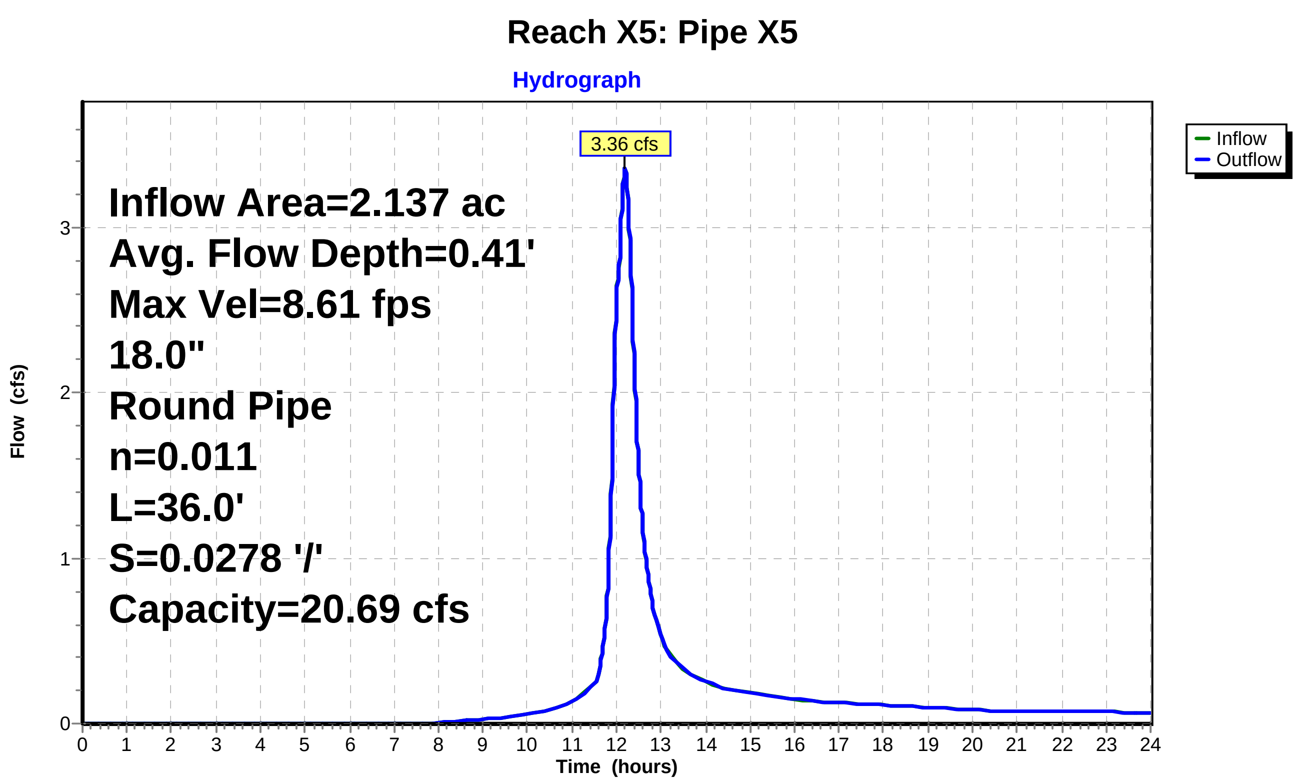
Inflow Area = 2.137 ac, 5.05% Impervious, Inflow Depth > 1.83" for 10 Year Storm event
Inflow = 3.36 cfs @ 12.19 hrs, Volume= 0.327 af
Outflow = 3.36 cfs @ 12.19 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.61 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 0.2 min

Peak Storage= 14 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 20.69 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 36.0' Slope= 0.0278 '/'
Inlet Invert= 325.00', Outlet Invert= 324.00'





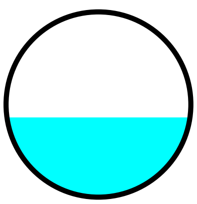
Summary for Reach X6: Pipe X6

Inflow Area = 2.598 ac, 15.67% Impervious, Inflow Depth > 1.93" for 10 Year Storm event
Inflow = 4.02 cfs @ 11.94 hrs, Volume= 0.417 af
Outflow = 4.02 cfs @ 11.94 hrs, Volume= 0.417 af, Atten= 0%, Lag= 0.2 min

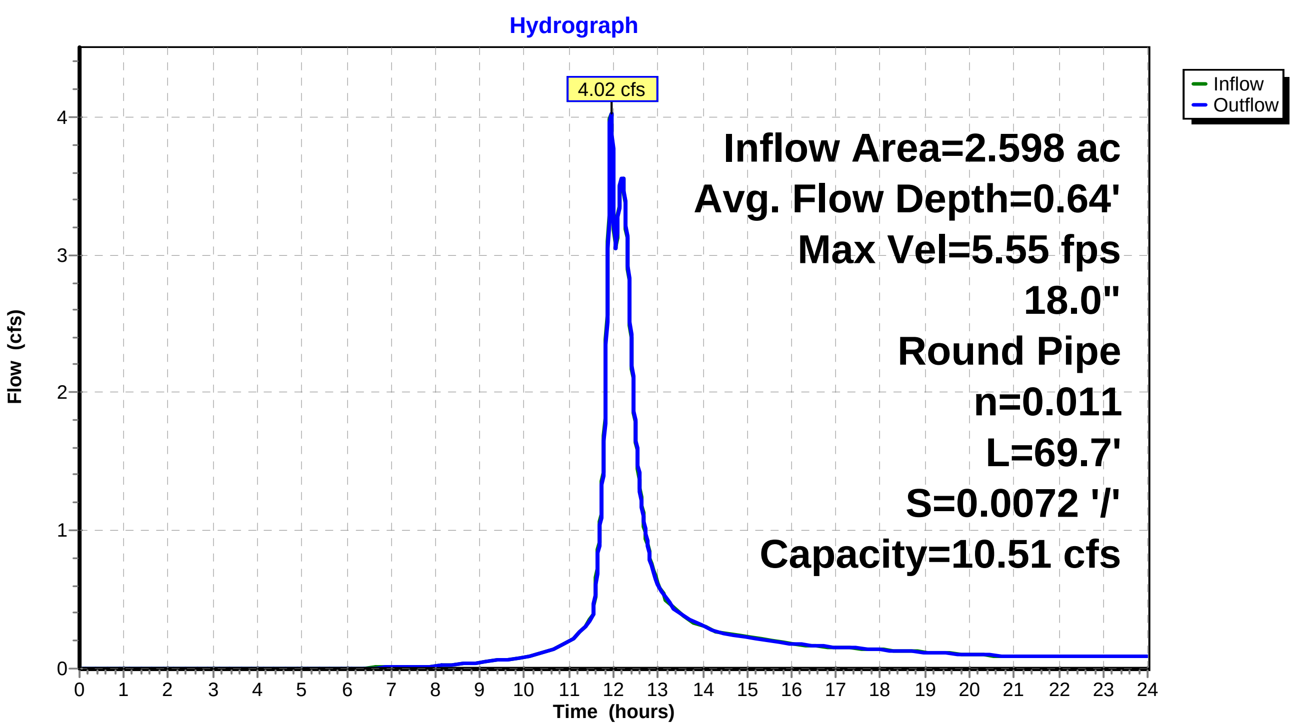
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.55 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.99 fps, Avg. Travel Time= 0.6 min

Peak Storage= 51 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.51 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 69.7' Slope= 0.0072 '/'
Inlet Invert= 323.50', Outlet Invert= 323.00'



Reach X6: Pipe X6



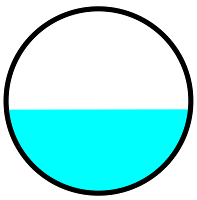
Summary for Reach X7: Pipe X7

Inflow Area = 2.793 ac, 21.55% Impervious, Inflow Depth > 2.00" for 10 Year Storm event
Inflow = 4.95 cfs @ 11.93 hrs, Volume= 0.465 af
Outflow = 4.94 cfs @ 11.93 hrs, Volume= 0.465 af, Atten= 0%, Lag= 0.1 min

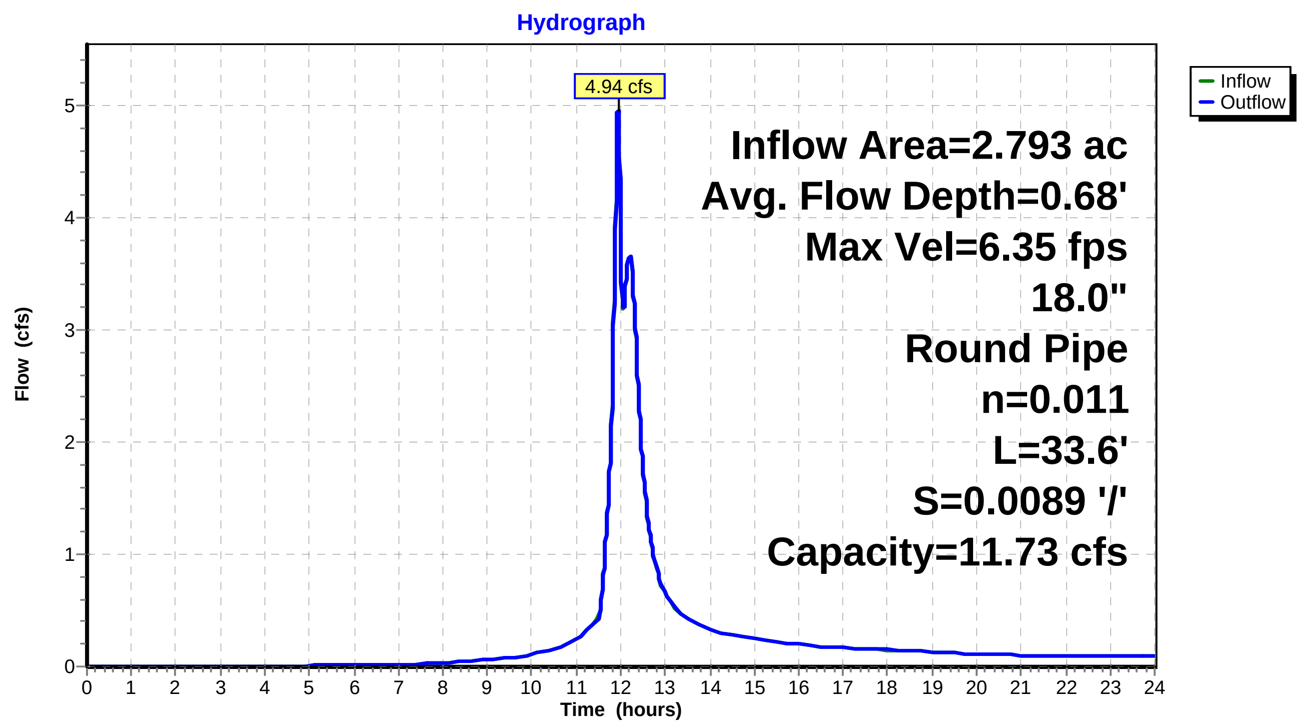
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.35 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.05 fps, Avg. Travel Time= 0.3 min

Peak Storage= 26 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.73 cfs

18.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 33.6' Slope= 0.0089 '/'
Inlet Invert= 322.90', Outlet Invert= 322.60'



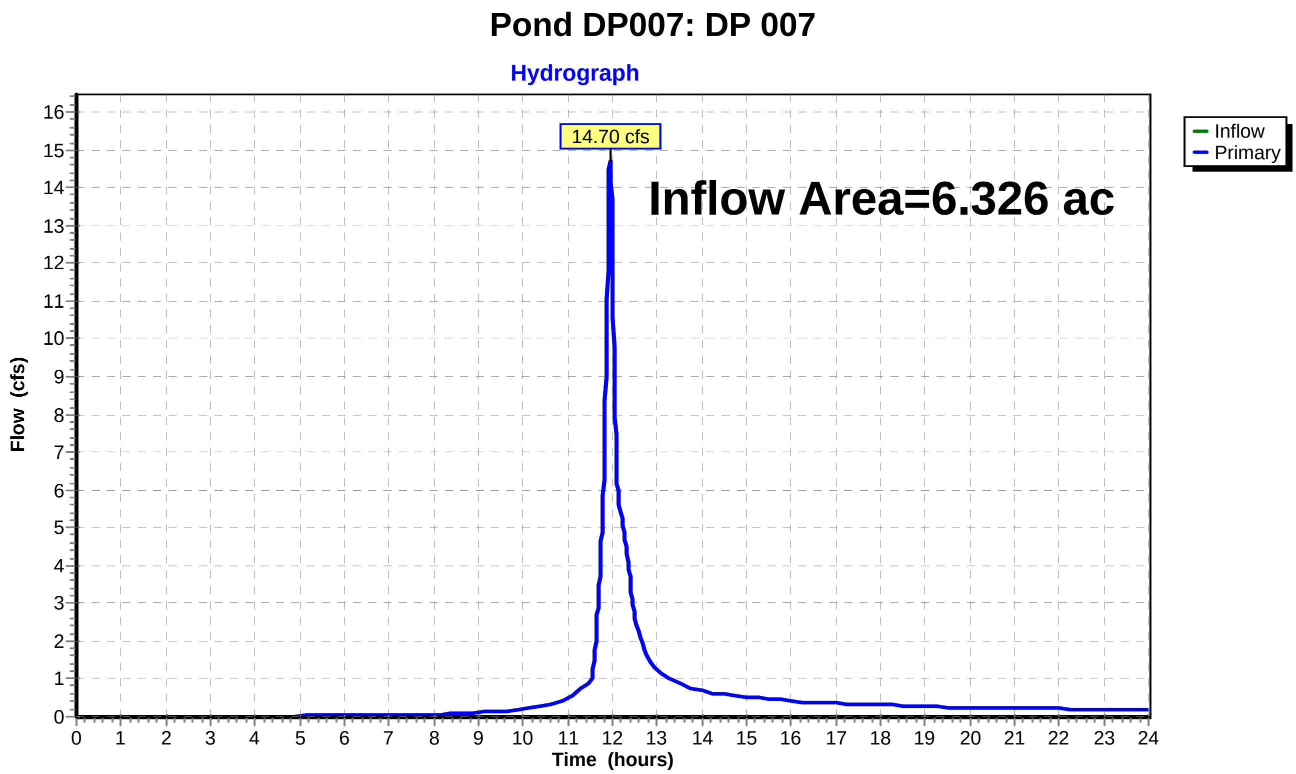
Reach X7: Pipe X7

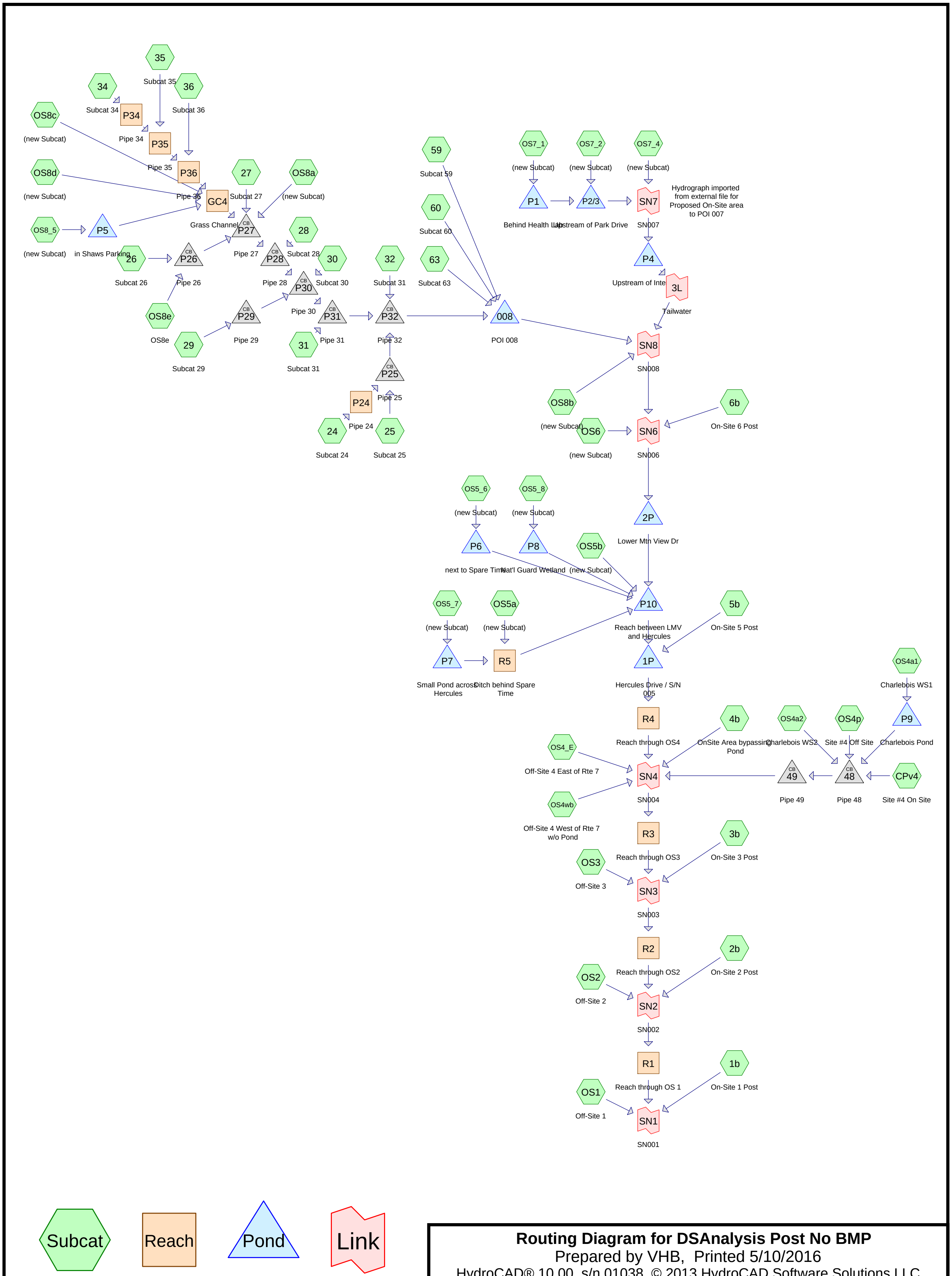


Summary for Pond DP007: DP 007

Inflow Area =	6.326 ac,	20.88% Impervious, Inflow Depth > 1.85"	for 10 Year Storm event	
Inflow =	14.70 cfs @	11.94 hrs, Volume=	0.975 af	
Primary =	14.70 cfs @	11.94 hrs, Volume=	0.975 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs





Routing Diagram for DSAnalysis Post No BMP
Prepared by VHB, Printed 5/10/2016
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.681	39	>75% Grass cover, Good, HSG A (1b, 2b, 3b, CPv4)
1.290	61	>75% Grass cover, Good, HSG B (3b, 4b, 6b, 24, 59, CPv4)
0.201	74	>75% Grass cover, Good, HSG C (3b)
2.925	80	>75% Grass cover, Good, HSG D (4b, 6b, 24, 25, 26, 28, 29, 30, 32, 34, 35, 36, 60, 63, CPv4)
15.016	46	Composite CN (OS1)
13.610	56	Composite CN (OS2)
20.942	74	Composite CN (OS3)
1.860	93	From 2005 Permit Application (OS4a1)
0.114	80	Pasture/grassland/range, Good, HSG D (5b)
0.186	98	Paved roads w/curbs & sewers, HSG A (3b, CPv4)
0.751	98	Paved roads w/curbs & sewers, HSG B (6b, 24, 59, CPv4)
0.513	98	Paved roads w/curbs & sewers, HSG C (3b, CPv4)
5.358	98	Paved roads w/curbs & sewers, HSG D (4b, 5b, 6b, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 60, 63, CPv4)
1.830	83	Paved roads w/open ditches, 50% imp, HSG A (1b, 2b)
0.243	98	Water Surface, 0% imp, HSG B (CPv4)
0.309	32	Woods/grass comb., Good, HSG A (1b, 2b)
16.735	73	composite (OS4_E)
4.986	84	composite CN (OS4p)
15.557	86	composite CN (OS4wb)
1.120	80	from 2005 Permit Application (OS4a2)
27.882	70	weighted CN (OS5a, OS7_1)
141.727	74	weighted CN (OS5b, OS5_8, OS7_4)
7.318	83	weighted CN (OS5_6)
2.744	65	weighted CN (OS5_7)
21.459	75	weighted CN (OS6)
21.469	77	weighted CN (OS7_2)
2.557	88	weighted CN (OS8a)
5.517	82	weighted CN (OS8b)
7.231	84	weighted CN (OS8c, OS8d, OS8e)
17.067	91	weighted CN (OS8_5)
359.198	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.006	HSG A	1b, 2b, 3b, CPv4
2.284	HSG B	3b, 4b, 6b, 24, 59, CPv4
0.714	HSG C	3b, CPv4
8.397	HSG D	4b, 5b, 6b, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 60, 63, CPv4
344.797	Other	OS1, OS2, OS3, OS4a1, OS4a2, OS4p, OS4wb, OS4_E, OS5a, OS5b, OS5_6, OS5_7, OS5_8, OS6, OS7_1, OS7_2, OS7_4, OS8a, OS8b, OS8c, OS8d, OS8e, OS8_5
359.198		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchr Numbers
0.681	1.290	0.201	2.925	0.000	5.097	>75% Grass cover, Good	
0.000	0.000	0.000	0.000	49.568	49.568	Composite CN	
0.000	0.000	0.000	0.000	1.860	1.860	From 2005 Permit Application	
0.000	0.000	0.000	0.114	0.000	0.114	Pasture/grassland/range, Good	
0.186	0.751	0.513	5.358	0.000	6.808	Paved roads w/curbs & sewers	
1.830	0.000	0.000	0.000	0.000	1.830	Paved roads w/open ditches, 50% imp	
0.000	0.243	0.000	0.000	0.000	0.243	Water Surface, 0% imp	
0.309	0.000	0.000	0.000	0.000	0.309	Woods/grass comb., Good	
0.000	0.000	0.000	0.000	16.735	16.735	composite	
0.000	0.000	0.000	0.000	20.543	20.543	composite CN	
0.000	0.000	0.000	0.000	1.120	1.120	from 2005 Permit Application	
0.000	0.000	0.000	0.000	254.971	254.971	weighted CN	
3.006	**2.284**	**0.714**	**8.397**	**344.797**	**359.198**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1b: On-Site 1 Post Runoff Area=0.997 ac 38.47% Impervious Runoff Depth=1.31"
Flow Length=744' Tc=4.1 min CN=56/98 Runoff=1.98 cfs 0.109 af

Subcatchment 2b: On-Site 2 Post Runoff Area=1.672 ac 31.79% Impervious Runoff Depth=1.05"
Flow Length=727' Tc=5.8 min CN=51/98 Runoff=2.42 cfs 0.146 af

Subcatchment 3b: On-Site 3 Post Runoff Area=1.013 ac 66.14% Impervious Runoff Depth=2.10"
Flow Length=457' Slope=0.0240 '/' Tc=16.2 min CN=60/98 Runoff=2.31 cfs 0.177 af

Subcatchment 4b: OnSite Area bypassing Runoff Area=2.506 ac 48.52% Impervious Runoff Depth=1.95"
Flow Length=1,397' Tc=5.3 min CN=73/98 Runoff=7.90 cfs 0.406 af

Subcatchment 5b: On-Site 5 Post Runoff Area=0.302 ac 62.25% Impervious Runoff Depth=2.38"
Flow Length=231' Tc=1.7 min CN=80/98 Runoff=1.31 cfs 0.060 af

Subcatchment 6b: On-Site 6 Post Runoff Area=0.906 ac 68.54% Impervious Runoff Depth=2.25"
Flow Length=349' Tc=2.7 min CN=67/98 Runoff=3.48 cfs 0.170 af

Subcatchment 24: Subcat 24 Runoff Area=0.380 ac 87.37% Impervious Runoff Depth=2.69"
Flow Length=376' Slope=0.0308 '/' Tc=1.8 min CN=68/98 Runoff=1.78 cfs 0.085 af

Subcatchment 25: Subcat 25 Runoff Area=0.171 ac 96.49% Impervious Runoff Depth=2.91"
Flow Length=218' Slope=0.0314 '/' Tc=1.0 min CN=80/98 Runoff=0.89 cfs 0.042 af

Subcatchment 26: Subcat 26 Runoff Area=0.601 ac 40.43% Impervious Runoff Depth=2.03"
Flow Length=643' Tc=7.5 min CN=80/98 Runoff=1.90 cfs 0.102 af

Subcatchment 27: Subcat 27 Runoff Area=0.367 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=429' Slope=0.0326 '/' Tc=2.0 min CN=0/98 Runoff=1.88 cfs 0.091 af

Subcatchment 28: Subcat 28 Runoff Area=0.090 ac 94.44% Impervious Runoff Depth=2.88"
Flow Length=128' Slope=0.0272 '/' Tc=0.6 min CN=80/98 Runoff=0.47 cfs 0.022 af

Subcatchment 29: Subcat 29 Runoff Area=0.136 ac 33.09% Impervious Runoff Depth=1.92"
Flow Length=178' Tc=2.1 min CN=80/98 Runoff=0.49 cfs 0.022 af

Subcatchment 30: Subcat 30 Runoff Area=0.126 ac 70.63% Impervious Runoff Depth=2.51"
Flow Length=115' Tc=1.4 min CN=80/98 Runoff=0.57 cfs 0.026 af

Subcatchment 31: Subcat 31 Runoff Area=0.053 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=97' Slope=0.0249 '/' Tc=0.5 min CN=0/98 Runoff=0.28 cfs 0.013 af

Subcatchment 32: Subcat 31 Runoff Area=0.034 ac 88.24% Impervious Runoff Depth=2.78"
Flow Length=69' Tc=0.5 min CN=80/98 Runoff=0.17 cfs 0.008 af

Subcatchment 34: Subcat 34 Runoff Area=0.203 ac 57.14% Impervious Runoff Depth=2.30"
Flow Length=161' Tc=2.3 min CN=80/98 Runoff=0.84 cfs 0.039 af

Subcatchment 35: Subcat 35 Runoff Area=0.205 ac 86.34% Impervious Runoff Depth=2.75"
Flow Length=149' Slope=0.0186 '/' Tc=0.9 min CN=80/98 Runoff=1.02 cfs 0.047 af

Subcatchment 36: Subcat 36 Runoff Area=0.196 ac 99.49% Impervious Runoff Depth=2.96"
Flow Length=186' Slope=0.0429 '/' Tc=0.7 min CN=80/98 Runoff=1.04 cfs 0.048 af

Subcatchment 59: Subcat 59 Runoff Area=0.079 ac 56.96% Impervious Runoff Depth=1.88"
Flow Length=233' Tc=2.5 min CN=61/98 Runoff=0.25 cfs 0.012 af

Subcatchment 60: Subcat 60 Runoff Area=0.657 ac 54.64% Impervious Runoff Depth=2.26"
Flow Length=193' Tc=1.0 min CN=80/98 Runoff=2.79 cfs 0.124 af

Subcatchment 63: Subcat 63 Runoff Area=0.515 ac 26.99% Impervious Runoff Depth=1.82"
Flow Length=331' Tc=3.7 min CN=80/98 Runoff=1.70 cfs 0.078 af

Subcatchment CPv4: Site #4 On Site Runoff Area=3.192 ac 52.41% Impervious Runoff Depth=2.08"
Flow Length=1,397' Tc=5.3 min CN=75/98 Runoff=10.75 cfs 0.552 af

Subcatchment OS1: Off-Site 1 Runoff Area=15.016 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=1,440' Tc=24.5 min CN=46/0 Runoff=0.09 cfs 0.072 af

Subcatchment OS2: Off-Site 2 Runoff Area=13.610 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=1,300' Tc=32.9 min CN=56/0 Runoff=1.34 cfs 0.317 af

Subcatchment OS3: Off-Site 3 Runoff Area=20.942 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=668' Slope=0.0210 '/' Tc=28.9 min CN=74/0 Runoff=18.01 cfs 1.811 af

Subcatchment OS4a1: Charlebois WS1 Runoff Area=1.860 ac 0.00% Impervious Runoff Depth=2.45"
Tc=5.8 min CN=93/0 Runoff=7.66 cfs 0.379 af

Subcatchment OS4a2: Charlebois WS2 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=1.40"
Tc=1.5 min CN=80/0 Runoff=3.33 cfs 0.131 af

Subcatchment OS4p: Site #4 Off Site Runoff Area=4.986 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=1,310' Tc=7.4 min CN=84/0 Runoff=14.19 cfs 0.699 af

Subcatchment OS4wb: Off-Site 4 West of Runoff Area=15.557 ac 0.00% Impervious Runoff Depth=1.84"
Flow Length=2,060' Tc=21.8 min CN=86/0 Runoff=30.24 cfs 2.379 af

Subcatchment OS4_E: Off-Site 4 East of Runoff Area=16.735 ac 0.00% Impervious Runoff Depth=0.98"
Flow Length=1,140' Slope=0.0114 '/' Tc=38.8 min CN=73/0 Runoff=10.95 cfs 1.371 af

Subcatchment OS5a: (new Subcat) Runoff Area=19.687 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,356' Slope=0.0012 '/' Tc=98.7 min CN=70/0 Runoff=5.16 cfs 1.359 af

Subcatchment OS5b: (new Subcat) Runoff Area=61.972 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=3,643' Tc=207.9 min CN=74/0 Runoff=12.08 cfs 5.358 af

Subcatchment OS5_6: (new Subcat) Runoff Area=7.318 ac 0.00% Impervious Runoff Depth=1.61"
Flow Length=660' Tc=6.1 min CN=83/0 Runoff=20.95 cfs 0.981 af

Subcatchment OS5_7: (new Subcat) Runoff Area=2.744 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=556' Slope=0.0010 '/' Tc=49.1 min CN=65/0 Runoff=0.76 cfs 0.137 af

Subcatchment OS5_8: (new Subcat) Runoff Area=66.948 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=2,163' Tc=40.1 min CN=74/0 Runoff=45.62 cfs 5.788 af

Subcatchment OS6: (new Subcat) Runoff Area=21.459 ac 0.00% Impervious Runoff Depth=1.09"
Flow Length=1,476' Tc=18.7 min CN=75/0 Runoff=26.04 cfs 1.956 af

Subcatchment OS7_1: (new Subcat) Runoff Area=8.195 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=136' Slope=0.0108 '/' Tc=33.6 min CN=70/0 Runoff=4.73 cfs 0.566 af

Subcatchment OS7_2: (new Subcat) Runoff Area=21.469 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=779' Tc=6.1 min CN=77/0 Runoff=46.37 cfs 2.168 af

Subcatchment OS7_4: (new Subcat) Runoff Area=12.807 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=503' Slope=0.0219 '/' Tc=33.5 min CN=74/0 Runoff=9.96 cfs 1.107 af

Subcatchment OS8a: (new Subcat) Runoff Area=2.557 ac 0.00% Impervious Runoff Depth=2.00"
Flow Length=680' Tc=12.7 min CN=88/0 Runoff=7.09 cfs 0.426 af

Subcatchment OS8b: (new Subcat) Runoff Area=5.517 ac 0.00% Impervious Runoff Depth=1.54"
Flow Length=799' Tc=20.3 min CN=82/0 Runoff=9.32 cfs 0.707 af

Subcatchment OS8c: (new Subcat) Runoff Area=0.298 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=240' Slope=0.0504 '/' Tc=9.5 min CN=84/0 Runoff=0.79 cfs 0.042 af

Subcatchment OS8d: (new Subcat) Runoff Area=2.208 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=740' Tc=22.9 min CN=84/0 Runoff=3.81 cfs 0.310 af

Subcatchment OS8e: OS8e Runoff Area=4.725 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=370' Slope=0.0538 '/' Tc=20.9 min CN=84/0 Runoff=8.63 cfs 0.662 af

Subcatchment OS8_5: (new Subcat) Runoff Area=17.067 ac 0.00% Impervious Runoff Depth=2.26"
Flow Length=1,741' Tc=7.2 min CN=91/0 Runoff=63.26 cfs 3.212 af

Reach GC4: Grass Channel 4 Avg. Flow Depth=0.50' Max Vel=4.08 fps Inflow=14.38 cfs 2.810 af
n=0.030 L=370.2' S=0.0243 '/' Capacity=123.15 cfs Outflow=14.35 cfs 2.809 af

Reach P24: Pipe 24 Avg. Flow Depth=0.33' Max Vel=6.00 fps Inflow=1.78 cfs 0.085 af
18.0" Round Pipe n=0.013 L=140.7' S=0.0237 '/' Capacity=16.18 cfs Outflow=1.77 cfs 0.085 af

Reach P34: Pipe 34 Avg. Flow Depth=0.34' Max Vel=2.76 fps Inflow=0.84 cfs 0.039 af
18.0" Round Pipe n=0.013 L=34.9' S=0.0049 '/' Capacity=7.33 cfs Outflow=0.84 cfs 0.039 af

Reach P35: Pipe 35 Avg. Flow Depth=0.44' Max Vel=4.19 fps Inflow=1.82 cfs 0.086 af
18.0" Round Pipe n=0.013 L=84.2' S=0.0084 '/' Capacity=9.65 cfs Outflow=1.81 cfs 0.086 af

Reach P36: Pipe 36 Avg. Flow Depth=0.57' Max Vel=3.78 fps Inflow=2.82 cfs 0.134 af
24.0" Round Pipe n=0.013 L=16.6' S=0.0048 '/' Capacity=15.70 cfs Outflow=2.82 cfs 0.134 af

Reach R1: Reach through OS 1 Avg. Flow Depth=0.52' Max Vel=3.95 fps Inflow=67.23 cfs 33.177 af
n=0.035 L=590.0' S=0.0220 '/' Capacity=2,282.34 cfs Outflow=67.01 cfs 33.165 af

Reach R2: Reach through OS2 Avg. Flow Depth=0.81' Max Vel=6.76 fps Inflow=66.13 cfs 32.720 af
n=0.035 L=580.0' S=0.0500 '/' Capacity=1,850.26 cfs Outflow=66.01 cfs 32.714 af

Reach R3: Reach through OS3 Avg. Flow Depth=0.47' Max Vel=1.48 fps Inflow=55.27 cfs 30.759 af
n=0.040 L=580.0' S=0.0052 '/' Capacity=2,787.67 cfs Outflow=48.46 cfs 30.732 af

Reach R4: Reach through OS4 Avg. Flow Depth=0.39' Max Vel=1.00 fps Inflow=31.94 cfs 24.907 af
n=0.035 L=750.0' S=0.0020 '/' Capacity=1,717.01 cfs Outflow=31.90 cfs 24.864 af

Reach R5: Ditch behind Spare Time Avg. Flow Depth=0.79' Max Vel=1.26 fps Inflow=5.16 cfs 1.411 af
n=0.025 L=325.0' S=0.0012 '/' Capacity=43.39 cfs Outflow=5.13 cfs 1.411 af

Pond 1P: Hercules Drive / S/N 005 Peak Elev=302.20' Storage=31,339 cf Inflow=32.52 cfs 24.915 af
Outflow=31.94 cfs 24.907 af

Pond 2P: Lower Mtn View Dr Peak Elev=310.00' Storage=95,999 cf Inflow=66.60 cfs 11.739 af
Outflow=14.07 cfs 11.736 af

Pond 008: POI 008 Inflow=30.43 cfs 4.521 af
Primary=30.43 cfs 4.521 af

Pond 48: Pipe 48 Peak Elev=325.29' Inflow=26.81 cfs 1.739 af
30.0" Round Culvert n=0.013 L=75.0' S=0.0360 '/' Outflow=26.81 cfs 1.739 af

Pond 49: Pipe 49 Peak Elev=321.54' Inflow=26.81 cfs 1.739 af
30.0" Round Culvert n=0.013 L=28.0' S=0.1071 '/' Outflow=26.81 cfs 1.739 af

Pond P1: Behind Health Lab Peak Elev=310.17' Storage=24,634 cf Inflow=4.73 cfs 0.566 af
Outflow=0.00 cfs 0.000 af

Pond P10: Reach between LMV and Peak Elev=308.04' Storage=54,721 cf Inflow=32.69 cfs 25.021 af
Outflow=32.49 cfs 24.855 af

Pond P2/3: Upstream of Park Drive Peak Elev=310.77' Storage=57,533 cf Inflow=46.37 cfs 2.168 af
12.0" Round Culvert n=0.013 L=100.0' S=0.0025 '/' Outflow=1.21 cfs 1.790 af

Pond P25: Pipe 25 Peak Elev=329.90' Inflow=2.63 cfs 0.127 af
18.0" Round Culvert n=0.013 L=57.2' S=0.0552 '/' Outflow=2.63 cfs 0.127 af

Pond P26: Pipe 26 Peak Elev=333.53' Inflow=9.19 cfs 0.764 af
24.0" Round Culvert n=0.013 L=35.6' S=0.0048 '/' Outflow=9.19 cfs 0.764 af

Pond P27: Pipe 27 Peak Elev=333.16' Inflow=29.26 cfs 4.090 af
30.0" Round Culvert n=0.013 L=71.7' S=0.0050 '/' Outflow=29.26 cfs 4.090 af

Pond P28: Pipe 28 Peak Elev=331.64' Inflow=29.31 cfs 4.111 af
30.0" Round Culvert n=0.013 L=73.4' S=0.0050 '/' Outflow=29.31 cfs 4.111 af

Pond P29: Pipe 29 Peak Elev=330.12' Inflow=0.49 cfs 0.022 af
24.0" Round Culvert n=0.013 L=23.2' S=0.0052 '/' Outflow=0.49 cfs 0.022 af

Pond P30: Pipe 30 Peak Elev=330.12' Inflow=29.44 cfs 4.159 af
36.0" Round Culvert n=0.013 L=37.8' S=0.0050 '/' Outflow=29.44 cfs 4.159 af

Pond P31: Pipe 31 Peak Elev=329.38' Inflow=29.47 cfs 4.173 af
36.0" Round Culvert n=0.013 L=33.7' S=0.0050 '/' Outflow=29.47 cfs 4.173 af

Pond P32: Pipe 32 Peak Elev=328.63' Inflow=29.80 cfs 4.307 af
36.0" Round Culvert n=0.013 L=134.4' S=0.0037 '/' Outflow=29.80 cfs 4.307 af

Pond P4: Upstream of Interstate Peak Elev=309.75' Storage=95,534 cf Inflow=28.92 cfs 4.533 af
35.0" x 24.0", R=17.9"/55.1" Pipe Arch Culvert n=0.013 L=216.0' S=0.0053 '/' Outflow=4.23 cfs 4.385 af

Pond P5: in Shaws Parking Peak Elev=358.34' Storage=73,624 cf Inflow=63.26 cfs 3.212 af
Outflow=10.02 cfs 2.325 af

Pond P6: next to Spare Time Peak Elev=310.49' Storage=28,585 cf Inflow=20.95 cfs 0.981 af
Outflow=0.41 cfs 0.887 af

Pond P7: Small Pond across Hercules Peak Elev=313.51' Storage=3,714 cf Inflow=0.76 cfs 0.137 af
Outflow=0.11 cfs 0.053 af

Pond P8: Nat'l Guard Wetland Peak Elev=309.65' Storage=123,684 cf Inflow=45.62 cfs 5.788 af
Outflow=4.79 cfs 5.629 af

Pond P9: Charlebois Pond Peak Elev=333.57' Storage=0.296 af Inflow=7.66 cfs 0.379 af
Outflow=0.80 cfs 0.357 af

Link 3L: Tailwater Inflow=4.23 cfs 4.385 af
Primary=4.23 cfs 4.385 af

Link SN1: SN001 Inflow=67.25 cfs 33.346 af
Primary=67.25 cfs 33.346 af

Link SN2: SN002 Inflow=67.23 cfs 33.177 af
Primary=67.23 cfs 33.177 af

Link SN3: SN003 Inflow=66.13 cfs 32.720 af
Primary=66.13 cfs 32.720 af

Link SN4: SN004 Inflow=55.27 cfs 30.759 af
Primary=55.27 cfs 30.759 af

Link SN6: SN006 Inflow=66.60 cfs 11.739 af
Primary=66.60 cfs 11.739 af

Link 0 Colchester Ave 250\tech\Stormwater\VTrans HydroCAD\On-Site 7 PR no Detention~Pond 007.hce Inflow=28.92 cfs 4.533 af
Area= 9.375 ac 23.57% Imperv. Primary=28.92 cfs 4.533 af

Link SN8: SN008 Inflow=40.20 cfs 9.613 af
Primary=40.20 cfs 9.613 af

Total Runoff Area = 359.198 ac Runoff Volume = 34.317 af Average Runoff Depth = 1.15"
97.85% Pervious = 351.475 ac 2.15% Impervious = 7.723 ac

Summary for Subcatchment 1b: On-Site 1 Post

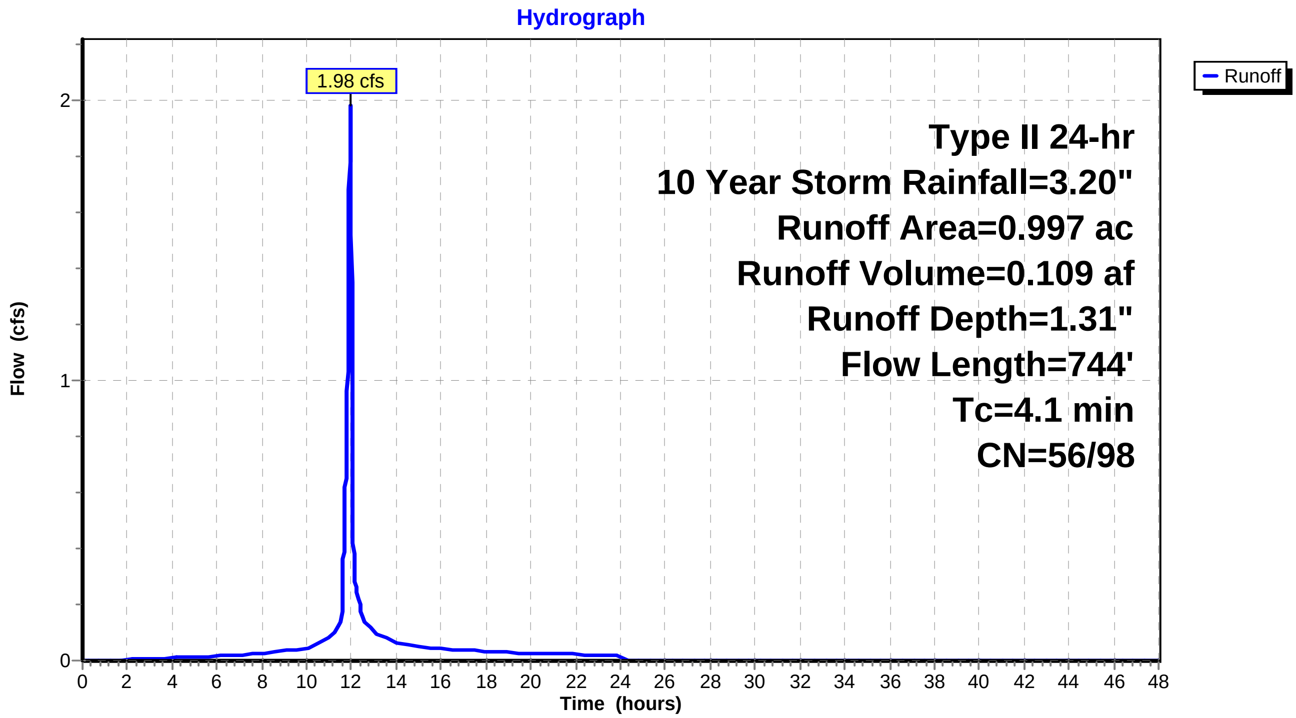
Runoff = 1.98 cfs @ 11.95 hrs, Volume= 0.109 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.767	83	Paved roads w/open ditches, 50% imp, HSG A
0.140	39	>75% Grass cover, Good, HSG A
0.090	32	Woods/grass comb., Good, HSG A
0.997	72	Weighted Average
0.613	56	61.53% Pervious Area
0.383	98	38.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0370	1.49		**Sheet Flow, Sheet 1** Smooth surfaces n= 0.011 P2= 2.30"
0.4	89	0.0370	3.90		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
1.8	436	0.0573	4.14	5.38	**Channel Flow, Channel 1** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.8	119	0.1424	2.64		**Shallow Concentrated Flow, Shallow 1b** Short Grass Pasture Kv= 7.0 fps
4.1	744	Total			

Subcatchment 1b: On-Site 1 Post



Summary for Subcatchment 2b: On-Site 2 Post

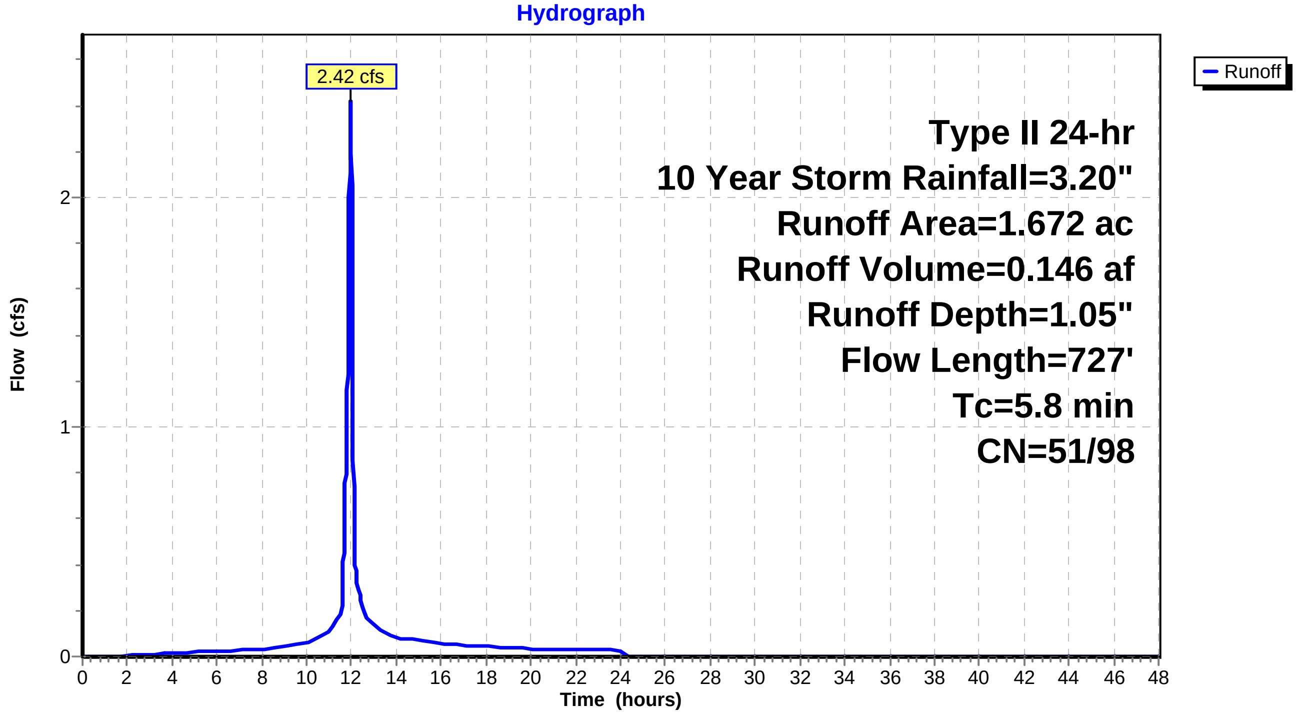
Runoff = 2.42 cfs @ 11.97 hrs, Volume= 0.146 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
1.063	83	Paved roads w/open ditches, 50% imp, HSG A
0.390	39	>75% Grass cover, Good, HSG A
0.219	32	Woods/grass comb., Good, HSG A
1.672	66	Weighted Average
1.140	51	68.21% Pervious Area
0.531	98	31.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0144	1.02		**Sheet Flow, Sheet 2** Smooth surfaces n= 0.011 P2= 2.30"
4.1	595	0.0144	2.44		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
0.1	25	0.0792	4.87	6.33	**Channel Flow, Channel 2** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.0	7	0.5368	5.13		**Shallow Concentrated Flow, Shallow 2b** Short Grass Pasture Kv= 7.0 fps
5.8	727	Total			

Subcatchment 2b: On-Site 2 Post



Summary for Subcatchment 3b: On-Site 3 Post

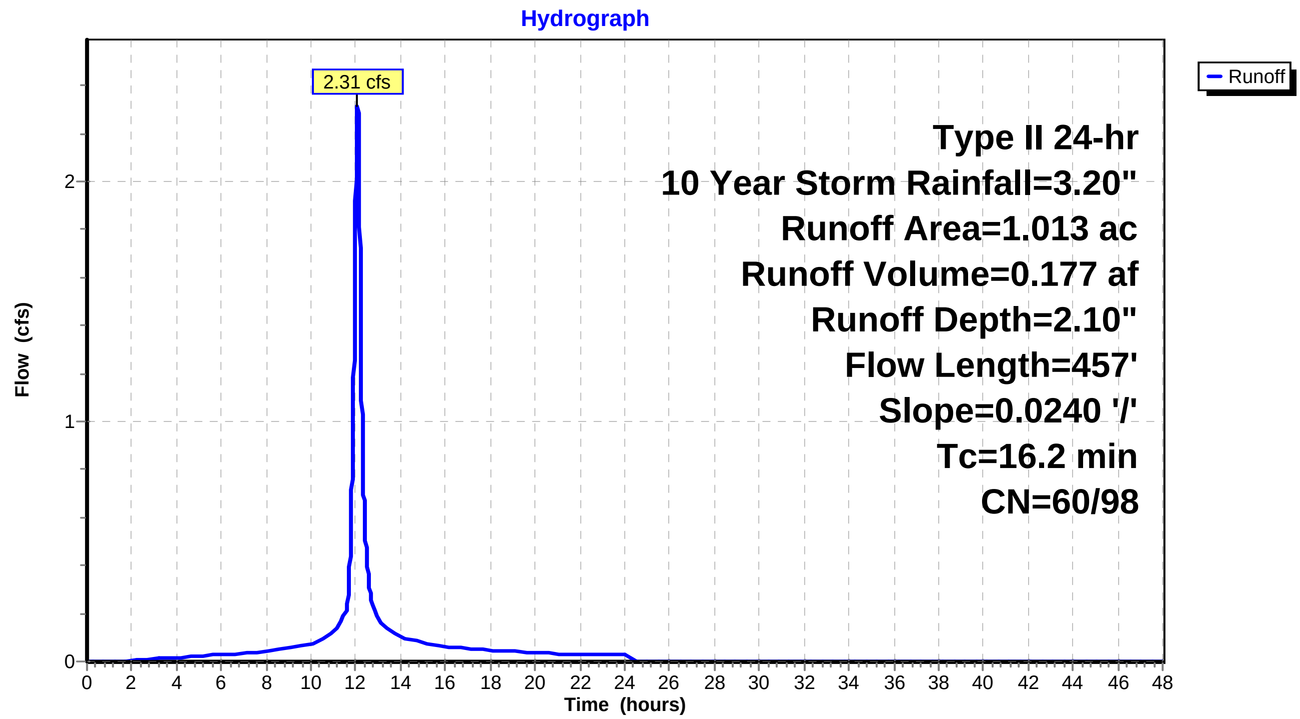
Runoff = 2.31 cfs @ 12.08 hrs, Volume= 0.177 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.129	39	>75% Grass cover, Good, HSG A
0.013	61	>75% Grass cover, Good, HSG B
0.201	74	>75% Grass cover, Good, HSG C
0.160	98	Paved roads w/curbs & sewers, HSG A
0.510	98	Paved roads w/curbs & sewers, HSG C
1.013	85	Weighted Average
0.343	60	33.86% Pervious Area
0.670	98	66.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	357	0.0240	1.08		**Shallow Concentrated Flow, Shallow 3** Short Grass Pasture Kv= 7.0 fps
10.7	100	0.0240	0.16		**Sheet Flow, Sheet 3** Grass: Short n= 0.150 P2= 2.30"
16.2	457	Total			

Subcatchment 3b: On-Site 3 Post



Summary for Subcatchment 4b: OnSite Area bypassing Pond

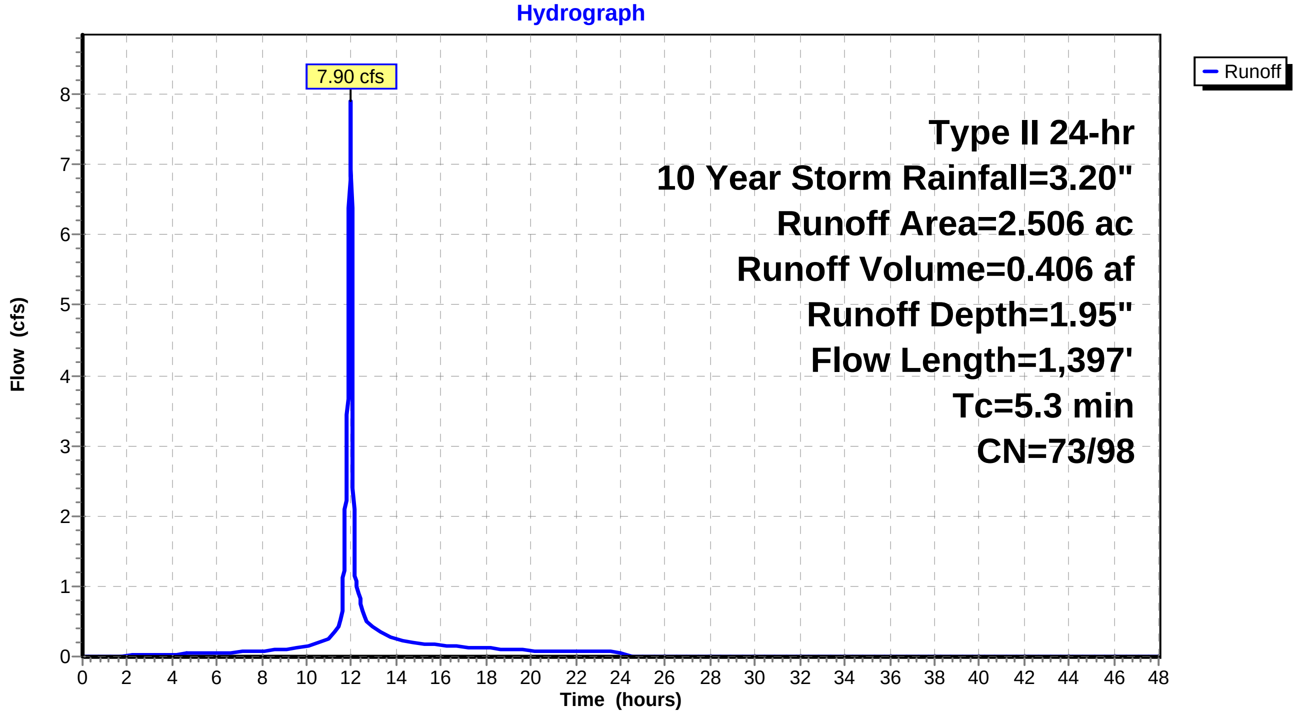
Runoff = 7.90 cfs @ 11.96 hrs, Volume= 0.406 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.000	98	Paved roads w/curbs & sewers, HSG A
0.453	61	>75% Grass cover, Good, HSG B
0.000	98	Water Surface, 0% imp, HSG B
0.000	98	Paved roads w/curbs & sewers, HSG B
0.000	74	>75% Grass cover, Good, HSG C
0.000	98	Paved roads w/curbs & sewers, HSG C
0.837	80	>75% Grass cover, Good, HSG D
1.216	98	Paved roads w/curbs & sewers, HSG D
2.506	85	Weighted Average
1.290	73	51.48% Pervious Area
1.216	98	48.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	67	0.0147	0.95		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.30"
0.3	68	0.0413	4.13		**Shallow Concentrated Flow, Shallow Pave 1** Paved Kv= 20.3 fps
1.5	444	0.0091	4.86	38.91	**Channel Flow, Grass Channel 1** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.2	61	0.0311	5.45	9.63	**Pipe Channel, Culvert 1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
1.8	632	0.0131	5.84	46.68	**Channel Flow, Channel 2** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.3	125	0.0649	7.87	13.92	**Pipe Channel, Culvert 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
5.3	1,397	Total			

Subcatchment 4b: OnSite Area bypassing Pond



Summary for Subcatchment 5b: On-Site 5 Post

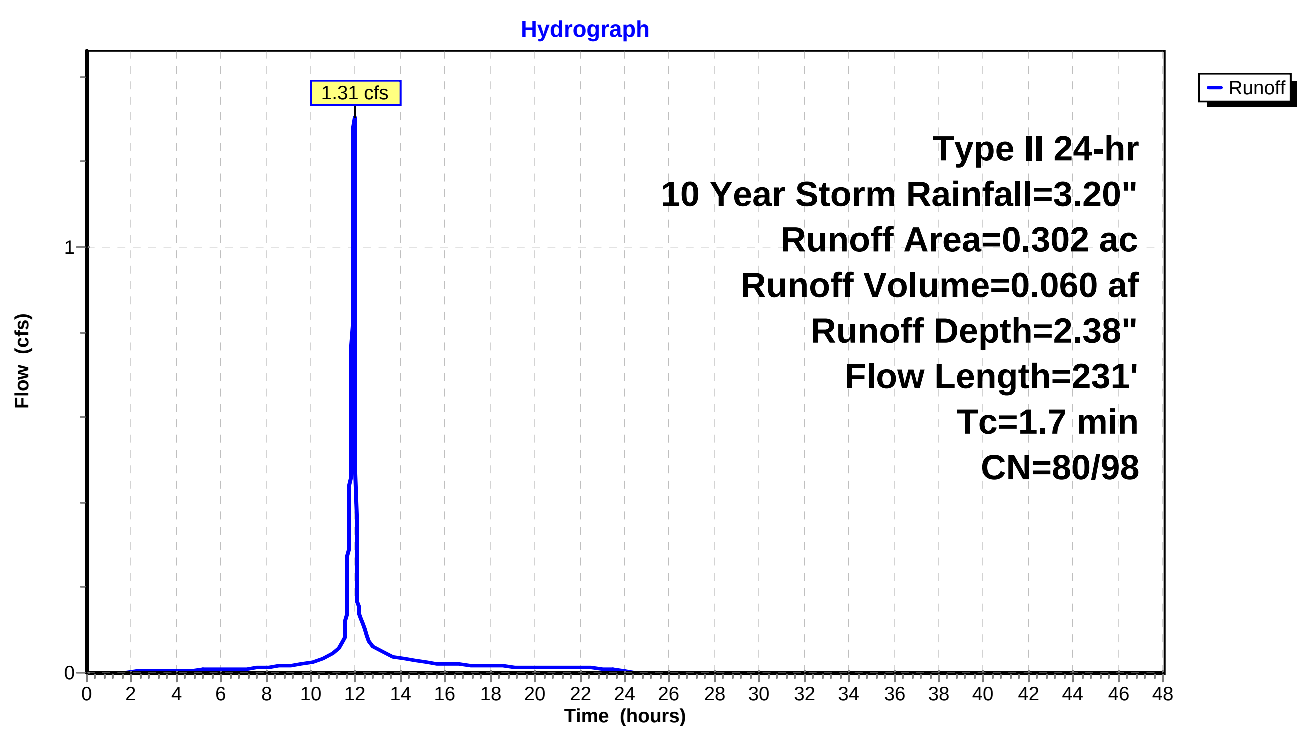
Runoff = 1.31 cfs @ 11.92 hrs, Volume= 0.060 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.188	98	Paved roads w/curbs & sewers, HSG D
0.114	80	Pasture/grassland/range, Good, HSG D
0.302	91	Weighted Average
0.114	80	37.75% Pervious Area
0.188	98	62.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0351	1.46		**Sheet Flow, Sheet 5** Smooth surfaces n= 0.011 P2= 2.30"
0.4	99	0.0351	3.80		**Shallow Concentrated Flow, Shallow 5a** Paved Kv= 20.3 fps
0.2	32	0.1243	2.47		**Shallow Concentrated Flow, Shallow 5b** Short Grass Pasture Kv= 7.0 fps
1.7	231	Total			

Subcatchment 5b: On-Site 5 Post



Summary for Subcatchment 6b: On-Site 6 Post

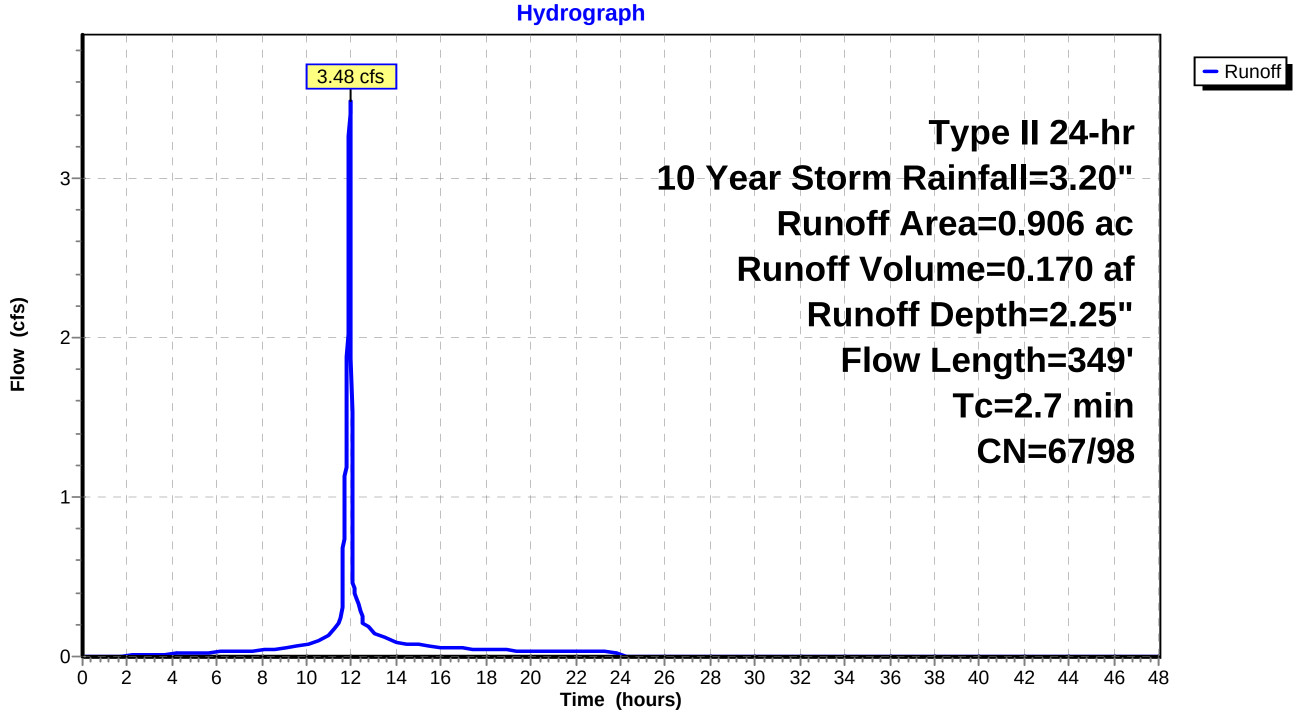
Runoff = 3.48 cfs @ 11.93 hrs, Volume= 0.170 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.207	98	Paved roads w/curbs & sewers, HSG B
0.198	61	>75% Grass cover, Good, HSG B
0.414	98	Paved roads w/curbs & sewers, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.906	88	Weighted Average
0.285	67	31.46% Pervious Area
0.621	98	68.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	130	0.0115	2.53	3.29	**Channel Flow, Channel 6a** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
1.1	100	0.0418	1.57		**Sheet Flow, Sheet 6** Smooth surfaces n= 0.011 P2= 2.30"
0.1	20	0.0418	4.15		**Shallow Concentrated Flow, Shallow 6a** Paved Kv= 20.3 fps
0.1	32	0.0630	5.92	7.70	**Channel Flow, Channel 6b** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
0.5	67	0.1194	2.42		**Shallow Concentrated Flow, Shallow 6b** Short Grass Pasture Kv= 7.0 fps
2.7	349	Total			

Subcatchment 6b: On-Site 6 Post



Summary for Subcatchment 24: Subcat 24

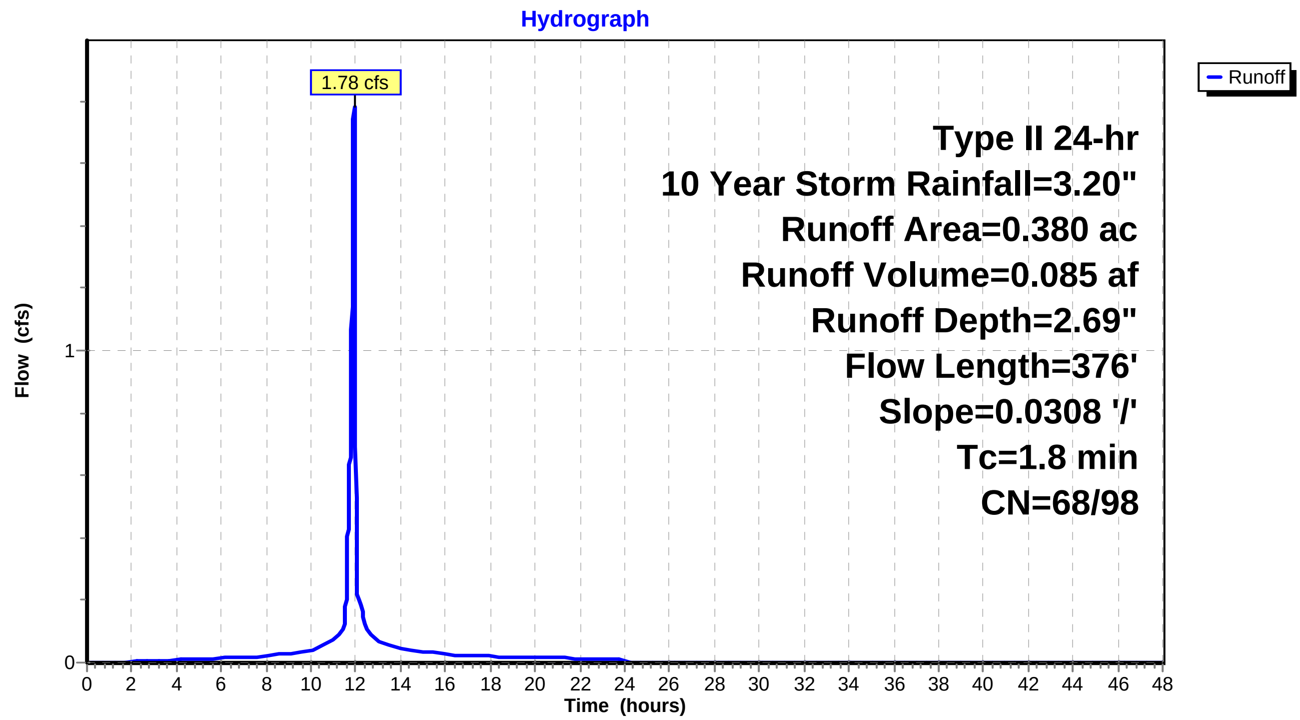
Runoff = 1.78 cfs @ 11.92 hrs, Volume= 0.085 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.308	98	Paved roads w/curbs & sewers, HSG D
0.024	98	Paved roads w/curbs & sewers, HSG B
0.030	61	>75% Grass cover, Good, HSG B
0.016	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.380	94	Weighted Average
0.048	68	12.63% Pervious Area
0.332	98	87.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	376	0.0308	3.56		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 24: Subcat 24



Summary for Subcatchment 25: Subcat 25

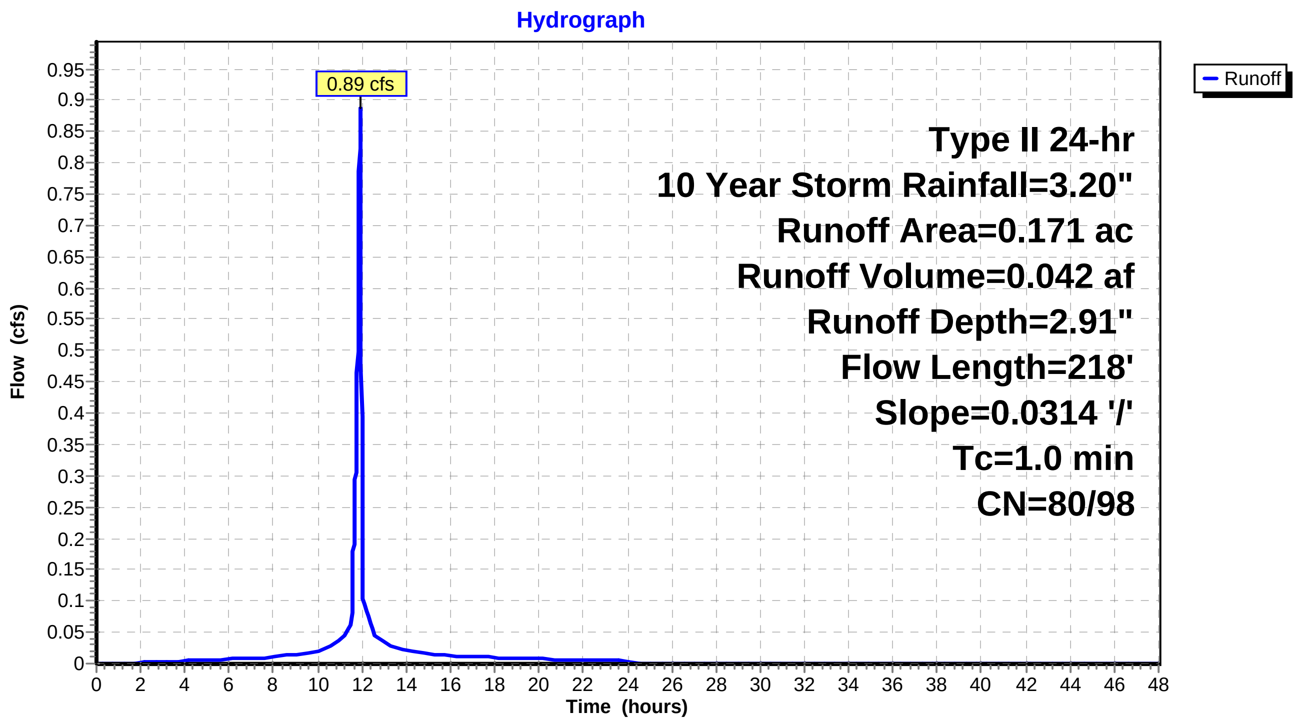
Runoff = 0.89 cfs @ 11.91 hrs, Volume= 0.042 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.165	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.171	97	Weighted Average
0.006	80	3.51% Pervious Area
0.165	98	96.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	218	0.0314	3.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 25: Subcat 25



Summary for Subcatchment 26: Subcat 26

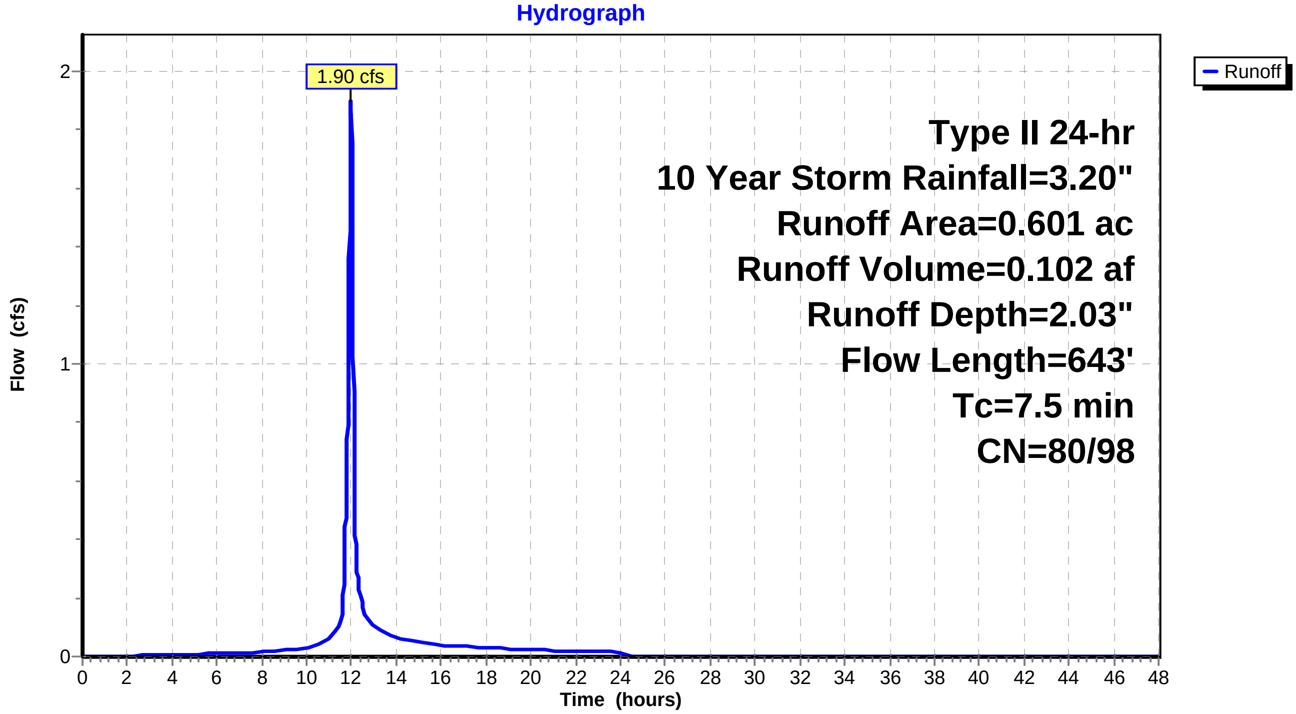
Runoff = 1.90 cfs @ 11.99 hrs, Volume= 0.102 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.079	98	Paved roads w/curbs & sewers, HSG D
0.043	98	Paved roads w/curbs & sewers, HSG D
0.191	80	>75% Grass cover, Good, HSG D
0.018	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.106	98	Paved roads w/curbs & sewers, HSG D
0.075	80	>75% Grass cover, Good, HSG D
0.015	98	Paved roads w/curbs & sewers, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.601	87	Weighted Average
0.358	80	59.57% Pervious Area
0.243	98	40.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	26	0.0623	5.07		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	617	0.0393	1.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.5	643	Total			

Subcatchment 26: Subcat 26



Summary for Subcatchment 27: Subcat 27

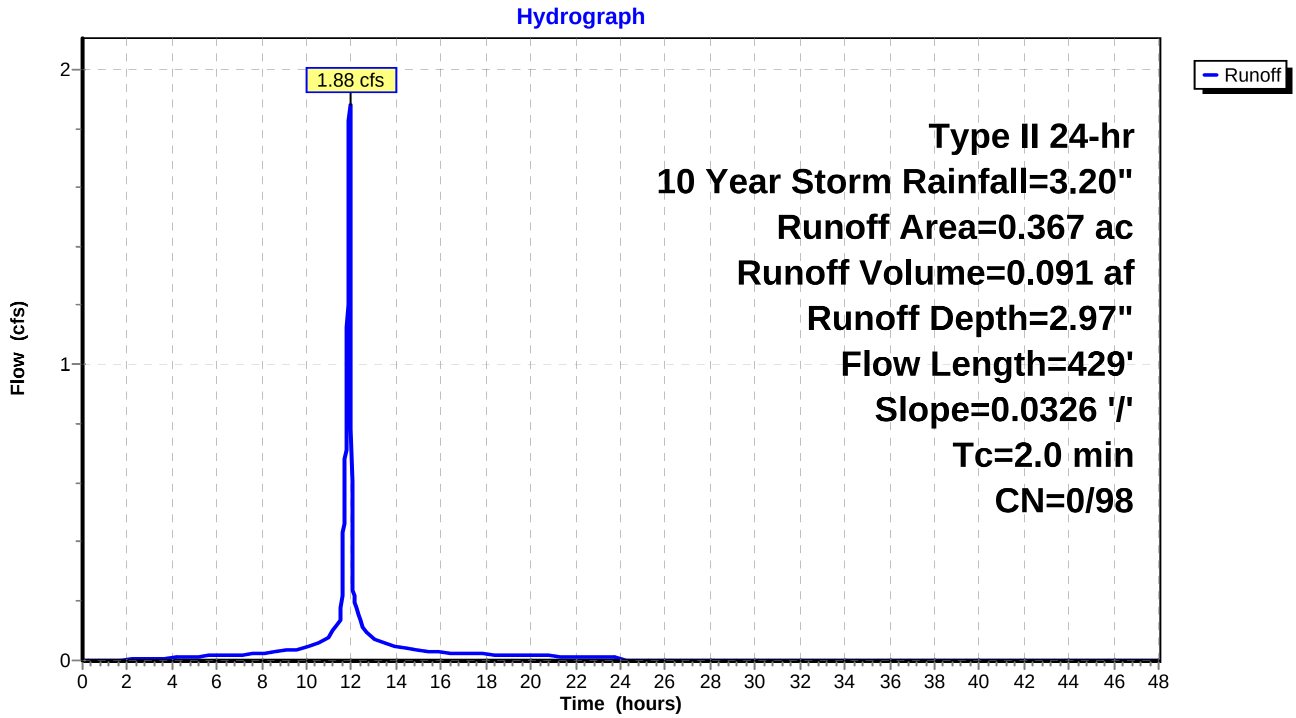
Runoff = 1.88 cfs @ 11.92 hrs, Volume= 0.091 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.367	98	Paved roads w/curbs & sewers, HSG D
0.367	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	429	0.0326	3.67		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 27: Subcat 27



Summary for Subcatchment 28: Subcat 28

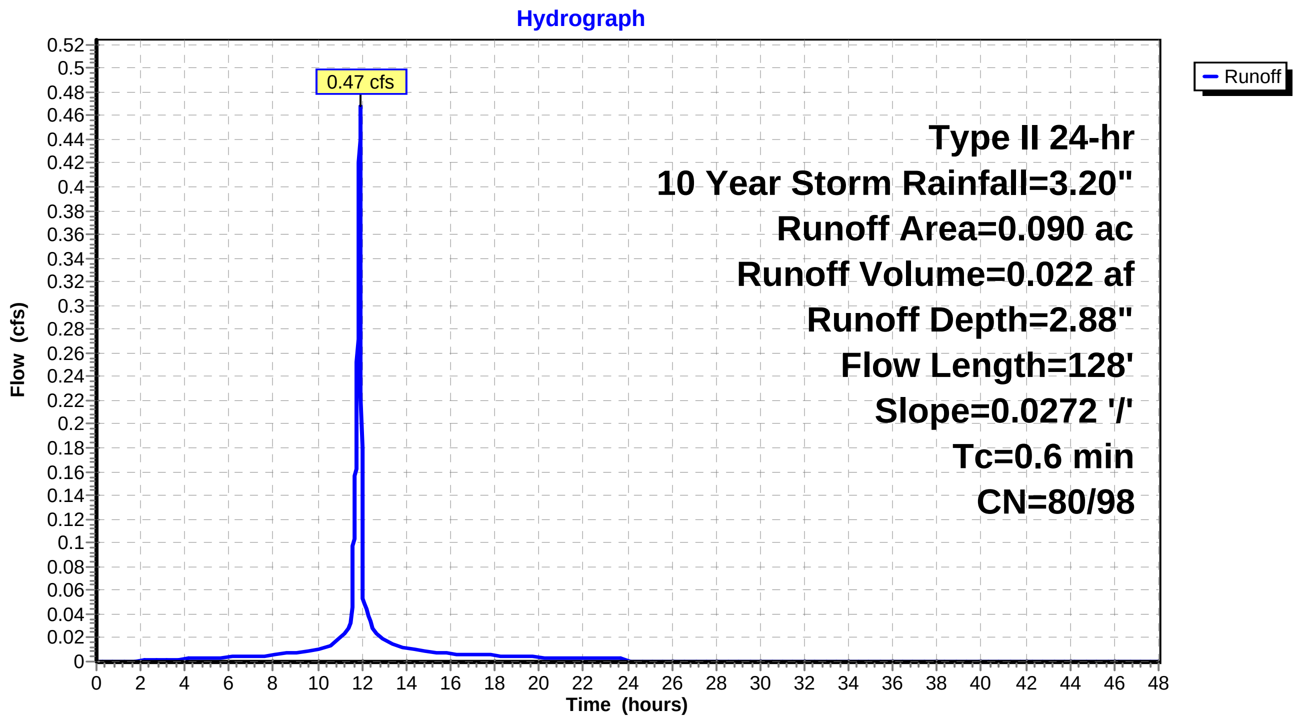
Runoff = 0.47 cfs @ 11.91 hrs, Volume= 0.022 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.079	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.005	80	>75% Grass cover, Good, HSG D
0.090	97	Weighted Average
0.005	80	5.56% Pervious Area
0.085	98	94.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	128	0.0272	3.35		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 28: Subcat 28



Summary for Subcatchment 29: Subcat 29

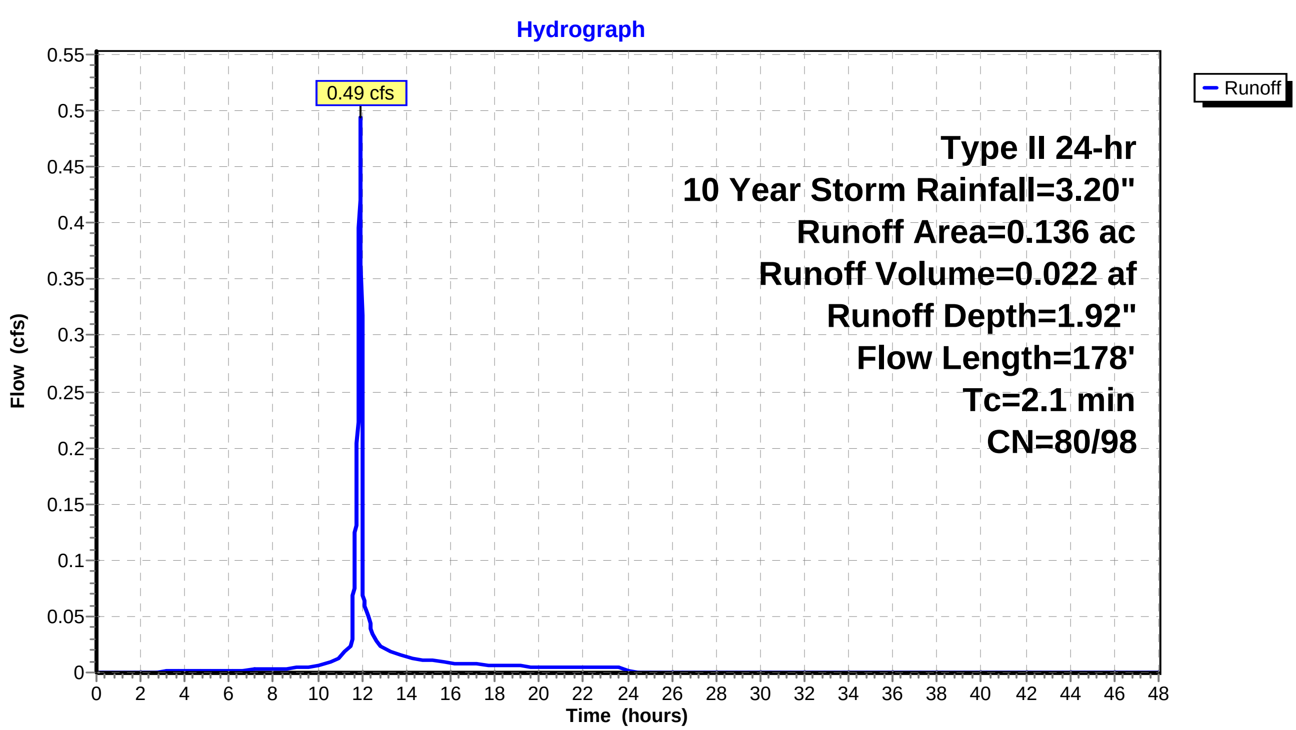
Runoff = 0.49 cfs @ 11.93 hrs, Volume= 0.022 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.039	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.088	80	>75% Grass cover, Good, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.136	86	Weighted Average
0.091	80	66.91% Pervious Area
0.045	98	33.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0353	3.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.0	163	0.0388	1.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	178	Total			

Subcatchment 29: Subcat 29



Summary for Subcatchment 30: Subcat 30

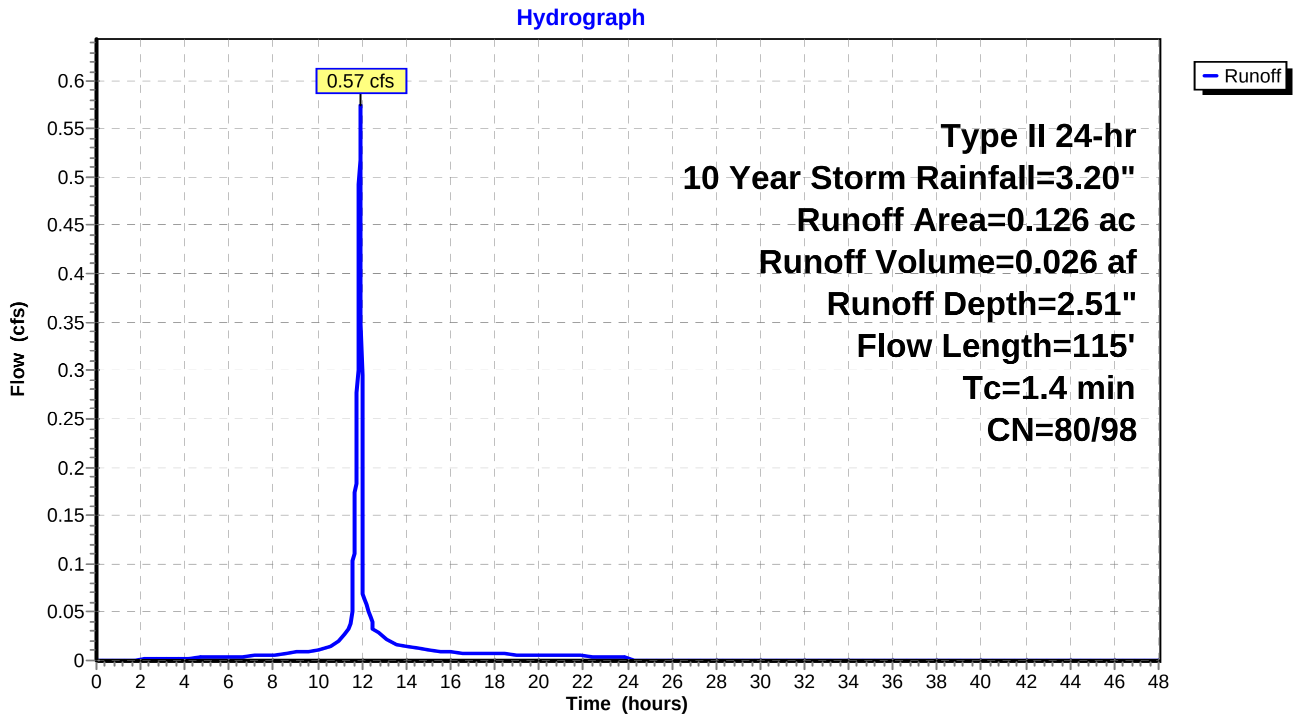
Runoff = 0.57 cfs @ 11.92 hrs, Volume= 0.026 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.089	98	Paved roads w/curbs & sewers, HSG D
0.027	80	>75% Grass cover, Good, HSG D
0.010	80	>75% Grass cover, Good, HSG D
0.126	93	Weighted Average
0.037	80	29.37% Pervious Area
0.089	98	70.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	75	0.0213	1.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.0324	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	115	Total			

Subcatchment 30: Subcat 30



Summary for Subcatchment 31: Subcat 31

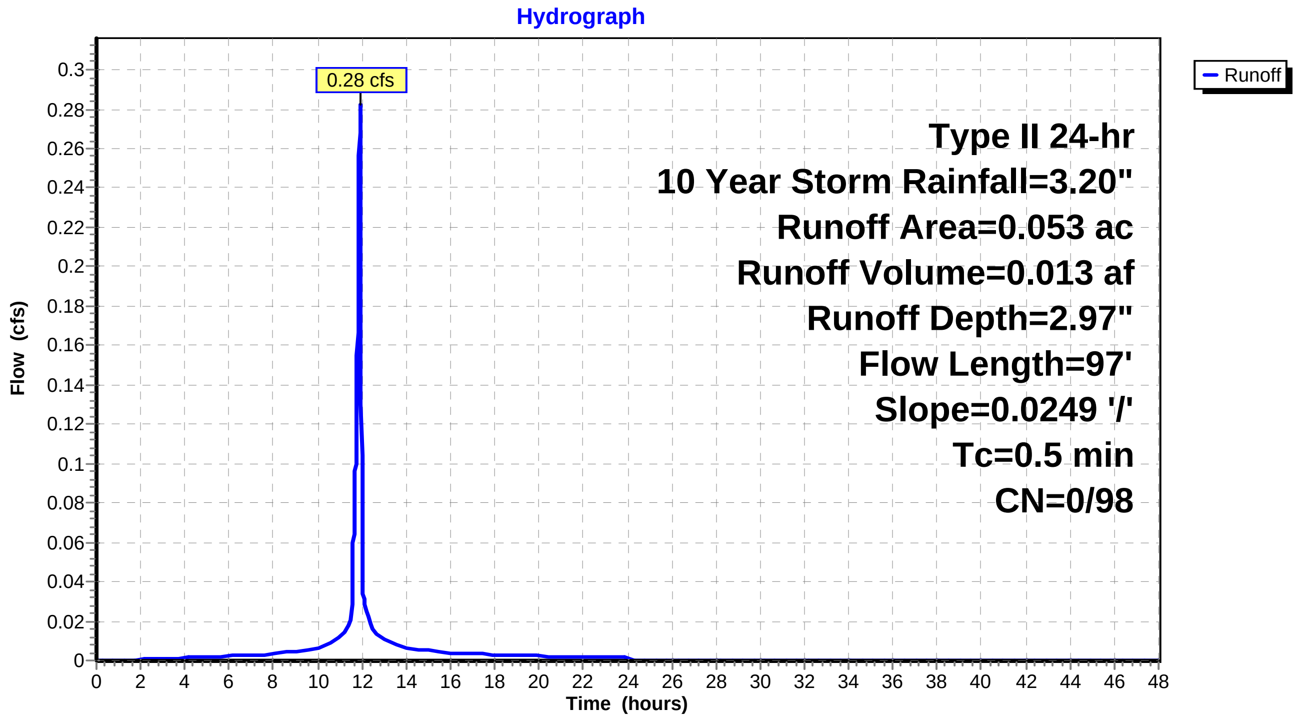
Runoff = 0.28 cfs @ 11.91 hrs, Volume= 0.013 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.053	98	Paved roads w/curbs & sewers, HSG D
0.053	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	97	0.0249	3.20		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 31: Subcat 31



Summary for Subcatchment 32: Subcat 31

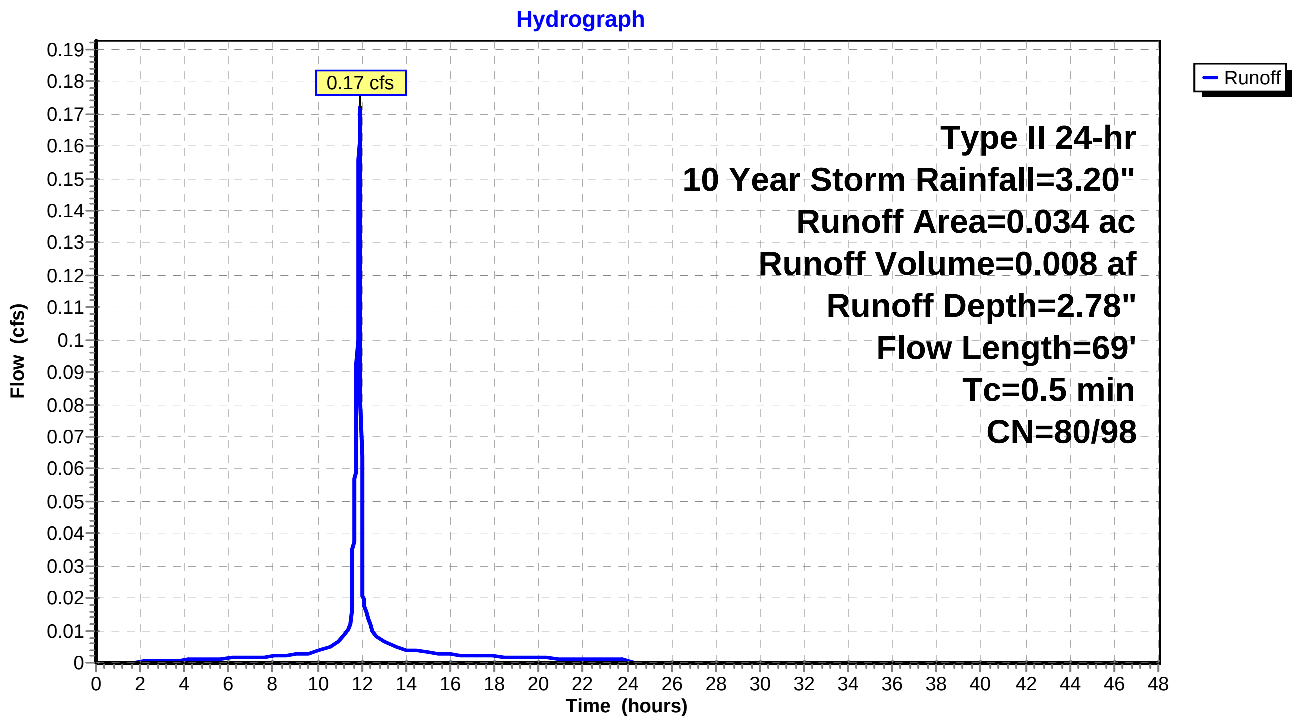
Runoff = 0.17 cfs @ 11.91 hrs, Volume= 0.008 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.030	98	Paved roads w/curbs & sewers, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.034	96	Weighted Average
0.004	80	11.76% Pervious Area
0.030	98	88.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0423	1.44		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	56	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	69	Total			

Subcatchment 32: Subcat 31



Summary for Subcatchment 34: Subcat 34

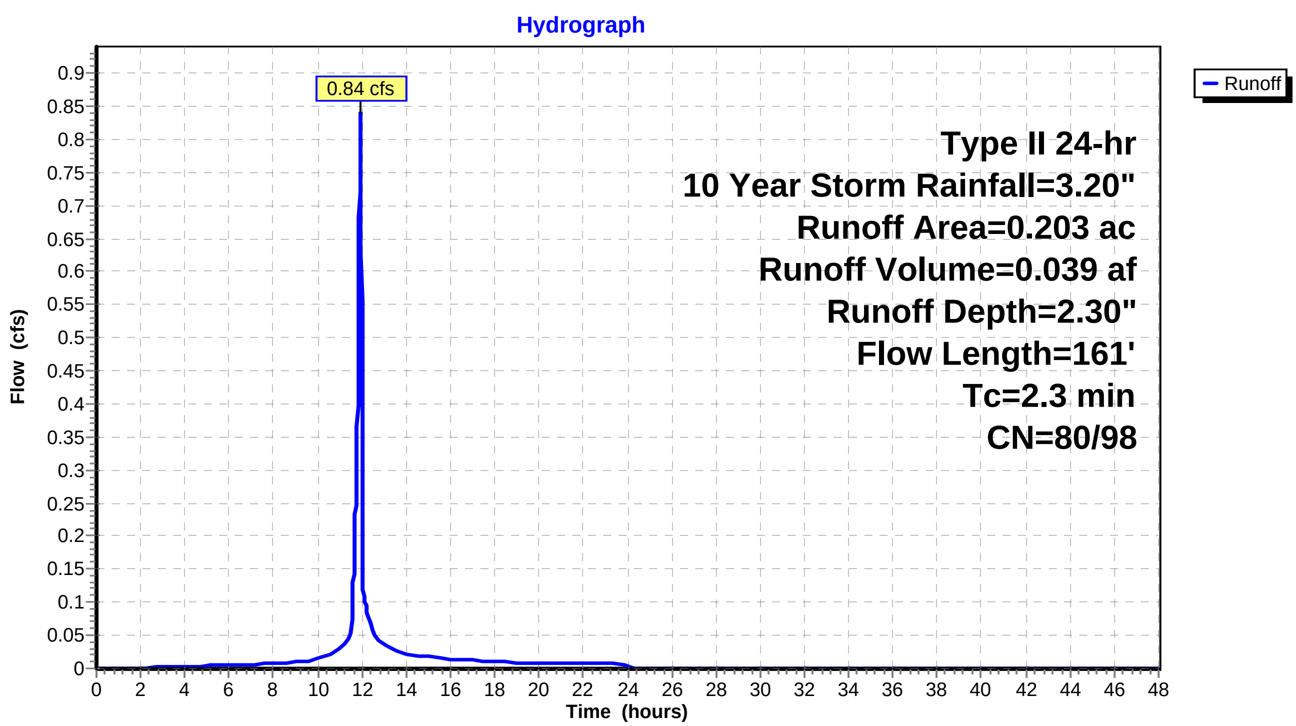
Runoff = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.039	98	Paved roads w/curbs & sewers, HSG D
0.045	98	Paved roads w/curbs & sewers, HSG D
0.032	98	Paved roads w/curbs & sewers, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.203	90	Weighted Average
0.087	80	42.86% Pervious Area
0.116	98	57.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.0197	2.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	123	0.0186	0.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	161	Total			

Subcatchment 34: Subcat 34



Summary for Subcatchment 35: Subcat 35

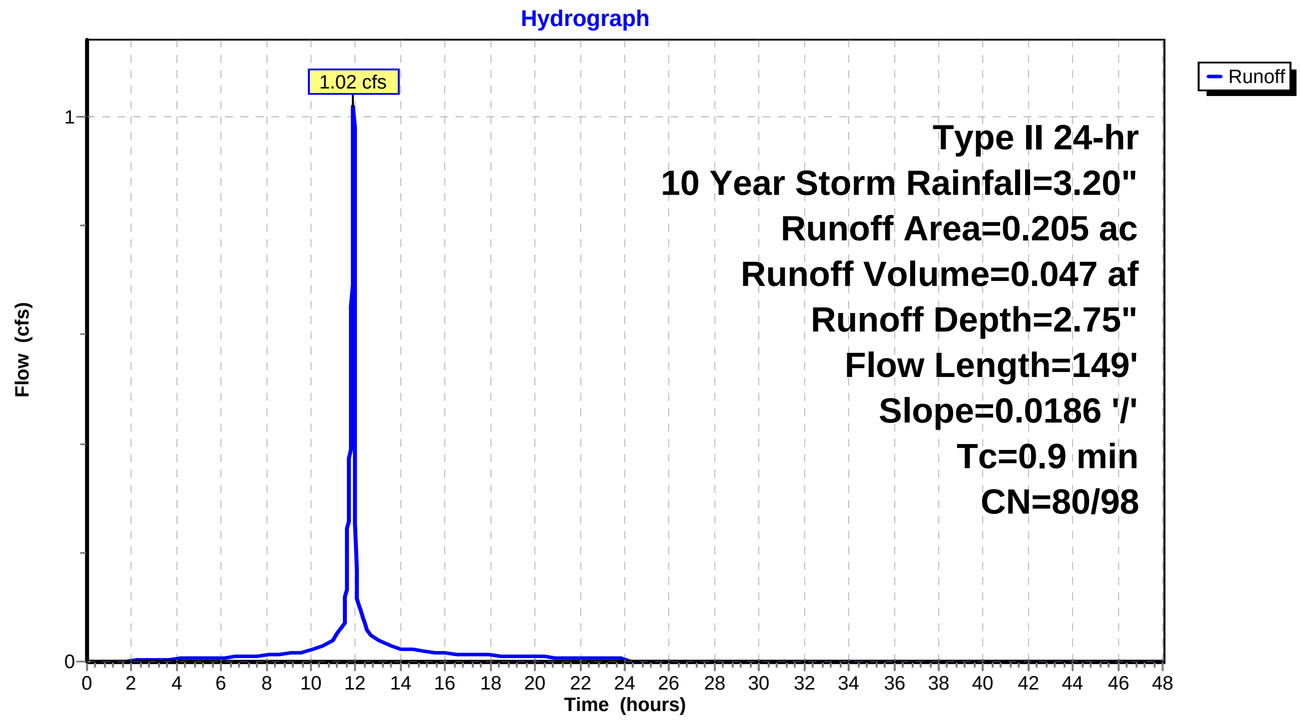
Runoff = 1.02 cfs @ 11.91 hrs, Volume= 0.047 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.177	98	Paved roads w/curbs & sewers, HSG D
0.007	80	>75% Grass cover, Good, HSG D
0.021	80	>75% Grass cover, Good, HSG D
0.205	96	Weighted Average
0.028	80	13.66% Pervious Area
0.177	98	86.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	149	0.0186	2.77		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 35: Subcat 35



Summary for Subcatchment 36: Subcat 36

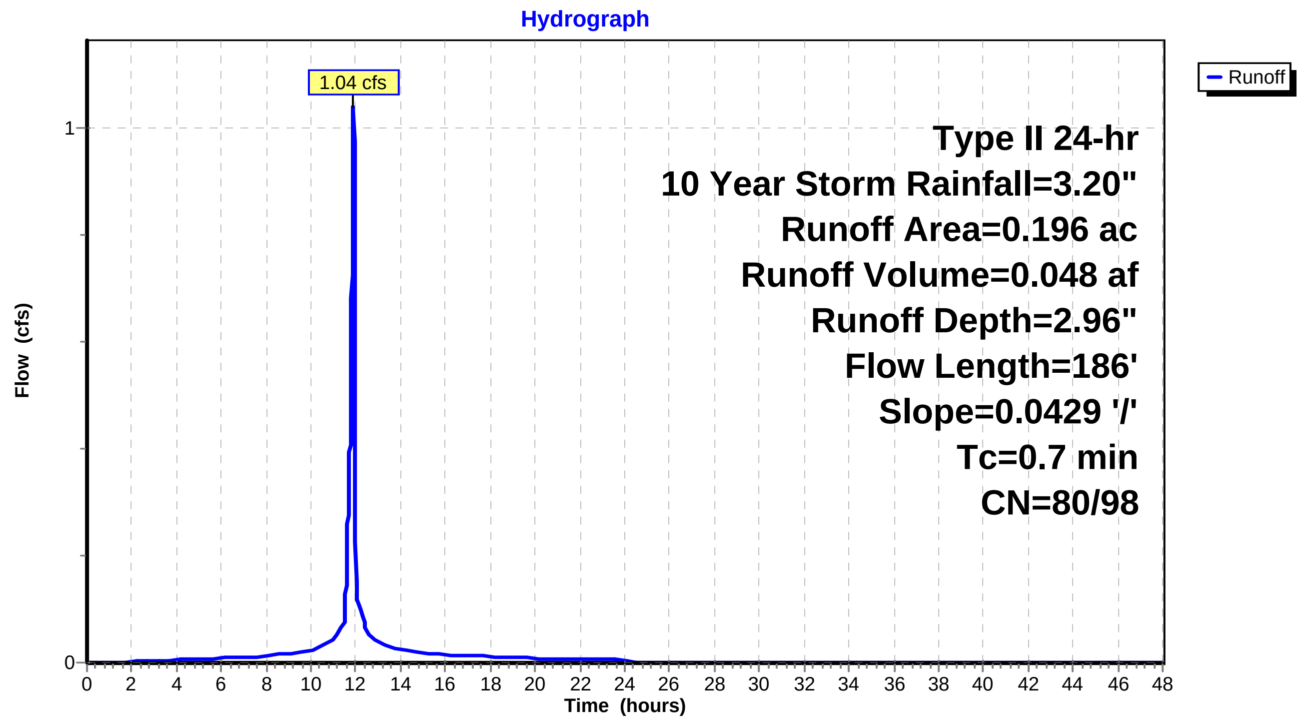
Runoff = 1.04 cfs @ 11.91 hrs, Volume= 0.048 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.187	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.001	98	Paved roads w/curbs & sewers, HSG D
0.001	98	Paved roads w/curbs & sewers, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.196	98	Weighted Average
0.001	80	0.51% Pervious Area
0.195	98	99.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	186	0.0429	4.20		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 36: Subcat 36



Summary for Subcatchment 59: Subcat 59

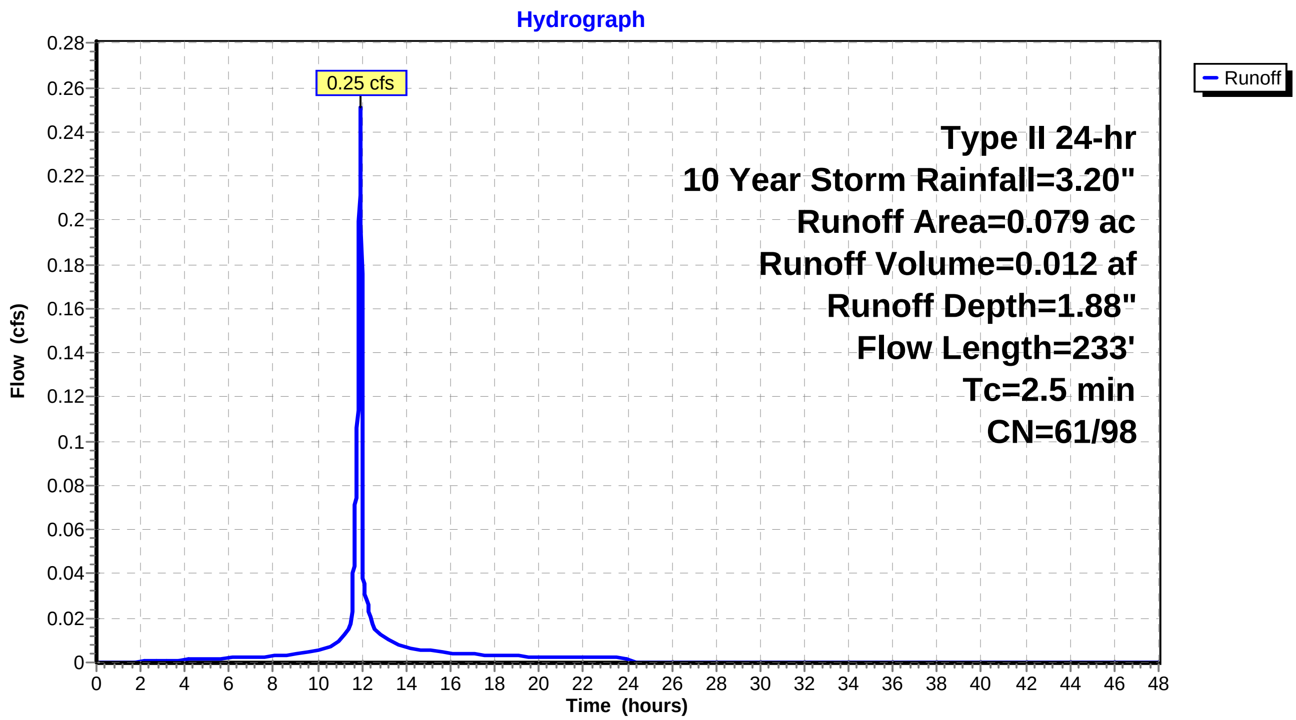
Runoff = 0.25 cfs @ 11.93 hrs, Volume= 0.012 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.045	98	Paved roads w/curbs & sewers, HSG B
0.034	61	>75% Grass cover, Good, HSG B
0.079	82	Weighted Average
0.034	61	43.04% Pervious Area
0.045	98	56.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	227	0.0515	1.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	233	Total			

Subcatchment 59: Subcat 59



Summary for Subcatchment 60: Subcat 60

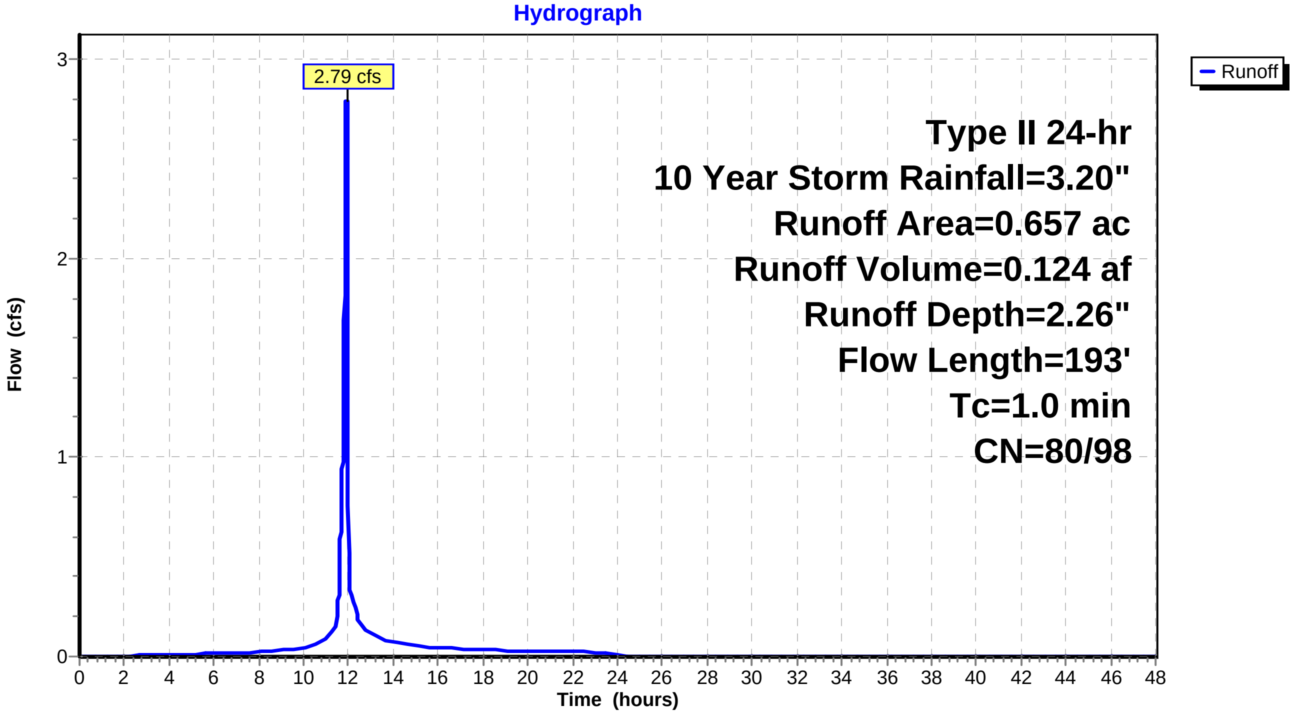
Runoff = 2.79 cfs @ 11.91 hrs, Volume= 0.124 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.228	98	Paved roads w/curbs & sewers, HSG D
0.007	98	Paved roads w/curbs & sewers, HSG D
0.016	98	Paved roads w/curbs & sewers, HSG D
0.008	98	Paved roads w/curbs & sewers, HSG D
0.100	98	Paved roads w/curbs & sewers, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.259	80	>75% Grass cover, Good, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.657	90	Weighted Average
0.298	80	45.36% Pervious Area
0.359	98	54.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	100	0.0461	4.36		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	93	0.1199	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	193	Total			

Subcatchment 60: Subcat 60



Summary for Subcatchment 63: Subcat 63

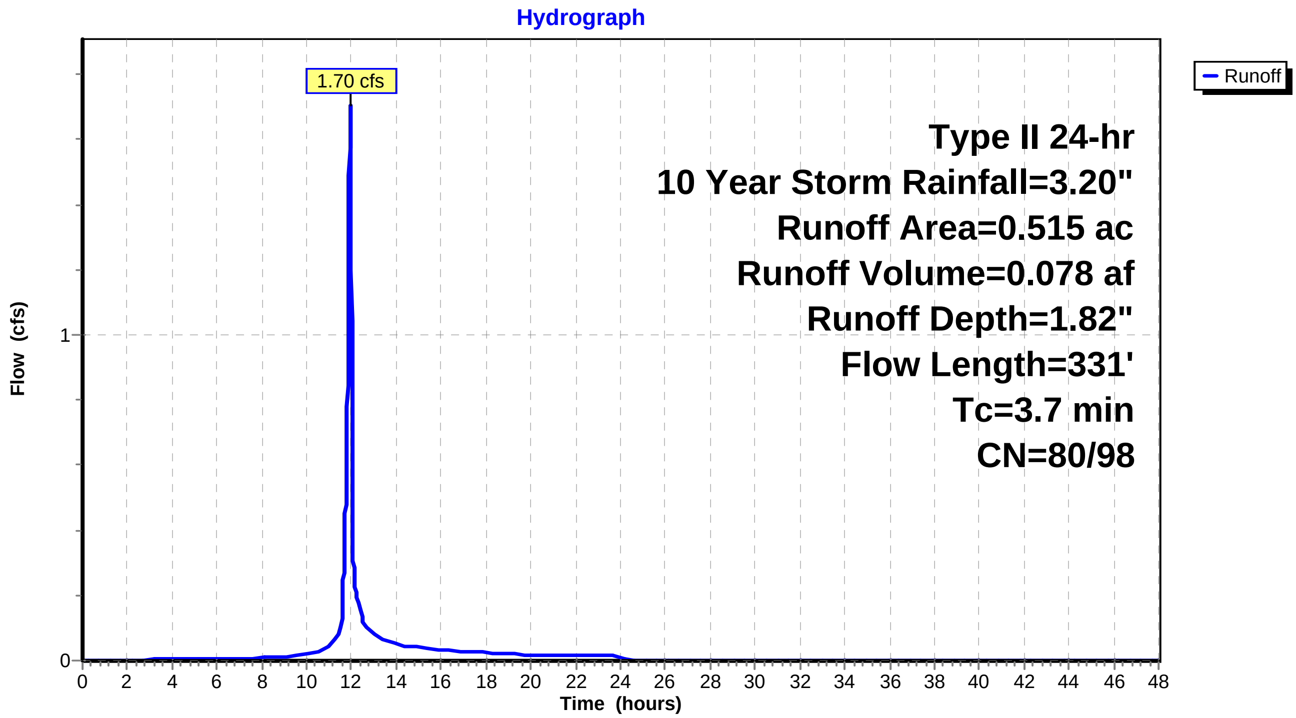
Runoff = 1.70 cfs @ 11.95 hrs, Volume= 0.078 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.135	98	Paved roads w/curbs & sewers, HSG D
0.004	98	Paved roads w/curbs & sewers, HSG D
0.011	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.177	80	>75% Grass cover, Good, HSG D
0.515	85	Weighted Average
0.376	80	73.01% Pervious Area
0.139	98	26.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	31	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	83	0.0139	2.39		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	217	0.0453	1.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.7	331	Total			

Subcatchment 63: Subcat 63



Summary for Subcatchment CPv4: Site #4 On Site

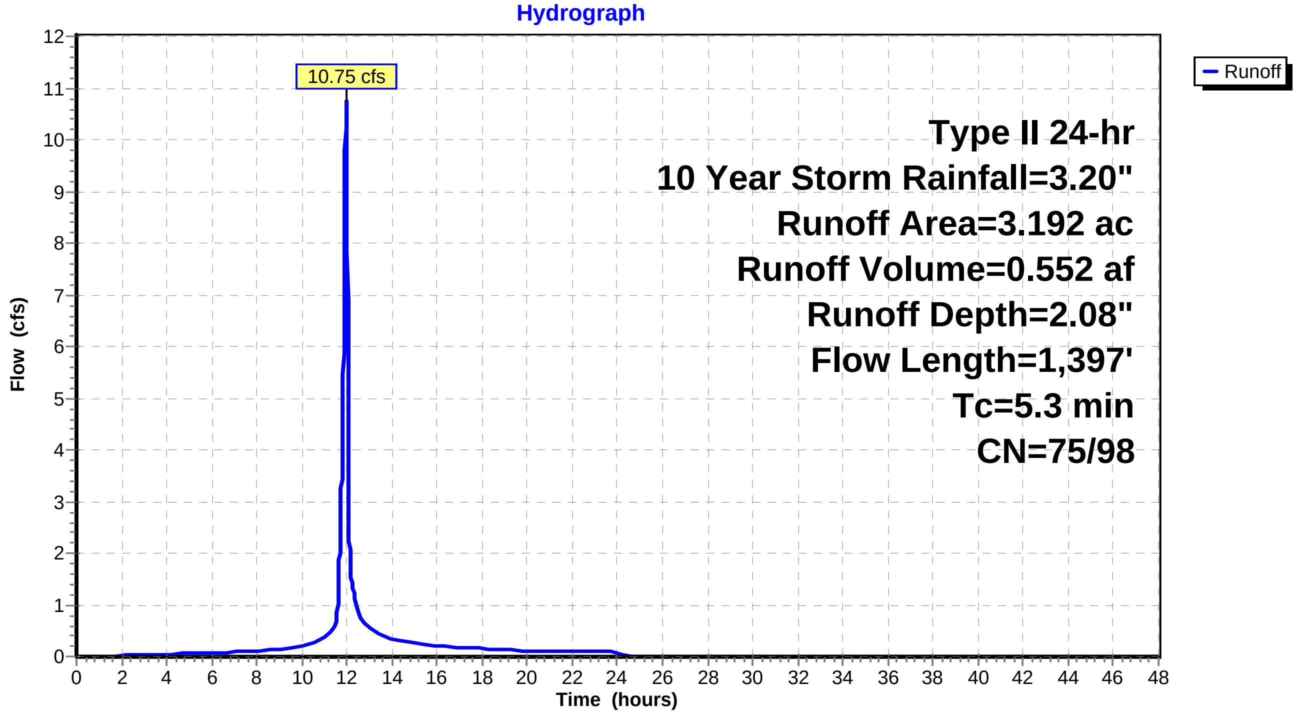
Runoff = 10.75 cfs @ 11.96 hrs, Volume= 0.552 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.022	39	>75% Grass cover, Good, HSG A
0.026	98	Paved roads w/curbs & sewers, HSG A
0.562	61	>75% Grass cover, Good, HSG B
0.243	98	Water Surface, 0% imp, HSG B
0.475	98	Paved roads w/curbs & sewers, HSG B
0.000	74	>75% Grass cover, Good, HSG C
0.003	98	Paved roads w/curbs & sewers, HSG C
0.692	80	>75% Grass cover, Good, HSG D
1.169	98	Paved roads w/curbs & sewers, HSG D
3.192	87	Weighted Average
1.519	75	47.59% Pervious Area
1.673	98	52.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	67	0.0147	0.95		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.30"
0.3	68	0.0413	4.13		**Shallow Concentrated Flow, Shallow Pave 1** Paved Kv= 20.3 fps
1.5	444	0.0091	4.86	38.91	**Channel Flow, Grass Channel 1** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.2	61	0.0311	5.45	9.63	**Pipe Channel, Culvert 1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
1.8	632	0.0131	5.84	46.68	**Channel Flow, Channel 2** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.3	125	0.0649	7.87	13.92	**Pipe Channel, Culvert 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
5.3	1,397	Total			

Subcatchment CPv4: Site #4 On Site



Summary for Subcatchment OS1: Off-Site 1

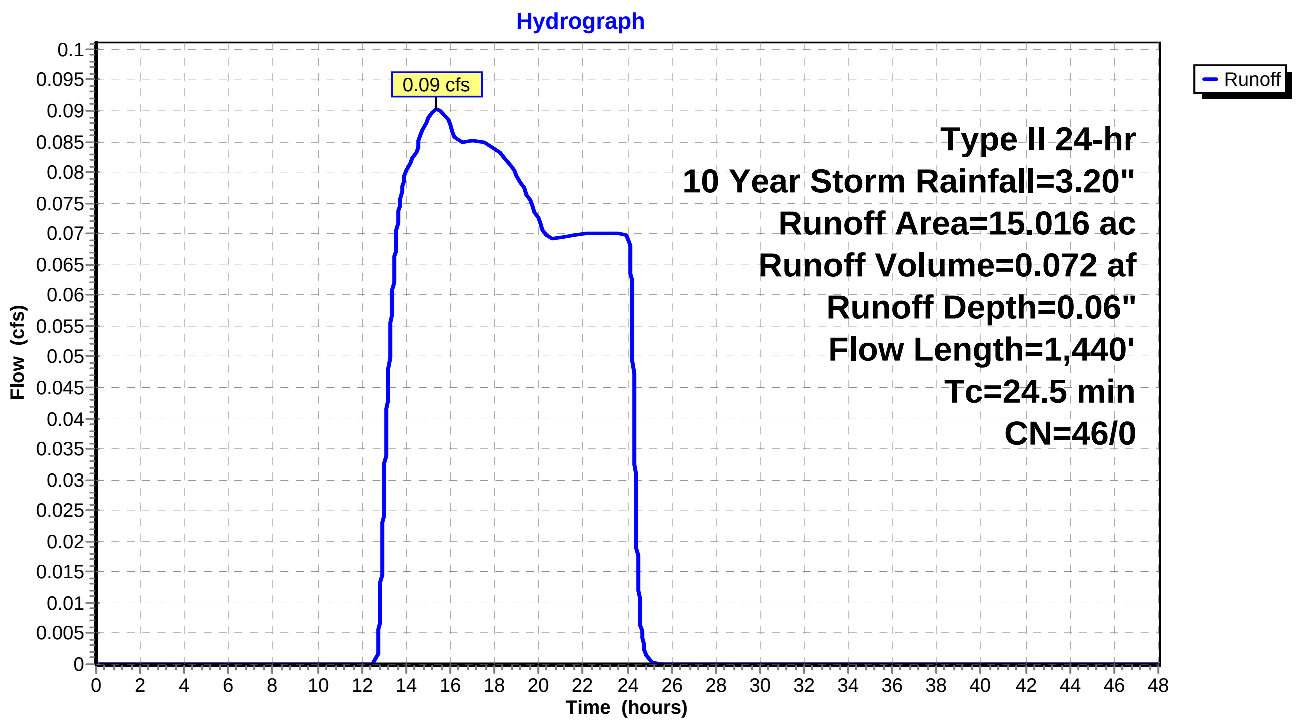
Runoff = 0.09 cfs @ 15.38 hrs, Volume= 0.072 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	15.016	46	Composite CN
	15.016	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	100	0.0426	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	464	0.0426	3.32		**Shallow Concentrated Flow, woods segment** Unpaved Kv= 16.1 fps
2.9	586	0.0427	3.33		**Shallow Concentrated Flow, grass segment** Unpaved Kv= 16.1 fps
0.1	156	0.1731	29.96	94.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	134	0.0746	4.10		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
24.5	1,440	Total			

Subcatchment OS1: Off-Site 1



Summary for Subcatchment OS2: Off-Site 2

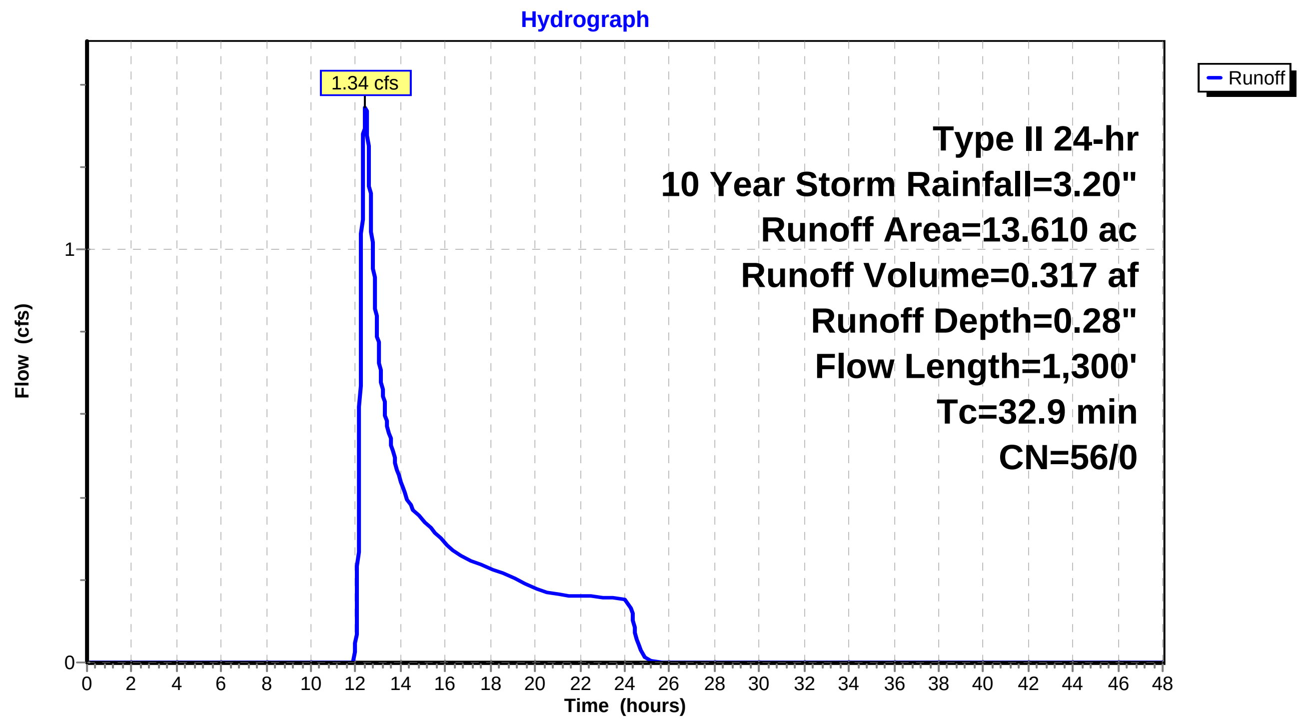
Runoff = 1.34 cfs @ 12.43 hrs, Volume= 0.317 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	13.610	56	Composite CN
	13.610	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.7	100	0.0176	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
5.4	690	0.0176	2.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	510	0.0585	10.87	41.30	**Trap/Vee/Rect Channel Flow, channel** Bot.W=2.50' D=1.00' Z= 1.3 '/' Top.W=5.10' n= 0.025
32.9	1,300	Total			

Subcatchment OS2: Off-Site 2



Summary for Subcatchment OS3: Off-Site 3

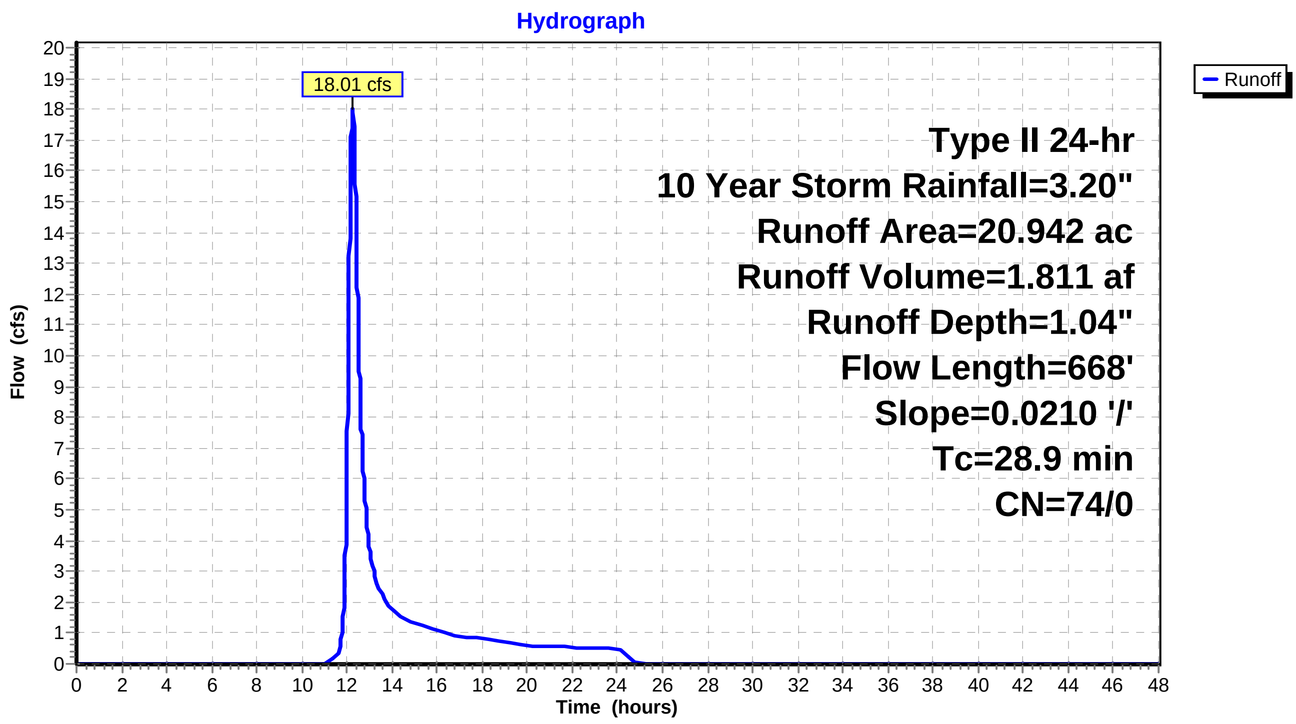
Runoff = 18.01 cfs @ 12.24 hrs, Volume= 1.811 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	20.942	74	Composite CN
	20.942	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	100	0.0210	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
4.1	568	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28.9	668	Total			

Subcatchment OS3: Off-Site 3



Summary for Subcatchment OS4a1: Charlebois WS1

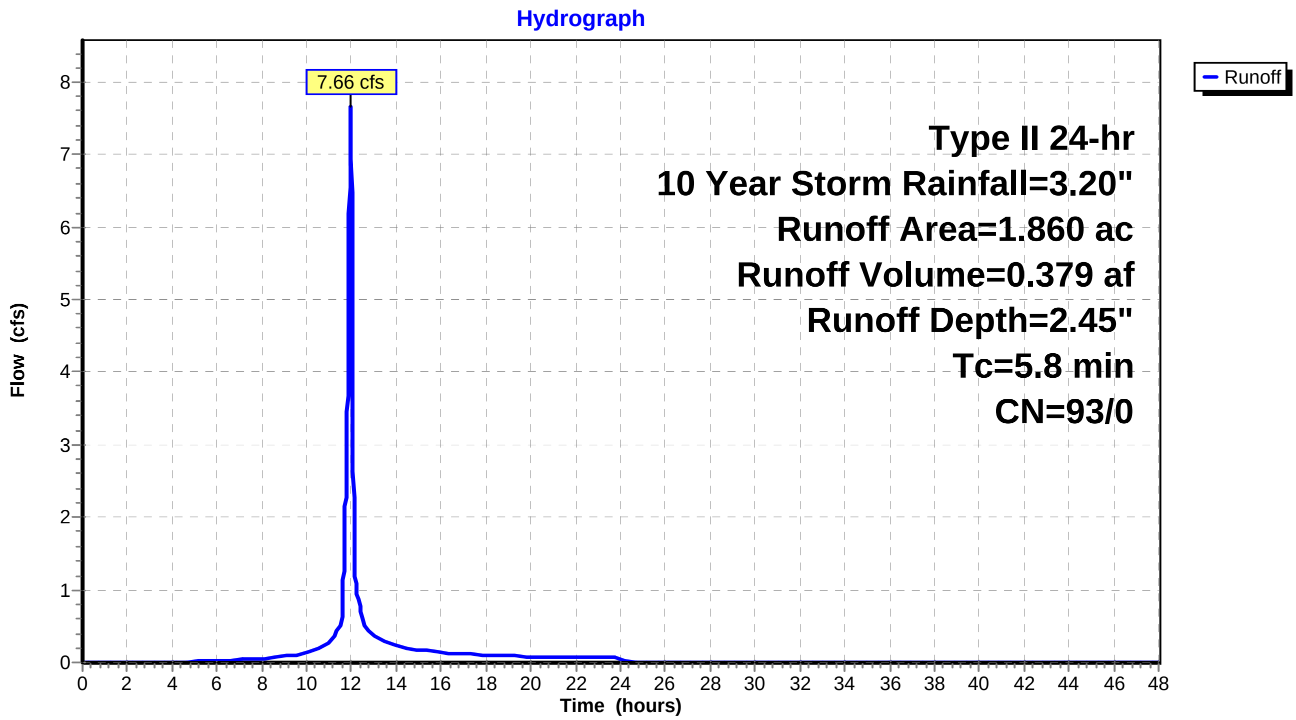
Runoff = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.860	93	From 2005 Permit Application
	1.860	93	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8					**Direct Entry, from 2005 permit application**

Subcatchment OS4a1: Charlebois WS1



Summary for Subcatchment OS4a2: Charlebois WS2

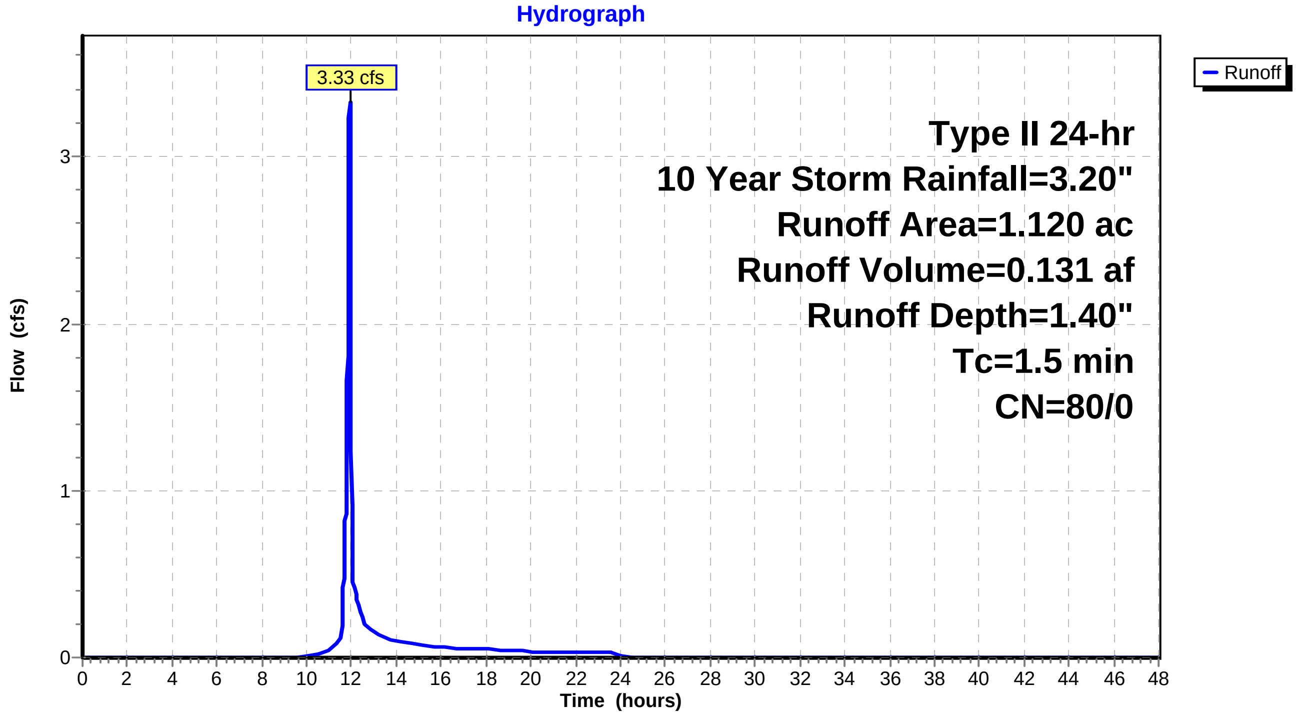
Runoff = 3.33 cfs @ 11.92 hrs, Volume= 0.131 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.120	80	from 2005 Permit Application
	1.120	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5					**Direct Entry, from 2005 Permit Application**

Subcatchment OS4a2: Charlebois WS2



Summary for Subcatchment OS4p: Site #4 Off Site

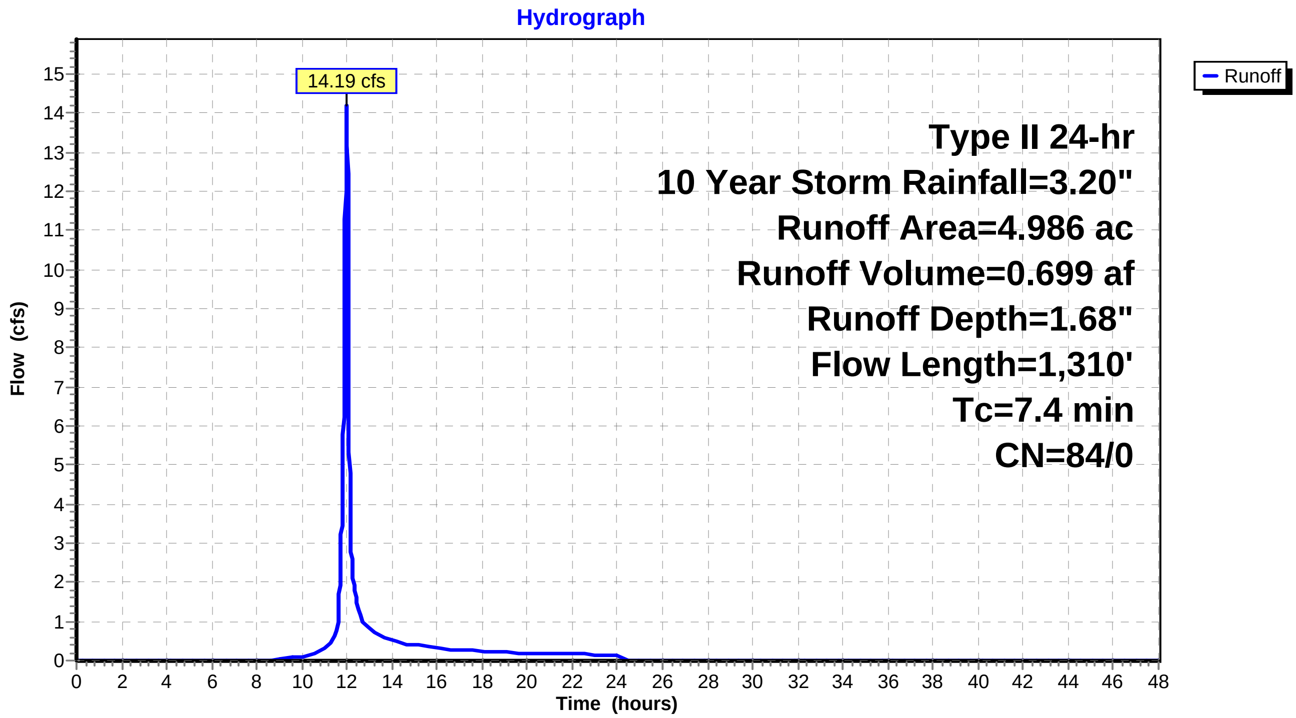
Runoff = 14.19 cfs @ 11.99 hrs, Volume= 0.699 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	4.986	84	composite CN
	4.986	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	191	0.0200	6.33	50.63	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.025 Earth, clean & straight
0.3	149	0.0400	8.95	71.60	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.025
0.3	177	0.0700	11.46	80.25	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.025
0.2	161	0.0900	13.29	79.74	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=1.00' Z= 3.0 '/' Top.W=9.00' n= 0.025
1.7	174	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	206	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	106	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	146	0.1370	1.85		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	1,310	Total			

Subcatchment OS4p: Site #4 Off Site



Summary for Subcatchment OS4wb: Off-Site 4 West of Rte 7 w/o Pond

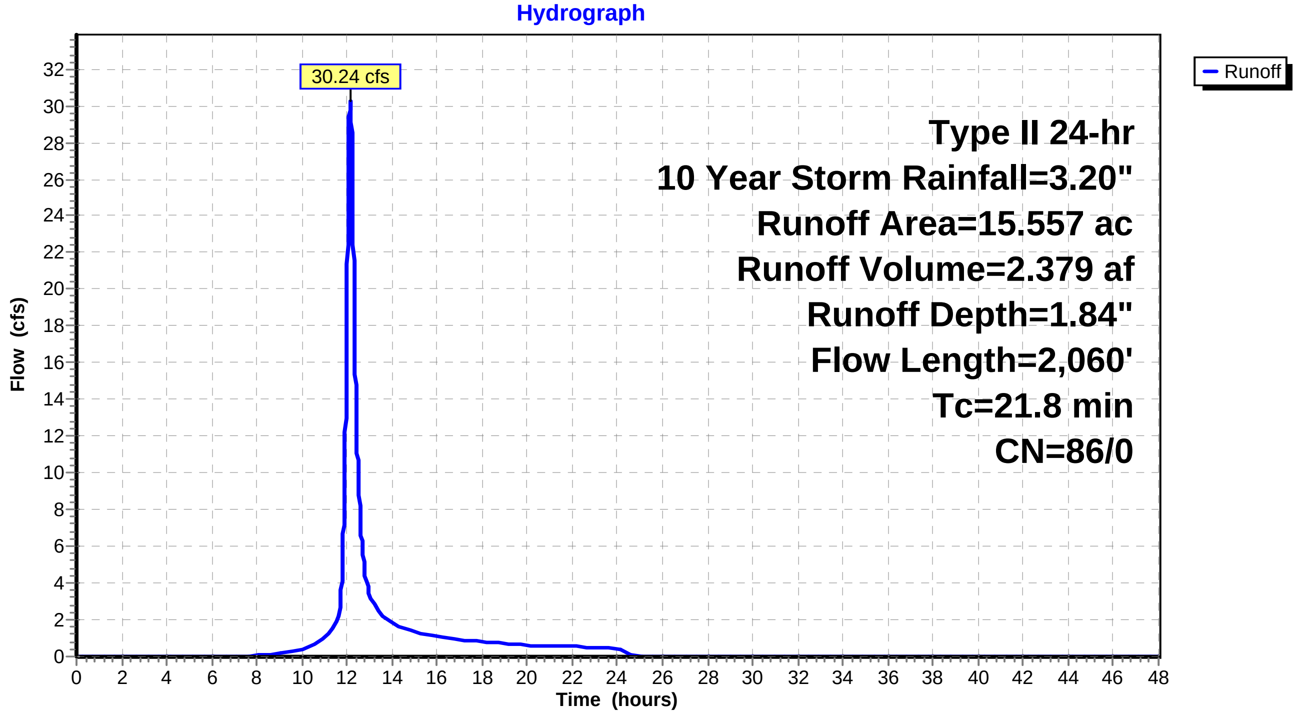
Runoff = 30.24 cfs @ 12.14 hrs, Volume= 2.379 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	15.557	86	composite CN
	15.557	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0312	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.9	320	0.0312	2.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	940	0.0137	3.55	7.98	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=0.50' Z= 4.0 & 2.0 '/' Top.W=6.00' n= 0.025
0.1	110	0.0357	13.61	42.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	160	0.0123	5.10	214.24	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=2.00' Z= 8.0 '/' Top.W=37.00' n= 0.035
0.4	320	0.0402	14.44	45.36	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	110	0.0826	4.31		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
21.8	2,060	Total			

Subcatchment OS4wb: Off-Site 4 West of Rte 7 w/o Pond



Summary for Subcatchment OS4_E: Off-Site 4 East of Rte 7

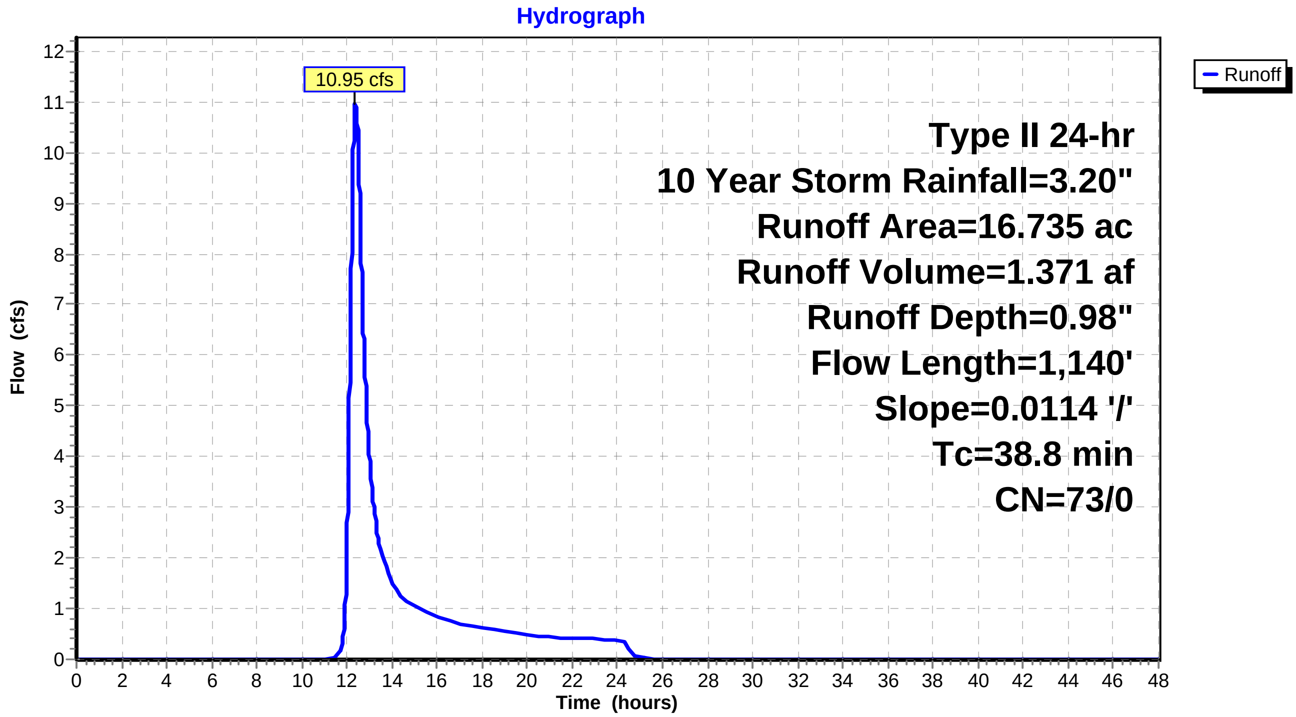
Runoff = 10.95 cfs @ 12.37 hrs, Volume= 1.371 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	16.735	73	composite
	16.735	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0114	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
9.6	990	0.0114	1.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.8	1,140	Total			

Subcatchment OS4_E: Off-Site 4 East of Rte 7



Summary for Subcatchment OS5a: (new Subcat)

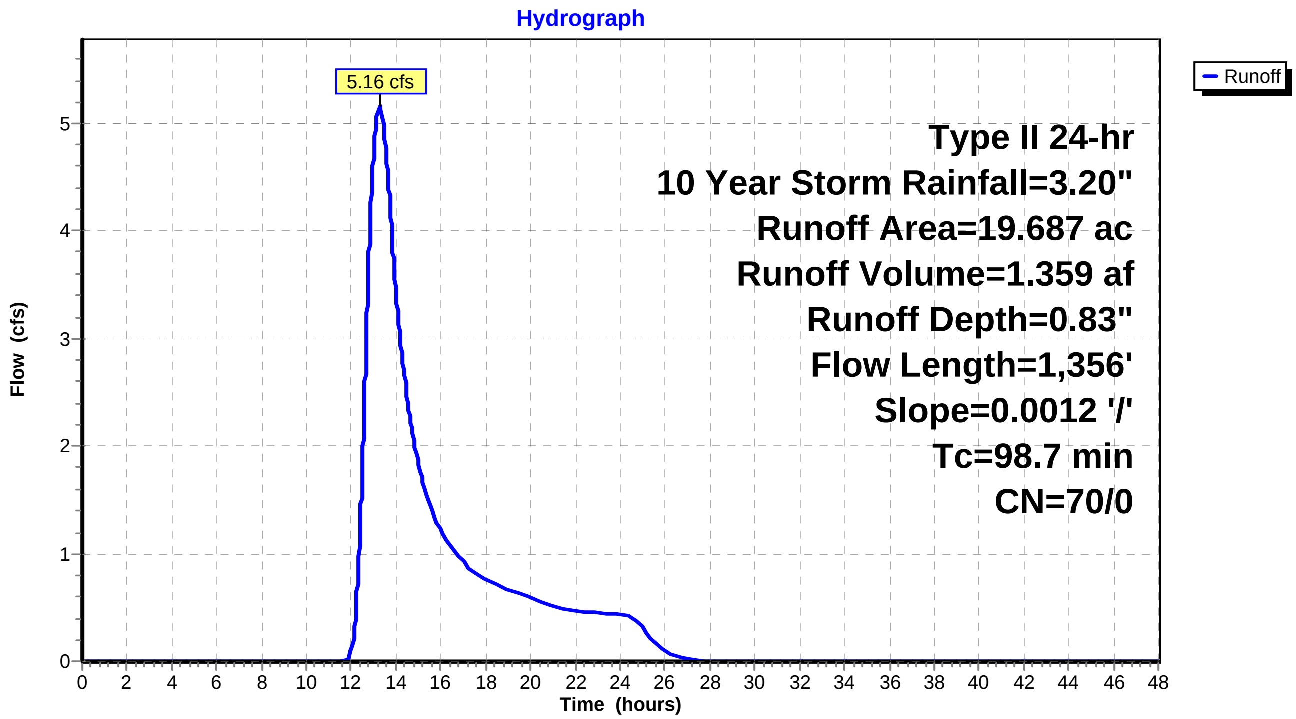
Runoff = 5.16 cfs @ 13.27 hrs, Volume= 1.359 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	19.687	70	weighted CN
	19.687	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
78.0	100	0.0012	0.02		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.4	313	0.0012	0.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	489	0.0012	0.98	1.95	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.025
3.0	454	0.0012	2.49	7.84	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
98.7	1,356	Total			

Subcatchment OS5a: (new Subcat)



Summary for Subcatchment OS5b: (new Subcat)

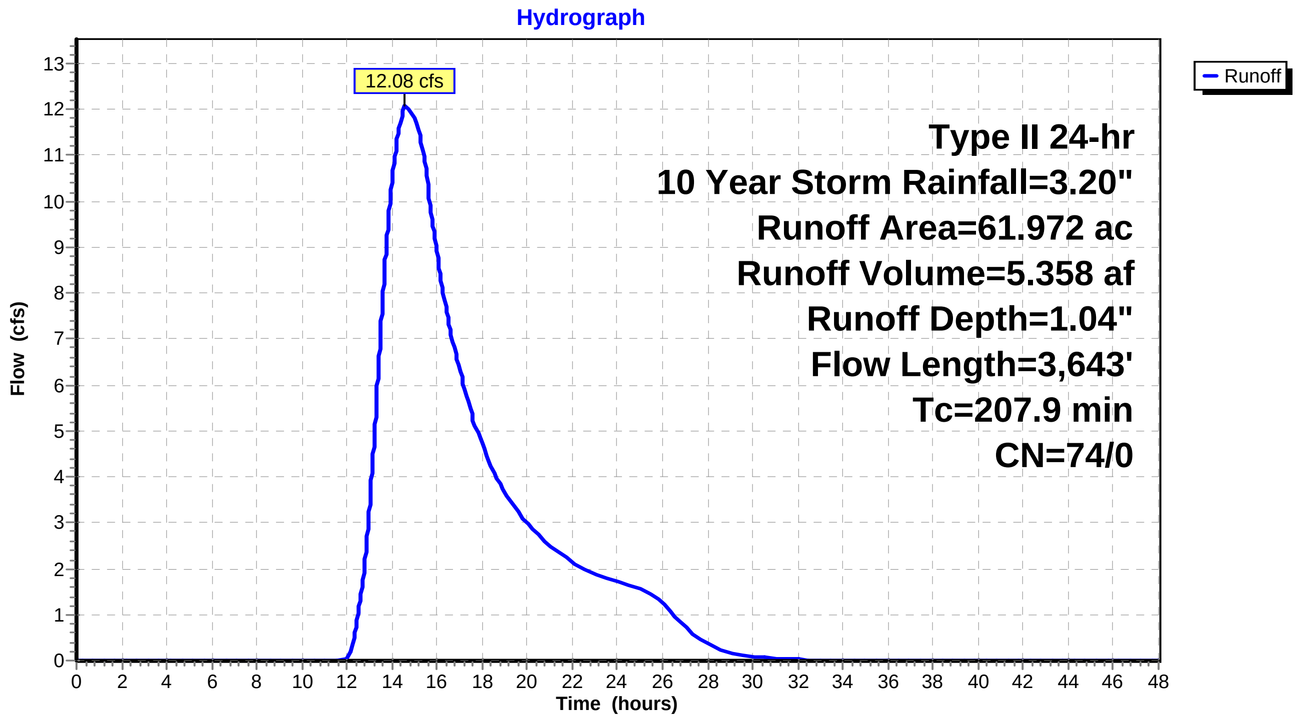
Runoff = 12.08 cfs @ 14.56 hrs, Volume= 5.358 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	61.972	74	weighted CN
	61.972	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.4	100	0.0015	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.4	50	0.0015	0.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
113.4	1,318	0.0015	0.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	670	0.0081	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	666	0.0009	1.08	3.25	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.025
10.7	839	0.0048	1.31	8.19	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
207.9	3,643	Total			

Subcatchment OS5b: (new Subcat)



Summary for Subcatchment OS5_6: (new Subcat)

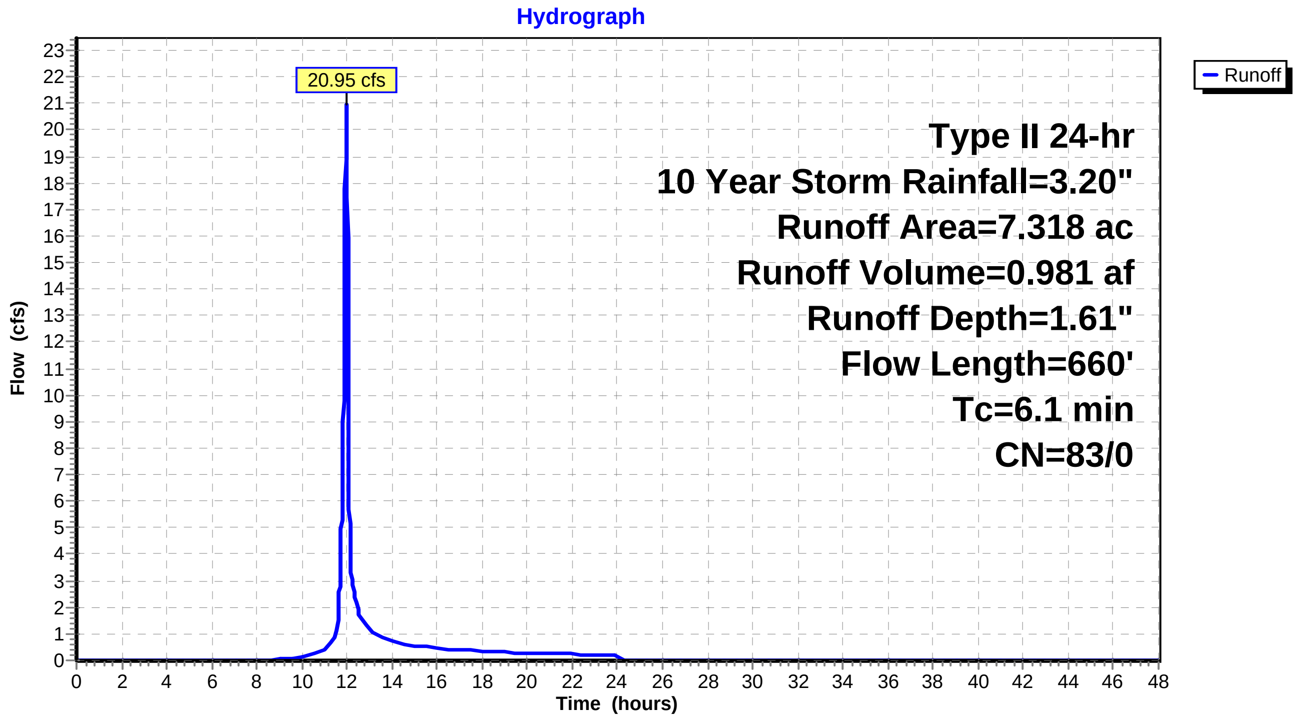
Runoff = 20.95 cfs @ 11.98 hrs, Volume= 0.981 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	7.318	83	weighted CN
	7.318	83	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	50	0.0130	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.4	340	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	270	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.1	660	Total			

Subcatchment OS5_6: (new Subcat)



Summary for Subcatchment OS5_7: (new Subcat)

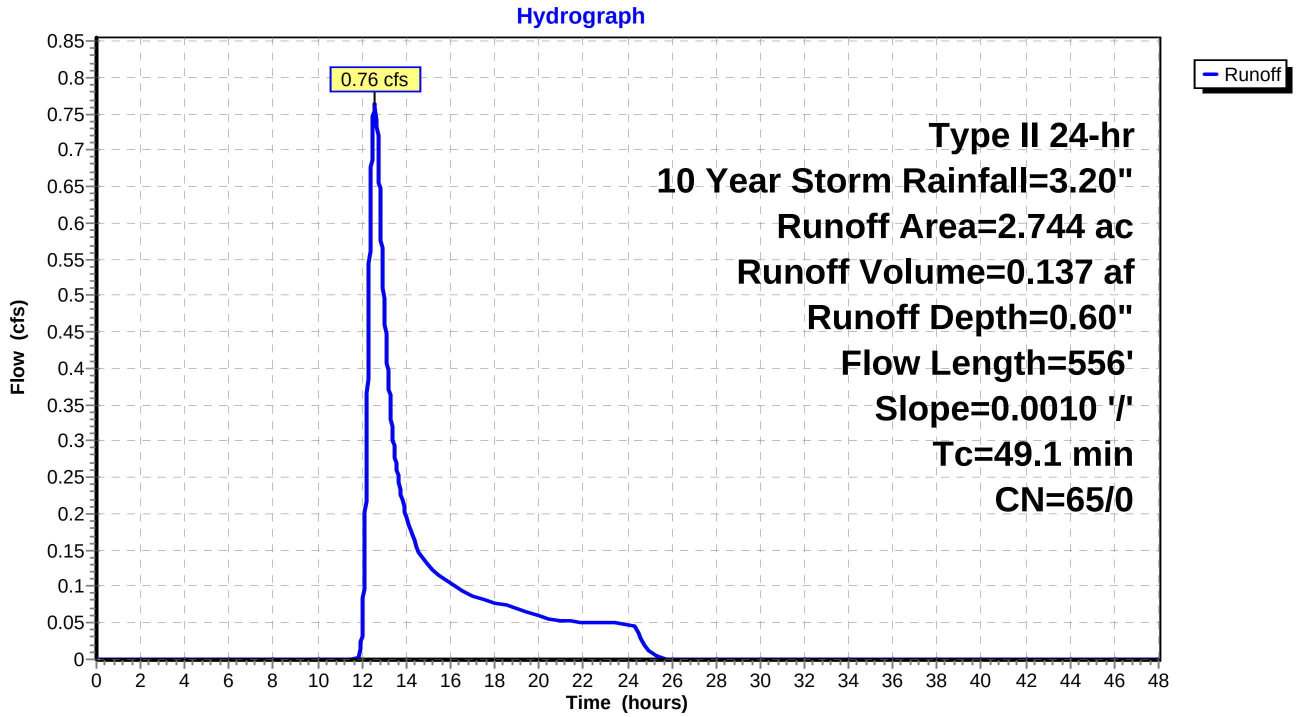
Runoff = 0.76 cfs @ 12.60 hrs, Volume= 0.137 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.744	65	weighted CN
	2.744	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.2	100	0.0010	0.05		**Sheet Flow,** Range n= 0.130 P2= 2.30"
14.9	456	0.0010	0.51		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
49.1	556	Total			

Subcatchment OS5_7: (new Subcat)



Summary for Subcatchment OS5_8: (new Subcat)

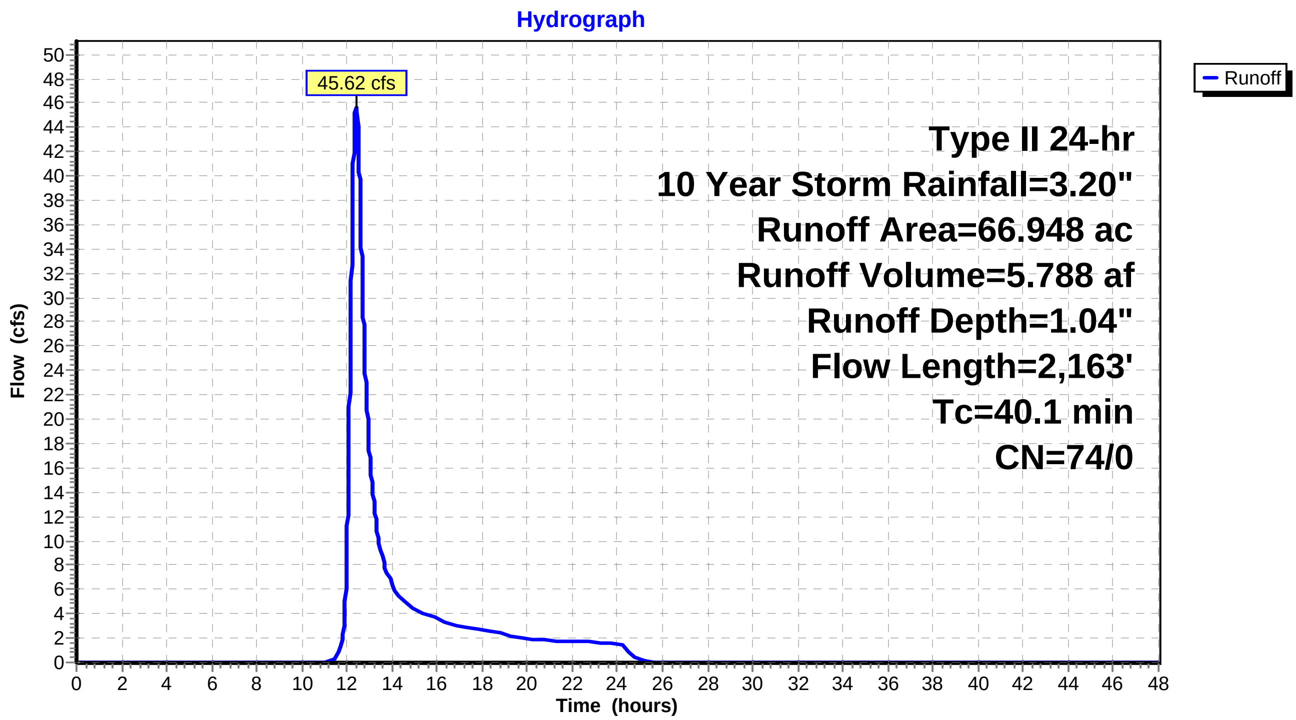
Runoff = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	66.948	74	weighted CN
	66.948	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.0025	0.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
5.7	345	0.0025	1.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
32.5	1,768	0.0023	0.91	5.67	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
40.1	2,163	Total			

Subcatchment OS5_8: (new Subcat)



Summary for Subcatchment OS6: (new Subcat)

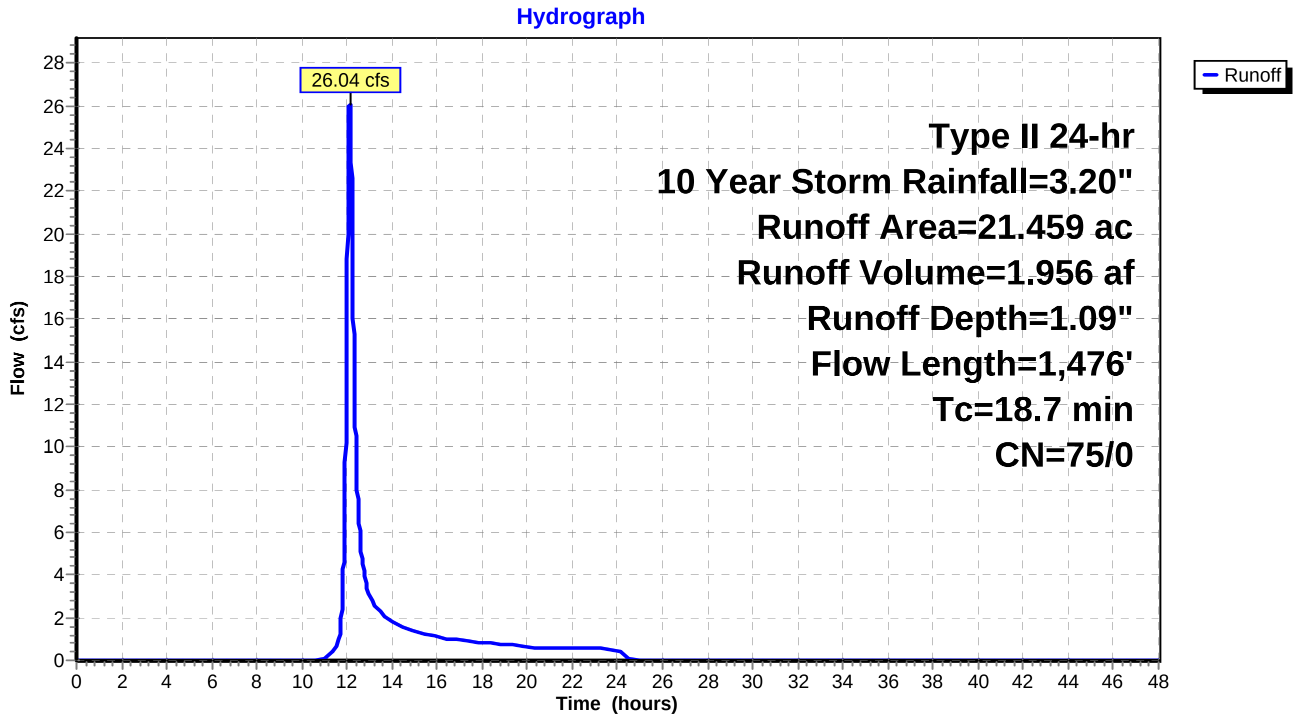
Runoff = 26.04 cfs @ 12.12 hrs, Volume= 1.956 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.459	75	weighted CN
	21.459	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.7	488	0.0930	4.91		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.9	938	0.0043	0.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.7	1,476	Total			

Subcatchment OS6: (new Subcat)



Summary for Subcatchment OS7_1: (new Subcat)

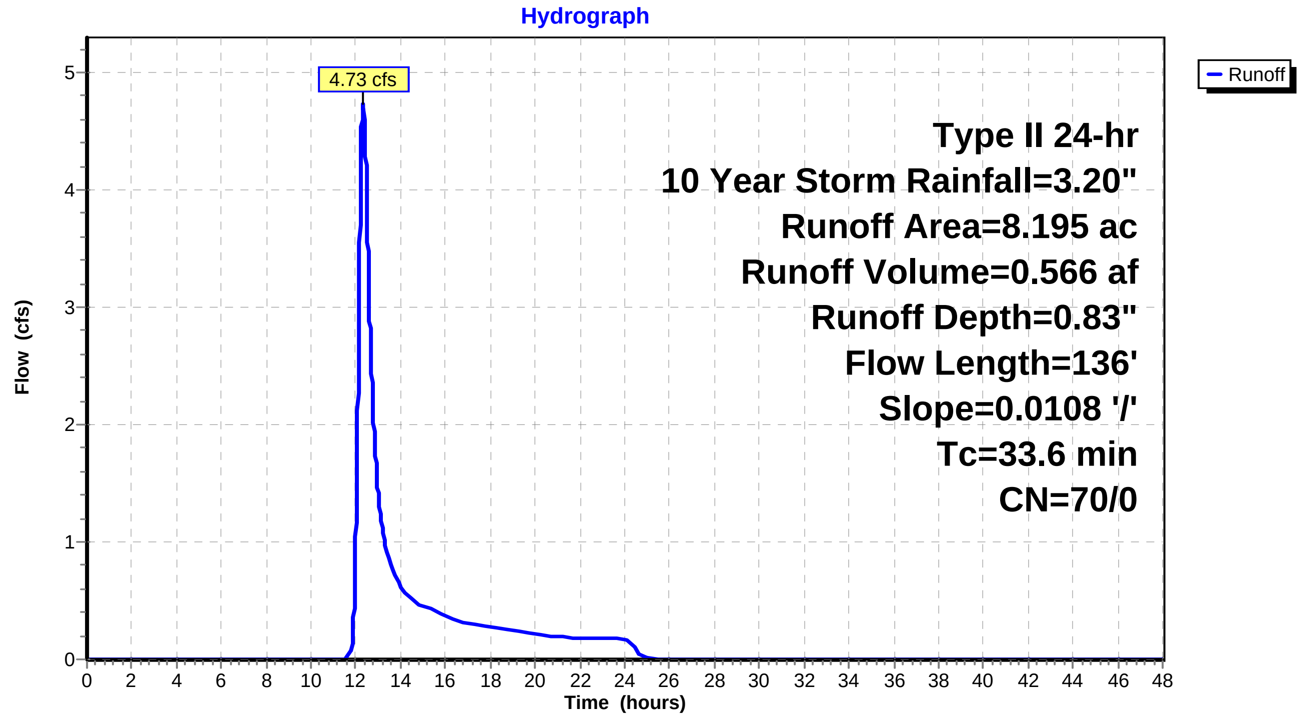
Runoff = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	8.195	70	weighted CN
	8.195	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	100	0.0108	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	36	0.0108	0.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.6	136	Total			

Subcatchment OS7_1: (new Subcat)



Summary for Subcatchment OS7_2: (new Subcat)

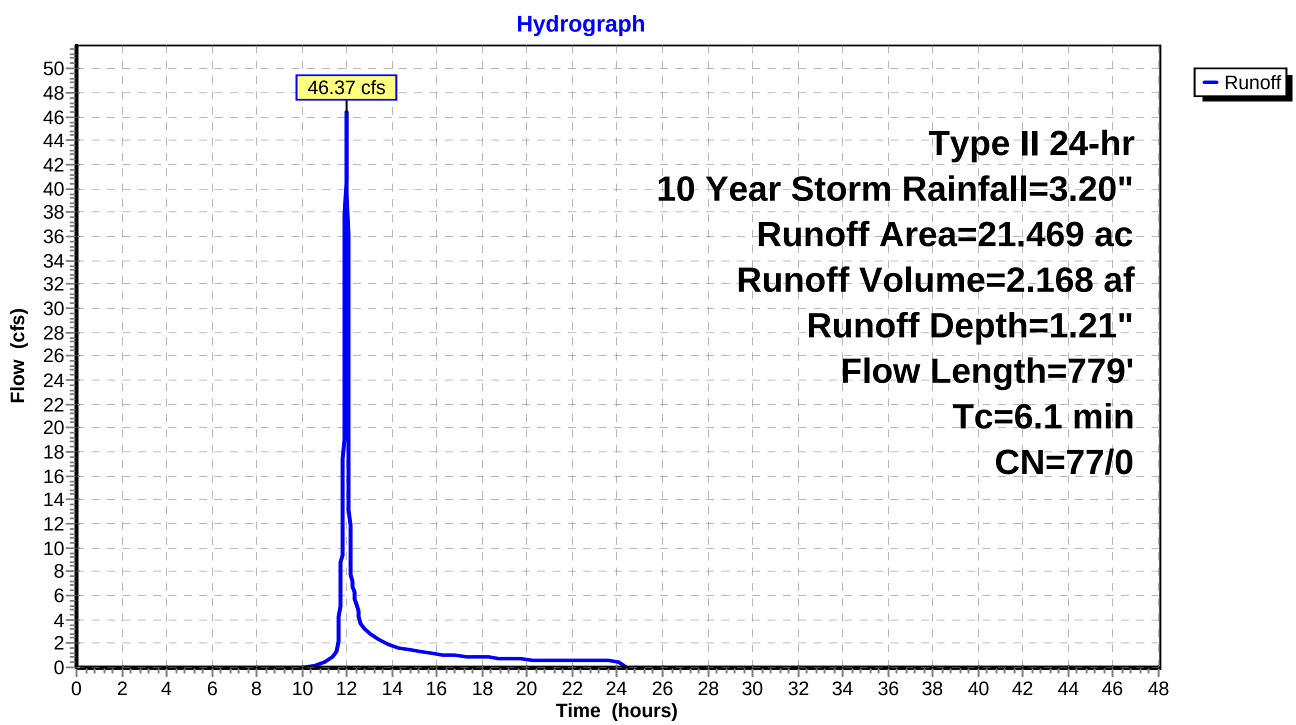
Runoff = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.469	77	weighted CN
	21.469	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.3	273	0.0093	1.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	456	0.0175	2.81	4.22	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.035
6.1	779	Total			

Subcatchment OS7_2: (new Subcat)



Summary for Subcatchment OS7_4: (new Subcat)

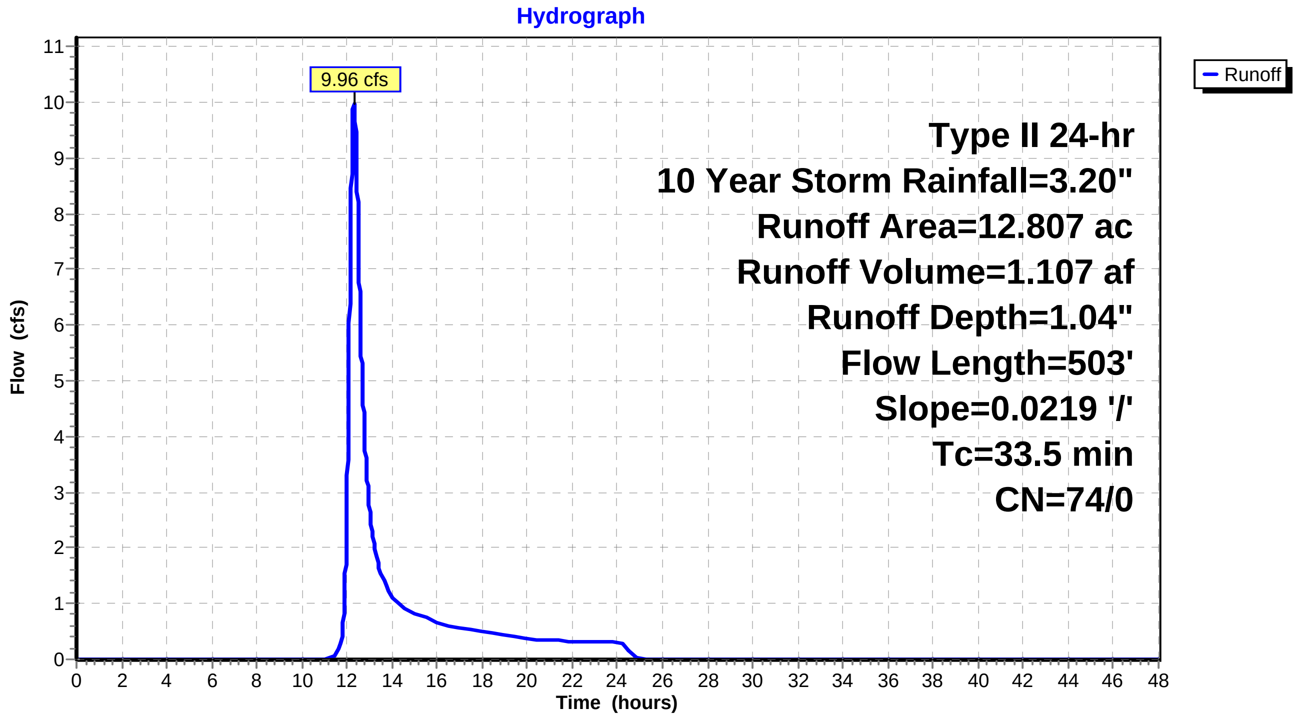
Runoff = 9.96 cfs @ 12.32 hrs, Volume= 1.107 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	12.807	74	weighted CN
	12.807	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.4	100	0.0219	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.1	403	0.0219	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.5	503	Total			

Subcatchment OS7_4: (new Subcat)



Summary for Subcatchment OS8a: (new Subcat)

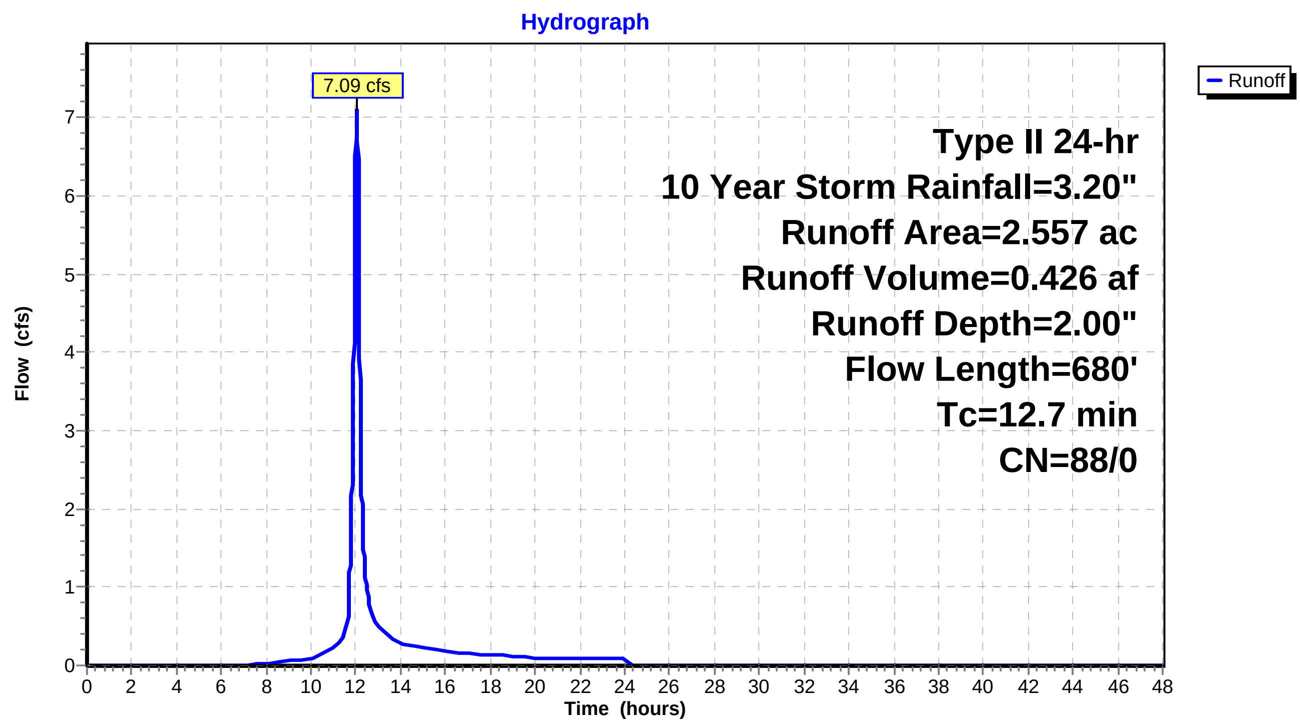
Runoff = 7.09 cfs @ 12.04 hrs, Volume= 0.426 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.557	88	weighted CN
	2.557	88	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	60	0.1228	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	290	0.0103	2.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	90	0.1319	2.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	240	0.0243	2.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.7	680	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8b: (new Subcat)

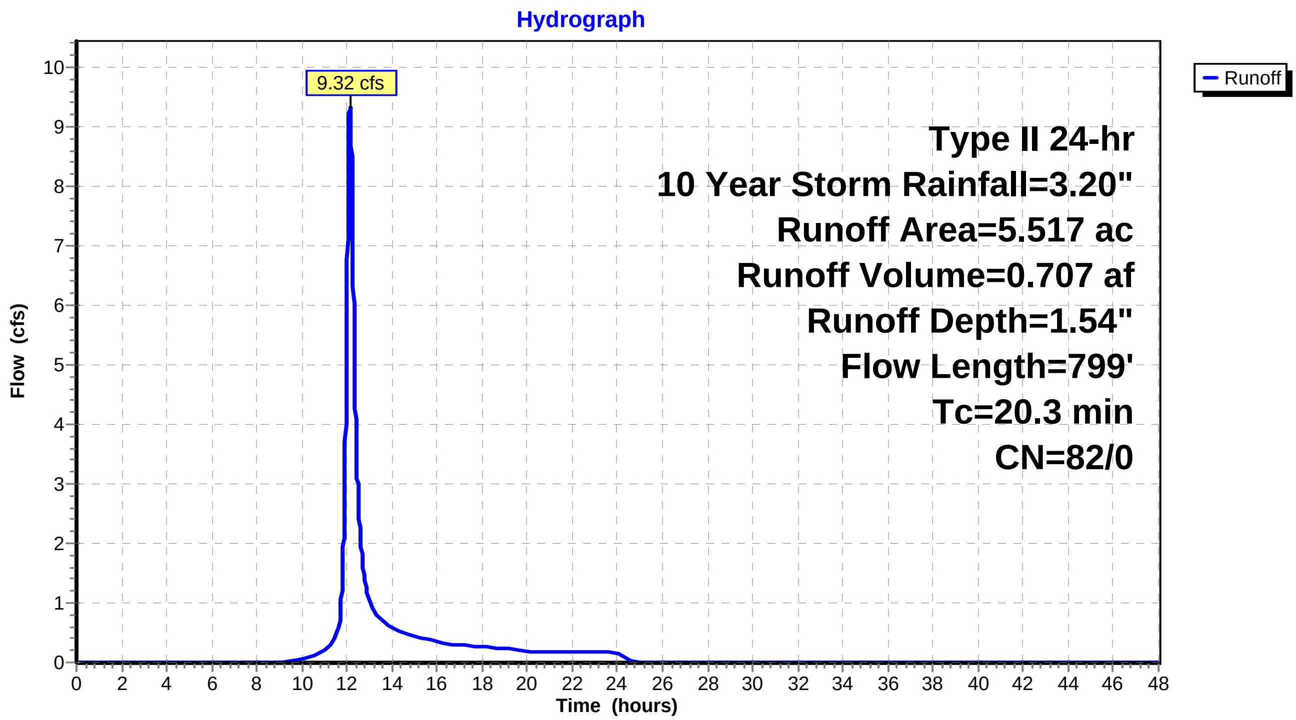
Runoff = 9.32 cfs @ 12.13 hrs, Volume= 0.707 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	5.517	82	weighted CN
	5.517	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0032	0.17		**Sheet Flow, roadside channel** Fallow n= 0.050 P2= 2.30"
9.5	518	0.0032	0.91		**Shallow Concentrated Flow, roadside channel** Unpaved Kv= 16.1 fps
0.8	181	0.0055	3.86	17.89	**Pipe Channel, CMP_Arch_1/2 35x24** 35.0" x 24.0", R=17.9"/55.1" Pipe Arch Area= 4.6 sf Perim= 7.9' r= n= 0.020 Corrugated PE, corrugated interior
20.3	799	Total			

Subcatchment OS8b: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

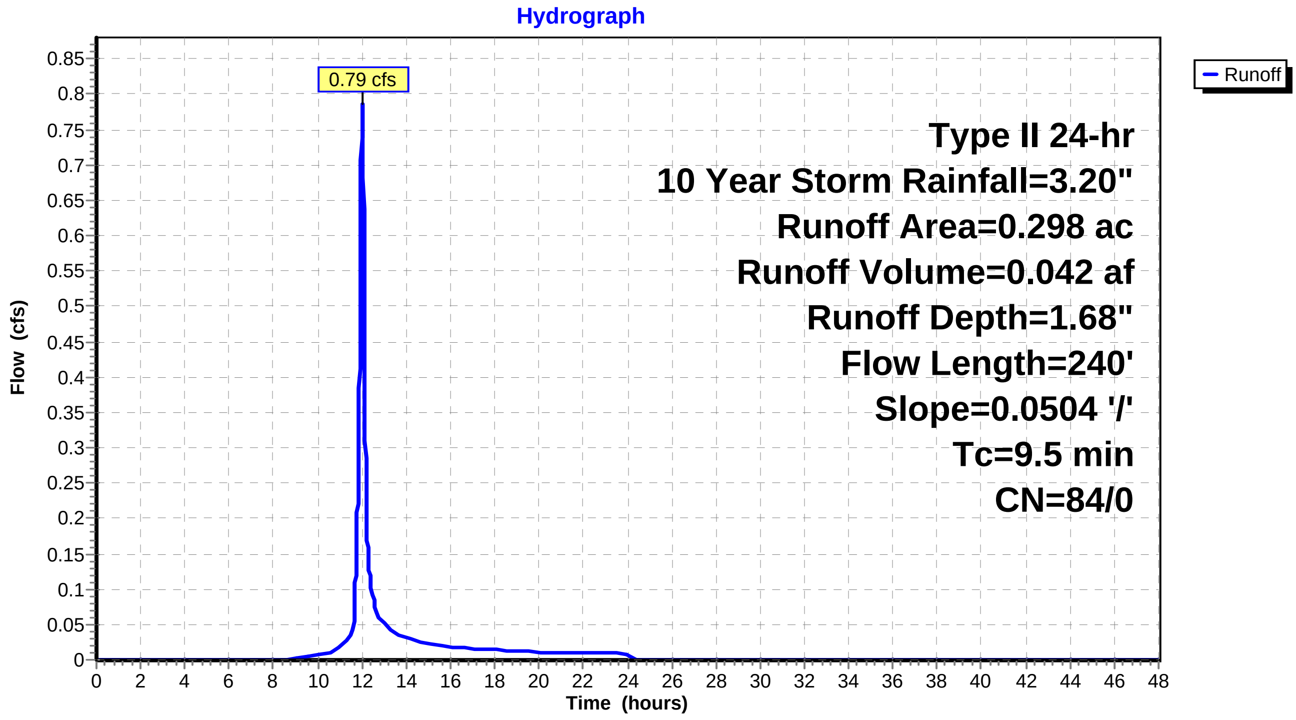
Runoff = 0.79 cfs @ 12.01 hrs, Volume= 0.042 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	0.298	84	weighted CN
	0.298	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	240	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

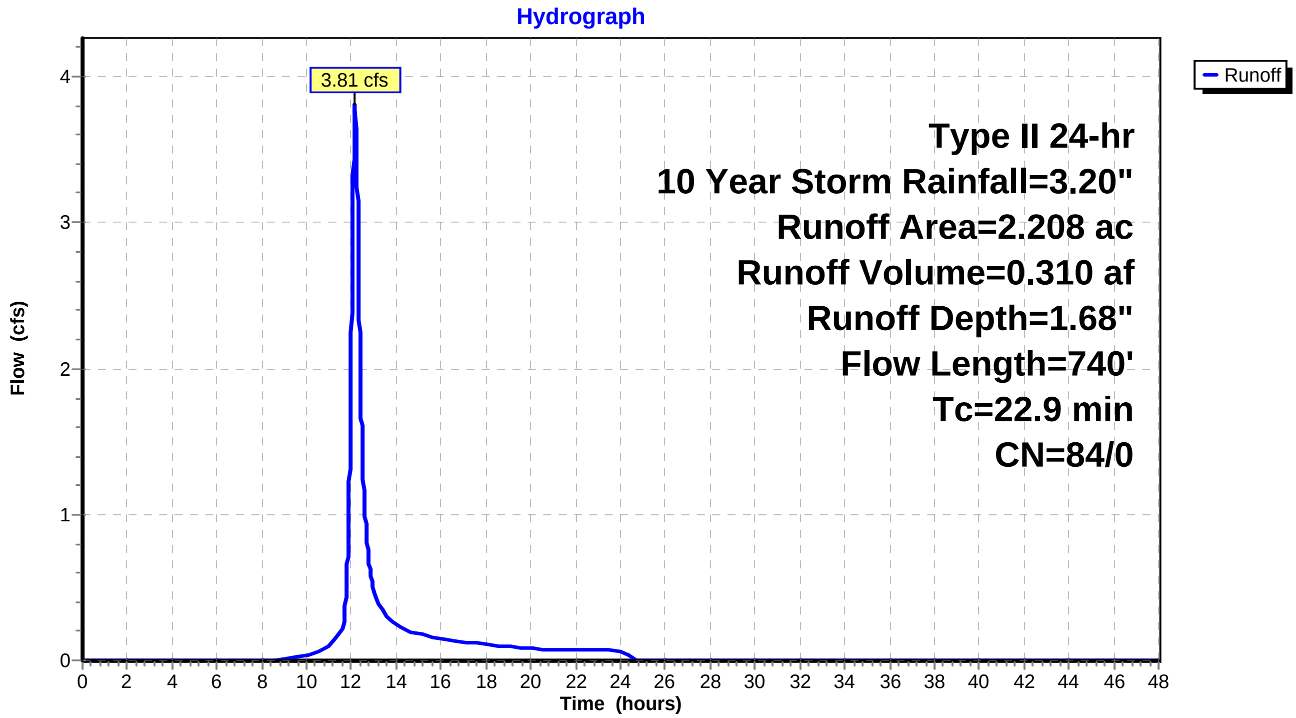
Runoff = 3.81 cfs @ 12.16 hrs, Volume= 0.310 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.208	84	weighted CN
	2.208	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8e: OS8e

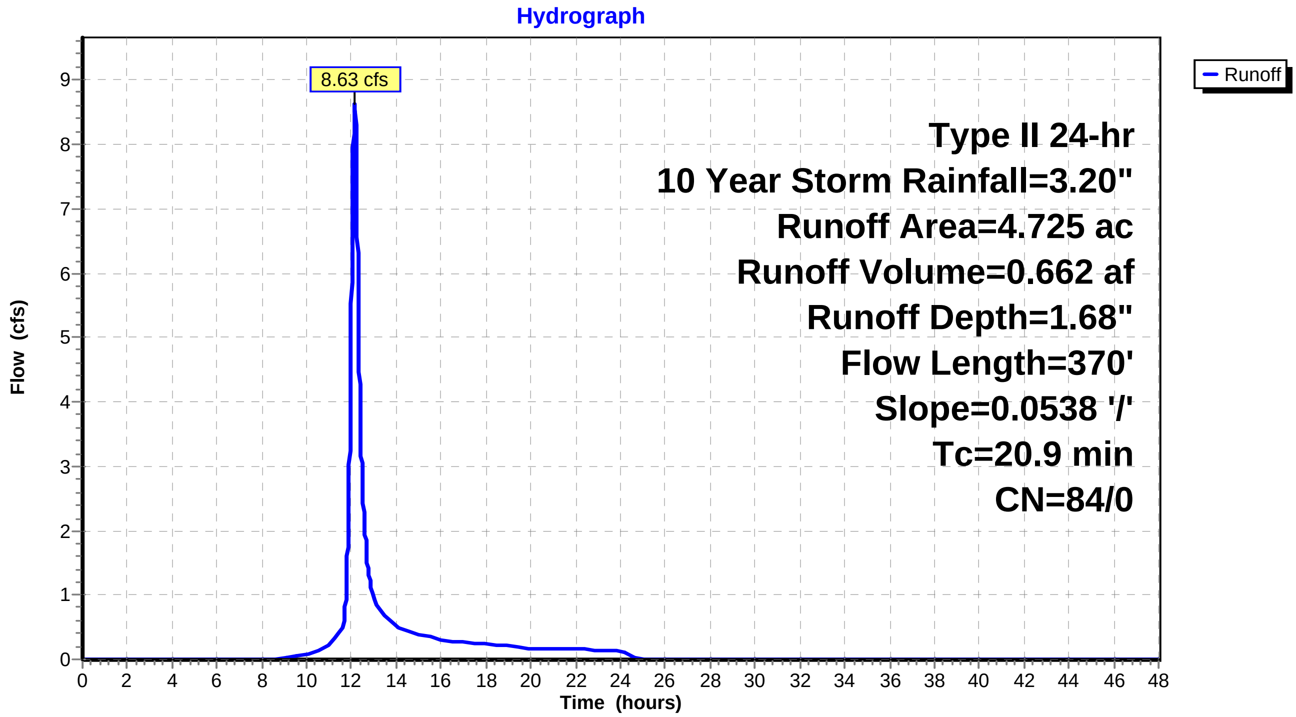
Runoff = 8.63 cfs @ 12.14 hrs, Volume= 0.662 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	4.725	84	weighted CN
	4.725	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0538	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
3.9	270	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	370	Total			

Subcatchment OS8e: OS8e



Summary for Subcatchment OS8_5: (new Subcat)

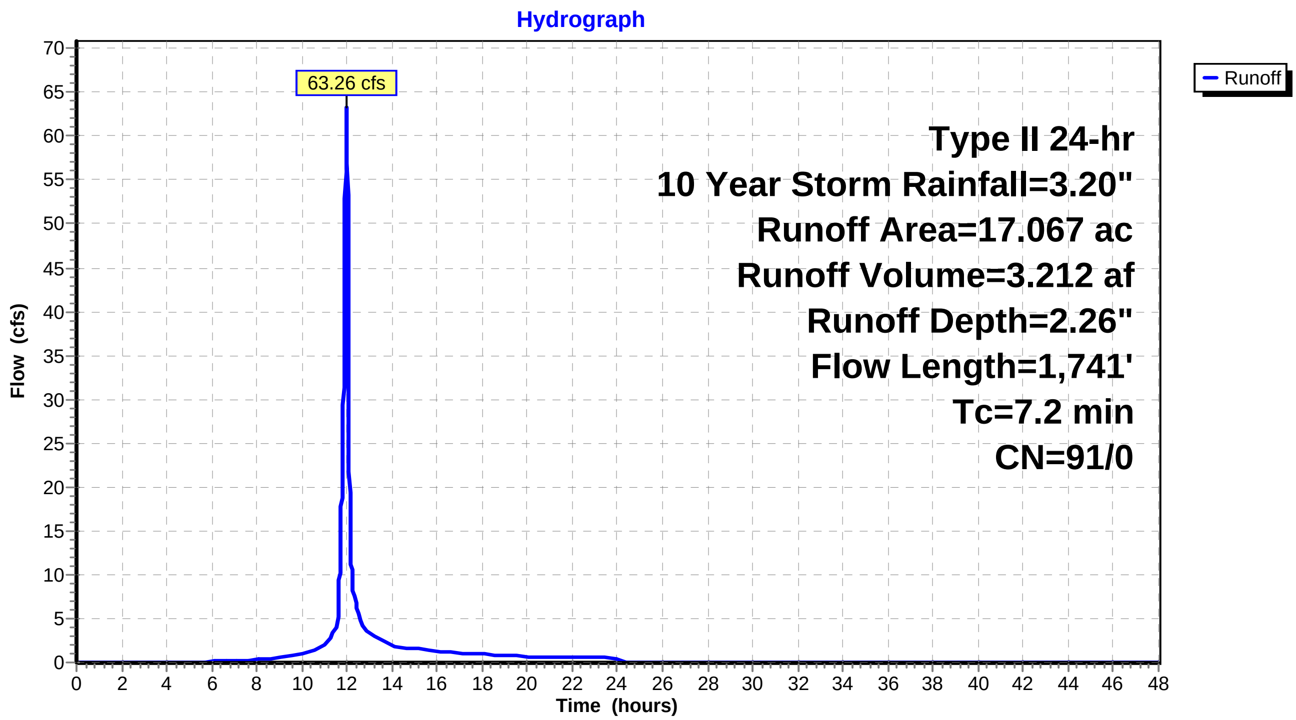
Runoff = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	17.067	91	weighted CN
	17.067	91	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



Summary for Reach GC4: Grass Channel 4

Inflow Area = 20.177 ac, 2.42% Impervious, Inflow Depth > 1.67" for 10 Year Storm event
Inflow = 14.38 cfs @ 12.16 hrs, Volume= 2.810 af
Outflow = 14.35 cfs @ 12.18 hrs, Volume= 2.809 af, Atten= 0%, Lag= 1.1 min

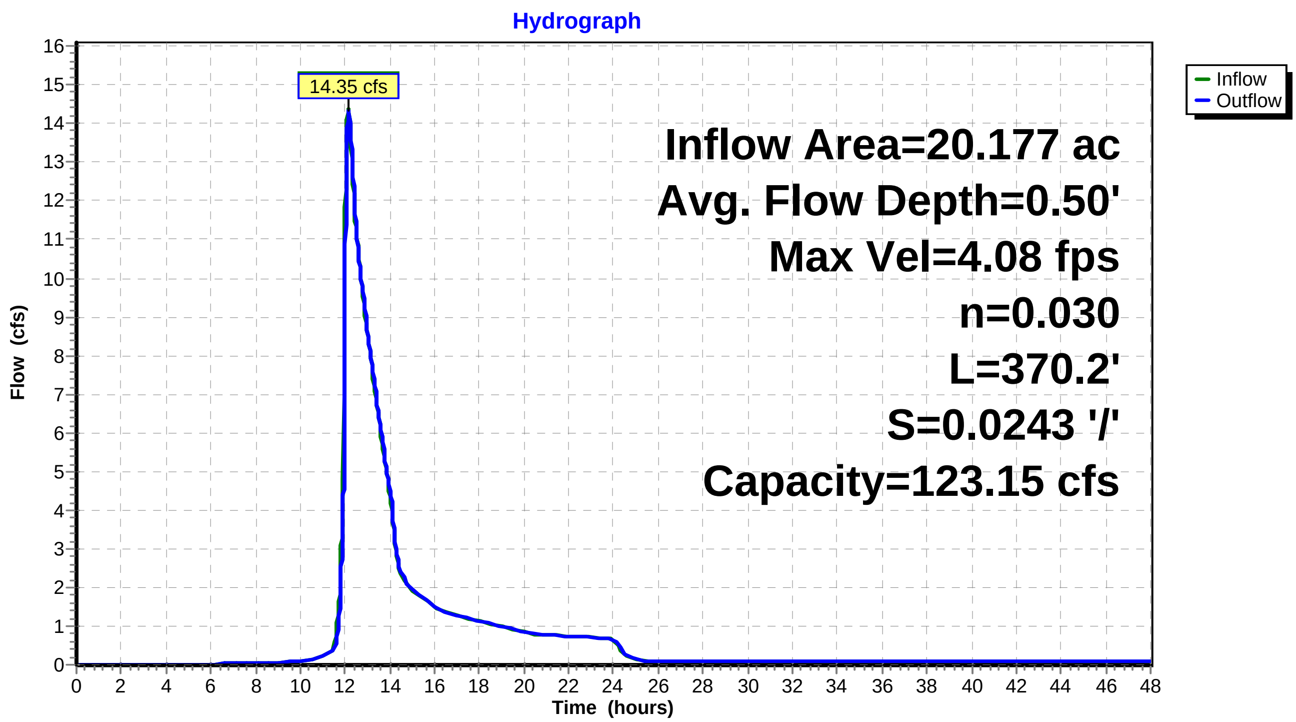
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.08 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 6.0 min

Peak Storage= 1,300 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.50' Flow Area= 16.5 sf, Capacity= 123.15 cfs

5.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 17.00'
Length= 370.2' Slope= 0.0243 '/'
Inlet Invert= 342.69', Outlet Invert= 333.69'

‡

Reach GC4: Grass Channel 4



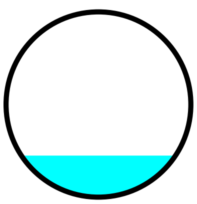
Summary for Reach P24: Pipe 24

Inflow Area = 0.380 ac, 87.37% Impervious, Inflow Depth = 2.69" for 10 Year Storm event
Inflow = 1.78 cfs @ 11.92 hrs, Volume= 0.085 af
Outflow = 1.77 cfs @ 11.93 hrs, Volume= 0.085 af, Atten= 1%, Lag= 0.3 min

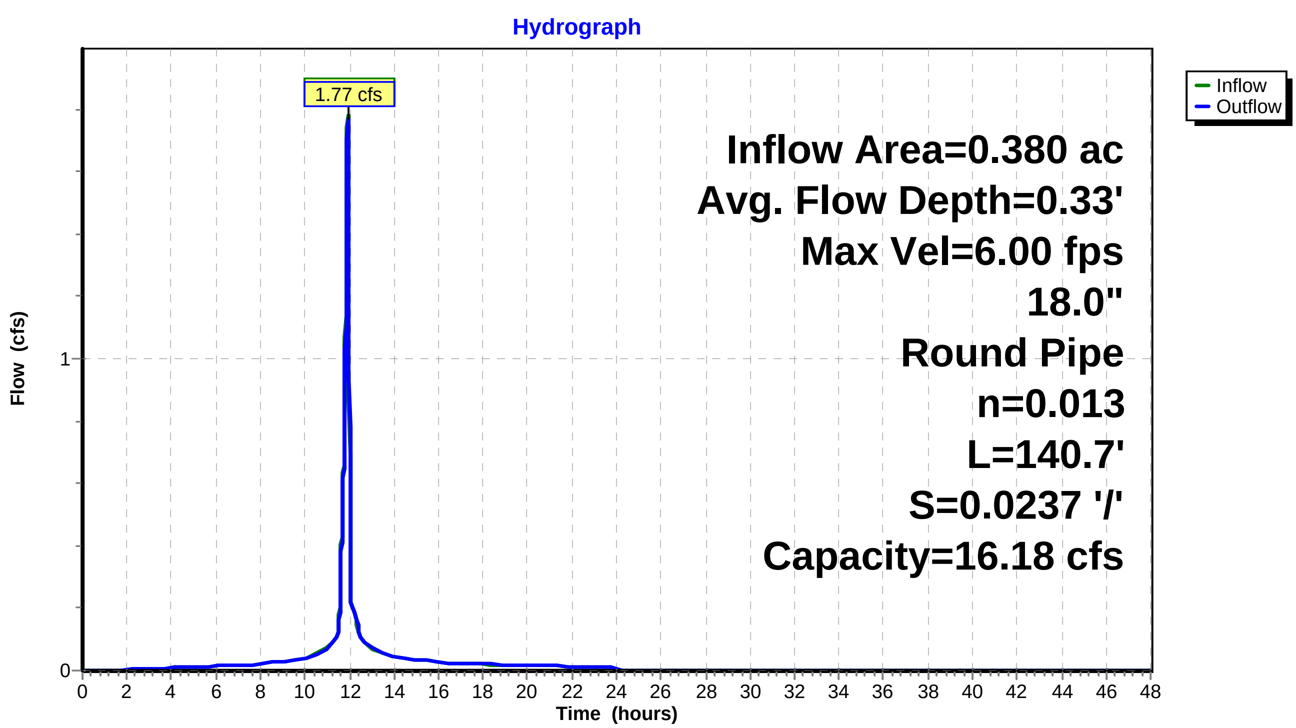
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.00 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 1.4 min

Peak Storage= 41 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.18 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 140.7' Slope= 0.0237 '/'
Inlet Invert= 332.99', Outlet Invert= 329.65'



Reach P24: Pipe 24



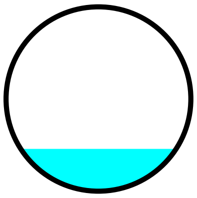
Summary for Reach P34: Pipe 34

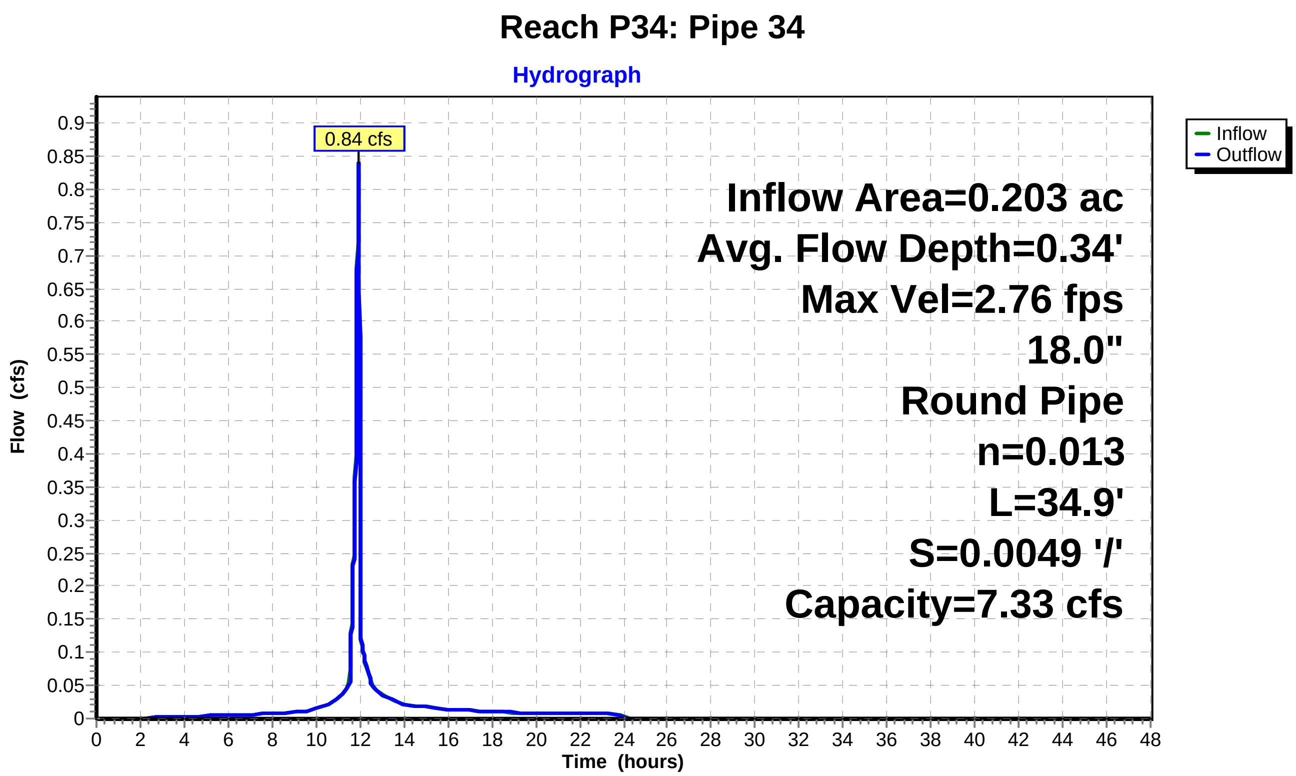
Inflow Area = 0.203 ac, 57.14% Impervious, Inflow Depth = 2.30" for 10 Year Storm event
Inflow = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af
Outflow = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 0.8 min

Peak Storage= 11 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.33 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.9' Slope= 0.0049 '/'
Inlet Invert= 343.87', Outlet Invert= 343.70'





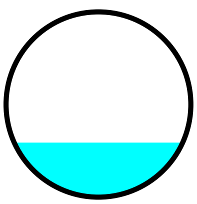
Summary for Reach P35: Pipe 35

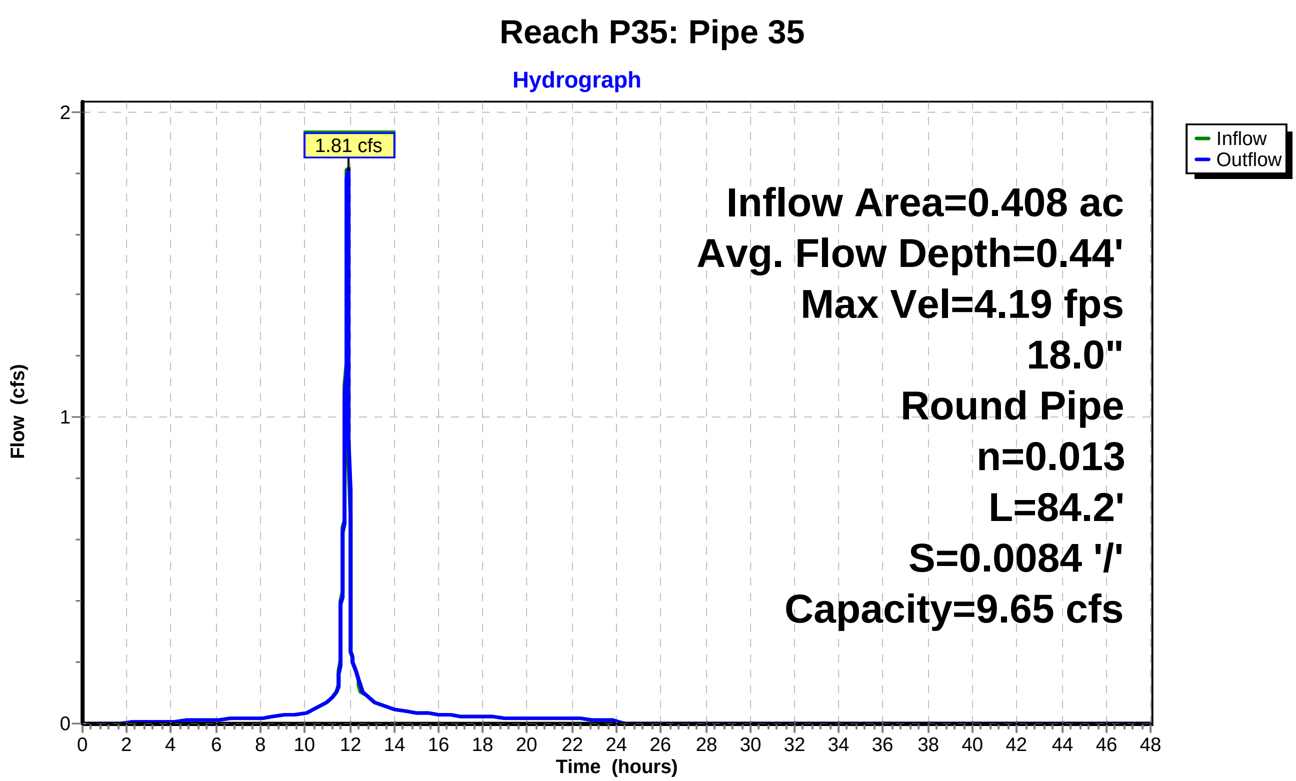
Inflow Area = 0.408 ac, 71.81% Impervious, Inflow Depth = 2.53" for 10 Year Storm event
Inflow = 1.82 cfs @ 11.91 hrs, Volume= 0.086 af
Outflow = 1.81 cfs @ 11.92 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.19 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 1.2 min

Peak Storage= 36 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.65 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 84.2' Slope= 0.0084 '/'
Inlet Invert= 343.59', Outlet Invert= 342.88'





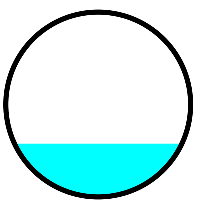
Summary for Reach P36: Pipe 36

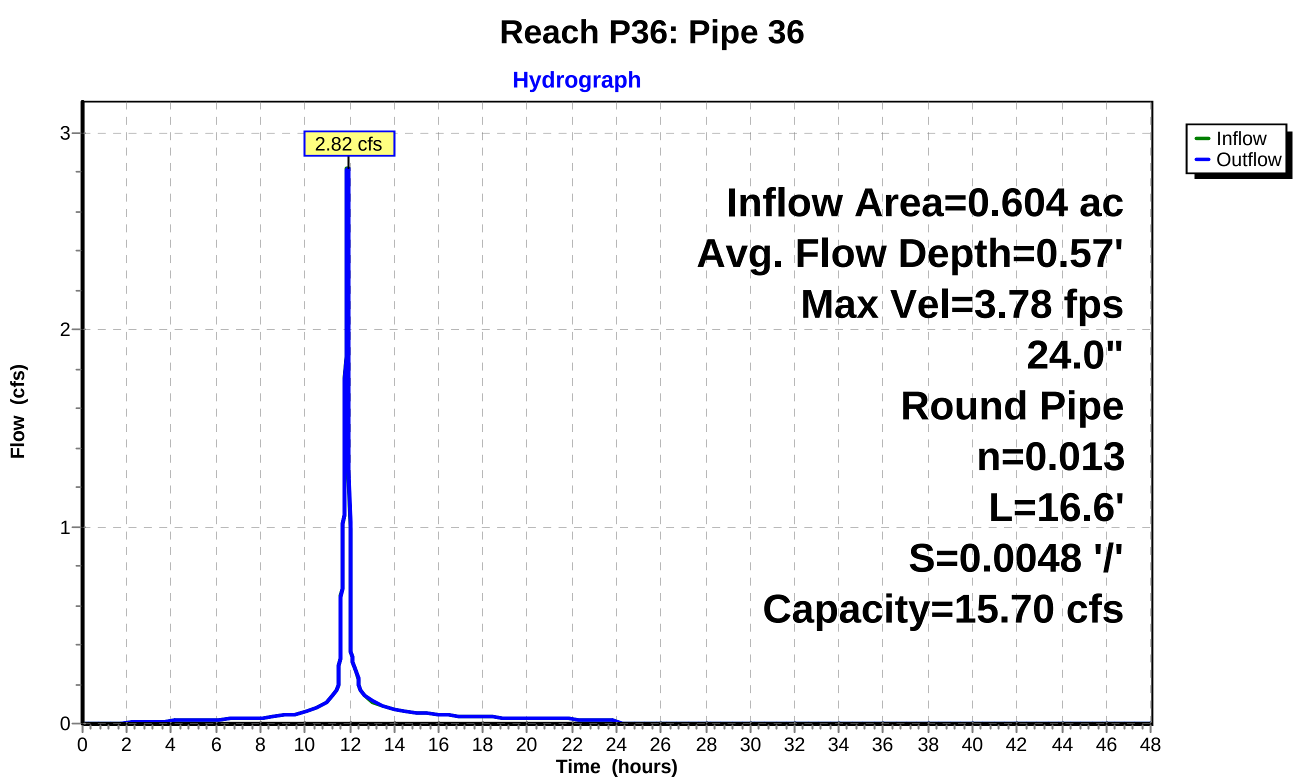
Inflow Area = 0.604 ac, 80.79% Impervious, Inflow Depth = 2.67" for 10 Year Storm event
Inflow = 2.82 cfs @ 11.91 hrs, Volume= 0.134 af
Outflow = 2.82 cfs @ 11.91 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 15.70 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 16.6' Slope= 0.0048 '/'
Inlet Invert= 342.77', Outlet Invert= 342.69'





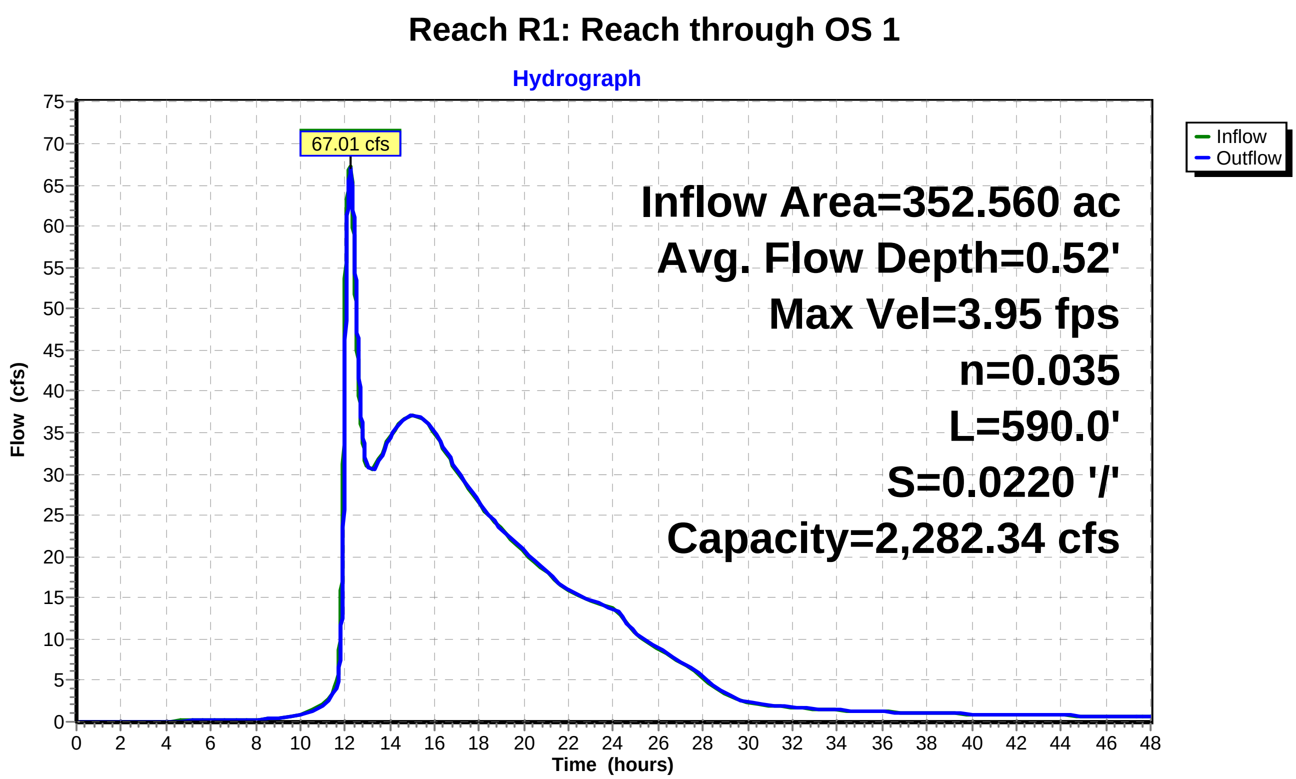
Summary for Reach R1: Reach through OS 1

Inflow Area = 352.560 ac, 2.71% Impervious, Inflow Depth > 1.13" for 10 Year Storm event
Inflow = 67.23 cfs @ 12.23 hrs, Volume= 33.177 af
Outflow = 67.01 cfs @ 12.25 hrs, Volume= 33.165 af, Atten= 0%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.95 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.42 fps, Avg. Travel Time= 6.9 min

Peak Storage= 10,021 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 4.00' Flow Area= 172.0 sf, Capacity= 2,282.34 cfs

31.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 55.00'
Length= 590.0' Slope= 0.0220 '/'
Inlet Invert= 266.00', Outlet Invert= 253.00'



Summary for Reach R2: Reach through OS2

Inflow Area = 337.278 ac, 2.67% Impervious, Inflow Depth > 1.16" for 10 Year Storm event
Inflow = 66.13 cfs @ 12.20 hrs, Volume= 32.720 af
Outflow = 66.01 cfs @ 12.22 hrs, Volume= 32.714 af, Atten= 0%, Lag= 1.0 min

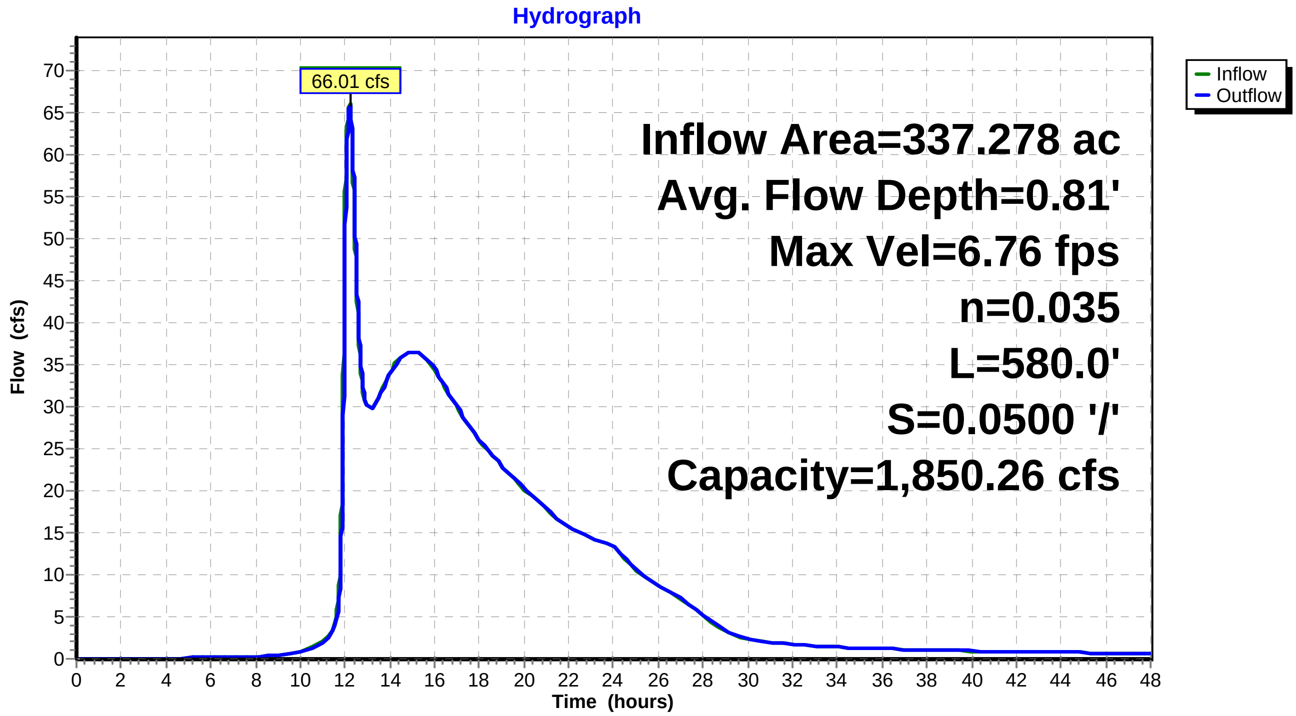
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.76 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 2.69 fps, Avg. Travel Time= 3.6 min

Peak Storage= 5,665 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 4.00' Flow Area= 112.0 sf, Capacity= 1,850.26 cfs

8.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 48.00'
Length= 580.0' Slope= 0.0500 '/'
Inlet Invert= 295.00', Outlet Invert= 266.00'

‡

Reach R2: Reach through OS2



Summary for Reach R3: Reach through OS3

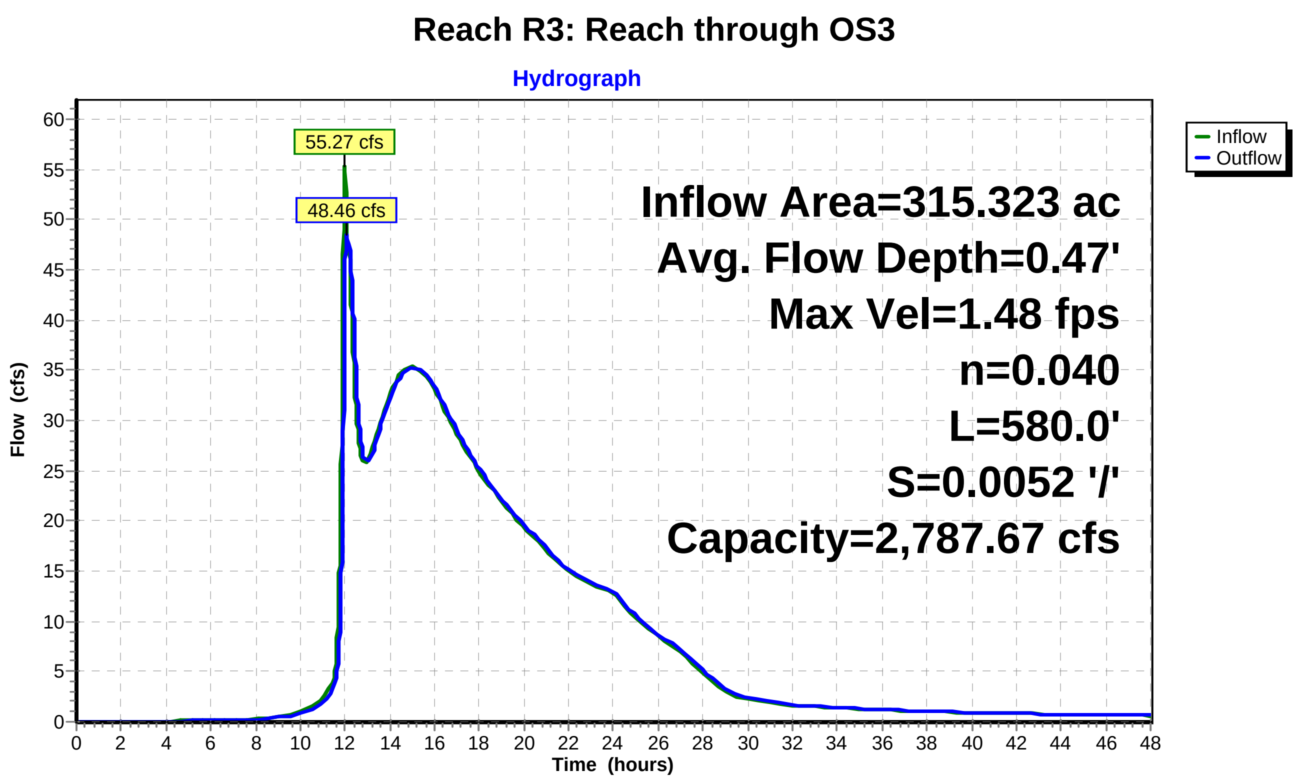
Inflow Area = 315.323 ac, 2.65% Impervious, Inflow Depth > 1.17" for 10 Year Storm event
Inflow = 55.27 cfs @ 11.99 hrs, Volume= 30.759 af
Outflow = 48.46 cfs @ 12.07 hrs, Volume= 30.732 af, Atten= 12%, Lag= 4.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.48 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 15.8 min

Peak Storage= 18,927 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 4.00' Flow Area= 560.0 sf, Capacity= 2,787.67 cfs

60.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 20.0 '/' Top Width= 220.00'
Length= 580.0' Slope= 0.0052 '/'
Inlet Invert= 298.00', Outlet Invert= 295.00'

‡



Summary for Reach R4: Reach through OS4

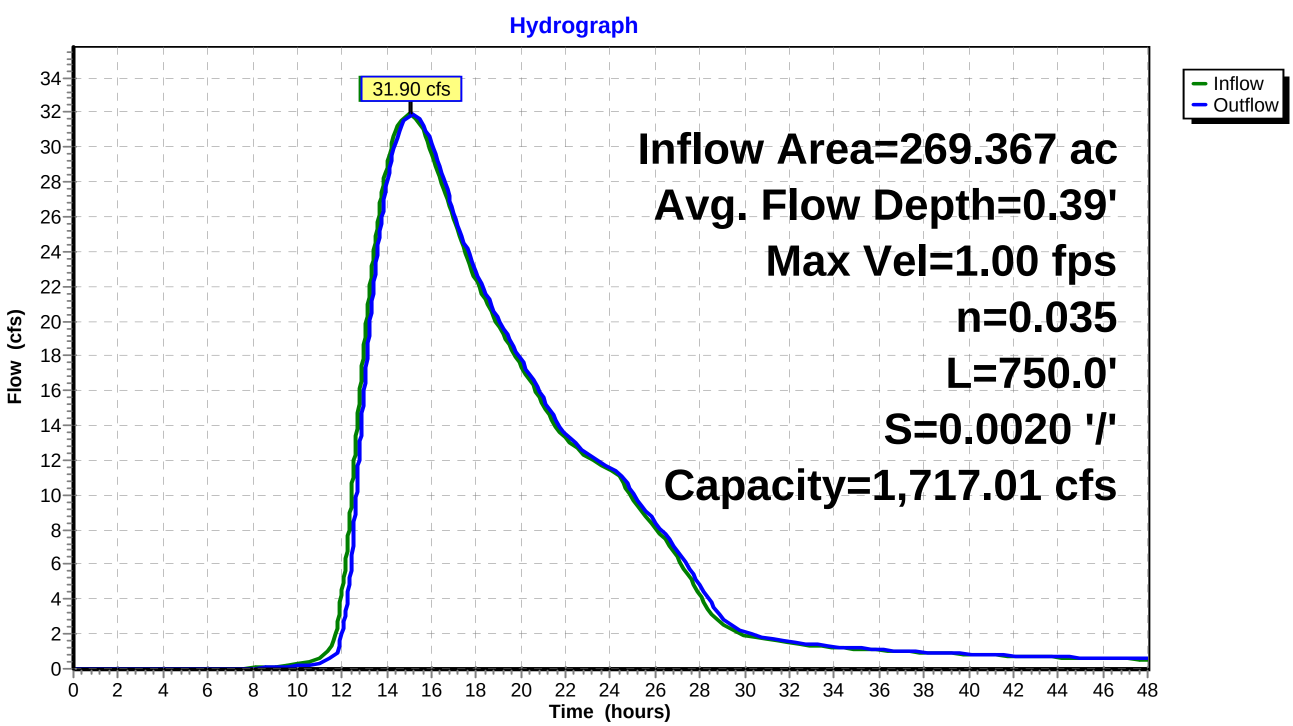
Inflow Area = 269.367 ac, 2.03% Impervious, Inflow Depth > 1.11" for 10 Year Storm event
Inflow = 31.94 cfs @ 14.98 hrs, Volume= 24.907 af
Outflow = 31.90 cfs @ 15.12 hrs, Volume= 24.864 af, Atten= 0%, Lag= 8.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.00 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 28.9 min

Peak Storage= 24,032 cf @ 15.12 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 4.00' Flow Area= 412.0 sf, Capacity= 1,717.01 cfs

80.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 6.5 '/' Top Width= 126.00'
Length= 750.0' Slope= 0.0020 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'

Reach R4: Reach through OS4



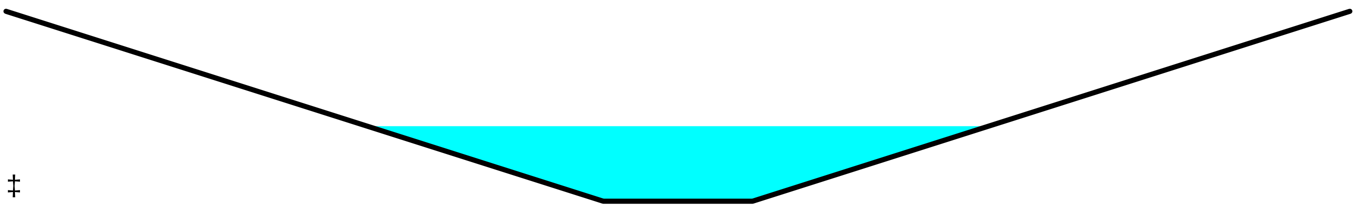
Summary for Reach R5: Ditch behind Spare Time

Inflow Area = 22.431 ac, 0.00% Impervious, Inflow Depth = 0.75" for 10 Year Storm event
Inflow = 5.16 cfs @ 13.27 hrs, Volume= 1.411 af
Outflow = 5.13 cfs @ 13.31 hrs, Volume= 1.411 af, Atten= 1%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 9.1 min

Peak Storage= 1,324 cf @ 13.31 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 43.39 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 325.0' Slope= 0.0012 '/'
Inlet Invert= 312.00', Outlet Invert= 311.61'



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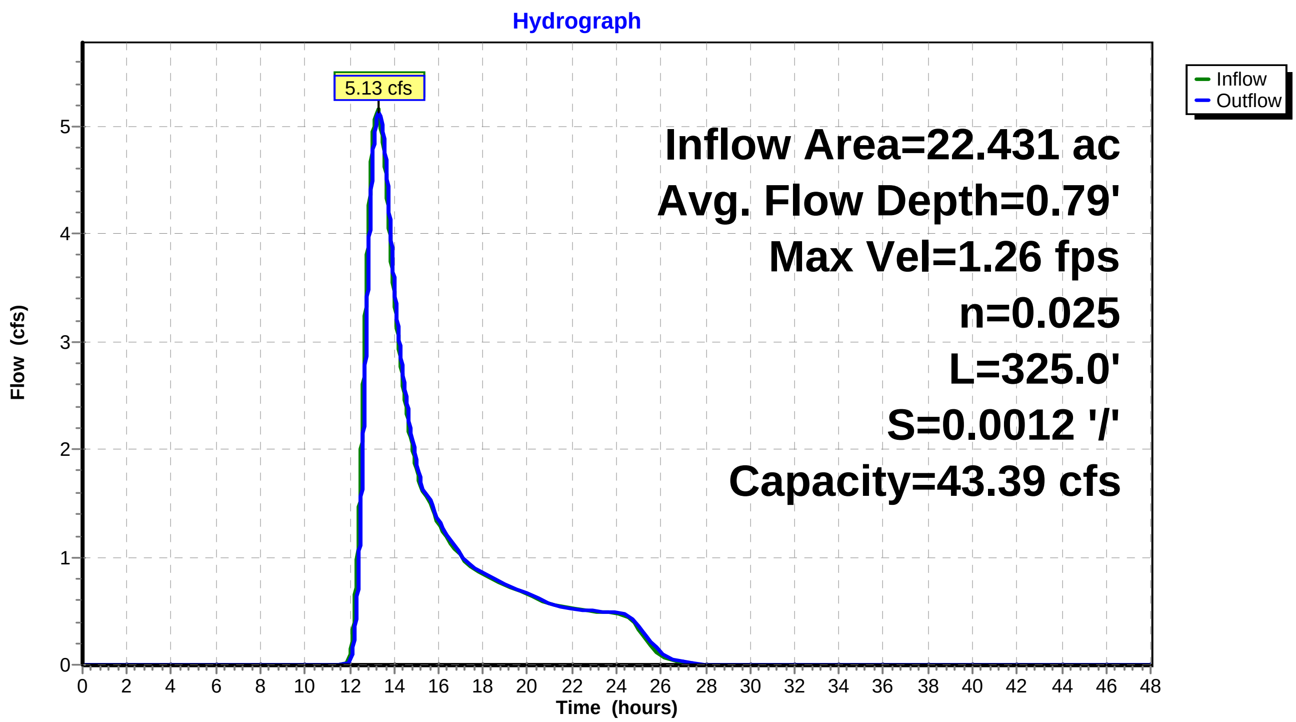
Reach R5: Ditch behind Spare Time



Summary for Pond 1P: Hercules Drive / S/N 005

Inflow Area = 269.367 ac, 2.03% Impervious, Inflow Depth > 1.11" for 10 Year Storm event
Inflow = 32.52 cfs @ 14.56 hrs, Volume= 24.915 af
Outflow = 31.94 cfs @ 14.98 hrs, Volume= 24.907 af, Atten= 2%, Lag= 25.5 min
Primary = 31.94 cfs @ 14.98 hrs, Volume= 24.907 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 300.01' Surf.Area= 698 sf Storage= 262 cf
Peak Elev= 302.20' @ 14.98 hrs Surf.Area= 37,683 sf Storage= 31,339 cf (31,077 cf above start)

Plug-Flow detention time= 12.8 min calculated for 24.896 af (100% of inflow)
Center-of-Mass det. time= 11.7 min (1,172.2 - 1,160.5)

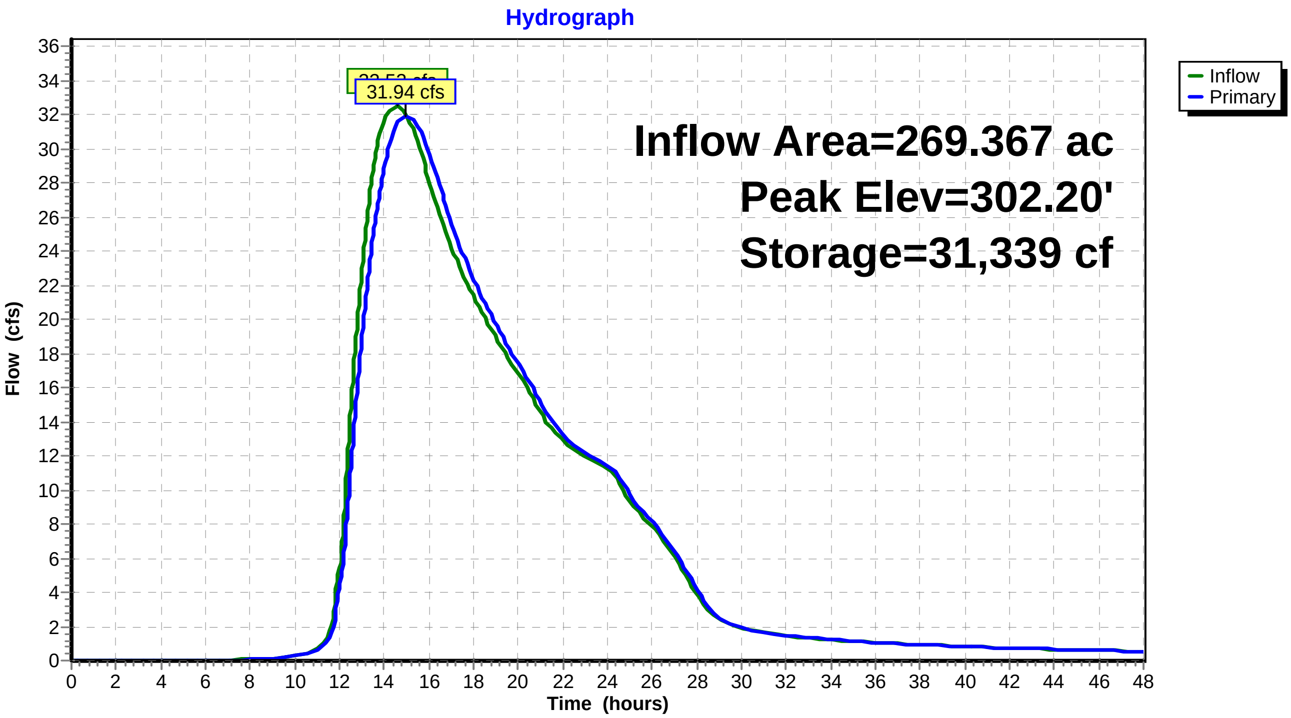
Volume	Invert	Avail.Storage	Storage Description
#1	299.00'	289,977 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
299.00	12	38.0	0	0	12
300.00	664	524.0	255	255	21,749
301.00	8,419	934.0	3,816	4,071	69,324
302.00	34,889	1,232.0	20,149	24,220	120,701
303.00	50,252	1,311.0	42,338	66,557	136,738
304.00	63,333	1,347.0	56,667	123,224	144,468
306.00	105,180	1,900.0	166,753	289,977	287,393

Device	Routing	Invert	Outlet Devices
#1	Primary	300.01'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.01' / 299.50' S= 0.0067 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf
#2	Primary	300.07'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 299.72' / 300.07' S= -0.0046 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf

Primary OutFlow Max=31.94 cfs @ 14.98 hrs HW=302.20' TW=299.89' (Dynamic Tailwater)
├**1=Culvert** (Barrel Controls 16.73 cfs @ 4.23 fps)
└**2=Culvert** (Barrel Controls 15.21 cfs @ 3.31 fps)

Pond 1P: Hercules Drive / S/N 005



Summary for Pond 2P: Lower Mtn View Dr

Inflow Area = 110.396 ac, 4.77% Impervious, Inflow Depth > 1.28" for 10 Year Storm event
Inflow = 66.60 cfs @ 12.11 hrs, Volume= 11.739 af
Outflow = 14.07 cfs @ 12.73 hrs, Volume= 11.736 af, Atten= 79%, Lag= 36.9 min
Primary = 14.07 cfs @ 12.73 hrs, Volume= 11.736 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 1,916 sf Storage= 898 cf
Peak Elev= 310.00' @ 13.10 hrs Surf.Area= 98,228 sf Storage= 95,999 cf (95,100 cf above start)

Plug-Flow detention time= 52.3 min calculated for 11.715 af (100% of inflow)
Center-of-Mass det. time= 47.0 min (1,131.2 - 1,084.2)

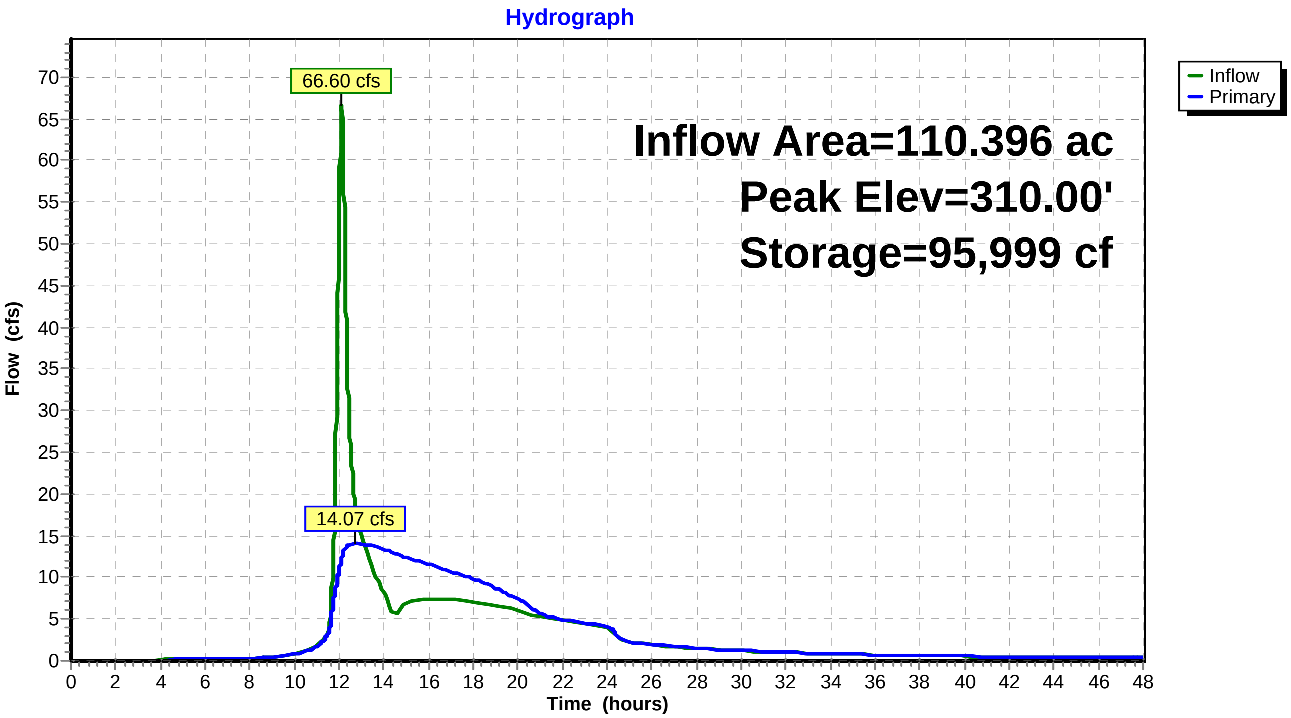
Volume	Invert	Avail.Storage	Storage Description
#1	305.81'	2,697,851 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.81	0	20.0	0	0	0
306.00	86	86.0	5	5	557
307.00	523	295.0	274	279	6,896
308.00	3,791	669.0	1,907	2,187	35,591
309.00	48,653	2,441.0	22,008	24,195	474,139
310.00	98,391	2,208.0	72,077	96,272	560,370
312.00	463,287	3,621.0	516,787	613,059	1,215,826
316.50	463,287	3,621.0	2,084,792	2,697,851	1,232,120

Device	Routing	Invert	Outlet Devices
#1	Primary	305.81'	**24.0" Round Culvert** L= 102.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 305.81' / 304.74' S= 0.0105 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Primary	316.13'	**190.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=14.06 cfs @ 12.73 hrs HW=309.97' TW=307.92' (Dynamic Tailwater)
1=Culvert (Outlet Controls 14.06 cfs @ 4.48 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

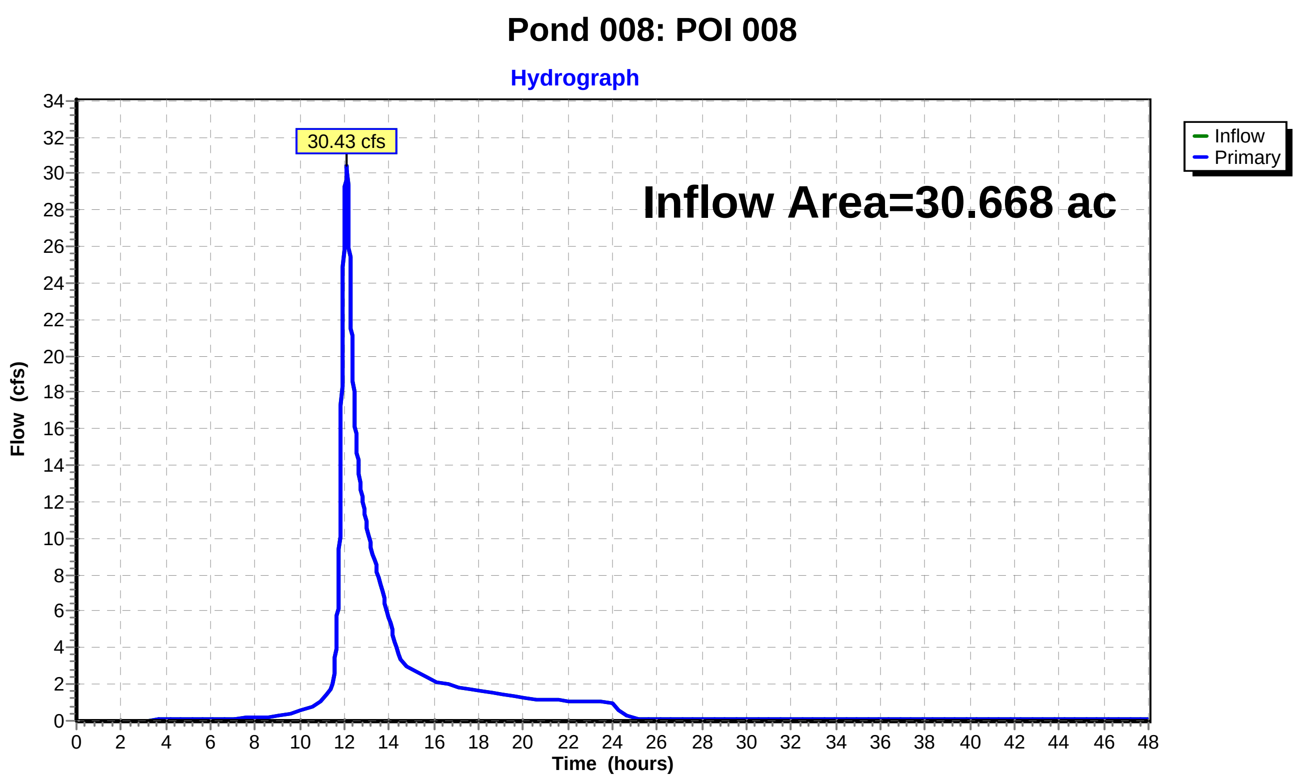
Pond 2P: Lower Mtn View Dr



Summary for Pond 008: POI 008

Inflow Area = 30.668 ac, 7.96% Impervious, Inflow Depth > 1.77" for 10 Year Storm event
Inflow = 30.43 cfs @ 12.09 hrs, Volume= 4.521 af
Primary = 30.43 cfs @ 12.09 hrs, Volume= 4.521 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Summary for Pond 48: Pipe 48

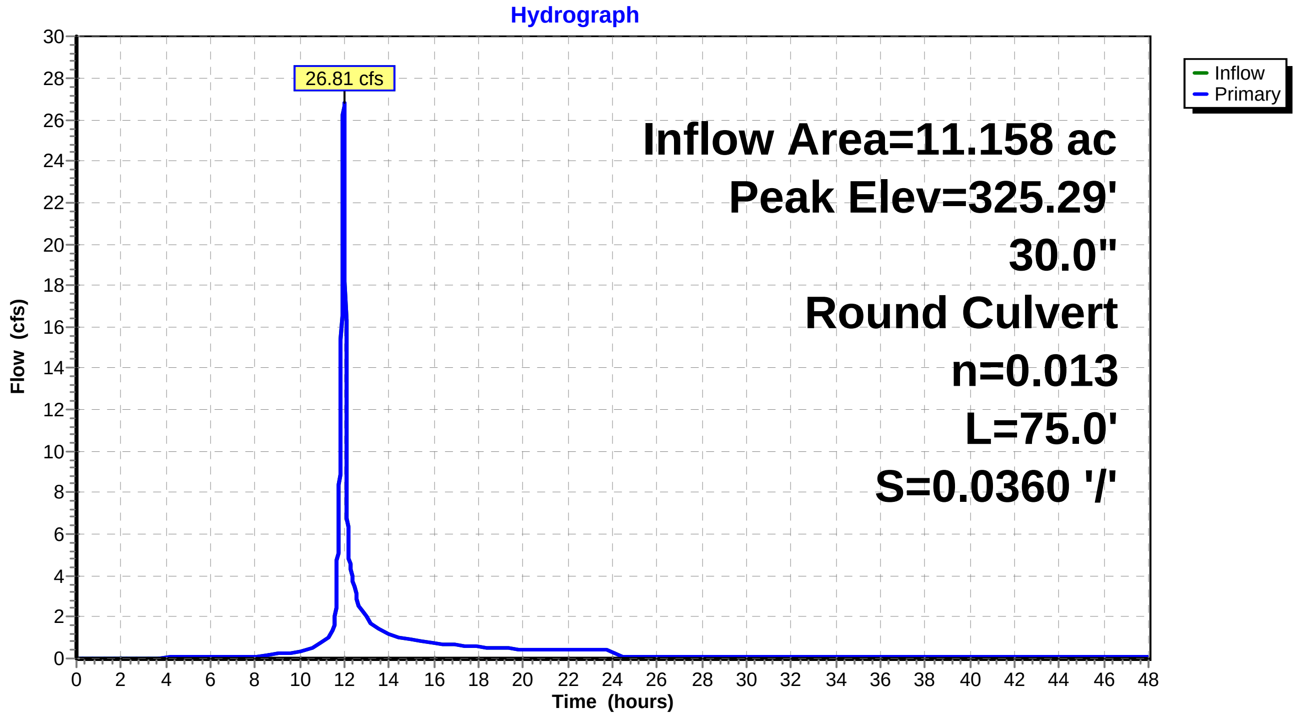
Inflow Area = 11.158 ac, 14.99% Impervious, Inflow Depth > 1.87" for 10 Year Storm event
Inflow = 26.81 cfs @ 11.97 hrs, Volume= 1.739 af
Outflow = 26.81 cfs @ 11.97 hrs, Volume= 1.739 af, Atten= 0%, Lag= 0.0 min
Primary = 26.81 cfs @ 11.97 hrs, Volume= 1.739 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 325.29' @ 11.97 hrs
Flood Elev= 326.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	322.75'	**30.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 322.75' / 320.05' S= 0.0360 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=26.78 cfs @ 11.97 hrs HW=325.28' TW=321.53' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 26.78 cfs @ 5.46 fps)

Pond 48: Pipe 48



Summary for Pond 49: Pipe 49

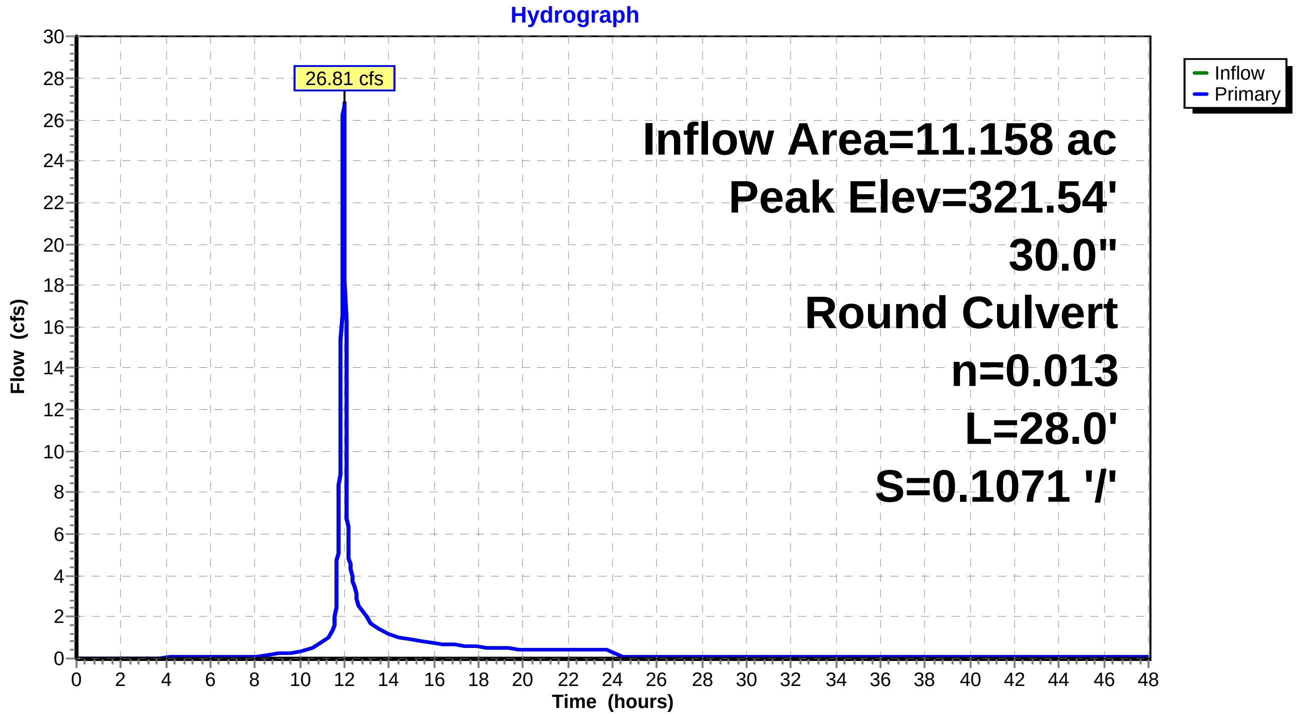
Inflow Area =	11.158 ac,	14.99% Impervious,	Inflow Depth > 1.87"	for 10 Year Storm event
Inflow =	26.81 cfs @	11.97 hrs,	Volume=	1.739 af
Outflow =	26.81 cfs @	11.97 hrs,	Volume=	1.739 af, Atten= 0%, Lag= 0.0 min
Primary =	26.81 cfs @	11.97 hrs,	Volume=	1.739 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 321.54' @ 11.97 hrs
Flood Elev= 324.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**30.0" Round Culvert** L= 28.0' Ke= 0.500 Inlet / Outlet Invert= 319.00' / 316.00' S= 0.1071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=26.78 cfs @ 11.97 hrs HW=321.53' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 26.78 cfs @ 5.46 fps)

Pond 49: Pipe 49



Summary for Pond P1: Behind Health Lab

Inflow Area = 8.195 ac, 0.00% Impervious, Inflow Depth = 0.83" for 10 Year Storm event
Inflow = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af
Outflow = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.17' @ 25.92 hrs Surf.Area= 141,660 sf Storage= 24,634 cf

Plug-Flow detention time= 3.3 min calculated for 0.000 af (0% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

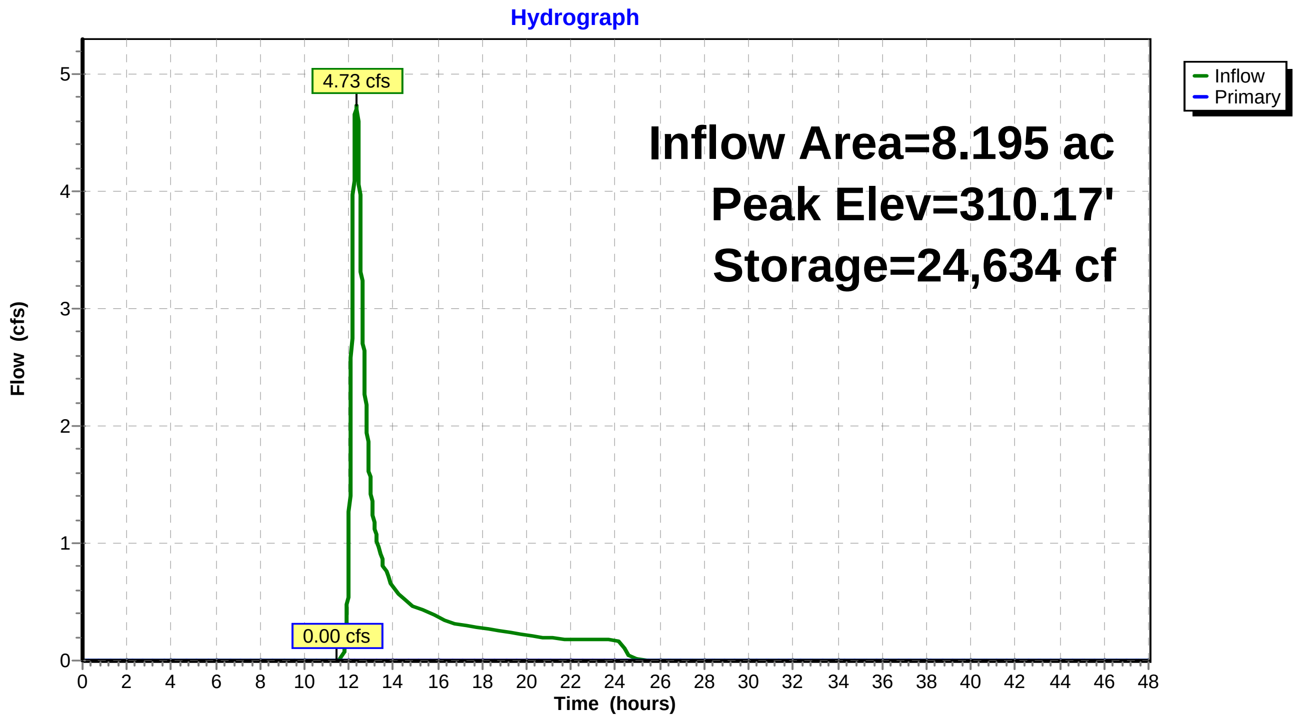
Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	372,741 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	140,477	1,706.0	0	0	140,477
312.50	157,885	1,775.0	372,741	372,741	160,080

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 3.00 9.00

Primary OutFlow Max=0.00 cfs @ 11.47 hrs HW=310.00' TW=310.03' (Dynamic Tailwater)
└─**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond P1: Behind Health Lab



Summary for Pond P10: Reach between LMV and Hercules

Inflow Area = 269.065 ac, 1.96% Impervious, Inflow Depth > 1.12" for 10 Year Storm event
Inflow = 32.69 cfs @ 14.10 hrs, Volume= 25.021 af
Outflow = 32.49 cfs @ 14.56 hrs, Volume= 24.855 af, Atten= 1%, Lag= 27.4 min
Primary = 32.49 cfs @ 14.56 hrs, Volume= 24.855 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 88,869 sf Storage= 3,516 cf
Peak Elev= 308.04' @ 14.56 hrs Surf.Area= 115,570 sf Storage= 54,721 cf (51,205 cf above start)

Plug-Flow detention time= 48.9 min calculated for 24.769 af (99% of inflow)
Center-of-Mass det. time= 31.4 min (1,161.4 - 1,130.0)

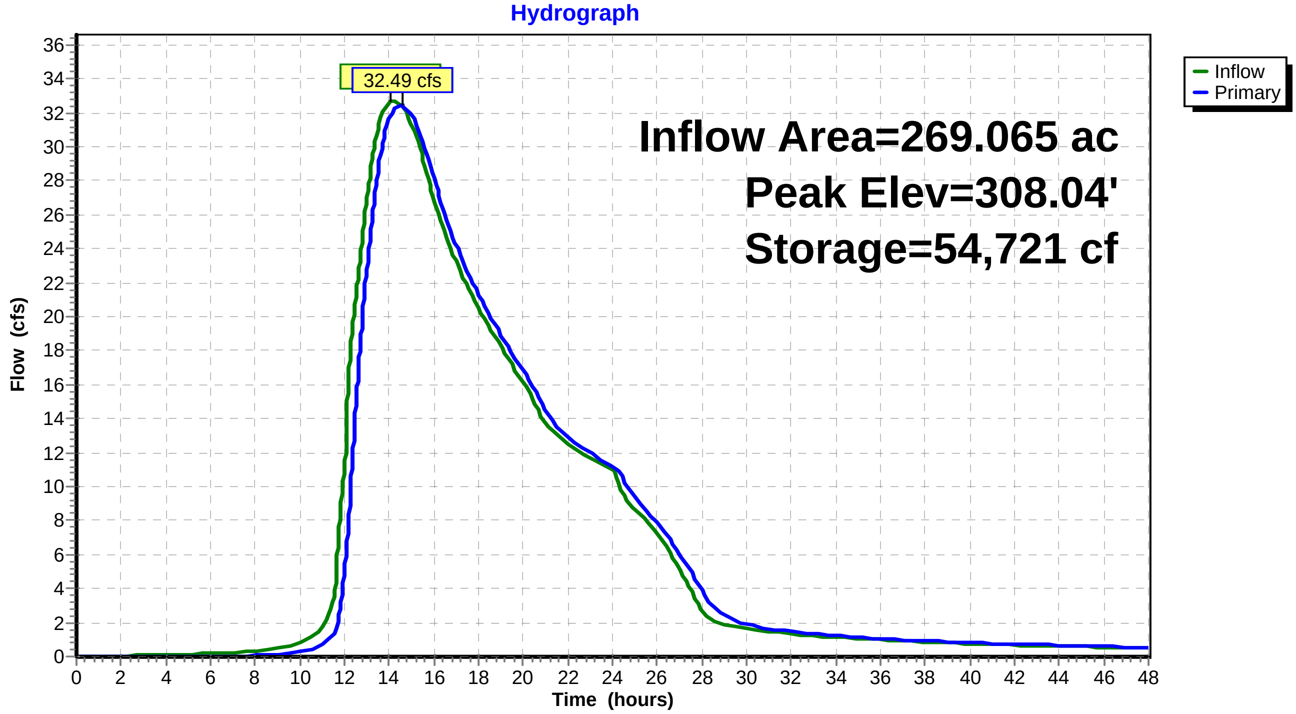
Volume	Invert	Avail.Storage	Storage Description
#1	307.50'	114,777 cf	**Storage 1066' DS of LMV (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
307.50	86,932	3,099.0	0	0	86,932
308.00	112,678	3,270.0	49,764	49,764	173,614
308.50	148,186	3,641.0	65,014	114,777	377,657

Device	Routing	Invert	Outlet Devices
#1	Primary	307.54'	**Asymmetrical Weir, C= 3.27** Offset (feet) -143.00 -133.00 -52.00 -41.00 -21.00 -11.00 0.00 21.00 38.00 60.00 88.00 Elev. (feet) 310.00 309.18 309.07 309.34 308.76 307.71 307.54 307.67 308.66 309.24 310.00

Primary OutFlow Max=32.49 cfs @ 14.56 hrs HW=308.04' TW=302.17' (Dynamic Tailwater)
└─**1=Asymmetrical Weir** (Weir Controls 32.49 cfs @ 1.66 fps)

Pond P10: Reach between LMV and Hercules



Summary for Pond P2/3: Upstream of Park Drive

Inflow Area = 29.664 ac, 0.00% Impervious, Inflow Depth = 0.88" for 10 Year Storm event
Inflow = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af
Outflow = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af, Atten= 97%, Lag= 219.0 min
Primary = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.77' @ 15.63 hrs Surf.Area= 84,106 sf Storage= 57,533 cf

Plug-Flow detention time= 647.0 min calculated for 1.790 af (83% of inflow)
Center-of-Mass det. time= 568.5 min (1,417.6 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	128,517 cf	**Pond 2 (Irregular)** Listed below (Recalc)
#2	310.00'	83,492 cf	**Pond 3 (Irregular)** Listed below (Recalc)
		212,008 cf	Total Available Storage

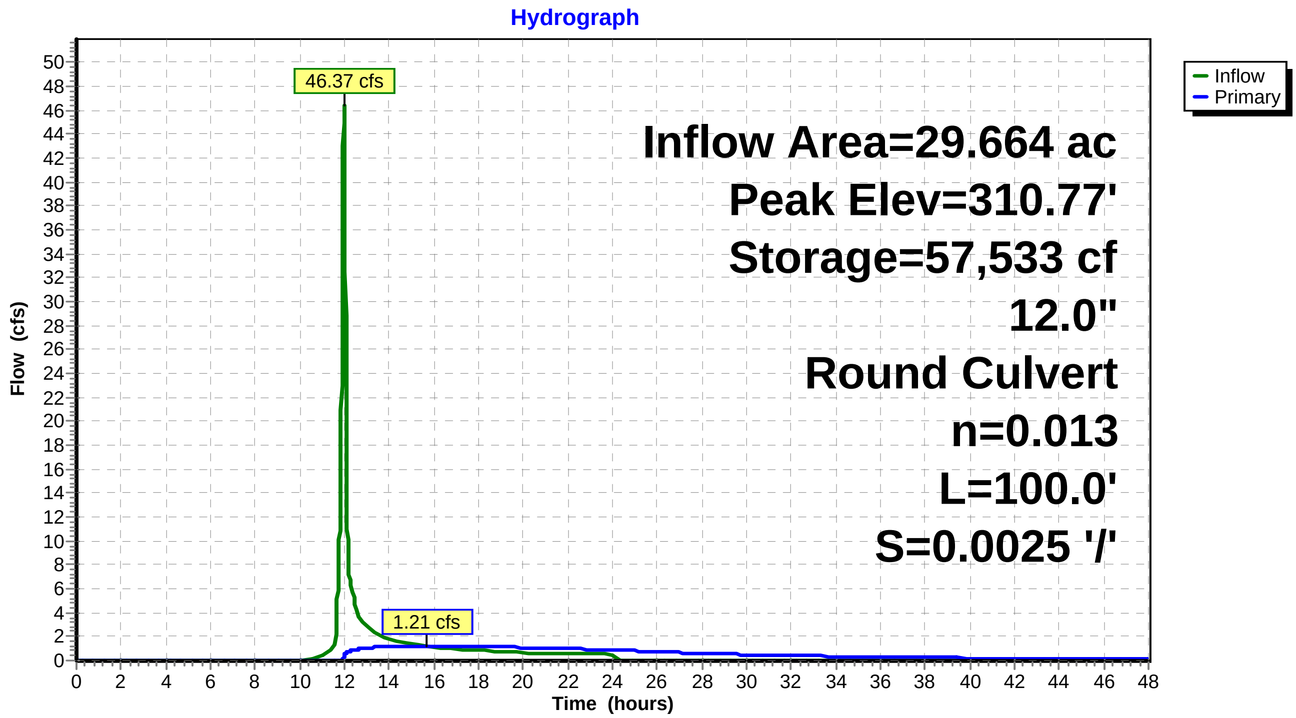
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	39,781	975.0	0	0	39,781
312.25	76,433	1,197.0	128,517	128,517	78,230

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	25,767	687.0	0	0	25,767
312.25	49,751	855.0	83,492	83,492	46,455

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**12.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 310.00' / 309.75' S= 0.0025 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 15.63 hrs HW=310.77' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.21 cfs @ 2.57 fps)

Pond P2/3: Upstream of Park Drive



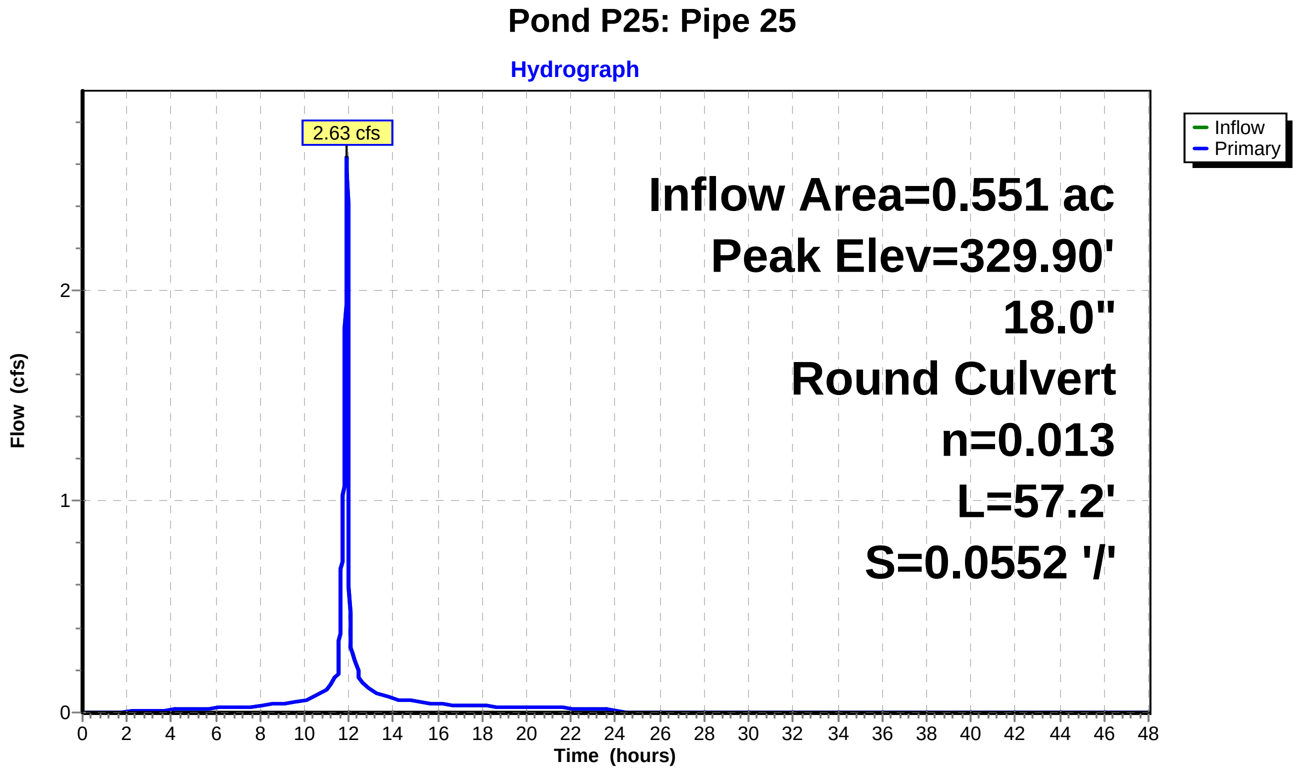
Summary for Pond P25: Pipe 25

Inflow Area =	0.551 ac,	90.20% Impervious,	Inflow Depth = 2.76"	for 10 Year Storm event
Inflow =	2.63 cfs @	11.92 hrs, Volume=	0.127 af	
Outflow =	2.63 cfs @	11.92 hrs, Volume=	0.127 af, Atten= 0%, Lag= 0.0 min	
Primary =	2.63 cfs @	11.92 hrs, Volume=	0.127 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.90' @ 11.92 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	329.15'	**18.0" Round Culvert** L= 57.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 329.15' / 325.99' S= 0.0552 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.62 cfs @ 11.92 hrs HW=329.90' TW=327.97' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.62 cfs @ 2.95 fps)



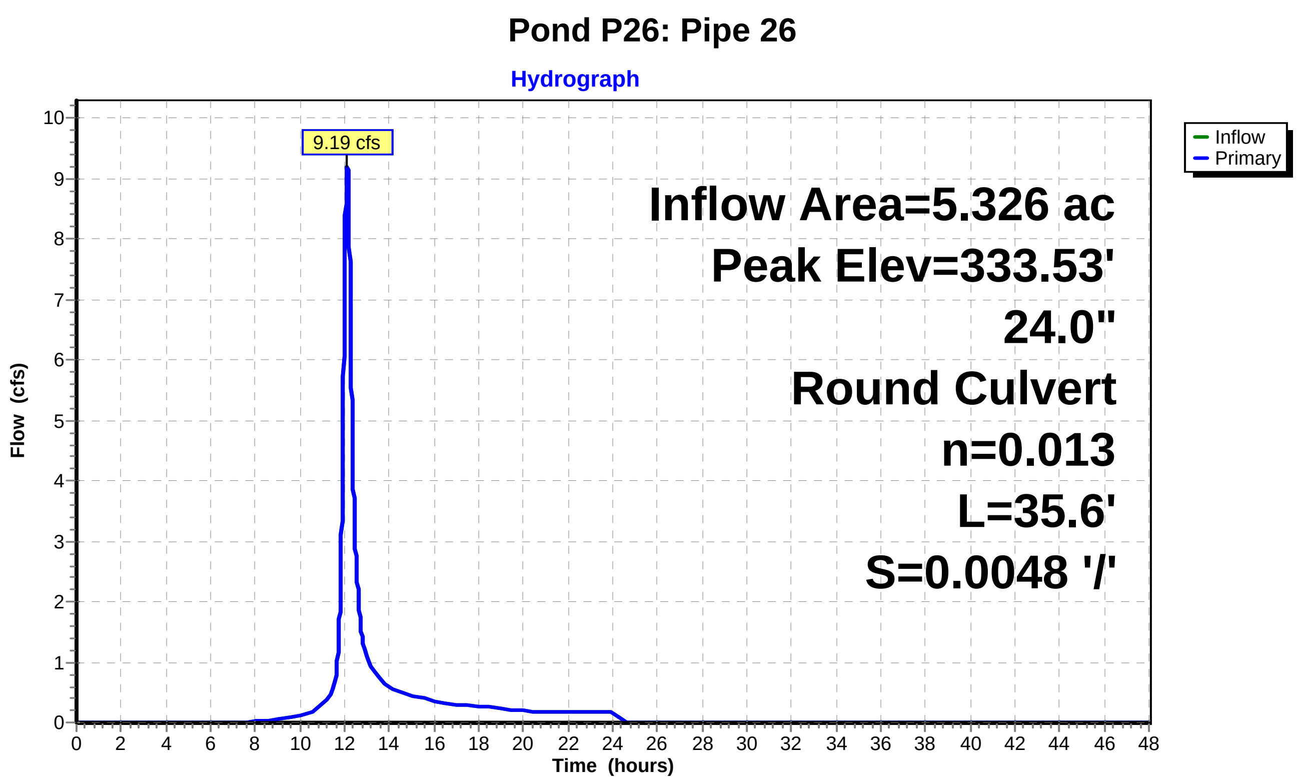
Summary for Pond P26: Pipe 26

Inflow Area =	5.326 ac,	4.56% Impervious,	Inflow Depth = 1.72"	for 10 Year Storm event	
Inflow =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af	
Outflow =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 333.53' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	329.02'	**24.0" Round Culvert** L= 35.6' Ke= 0.500 Inlet / Outlet Invert= 329.02' / 328.85' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.35 cfs @ 12.12 hrs HW=333.52' TW=333.14' (Dynamic Tailwater)
1=Culvert (Inlet Controls 9.35 cfs @ 2.98 fps)



Summary for Pond P27: Pipe 27

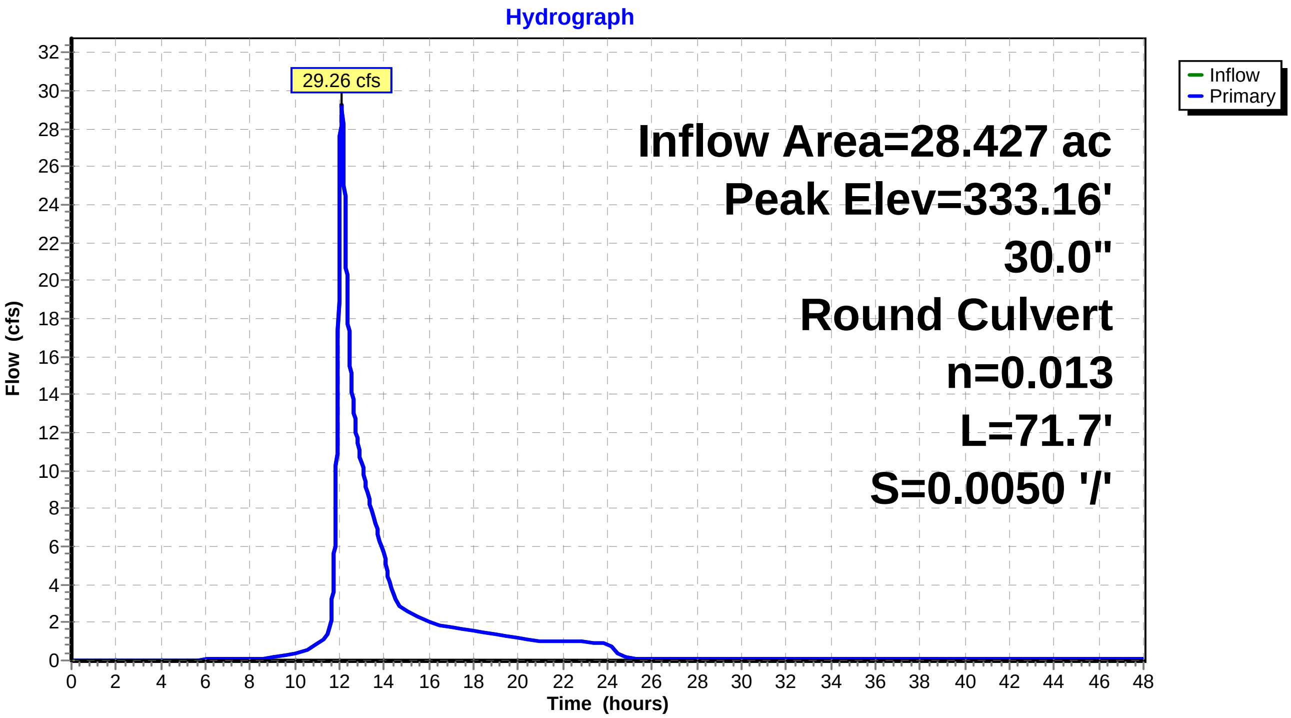
Inflow Area = 28.427 ac, 3.86% Impervious, Inflow Depth > 1.73" for 10 Year Storm event
Inflow = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af
Outflow = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af, Atten= 0%, Lag= 0.0 min
Primary = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 333.16' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	328.75'	**30.0" Round Culvert** L= 71.7' Ke= 0.500 Inlet / Outlet Invert= 328.75' / 328.39' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=28.79 cfs @ 12.10 hrs HW=333.11' TW=331.62' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 28.79 cfs @ 5.87 fps)

Pond P27: Pipe 27



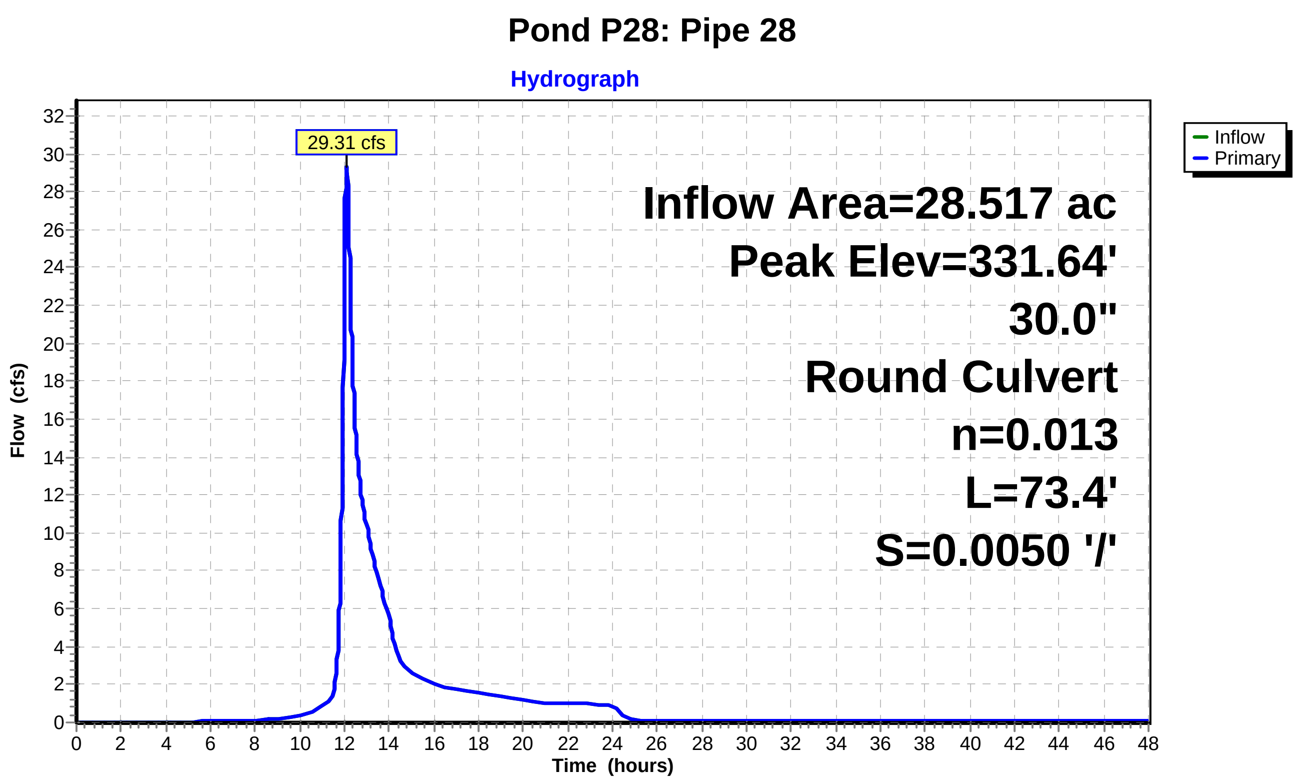
Summary for Pond P28: Pipe 28

Inflow Area =	28.517 ac,	4.15% Impervious,	Inflow Depth > 1.73"	for 10 Year Storm event
Inflow =	29.31 cfs @	12.10 hrs, Volume=	4.111 af	
Outflow =	29.31 cfs @	12.10 hrs, Volume=	4.111 af, Atten= 0%, Lag= 0.0 min	
Primary =	29.31 cfs @	12.10 hrs, Volume=	4.111 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 331.64' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	328.29'	**30.0" Round Culvert** L= 73.4' Ke= 0.500 Inlet / Outlet Invert= 328.29' / 327.92' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=29.06 cfs @ 12.10 hrs HW=331.62' TW=330.11' (Dynamic Tailwater)
1=Culvert (Inlet Controls 29.06 cfs @ 5.92 fps)



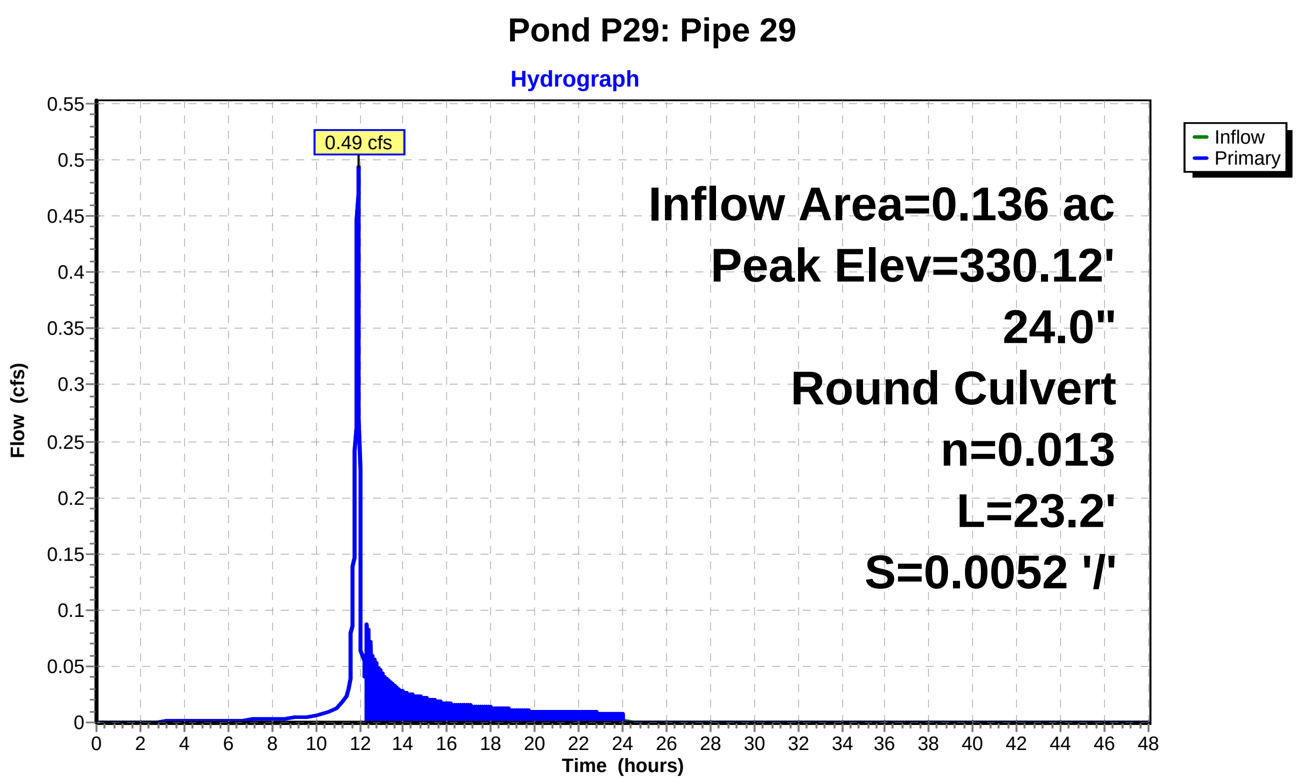
Summary for Pond P29: Pipe 29

Inflow Area = 0.136 ac, 33.09% Impervious, Inflow Depth = 1.92" for 10 Year Storm event
Inflow = 0.49 cfs @ 11.93 hrs, Volume= 0.022 af
Outflow = 0.49 cfs @ 11.93 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 11.93 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 330.12' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.67'	**24.0" Round Culvert** L= 23.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 326.67' / 326.55' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.00 cfs @ 11.93 hrs HW=328.70' TW=328.78' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Summary for Pond P30: Pipe 30

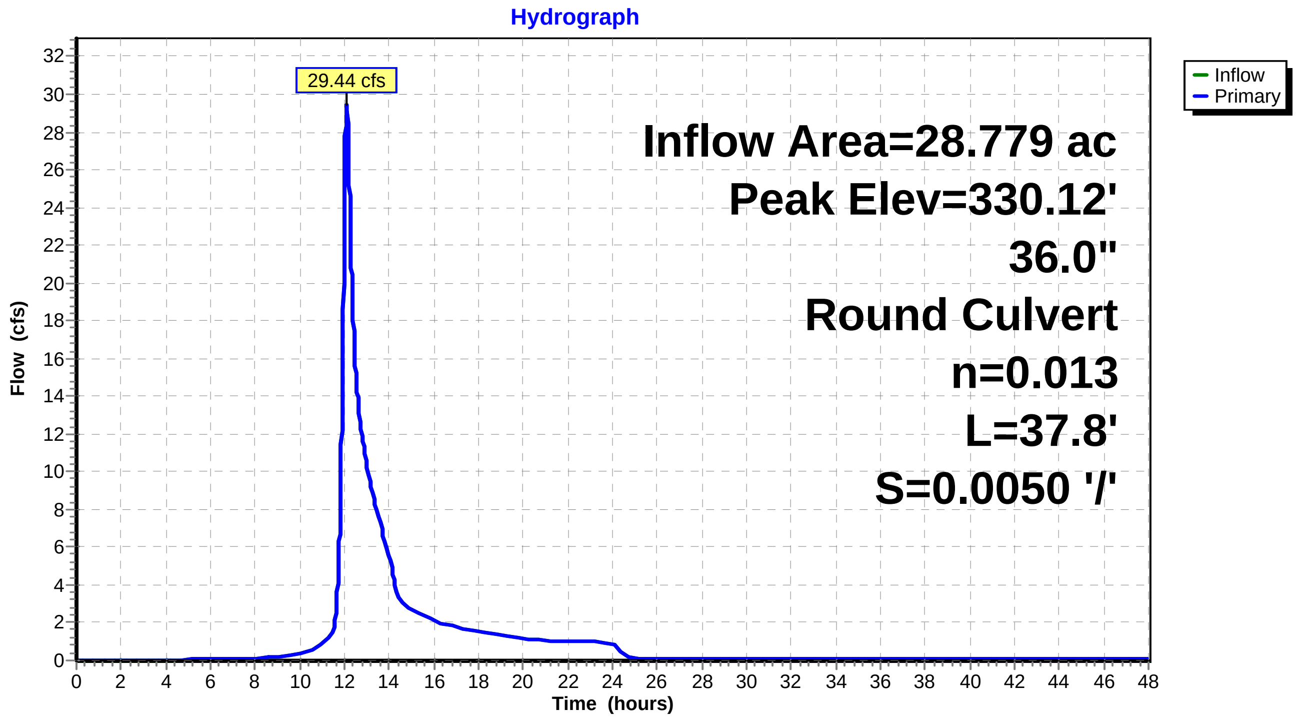
Inflow Area =	28.779 ac,	4.58% Impervious,	Inflow Depth > 1.73"	for 10 Year Storm event	
Inflow =	29.44 cfs @	12.10 hrs,	Volume=	4.159 af	
Outflow =	29.44 cfs @	12.10 hrs,	Volume=	4.159 af,	Atten= 0%, Lag= 0.0 min
Primary =	29.44 cfs @	12.10 hrs,	Volume=	4.159 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 330.12' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.45'	**36.0" Round Culvert** L= 37.8' Ke= 0.500 Inlet / Outlet Invert= 326.45' / 326.26' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.20 cfs @ 12.10 hrs HW=330.11' TW=329.37' (Dynamic Tailwater)
1=Culvert (Inlet Controls 29.20 cfs @ 4.13 fps)

Pond P30: Pipe 30



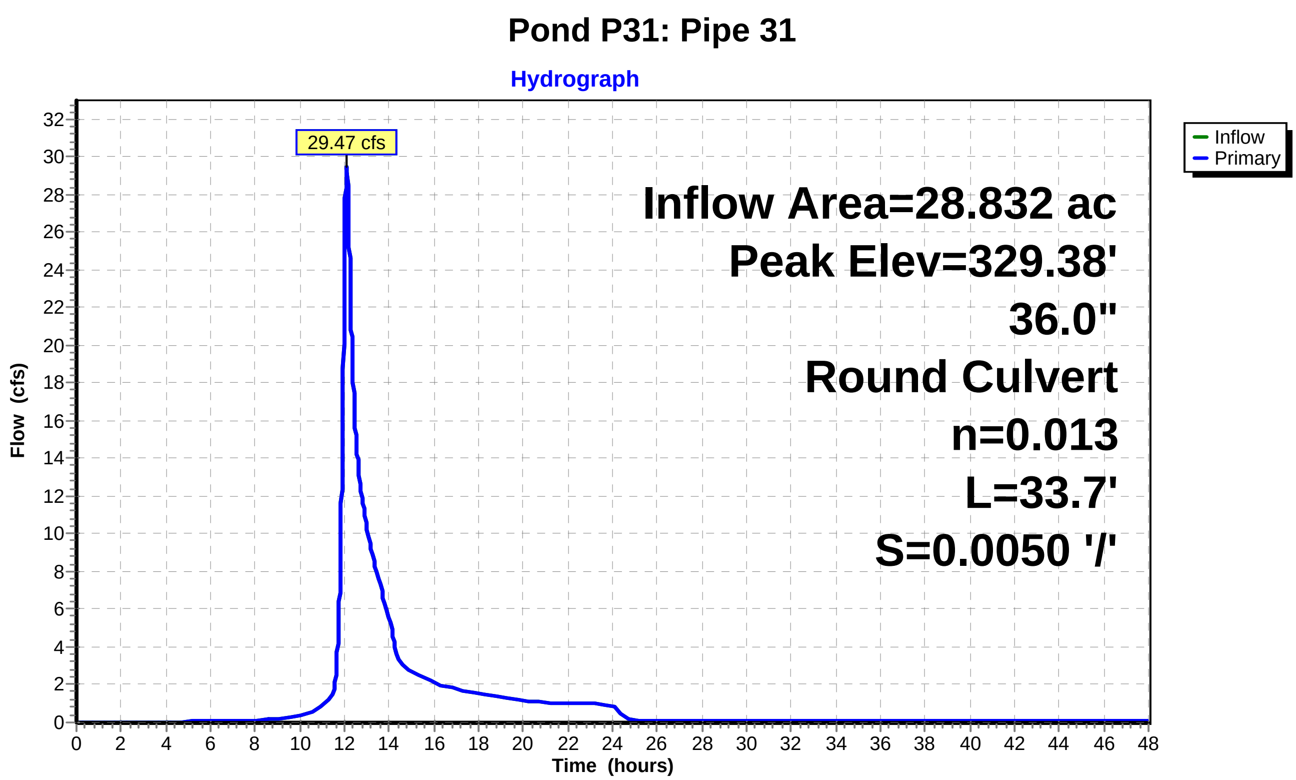
Summary for Pond P31: Pipe 31

Inflow Area =	28.832 ac,	4.75% Impervious, Inflow Depth > 1.74"	for 10 Year Storm event	
Inflow =	29.47 cfs @	12.10 hrs, Volume=	4.173 af	
Outflow =	29.47 cfs @	12.10 hrs, Volume=	4.173 af,	Atten= 0%, Lag= 0.0 min
Primary =	29.47 cfs @	12.10 hrs, Volume=	4.173 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.38' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.16'	**36.0" Round Culvert** L= 33.7' Ke= 0.500 Inlet / Outlet Invert= 326.16' / 325.99' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.40 cfs @ 12.10 hrs HW=329.37' TW=328.63' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 29.40 cfs @ 4.16 fps)



Summary for Pond P32: Pipe 32

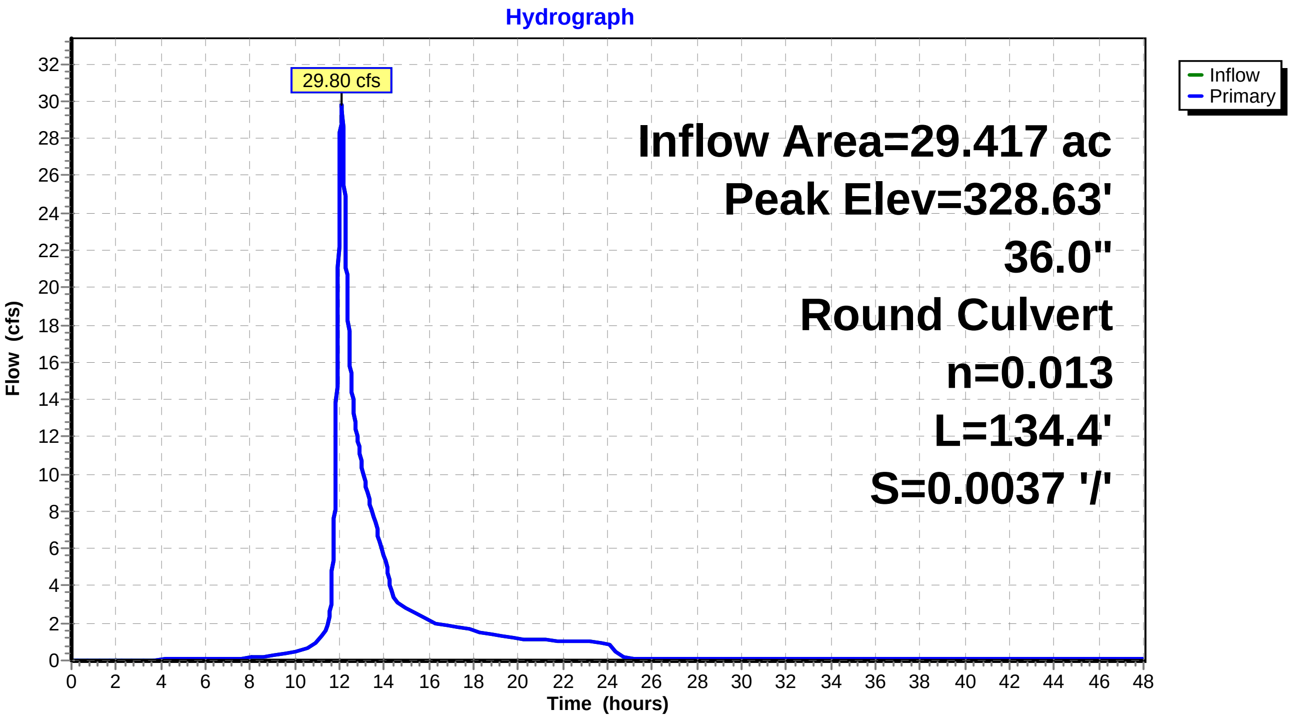
Inflow Area = 29.417 ac, 6.45% Impervious, Inflow Depth > 1.76" for 10 Year Storm event
Inflow = 29.80 cfs @ 12.10 hrs, Volume= 4.307 af
Outflow = 29.80 cfs @ 12.10 hrs, Volume= 4.307 af, Atten= 0%, Lag= 0.0 min
Primary = 29.80 cfs @ 12.10 hrs, Volume= 4.307 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 328.63' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	325.89'	**36.0" Round Culvert** L= 134.4' Ke= 0.500 Inlet / Outlet Invert= 325.89' / 325.39' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.78 cfs @ 12.10 hrs HW=328.63' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 29.78 cfs @ 5.78 fps)

Pond P32: Pipe 32



Summary for Pond P4: Upstream of Interstate

Inflow Area =	51.846 ac,	4.26% Impervious, Inflow Depth > 1.05"		for 10 Year Storm event
Inflow =	28.92 cfs @	11.94 hrs, Volume=	4.533 af	
Outflow =	4.23 cfs @	17.82 hrs, Volume=	4.385 af,	Atten= 85%, Lag= 352.8 min
Primary =	4.23 cfs @	17.82 hrs, Volume=	4.385 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.75' @ 15.27 hrs Surf.Area= 125,070 sf Storage= 95,534 cf

Plug-Flow detention time= 406.6 min calculated for 4.384 af (97% of inflow)
Center-of-Mass det. time= 356.4 min (1,419.7 - 1,063.3)

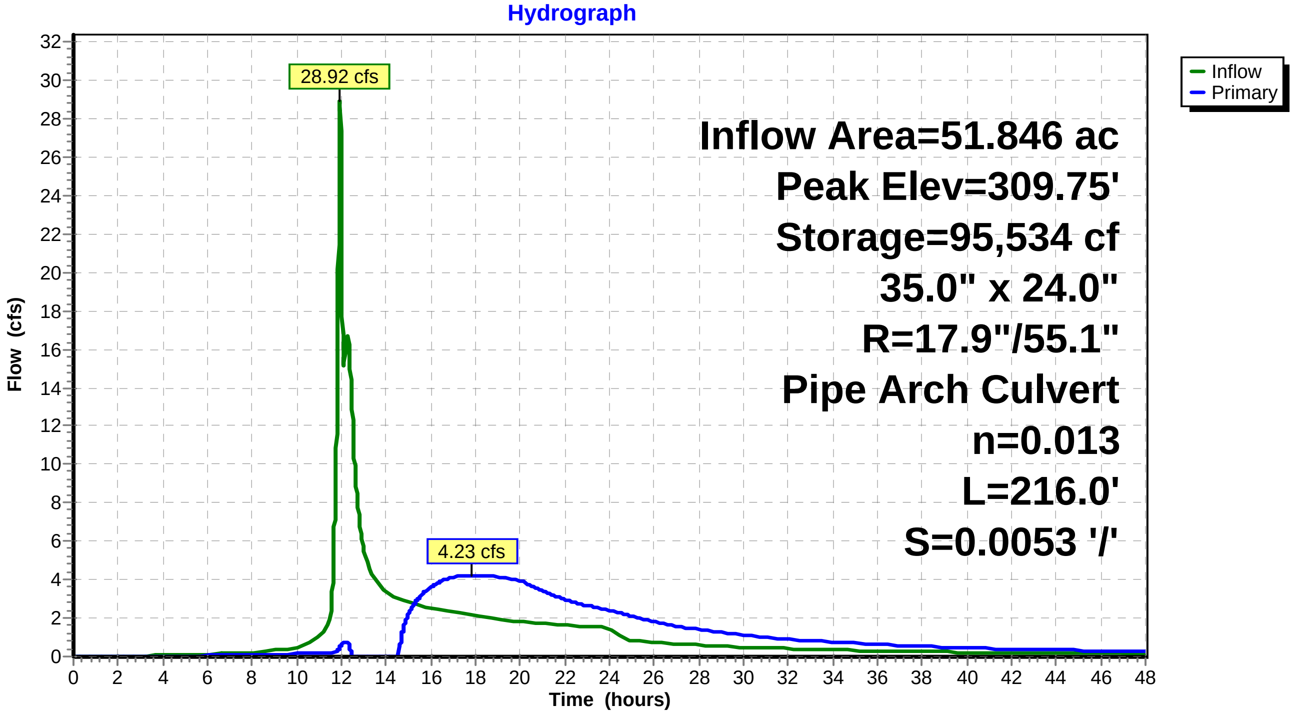
Volume	Invert	Avail.Storage	Storage Description
#1	308.84'	264,873 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.84	100	40.0	0	0	100
309.00	113,232	2,956.0	6,224	6,224	695,316
311.00	146,115	3,003.0	258,649	264,873	718,386

Device	Routing	Invert	Outlet Devices
#1	Primary	308.84'	**35.0" W x 24.0" H, R=17.9"/55.1" Pipe Arch CMP_Arch_1/2 35x24** L= 216.0' Ke= 0.500 Inlet / Outlet Invert= 308.84' / 307.69' S= 0.0053 '/' Cc= 0.900 n= 0.013 Asphalt, smooth, Flow Area= 4.63 sf

Primary OutFlow Max=4.24 cfs @ 17.82 hrs HW=309.65' TW=308.98' (Dynamic Tailwater)
└─**1=CMP_Arch_1/2 35x24** (Outlet Controls 4.24 cfs @ 2.96 fps)

Pond P4: Upstream of Interstate



Summary for Pond P5: in Shaws Parking

Data from Champlain Consulting Engineers 8 SEP 00

Inflow Area = 17.067 ac, 0.00% Impervious, Inflow Depth = 2.26" for 10 Year Storm event
Inflow = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af
Outflow = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af, Atten= 84%, Lag= 14.0 min
Primary = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 358.34' @ 12.22 hrs Surf.Area= 21,910 sf Storage= 73,624 cf

Plug-Flow detention time= 279.0 min calculated for 2.324 af (72% of inflow)
Center-of-Mass det. time= 185.0 min (985.5 - 800.5)

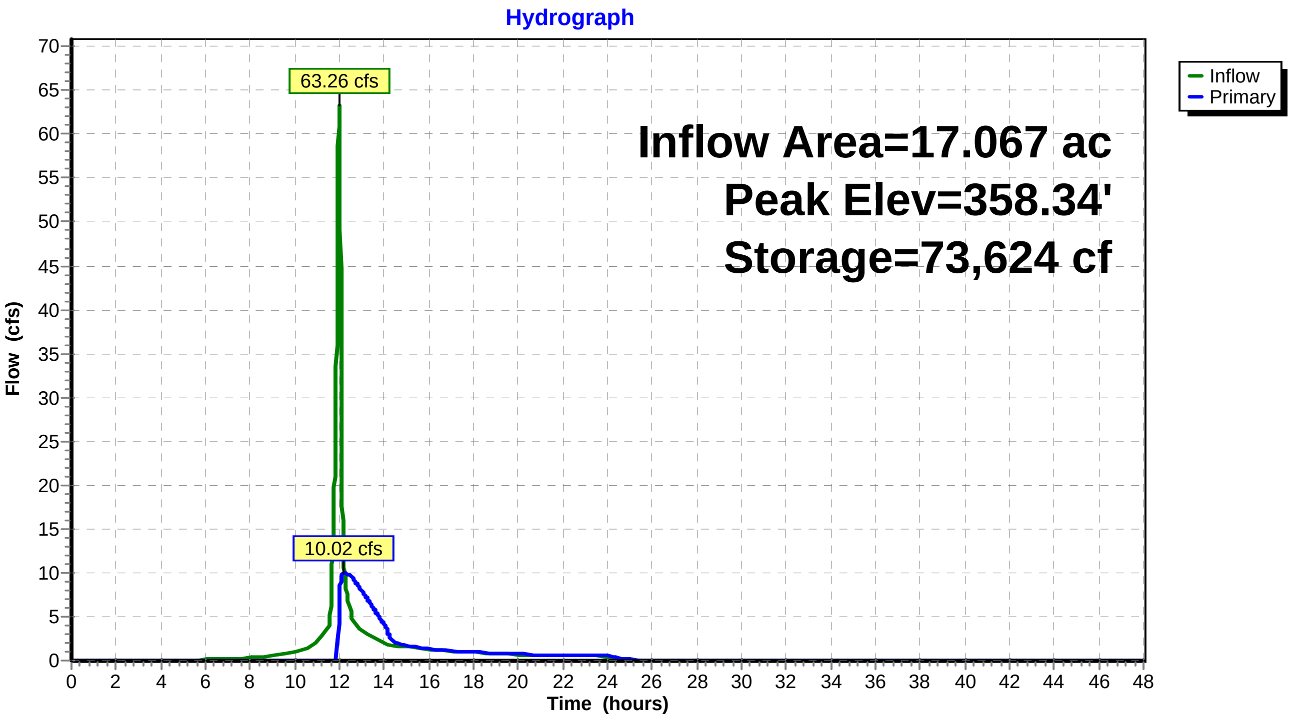
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.02 cfs @ 12.22 hrs HW=358.34' TW=343.19' (Dynamic Tailwater)
—**1=2" ORIFICE/GRATE** (Orifice Controls 0.16 cfs @ 7.21 fps)
—**2=6" HORIZONTAL ORIFICE/GRATE X9** (Orifice Controls 9.86 cfs @ 5.58 fps)
—**3=18" HORIZONTAL ORIFICE/GRATE** (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Pond P6: next to Spare Time

Inflow Area =	7.318 ac,	0.00% Impervious, Inflow Depth = 1.61"	for 10 Year Storm event
Inflow =	20.95 cfs @	11.98 hrs, Volume=	0.981 af
Outflow =	0.41 cfs @	16.49 hrs, Volume=	0.887 af, Atten= 98%, Lag= 270.9 min
Primary =	0.41 cfs @	16.49 hrs, Volume=	0.887 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.49' @ 16.49 hrs Surf.Area= 14,614 sf Storage= 28,585 cf

Plug-Flow detention time= 844.7 min calculated for 0.887 af (90% of inflow)
Center-of-Mass det. time= 795.3 min (1,625.2 - 829.8)

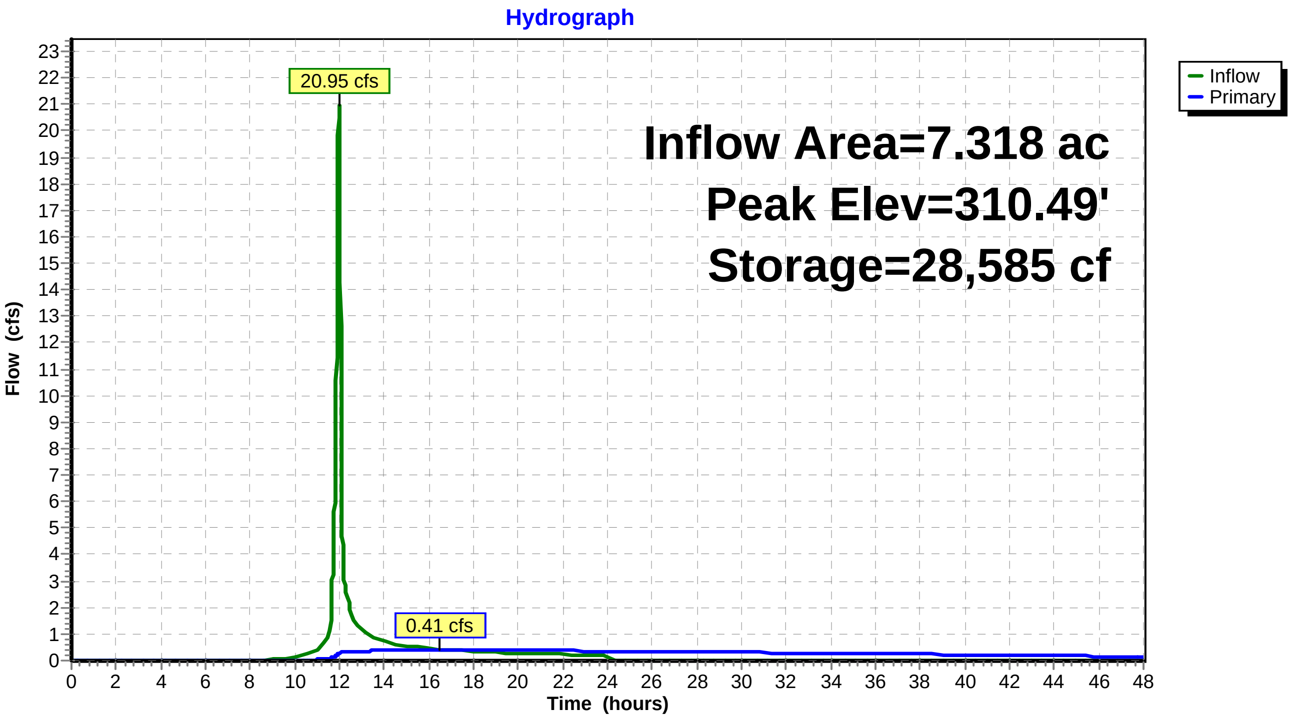
Volume	Invert	Avail.Storage	Storage Description
#1	308.00'	52,935 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.00	8,207	459.0	0	0	8,207
310.00	13,684	465.0	21,659	21,659	9,231
312.00	17,677	465.0	31,276	52,935	10,161

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	310.14'	**18.0" Round Culvert** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 310.14' / 310.09' S= 0.0015 '/' Cc= 0.900 n= 0.120, Flow Area= 1.77 sf

Primary OutFlow Max=0.41 cfs @ 16.49 hrs HW=310.49' TW=307.99' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 0.36 cfs @ 7.40 fps)
2=Culvert (Barrel Controls 0.05 cfs @ 0.23 fps)

Pond P6: next to Spare Time



Summary for Pond P7: Small Pond across Hercules

Inflow Area =	2.744 ac,	0.00% Impervious, Inflow Depth = 0.60"	for 10 Year Storm event	
Inflow =	0.76 cfs @	12.60 hrs, Volume=	0.137 af	
Outflow =	0.11 cfs @	15.57 hrs, Volume=	0.053 af,	Atten= 85%, Lag= 178.6 min
Primary =	0.11 cfs @	15.57 hrs, Volume=	0.053 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 313.51' @ 15.57 hrs Surf.Area= 3,312 sf Storage= 3,714 cf

Plug-Flow detention time= 402.5 min calculated for 0.053 af (38% of inflow)
Center-of-Mass det. time= 230.1 min (1,163.1 - 932.9)

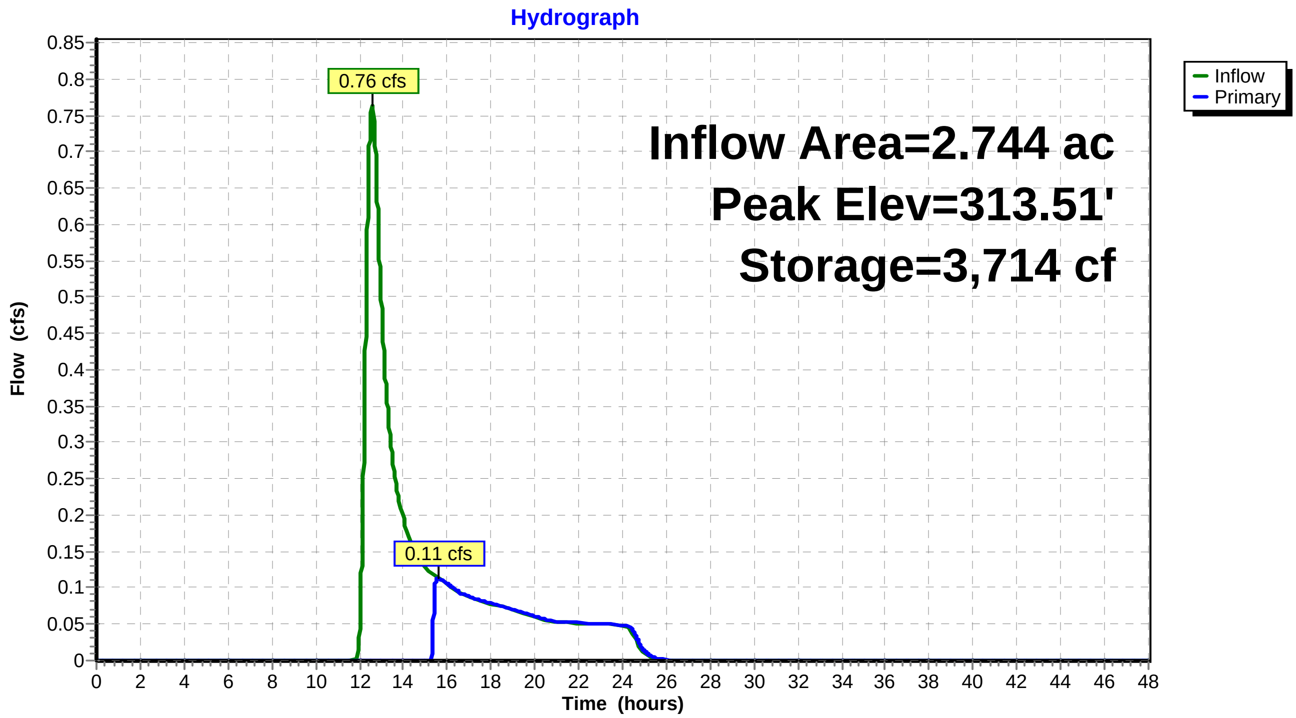
Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	5,495 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
312.00	1,699	250.0	0	0	1,699
314.00	3,952	313.0	5,495	5,495	4,577

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**50.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.11 cfs @ 15.57 hrs HW=313.51' TW=312.45' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.25 fps)

Pond P7: Small Pond across Hercules



Summary for Pond P8: Nat'l Guard Wetland

Inflow Area = 66.948 ac, 0.00% Impervious, Inflow Depth = 1.04" for 10 Year Storm event
Inflow = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af
Outflow = 4.79 cfs @ 16.83 hrs, Volume= 5.629 af, Atten= 90%, Lag= 266.2 min
Primary = 4.79 cfs @ 16.83 hrs, Volume= 5.629 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.65' @ 14.69 hrs Surf.Area= 209,352 sf Storage= 123,684 cf

Plug-Flow detention time= 295.4 min calculated for 5.628 af (97% of inflow)
Center-of-Mass det. time= 279.9 min (1,170.3 - 890.4)

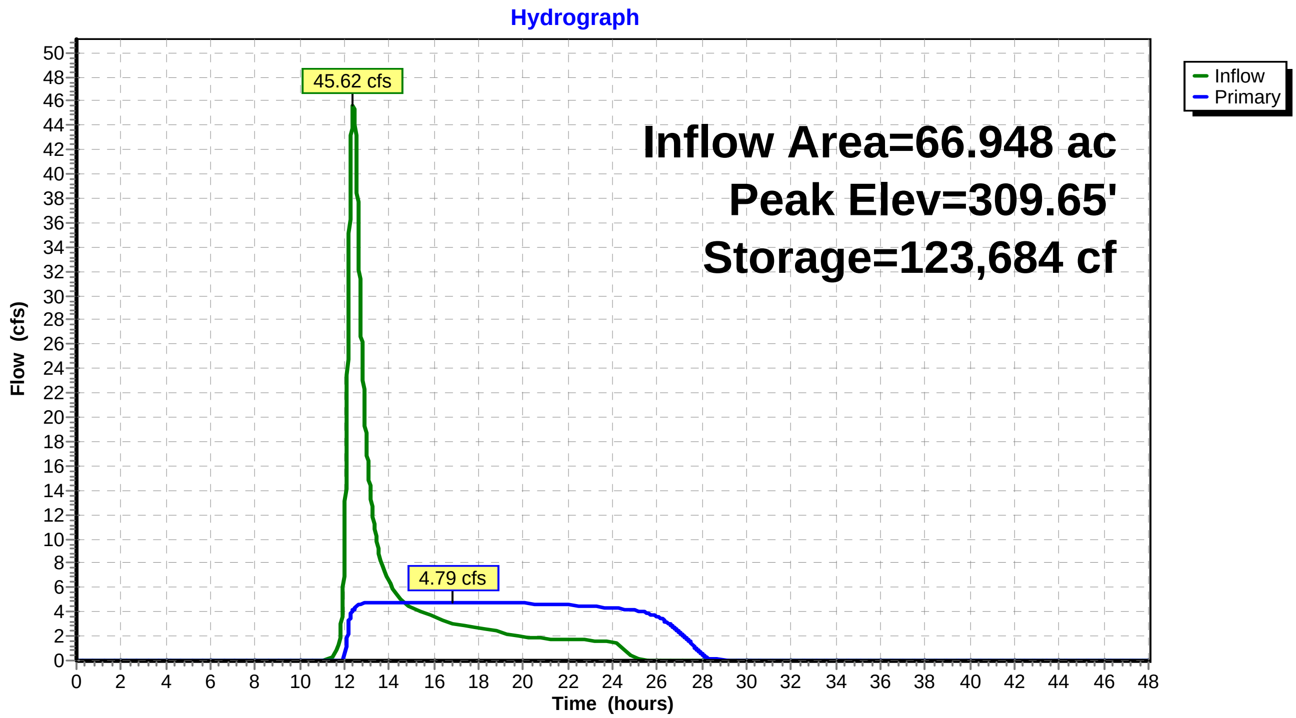
Volume	Invert	Avail.Storage	Storage Description
#1	306.60'	2,725,483 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
306.60	3,900	2,500.0	0	0	3,900
308.60	19,200	7,100.0	21,169	21,169	3,518,054
312.60	1,822,000	6,500.0	2,704,314	2,725,483	4,167,976

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 306.60' / 306.50' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	312.30'	**60.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.79 cfs @ 16.83 hrs HW=309.62' TW=307.98' (Dynamic Tailwater)
1=Culvert (Outlet Controls 4.79 cfs @ 6.10 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P8: Nat'l Guard Wetland



Summary for Pond P9: Charlebois Pond

Inflow Area = 1.860 ac, 0.00% Impervious, Inflow Depth = 2.45" for 10 Year Storm event
Inflow = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af
Outflow = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af, Atten= 90%, Lag= 22.4 min
Primary = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 331.00' Surf.Area= 0.050 ac Storage= 0.082 af
Peak Elev= 333.57' @ 12.34 hrs Surf.Area= 0.119 ac Storage= 0.296 af (0.214 af above start)

Plug-Flow detention time= 979.3 min calculated for 0.274 af (72% of inflow)
Center-of-Mass det. time= 670.0 min (1,459.3 - 789.3)

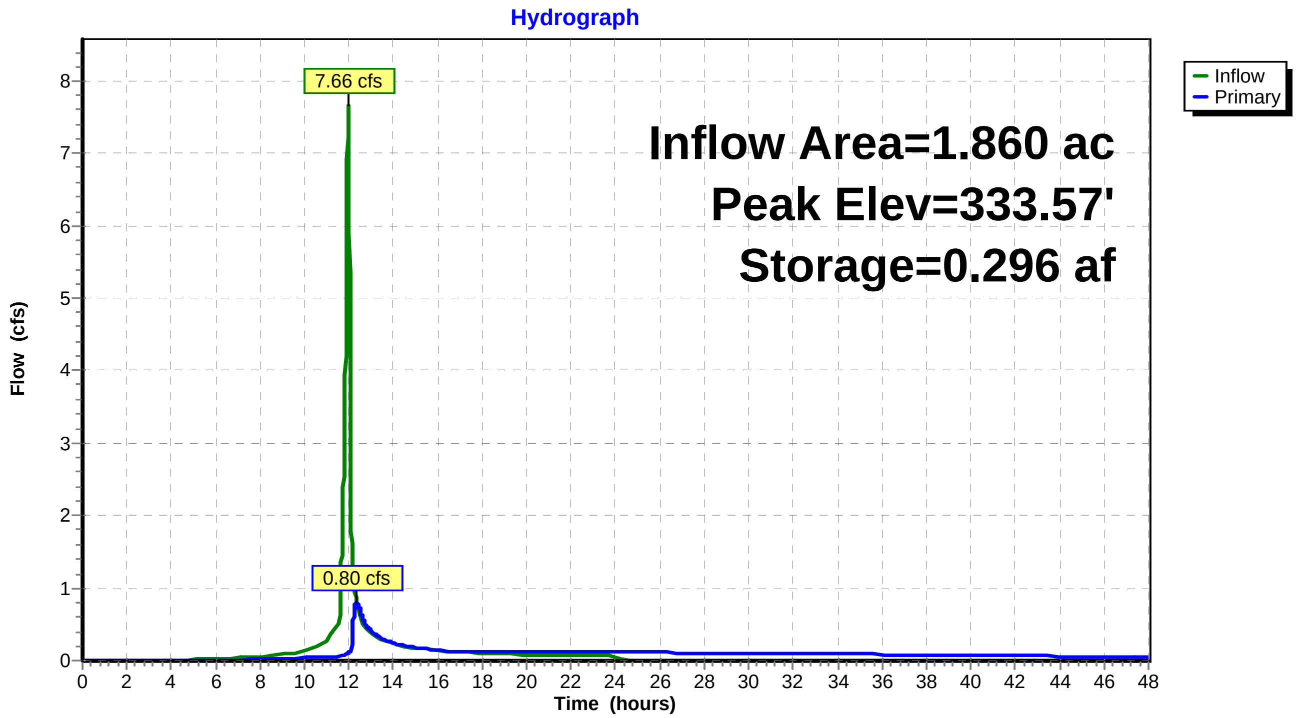
Volume	Invert	Avail.Storage	Storage Description
#1	327.00'	0.351 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
327.00	0.003	0.000	0.000
328.00	0.009	0.006	0.006
329.00	0.018	0.014	0.020
330.00	0.029	0.024	0.043
331.00	0.050	0.039	0.082
332.00	0.075	0.062	0.145
333.00	0.102	0.088	0.233
334.00	0.132	0.117	0.351

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	**15.0" Round Culvert** L= 45.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 331.00' / 330.00' S= 0.0220 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	331.00'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Primary	333.50'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 12.34 hrs HW=333.57' TW=323.54' (Dynamic Tailwater)
1=Culvert (Passes 0.12 cfs of 8.23 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.12 cfs @ 7.61 fps)
3=Orifice/Grate (Weir Controls 0.68 cfs @ 0.85 fps)

Pond P9: Charlebois Pond



Summary for Link 3L: Tailwater

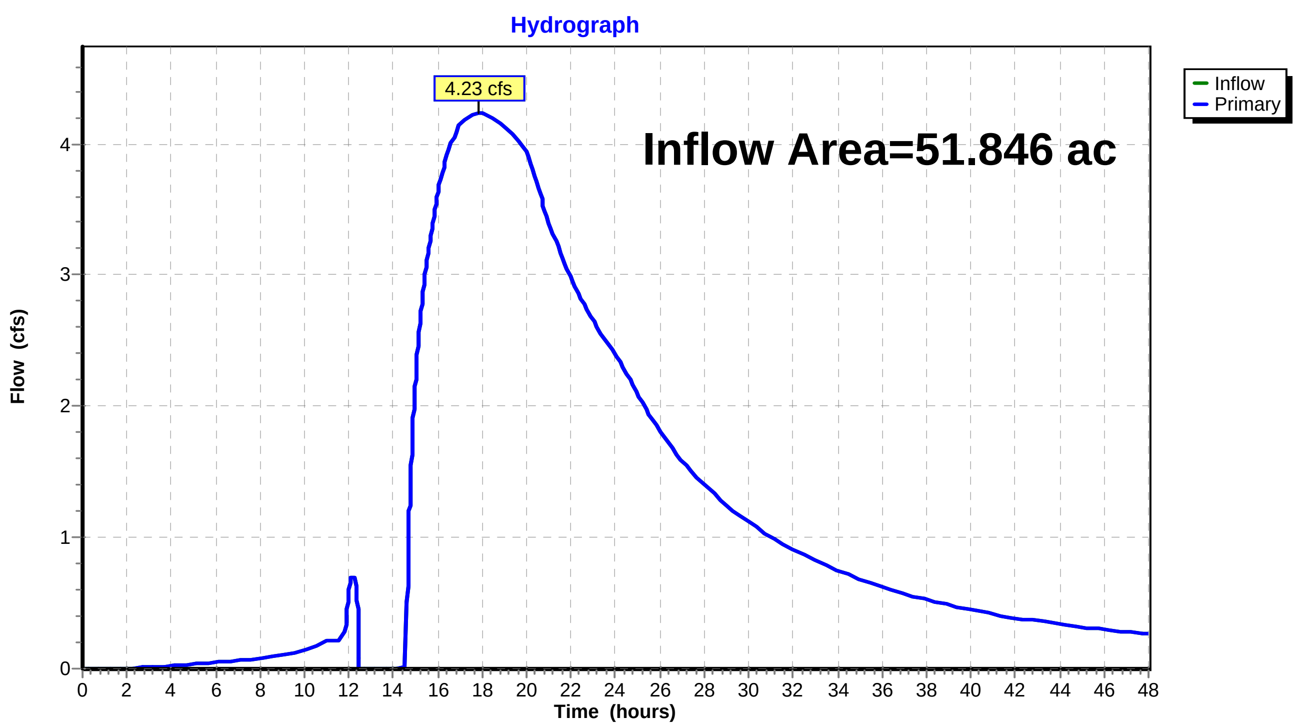
Inflow Area = 51.846 ac, 4.26% Impervious, Inflow Depth > 1.01" for 10 Year Storm event
Inflow = 4.23 cfs @ 17.82 hrs, Volume= 4.385 af
Primary = 4.23 cfs @ 17.82 hrs, Volume= 4.385 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

49 Point manual elevation table, To= 0.00 hrs, dt= 1.00 hrs, feet =

307.54	307.54	307.54	307.54	307.55	307.55	307.56	307.56	307.57
307.59	307.61	307.67	308.98	310.00	309.90	309.62	309.39	309.16
308.94	308.71	308.45	308.19	308.10	308.06	308.02	307.87	307.83
307.80	307.75	307.71	307.70	307.68	307.68	307.67	307.66	307.66
307.65	307.65	307.65	307.64	307.64	307.64	307.63	307.63	307.63
307.63	307.63	307.62	307.62					

Link 3L: Tailwater

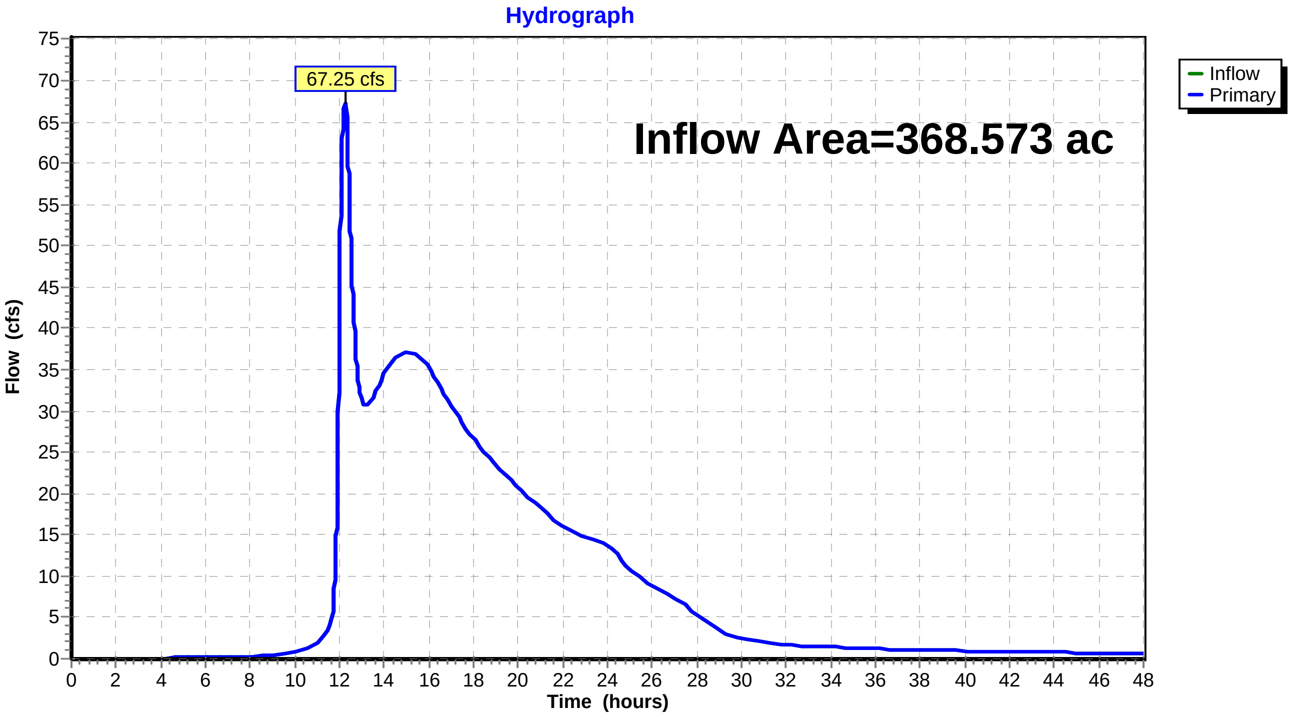


Summary for Link SN1: SN001

Inflow Area = 368.573 ac, 2.69% Impervious, Inflow Depth > 1.09" for 10 Year Storm event
Inflow = 67.25 cfs @ 12.25 hrs, Volume= 33.346 af
Primary = 67.25 cfs @ 12.25 hrs, Volume= 33.346 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN1: SN001

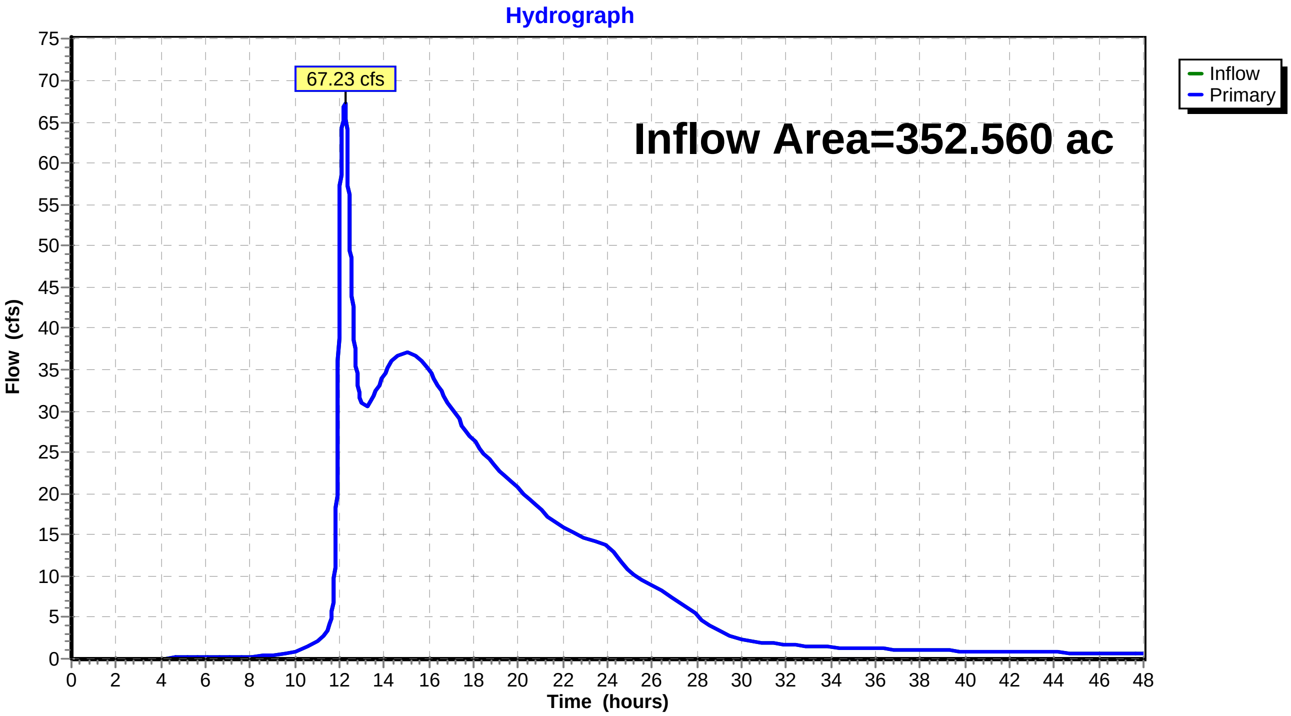


Summary for Link SN2: SN002

Inflow Area =	352.560 ac,	2.71% Impervious, Inflow Depth > 1.13"	for 10 Year Storm event
Inflow =	67.23 cfs @	12.23 hrs, Volume=	33.177 af
Primary =	67.23 cfs @	12.23 hrs, Volume=	33.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

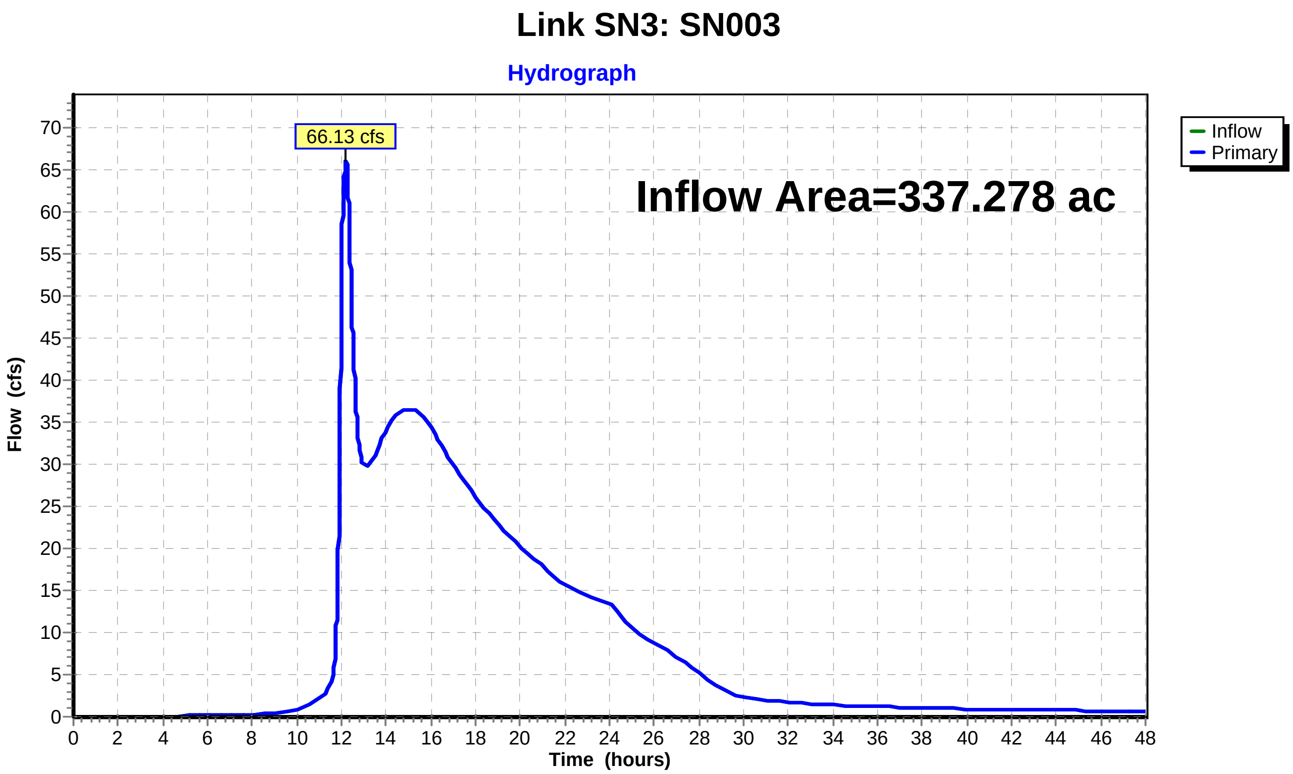
Link SN2: SN002



Summary for Link SN3: SN003

Inflow Area = 337.278 ac, 2.67% Impervious, Inflow Depth > 1.16" for 10 Year Storm event
Inflow = 66.13 cfs @ 12.20 hrs, Volume= 32.720 af
Primary = 66.13 cfs @ 12.20 hrs, Volume= 32.720 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

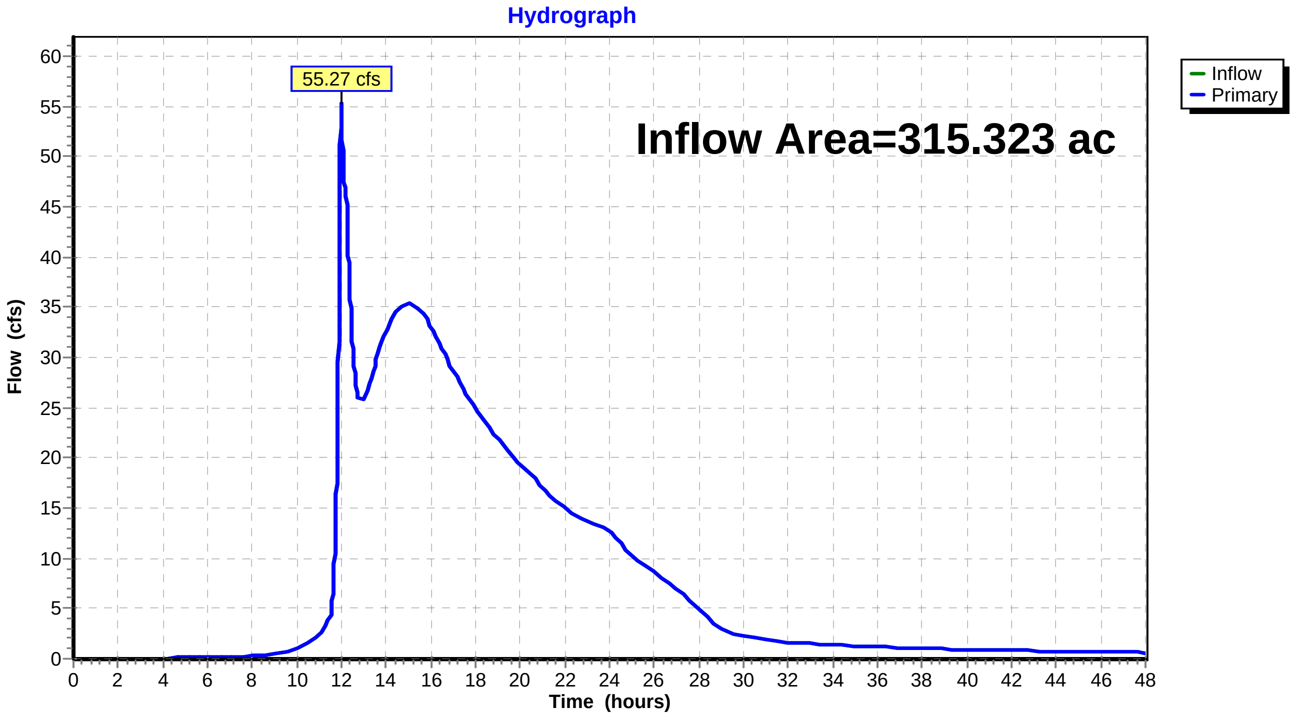


Summary for Link SN4: SN004

Inflow Area = 315.323 ac, 2.65% Impervious, Inflow Depth > 1.17" for 10 Year Storm event
Inflow = 55.27 cfs @ 11.99 hrs, Volume= 30.759 af
Primary = 55.27 cfs @ 11.99 hrs, Volume= 30.759 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

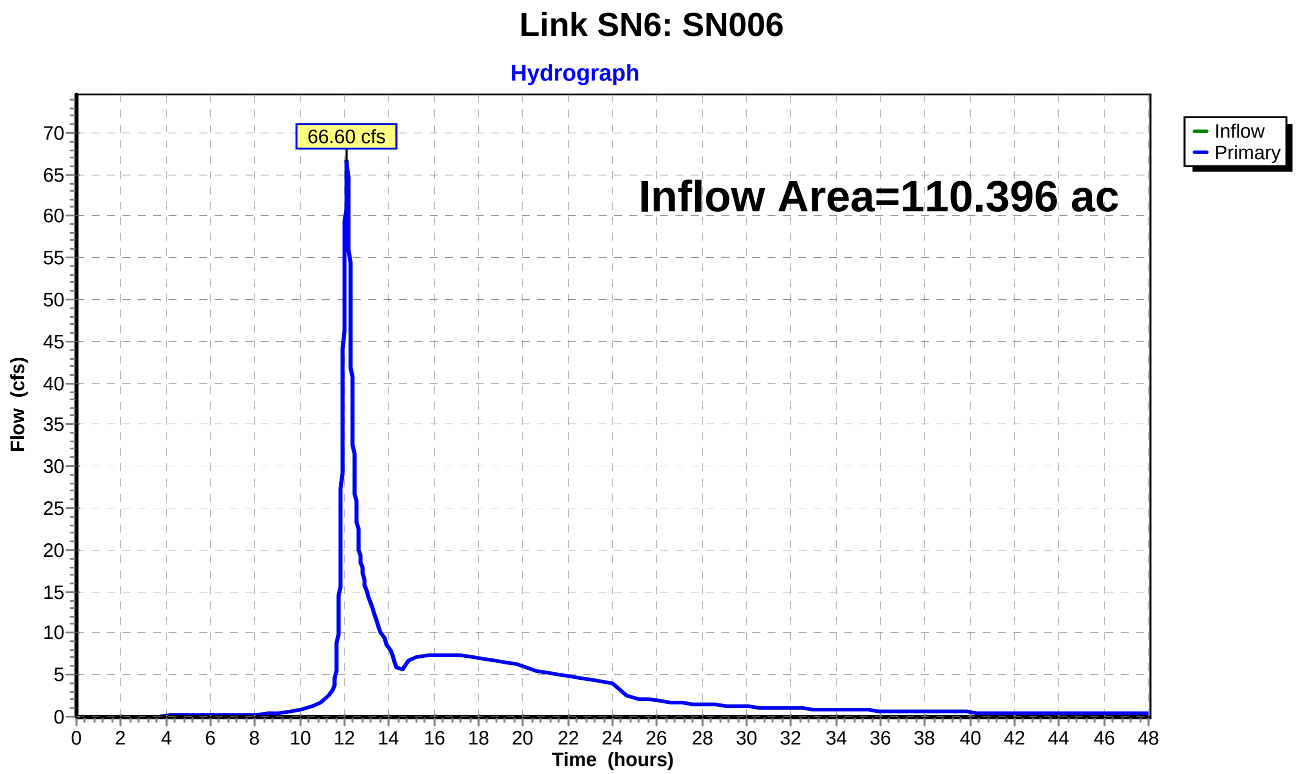
Link SN4: SN004



Summary for Link SN6: SN006

Inflow Area = 110.396 ac, 4.77% Impervious, Inflow Depth > 1.28" for 10 Year Storm event
Inflow = 66.60 cfs @ 12.11 hrs, Volume= 11.739 af
Primary = 66.60 cfs @ 12.11 hrs, Volume= 11.739 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



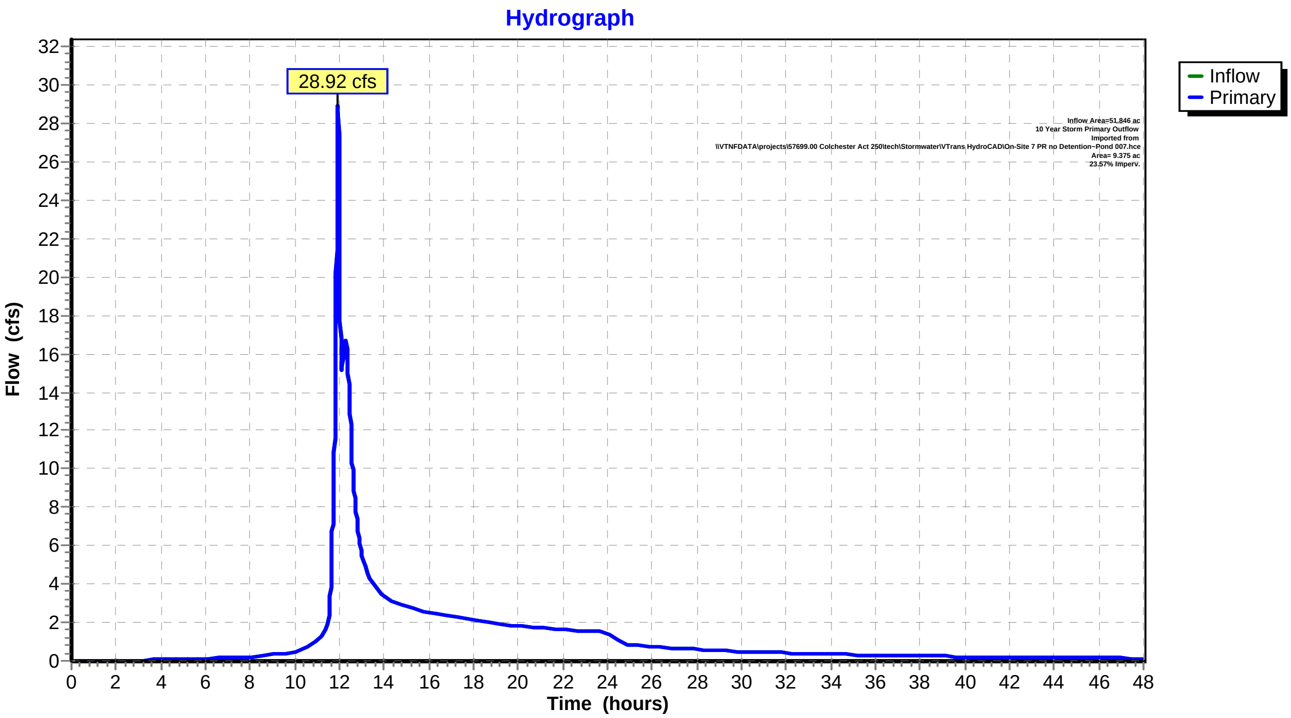
Summary for Link SN7: SN007

Inflow Area = 51.846 ac, 4.26% Impervious, Inflow Depth > 1.05" for 10 Year Storm event
Inflow = 28.92 cfs @ 11.94 hrs, Volume= 4.533 af
Primary = 28.92 cfs @ 11.94 hrs, Volume= 4.533 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

10 Year Storm Primary Outflow Imported from \\VTNFDATA\projects\57699.00 Colchester Act 250\tech\Stormwater\V

Link SN7: SN007

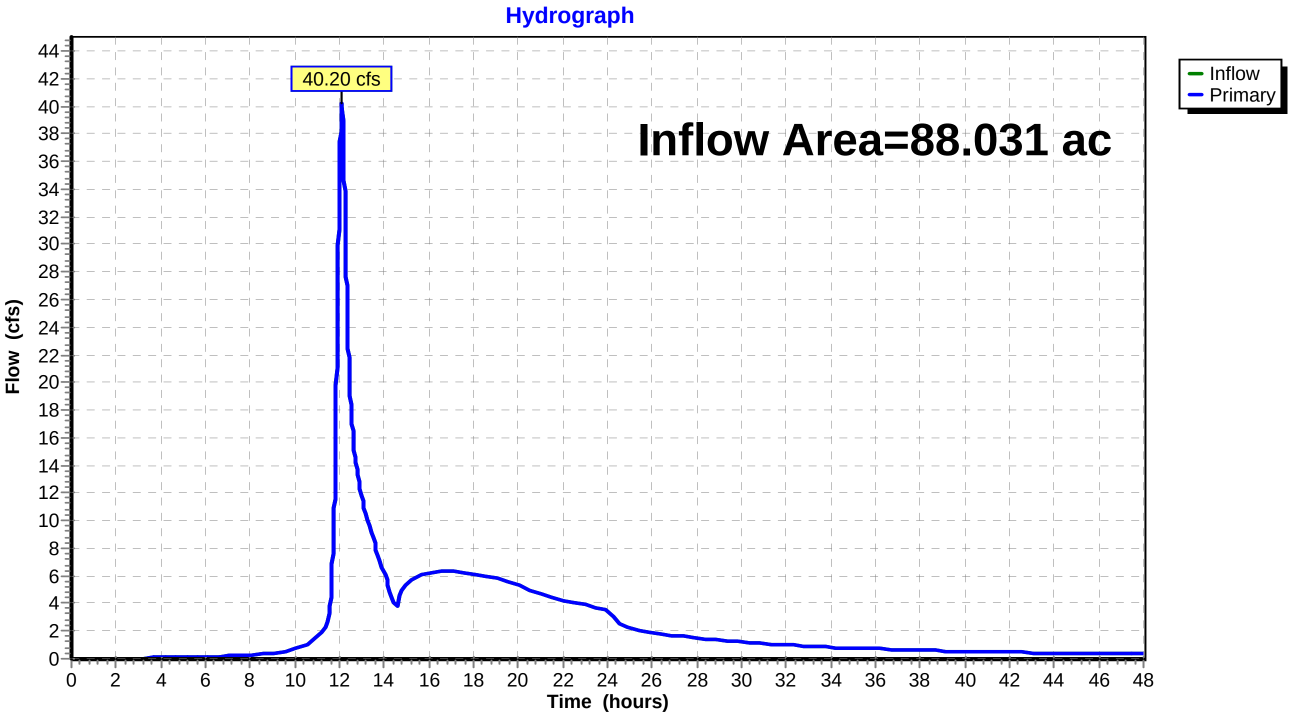


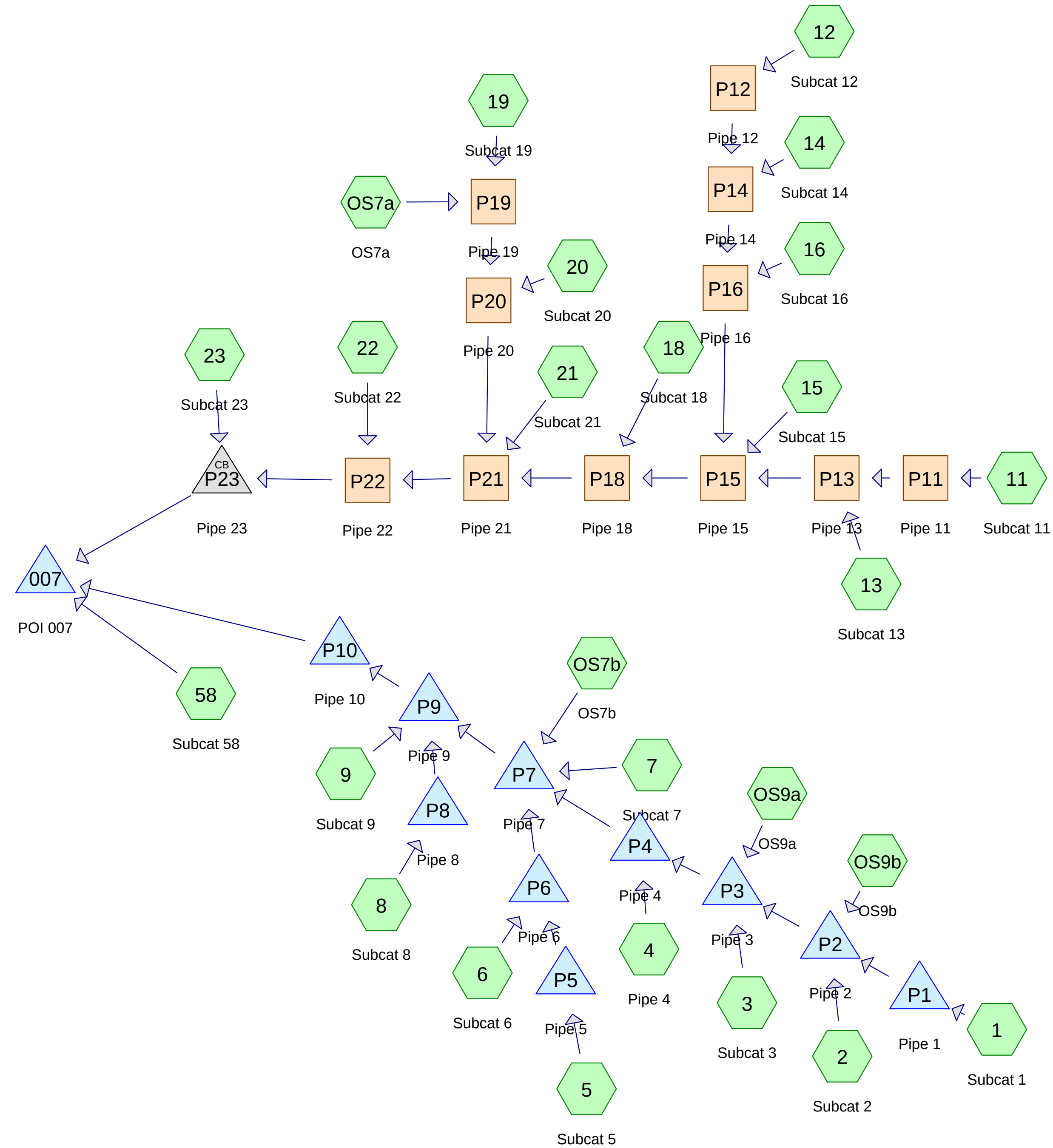
Summary for Link SN8: SN008

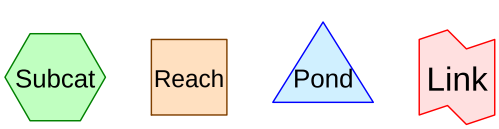
Inflow Area = 88.031 ac, 5.28% Impervious, Inflow Depth > 1.31" for 10 Year Storm event
Inflow = 40.20 cfs @ 12.11 hrs, Volume= 9.613 af
Primary = 40.20 cfs @ 12.11 hrs, Volume= 9.613 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN8: SN008







Routing Diagram for On-Site 7 PR no Detention
Prepared by VHB, Printed 4/27/2016
HydroCAD® 10.00 s/n 01038 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=0.324 ac 90.74% Impervious Runoff Depth=4.79"
Flow Length=345' Slope=0.0067 '/' Tc=3.5 min CN=80/98 Runoff=2.53 cfs 0.129 af

Subcatchment 2: Subcat 2 Runoff Area=0.139 ac 92.81% Impervious Runoff Depth=4.83"
Flow Length=123' Slope=0.0065 '/' Tc=1.3 min CN=80/98 Runoff=1.16 cfs 0.056 af

Subcatchment 3: Subcat 3 Runoff Area=0.233 ac 91.85% Impervious Runoff Depth=4.81"
Flow Length=240' Slope=0.0077 '/' Tc=2.2 min CN=80/98 Runoff=1.90 cfs 0.093 af

Subcatchment 4: Pipe 4 Runoff Area=0.269 ac 57.25% Impervious Runoff Depth=4.15"
Flow Length=189' Slope=0.0089 '/' Tc=1.6 min CN=80/98 Runoff=2.03 cfs 0.093 af

Subcatchment 5: Subcat 5 Runoff Area=0.212 ac 48.11% Impervious Runoff Depth=3.98"
Flow Length=206' Tc=2.1 min CN=80/98 Runoff=1.53 cfs 0.070 af

Subcatchment 6: Subcat 6 Runoff Area=0.091 ac 83.52% Impervious Runoff Depth=4.65"
Flow Length=115' Slope=0.0088 '/' Tc=1.0 min CN=80/98 Runoff=0.75 cfs 0.035 af

Subcatchment 7: Subcat 7 Runoff Area=0.116 ac 70.69% Impervious Runoff Depth=4.41"
Flow Length=119' Slope=0.0096 '/' Tc=1.0 min CN=80/98 Runoff=0.92 cfs 0.043 af

Subcatchment 8: Subcat 8 Runoff Area=0.142 ac 98.59% Impervious Runoff Depth=4.94"
Flow Length=192' Slope=0.0036 '/' Tc=2.6 min CN=80/98 Runoff=1.16 cfs 0.058 af

Subcatchment 9: Subcat 9 Runoff Area=0.173 ac 92.49% Impervious Runoff Depth=4.82"
Flow Length=182' Tc=2.5 min CN=80/98 Runoff=1.40 cfs 0.069 af

Subcatchment 11: Subcat 11 Runoff Area=0.015 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=46' Slope=0.0211 '/' Tc=0.3 min CN=0/98 Runoff=0.13 cfs 0.006 af

Subcatchment 12: Subcat 12 Runoff Area=0.016 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=47' Slope=0.0189 '/' Tc=0.3 min CN=0/98 Runoff=0.14 cfs 0.007 af

Subcatchment 13: Subcat 13 Runoff Area=0.074 ac 91.89% Impervious Runoff Depth=4.81"
Flow Length=124' Tc=1.5 min CN=80/98 Runoff=0.62 cfs 0.030 af

Subcatchment 14: Subcat 14 Runoff Area=0.063 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=116' Slope=0.0203 '/' Tc=0.7 min CN=0/98 Runoff=0.55 cfs 0.026 af

Subcatchment 15: Subcat 15 Runoff Area=0.062 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=114' Slope=0.0242 '/' Tc=0.6 min CN=0/98 Runoff=0.54 cfs 0.026 af

Subcatchment 16: Subcat 16 Runoff Area=0.064 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=118' Slope=0.0331 '/' Tc=0.5 min CN=0/98 Runoff=0.56 cfs 0.026 af

Subcatchment 18: Subcat 18 Runoff Area=0.070 ac 100.00% Impervious Runoff Depth=4.96"
Flow Length=81' Slope=0.0293 '/' Tc=0.4 min CN=0/98 Runoff=0.61 cfs 0.029 af

Subcatchment 19: Subcat 19 Runoff Area=0.325 ac 29.54% Impervious Runoff Depth=3.63"
Flow Length=213' Tc=2.7 min CN=80/98 Runoff=2.18 cfs 0.098 af

Subcatchment 20: Subcat 20 Runoff Area=0.109 ac 88.99% Impervious Runoff Depth=4.75"
Flow Length=107' Slope=0.0206 '/' Tc=0.6 min CN=80/98 Runoff=0.92 cfs 0.043 af

Subcatchment 21: Subcat 21 Runoff Area=0.028 ac 89.29% Impervious Runoff Depth=4.76"
Flow Length=61' Slope=0.0047 '/' Tc=0.7 min CN=80/98 Runoff=0.24 cfs 0.011 af

Subcatchment 22: Subcat 22 Runoff Area=0.043 ac 93.02% Impervious Runoff Depth=4.83"
Flow Length=90' Slope=0.0080 '/' Tc=0.8 min CN=80/98 Runoff=0.37 cfs 0.017 af

Subcatchment 23: Subcat 23 Runoff Area=0.342 ac 44.44% Impervious Runoff Depth=3.91"
Flow Length=272' Tc=2.8 min CN=80/98 Runoff=2.39 cfs 0.111 af

Subcatchment 58: Subcat 58 Runoff Area=0.602 ac 15.12% Impervious Runoff Depth=3.35"
Flow Length=155' Tc=3.6 min CN=80/98 Runoff=3.73 cfs 0.168 af

Subcatchment OS7a: OS7a Runoff Area=1.853 ac 0.00% Impervious Runoff Depth=3.65"
Flow Length=598' Tc=26.3 min CN=86/0 Runoff=6.35 cfs 0.564 af

Subcatchment OS7b: OS7b Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=3.16"
Flow Length=260' Slope=0.1483 '/' Tc=6.1 min CN=81/0 Runoff=8.21 cfs 0.391 af

Subcatchment OS9a: OS9a Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=3.76"
Flow Length=340' Tc=1.8 min CN=87/0 Runoff=8.92 cfs 0.381 af

Subcatchment OS9b: OS9b Runoff Area=1.309 ac 0.00% Impervious Runoff Depth=4.51"
Flow Length=470' Tc=7.6 min CN=94/0 Runoff=8.90 cfs 0.491 af

Reach P11: Pipe 11 Avg. Flow Depth=0.10' Max Vel=2.68 fps Inflow=0.13 cfs 0.006 af
18.0" Round Pipe n=0.013 L=65.5' S=0.0220 '/' Capacity=15.58 cfs Outflow=0.13 cfs 0.006 af

Reach P12: Pipe 12 Avg. Flow Depth=0.10' Max Vel=2.74 fps Inflow=0.14 cfs 0.007 af
18.0" Round Pipe n=0.013 L=65.0' S=0.0222 '/' Capacity=15.63 cfs Outflow=0.14 cfs 0.007 af

Reach P13: Pipe 13 Avg. Flow Depth=0.25' Max Vel=3.92 fps Inflow=0.74 cfs 0.036 af
18.0" Round Pipe n=0.013 L=66.0' S=0.0147 '/' Capacity=12.73 cfs Outflow=0.74 cfs 0.036 af

Reach P14: Pipe 14 Avg. Flow Depth=0.24' Max Vel=3.83 fps Inflow=0.69 cfs 0.033 af
18.0" Round Pipe n=0.013 L=66.0' S=0.0147 '/' Capacity=12.73 cfs Outflow=0.68 cfs 0.033 af

Reach P15: Pipe 15 Avg. Flow Depth=0.60' Max Vel=3.76 fps Inflow=2.50 cfs 0.121 af
18.0" Round Pipe n=0.013 L=34.8' S=0.0049 '/' Capacity=7.34 cfs Outflow=2.49 cfs 0.121 af

Reach P16: Pipe 16 Avg. Flow Depth=0.39' Max Vel=3.37 fps Inflow=1.24 cfs 0.059 af
18.0" Round Pipe n=0.013 L=3.2' S=0.0063 '/' Capacity=8.30 cfs Outflow=1.24 cfs 0.059 af

Reach P18: Pipe 18 Avg. Flow Depth=0.68' Max Vel=3.99 fps Inflow=3.10 cfs 0.150 af
18.0" Round Pipe n=0.013 L=44.7' S=0.0049 '/' Capacity=7.37 cfs Outflow=3.09 cfs 0.150 af

Reach P19: Pipe 19 Avg. Flow Depth=1.08' Max Vel=4.82 fps Inflow=6.60 cfs 0.663 af
18.0" Round Pipe n=0.013 L=13.5' S=0.0052 '/' Capacity=7.56 cfs Outflow=6.60 cfs 0.663 af

Reach P20: Pipe 20 Avg. Flow Depth=1.11' Max Vel=4.76 fps Inflow=6.69 cfs 0.706 af
18.0" Round Pipe n=0.013 L=47.9' S=0.0050 '/' Capacity=7.44 cfs Outflow=6.68 cfs 0.706 af

Reach P21: Pipe 21 Avg. Flow Depth=1.50' Max Vel=4.74 fps Inflow=8.36 cfs 0.866 af
18.0" Round Pipe n=0.013 L=36.8' S=0.0049 '/' Capacity=7.35 cfs Outflow=7.82 cfs 0.866 af

Reach P22: Pipe 22 Avg. Flow Depth=0.79' Max Vel=8.60 fps Inflow=8.18 cfs 0.884 af
18.0" Round Pipe n=0.013 L=89.6' S=0.0201 '/' Capacity=14.89 cfs Outflow=8.10 cfs 0.884 af

Pond 007: POI 007 Inflow=50.12 cfs 3.075 af
Primary=50.12 cfs 3.075 af

Pond P1: Pipe 1 Peak Elev=336.69' Storage=50 cf Inflow=2.53 cfs 0.129 af
18.0" Round Culvert n=0.013 L=67.2' S=0.0051 '/' Outflow=2.62 cfs 0.129 af

Pond P10: Pipe 10 Peak Elev=322.30' Storage=49 cf Inflow=36.48 cfs 1.911 af
30.0" Round Culvert n=0.013 L=34.6' S=0.0055 '/' Outflow=36.36 cfs 1.911 af

Pond P2: Pipe 2 Peak Elev=336.63' Storage=50 cf Inflow=11.81 cfs 0.677 af
18.0" Round Culvert n=0.013 L=74.0' S=0.0050 '/' Outflow=11.93 cfs 0.677 af

Pond P23: Pipe 23 Peak Elev=320.39' Inflow=10.25 cfs 0.995 af
24.0" Round Culvert n=0.013 L=85.2' S=0.0050 '/' Outflow=10.25 cfs 0.995 af

Pond P3: Pipe 3 Peak Elev=334.61' Storage=50 cf Inflow=21.69 cfs 1.151 af
24.0" Round Culvert n=0.013 L=186.7' S=0.0050 '/' Outflow=21.78 cfs 1.151 af

Pond P4: Pipe 4 Peak Elev=332.08' Storage=50 cf Inflow=23.88 cfs 1.244 af
24.0" Round Culvert n=0.013 L=121.4' S=0.0050 '/' Outflow=23.82 cfs 1.244 af

Pond P5: Pipe 5 Peak Elev=329.70' Storage=50 cf Inflow=1.53 cfs 0.070 af
18.0" Round Culvert n=0.013 L=56.3' S=0.0050 '/' Outflow=1.65 cfs 0.070 af

Pond P6: Pipe 6 Peak Elev=329.67' Storage=50 cf Inflow=2.38 cfs 0.106 af
18.0" Round Culvert n=0.013 L=61.9' S=0.0050 '/' Outflow=2.32 cfs 0.106 af

Pond P7: Pipe 7 Peak Elev=329.63' Storage=50 cf Inflow=33.99 cfs 1.783 af
24.0" Round Culvert n=0.013 L=96.4' S=0.0050 '/' Outflow=33.93 cfs 1.783 af

Pond P8: Pipe 8 Peak Elev=324.70' Storage=50 cf Inflow=1.16 cfs 0.058 af
18.0" Round Culvert n=0.013 L=123.6' S=0.0050 '/' Outflow=1.24 cfs 0.058 af

Pond P9: Pipe 9 Peak Elev=324.68' Storage=50 cf Inflow=36.33 cfs 1.911 af
30.0" Round Culvert n=0.013 L=33.6' S=0.0051 '/' Outflow=36.48 cfs 1.911 af

Total Runoff Area = 9.375 ac Runoff Volume = 3.075 af Average Runoff Depth = 3.94"
76.43% Pervious = 7.165 ac 23.57% Impervious = 2.210 ac

Summary for Subcatchment 1: Subcat 1

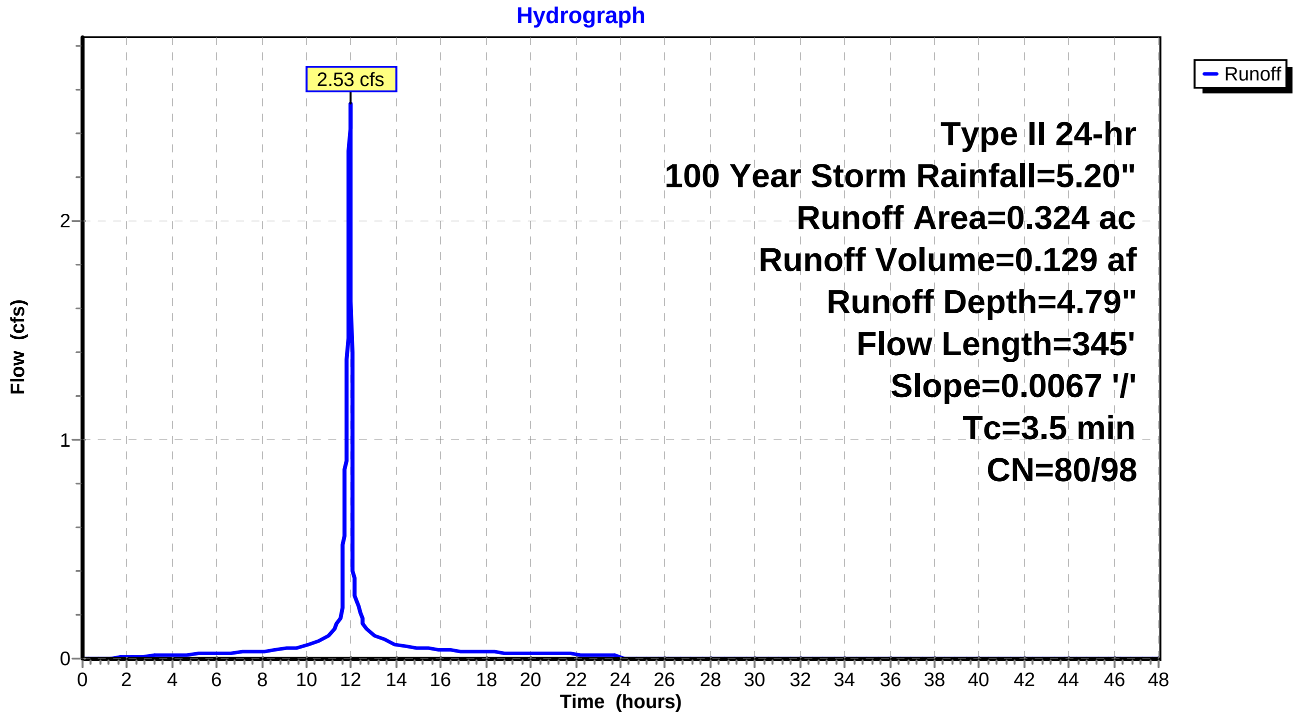
Runoff = 2.53 cfs @ 11.94 hrs, Volume= 0.129 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.294	98	Paved roads w/curbs & sewers, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.324	96	Weighted Average
0.030		9.26% Pervious Area
0.294		90.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	345	0.0067	1.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

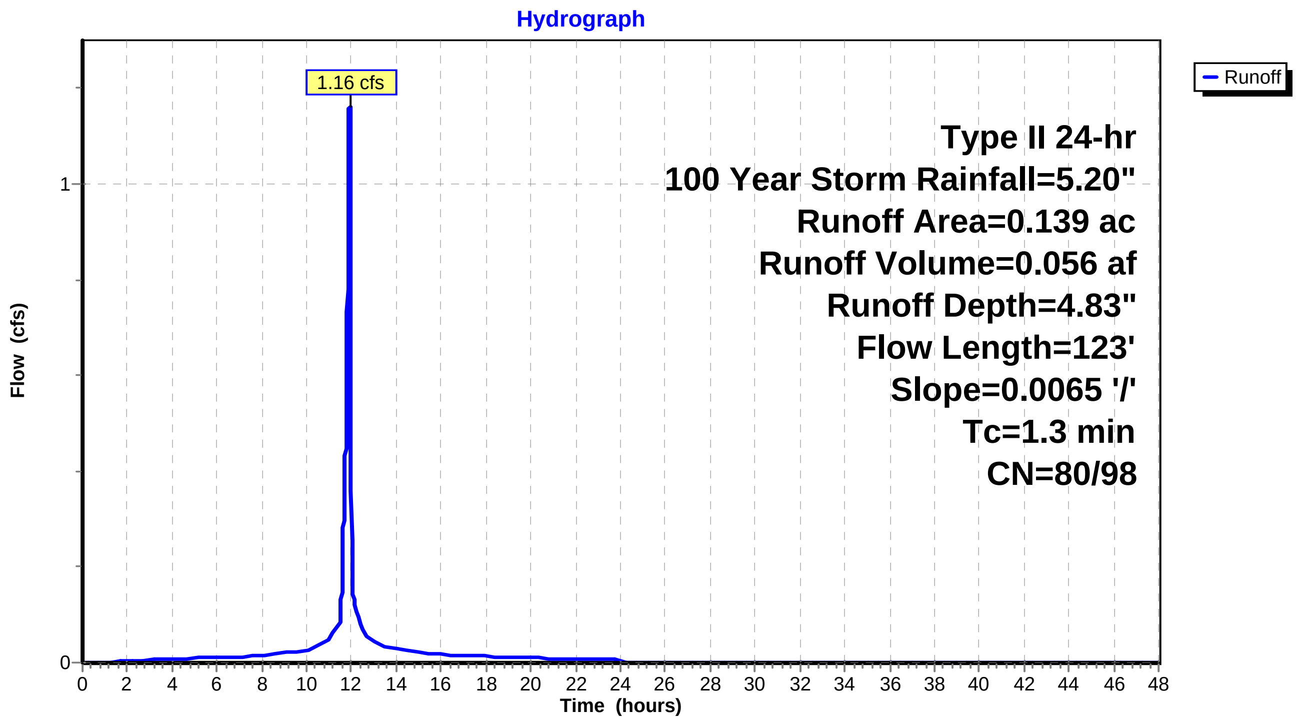
Runoff = 1.16 cfs @ 11.91 hrs, Volume= 0.056 af, Depth= 4.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.089	98	Paved roads w/curbs & sewers, HSG D
0.040	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.139	97	Weighted Average
0.010		7.19% Pervious Area
0.129		92.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	123	0.0065	1.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

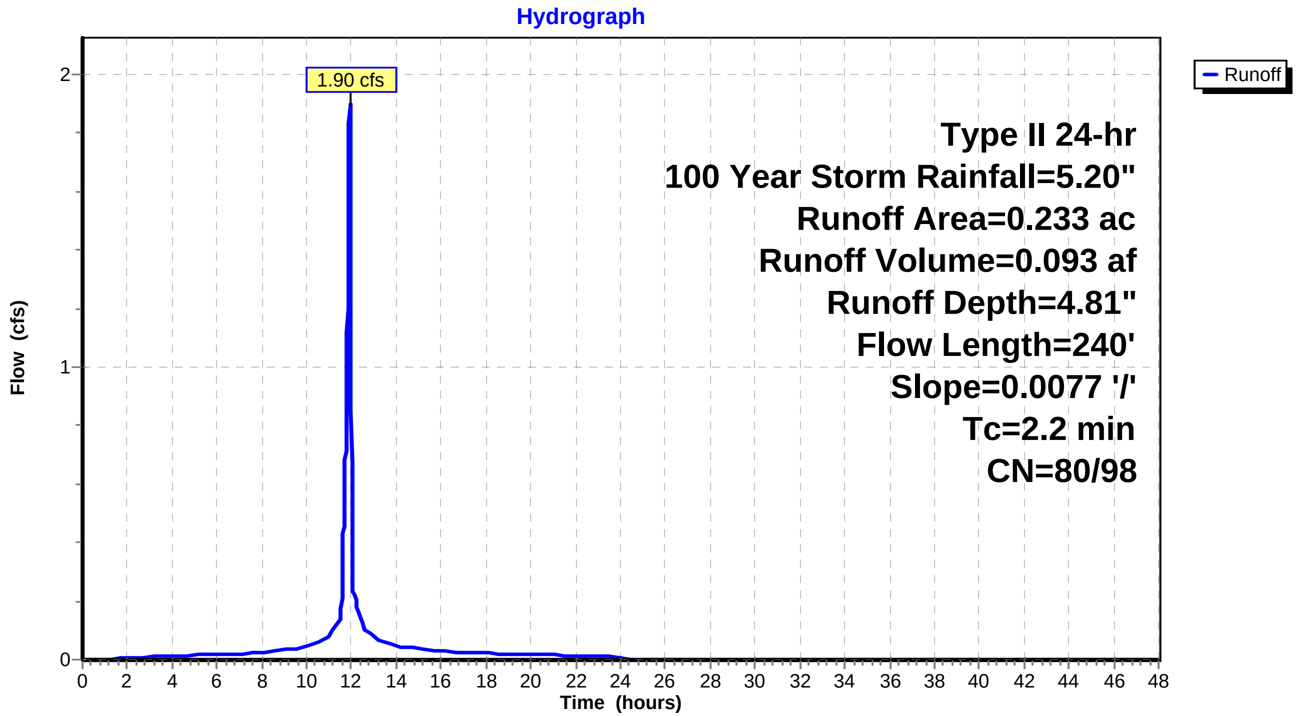
Runoff = 1.90 cfs @ 11.92 hrs, Volume= 0.093 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.201	98	Paved roads w/curbs & sewers, HSG D
0.013	98	Paved roads w/curbs & sewers, HSG D
0.011	80	>75% Grass cover, Good, HSG D
0.008	80	>75% Grass cover, Good, HSG D
0.233	97	Weighted Average
0.019		8.15% Pervious Area
0.214		91.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	240	0.0077	1.78		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Pipe 4

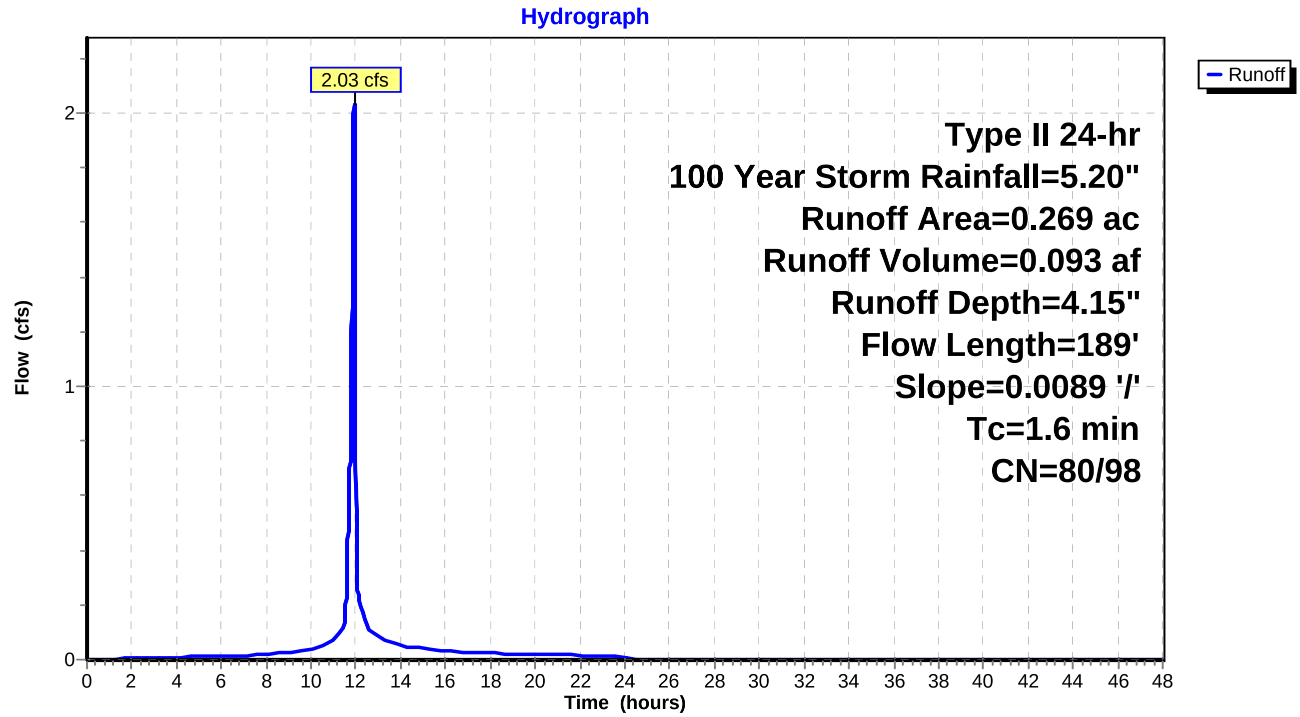
Runoff = 2.03 cfs @ 11.92 hrs, Volume= 0.093 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.128	98	Paved roads w/curbs & sewers, HSG D
0.026	98	Paved roads w/curbs & sewers, HSG D
0.010	80	>75% Grass cover, Good, HSG D
0.105	80	>75% Grass cover, Good, HSG D
0.269	90	Weighted Average
0.115		42.75% Pervious Area
0.154		57.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	189	0.0089	1.92		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 4: Pipe 4



Summary for Subcatchment 5: Subcat 5

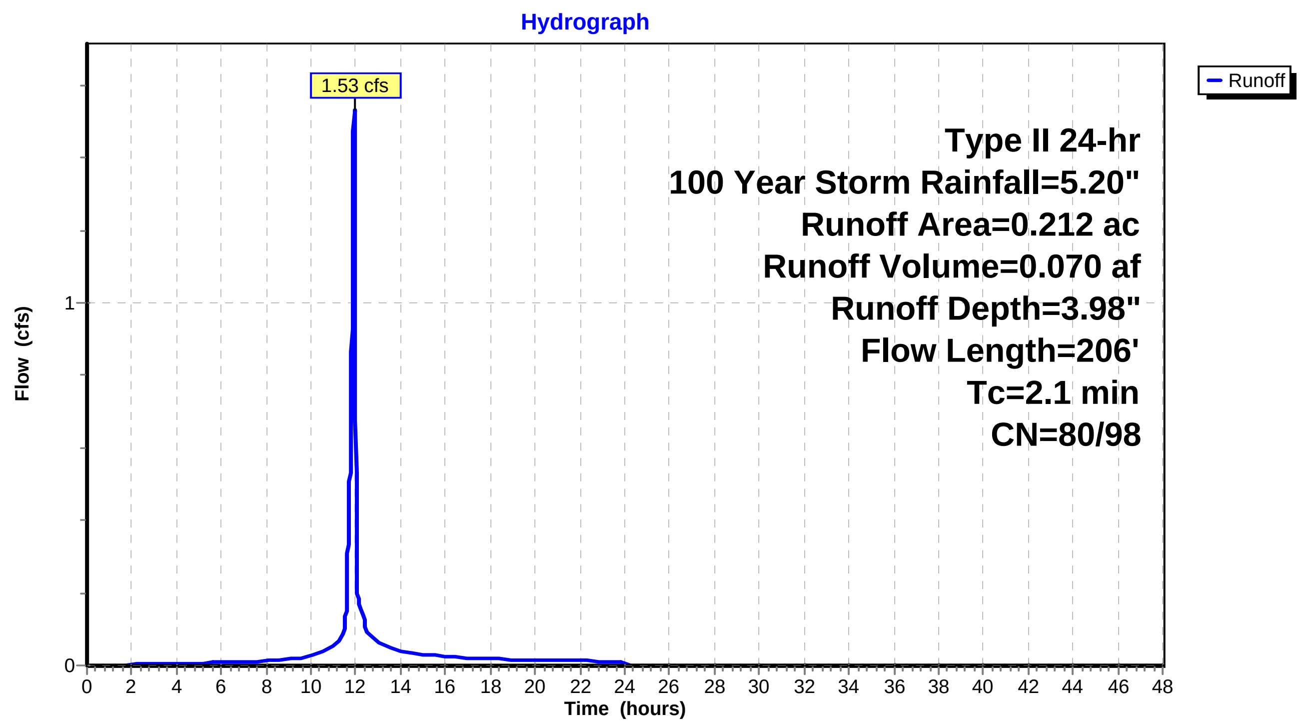
Runoff = 1.53 cfs @ 11.92 hrs, Volume= 0.070 af, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.102	98	Paved roads w/curbs & sewers, HSG D
0.083	80	>75% Grass cover, Good, HSG D
0.027	80	>75% Grass cover, Good, HSG D
0.212	89	Weighted Average
0.110		51.89% Pervious Area
0.102		48.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.0	194	0.0554	1.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	206	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

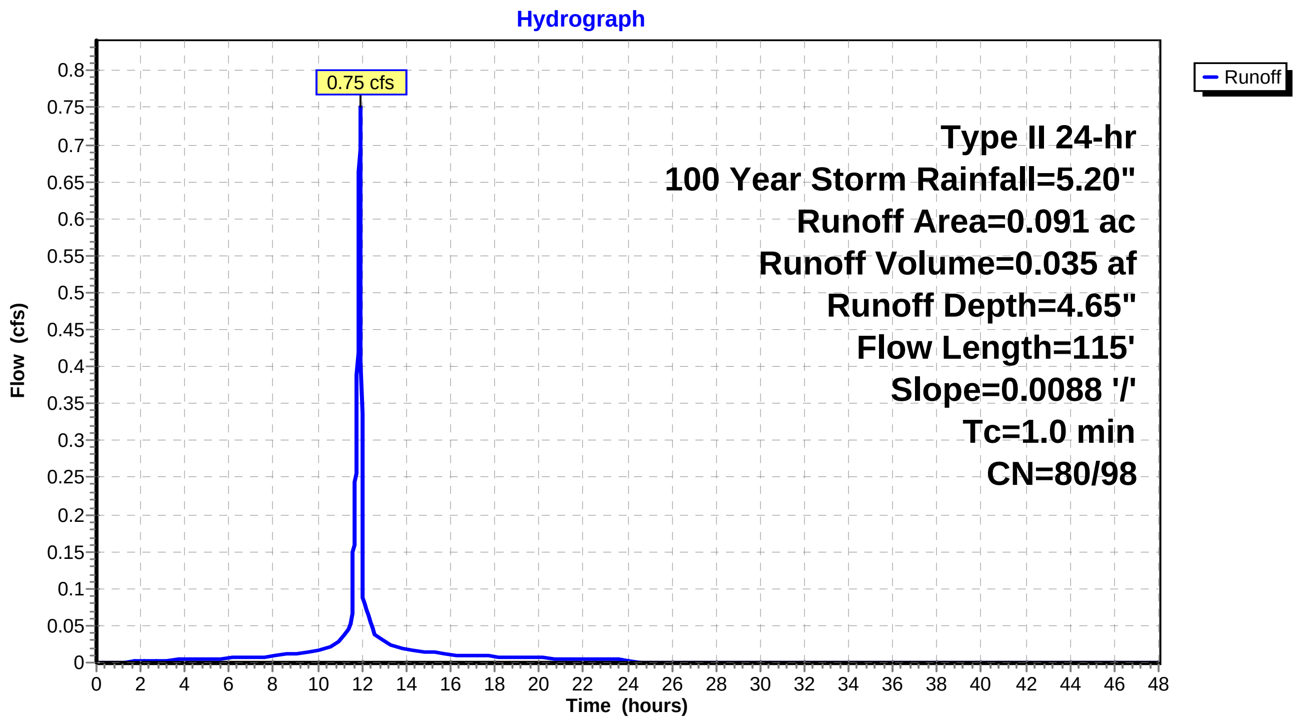
Runoff = 0.75 cfs @ 11.91 hrs, Volume= 0.035 af, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.072	98	Paved roads w/curbs & sewers, HSG D
0.004	98	Paved roads w/curbs & sewers, HSG D
0.009	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.091	95	Weighted Average
0.015		16.48% Pervious Area
0.076		83.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	115	0.0088	1.90		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

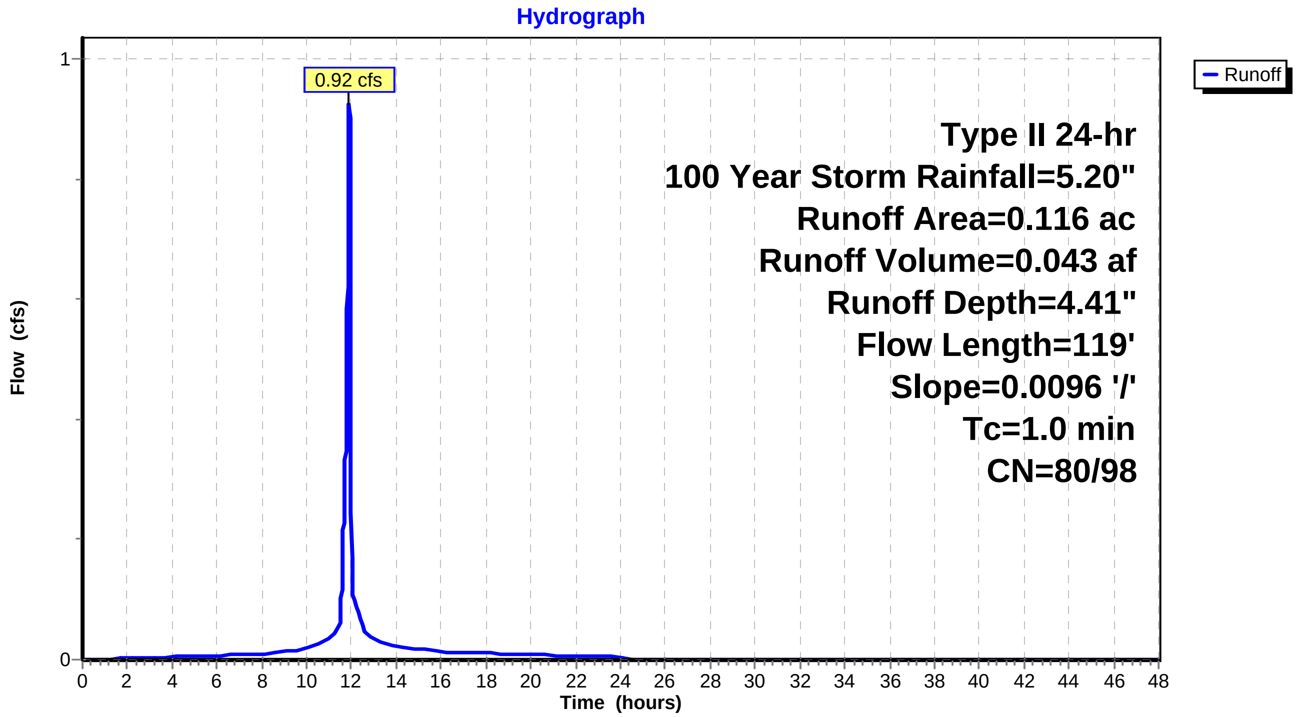
Runoff = 0.92 cfs @ 11.91 hrs, Volume= 0.043 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.070	98	Paved roads w/curbs & sewers, HSG D
0.012	98	Paved roads w/curbs & sewers, HSG D
0.005	80	>75% Grass cover, Good, HSG D
0.029	80	>75% Grass cover, Good, HSG D
0.116	93	Weighted Average
0.034		29.31% Pervious Area
0.082		70.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	119	0.0096	1.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

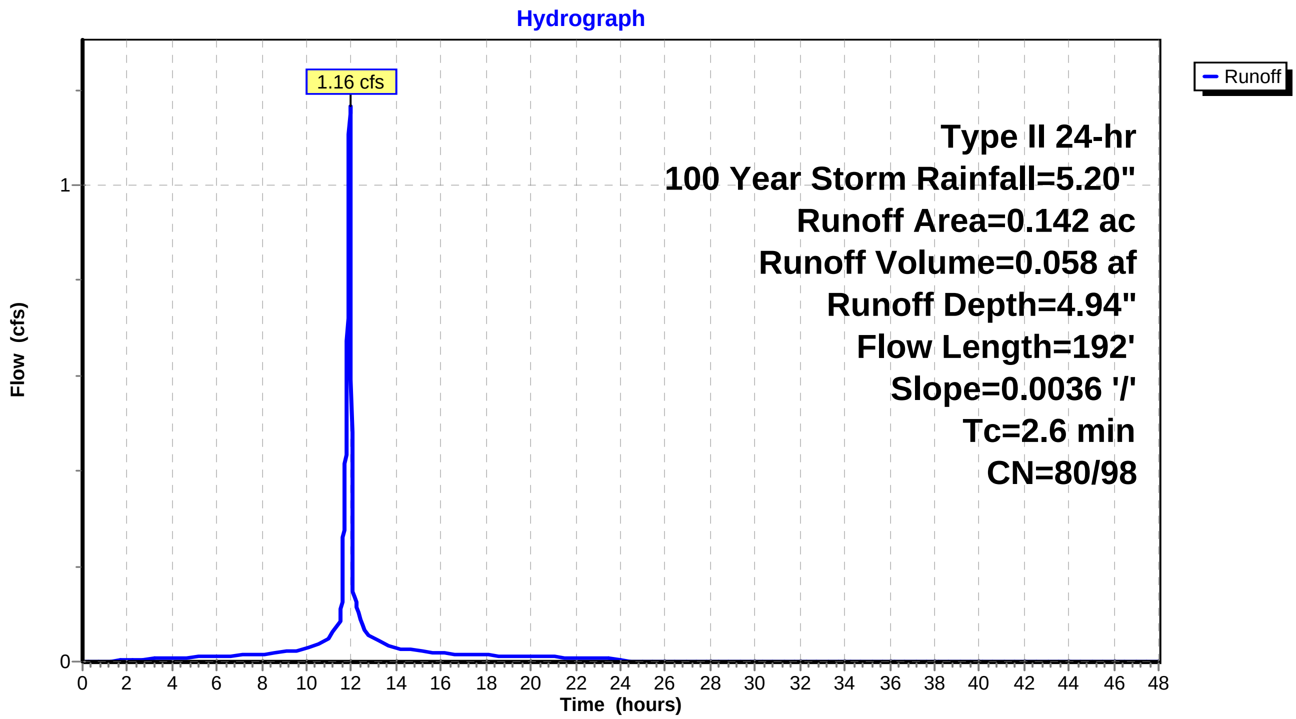
Runoff = 1.16 cfs @ 11.93 hrs, Volume= 0.058 af, Depth= 4.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.129	98	Paved roads w/curbs & sewers, HSG D
0.011	98	Paved roads w/curbs & sewers, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.142	98	Weighted Average
0.002		1.41% Pervious Area
0.140		98.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	192	0.0036	1.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

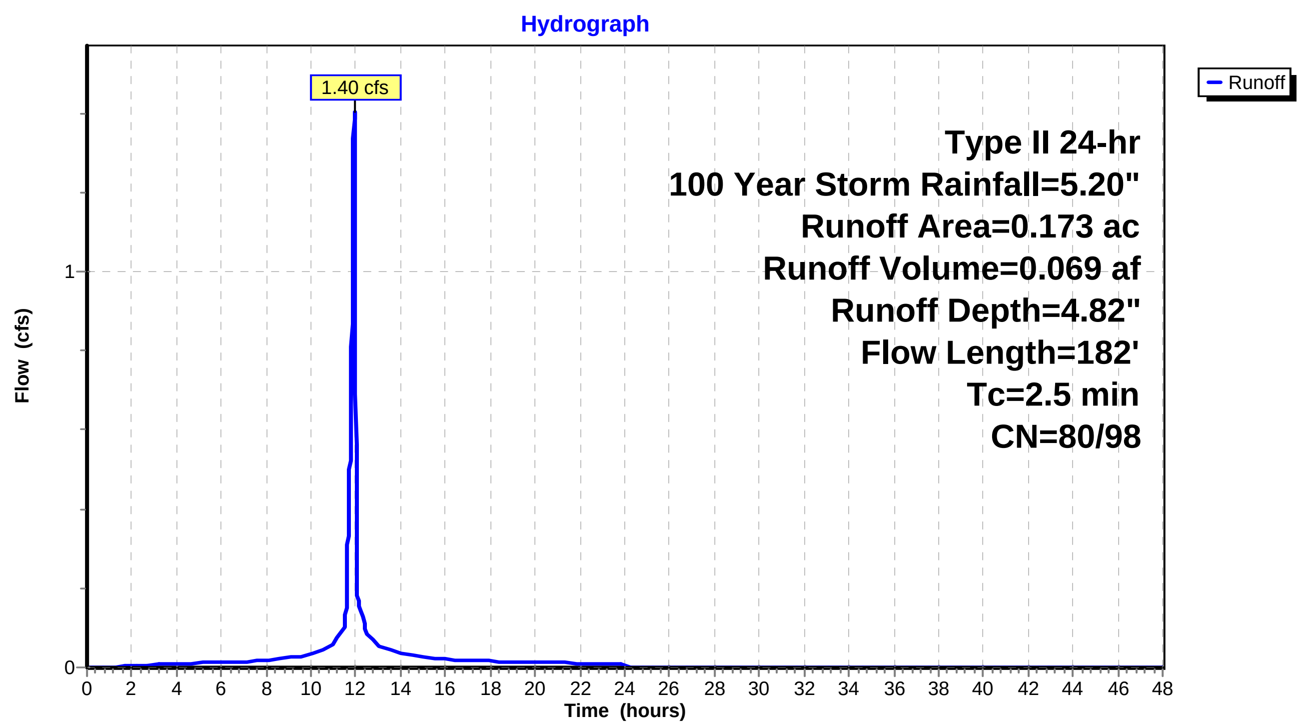
Runoff = 1.40 cfs @ 11.93 hrs, Volume= 0.069 af, Depth= 4.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.160	98	Paved roads w/curbs & sewers, HSG D
0.013	80	>75% Grass cover, Good, HSG D
0.173	97	Weighted Average
0.013		7.51% Pervious Area
0.160		92.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	73	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	109	0.0039	1.27		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	182	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 11: Subcat 11

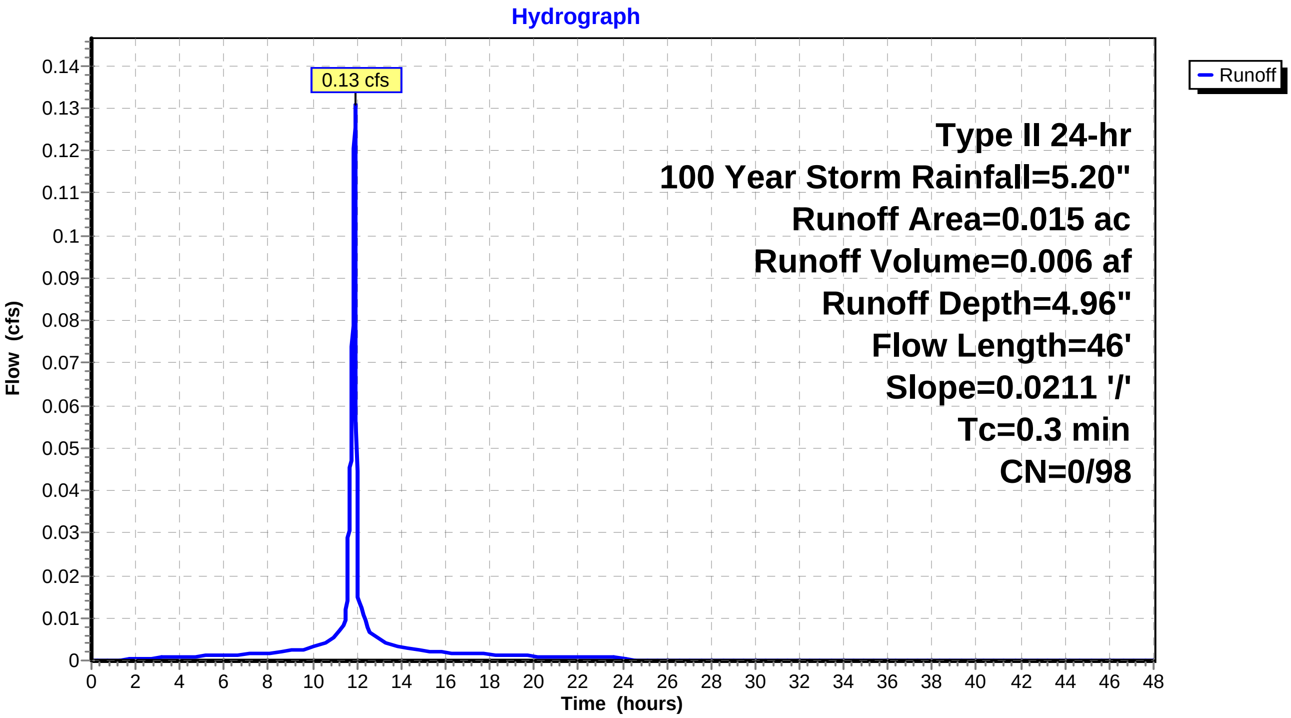
Runoff = 0.13 cfs @ 11.90 hrs, Volume= 0.006 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.015	98	Paved roads w/curbs & sewers, HSG D
0.015		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	46	0.0211	2.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 11: Subcat 11



Summary for Subcatchment 12: Subcat 12

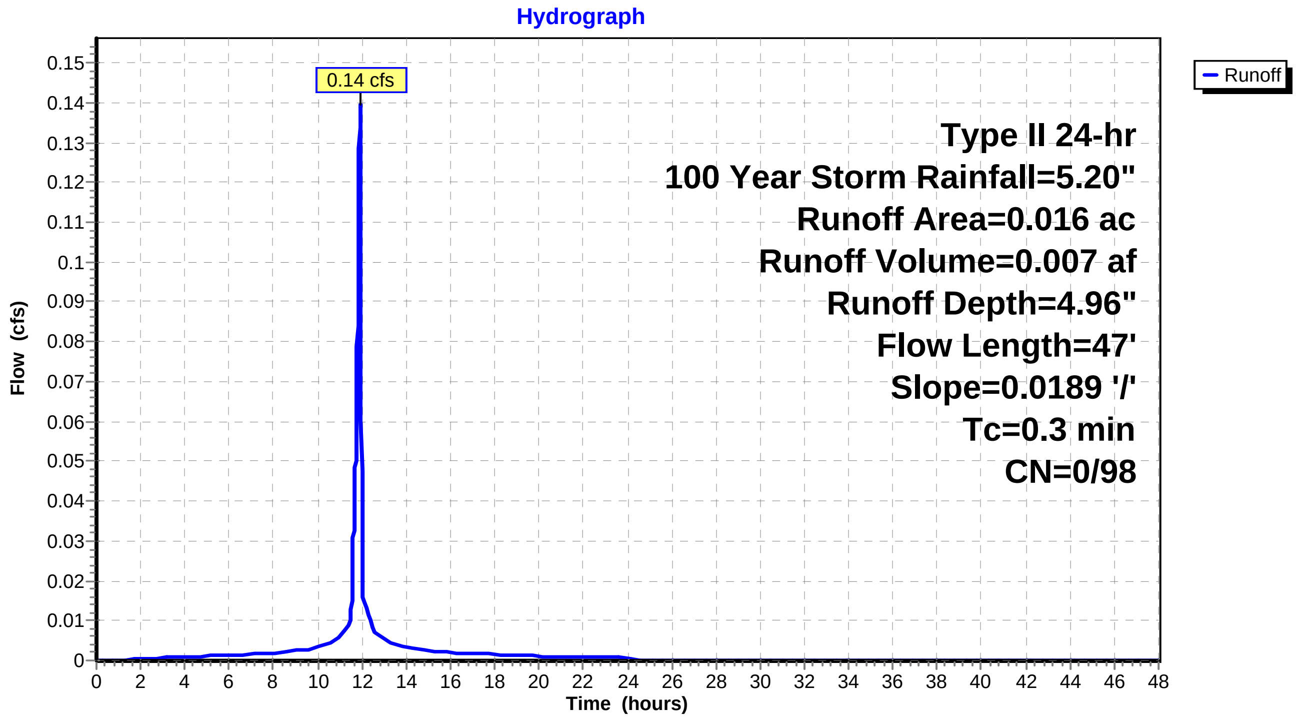
Runoff = 0.14 cfs @ 11.90 hrs, Volume= 0.007 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.016	98	Paved roads w/curbs & sewers, HSG D
0.016		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	47	0.0189	2.79		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 12: Subcat 12



Summary for Subcatchment 13: Subcat 13

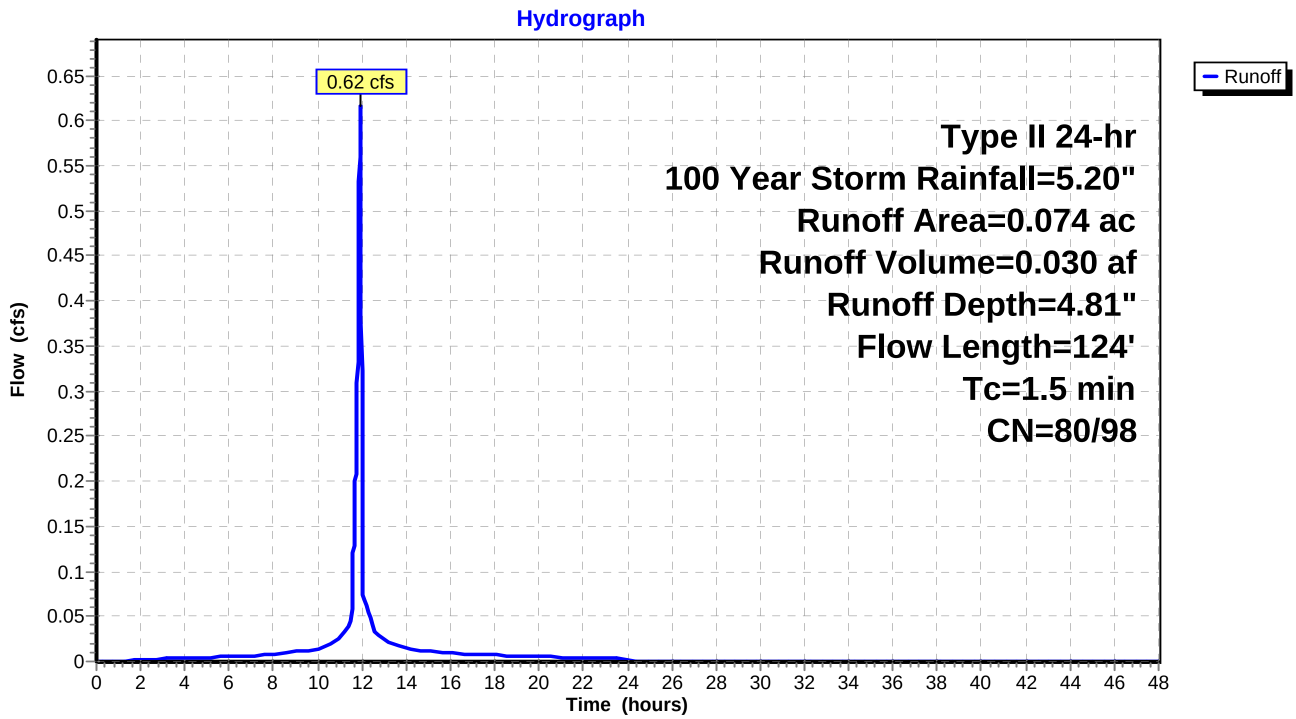
Runoff = 0.62 cfs @ 11.92 hrs, Volume= 0.030 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.060	98	Paved roads w/curbs & sewers, HSG D
0.008	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.074	97	Weighted Average
0.006		8.11% Pervious Area
0.068		91.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0065	1.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	54	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	62	0.0329	3.68		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	124	Total			

Subcatchment 13: Subcat 13



Summary for Subcatchment 14: Subcat 14

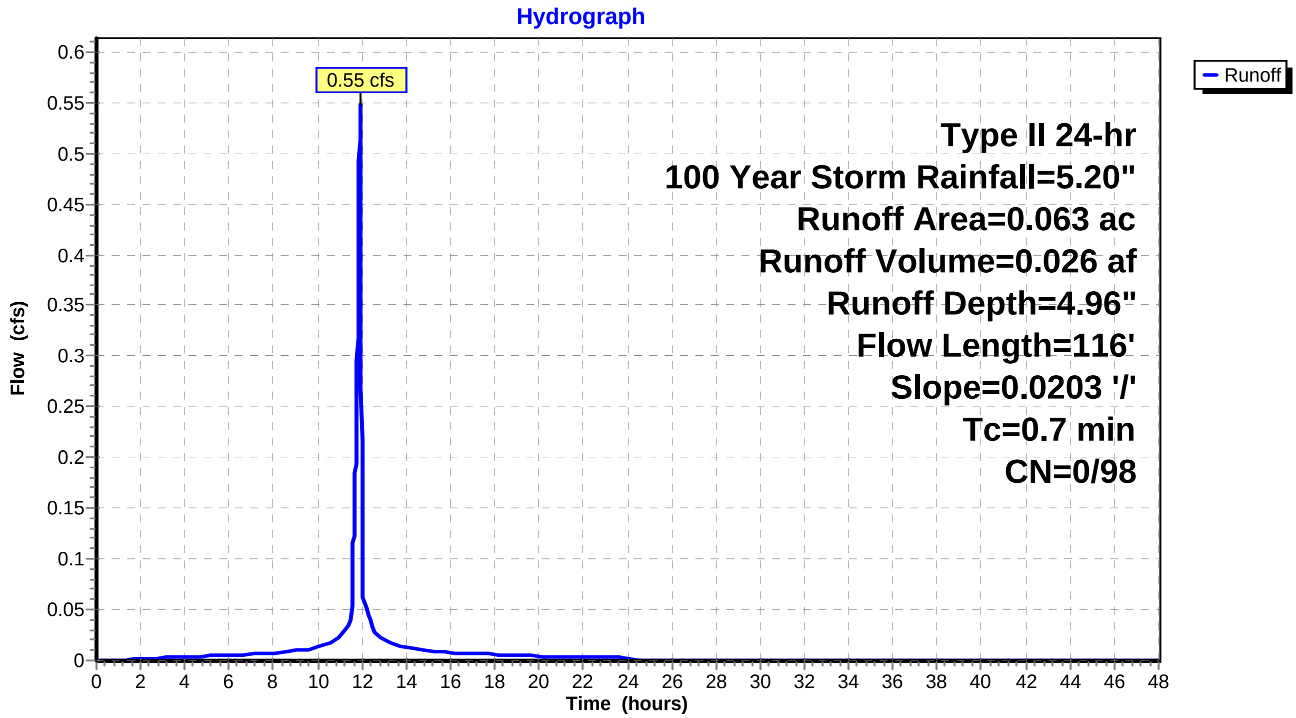
Runoff = 0.55 cfs @ 11.91 hrs, Volume= 0.026 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.063	98	Paved roads w/curbs & sewers, HSG D
0.063		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	116	0.0203	2.89		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 14: Subcat 14



Summary for Subcatchment 15: Subcat 15

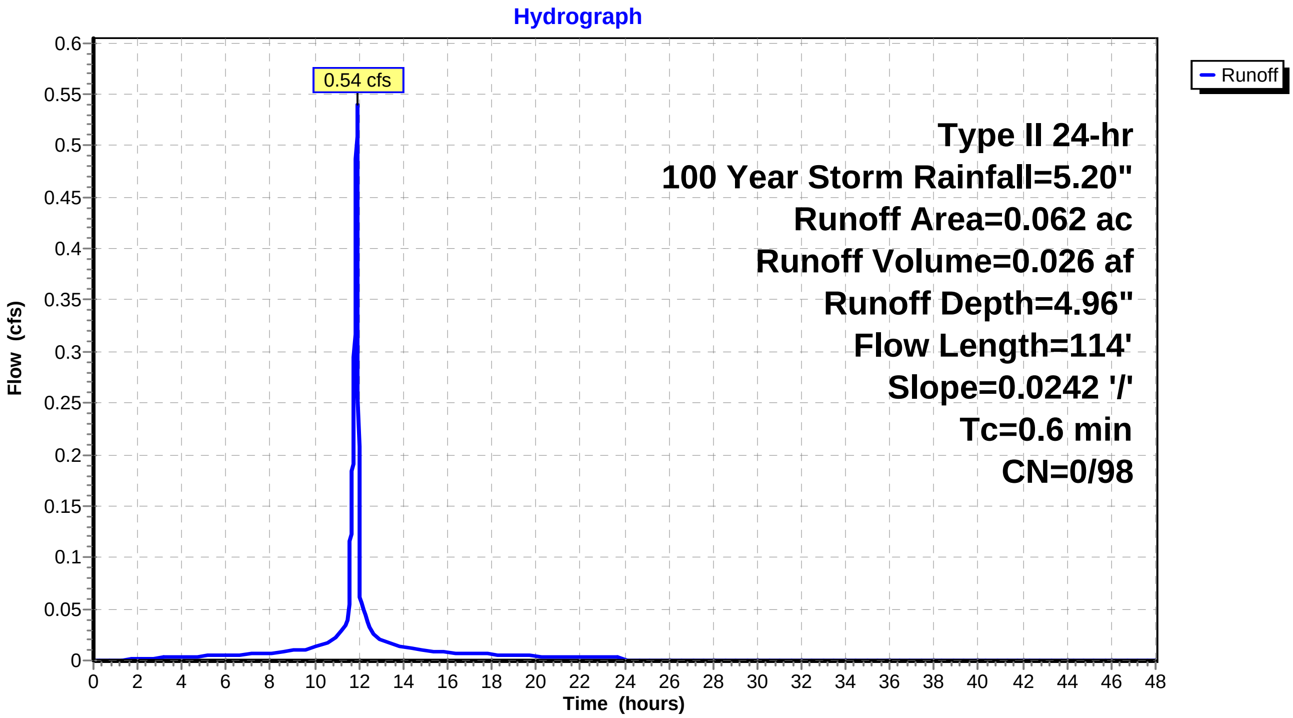
Runoff = 0.54 cfs @ 11.91 hrs, Volume= 0.026 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.062	98	Paved roads w/curbs & sewers, HSG D
0.062		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	114	0.0242	3.16		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 15: Subcat 15



Summary for Subcatchment 16: Subcat 16

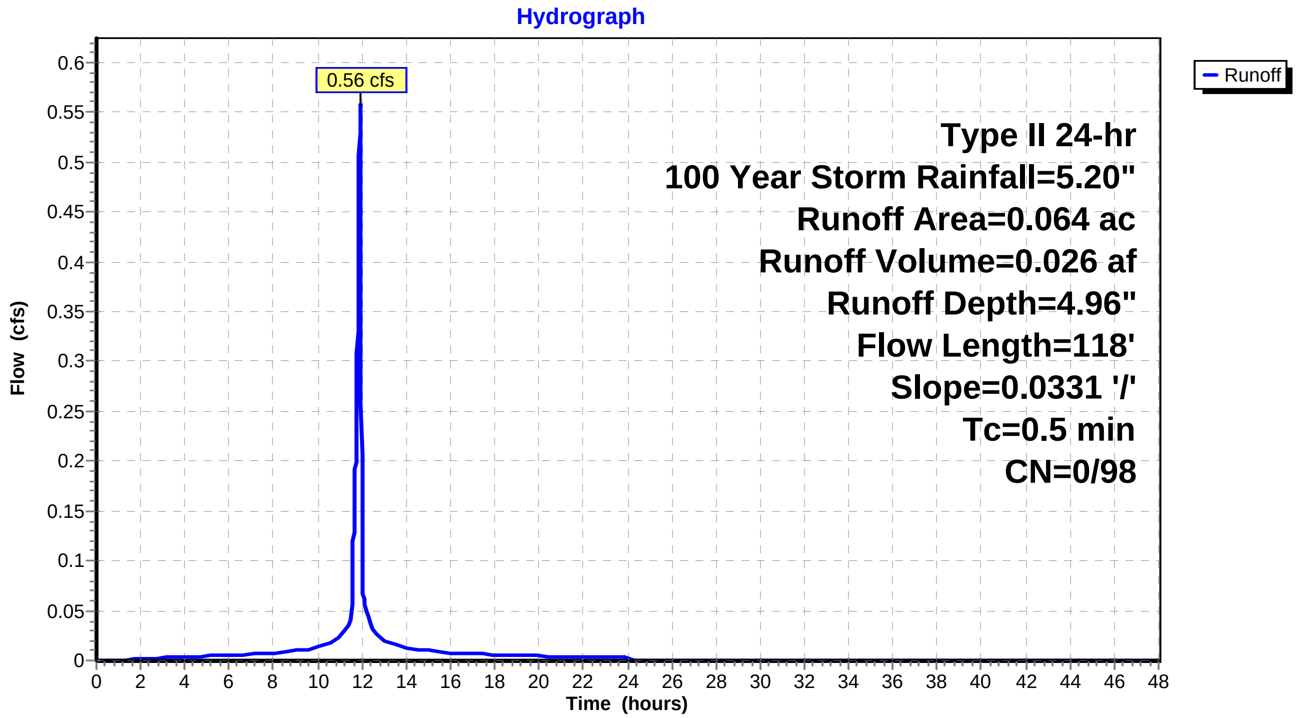
Runoff = 0.56 cfs @ 11.91 hrs, Volume= 0.026 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.064	98	Paved roads w/curbs & sewers, HSG D
0.064		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	118	0.0331	3.69		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 16: Subcat 16



Summary for Subcatchment 18: Subcat 18

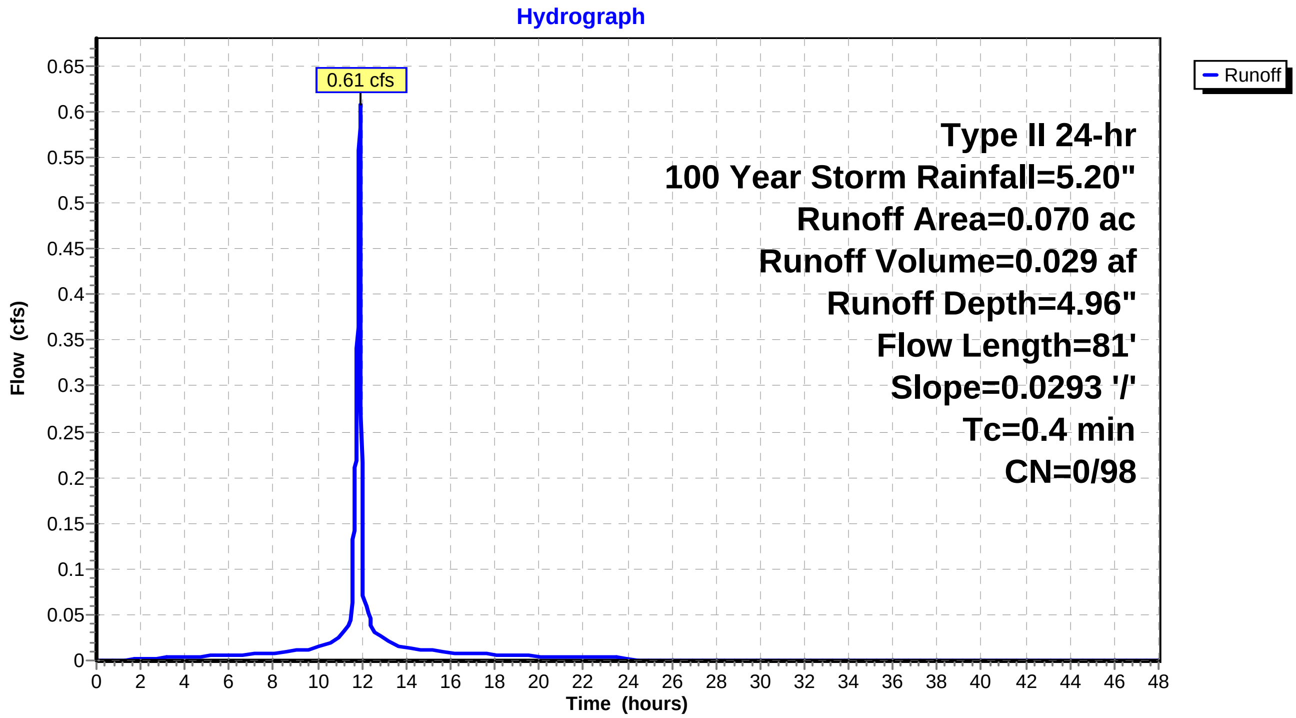
Runoff = 0.61 cfs @ 11.90 hrs, Volume= 0.029 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.070	98	Paved roads w/curbs & sewers, HSG D
0.070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	81	0.0293	3.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 18: Subcat 18



Summary for Subcatchment 19: Subcat 19

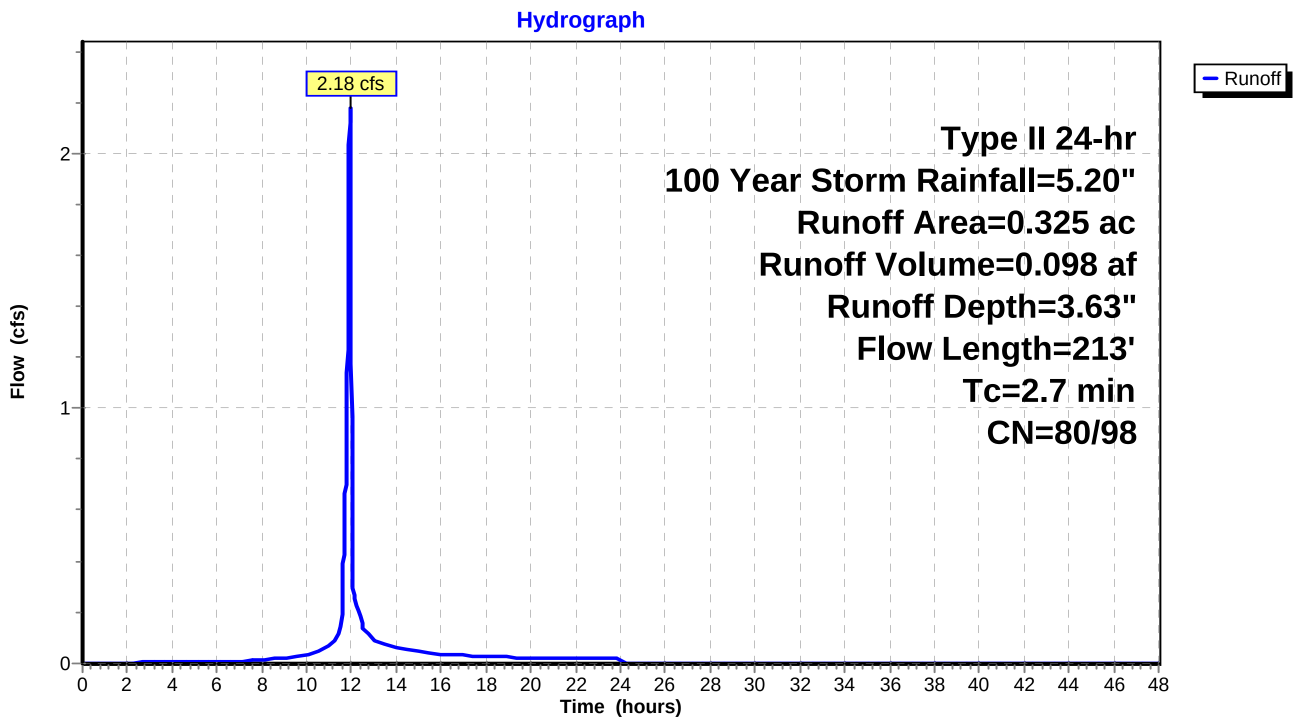
Runoff = 2.18 cfs @ 11.93 hrs, Volume= 0.098 af, Depth= 3.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.044	98	Paved roads w/curbs & sewers, HSG D
0.052	98	Paved roads w/curbs & sewers, HSG D
0.214	80	>75% Grass cover, Good, HSG D
0.015	80	>75% Grass cover, Good, HSG D
0.325	85	Weighted Average
0.229		70.46% Pervious Area
0.096		29.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	198	0.0321	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	213	Total			

Subcatchment 19: Subcat 19



Summary for Subcatchment 20: Subcat 20

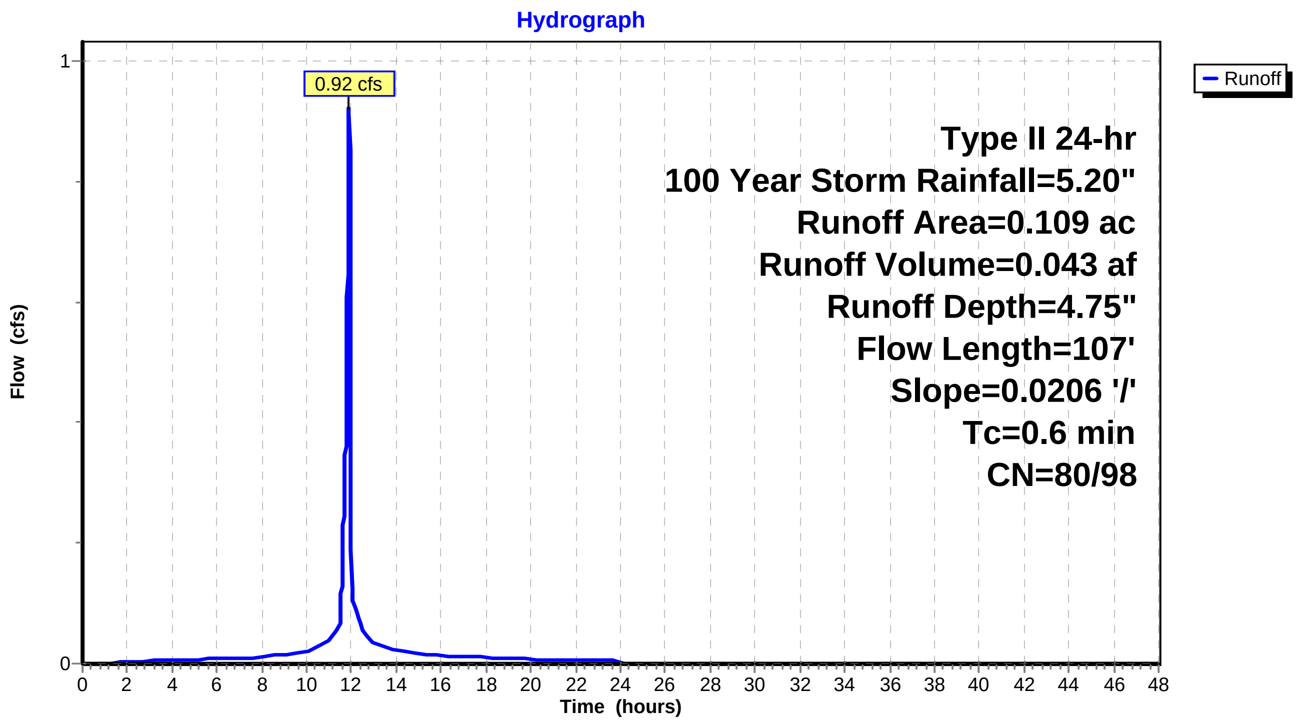
Runoff = 0.92 cfs @ 11.91 hrs, Volume= 0.043 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.097	98	Paved roads w/curbs & sewers, HSG D
0.012	80	>75% Grass cover, Good, HSG D
0.109	96	Weighted Average
0.012		11.01% Pervious Area
0.097		88.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	107	0.0206	2.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 20: Subcat 20



Summary for Subcatchment 21: Subcat 21

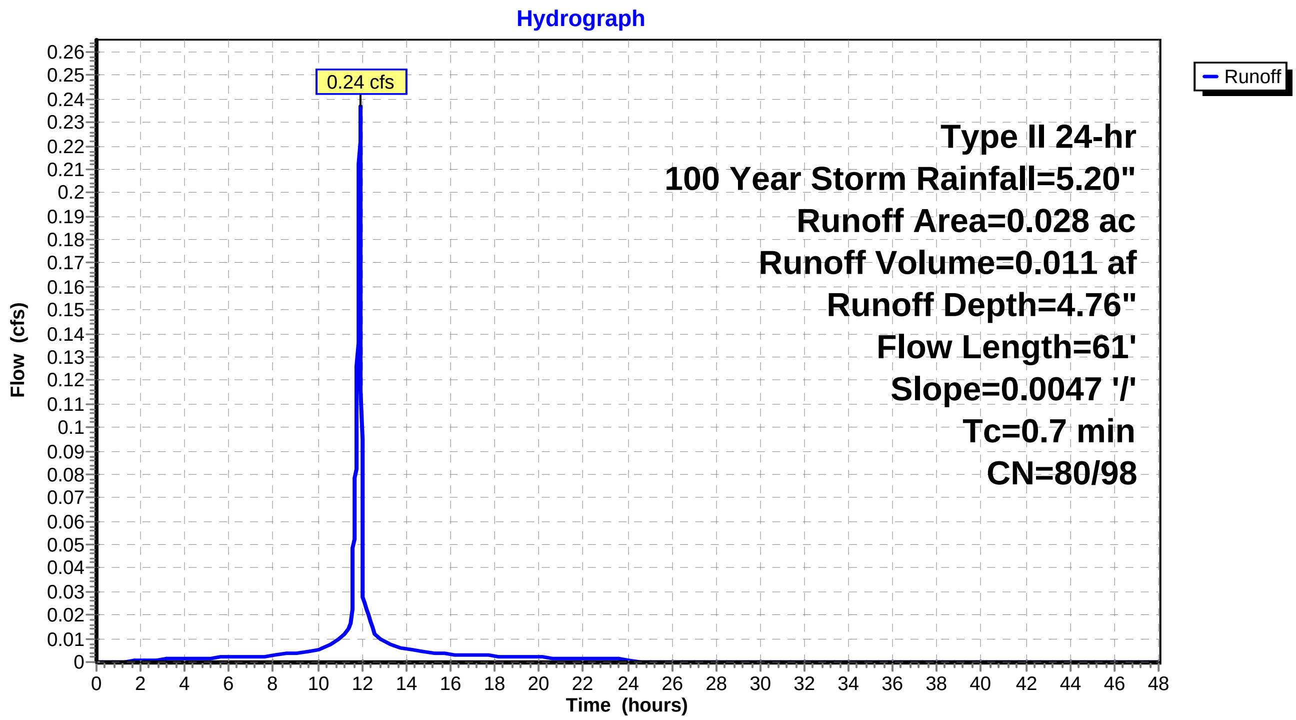
Runoff = 0.24 cfs @ 11.91 hrs, Volume= 0.011 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.023	98	Paved roads w/curbs & sewers, HSG D
0.002	98	Paved roads w/curbs & sewers, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.028	96	Weighted Average
0.003		10.71% Pervious Area
0.025		89.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	61	0.0047	1.39		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 21: Subcat 21



Summary for Subcatchment 22: Subcat 22

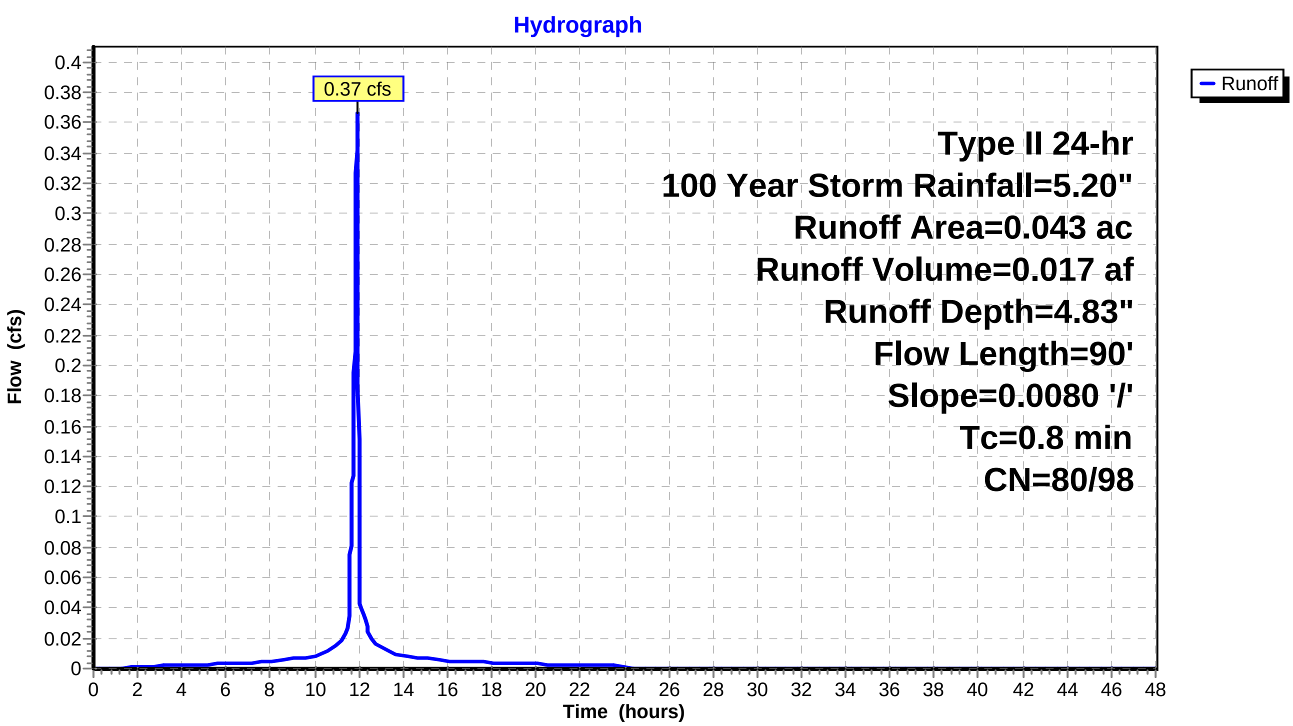
Runoff = 0.37 cfs @ 11.91 hrs, Volume= 0.017 af, Depth= 4.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.040	98	Paved roads w/curbs & sewers, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.043	97	Weighted Average
0.003		6.98% Pervious Area
0.040		93.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	90	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 22: Subcat 22



Summary for Subcatchment 23: Subcat 23

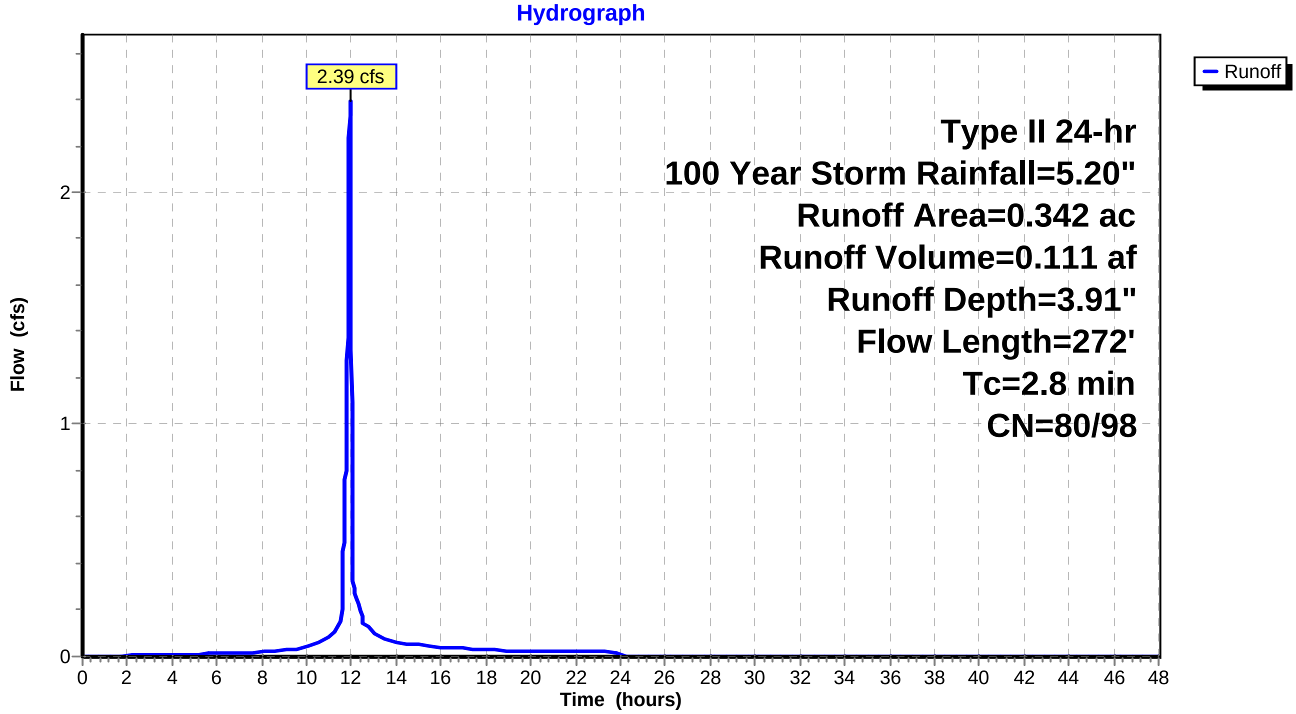
Runoff = 2.39 cfs @ 11.93 hrs, Volume= 0.111 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.064	98	Paved roads w/curbs & sewers, HSG D
0.062	98	Paved roads w/curbs & sewers, HSG D
0.008	80	>75% Grass cover, Good, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.095	80	>75% Grass cover, Good, HSG D
0.067	80	>75% Grass cover, Good, HSG D
0.026	98	Paved roads w/curbs & sewers, HSG D
0.342	88	Weighted Average
0.190		55.56% Pervious Area
0.152		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	253	0.0462	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	19	0.0298	10.26	18.13	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.8	272	Total			

Subcatchment 23: Subcat 23



Summary for Subcatchment 58: Subcat 58

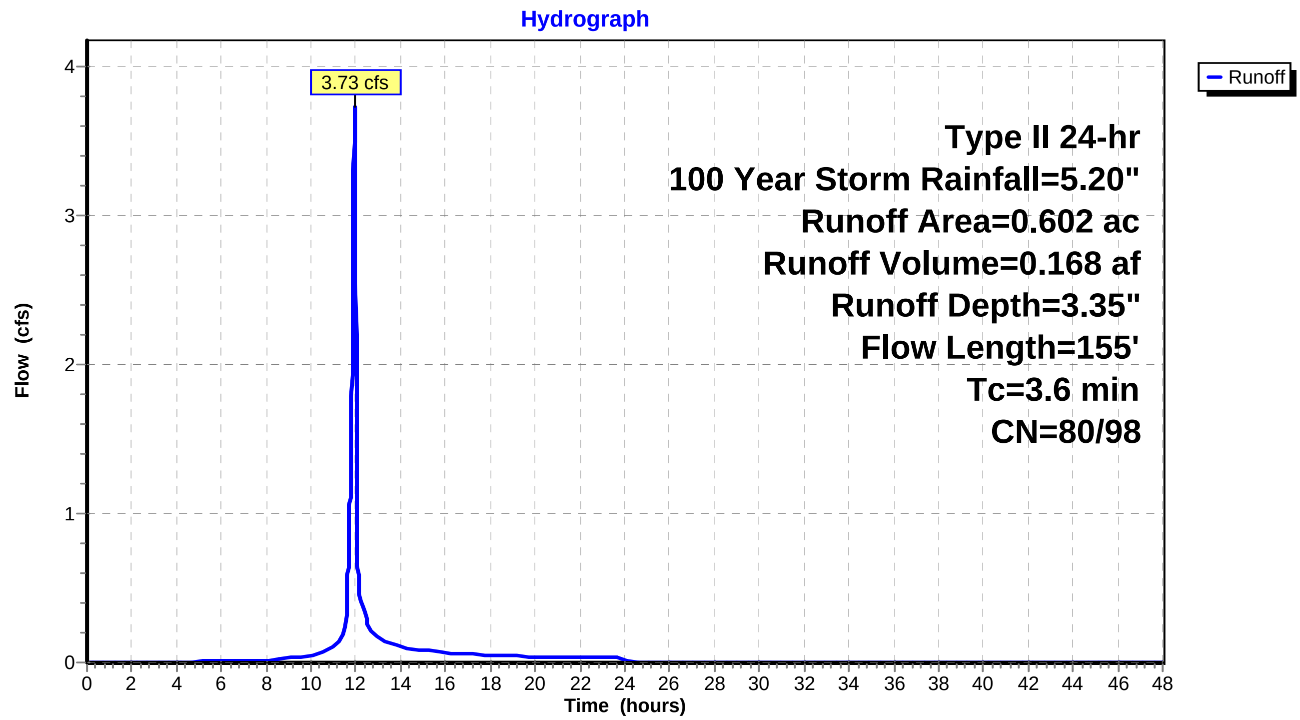
Runoff = 3.73 cfs @ 11.94 hrs, Volume= 0.168 af, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

Area (ac)	CN	Description
0.091	98	Paved roads w/curbs & sewers, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
0.029	80	>75% Grass cover, Good, HSG D
0.374	80	>75% Grass cover, Good, HSG D
0.602	83	Weighted Average
0.511		84.88% Pervious Area
0.091		15.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	97	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0389	4.00		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	40	0.1630	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	155	Total			

Subcatchment 58: Subcat 58



Summary for Subcatchment OS7a: OS7a

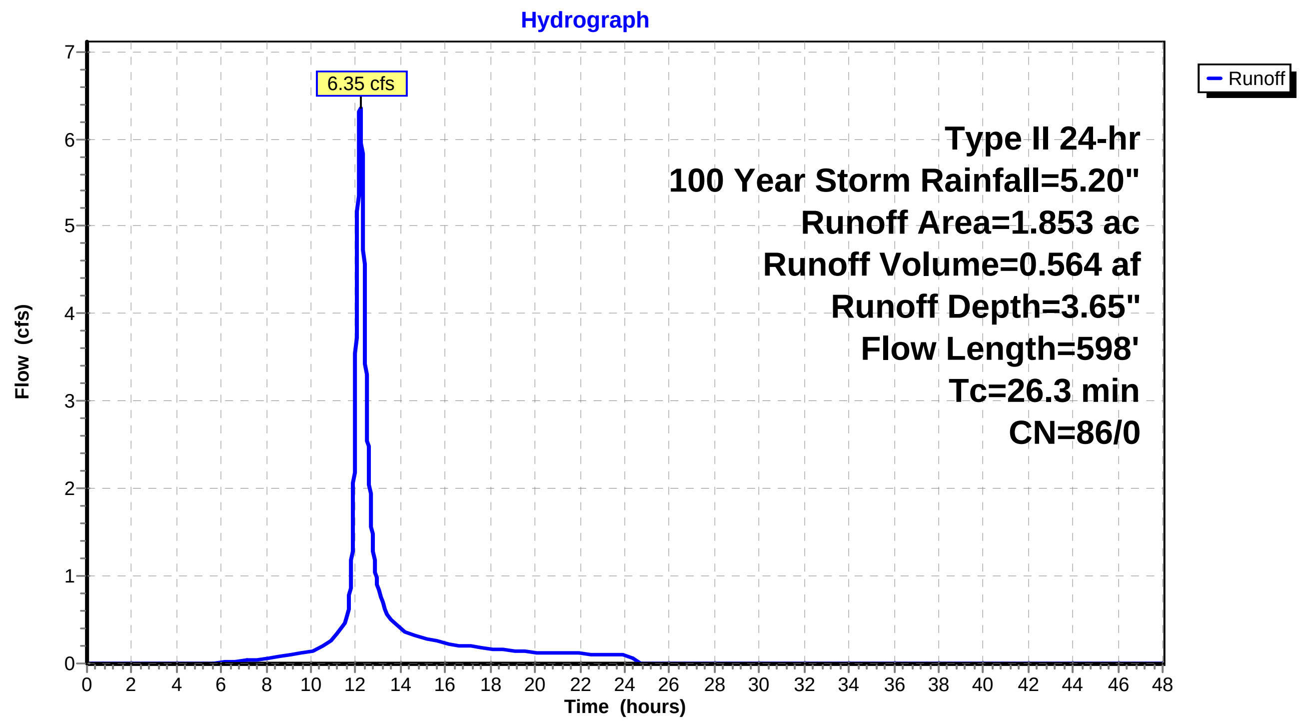
Runoff = 6.35 cfs @ 12.19 hrs, Volume= 0.564 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

	Area (ac)	CN	Description
*	1.853	86	weighted CN
	1.853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	50	0.0132	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.30"
8.5	410	0.0132	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	78	0.0256	9.51	16.81	**Pipe Channel, CMP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	60	0.1455	5.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.3	598	Total			

Subcatchment OS7a: OS7a



Summary for Subcatchment OS7b: OS7b

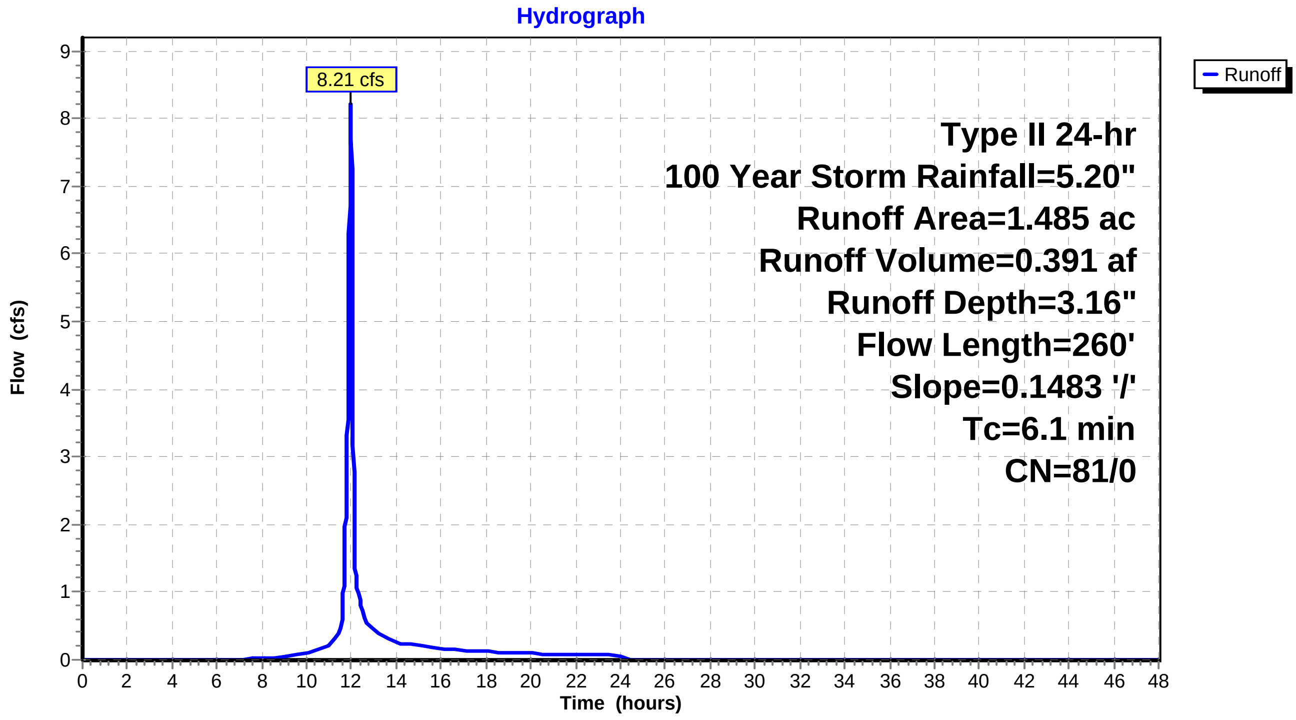
Runoff = 8.21 cfs @ 11.97 hrs, Volume= 0.391 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

	Area (ac)	CN	Description
*	1.485	81	weighted CN
	1.485		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.1483	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.8	210	0.1483	1.93		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.1	260	Total			

Subcatchment OS7b: OS7b



Summary for Subcatchment OS9a: OS9a

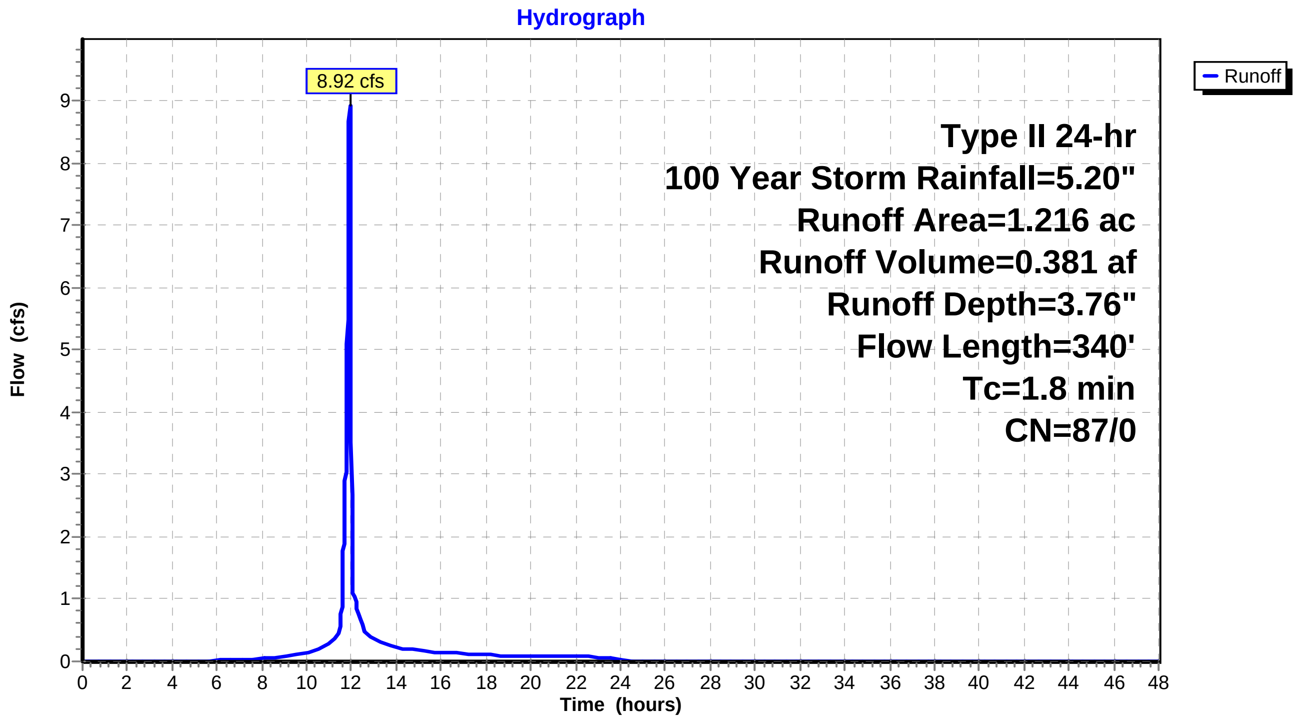
Runoff = 8.92 cfs @ 11.92 hrs, Volume= 0.381 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

	Area (ac)	CN	Description
*	1.216	87	weighted CN
	1.216		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0649	1.63		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.1	30	0.0649	5.17		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	160	0.1290	7.29		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	100	0.0211	2.18		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.8	340	Total			

Subcatchment OS9a: OS9a



Summary for Subcatchment OS9b: OS9b

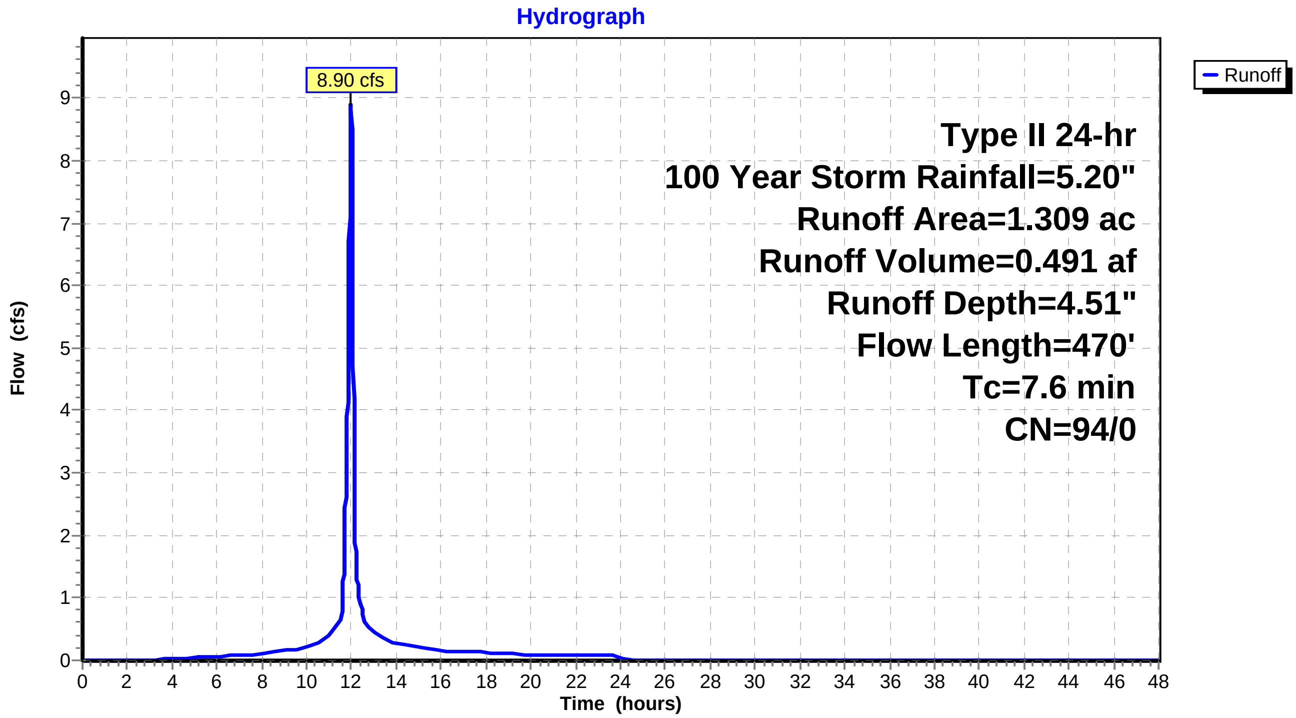
Runoff = 8.90 cfs @ 11.98 hrs, Volume= 0.491 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 Year Storm Rainfall=5.20"

	Area (ac)	CN	Description
*	1.309	94	weighted CN
	1.309		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0606	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.2	20	0.0606	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	400	0.0732	5.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.6	470	Total			

Subcatchment OS9b: OS9b



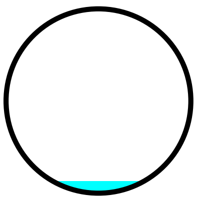
Summary for Reach P11: Pipe 11

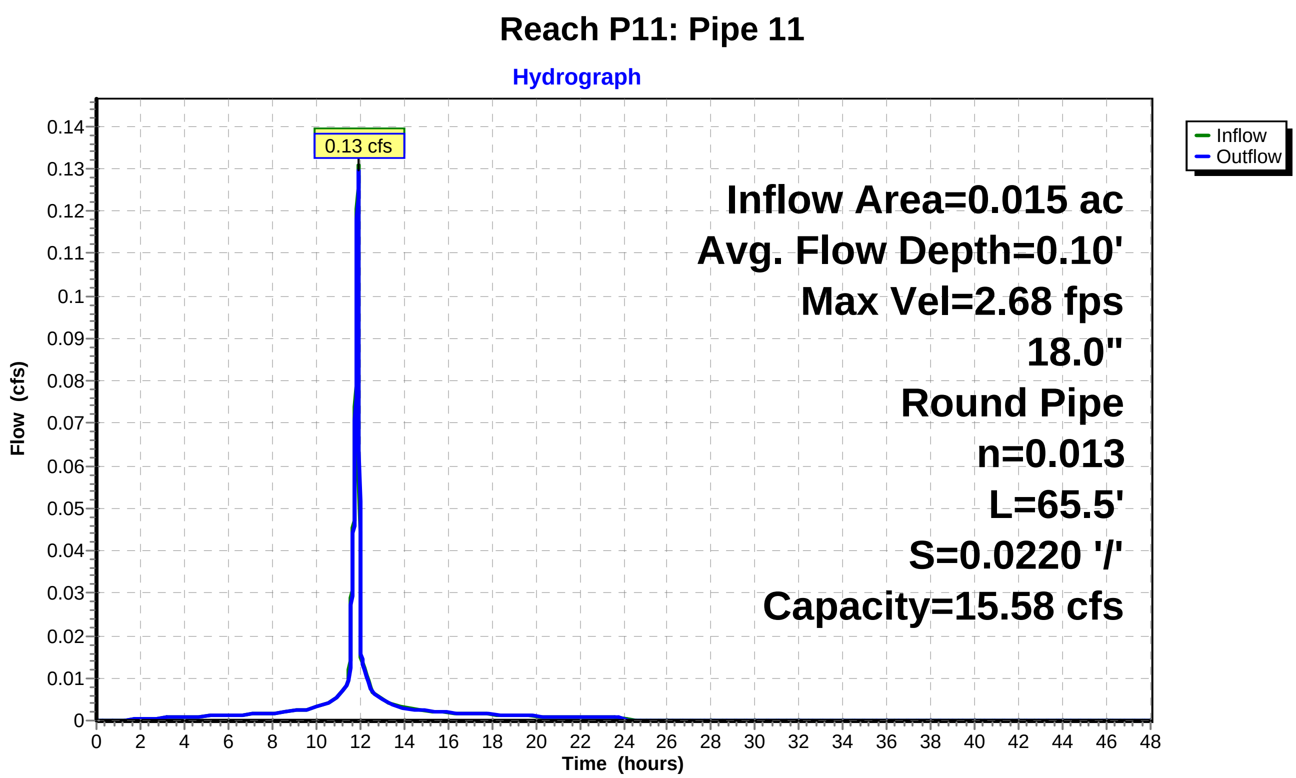
Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth = 4.96" for 100 Year Storm event
Inflow = 0.13 cfs @ 11.90 hrs, Volume= 0.006 af
Outflow = 0.13 cfs @ 11.91 hrs, Volume= 0.006 af, Atten= 1%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.68 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 1.3 min

Peak Storage= 3 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 15.58 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 65.5' Slope= 0.0220 '/'
Inlet Invert= 326.66', Outlet Invert= 325.22'





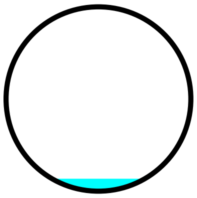
Summary for Reach P12: Pipe 12

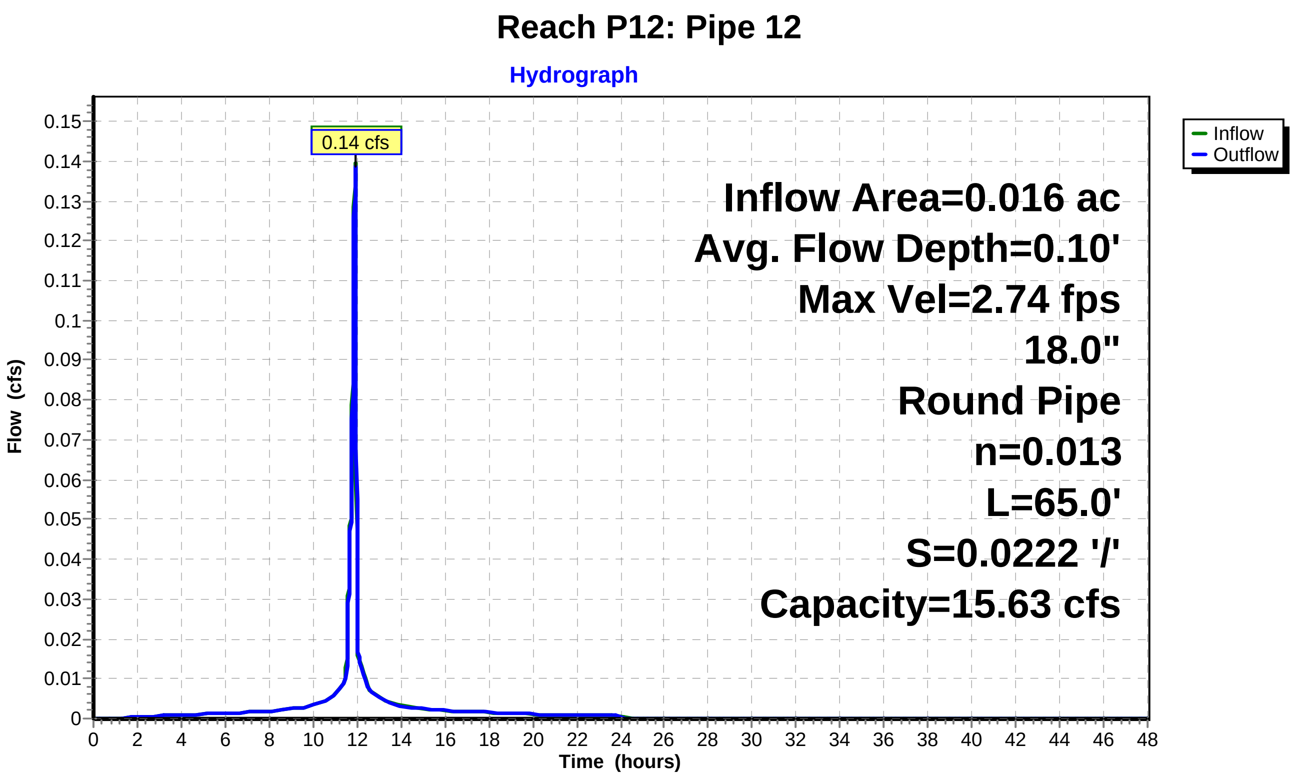
Inflow Area = 0.016 ac,100.00% Impervious, Inflow Depth = 4.96" for 100 Year Storm event
Inflow = 0.14 cfs @ 11.90 hrs, Volume= 0.007 af
Outflow = 0.14 cfs @ 11.91 hrs, Volume= 0.007 af, Atten= 1%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 1.3 min

Peak Storage= 3 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 15.63 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 65.0' Slope= 0.0222 '/'
Inlet Invert= 326.66', Outlet Invert= 325.22'





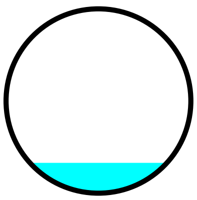
Summary for Reach P13: Pipe 13

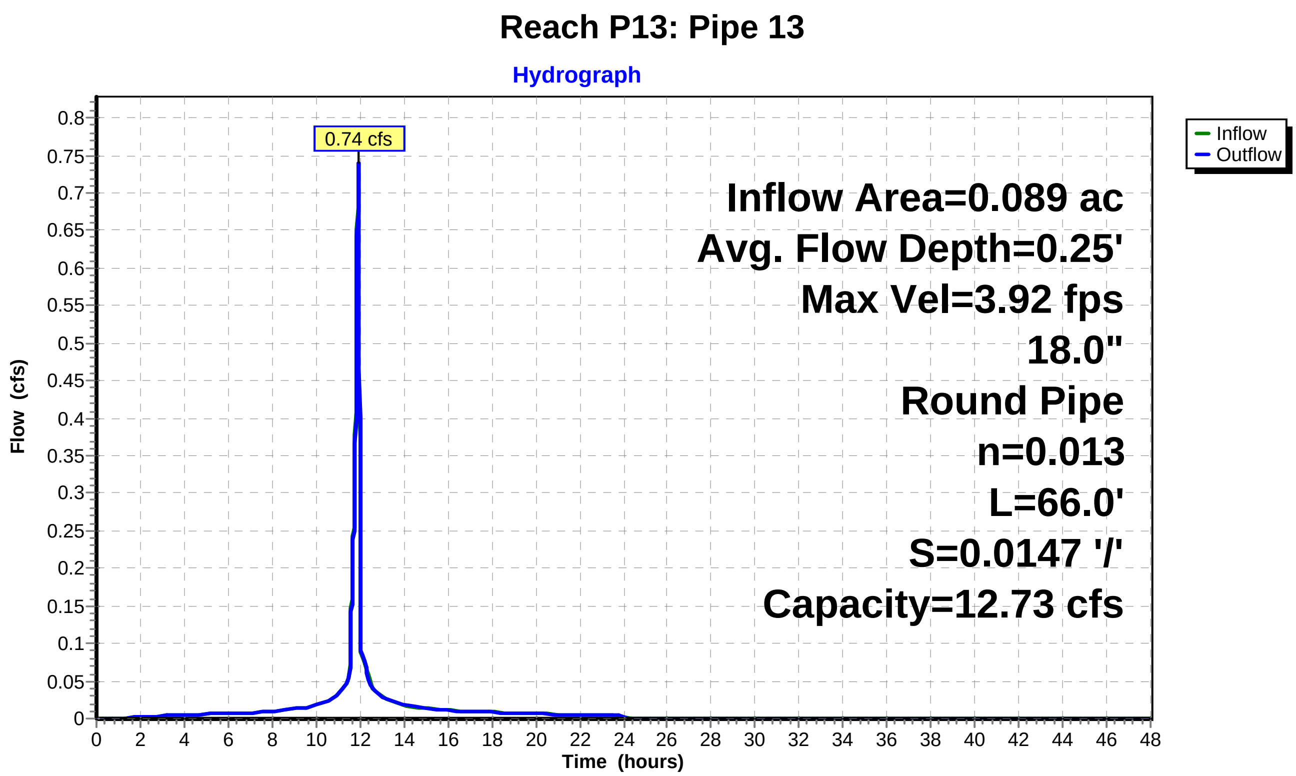
Inflow Area = 0.089 ac, 93.26% Impervious, Inflow Depth = 4.84" for 100 Year Storm event
Inflow = 0.74 cfs @ 11.91 hrs, Volume= 0.036 af
Outflow = 0.74 cfs @ 11.92 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.92 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 1.0 min

Peak Storage= 12 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.73 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 66.0' Slope= 0.0147 '/'
Inlet Invert= 325.12', Outlet Invert= 324.15'





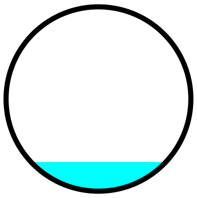
Summary for Reach P14: Pipe 14

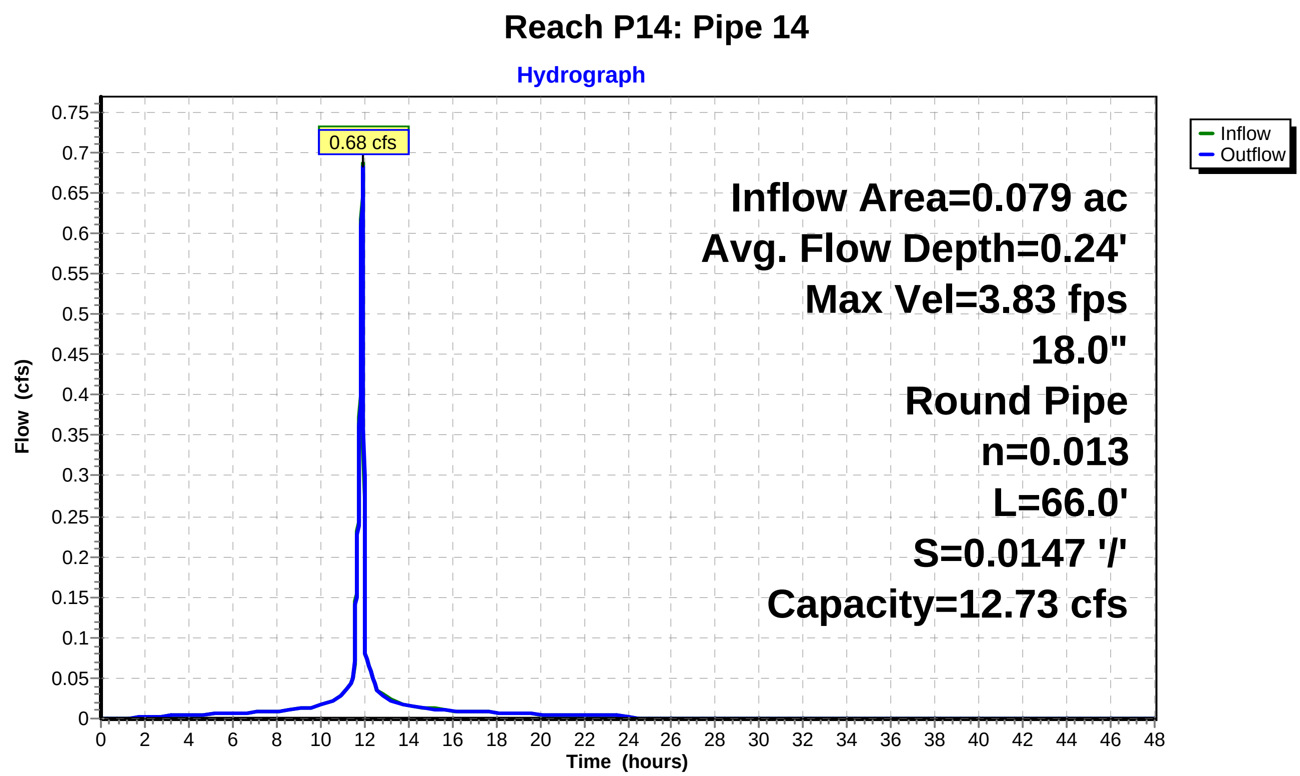
Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth = 4.96" for 100 Year Storm event
Inflow = 0.69 cfs @ 11.91 hrs, Volume= 0.033 af
Outflow = 0.68 cfs @ 11.91 hrs, Volume= 0.033 af, Atten= 1%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.83 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.0 min

Peak Storage= 12 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.73 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 66.0' Slope= 0.0147 '/'
Inlet Invert= 325.12', Outlet Invert= 324.15'





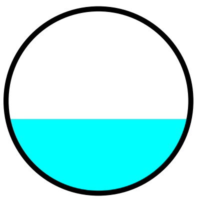
Summary for Reach P15: Pipe 15

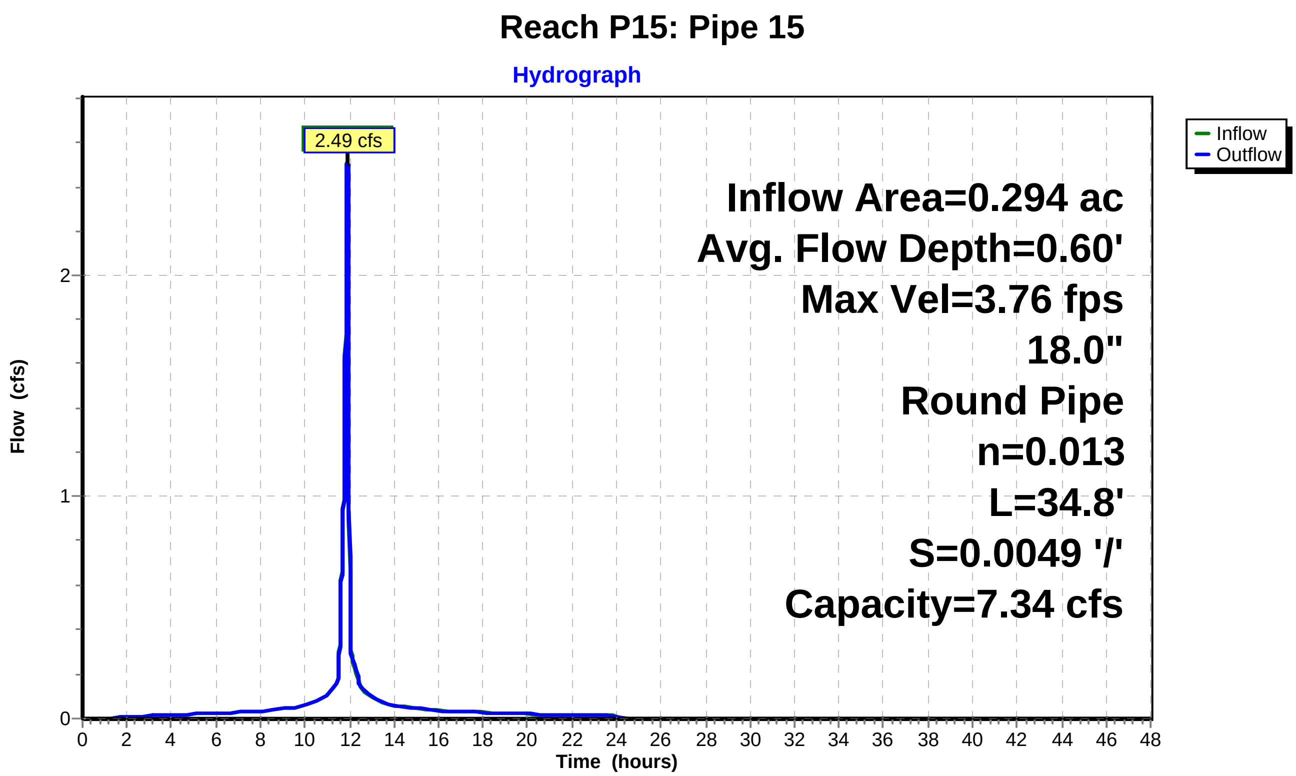
Inflow Area = 0.294 ac, 97.96% Impervious, Inflow Depth = 4.92" for 100 Year Storm event
Inflow = 2.50 cfs @ 11.91 hrs, Volume= 0.121 af
Outflow = 2.49 cfs @ 11.91 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 0.5 min

Peak Storage= 23 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.34 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.8' Slope= 0.0049 '/'
Inlet Invert= 323.93', Outlet Invert= 323.76'





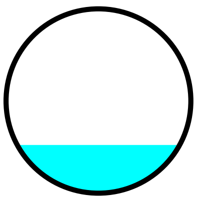
Summary for Reach P16: Pipe 16

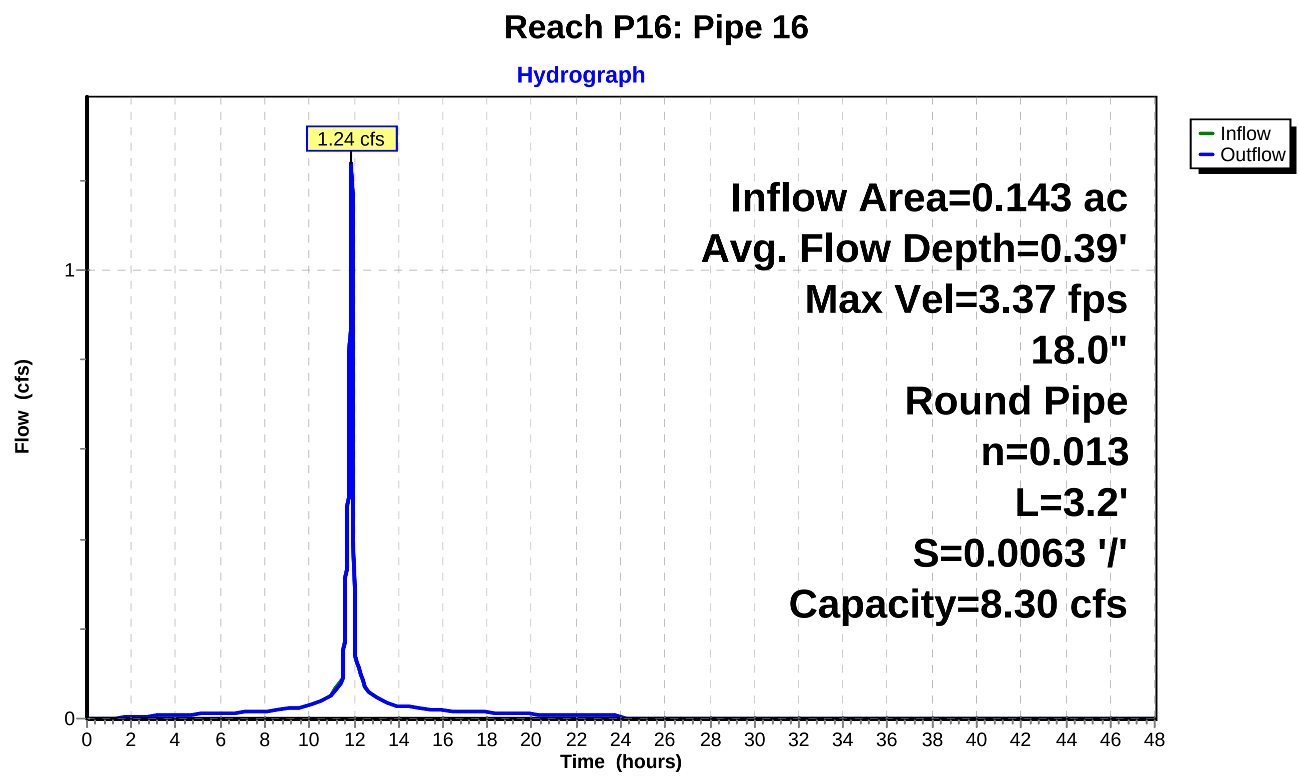
Inflow Area = 0.143 ac,100.00% Impervious, Inflow Depth = 4.96" for 100 Year Storm event
Inflow = 1.24 cfs @ 11.91 hrs, Volume= 0.059 af
Outflow = 1.24 cfs @ 11.91 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.30 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 3.2' Slope= 0.0063 '/'
Inlet Invert= 324.05', Outlet Invert= 324.03'





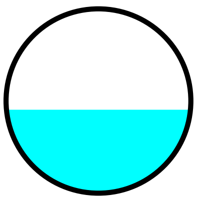
Summary for Reach P18: Pipe 18

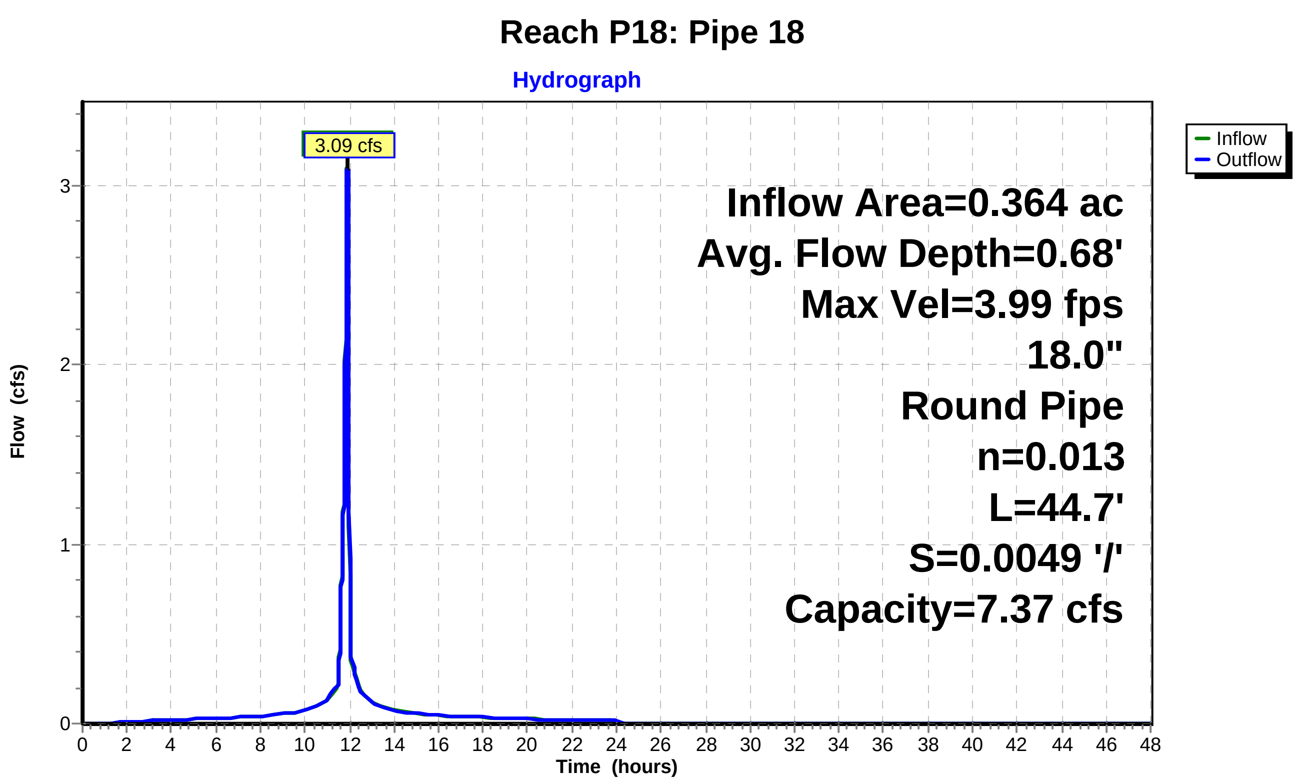
Inflow Area = 0.364 ac, 98.35% Impervious, Inflow Depth = 4.93" for 100 Year Storm event
Inflow = 3.10 cfs @ 11.91 hrs, Volume= 0.150 af
Outflow = 3.09 cfs @ 11.91 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 0.7 min

Peak Storage= 35 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.37 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 44.7' Slope= 0.0049 '/'
Inlet Invert= 323.04', Outlet Invert= 322.82'





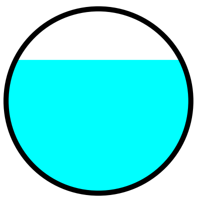
Summary for Reach P19: Pipe 19

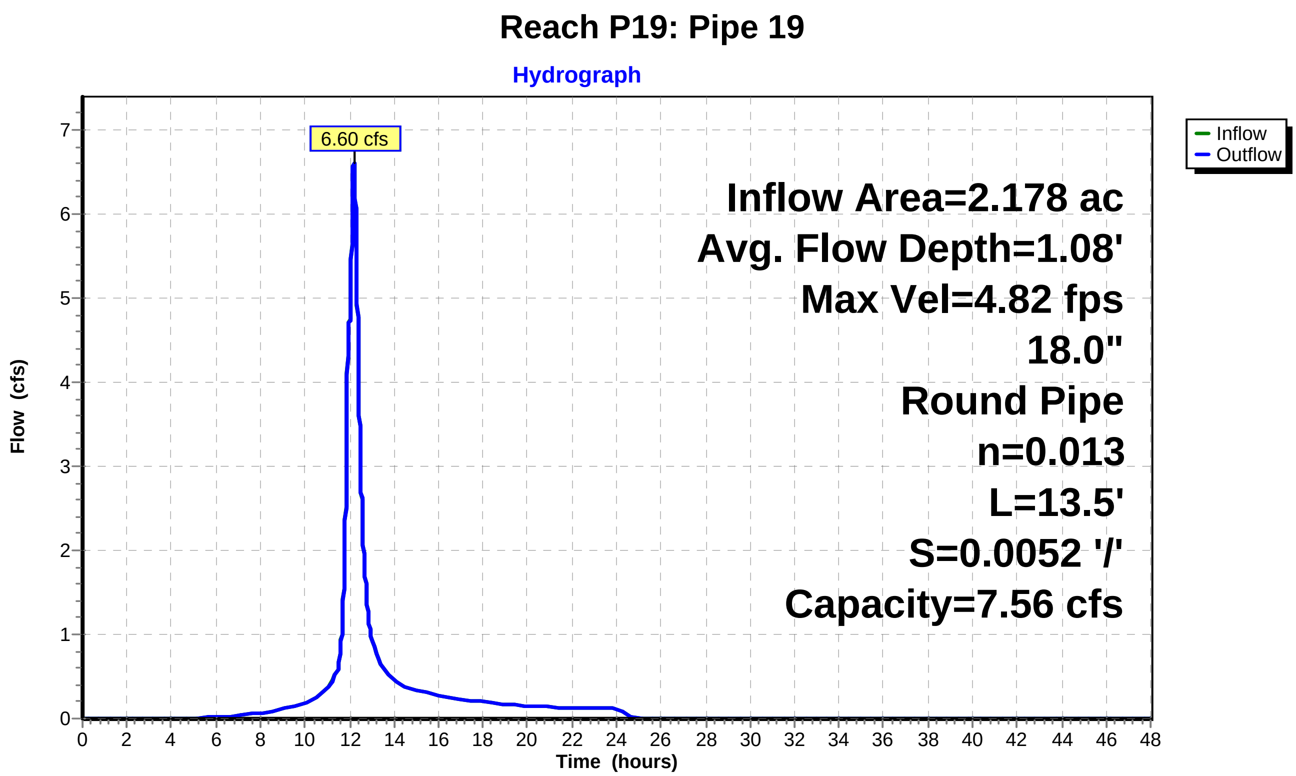
Inflow Area = 2.178 ac, 4.41% Impervious, Inflow Depth = 3.65" for 100 Year Storm event
Inflow = 6.60 cfs @ 12.19 hrs, Volume= 0.663 af
Outflow = 6.60 cfs @ 12.19 hrs, Volume= 0.663 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 0.1 min

Peak Storage= 18 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.08'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.56 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 13.5' Slope= 0.0052 '/'
Inlet Invert= 322.97', Outlet Invert= 322.90'





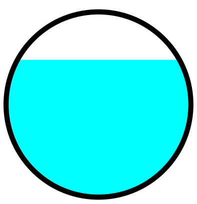
Summary for Reach P20: Pipe 20

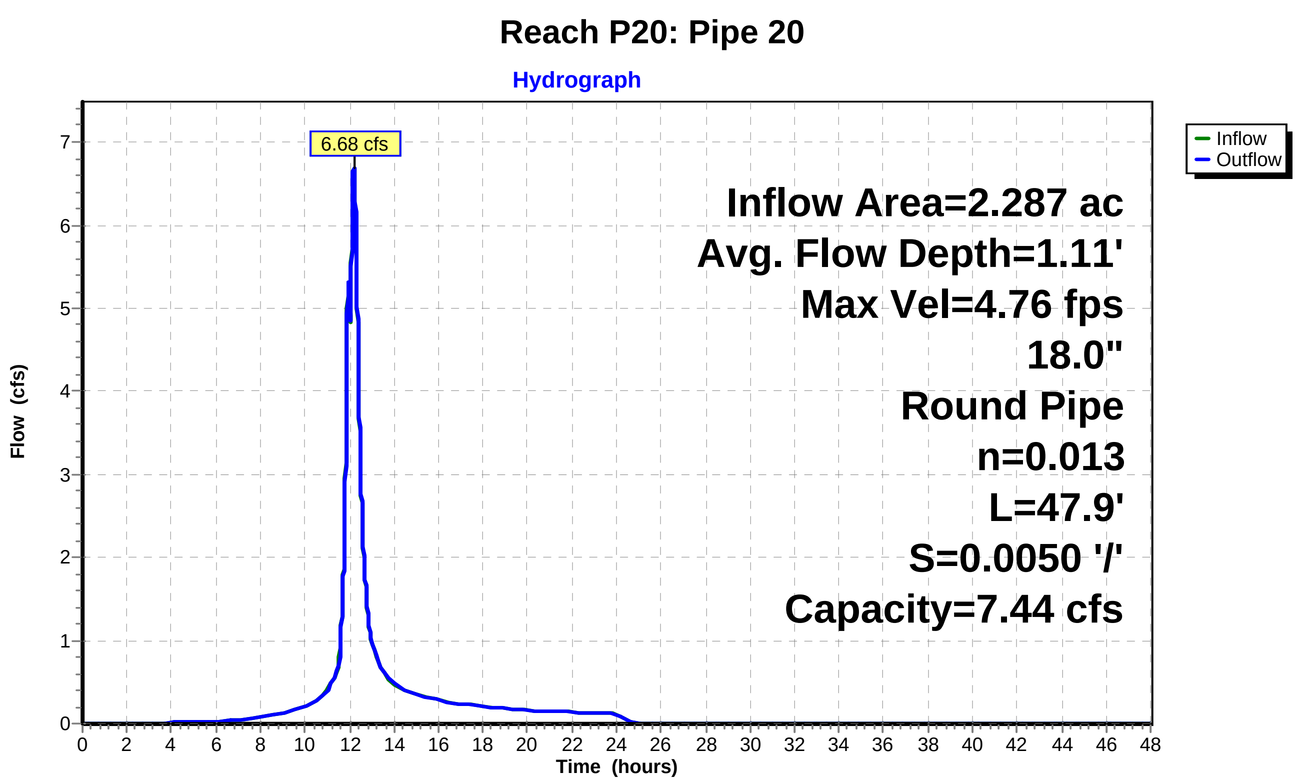
Inflow Area = 2.287 ac, 8.44% Impervious, Inflow Depth = 3.70" for 100 Year Storm event
Inflow = 6.69 cfs @ 12.19 hrs, Volume= 0.706 af
Outflow = 6.68 cfs @ 12.19 hrs, Volume= 0.706 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.63 fps, Avg. Travel Time= 0.5 min

Peak Storage= 67 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.44 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 47.9' Slope= 0.0050 '/'
Inlet Invert= 322.40', Outlet Invert= 322.16'





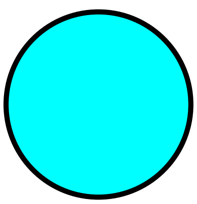
Summary for Reach P21: Pipe 21

Inflow Area = 2.679 ac, 21.50% Impervious, Inflow Depth = 3.88" for 100 Year Storm event
Inflow = 8.36 cfs @ 11.92 hrs, Volume= 0.866 af
Outflow = 7.82 cfs @ 11.90 hrs, Volume= 0.866 af, Atten= 6%, Lag= 0.0 min

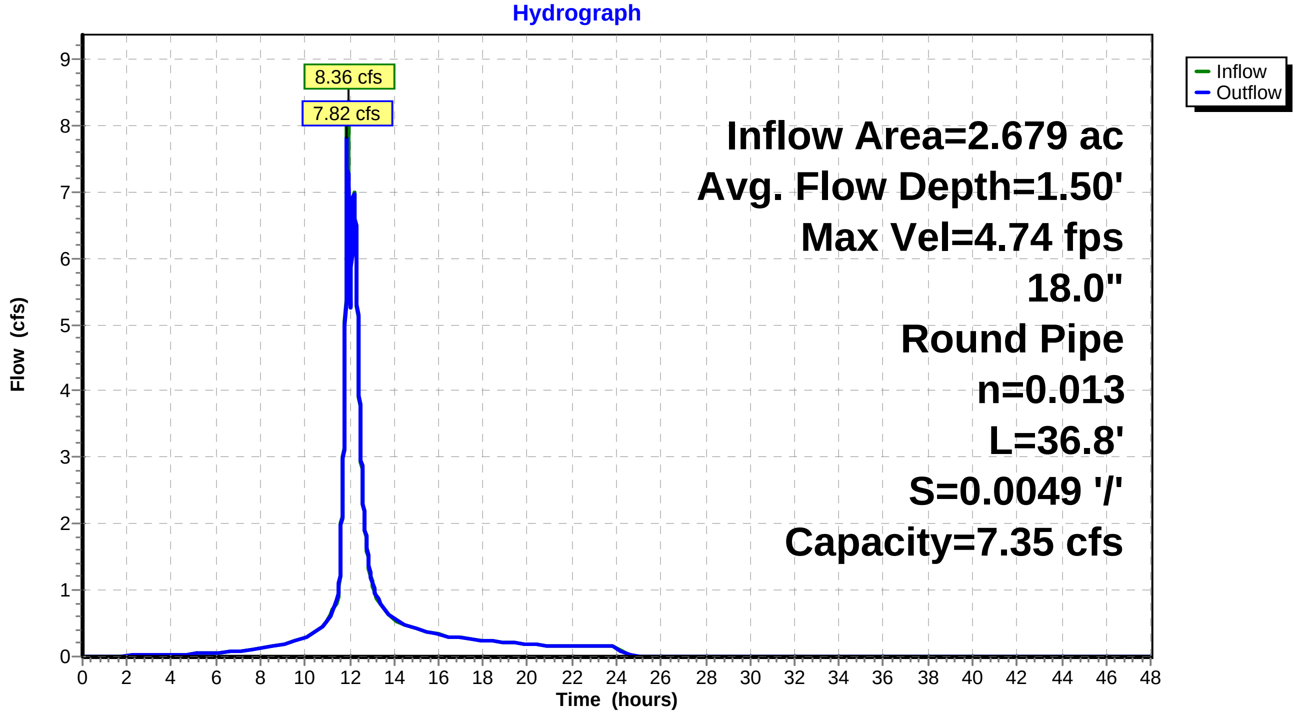
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 0.3 min

Peak Storage= 65 cf @ 11.91 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.35 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 36.8' Slope= 0.0049 '/'
Inlet Invert= 321.66', Outlet Invert= 321.48'



Reach P21: Pipe 21



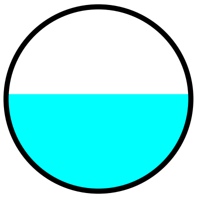
Summary for Reach P22: Pipe 22

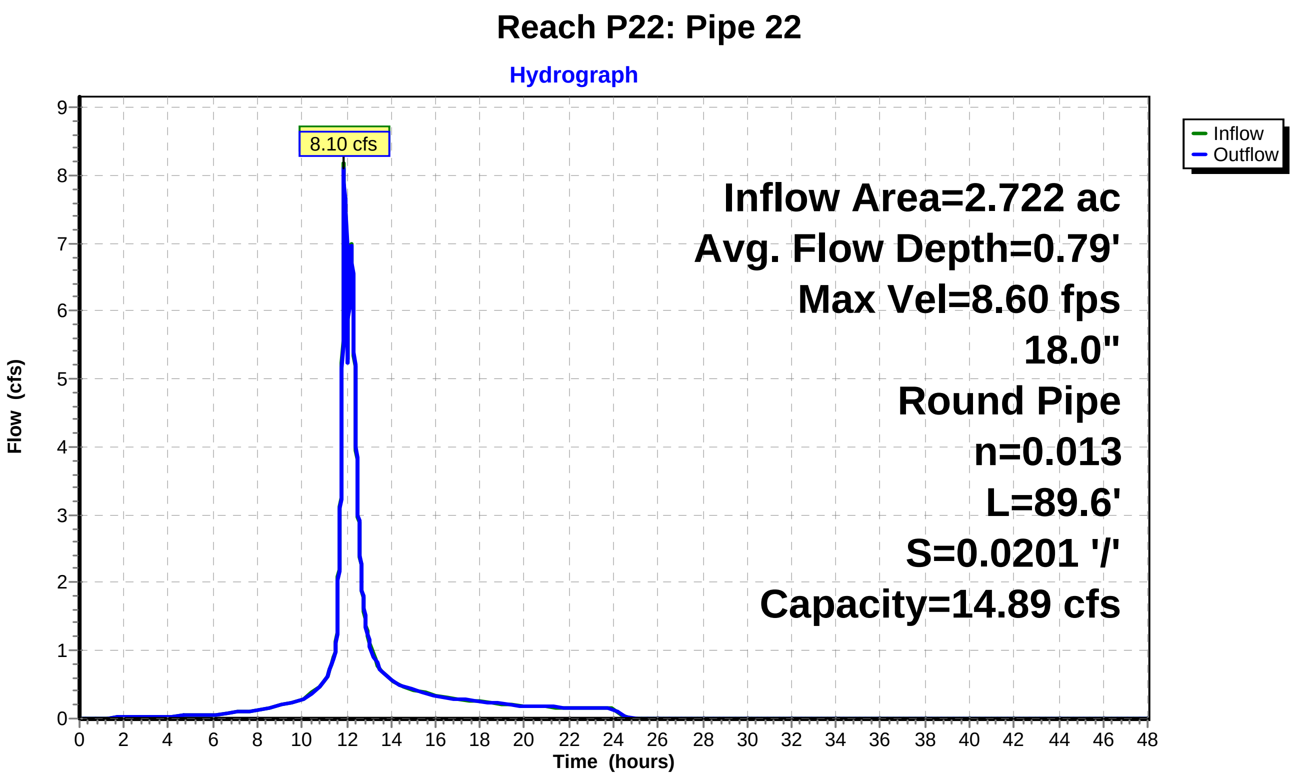
Inflow Area = 2.722 ac, 22.63% Impervious, Inflow Depth = 3.90" for 100 Year Storm event
Inflow = 8.18 cfs @ 11.90 hrs, Volume= 0.884 af
Outflow = 8.10 cfs @ 11.90 hrs, Volume= 0.884 af, Atten= 1%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.60 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.94 fps, Avg. Travel Time= 0.5 min

Peak Storage= 84 cf @ 11.90 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 14.89 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 89.6' Slope= 0.0201 '/'
Inlet Invert= 320.98', Outlet Invert= 319.18'



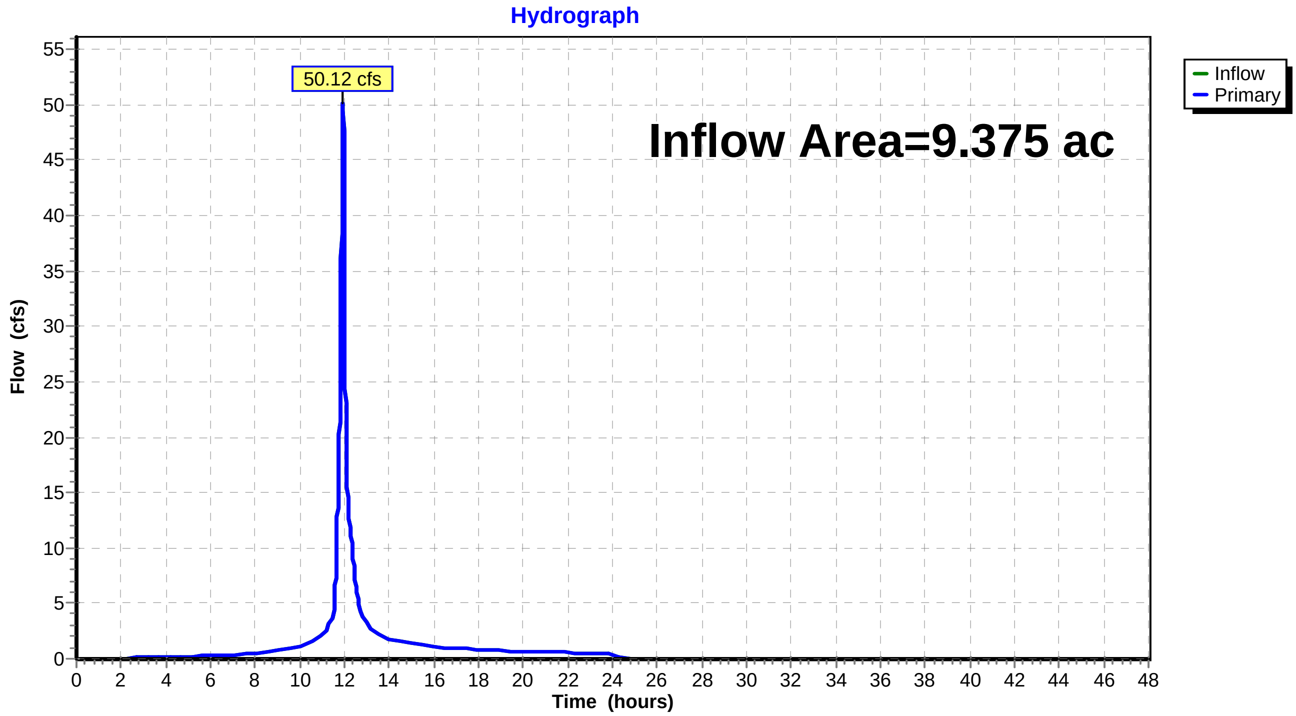


Summary for Pond 007: POI 007

Inflow Area = 9.375 ac, 23.57% Impervious, Inflow Depth = 3.94" for 100 Year Storm event
Inflow = 50.12 cfs @ 11.93 hrs, Volume= 3.075 af
Primary = 50.12 cfs @ 11.93 hrs, Volume= 3.075 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Pond 007: POI 007



Summary for Pond P1: Pipe 1

Inflow Area =	0.324 ac,	90.74% Impervious,	Inflow Depth = 4.79"	for 100 Year Storm event	
Inflow =	2.53 cfs @	11.94 hrs,	Volume=	0.129 af	
Outflow =	2.62 cfs @	11.94 hrs,	Volume=	0.129 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.62 cfs @	11.94 hrs,	Volume=	0.129 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 336.69' @ 11.97 hrs Surf.Area= 13 sf Storage= 50 cf

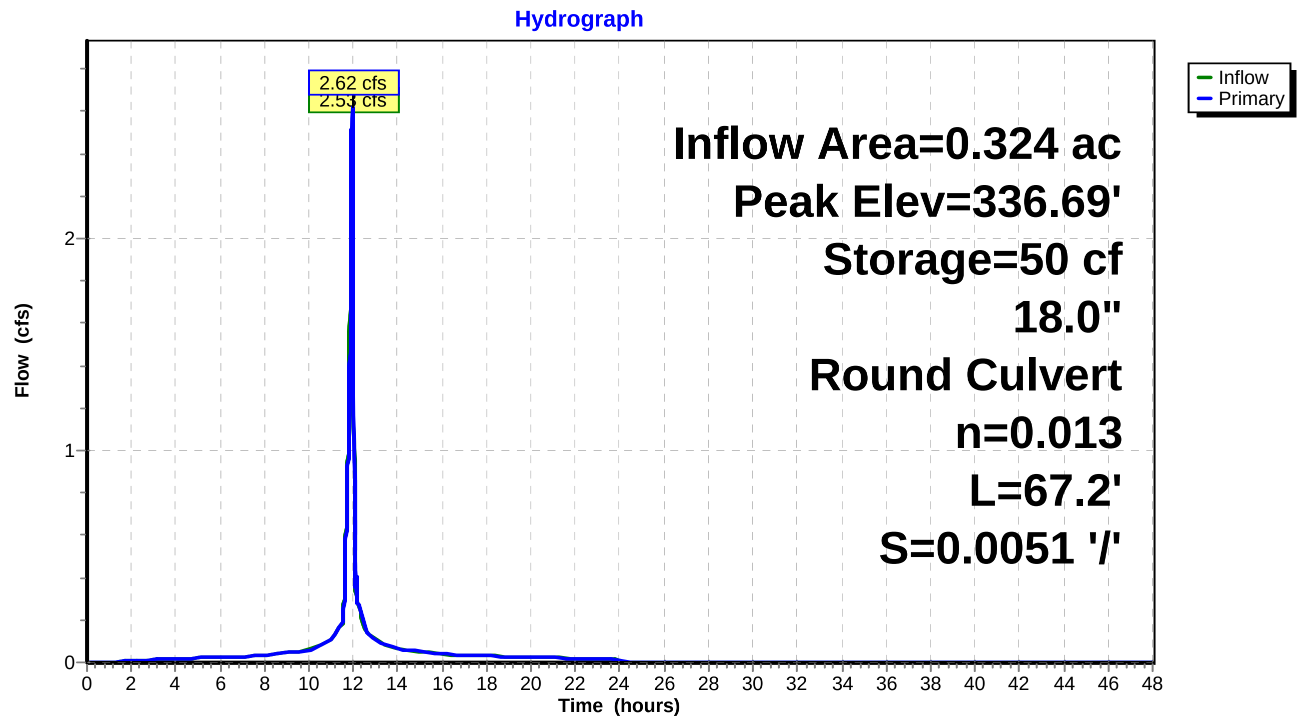
Plug-Flow detention time= 0.5 min calculated for 0.129 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (745.8 - 745.3)

Volume	Invert	Avail.Storage	Storage Description
#1	321.64'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	321.64'	**18.0" Round Culvert** L= 67.2' Ke= 0.500 Inlet / Outlet Invert= 321.64' / 321.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.94 hrs HW=334.49' TW=335.60' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Pond P1: Pipe 1



Summary for Pond P10: Pipe 10

Inflow Area = 5.709 ac, 23.66% Impervious, Inflow Depth = 4.02" for 100 Year Storm event
Inflow = 36.48 cfs @ 11.94 hrs, Volume= 1.911 af
Outflow = 36.36 cfs @ 11.93 hrs, Volume= 1.911 af, Atten= 0%, Lag= 0.0 min
Primary = 36.36 cfs @ 11.93 hrs, Volume= 1.911 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 322.30' @ 11.93 hrs Surf.Area= 13 sf Storage= 49 cf

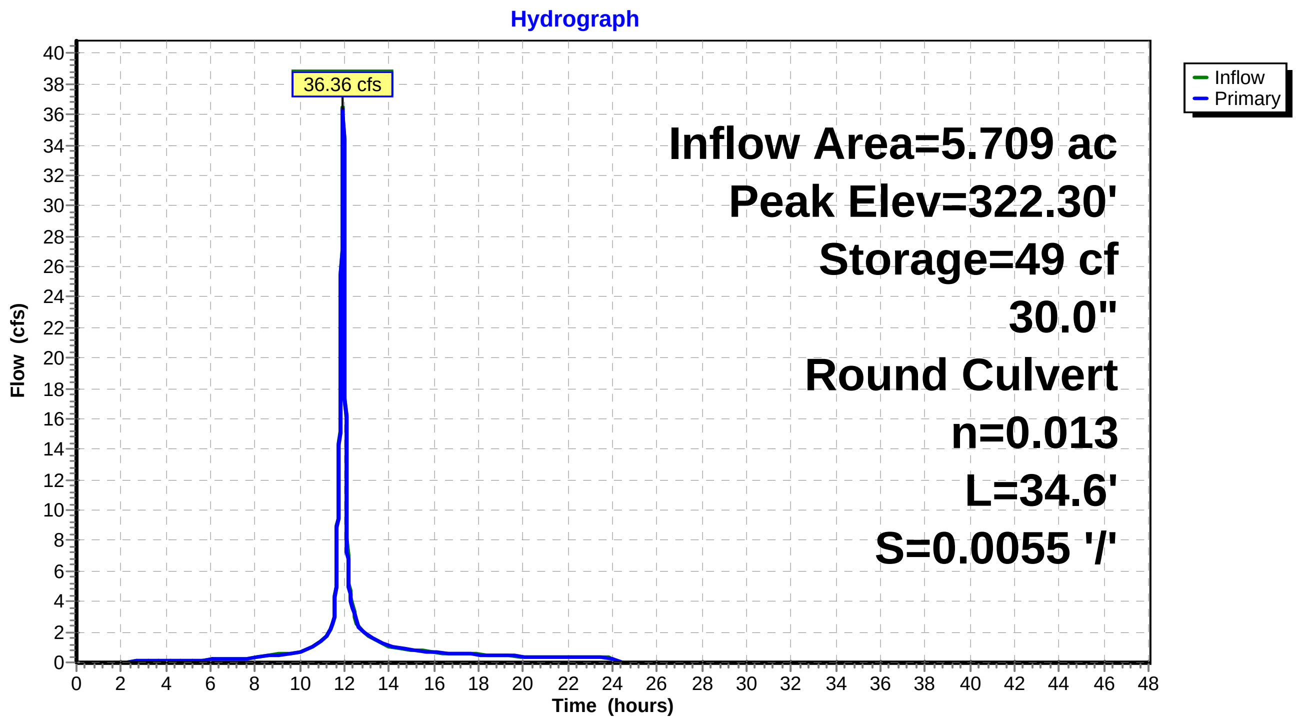
Plug-Flow detention time= 0.1 min calculated for 1.911 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (777.4 - 777.4)

Volume	Invert	Avail.Storage	Storage Description
#1	318.44'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	318.44'	**30.0" Round Culvert** L= 34.6' Ke= 0.500 Inlet / Outlet Invert= 318.44' / 318.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=36.32 cfs @ 11.93 hrs HW=322.30' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 36.32 cfs @ 7.40 fps)

Pond P10: Pipe 10



Summary for Pond P2: Pipe 2

Inflow Area = 1.772 ac, 23.87% Impervious, Inflow Depth = 4.58" for 100 Year Storm event
Inflow = 11.81 cfs @ 11.96 hrs, Volume= 0.677 af
Outflow = 11.93 cfs @ 11.96 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min
Primary = 11.93 cfs @ 11.96 hrs, Volume= 0.677 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 336.63' @ 11.96 hrs Surf.Area= 13 sf Storage= 50 cf

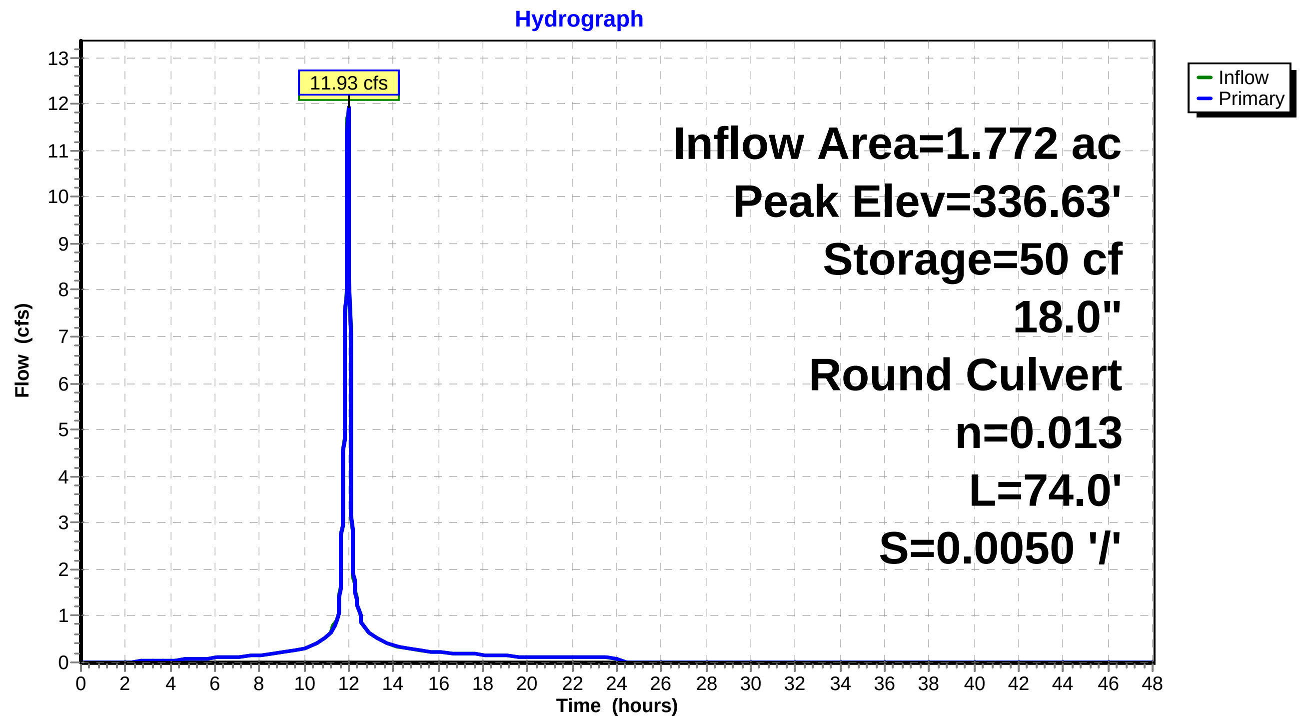
Plug-Flow detention time= 0.3 min calculated for 0.677 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (763.5 - 763.3)

Volume	Invert	Avail.Storage	Storage Description
#1	321.30'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	321.30'	**18.0" Round Culvert** L= 74.0' Ke= 0.500 Inlet / Outlet Invert= 321.30' / 320.93' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.32 cfs @ 11.96 hrs HW=336.62' TW=334.47' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 12.32 cfs @ 6.97 fps)

Pond P2: Pipe 2



Summary for Pond P23: Pipe 23

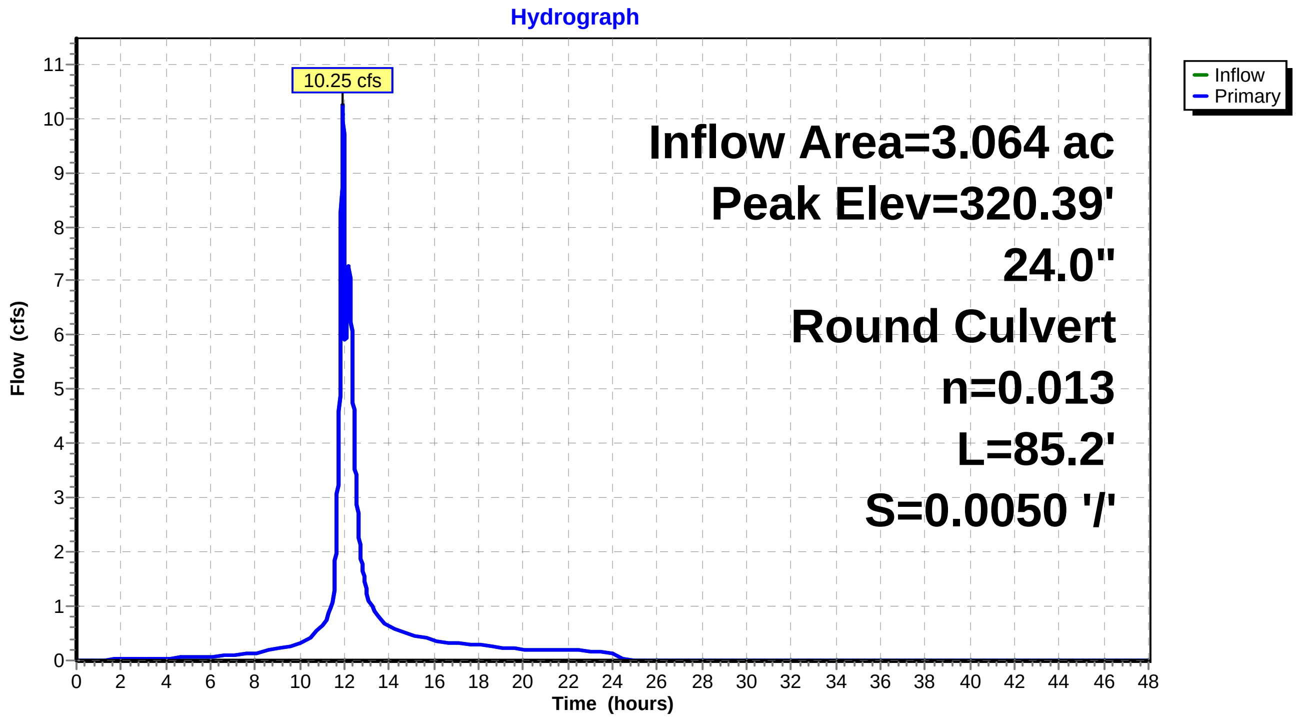
Inflow Area =	3.064 ac,	25.07% Impervious,	Inflow Depth = 3.90"	for 100 Year Storm event
Inflow =	10.25 cfs @	11.90 hrs, Volume=	0.995 af	
Outflow =	10.25 cfs @	11.90 hrs, Volume=	0.995 af, Atten= 0%, Lag= 0.0 min	
Primary =	10.25 cfs @	11.90 hrs, Volume=	0.995 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 320.39' @ 11.90 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	318.68'	**24.0" Round Culvert** L= 85.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 318.68' / 318.25' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.18 cfs @ 11.90 hrs HW=320.38' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 10.18 cfs @ 4.80 fps)

Pond P23: Pipe 23



Summary for Pond P3: Pipe 3

Inflow Area =	3.221 ac, 19.78% Impervious, Inflow Depth = 4.29"	for 100 Year Storm event	
Inflow =	21.69 cfs @ 11.92 hrs, Volume=	1.151 af	
Outflow =	21.78 cfs @ 11.92 hrs, Volume=	1.151 af, Atten= 0%, Lag= 0.0 min	
Primary =	21.78 cfs @ 11.92 hrs, Volume=	1.151 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 334.61' @ 11.95 hrs Surf.Area= 13 sf Storage= 50 cf

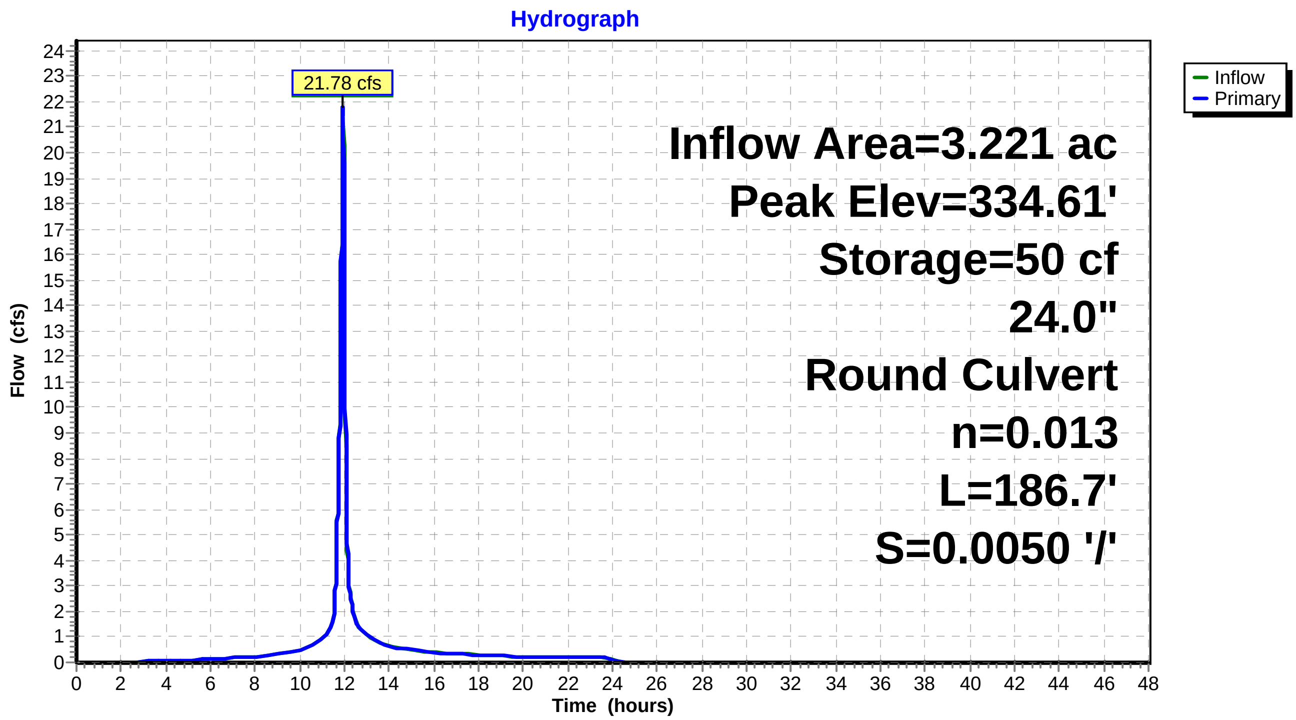
Plug-Flow detention time= 0.2 min calculated for 1.151 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (771.7 - 771.6)

Volume	Invert	Avail.Storage	Storage Description
#1	320.93'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.93'	**24.0" Round Culvert** L= 186.7' Ke= 0.500 Inlet / Outlet Invert= 320.93' / 320.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=17.30 cfs @ 11.92 hrs HW=332.73' TW=330.93' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 17.30 cfs @ 5.51 fps)

Pond P3: Pipe 3



Summary for Pond P4: Pipe 4

Inflow Area = 3.490 ac, 22.66% Impervious, Inflow Depth = 4.28" for 100 Year Storm event
Inflow = 23.88 cfs @ 11.92 hrs, Volume= 1.244 af
Outflow = 23.82 cfs @ 11.92 hrs, Volume= 1.244 af, Atten= 0%, Lag= 0.0 min
Primary = 23.82 cfs @ 11.92 hrs, Volume= 1.244 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 332.08' @ 11.94 hrs Surf.Area= 13 sf Storage= 50 cf

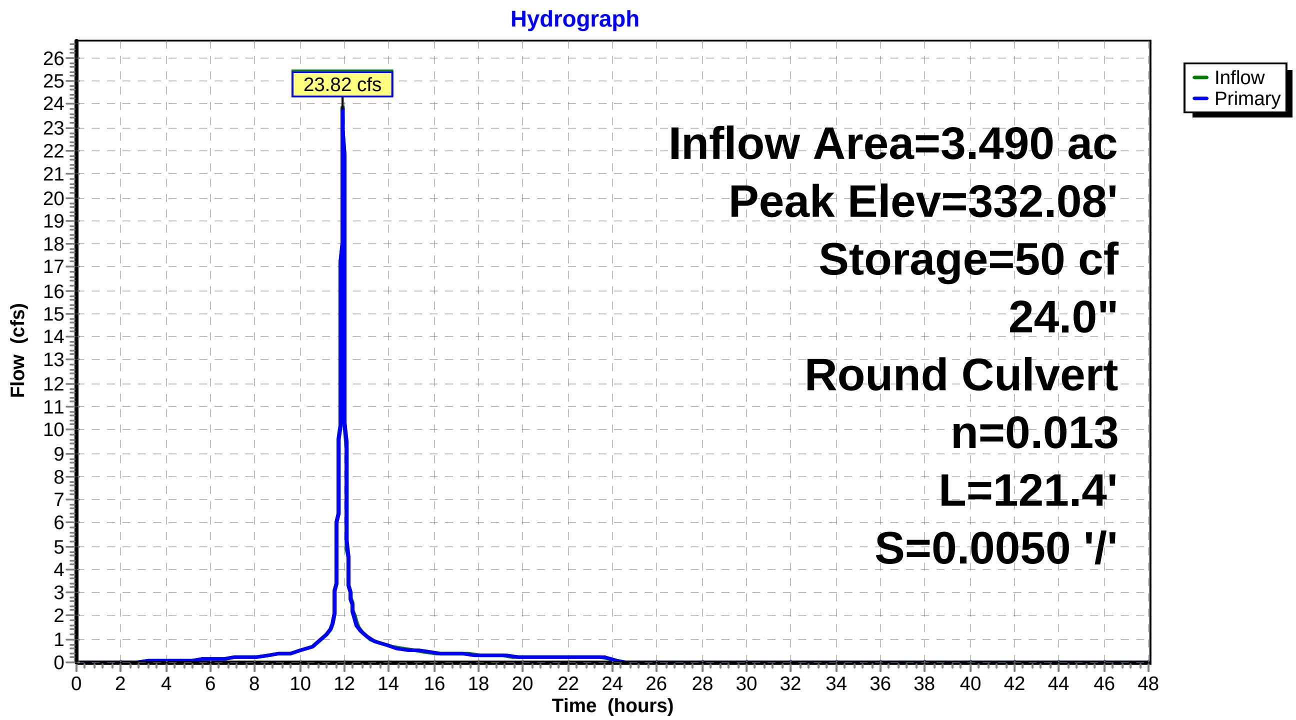
Plug-Flow detention time= 0.1 min calculated for 1.243 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (771.1 - 771.0)

Volume	Invert	Avail.Storage	Storage Description
#1	320.00'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.00'	**24.0" Round Culvert** L= 121.4' Ke= 0.500 Inlet / Outlet Invert= 320.00' / 319.39' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=20.51 cfs @ 11.92 hrs HW=331.18' TW=329.19' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 20.51 cfs @ 6.53 fps)

Pond P4: Pipe 4



Summary for Pond P5: Pipe 5

Inflow Area =	0.212 ac,	48.11% Impervious,	Inflow Depth = 3.98"	for 100 Year Storm event
Inflow =	1.53 cfs @	11.92 hrs, Volume=	0.070 af	
Outflow =	1.65 cfs @	11.92 hrs, Volume=	0.070 af, Atten= 0%, Lag= 0.0 min	
Primary =	1.65 cfs @	11.92 hrs, Volume=	0.070 af	

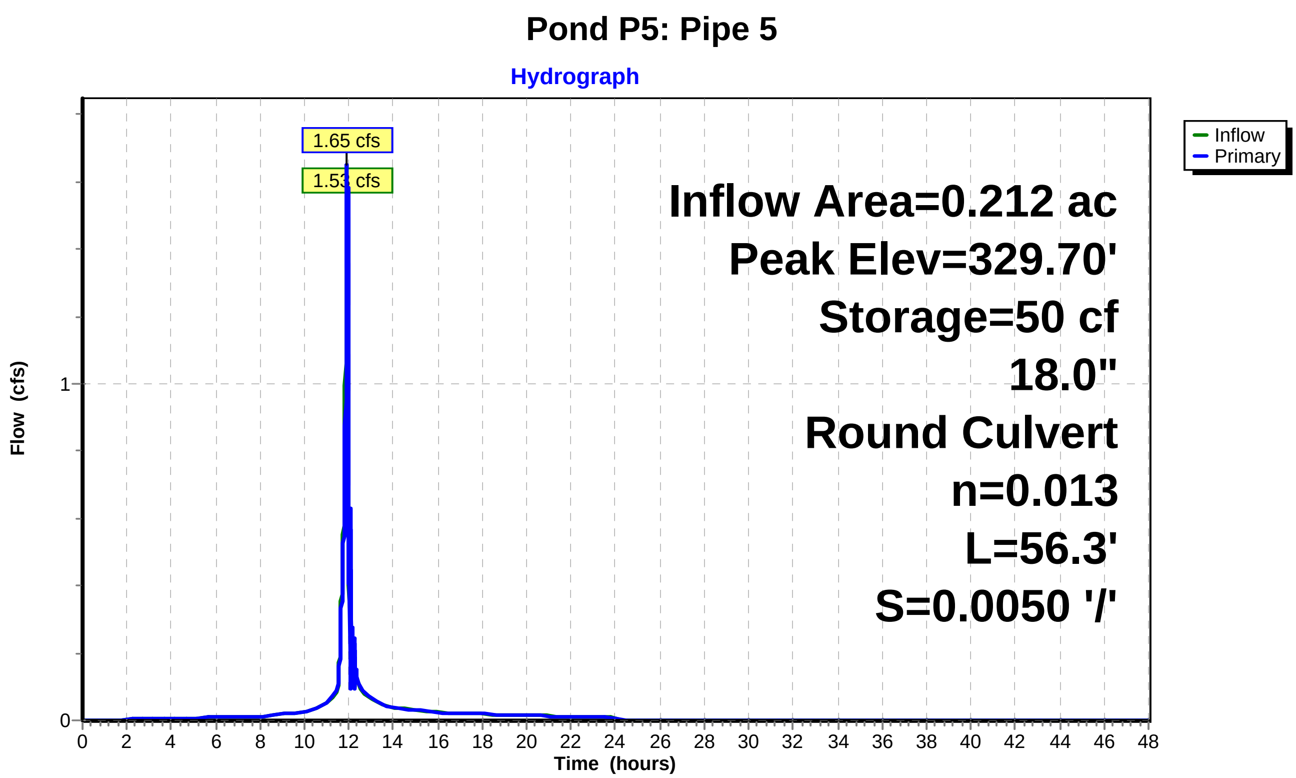
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.70' @ 11.96 hrs Surf.Area= 13 sf Storage= 50 cf

Plug-Flow detention time= 0.7 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (769.9 - 769.2)

Volume	Invert	Avail.Storage	Storage Description
#1	320.00'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.00'	**18.0" Round Culvert** L= 56.3' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 320.00' / 319.72' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.92 hrs HW=327.62' TW=328.37' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Summary for Pond P6: Pipe 6

Inflow Area = 0.303 ac, 58.75% Impervious, Inflow Depth = 4.18" for 100 Year Storm event
Inflow = 2.38 cfs @ 11.92 hrs, Volume= 0.106 af
Outflow = 2.32 cfs @ 11.92 hrs, Volume= 0.106 af, Atten= 3%, Lag= 0.0 min
Primary = 2.32 cfs @ 11.92 hrs, Volume= 0.106 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.67' @ 11.95 hrs Surf.Area= 13 sf Storage= 50 cf

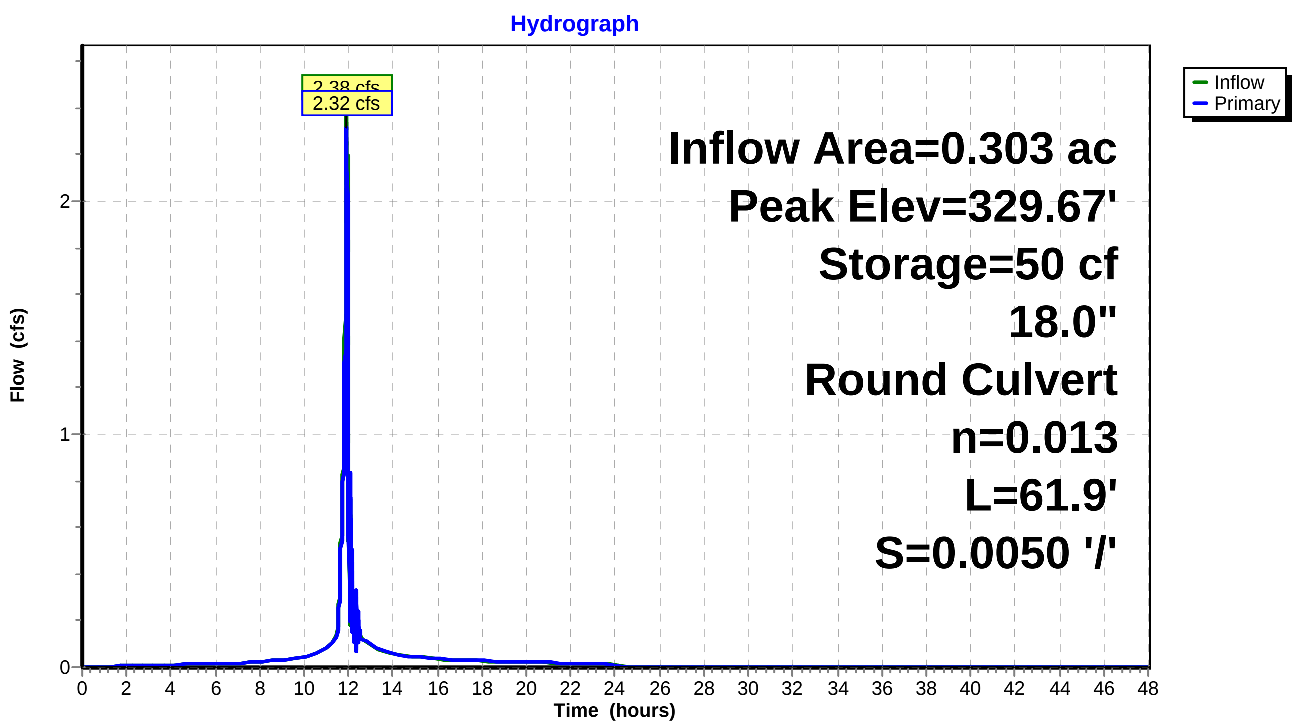
Plug-Flow detention time= 0.6 min calculated for 0.106 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (762.7 - 762.1)

Volume	Invert	Avail.Storage	Storage Description
#1	319.65'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.65'	**18.0" Round Culvert** L= 61.9' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 319.65' / 319.34' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.92 hrs HW=328.30' TW=329.03' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Pond P6: Pipe 6



Summary for Pond P7: Pipe 7

Inflow Area = 5.394 ac, 19.48% Impervious, Inflow Depth = 3.97" for 100 Year Storm event
Inflow = 33.99 cfs @ 11.94 hrs, Volume= 1.783 af
Outflow = 33.93 cfs @ 11.94 hrs, Volume= 1.783 af, Atten= 0%, Lag= 0.0 min
Primary = 33.93 cfs @ 11.94 hrs, Volume= 1.783 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.63' @ 11.94 hrs Surf.Area= 13 sf Storage= 50 cf

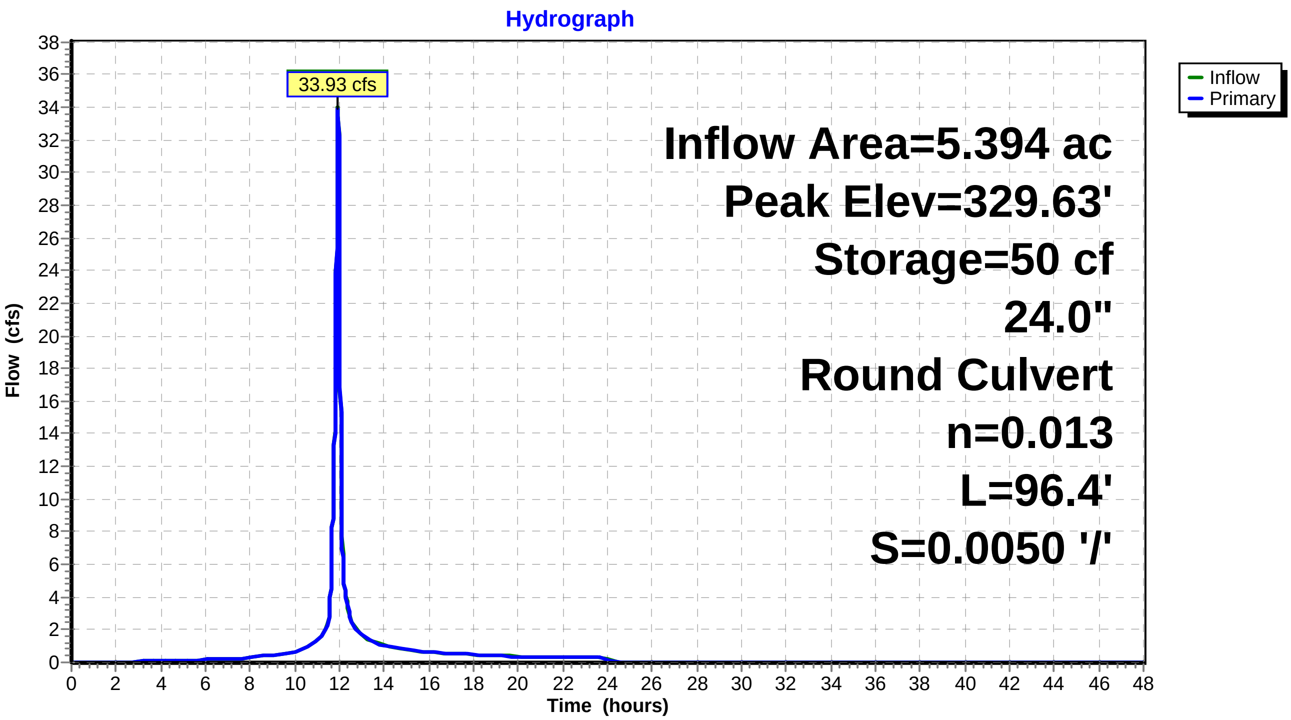
Plug-Flow detention time= 0.1 min calculated for 1.783 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (779.8 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	319.19'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.19'	**24.0" Round Culvert** L= 96.4' Ke= 0.500 Inlet / Outlet Invert= 319.19' / 318.71' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=33.51 cfs @ 11.94 hrs HW=329.56' TW=324.65' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 33.51 cfs @ 10.67 fps)

Pond P7: Pipe 7



Summary for Pond P8: Pipe 8

Inflow Area = 0.142 ac, 98.59% Impervious, Inflow Depth = 4.94" for 100 Year Storm event
Inflow = 1.16 cfs @ 11.93 hrs, Volume= 0.058 af
Outflow = 1.24 cfs @ 11.93 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.1 min
Primary = 1.24 cfs @ 11.93 hrs, Volume= 0.058 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 324.70' @ 11.95 hrs Surf.Area= 13 sf Storage= 50 cf

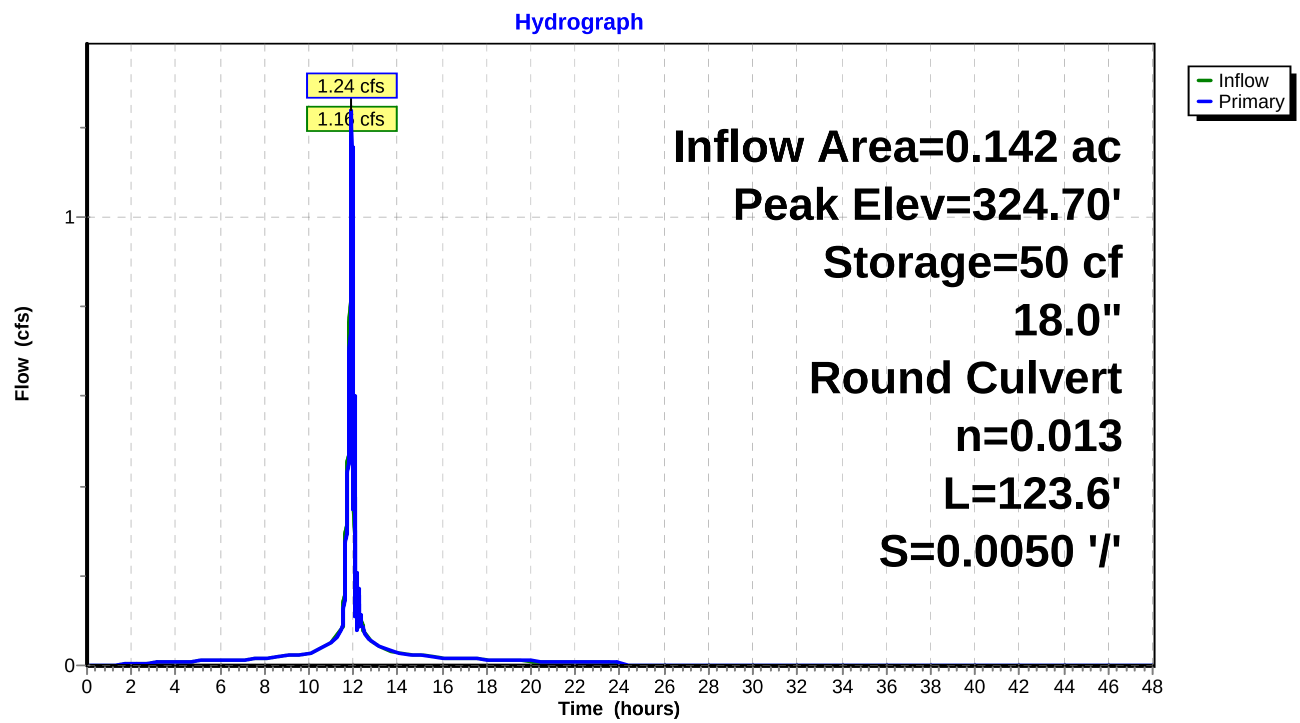
Plug-Flow detention time= 0.9 min calculated for 0.058 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (741.6 - 740.8)

Volume	Invert	Avail.Storage	Storage Description
#1	319.33'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.33'	**18.0" Round Culvert** L= 123.6' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 319.33' / 318.71' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.93 hrs HW=324.50' TW=324.62' (Dynamic Tailwater)
└—**1=Culvert** (Controls 0.00 cfs)

Pond P8: Pipe 8



Summary for Pond P9: Pipe 9

Inflow Area =	5.709 ac, 23.66% Impervious,	Inflow Depth = 4.02"	for 100 Year Storm event	
Inflow =	36.33 cfs @	11.93 hrs, Volume=	1.911 af	
Outflow =	36.48 cfs @	11.94 hrs, Volume=	1.911 af,	Atten= 0%, Lag= 0.1 min
Primary =	36.48 cfs @	11.94 hrs, Volume=	1.911 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 324.68' @ 11.94 hrs Surf.Area= 13 sf Storage= 50 cf

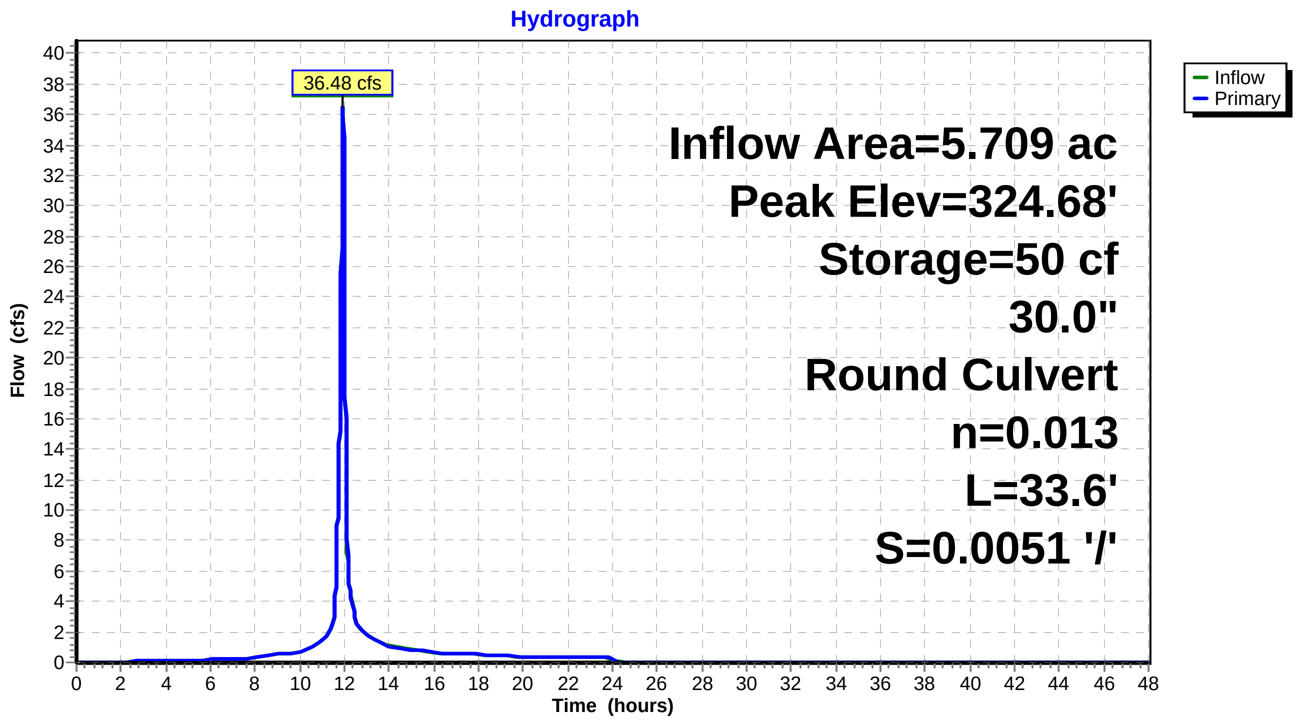
Plug-Flow detention time= 0.1 min calculated for 1.911 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (777.4 - 777.3)

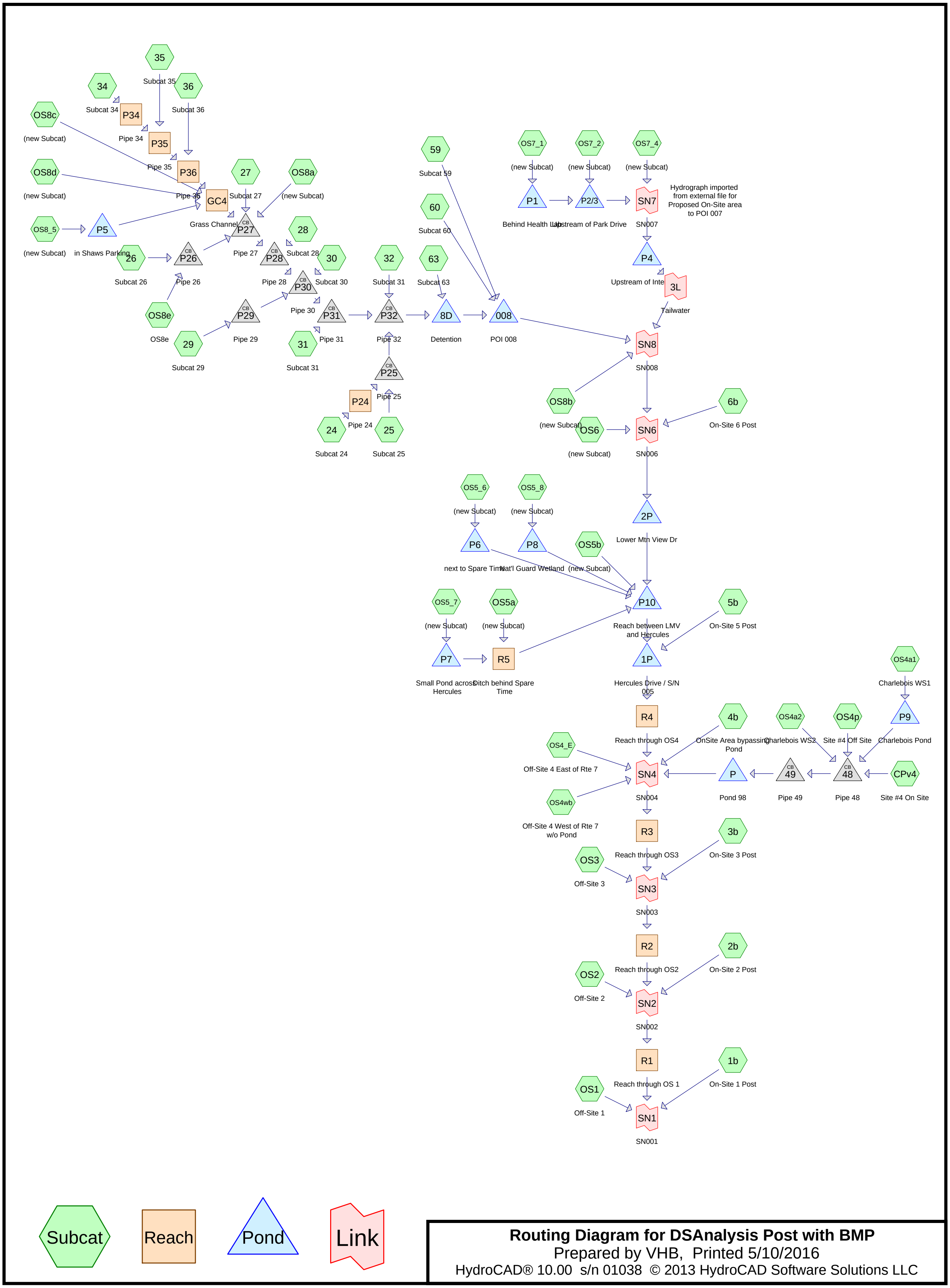
Volume	Invert	Avail.Storage	Storage Description
#1	318.61'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	318.61'	**30.0" Round Culvert** L= 33.6' Ke= 0.500 Inlet / Outlet Invert= 318.61' / 318.44' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=36.26 cfs @ 11.94 hrs HW=324.65' TW=322.29' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 36.26 cfs @ 7.39 fps)

Pond P9: Pipe 9





Routing Diagram for DSAnalysis Post with BMP
Prepared by VHB, Printed 5/10/2016
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.681	39	>75% Grass cover, Good, HSG A (1b, 2b, 3b, CPv4)
1.290	61	>75% Grass cover, Good, HSG B (3b, 4b, 6b, 24, 59, CPv4)
0.201	74	>75% Grass cover, Good, HSG C (3b)
2.925	80	>75% Grass cover, Good, HSG D (4b, 6b, 24, 25, 26, 28, 29, 30, 32, 34, 35, 36, 60, 63, CPv4)
15.016	46	Composite CN (OS1)
13.610	56	Composite CN (OS2)
20.942	74	Composite CN (OS3)
1.860	93	From 2005 Permit Application (OS4a1)
0.114	80	Pasture/grassland/range, Good, HSG D (5b)
0.186	98	Paved roads w/curbs & sewers, HSG A (3b, CPv4)
0.751	98	Paved roads w/curbs & sewers, HSG B (6b, 24, 59, CPv4)
0.513	98	Paved roads w/curbs & sewers, HSG C (3b, CPv4)
5.358	98	Paved roads w/curbs & sewers, HSG D (4b, 5b, 6b, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 60, 63, CPv4)
1.830	83	Paved roads w/open ditches, 50% imp, HSG A (1b, 2b)
0.243	98	Water Surface, 0% imp, HSG B (CPv4)
0.309	32	Woods/grass comb., Good, HSG A (1b, 2b)
16.735	73	composite (OS4_E)
4.986	84	composite CN (OS4p)
15.557	86	composite CN (OS4wb)
1.120	80	from 2005 Permit Application (OS4a2)
27.882	70	weighted CN (OS5a, OS7_1)
141.727	74	weighted CN (OS5b, OS5_8, OS7_4)
7.318	83	weighted CN (OS5_6)
2.744	65	weighted CN (OS5_7)
21.459	75	weighted CN (OS6)
21.469	77	weighted CN (OS7_2)
2.557	88	weighted CN (OS8a)
5.517	82	weighted CN (OS8b)
7.231	84	weighted CN (OS8c, OS8d, OS8e)
17.067	91	weighted CN (OS8_5)
359.198	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.006	HSG A	1b, 2b, 3b, CPv4
2.284	HSG B	3b, 4b, 6b, 24, 59, CPv4
0.714	HSG C	3b, CPv4
8.397	HSG D	4b, 5b, 6b, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 60, 63, CPv4
344.797	Other	OS1, OS2, OS3, OS4a1, OS4a2, OS4p, OS4wb, OS4_E, OS5a, OS5b, OS5_6, OS5_7, OS5_8, OS6, OS7_1, OS7_2, OS7_4, OS8a, OS8b, OS8c, OS8d, OS8e, OS8_5
359.198		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchr Numbers
0.681	1.290	0.201	2.925	0.000	5.097	>75% Grass cover, Good	
0.000	0.000	0.000	0.000	49.568	49.568	Composite CN	
0.000	0.000	0.000	0.000	1.860	1.860	From 2005 Permit Application	
0.000	0.000	0.000	0.114	0.000	0.114	Pasture/grassland/range, Good	
0.186	0.751	0.513	5.358	0.000	6.808	Paved roads w/curbs & sewers	
1.830	0.000	0.000	0.000	0.000	1.830	Paved roads w/open ditches, 50% imp	
0.000	0.243	0.000	0.000	0.000	0.243	Water Surface, 0% imp	
0.309	0.000	0.000	0.000	0.000	0.309	Woods/grass comb., Good	
0.000	0.000	0.000	0.000	16.735	16.735	composite	
0.000	0.000	0.000	0.000	20.543	20.543	composite CN	
0.000	0.000	0.000	0.000	1.120	1.120	from 2005 Permit Application	
0.000	0.000	0.000	0.000	254.971	254.971	weighted CN	
3.006	**2.284**	**0.714**	**8.397**	**344.797**	**359.198**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1b: On-Site 1 Post Runoff Area=0.997 ac 38.47% Impervious Runoff Depth=1.31"
Flow Length=744' Tc=4.1 min CN=56/98 Runoff=1.98 cfs 0.109 af

Subcatchment 2b: On-Site 2 Post Runoff Area=1.672 ac 31.79% Impervious Runoff Depth=1.05"
Flow Length=727' Tc=5.8 min CN=51/98 Runoff=2.42 cfs 0.146 af

Subcatchment 3b: On-Site 3 Post Runoff Area=1.013 ac 66.14% Impervious Runoff Depth=2.10"
Flow Length=457' Slope=0.0240 '/' Tc=16.2 min CN=60/98 Runoff=2.31 cfs 0.177 af

Subcatchment 4b: OnSite Area bypassing Runoff Area=2.506 ac 48.52% Impervious Runoff Depth=1.95"
Flow Length=1,397' Tc=5.3 min CN=73/98 Runoff=7.90 cfs 0.406 af

Subcatchment 5b: On-Site 5 Post Runoff Area=0.302 ac 62.25% Impervious Runoff Depth=2.38"
Flow Length=231' Tc=1.7 min CN=80/98 Runoff=1.31 cfs 0.060 af

Subcatchment 6b: On-Site 6 Post Runoff Area=0.906 ac 68.54% Impervious Runoff Depth=2.25"
Flow Length=349' Tc=2.7 min CN=67/98 Runoff=3.48 cfs 0.170 af

Subcatchment 24: Subcat 24 Runoff Area=0.380 ac 87.37% Impervious Runoff Depth=2.69"
Flow Length=376' Slope=0.0308 '/' Tc=1.8 min CN=68/98 Runoff=1.78 cfs 0.085 af

Subcatchment 25: Subcat 25 Runoff Area=0.171 ac 96.49% Impervious Runoff Depth=2.91"
Flow Length=218' Slope=0.0314 '/' Tc=1.0 min CN=80/98 Runoff=0.89 cfs 0.042 af

Subcatchment 26: Subcat 26 Runoff Area=0.601 ac 40.43% Impervious Runoff Depth=2.03"
Flow Length=643' Tc=7.5 min CN=80/98 Runoff=1.90 cfs 0.102 af

Subcatchment 27: Subcat 27 Runoff Area=0.367 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=429' Slope=0.0326 '/' Tc=2.0 min CN=0/98 Runoff=1.88 cfs 0.091 af

Subcatchment 28: Subcat 28 Runoff Area=0.090 ac 94.44% Impervious Runoff Depth=2.88"
Flow Length=128' Slope=0.0272 '/' Tc=0.6 min CN=80/98 Runoff=0.47 cfs 0.022 af

Subcatchment 29: Subcat 29 Runoff Area=0.136 ac 33.09% Impervious Runoff Depth=1.92"
Flow Length=178' Tc=2.1 min CN=80/98 Runoff=0.49 cfs 0.022 af

Subcatchment 30: Subcat 30 Runoff Area=0.126 ac 70.63% Impervious Runoff Depth=2.51"
Flow Length=115' Tc=1.4 min CN=80/98 Runoff=0.57 cfs 0.026 af

Subcatchment 31: Subcat 31 Runoff Area=0.053 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=97' Slope=0.0249 '/' Tc=0.5 min CN=0/98 Runoff=0.28 cfs 0.013 af

Subcatchment 32: Subcat 31 Runoff Area=0.034 ac 88.24% Impervious Runoff Depth=2.78"
Flow Length=69' Tc=0.5 min CN=80/98 Runoff=0.17 cfs 0.008 af

Subcatchment 34: Subcat 34 Runoff Area=0.203 ac 57.14% Impervious Runoff Depth=2.30"
Flow Length=161' Tc=2.3 min CN=80/98 Runoff=0.84 cfs 0.039 af

Subcatchment 35: Subcat 35 Runoff Area=0.205 ac 86.34% Impervious Runoff Depth=2.75"
Flow Length=149' Slope=0.0186 '/' Tc=0.9 min CN=80/98 Runoff=1.02 cfs 0.047 af

Subcatchment 36: Subcat 36 Runoff Area=0.196 ac 99.49% Impervious Runoff Depth=2.96"
Flow Length=186' Slope=0.0429 '/' Tc=0.7 min CN=80/98 Runoff=1.04 cfs 0.048 af

Subcatchment 59: Subcat 59 Runoff Area=0.079 ac 56.96% Impervious Runoff Depth=1.88"
Flow Length=233' Tc=2.5 min CN=61/98 Runoff=0.25 cfs 0.012 af

Subcatchment 60: Subcat 60 Runoff Area=0.657 ac 54.64% Impervious Runoff Depth=2.26"
Flow Length=193' Tc=1.0 min CN=80/98 Runoff=2.79 cfs 0.124 af

Subcatchment 63: Subcat 63 Runoff Area=0.515 ac 26.99% Impervious Runoff Depth=1.82"
Flow Length=331' Tc=3.7 min CN=80/98 Runoff=1.70 cfs 0.078 af

Subcatchment CPv4: Site #4 On Site Runoff Area=3.192 ac 52.41% Impervious Runoff Depth=2.08"
Flow Length=1,397' Tc=5.3 min CN=75/98 Runoff=10.75 cfs 0.552 af

Subcatchment OS1: Off-Site 1 Runoff Area=15.016 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=1,440' Tc=24.5 min CN=46/0 Runoff=0.09 cfs 0.072 af

Subcatchment OS2: Off-Site 2 Runoff Area=13.610 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=1,300' Tc=32.9 min CN=56/0 Runoff=1.34 cfs 0.317 af

Subcatchment OS3: Off-Site 3 Runoff Area=20.942 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=668' Slope=0.0210 '/' Tc=28.9 min CN=74/0 Runoff=18.01 cfs 1.811 af

Subcatchment OS4a1: Charlebois WS1 Runoff Area=1.860 ac 0.00% Impervious Runoff Depth=2.45"
Tc=5.8 min CN=93/0 Runoff=7.66 cfs 0.379 af

Subcatchment OS4a2: Charlebois WS2 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=1.40"
Tc=1.5 min CN=80/0 Runoff=3.33 cfs 0.131 af

Subcatchment OS4p: Site #4 Off Site Runoff Area=4.986 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=1,310' Tc=7.4 min CN=84/0 Runoff=14.19 cfs 0.699 af

Subcatchment OS4wb: Off-Site 4 West of Runoff Area=15.557 ac 0.00% Impervious Runoff Depth=1.84"
Flow Length=2,060' Tc=21.8 min CN=86/0 Runoff=30.24 cfs 2.379 af

Subcatchment OS4_E: Off-Site 4 East of Runoff Area=16.735 ac 0.00% Impervious Runoff Depth=0.98"
Flow Length=1,140' Slope=0.0114 '/' Tc=38.8 min CN=73/0 Runoff=10.95 cfs 1.371 af

Subcatchment OS5a: (new Subcat) Runoff Area=19.687 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,356' Slope=0.0012 '/' Tc=98.7 min CN=70/0 Runoff=5.16 cfs 1.359 af

Subcatchment OS5b: (new Subcat) Runoff Area=61.972 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=3,643' Tc=207.9 min CN=74/0 Runoff=12.08 cfs 5.358 af

Subcatchment OS5_6: (new Subcat) Runoff Area=7.318 ac 0.00% Impervious Runoff Depth=1.61"
Flow Length=660' Tc=6.1 min CN=83/0 Runoff=20.95 cfs 0.981 af

Subcatchment OS5_7: (new Subcat) Runoff Area=2.744 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=556' Slope=0.0010 '/' Tc=49.1 min CN=65/0 Runoff=0.76 cfs 0.137 af

Subcatchment OS5_8: (new Subcat) Runoff Area=66.948 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=2,163' Tc=40.1 min CN=74/0 Runoff=45.62 cfs 5.788 af

Subcatchment OS6: (new Subcat) Runoff Area=21.459 ac 0.00% Impervious Runoff Depth=1.09"
Flow Length=1,476' Tc=18.7 min CN=75/0 Runoff=26.04 cfs 1.956 af

Subcatchment OS7_1: (new Subcat) Runoff Area=8.195 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=136' Slope=0.0108 '/' Tc=33.6 min CN=70/0 Runoff=4.73 cfs 0.566 af

Subcatchment OS7_2: (new Subcat) Runoff Area=21.469 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=779' Tc=6.1 min CN=77/0 Runoff=46.37 cfs 2.168 af

Subcatchment OS7_4: (new Subcat) Runoff Area=12.807 ac 0.00% Impervious Runoff Depth=1.04"
Flow Length=503' Slope=0.0219 '/' Tc=33.5 min CN=74/0 Runoff=9.96 cfs 1.107 af

Subcatchment OS8a: (new Subcat) Runoff Area=2.557 ac 0.00% Impervious Runoff Depth=2.00"
Flow Length=680' Tc=12.7 min CN=88/0 Runoff=7.09 cfs 0.426 af

Subcatchment OS8b: (new Subcat) Runoff Area=5.517 ac 0.00% Impervious Runoff Depth=1.54"
Flow Length=799' Tc=20.3 min CN=82/0 Runoff=9.32 cfs 0.707 af

Subcatchment OS8c: (new Subcat) Runoff Area=0.298 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=240' Slope=0.0504 '/' Tc=9.5 min CN=84/0 Runoff=0.79 cfs 0.042 af

Subcatchment OS8d: (new Subcat) Runoff Area=2.208 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=740' Tc=22.9 min CN=84/0 Runoff=3.81 cfs 0.310 af

Subcatchment OS8e: OS8e Runoff Area=4.725 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=370' Slope=0.0538 '/' Tc=20.9 min CN=84/0 Runoff=8.63 cfs 0.662 af

Subcatchment OS8_5: (new Subcat) Runoff Area=17.067 ac 0.00% Impervious Runoff Depth=2.26"
Flow Length=1,741' Tc=7.2 min CN=91/0 Runoff=63.26 cfs 3.212 af

Reach GC4: Grass Channel 4 Avg. Flow Depth=0.50' Max Vel=4.08 fps Inflow=14.38 cfs 2.810 af
n=0.030 L=370.2' S=0.0243 '/' Capacity=123.15 cfs Outflow=14.35 cfs 2.809 af

Reach P24: Pipe 24 Avg. Flow Depth=0.33' Max Vel=6.00 fps Inflow=1.78 cfs 0.085 af
18.0" Round Pipe n=0.013 L=140.7' S=0.0237 '/' Capacity=16.18 cfs Outflow=1.77 cfs 0.085 af

Reach P34: Pipe 34 Avg. Flow Depth=0.34' Max Vel=2.76 fps Inflow=0.84 cfs 0.039 af
18.0" Round Pipe n=0.013 L=34.9' S=0.0049 '/' Capacity=7.33 cfs Outflow=0.84 cfs 0.039 af

Reach P35: Pipe 35 Avg. Flow Depth=0.44' Max Vel=4.19 fps Inflow=1.82 cfs 0.086 af
18.0" Round Pipe n=0.013 L=84.2' S=0.0084 '/' Capacity=9.65 cfs Outflow=1.81 cfs 0.086 af

Reach P36: Pipe 36 Avg. Flow Depth=0.57' Max Vel=3.78 fps Inflow=2.82 cfs 0.134 af
24.0" Round Pipe n=0.013 L=16.6' S=0.0048 '/' Capacity=15.70 cfs Outflow=2.82 cfs 0.134 af

Reach R1: Reach through OS 1 Avg. Flow Depth=0.48' Max Vel=3.76 fps Inflow=59.45 cfs 32.917 af
n=0.035 L=590.0' S=0.0220 '/' Capacity=2,282.34 cfs Outflow=59.05 cfs 32.902 af

Reach R2: Reach through OS2 Avg. Flow Depth=0.76' Max Vel=6.51 fps Inflow=58.22 cfs 32.461 af
n=0.035 L=580.0' S=0.0500 '/' Capacity=1,850.26 cfs Outflow=58.06 cfs 32.454 af

Reach R3: Reach through OS3 Avg. Flow Depth=0.42' Max Vel=1.38 fps Inflow=41.35 cfs 30.507 af
n=0.040 L=580.0' S=0.0052 '/' Capacity=2,787.67 cfs Outflow=39.15 cfs 30.473 af

Reach R4: Reach through OS4 Avg. Flow Depth=0.39' Max Vel=1.00 fps Inflow=31.91 cfs 24.907 af
n=0.035 L=750.0' S=0.0020 '/' Capacity=1,717.01 cfs Outflow=31.86 cfs 24.863 af

Reach R5: Ditch behind Spare Time Avg. Flow Depth=0.79' Max Vel=1.26 fps Inflow=5.16 cfs 1.411 af
n=0.025 L=325.0' S=0.0012 '/' Capacity=43.39 cfs Outflow=5.13 cfs 1.411 af

Pond 1P: Hercules Drive / S/N 005 Peak Elev=302.19' Storage=31,283 cf Inflow=32.49 cfs 24.914 af
Outflow=31.91 cfs 24.907 af

Pond 2P: Lower Mtn View Dr Peak Elev=309.96' Storage=92,367 cf Inflow=64.20 cfs 11.739 af
Outflow=13.93 cfs 11.735 af

Pond 008: POI 008 Inflow=28.53 cfs 4.521 af
Primary=28.53 cfs 4.521 af

Pond 8D: Detention Peak Elev=325.08' Storage=8,880 cf Inflow=30.07 cfs 4.385 af
Outflow=28.20 cfs 4.385 af

Pond 48: Pipe 48 Peak Elev=325.29' Inflow=26.81 cfs 1.739 af
30.0" Round Culvert n=0.013 L=75.0' S=0.0360 '/' Outflow=26.81 cfs 1.739 af

Pond 49: Pipe 49 Peak Elev=321.54' Inflow=26.81 cfs 1.739 af
30.0" Round Culvert n=0.013 L=28.0' S=0.1071 '/' Outflow=26.81 cfs 1.739 af

Pond P: Pond 98 Peak Elev=319.00' Storage=34,517 cf Inflow=26.81 cfs 1.739 af
Outflow=2.67 cfs 1.488 af

Pond P1: Behind Health Lab Peak Elev=310.17' Storage=24,634 cf Inflow=4.73 cfs 0.566 af
Outflow=0.00 cfs 0.000 af

Pond P10: Reach between LMV and Peak Elev=308.04' Storage=54,690 cf Inflow=32.65 cfs 25.021 af
Outflow=32.46 cfs 24.855 af

Pond P2/3: Upstream of Park Drive Peak Elev=310.77' Storage=57,533 cf Inflow=46.37 cfs 2.168 af
12.0" Round Culvert n=0.013 L=100.0' S=0.0025 '/' Outflow=1.21 cfs 1.790 af

Pond P25: Pipe 25 Peak Elev=329.90' Inflow=2.63 cfs 0.127 af
18.0" Round Culvert n=0.013 L=57.2' S=0.0552 '/' Outflow=2.63 cfs 0.127 af

Pond P26: Pipe 26 Peak Elev=333.53' Inflow=9.19 cfs 0.764 af
24.0" Round Culvert n=0.013 L=35.6' S=0.0048 '/' Outflow=9.19 cfs 0.764 af

Pond P27: Pipe 27 Peak Elev=333.16' Inflow=29.26 cfs 4.090 af
30.0" Round Culvert n=0.013 L=71.7' S=0.0050 '/' Outflow=29.26 cfs 4.090 af

Pond P28: Pipe 28 Peak Elev=331.64' Inflow=29.31 cfs 4.111 af
30.0" Round Culvert n=0.013 L=73.4' S=0.0050 '/' Outflow=29.31 cfs 4.111 af

Pond P29: Pipe 29 Peak Elev=330.12' Inflow=0.49 cfs 0.022 af
24.0" Round Culvert n=0.013 L=23.2' S=0.0052 '/' Outflow=0.49 cfs 0.022 af

Pond P30: Pipe 30 Peak Elev=330.12' Inflow=29.44 cfs 4.159 af
36.0" Round Culvert n=0.013 L=37.8' S=0.0050 '/' Outflow=29.44 cfs 4.159 af

Pond P31: Pipe 31 Peak Elev=329.38' Inflow=29.47 cfs 4.173 af
36.0" Round Culvert n=0.013 L=33.7' S=0.0050 '/' Outflow=29.47 cfs 4.173 af

Pond P32: Pipe 32 Peak Elev=328.63' Inflow=29.80 cfs 4.307 af
36.0" Round Culvert n=0.013 L=134.4' S=0.0037 '/' Outflow=29.80 cfs 4.307 af

Pond P4: Upstream of Interstate Peak Elev=309.74' Storage=94,485 cf Inflow=17.39 cfs 4.533 af
35.0" x 24.0", R=17.9"/55.1" Pipe Arch Culvert n=0.013 L=216.0' S=0.0053 '/' Outflow=4.29 cfs 4.385 af

Pond P5: in Shaws Parking Peak Elev=358.34' Storage=73,624 cf Inflow=63.26 cfs 3.212 af
Outflow=10.02 cfs 2.325 af

Pond P6: next to Spare Time Peak Elev=310.49' Storage=28,585 cf Inflow=20.95 cfs 0.981 af
Outflow=0.41 cfs 0.887 af

Pond P7: Small Pond across Hercules Peak Elev=313.51' Storage=3,714 cf Inflow=0.76 cfs 0.137 af
Outflow=0.11 cfs 0.053 af

Pond P8: Nat'l Guard Wetland Peak Elev=309.65' Storage=123,625 cf Inflow=45.62 cfs 5.788 af
Outflow=4.79 cfs 5.629 af

Pond P9: Charlebois Pond Peak Elev=333.57' Storage=0.296 af Inflow=7.66 cfs 0.379 af
Outflow=0.80 cfs 0.357 af

Link 3L: Tailwater Inflow=4.29 cfs 4.385 af
Primary=4.29 cfs 4.385 af

Link SN1: SN001 Inflow=59.27 cfs 33.083 af
Primary=59.27 cfs 33.083 af

Link SN2: SN002 Inflow=59.45 cfs 32.917 af
Primary=59.45 cfs 32.917 af

Link SN3: SN003 Inflow=58.22 cfs 32.461 af
Primary=58.22 cfs 32.461 af

Link SN4: SN004 Inflow=41.35 cfs 30.507 af
Primary=41.35 cfs 30.507 af

Link SN6: SN006 Inflow=64.20 cfs 11.739 af
Primary=64.20 cfs 11.739 af

Link 99.00 Colchester Act 250\tech\Stormwater\VTrans HydroCAD\On-Site 7 PR_asPonds~Pond 007.hce Inflow=17.39 cfs 4.533 af
Area= 9.375 ac 23.57% Imperv. Primary=17.39 cfs 4.533 af

Link SN8: SN008

Inflow=37.93 cfs 9.613 af
Primary=37.93 cfs 9.613 af

Total Runoff Area = 359.198 ac Runoff Volume = 34.317 af Average Runoff Depth = 1.15"
97.85% Pervious = 351.475 ac 2.15% Impervious = 7.723 ac

Summary for Subcatchment 1b: On-Site 1 Post

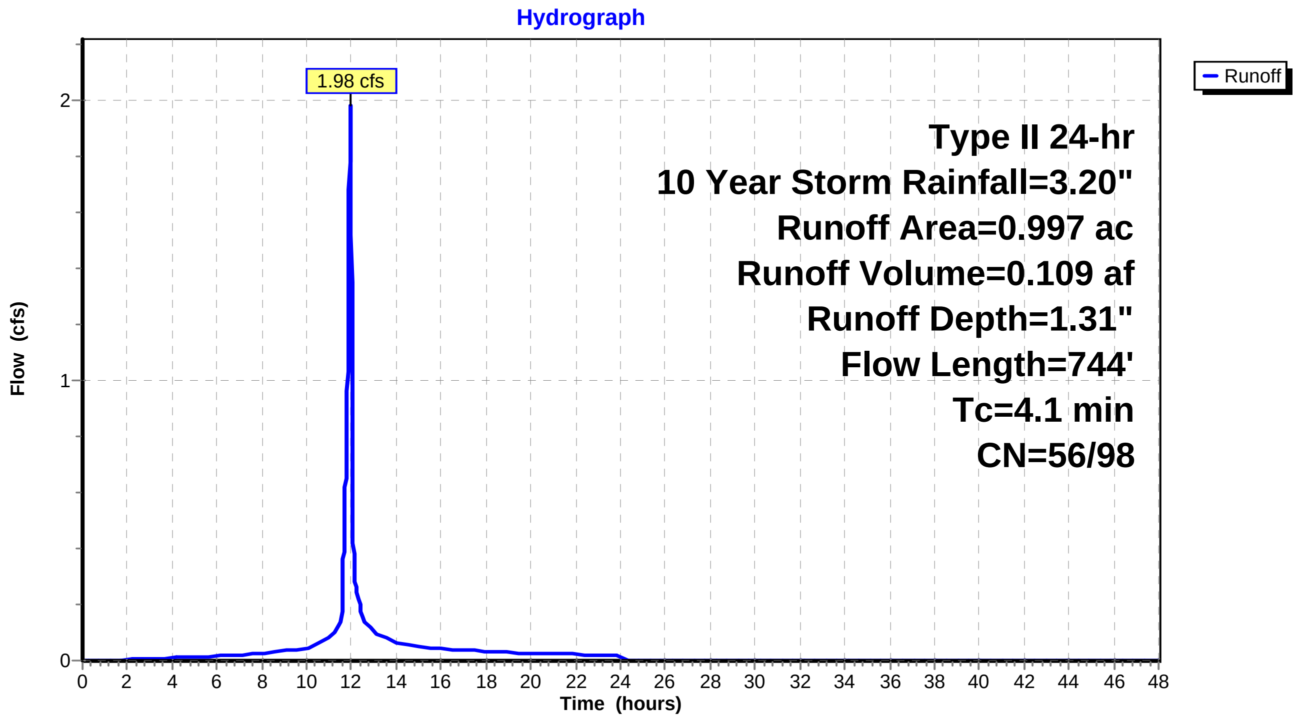
Runoff = 1.98 cfs @ 11.95 hrs, Volume= 0.109 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.767	83	Paved roads w/open ditches, 50% imp, HSG A
0.140	39	>75% Grass cover, Good, HSG A
0.090	32	Woods/grass comb., Good, HSG A
0.997	72	Weighted Average
0.613	56	61.53% Pervious Area
0.383	98	38.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0370	1.49		**Sheet Flow, Sheet 1** Smooth surfaces n= 0.011 P2= 2.30"
0.4	89	0.0370	3.90		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
1.8	436	0.0573	4.14	5.38	**Channel Flow, Channel 1** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.8	119	0.1424	2.64		**Shallow Concentrated Flow, Shallow 1b** Short Grass Pasture Kv= 7.0 fps
4.1	744	Total			

Subcatchment 1b: On-Site 1 Post



Summary for Subcatchment 2b: On-Site 2 Post

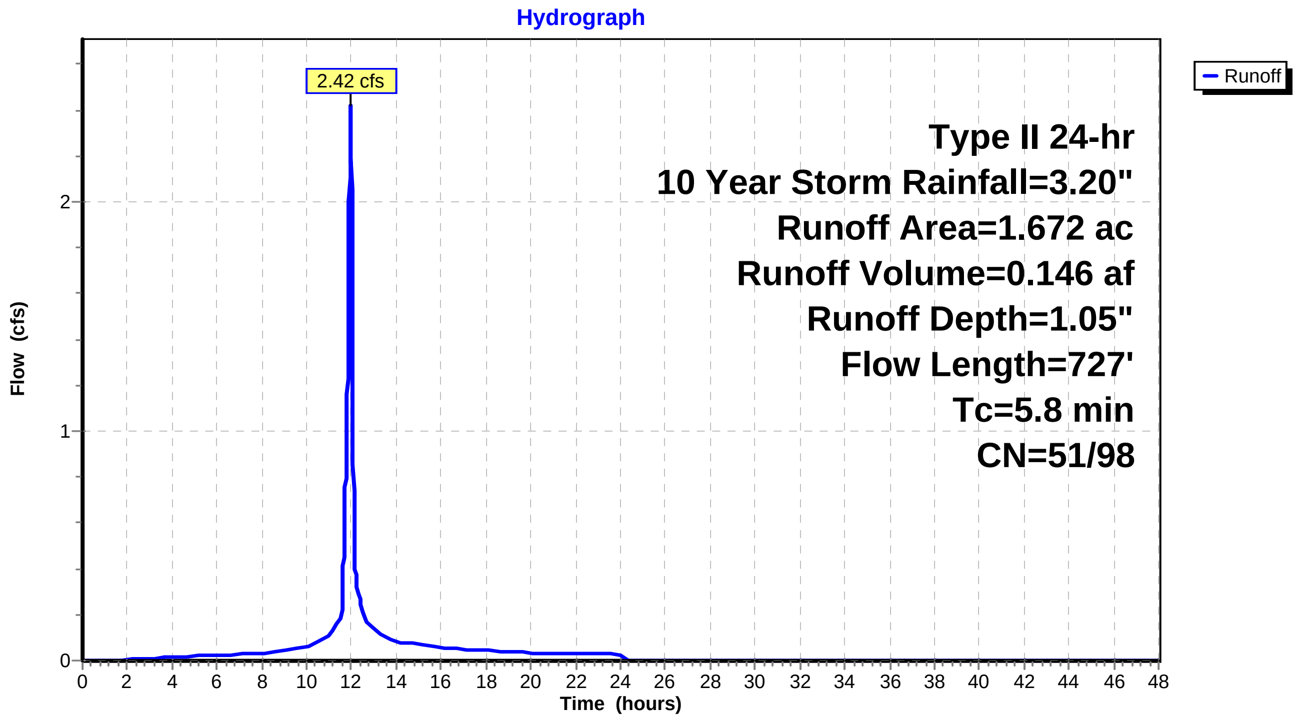
Runoff = 2.42 cfs @ 11.97 hrs, Volume= 0.146 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
1.063	83	Paved roads w/open ditches, 50% imp, HSG A
0.390	39	>75% Grass cover, Good, HSG A
0.219	32	Woods/grass comb., Good, HSG A
1.672	66	Weighted Average
1.140	51	68.21% Pervious Area
0.531	98	31.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0144	1.02		**Sheet Flow, Sheet 2** Smooth surfaces n= 0.011 P2= 2.30"
4.1	595	0.0144	2.44		**Shallow Concentrated Flow, Shallow 2a** Paved Kv= 20.3 fps
0.1	25	0.0792	4.87	6.33	**Channel Flow, Channel 2** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.030 Earth, grassed & winding
0.0	7	0.5368	5.13		**Shallow Concentrated Flow, Shallow 2b** Short Grass Pasture Kv= 7.0 fps
5.8	727	Total			

Subcatchment 2b: On-Site 2 Post



Summary for Subcatchment 3b: On-Site 3 Post

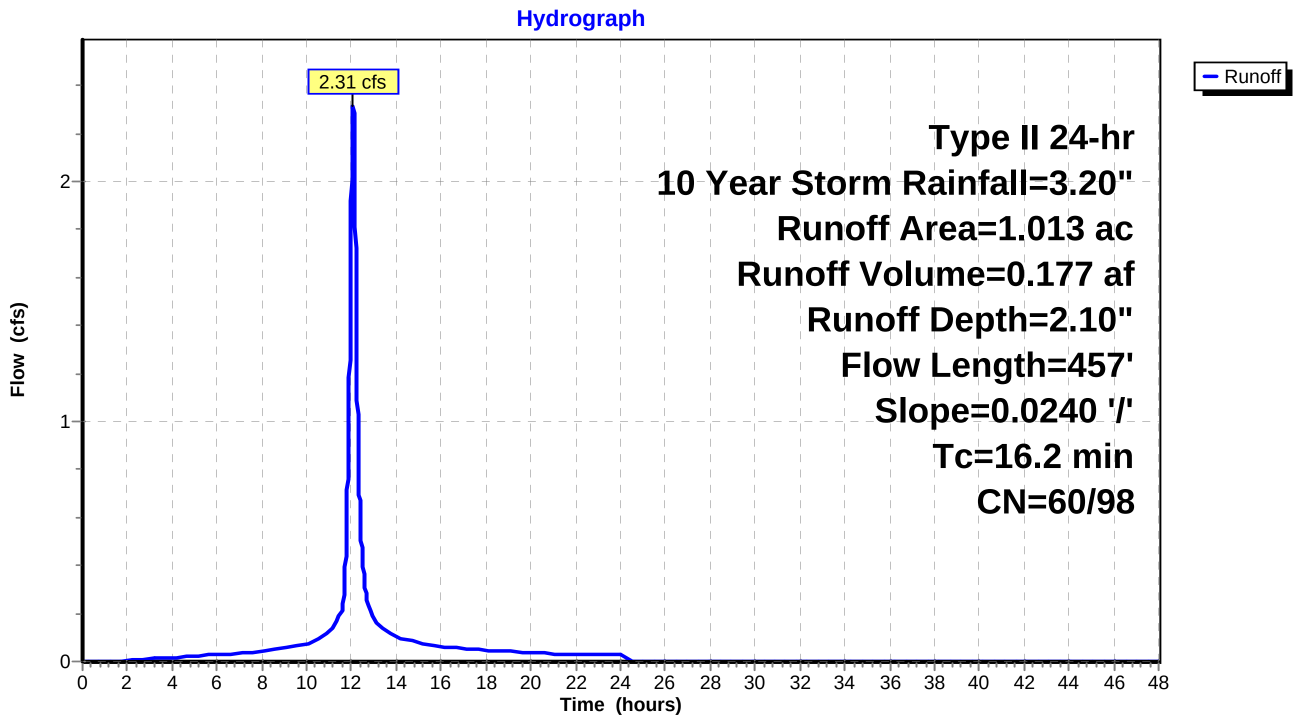
Runoff = 2.31 cfs @ 12.08 hrs, Volume= 0.177 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.129	39	>75% Grass cover, Good, HSG A
0.013	61	>75% Grass cover, Good, HSG B
0.201	74	>75% Grass cover, Good, HSG C
0.160	98	Paved roads w/curbs & sewers, HSG A
0.510	98	Paved roads w/curbs & sewers, HSG C
1.013	85	Weighted Average
0.343	60	33.86% Pervious Area
0.670	98	66.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	357	0.0240	1.08		**Shallow Concentrated Flow, Shallow 3** Short Grass Pasture Kv= 7.0 fps
10.7	100	0.0240	0.16		**Sheet Flow, Sheet 3** Grass: Short n= 0.150 P2= 2.30"
16.2	457	Total			

Subcatchment 3b: On-Site 3 Post



Summary for Subcatchment 4b: OnSite Area bypassing Pond

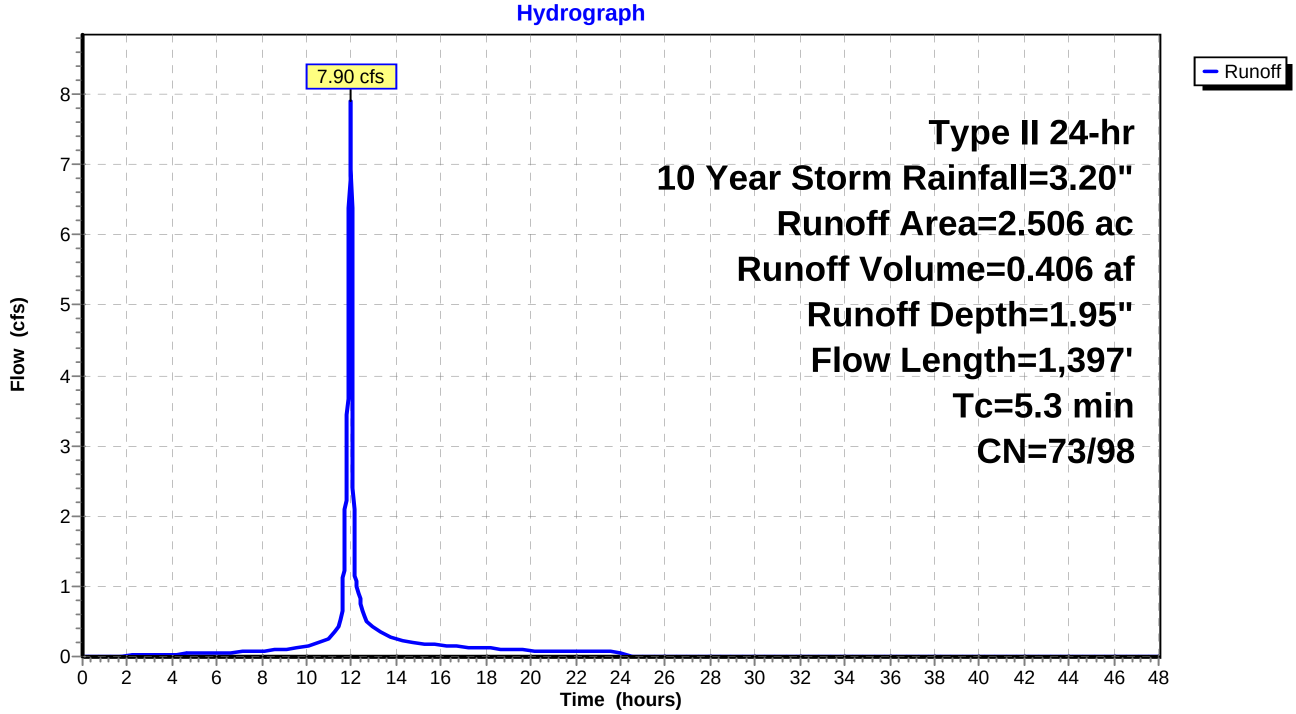
Runoff = 7.90 cfs @ 11.96 hrs, Volume= 0.406 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.000	98	Paved roads w/curbs & sewers, HSG A
0.453	61	>75% Grass cover, Good, HSG B
0.000	98	Water Surface, 0% imp, HSG B
0.000	98	Paved roads w/curbs & sewers, HSG B
0.000	74	>75% Grass cover, Good, HSG C
0.000	98	Paved roads w/curbs & sewers, HSG C
0.837	80	>75% Grass cover, Good, HSG D
1.216	98	Paved roads w/curbs & sewers, HSG D
2.506	85	Weighted Average
1.290	73	51.48% Pervious Area
1.216	98	48.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	67	0.0147	0.95		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.30"
0.3	68	0.0413	4.13		**Shallow Concentrated Flow, Shallow Pave 1** Paved Kv= 20.3 fps
1.5	444	0.0091	4.86	38.91	**Channel Flow, Grass Channel 1** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.2	61	0.0311	5.45	9.63	**Pipe Channel, Culvert 1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
1.8	632	0.0131	5.84	46.68	**Channel Flow, Channel 2** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.3	125	0.0649	7.87	13.92	**Pipe Channel, Culvert 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
5.3	1,397	Total			

Subcatchment 4b: OnSite Area bypassing Pond



Summary for Subcatchment 5b: On-Site 5 Post

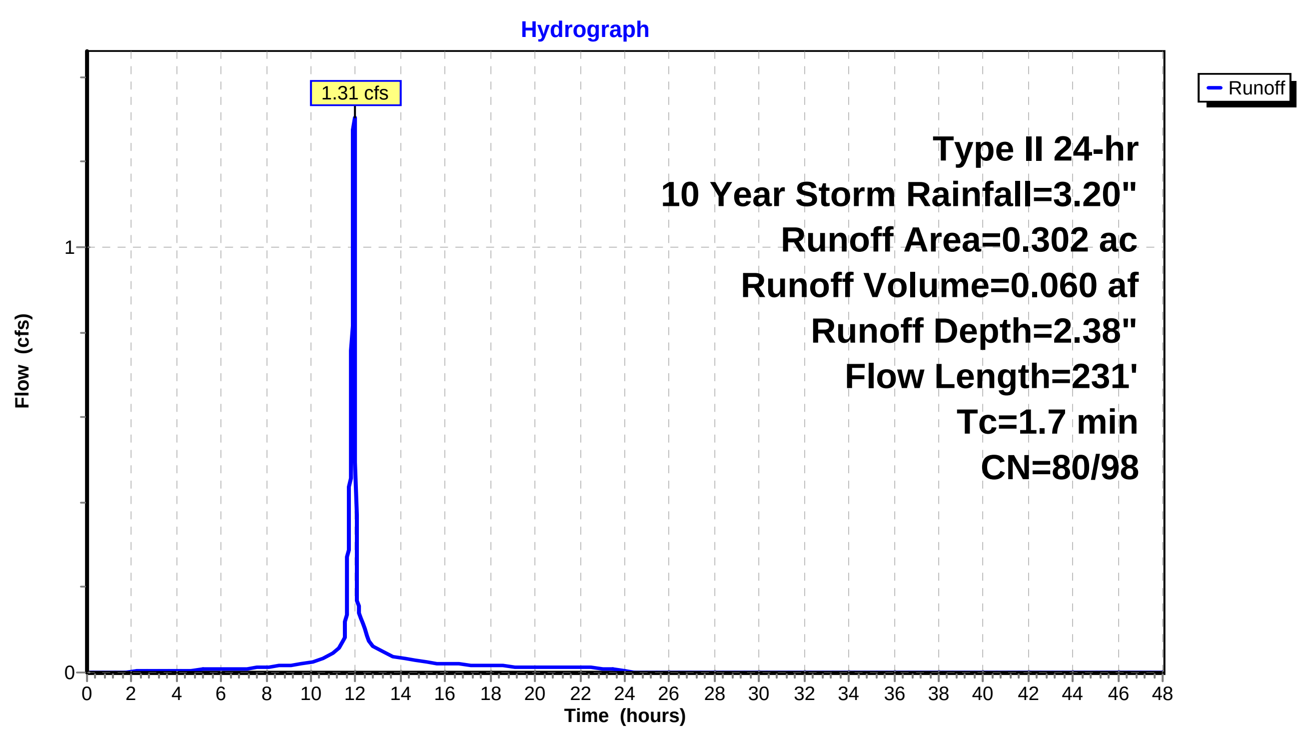
Runoff = 1.31 cfs @ 11.92 hrs, Volume= 0.060 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.188	98	Paved roads w/curbs & sewers, HSG D
0.114	80	Pasture/grassland/range, Good, HSG D
0.302	91	Weighted Average
0.114	80	37.75% Pervious Area
0.188	98	62.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0351	1.46		**Sheet Flow, Sheet 5** Smooth surfaces n= 0.011 P2= 2.30"
0.4	99	0.0351	3.80		**Shallow Concentrated Flow, Shallow 5a** Paved Kv= 20.3 fps
0.2	32	0.1243	2.47		**Shallow Concentrated Flow, Shallow 5b** Short Grass Pasture Kv= 7.0 fps
1.7	231	Total			

Subcatchment 5b: On-Site 5 Post



Summary for Subcatchment 6b: On-Site 6 Post

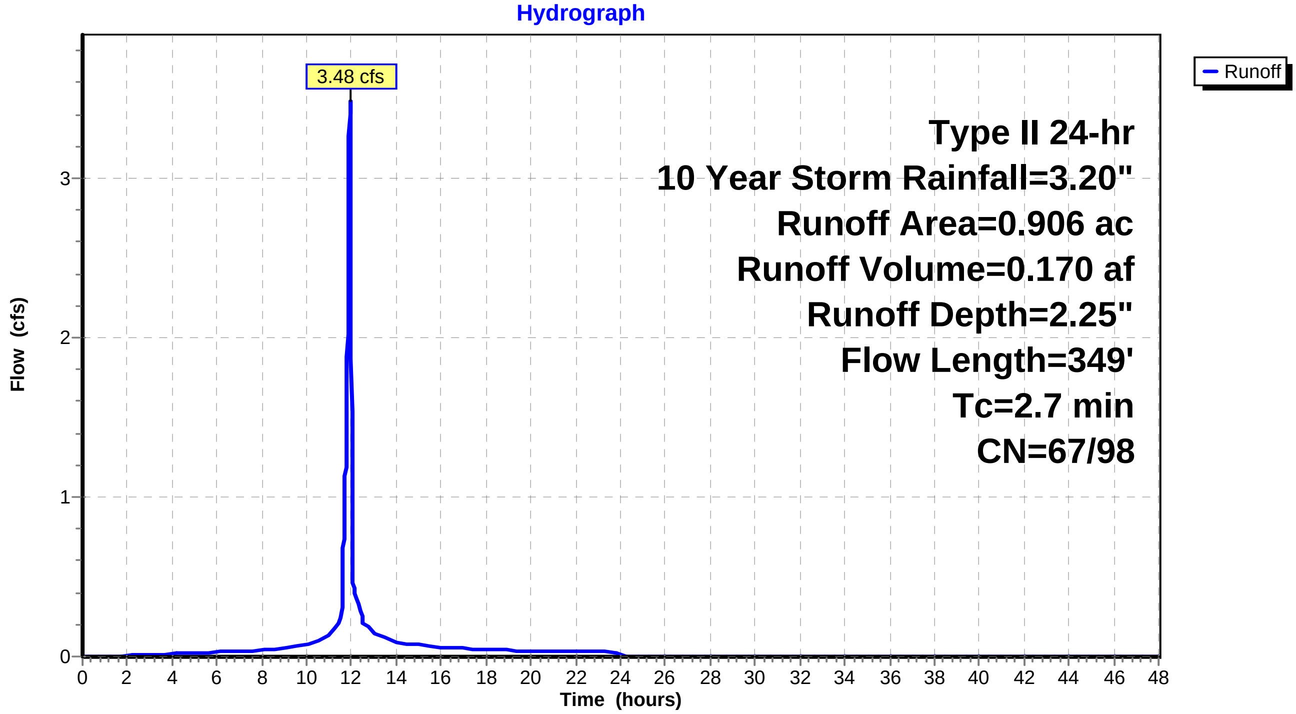
Runoff = 3.48 cfs @ 11.93 hrs, Volume= 0.170 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.207	98	Paved roads w/curbs & sewers, HSG B
0.198	61	>75% Grass cover, Good, HSG B
0.414	98	Paved roads w/curbs & sewers, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.906	88	Weighted Average
0.285	67	31.46% Pervious Area
0.621	98	68.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	130	0.0115	2.53	3.29	**Channel Flow, Channel 6a** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
1.1	100	0.0418	1.57		**Sheet Flow, Sheet 6** Smooth surfaces n= 0.011 P2= 2.30"
0.1	20	0.0418	4.15		**Shallow Concentrated Flow, Shallow 6a** Paved Kv= 20.3 fps
0.1	32	0.0630	5.92	7.70	**Channel Flow, Channel 6b** Area= 1.3 sf Perim= 6.3' r= 0.21' n= 0.022 Earth, clean & straight
0.5	67	0.1194	2.42		**Shallow Concentrated Flow, Shallow 6b** Short Grass Pasture Kv= 7.0 fps
2.7	349	Total			

Subcatchment 6b: On-Site 6 Post



Summary for Subcatchment 24: Subcat 24

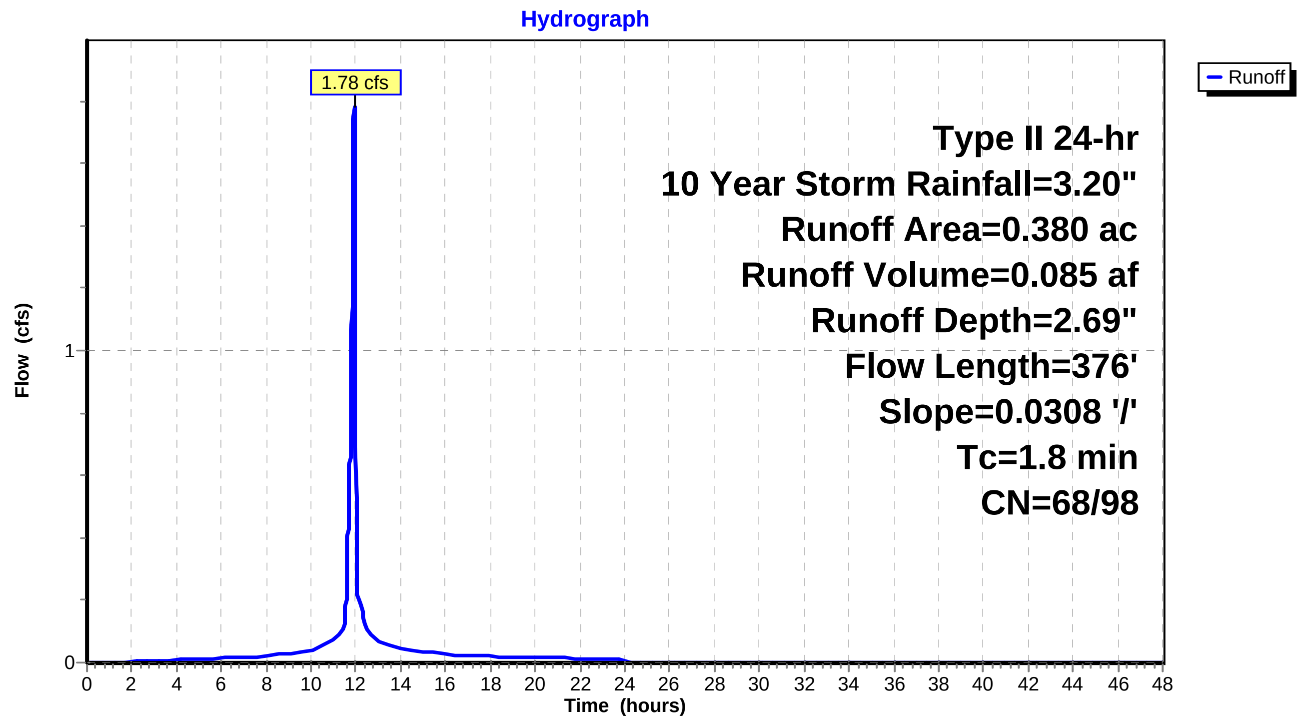
Runoff = 1.78 cfs @ 11.92 hrs, Volume= 0.085 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.308	98	Paved roads w/curbs & sewers, HSG D
0.024	98	Paved roads w/curbs & sewers, HSG B
0.030	61	>75% Grass cover, Good, HSG B
0.016	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.380	94	Weighted Average
0.048	68	12.63% Pervious Area
0.332	98	87.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	376	0.0308	3.56		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 24: Subcat 24



Summary for Subcatchment 25: Subcat 25

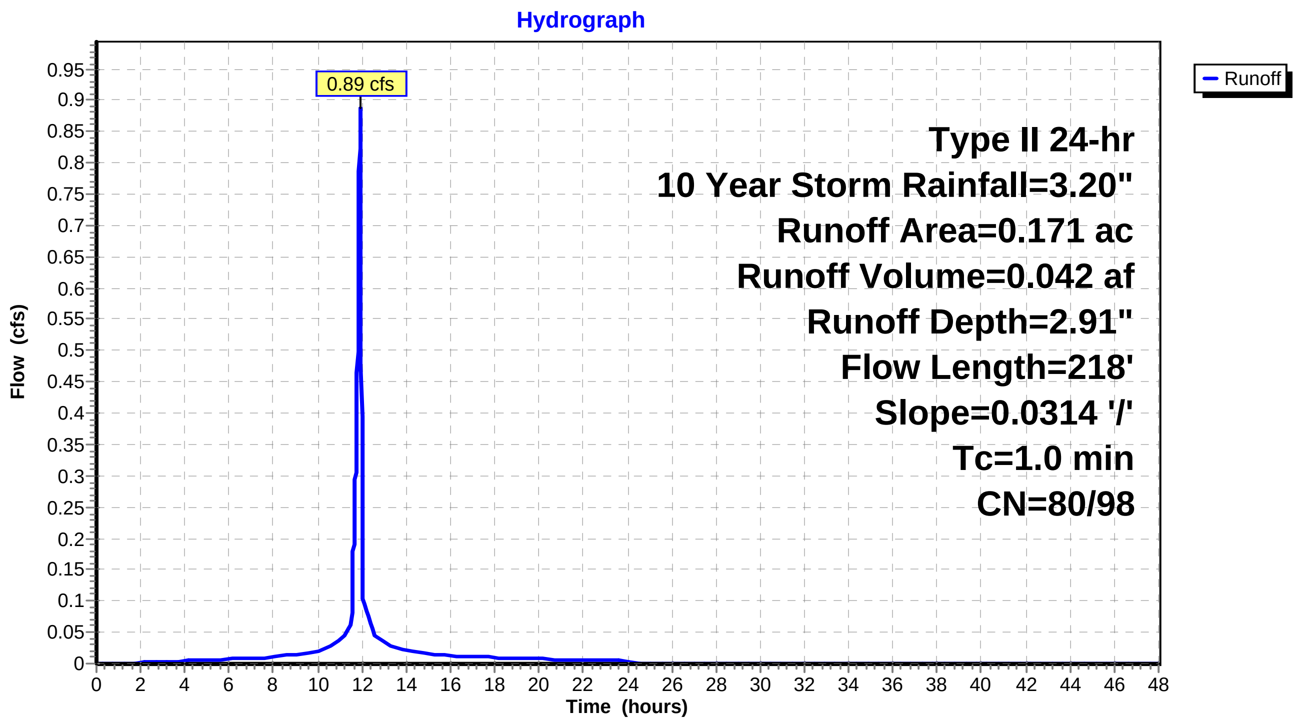
Runoff = 0.89 cfs @ 11.91 hrs, Volume= 0.042 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.165	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.171	97	Weighted Average
0.006	80	3.51% Pervious Area
0.165	98	96.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	218	0.0314	3.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 25: Subcat 25



Summary for Subcatchment 26: Subcat 26

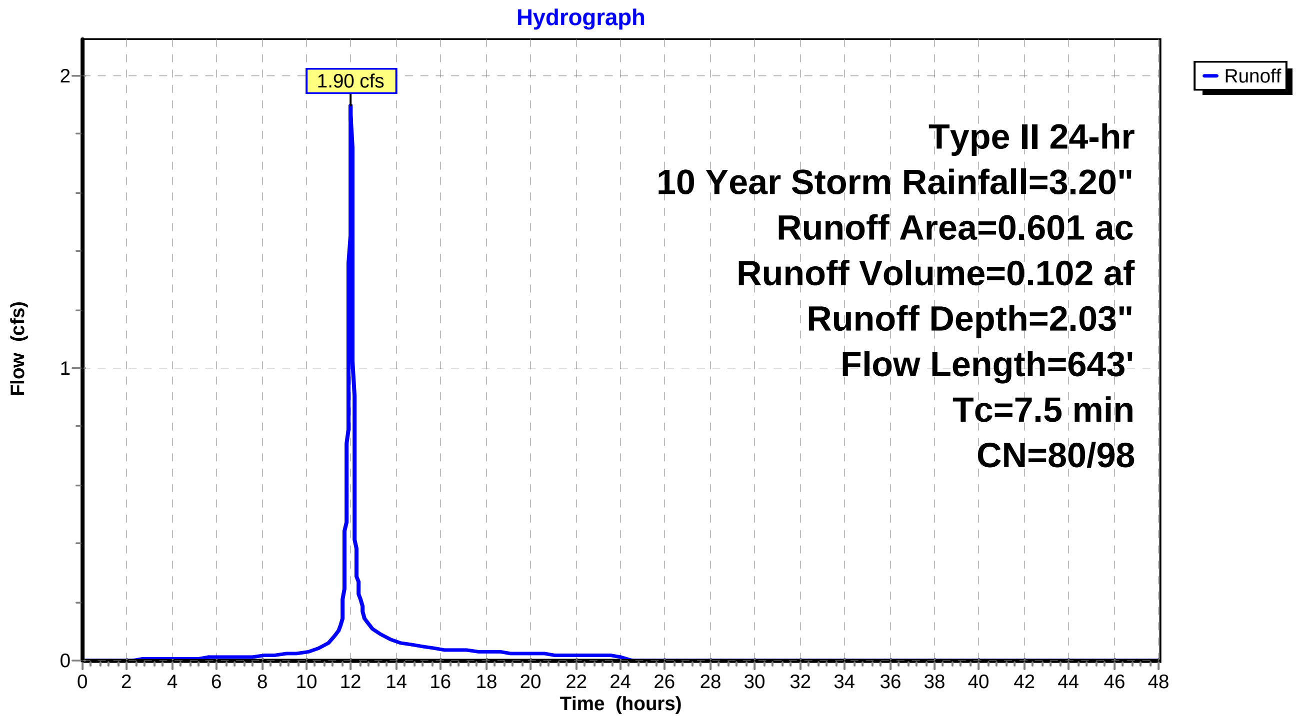
Runoff = 1.90 cfs @ 11.99 hrs, Volume= 0.102 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.079	98	Paved roads w/curbs & sewers, HSG D
0.043	98	Paved roads w/curbs & sewers, HSG D
0.191	80	>75% Grass cover, Good, HSG D
0.018	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.106	98	Paved roads w/curbs & sewers, HSG D
0.075	80	>75% Grass cover, Good, HSG D
0.015	98	Paved roads w/curbs & sewers, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.601	87	Weighted Average
0.358	80	59.57% Pervious Area
0.243	98	40.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	26	0.0623	5.07		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	617	0.0393	1.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.5	643	Total			

Subcatchment 26: Subcat 26



Summary for Subcatchment 27: Subcat 27

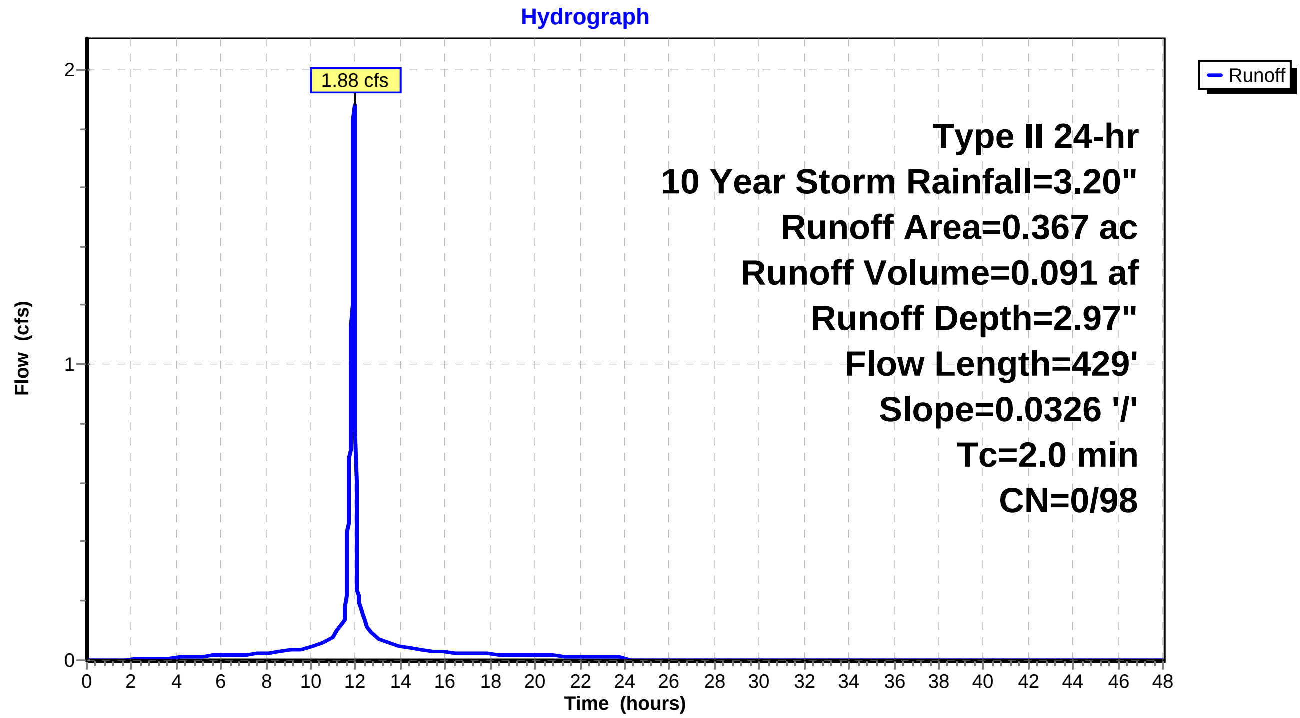
Runoff = 1.88 cfs @ 11.92 hrs, Volume= 0.091 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.367	98	Paved roads w/curbs & sewers, HSG D
0.367	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	429	0.0326	3.67		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 27: Subcat 27



Summary for Subcatchment 28: Subcat 28

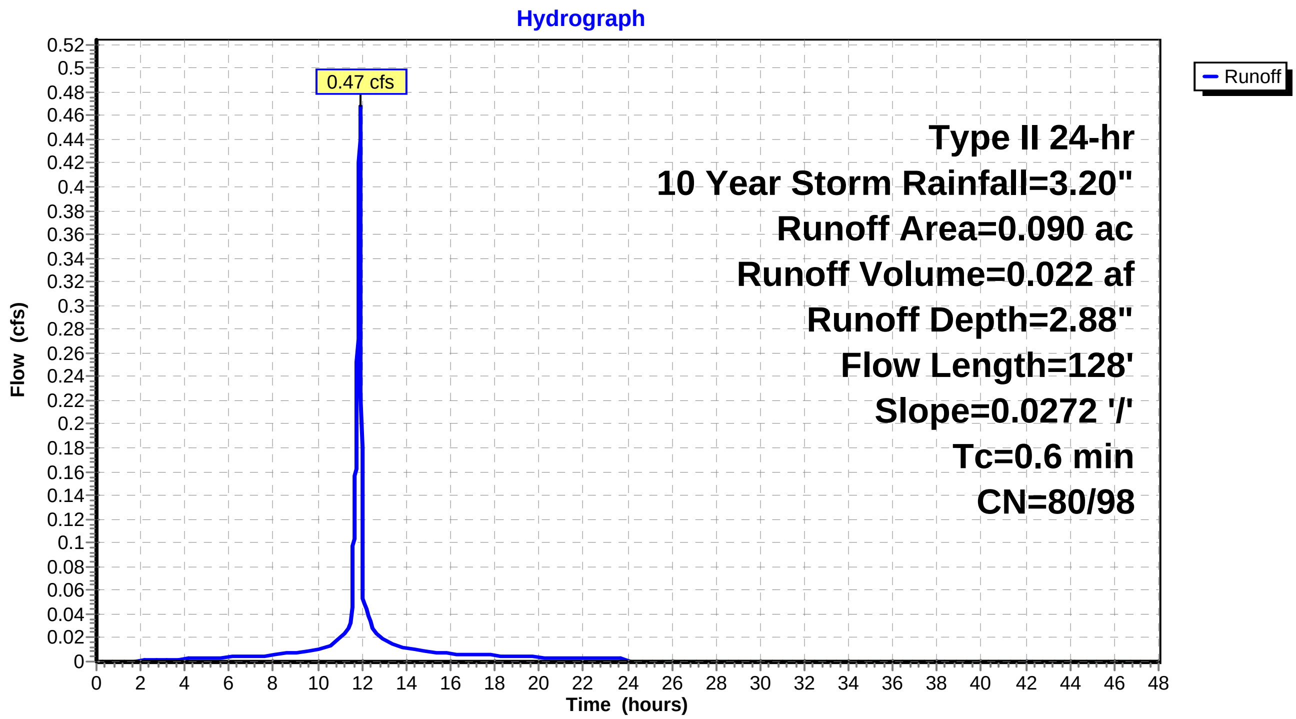
Runoff = 0.47 cfs @ 11.91 hrs, Volume= 0.022 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.079	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.005	80	>75% Grass cover, Good, HSG D
0.090	97	Weighted Average
0.005	80	5.56% Pervious Area
0.085	98	94.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	128	0.0272	3.35		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 28: Subcat 28



Summary for Subcatchment 29: Subcat 29

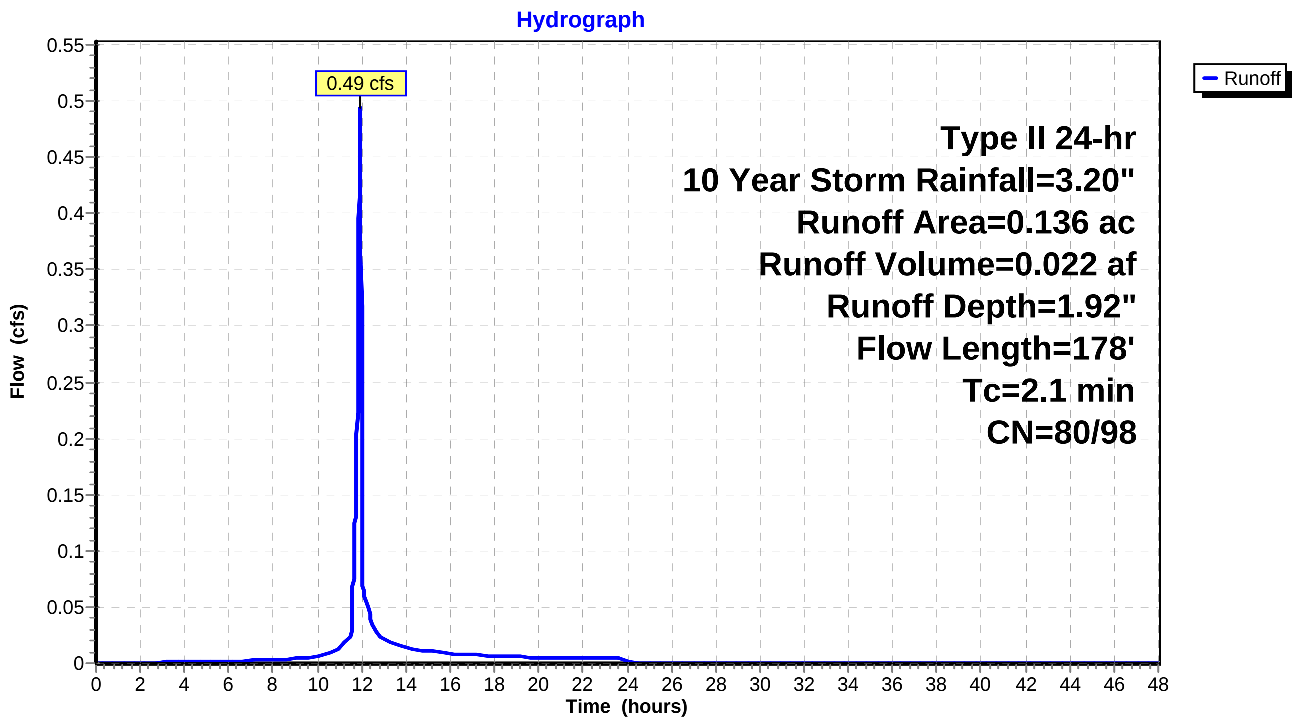
Runoff = 0.49 cfs @ 11.93 hrs, Volume= 0.022 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.039	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.088	80	>75% Grass cover, Good, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.136	86	Weighted Average
0.091	80	66.91% Pervious Area
0.045	98	33.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0353	3.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.0	163	0.0388	1.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	178	Total			

Subcatchment 29: Subcat 29



Summary for Subcatchment 30: Subcat 30

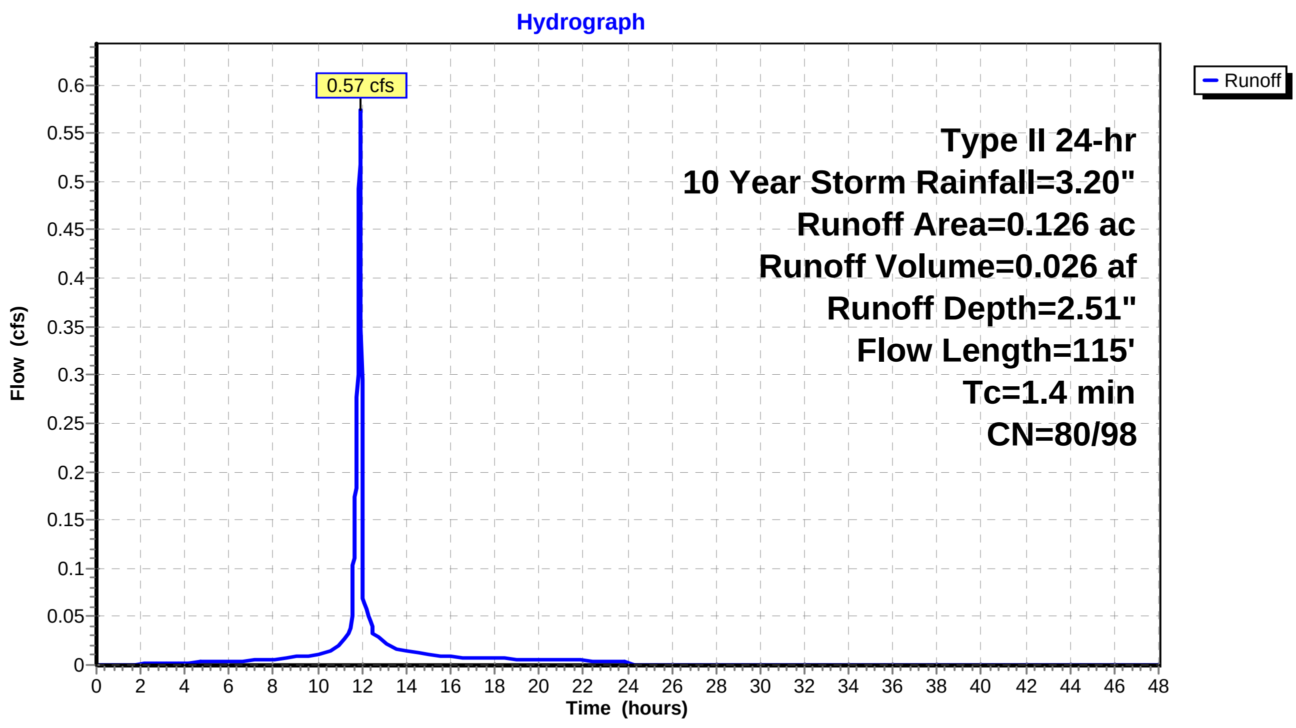
Runoff = 0.57 cfs @ 11.92 hrs, Volume= 0.026 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.089	98	Paved roads w/curbs & sewers, HSG D
0.027	80	>75% Grass cover, Good, HSG D
0.010	80	>75% Grass cover, Good, HSG D
0.126	93	Weighted Average
0.037	80	29.37% Pervious Area
0.089	98	70.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	75	0.0213	1.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.0324	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	115	Total			

Subcatchment 30: Subcat 30



Summary for Subcatchment 31: Subcat 31

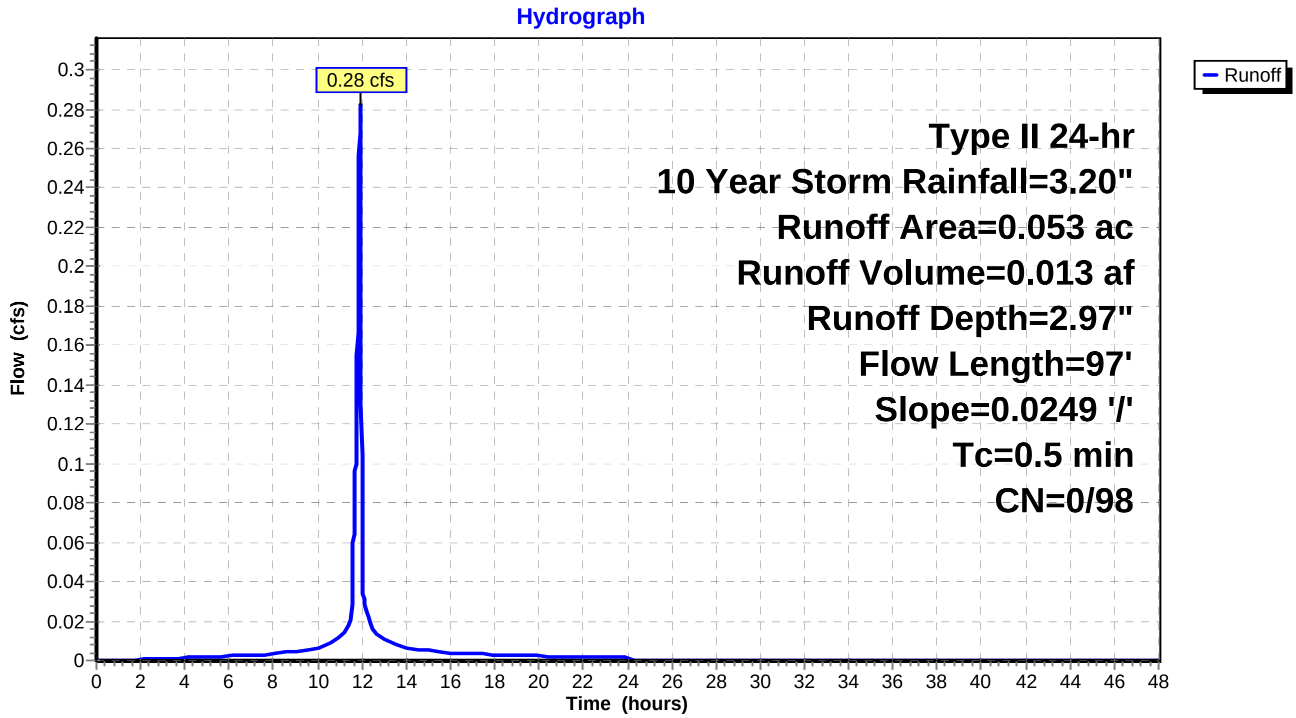
Runoff = 0.28 cfs @ 11.91 hrs, Volume= 0.013 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.053	98	Paved roads w/curbs & sewers, HSG D
0.053	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	97	0.0249	3.20		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 31: Subcat 31



Summary for Subcatchment 32: Subcat 31

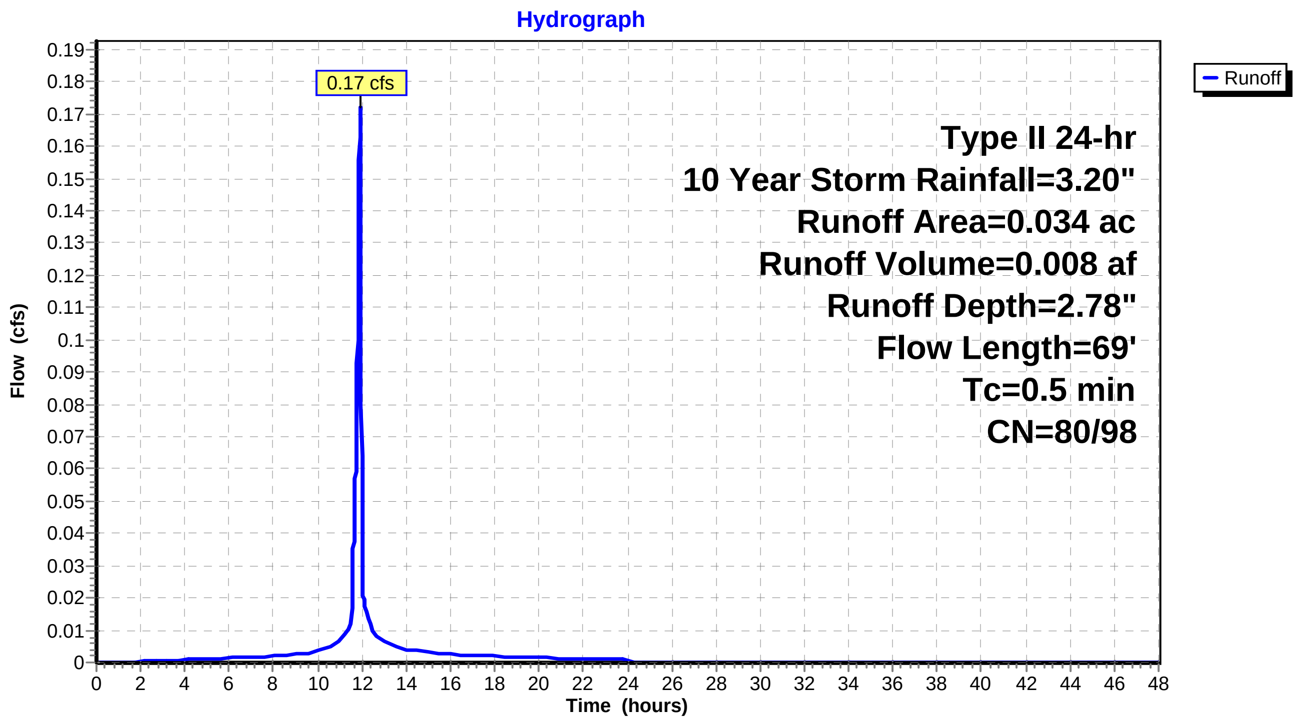
Runoff = 0.17 cfs @ 11.91 hrs, Volume= 0.008 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.030	98	Paved roads w/curbs & sewers, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.034	96	Weighted Average
0.004	80	11.76% Pervious Area
0.030	98	88.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0423	1.44		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	56	0.0310	3.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	69	Total			

Subcatchment 32: Subcat 31



Summary for Subcatchment 34: Subcat 34

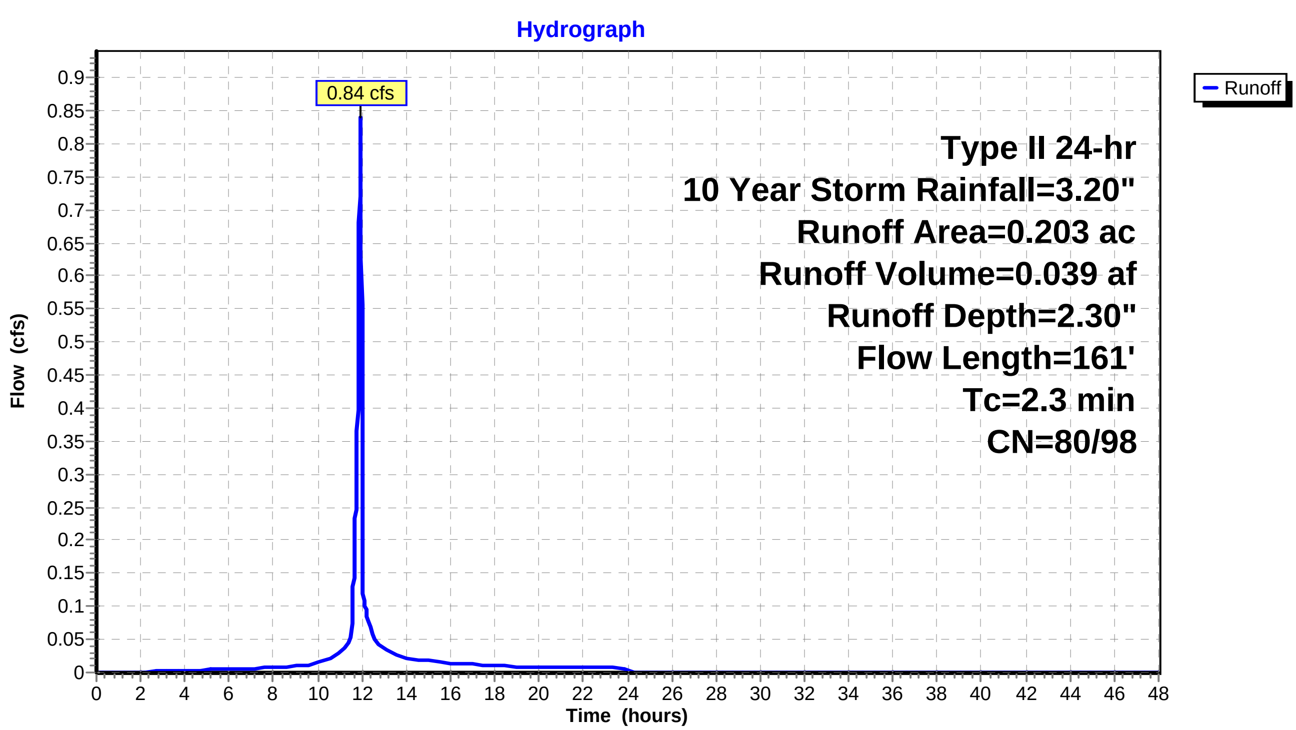
Runoff = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.039	98	Paved roads w/curbs & sewers, HSG D
0.045	98	Paved roads w/curbs & sewers, HSG D
0.032	98	Paved roads w/curbs & sewers, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.203	90	Weighted Average
0.087	80	42.86% Pervious Area
0.116	98	57.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.0197	2.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	123	0.0186	0.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	161	Total			

Subcatchment 34: Subcat 34



Summary for Subcatchment 35: Subcat 35

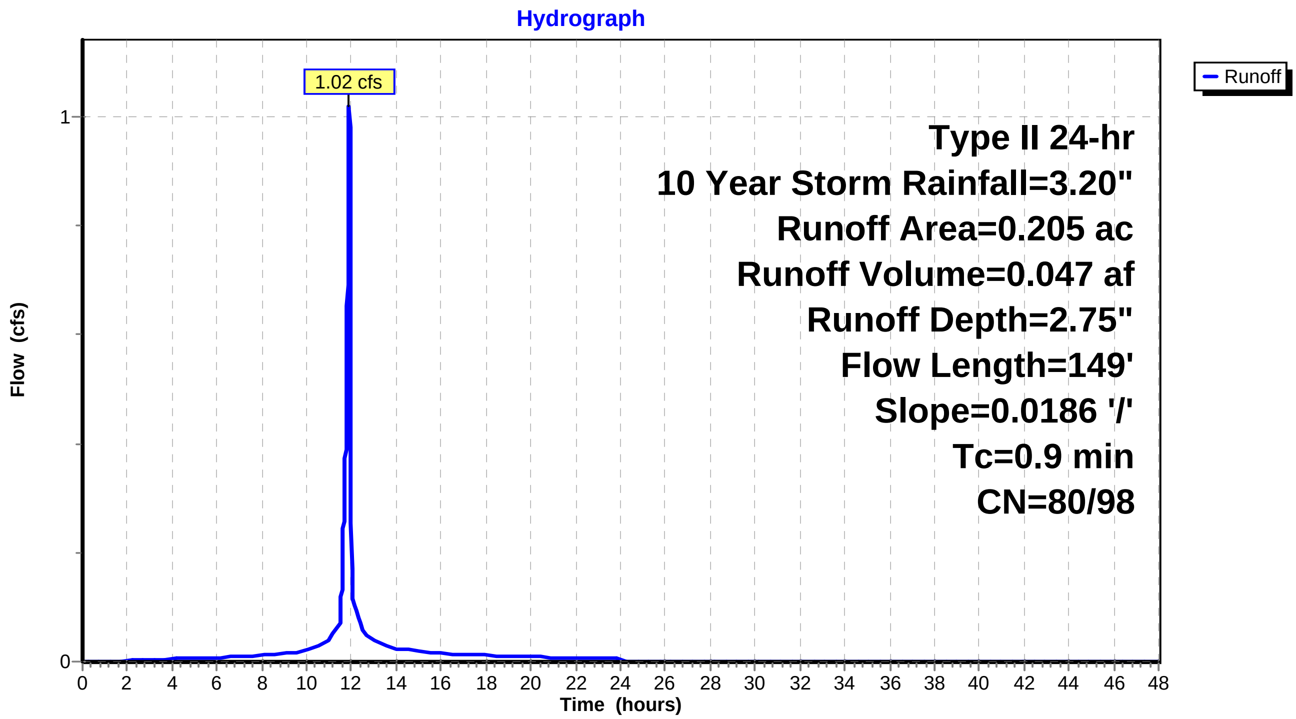
Runoff = 1.02 cfs @ 11.91 hrs, Volume= 0.047 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.177	98	Paved roads w/curbs & sewers, HSG D
0.007	80	>75% Grass cover, Good, HSG D
0.021	80	>75% Grass cover, Good, HSG D
0.205	96	Weighted Average
0.028	80	13.66% Pervious Area
0.177	98	86.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	149	0.0186	2.77		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 35: Subcat 35



Summary for Subcatchment 36: Subcat 36

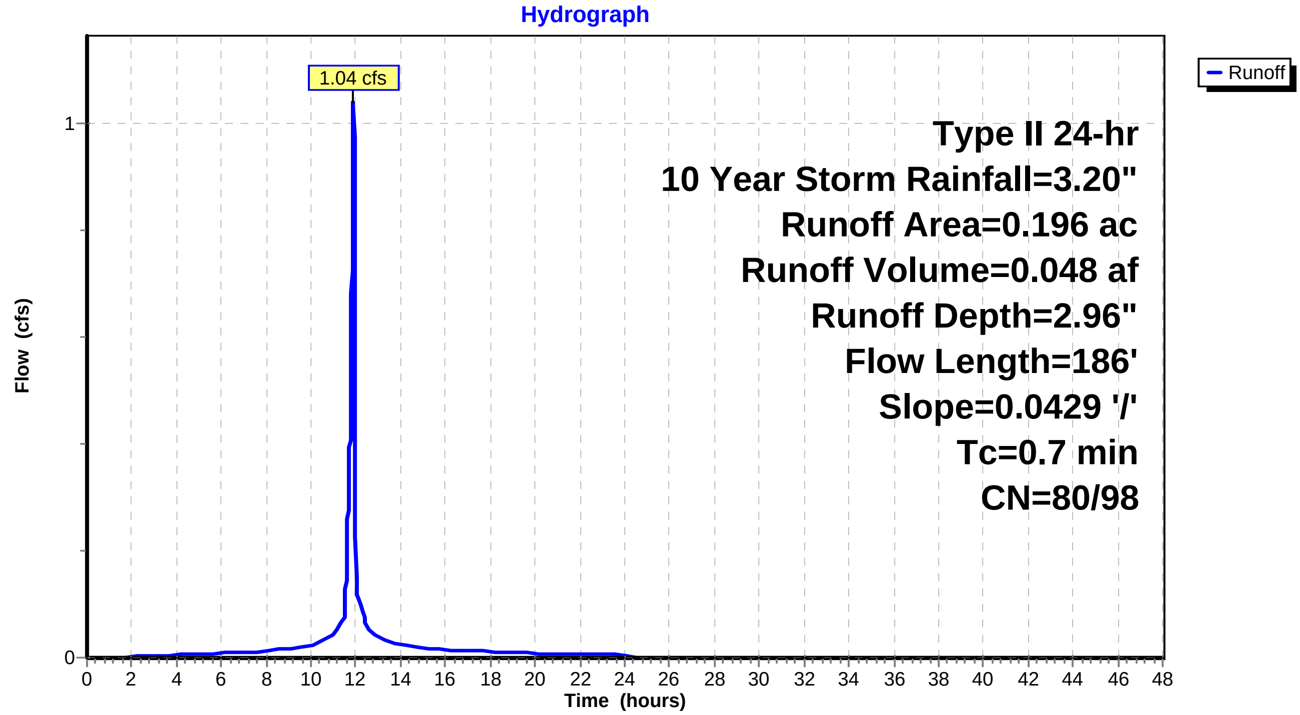
Runoff = 1.04 cfs @ 11.91 hrs, Volume= 0.048 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.187	98	Paved roads w/curbs & sewers, HSG D
0.006	98	Paved roads w/curbs & sewers, HSG D
0.001	98	Paved roads w/curbs & sewers, HSG D
0.001	98	Paved roads w/curbs & sewers, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.196	98	Weighted Average
0.001	80	0.51% Pervious Area
0.195	98	99.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	186	0.0429	4.20		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 36: Subcat 36



Summary for Subcatchment 59: Subcat 59

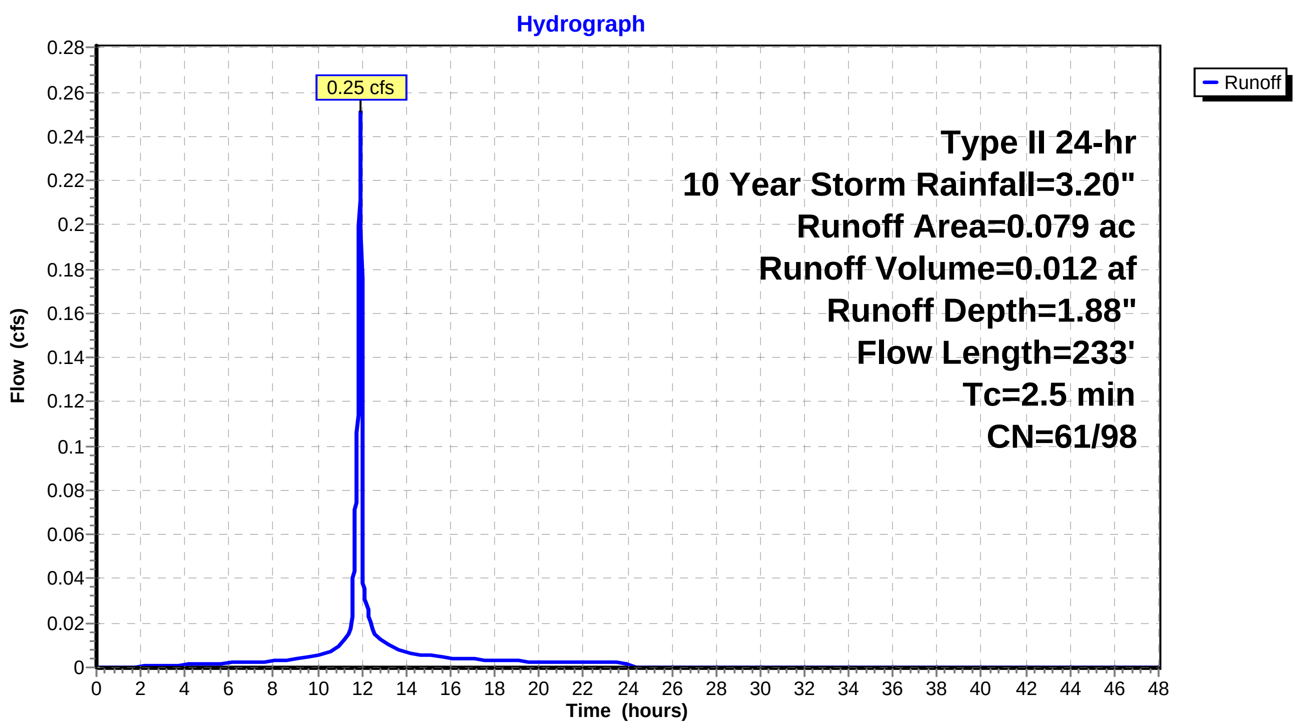
Runoff = 0.25 cfs @ 11.93 hrs, Volume= 0.012 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.045	98	Paved roads w/curbs & sewers, HSG B
0.034	61	>75% Grass cover, Good, HSG B
0.079	82	Weighted Average
0.034	61	43.04% Pervious Area
0.045	98	56.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	227	0.0515	1.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	233	Total			

Subcatchment 59: Subcat 59



Summary for Subcatchment 60: Subcat 60

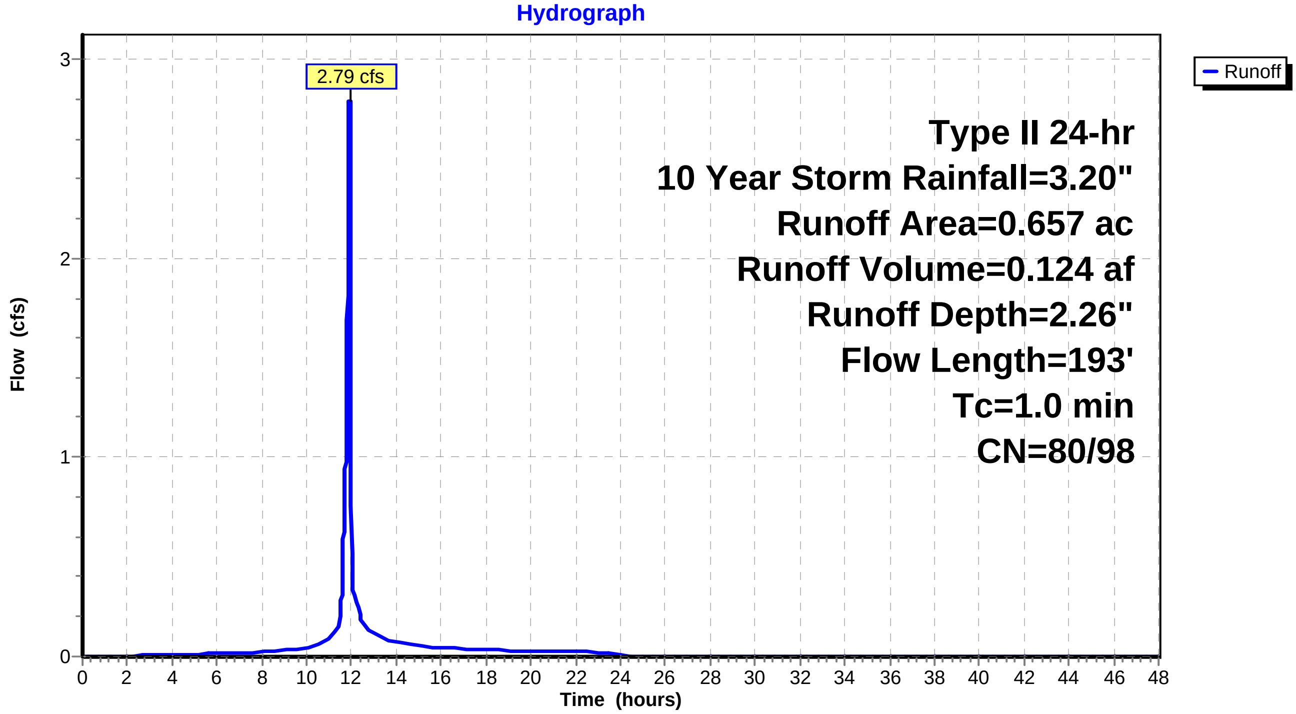
Runoff = 2.79 cfs @ 11.91 hrs, Volume= 0.124 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.228	98	Paved roads w/curbs & sewers, HSG D
0.007	98	Paved roads w/curbs & sewers, HSG D
0.016	98	Paved roads w/curbs & sewers, HSG D
0.008	98	Paved roads w/curbs & sewers, HSG D
0.100	98	Paved roads w/curbs & sewers, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.259	80	>75% Grass cover, Good, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.657	90	Weighted Average
0.298	80	45.36% Pervious Area
0.359	98	54.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	100	0.0461	4.36		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	93	0.1199	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	193	Total			

Subcatchment 60: Subcat 60



Summary for Subcatchment 63: Subcat 63

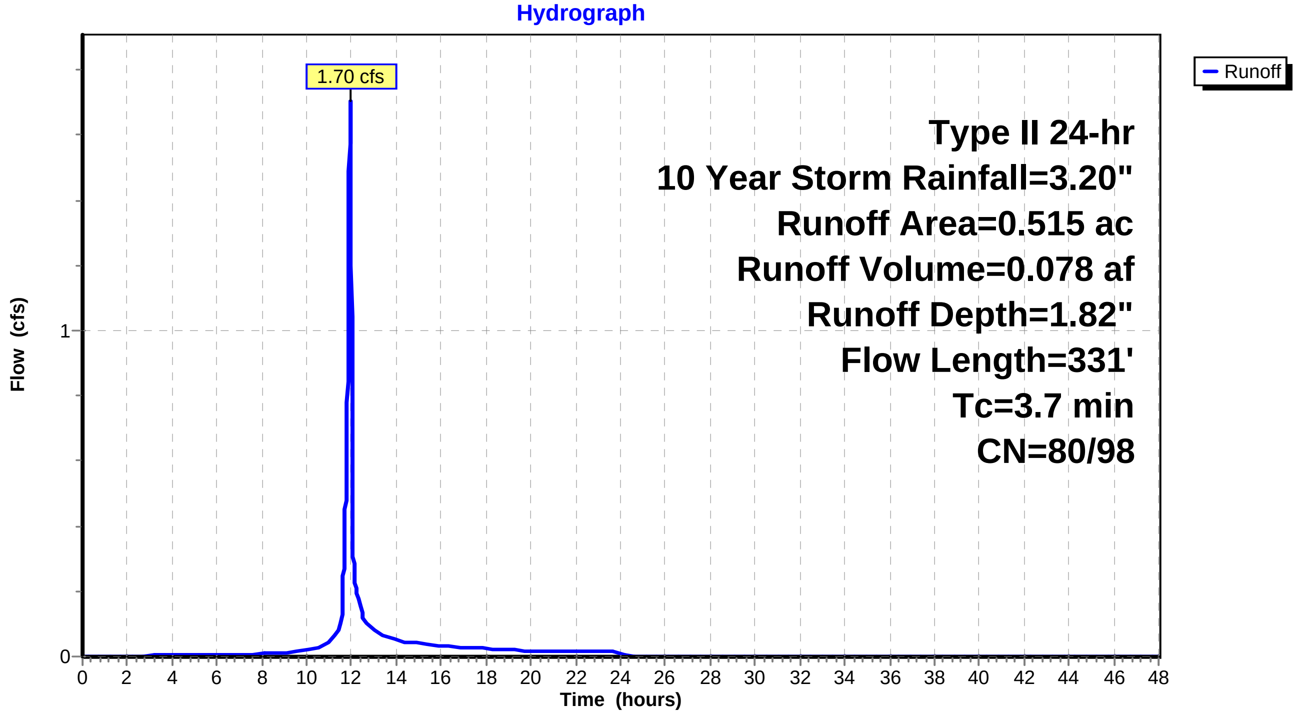
Runoff = 1.70 cfs @ 11.95 hrs, Volume= 0.078 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.135	98	Paved roads w/curbs & sewers, HSG D
0.004	98	Paved roads w/curbs & sewers, HSG D
0.011	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.177	80	>75% Grass cover, Good, HSG D
0.515	85	Weighted Average
0.376	80	73.01% Pervious Area
0.139	98	26.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	31	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	83	0.0139	2.39		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	217	0.0453	1.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.7	331	Total			

Subcatchment 63: Subcat 63



Summary for Subcatchment CPv4: Site #4 On Site

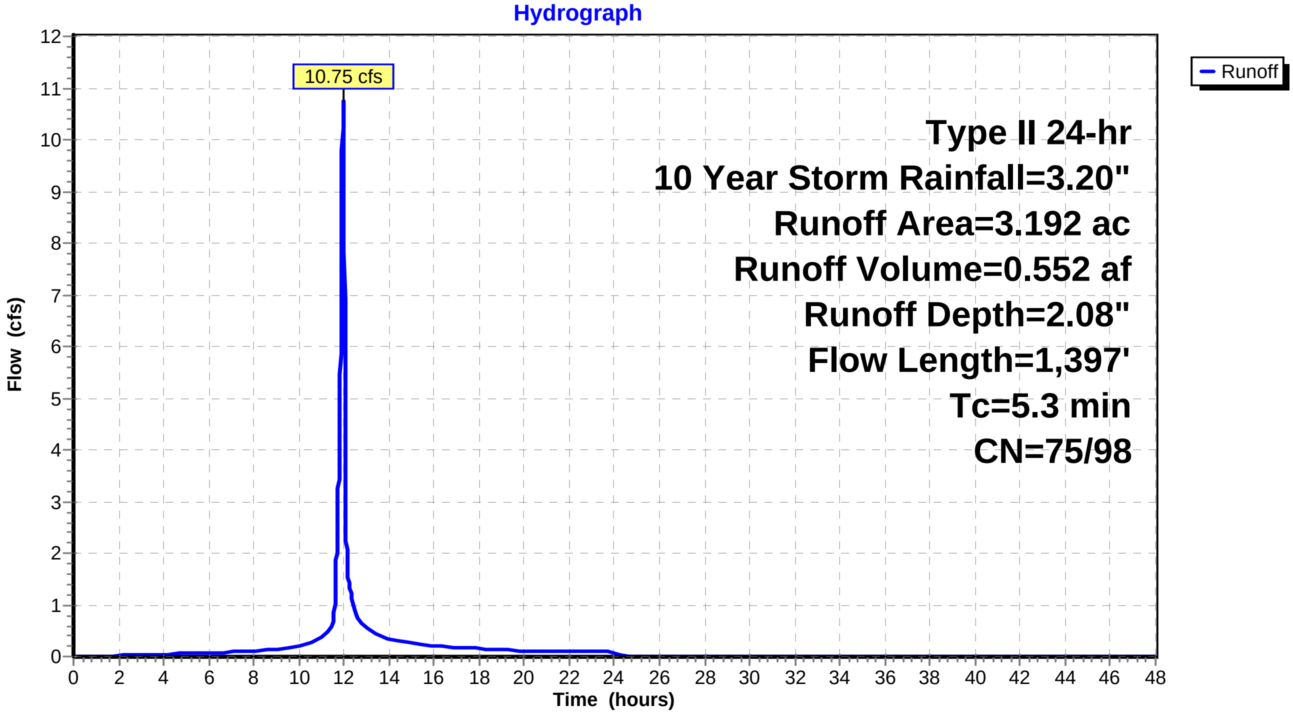
Runoff = 10.75 cfs @ 11.96 hrs, Volume= 0.552 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.022	39	>75% Grass cover, Good, HSG A
0.026	98	Paved roads w/curbs & sewers, HSG A
0.562	61	>75% Grass cover, Good, HSG B
0.243	98	Water Surface, 0% imp, HSG B
0.475	98	Paved roads w/curbs & sewers, HSG B
0.000	74	>75% Grass cover, Good, HSG C
0.003	98	Paved roads w/curbs & sewers, HSG C
0.692	80	>75% Grass cover, Good, HSG D
1.169	98	Paved roads w/curbs & sewers, HSG D
3.192	87	Weighted Average
1.519	75	47.59% Pervious Area
1.673	98	52.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	67	0.0147	0.95		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.30"
0.3	68	0.0413	4.13		**Shallow Concentrated Flow, Shallow Pave 1** Paved Kv= 20.3 fps
1.5	444	0.0091	4.86	38.91	**Channel Flow, Grass Channel 1** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.2	61	0.0311	5.45	9.63	**Pipe Channel, Culvert 1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
1.8	632	0.0131	5.84	46.68	**Channel Flow, Channel 2** Area= 8.0 sf Perim= 12.2' r= 0.66' n= 0.022 Earth, clean & straight
0.3	125	0.0649	7.87	13.92	**Pipe Channel, Culvert 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
5.3	1,397	Total			

Subcatchment CPv4: Site #4 On Site



Summary for Subcatchment OS1: Off-Site 1

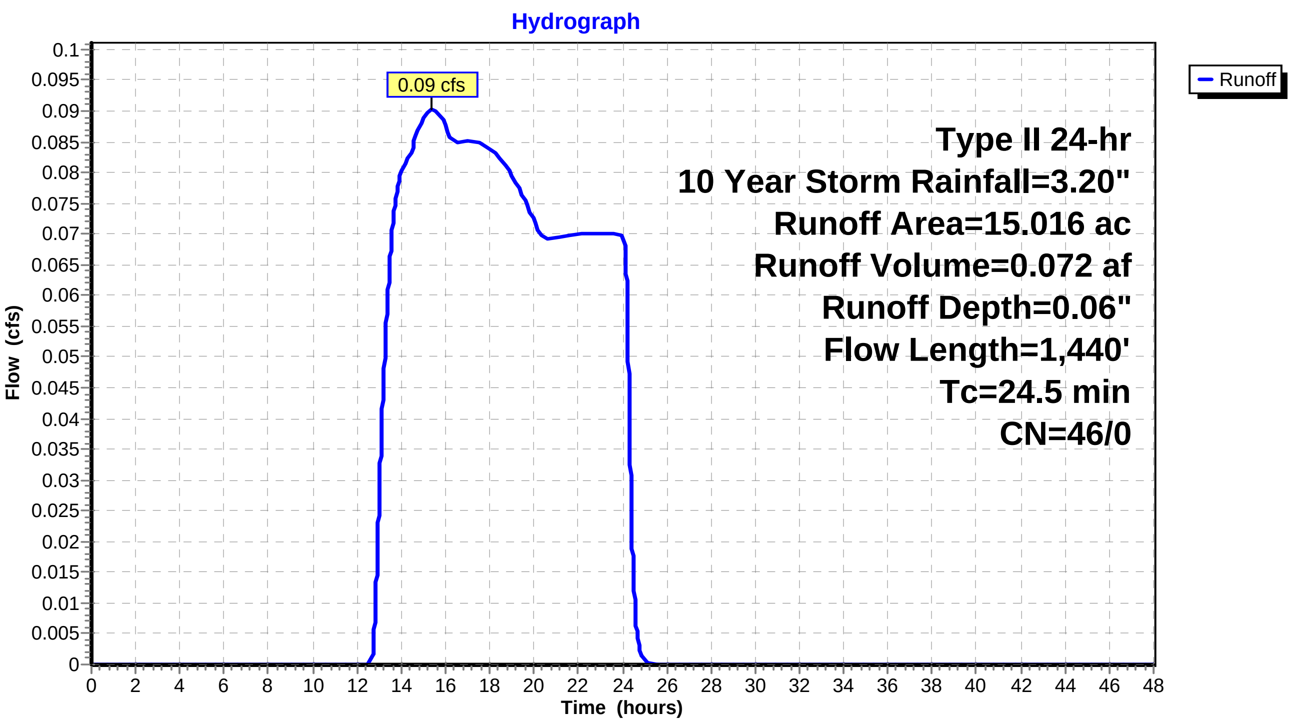
Runoff = 0.09 cfs @ 15.38 hrs, Volume= 0.072 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	15.016	46	Composite CN
	15.016	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	100	0.0426	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	464	0.0426	3.32		**Shallow Concentrated Flow, woods segment** Unpaved Kv= 16.1 fps
2.9	586	0.0427	3.33		**Shallow Concentrated Flow, grass segment** Unpaved Kv= 16.1 fps
0.1	156	0.1731	29.96	94.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	134	0.0746	4.10		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
24.5	1,440	Total			

Subcatchment OS1: Off-Site 1



Summary for Subcatchment OS2: Off-Site 2

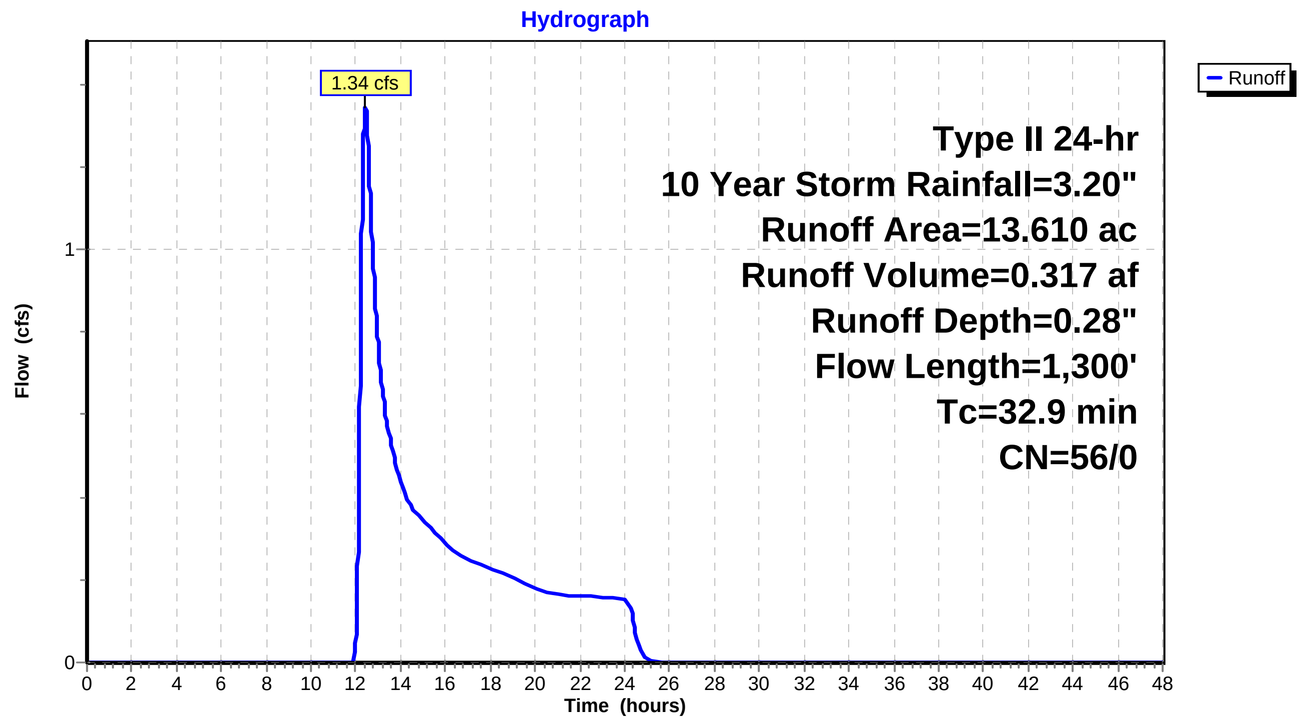
Runoff = 1.34 cfs @ 12.43 hrs, Volume= 0.317 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	13.610	56	Composite CN
	13.610	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.7	100	0.0176	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
5.4	690	0.0176	2.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	510	0.0585	10.87	41.30	**Trap/Vee/Rect Channel Flow, channel** Bot.W=2.50' D=1.00' Z= 1.3 '/' Top.W=5.10' n= 0.025
32.9	1,300	Total			

Subcatchment OS2: Off-Site 2



Summary for Subcatchment OS3: Off-Site 3

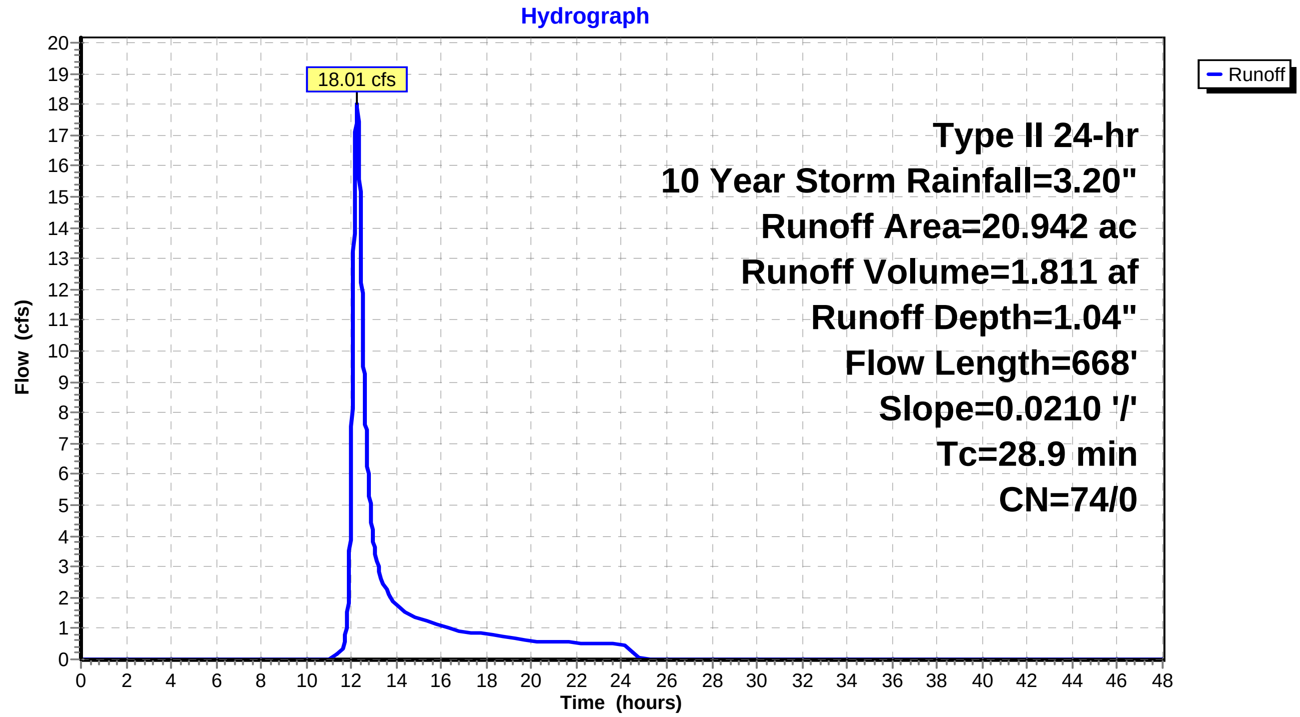
Runoff = 18.01 cfs @ 12.24 hrs, Volume= 1.811 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	20.942	74	Composite CN
	20.942	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	100	0.0210	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
4.1	568	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
28.9	668	Total			

Subcatchment OS3: Off-Site 3



Summary for Subcatchment OS4a1: Charlebois WS1

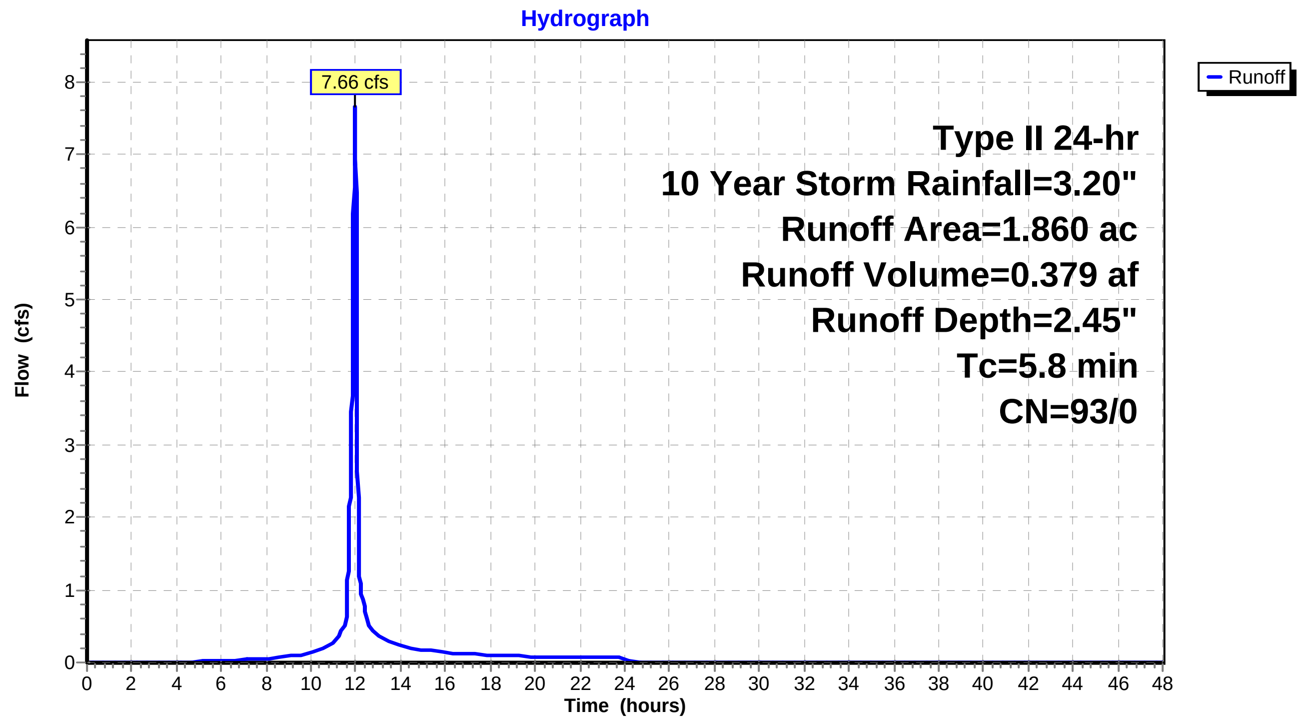
Runoff = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.860	93	From 2005 Permit Application
	1.860	93	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8					**Direct Entry, from 2005 permit application**

Subcatchment OS4a1: Charlebois WS1



Summary for Subcatchment OS4a2: Charlebois WS2

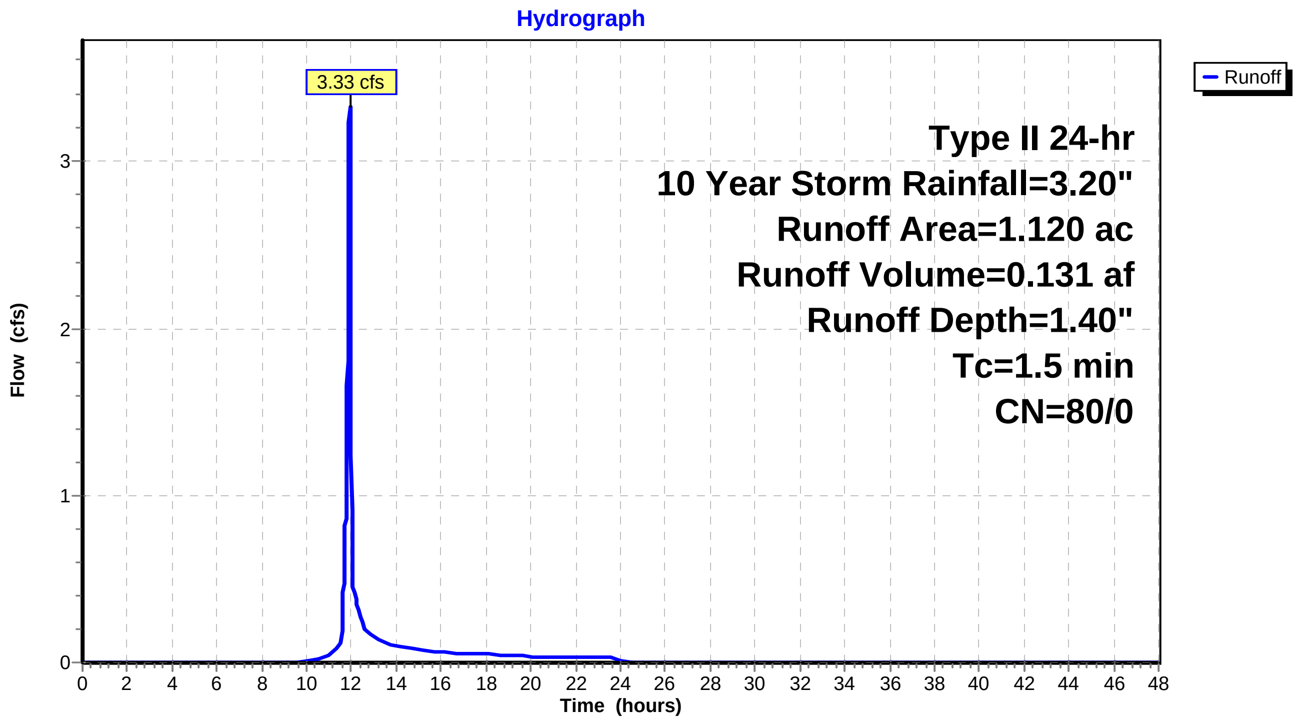
Runoff = 3.33 cfs @ 11.92 hrs, Volume= 0.131 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.120	80	from 2005 Permit Application
	1.120	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5					**Direct Entry, from 2005 Permit Application**

Subcatchment OS4a2: Charlebois WS2



Summary for Subcatchment OS4p: Site #4 Off Site

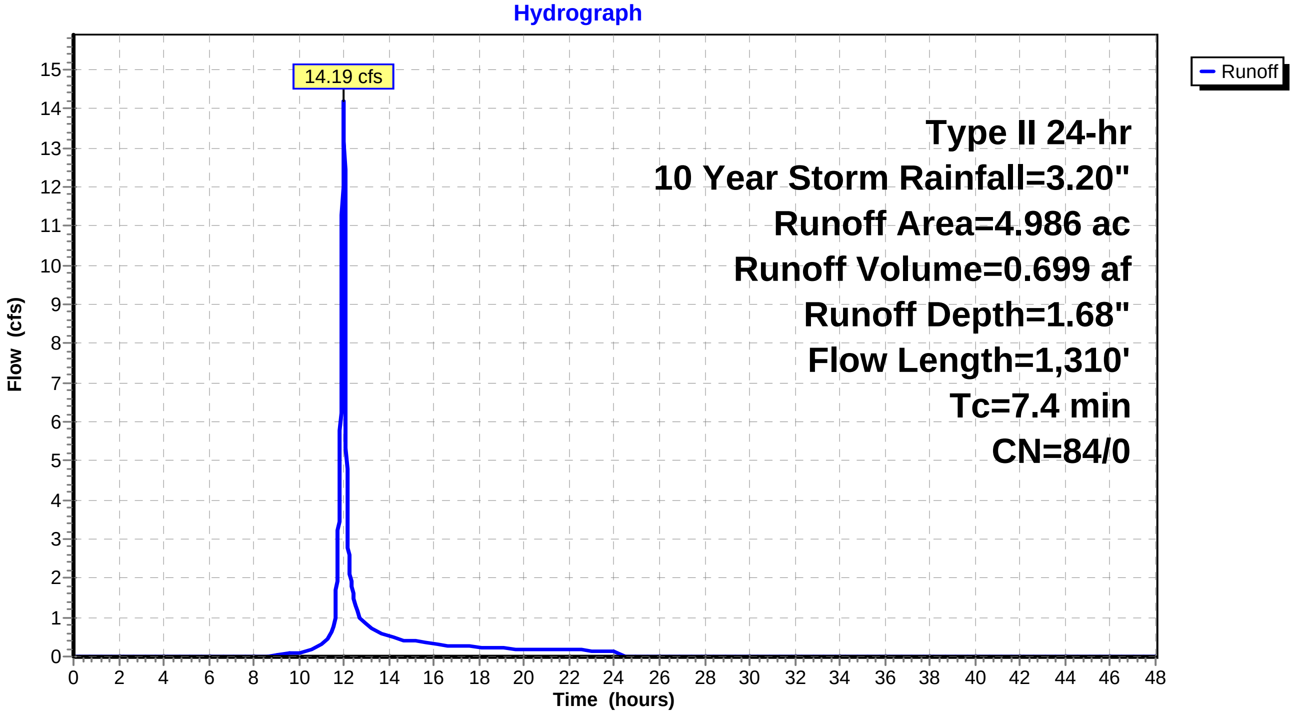
Runoff = 14.19 cfs @ 11.99 hrs, Volume= 0.699 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	4.986	84	composite CN
	4.986	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	191	0.0200	6.33	50.63	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.025 Earth, clean & straight
0.3	149	0.0400	8.95	71.60	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.025
0.3	177	0.0700	11.46	80.25	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.025
0.2	161	0.0900	13.29	79.74	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=1.00' Z= 3.0 '/' Top.W=9.00' n= 0.025
1.7	174	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	206	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	106	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	146	0.1370	1.85		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	1,310	Total			

Subcatchment OS4p: Site #4 Off Site



Summary for Subcatchment OS4wb: Off-Site 4 West of Rte 7 w/o Pond

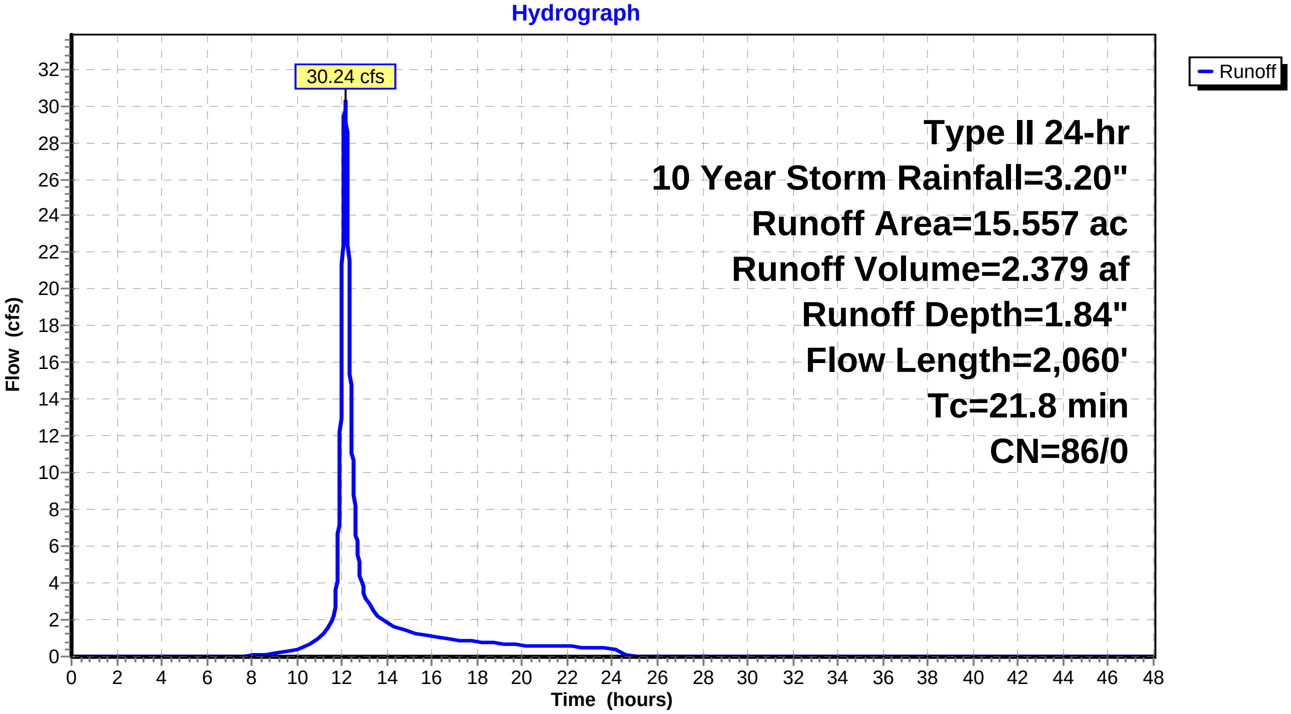
Runoff = 30.24 cfs @ 12.14 hrs, Volume= 2.379 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	15.557	86	composite CN
	15.557	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0312	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.9	320	0.0312	2.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	940	0.0137	3.55	7.98	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=0.50' Z= 4.0 & 2.0 '/' Top.W=6.00' n= 0.025
0.1	110	0.0357	13.61	42.74	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.5	160	0.0123	5.10	214.24	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=2.00' Z= 8.0 '/' Top.W=37.00' n= 0.035
0.4	320	0.0402	14.44	45.36	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	110	0.0826	4.31		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
21.8	2,060	Total			

Subcatchment OS4wb: Off-Site 4 West of Rte 7 w/o Pond



Summary for Subcatchment OS4_E: Off-Site 4 East of Rte 7

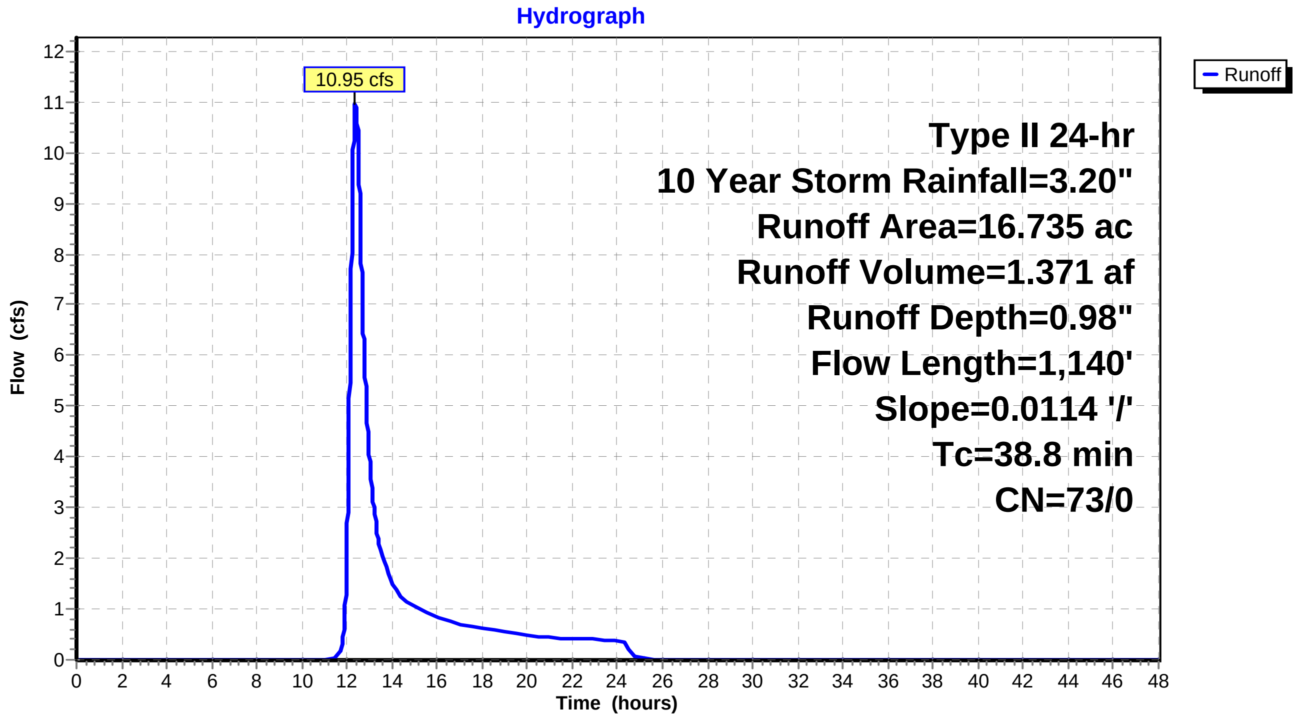
Runoff = 10.95 cfs @ 12.37 hrs, Volume= 1.371 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	16.735	73	composite
	16.735	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0114	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
9.6	990	0.0114	1.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.8	1,140	Total			

Subcatchment OS4_E: Off-Site 4 East of Rte 7



Summary for Subcatchment OS5a: (new Subcat)

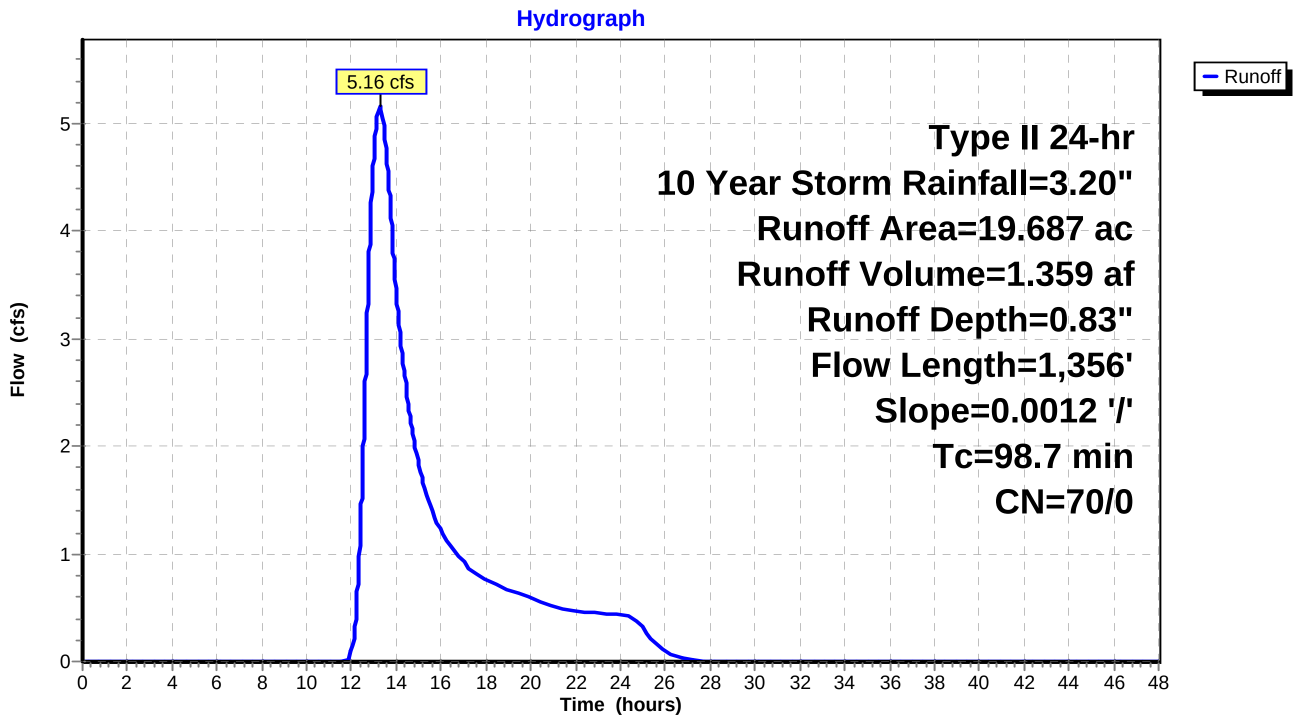
Runoff = 5.16 cfs @ 13.27 hrs, Volume= 1.359 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	19.687	70	weighted CN
	19.687	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
78.0	100	0.0012	0.02		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.4	313	0.0012	0.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	489	0.0012	0.98	1.95	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.025
3.0	454	0.0012	2.49	7.84	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
98.7	1,356	Total			

Subcatchment OS5a: (new Subcat)



Summary for Subcatchment OS5b: (new Subcat)

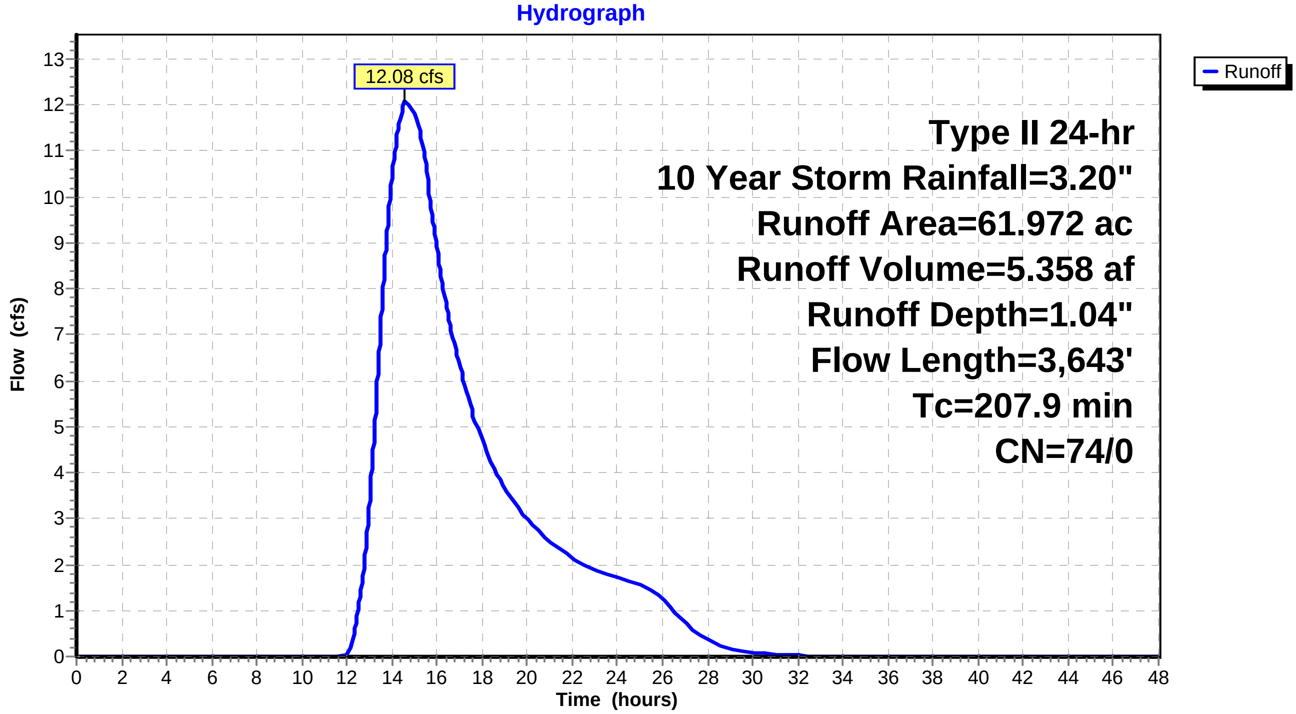
Runoff = 12.08 cfs @ 14.56 hrs, Volume= 5.358 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	61.972	74	weighted CN
	61.972	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.4	100	0.0015	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.4	50	0.0015	0.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
113.4	1,318	0.0015	0.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	670	0.0081	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	666	0.0009	1.08	3.25	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.025
10.7	839	0.0048	1.31	8.19	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
207.9	3,643	Total			

Subcatchment OS5b: (new Subcat)



Summary for Subcatchment OS5_6: (new Subcat)

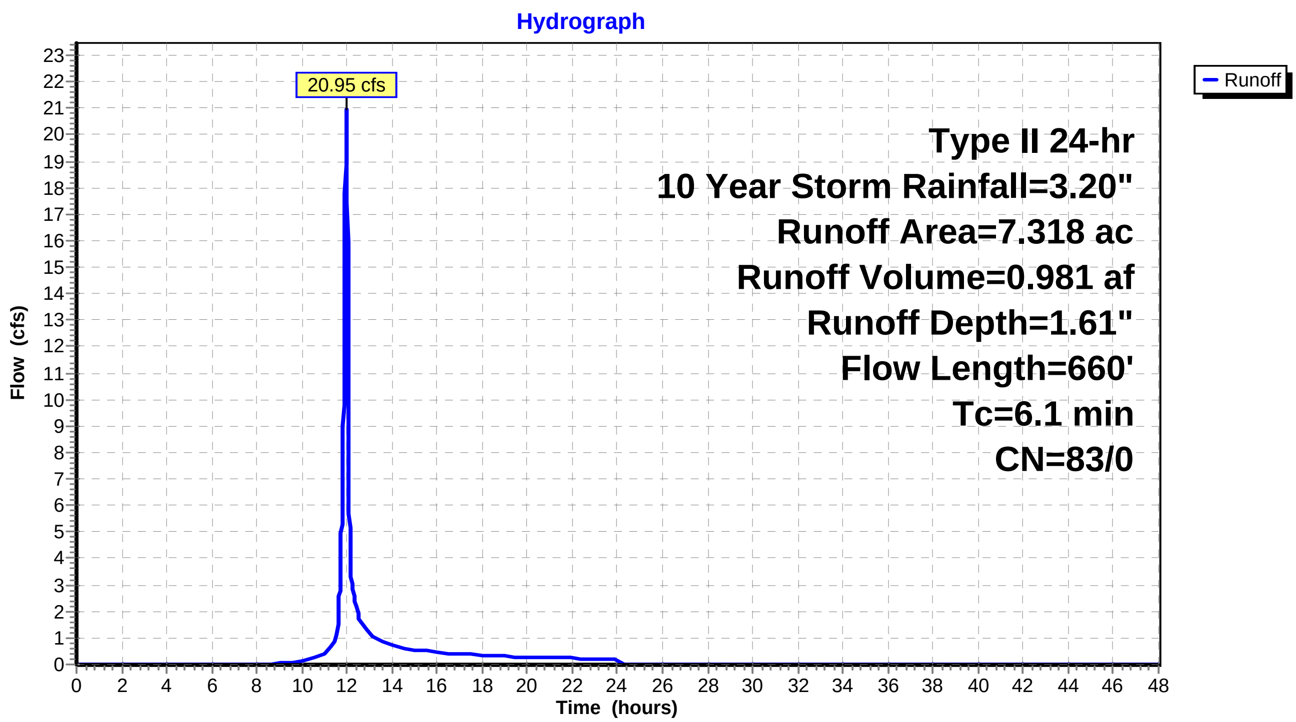
Runoff = 20.95 cfs @ 11.98 hrs, Volume= 0.981 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	7.318	83	weighted CN
	7.318	83	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	50	0.0130	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.4	340	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	270	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.1	660	Total			

Subcatchment OS5_6: (new Subcat)



Summary for Subcatchment OS5_7: (new Subcat)

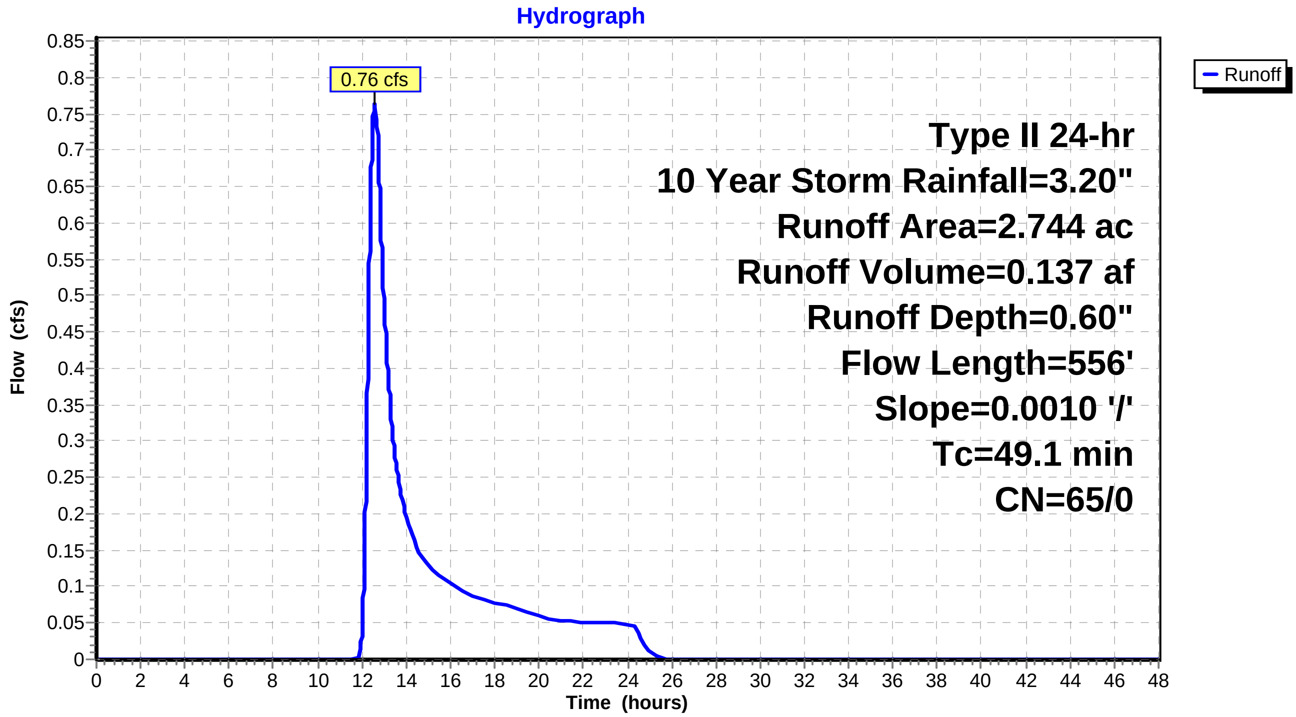
Runoff = 0.76 cfs @ 12.60 hrs, Volume= 0.137 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.744	65	weighted CN
	2.744	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.2	100	0.0010	0.05		**Sheet Flow,** Range n= 0.130 P2= 2.30"
14.9	456	0.0010	0.51		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
49.1	556	Total			

Subcatchment OS5_7: (new Subcat)



Summary for Subcatchment OS5_8: (new Subcat)

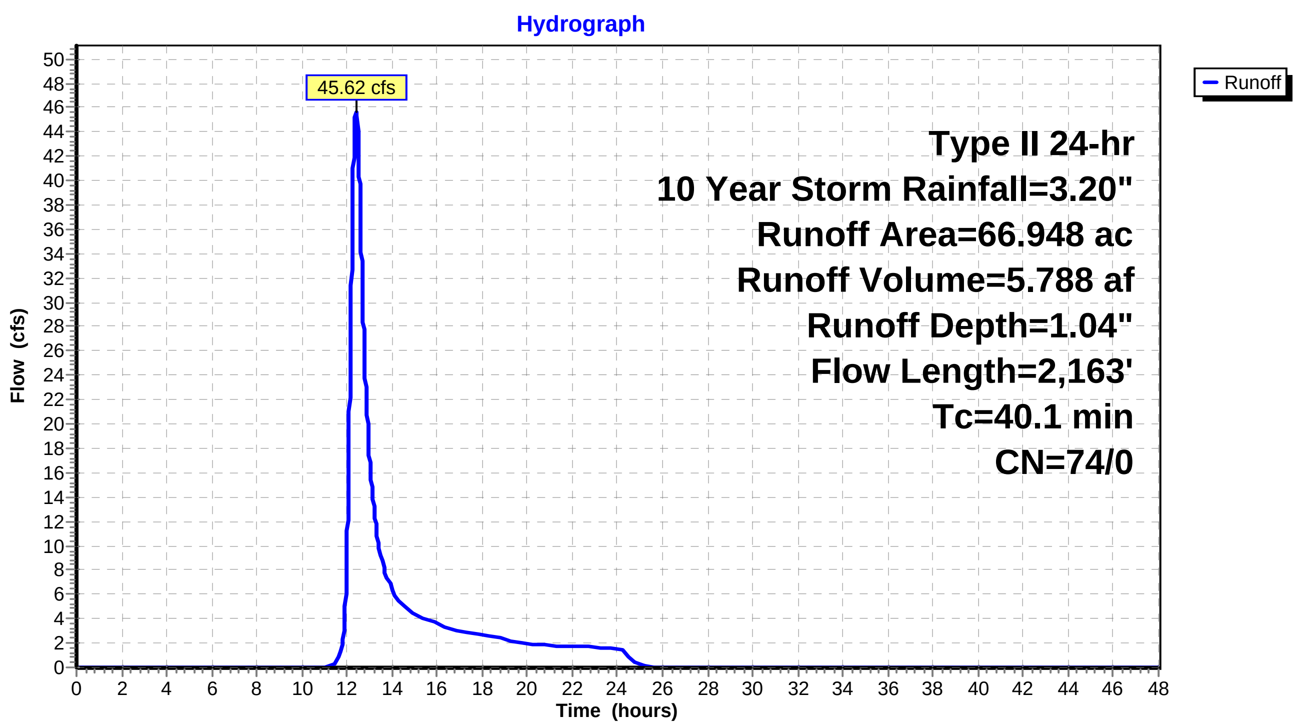
Runoff = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	66.948	74	weighted CN
	66.948	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.0025	0.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
5.7	345	0.0025	1.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
32.5	1,768	0.0023	0.91	5.67	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.50' Z= 17.0 '/' Top.W=21.00' n= 0.035
40.1	2,163	Total			

Subcatchment OS5_8: (new Subcat)



Summary for Subcatchment OS6: (new Subcat)

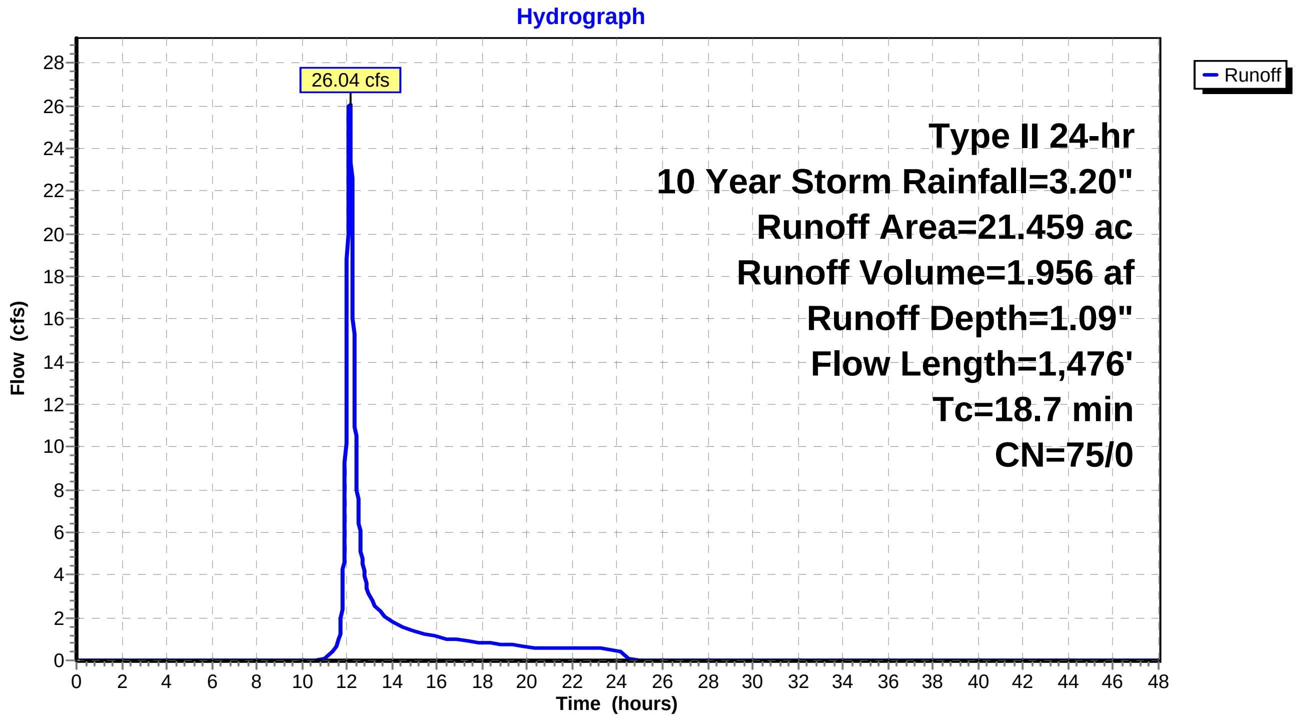
Runoff = 26.04 cfs @ 12.12 hrs, Volume= 1.956 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.459	75	weighted CN
	21.459	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.7	488	0.0930	4.91		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.9	938	0.0043	0.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.7	1,476	Total			

Subcatchment OS6: (new Subcat)



Summary for Subcatchment OS7_1: (new Subcat)

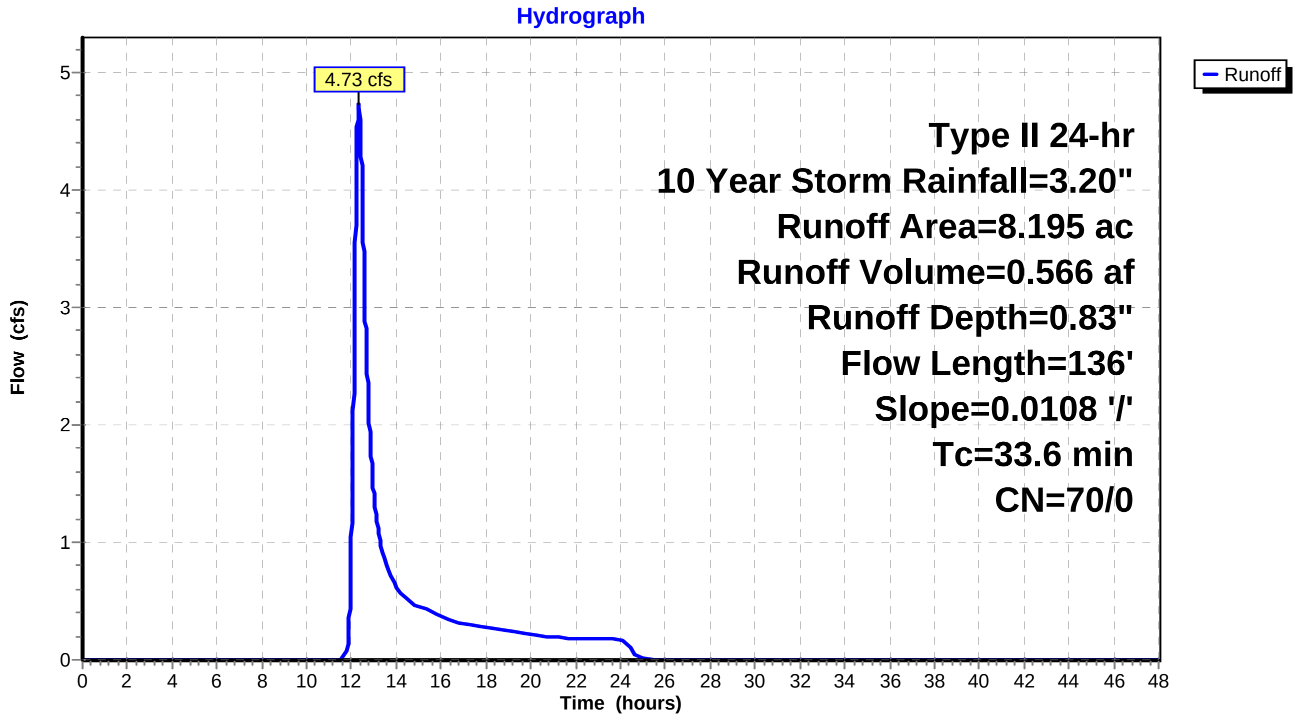
Runoff = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	8.195	70	weighted CN
	8.195	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	100	0.0108	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.2	36	0.0108	0.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.6	136	Total			

Subcatchment OS7_1: (new Subcat)



Summary for Subcatchment OS7_2: (new Subcat)

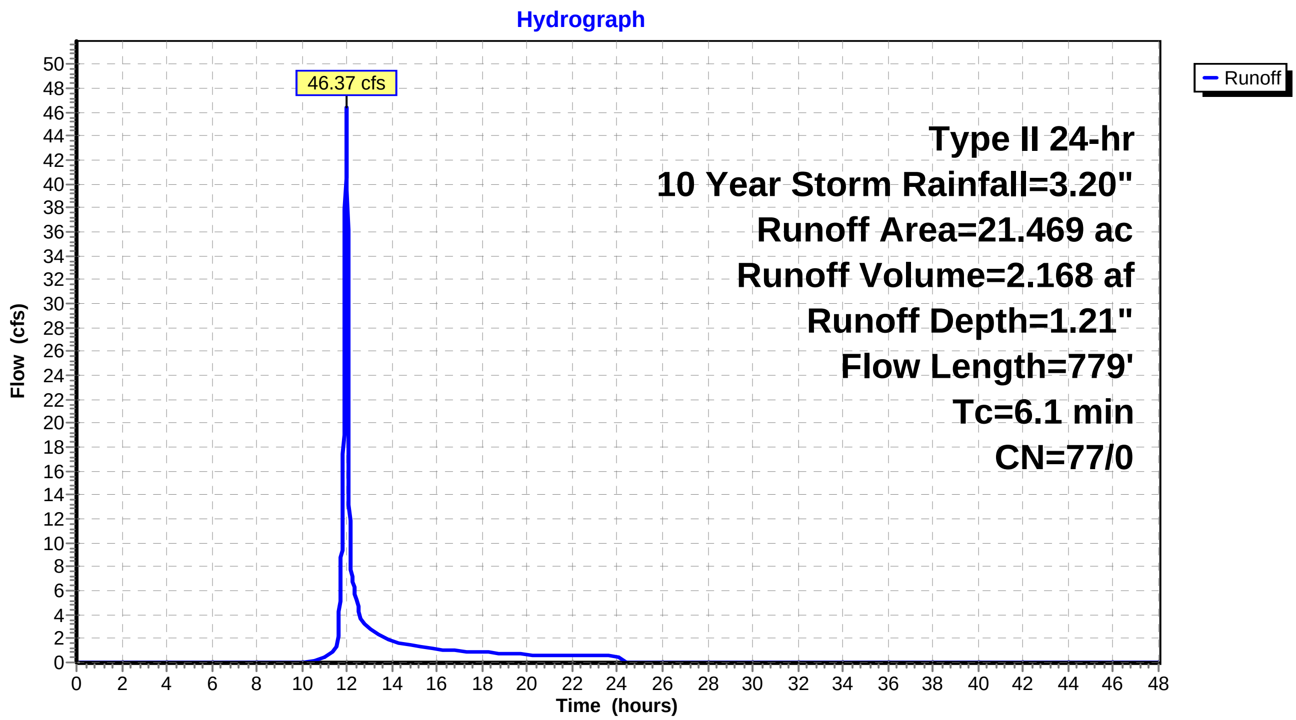
Runoff = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	21.469	77	weighted CN
	21.469	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0093	0.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.3	273	0.0093	1.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	456	0.0175	2.81	4.22	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.035
6.1	779	Total			

Subcatchment OS7_2: (new Subcat)



Summary for Subcatchment OS7_4: (new Subcat)

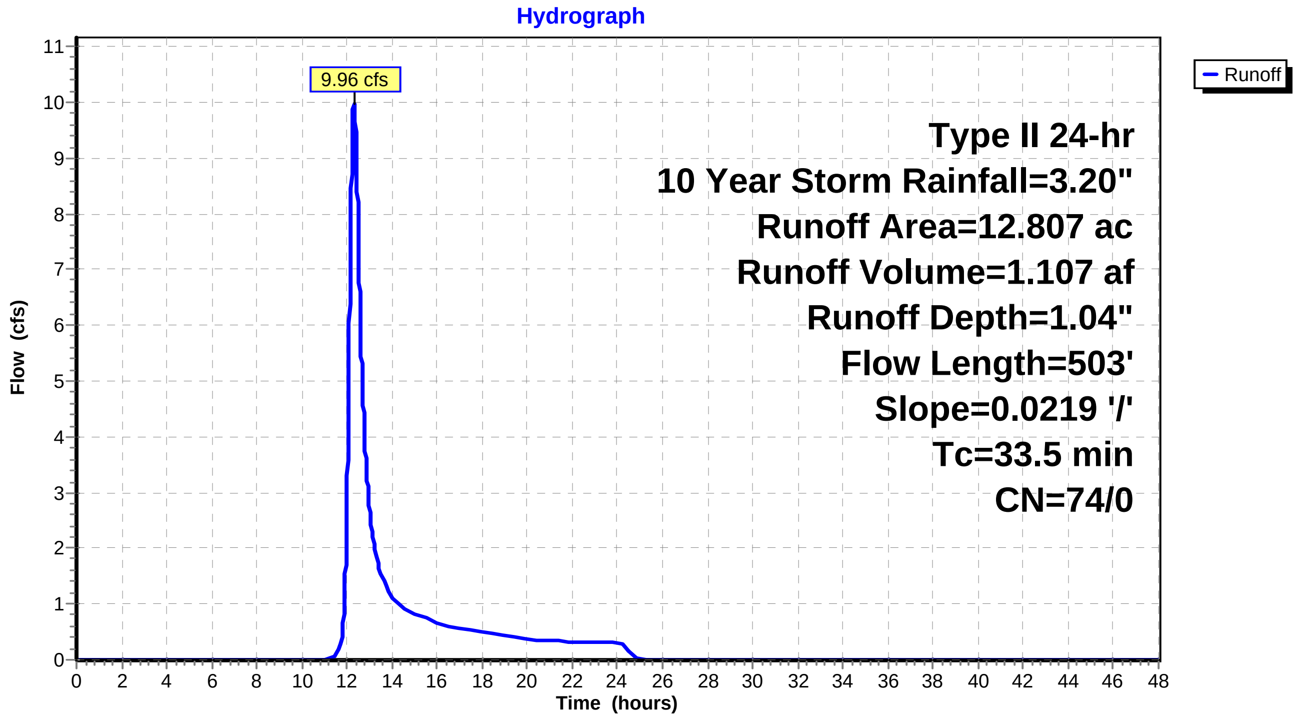
Runoff = 9.96 cfs @ 12.32 hrs, Volume= 1.107 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	12.807	74	weighted CN
	12.807	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.4	100	0.0219	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
9.1	403	0.0219	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.5	503	Total			

Subcatchment OS7_4: (new Subcat)



Summary for Subcatchment OS8a: (new Subcat)

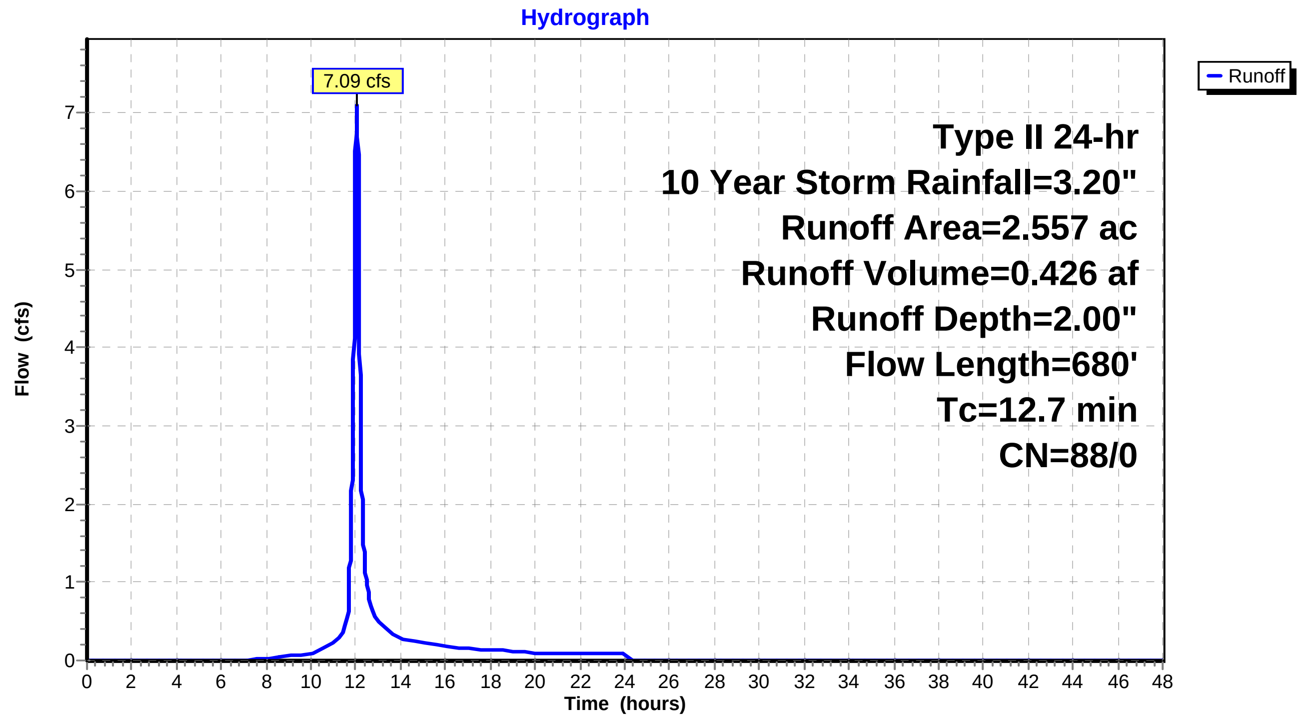
Runoff = 7.09 cfs @ 12.04 hrs, Volume= 0.426 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.557	88	weighted CN
	2.557	88	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	60	0.1228	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	290	0.0103	2.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	90	0.1319	2.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	240	0.0243	2.34		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.7	680	Total			

Subcatchment OS8a: (new Subcat)



Summary for Subcatchment OS8b: (new Subcat)

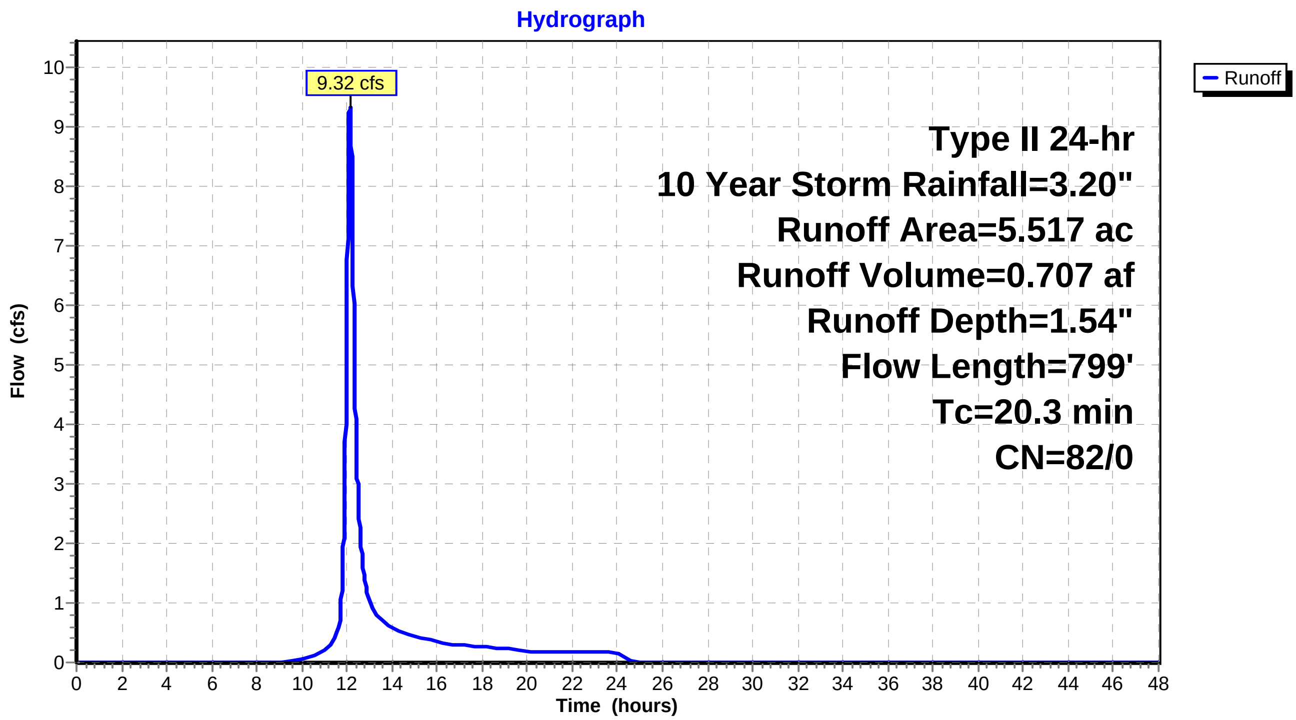
Runoff = 9.32 cfs @ 12.13 hrs, Volume= 0.707 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	5.517	82	weighted CN
	5.517	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0032	0.17		**Sheet Flow, roadside channel** Fallow n= 0.050 P2= 2.30"
9.5	518	0.0032	0.91		**Shallow Concentrated Flow, roadside channel** Unpaved Kv= 16.1 fps
0.8	181	0.0055	3.86	17.89	**Pipe Channel, CMP_Arch_1/2 35x24** 35.0" x 24.0", R=17.9"/55.1" Pipe Arch Area= 4.6 sf Perim= 7.9' r= n= 0.020 Corrugated PE, corrugated interior
20.3	799	Total			

Subcatchment OS8b: (new Subcat)



Summary for Subcatchment OS8c: (new Subcat)

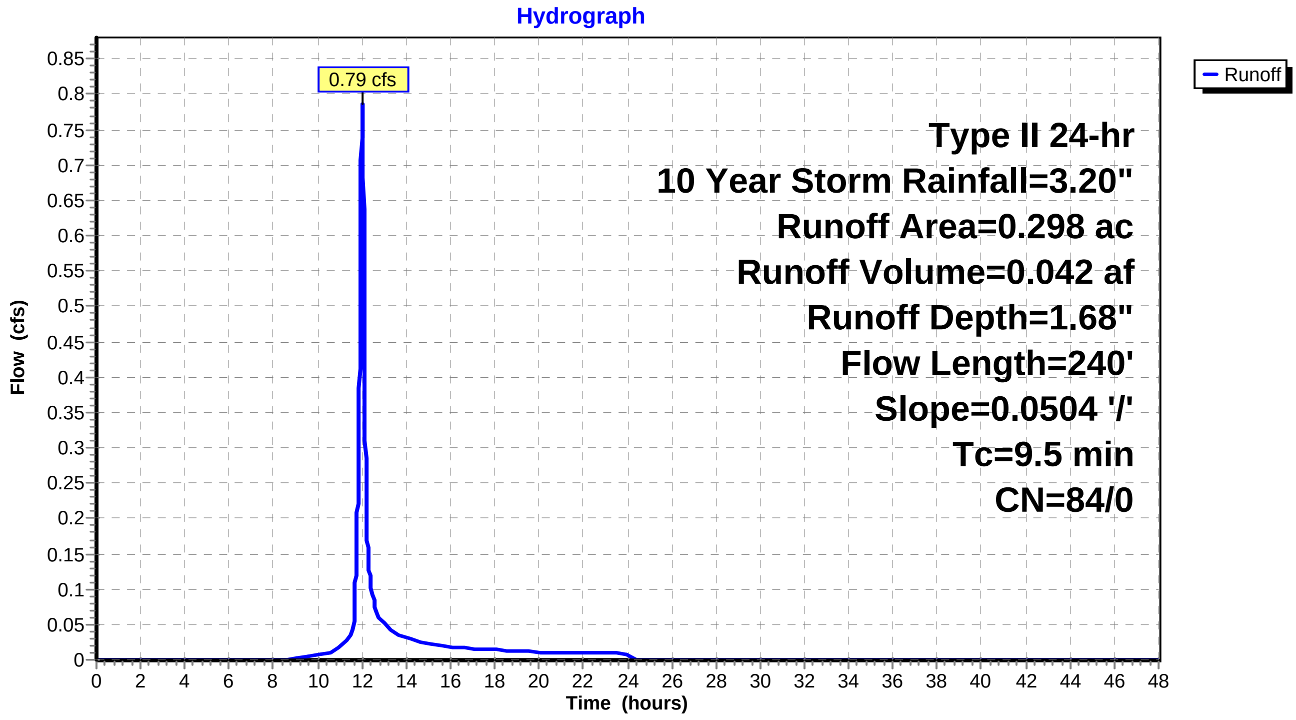
Runoff = 0.79 cfs @ 12.01 hrs, Volume= 0.042 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	0.298	84	weighted CN
	0.298	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0504	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.5	140	0.0504	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	240	Total			

Subcatchment OS8c: (new Subcat)



Summary for Subcatchment OS8d: (new Subcat)

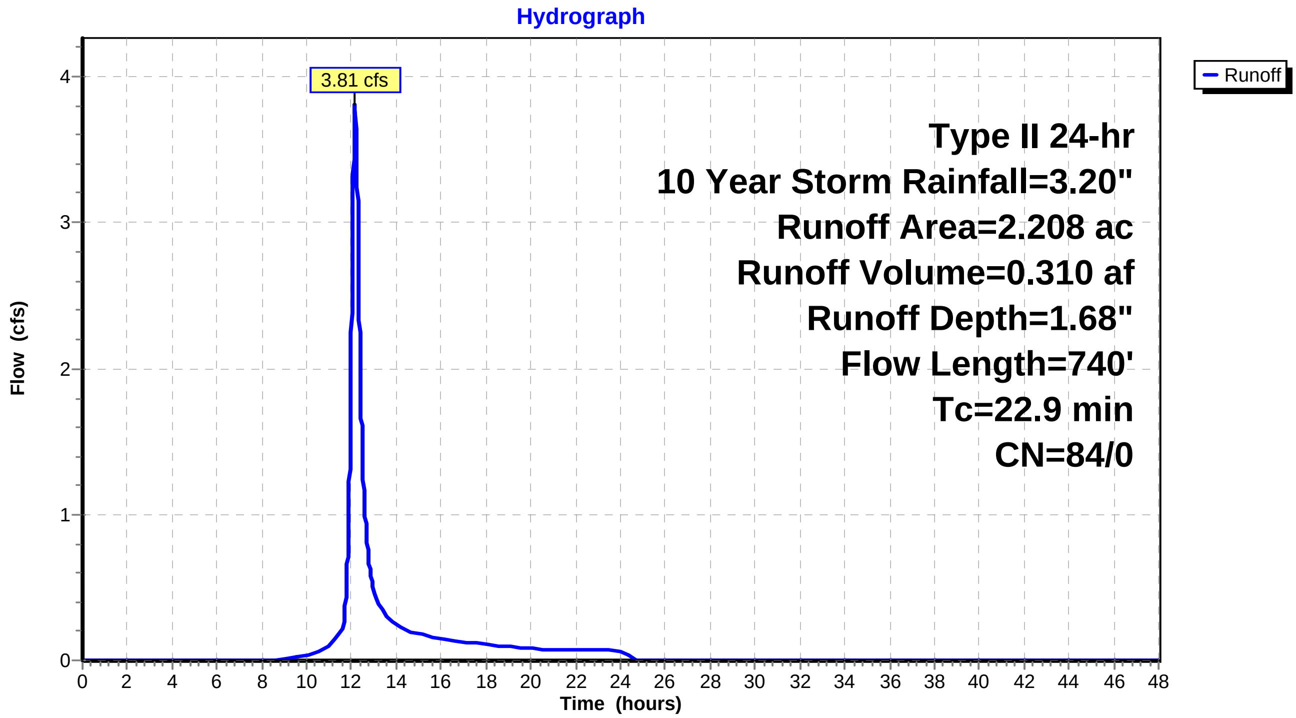
Runoff = 3.81 cfs @ 12.16 hrs, Volume= 0.310 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	2.208	84	weighted CN
	2.208	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0766	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.8	240	0.0796	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	400	0.0327	1.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.9	740	Total			

Subcatchment OS8d: (new Subcat)



Summary for Subcatchment OS8e: OS8e

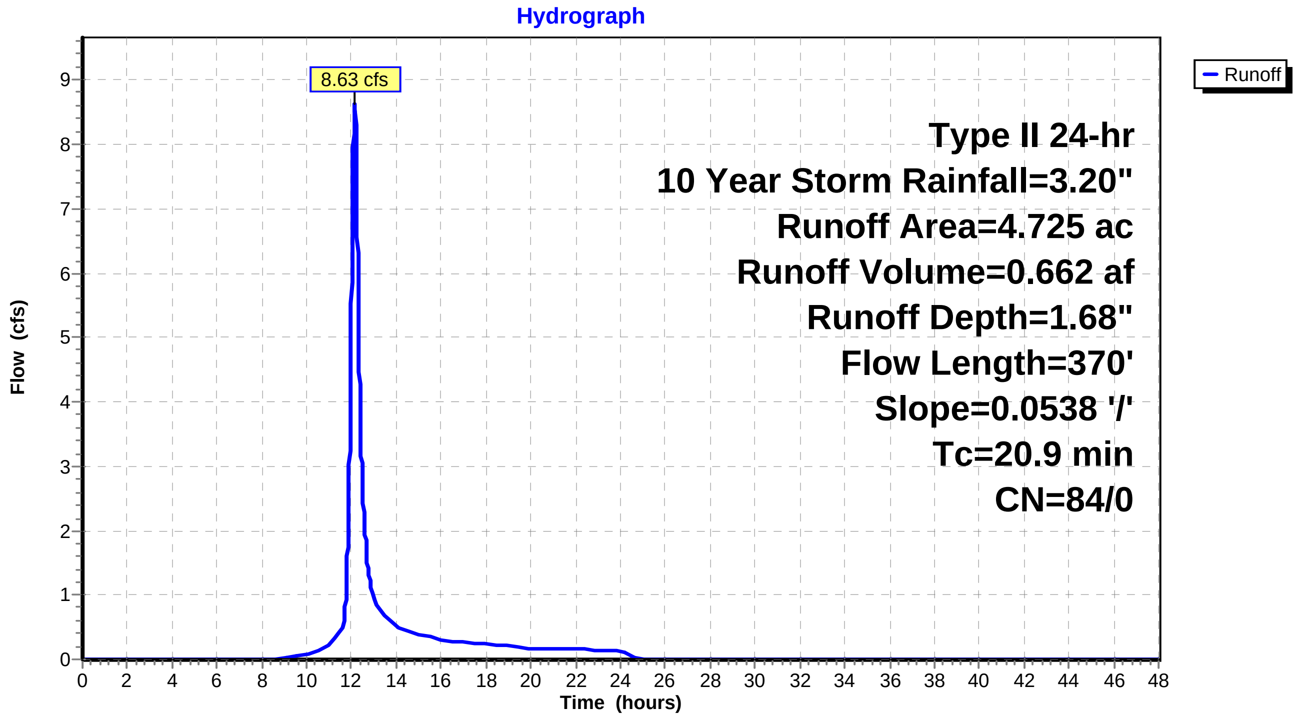
Runoff = 8.63 cfs @ 12.14 hrs, Volume= 0.662 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	4.725	84	weighted CN
	4.725	84	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	100	0.0538	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
3.9	270	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	370	Total			

Subcatchment OS8e: OS8e



Summary for Subcatchment OS8_5: (new Subcat)

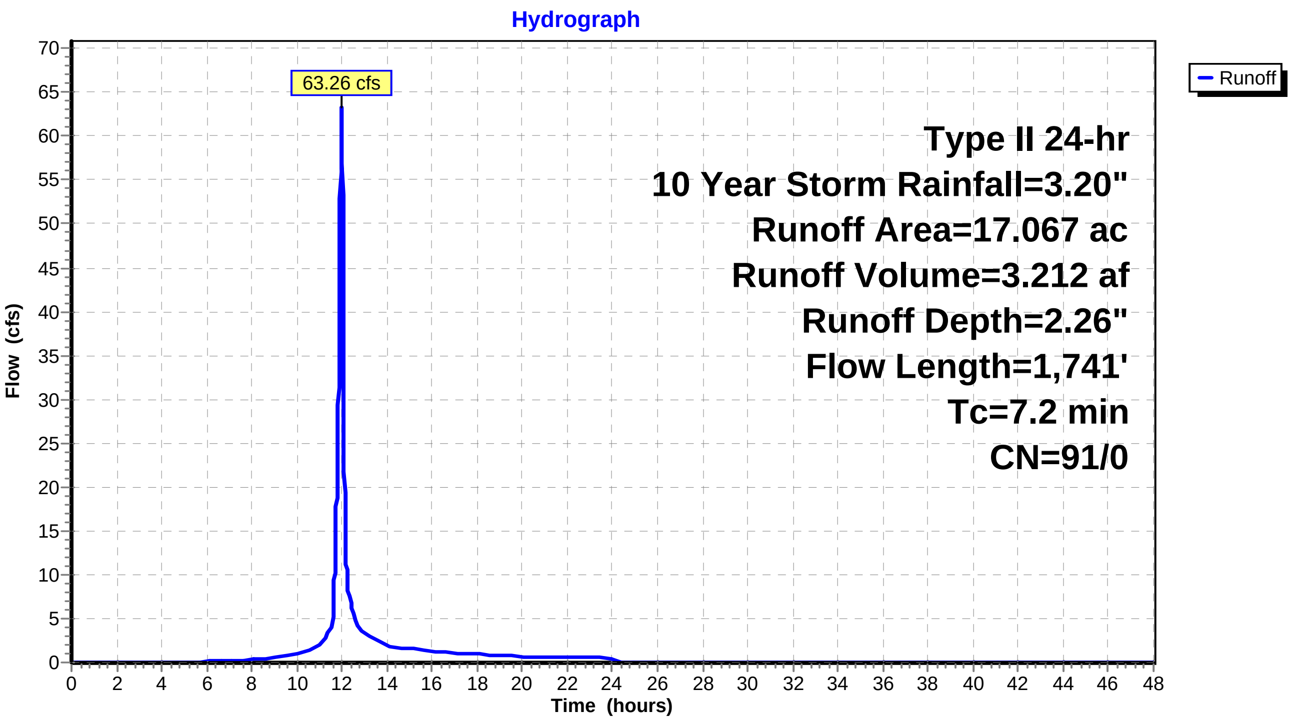
Runoff = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	17.067	91	weighted CN
	17.067	91	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0398	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.8	427	0.0398	4.05		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.8	1,264	0.0498	4.41	3.03	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.25' Z= 3.0 '/' Top.W=3.50' n= 0.025
7.2	1,741	Total			

Subcatchment OS8_5: (new Subcat)



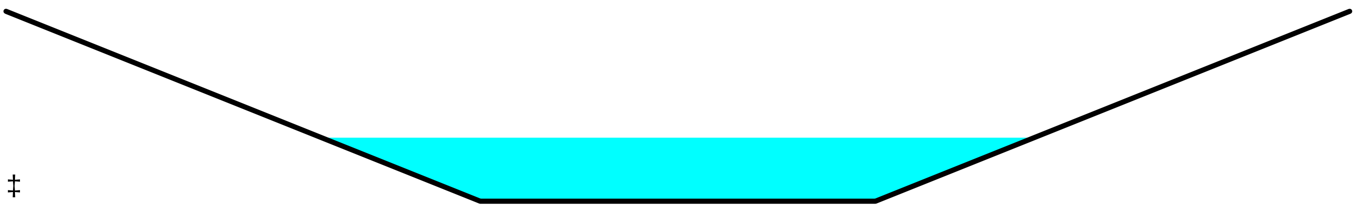
Summary for Reach GC4: Grass Channel 4

Inflow Area = 20.177 ac, 2.42% Impervious, Inflow Depth > 1.67" for 10 Year Storm event
Inflow = 14.38 cfs @ 12.16 hrs, Volume= 2.810 af
Outflow = 14.35 cfs @ 12.18 hrs, Volume= 2.809 af, Atten= 0%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.08 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 6.0 min

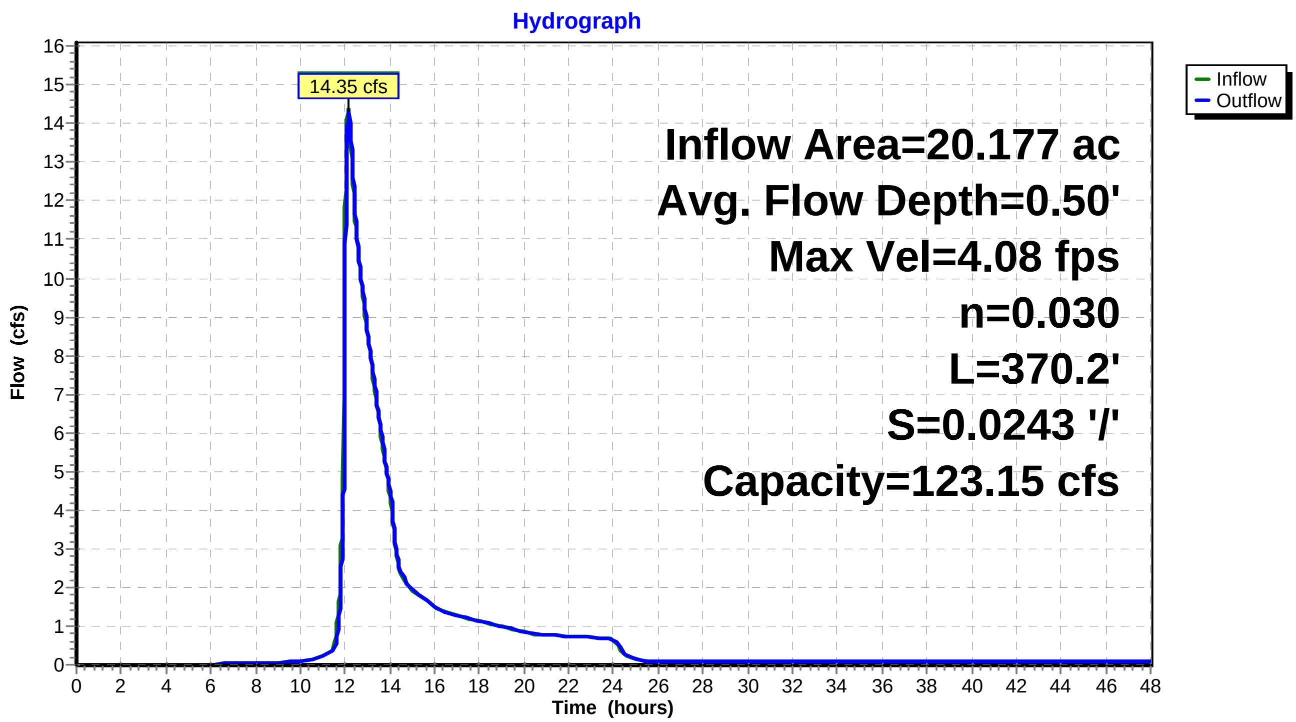
Peak Storage= 1,300 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.50' Flow Area= 16.5 sf, Capacity= 123.15 cfs

5.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 17.00'
Length= 370.2' Slope= 0.0243 '/'
Inlet Invert= 342.69', Outlet Invert= 333.69'



‡

Reach GC4: Grass Channel 4



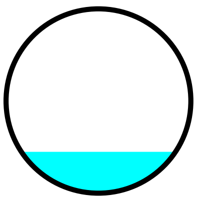
Summary for Reach P24: Pipe 24

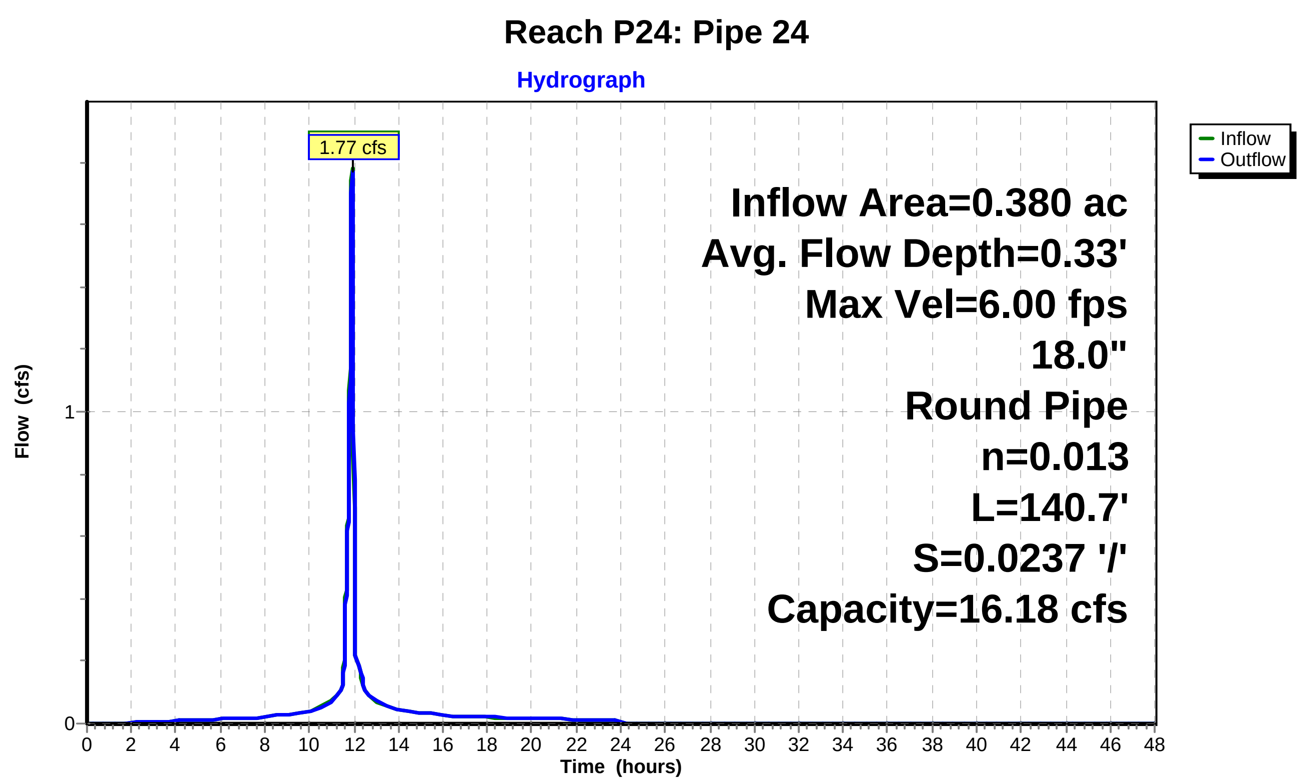
Inflow Area = 0.380 ac, 87.37% Impervious, Inflow Depth = 2.69" for 10 Year Storm event
Inflow = 1.78 cfs @ 11.92 hrs, Volume= 0.085 af
Outflow = 1.77 cfs @ 11.93 hrs, Volume= 0.085 af, Atten= 1%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.00 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 1.4 min

Peak Storage= 41 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.18 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 140.7' Slope= 0.0237 '/'
Inlet Invert= 332.99', Outlet Invert= 329.65'





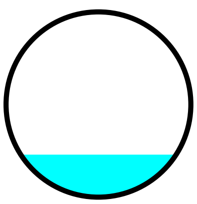
Summary for Reach P34: Pipe 34

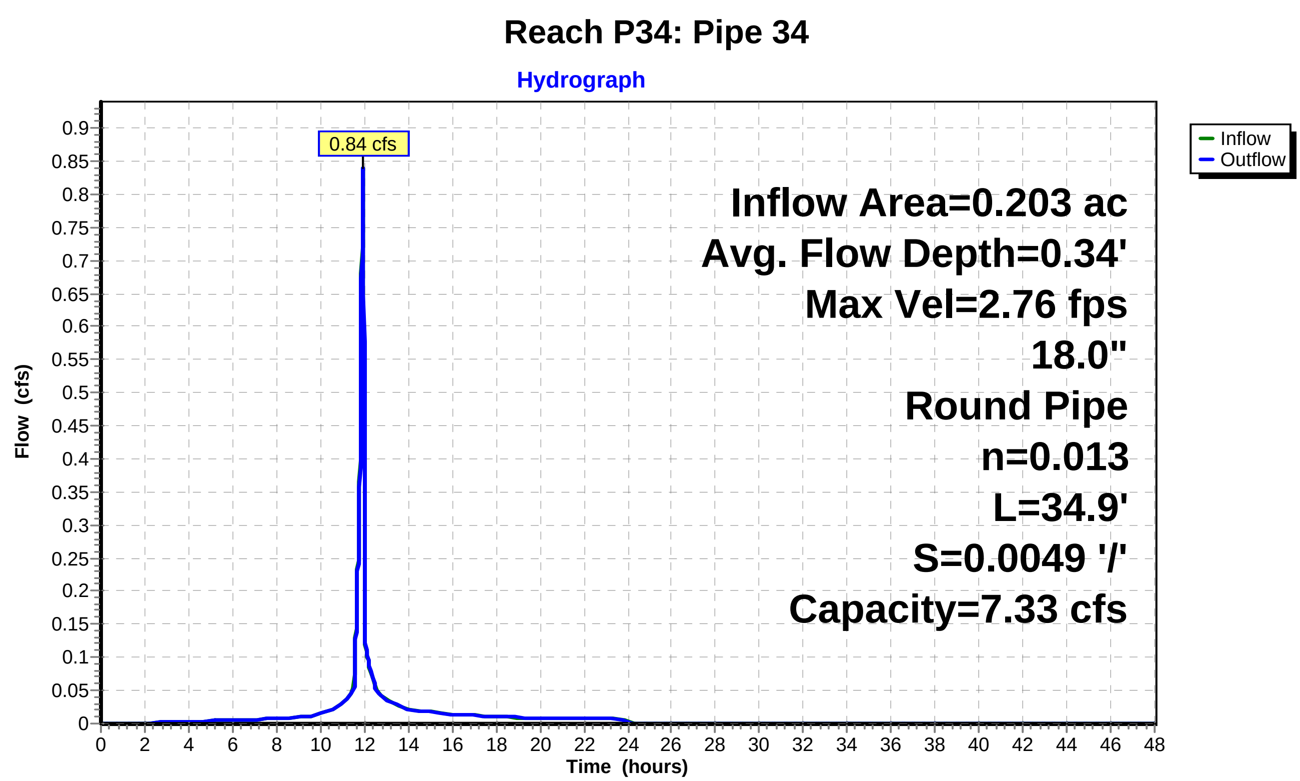
Inflow Area = 0.203 ac, 57.14% Impervious, Inflow Depth = 2.30" for 10 Year Storm event
Inflow = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af
Outflow = 0.84 cfs @ 11.93 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 0.8 min

Peak Storage= 11 cf @ 11.93 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.33 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.9' Slope= 0.0049 '/'
Inlet Invert= 343.87', Outlet Invert= 343.70'





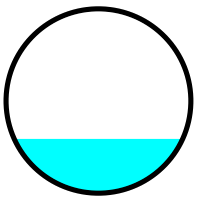
Summary for Reach P35: Pipe 35

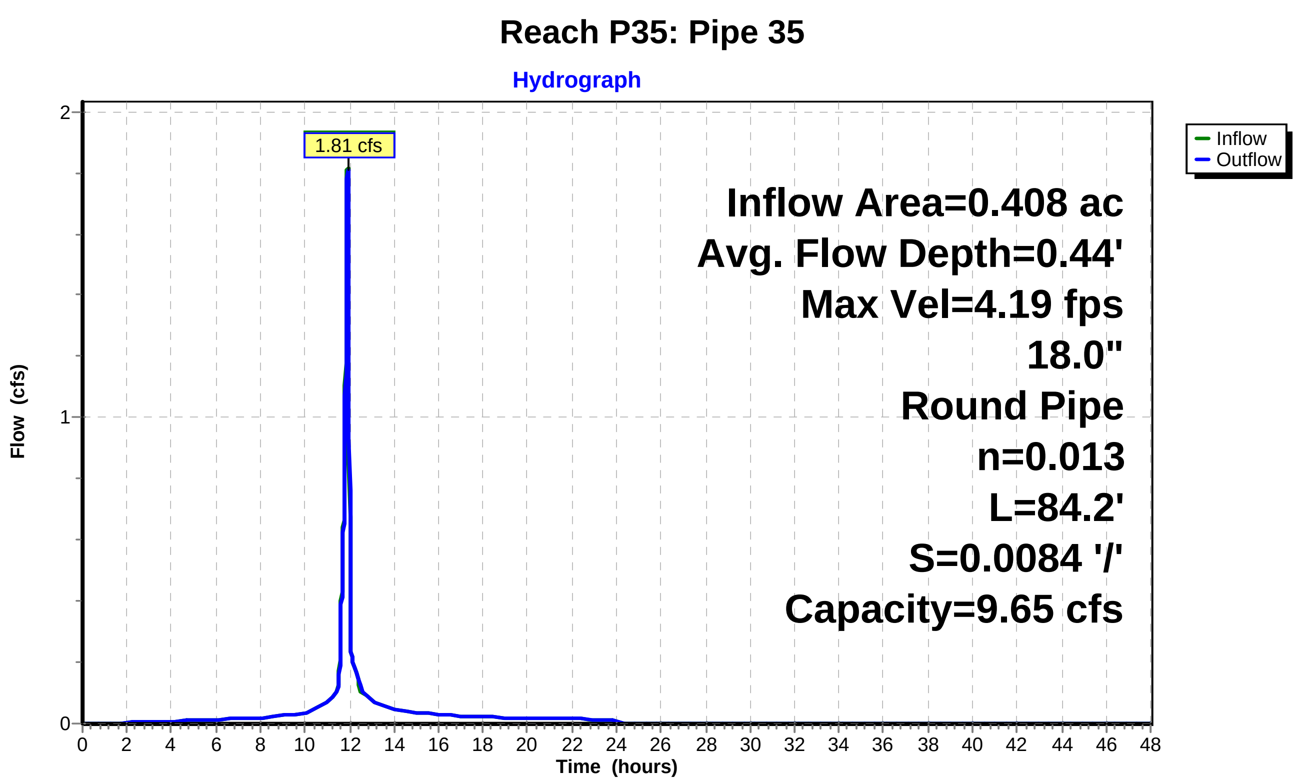
Inflow Area = 0.408 ac, 71.81% Impervious, Inflow Depth = 2.53" for 10 Year Storm event
Inflow = 1.82 cfs @ 11.91 hrs, Volume= 0.086 af
Outflow = 1.81 cfs @ 11.92 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.19 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 1.2 min

Peak Storage= 36 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.65 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 84.2' Slope= 0.0084 '/'
Inlet Invert= 343.59', Outlet Invert= 342.88'





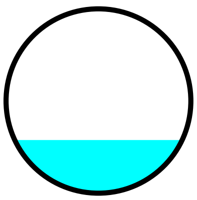
Summary for Reach P36: Pipe 36

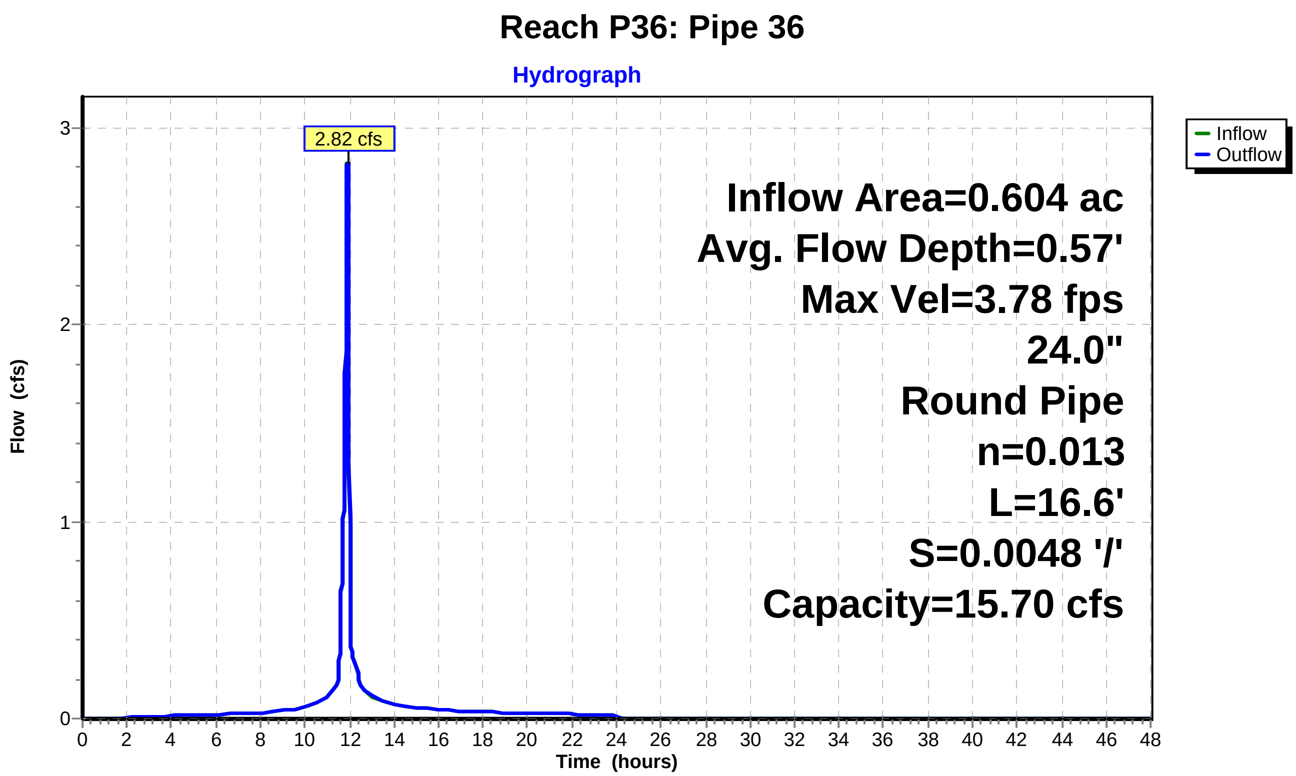
Inflow Area = 0.604 ac, 80.79% Impervious, Inflow Depth = 2.67" for 10 Year Storm event
Inflow = 2.82 cfs @ 11.91 hrs, Volume= 0.134 af
Outflow = 2.82 cfs @ 11.91 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 15.70 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 16.6' Slope= 0.0048 '/'
Inlet Invert= 342.77', Outlet Invert= 342.69'





Summary for Reach R1: Reach through OS 1

Inflow Area = 352.560 ac, 2.71% Impervious, Inflow Depth > 1.12" for 10 Year Storm event
Inflow = 59.45 cfs @ 12.27 hrs, Volume= 32.917 af
Outflow = 59.05 cfs @ 12.30 hrs, Volume= 32.902 af, Atten= 1%, Lag= 1.8 min

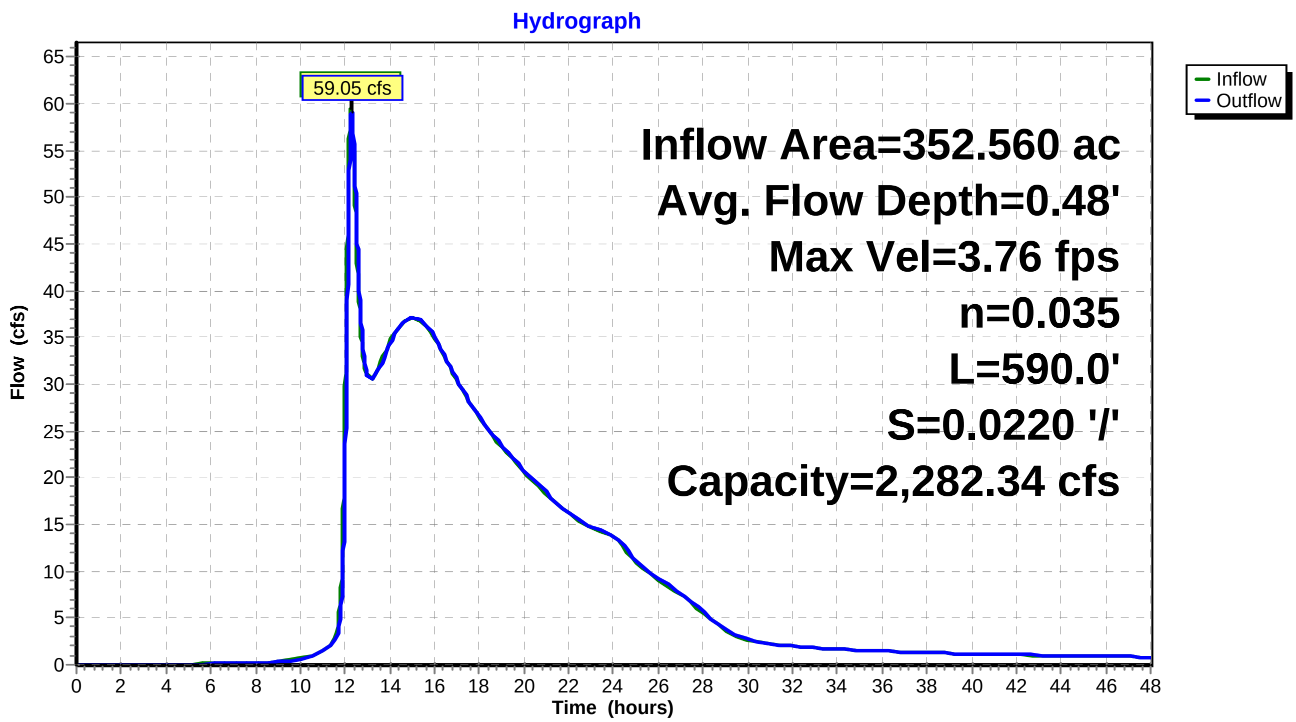
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 6.8 min

Peak Storage= 9,262 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 4.00' Flow Area= 172.0 sf, Capacity= 2,282.34 cfs

31.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 55.00'
Length= 590.0' Slope= 0.0220 '/'
Inlet Invert= 266.00', Outlet Invert= 253.00'

‡

Reach R1: Reach through OS 1



Summary for Reach R2: Reach through OS2

Inflow Area = 337.278 ac, 2.67% Impervious, Inflow Depth > 1.15" for 10 Year Storm event
Inflow = 58.22 cfs @ 12.25 hrs, Volume= 32.461 af
Outflow = 58.06 cfs @ 12.27 hrs, Volume= 32.454 af, Atten= 0%, Lag= 1.2 min

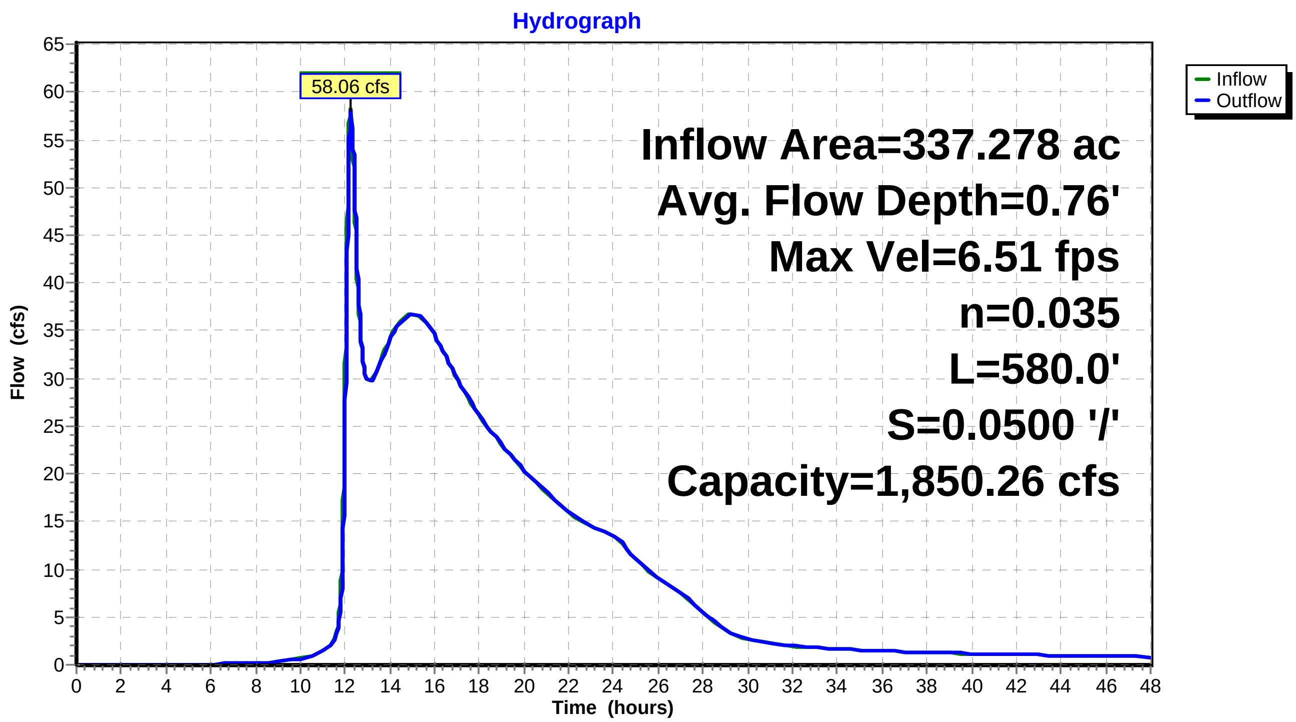
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.51 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 2.72 fps, Avg. Travel Time= 3.6 min

Peak Storage= 5,174 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 4.00' Flow Area= 112.0 sf, Capacity= 1,850.26 cfs

8.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 48.00'
Length= 580.0' Slope= 0.0500 '/'
Inlet Invert= 295.00', Outlet Invert= 266.00'

‡

Reach R2: Reach through OS2



Summary for Reach R3: Reach through OS3

Inflow Area = 315.323 ac, 2.65% Impervious, Inflow Depth > 1.16" for 10 Year Storm event
Inflow = 41.35 cfs @ 12.18 hrs, Volume= 30.507 af
Outflow = 39.15 cfs @ 12.26 hrs, Volume= 30.473 af, Atten= 5%, Lag= 4.9 min

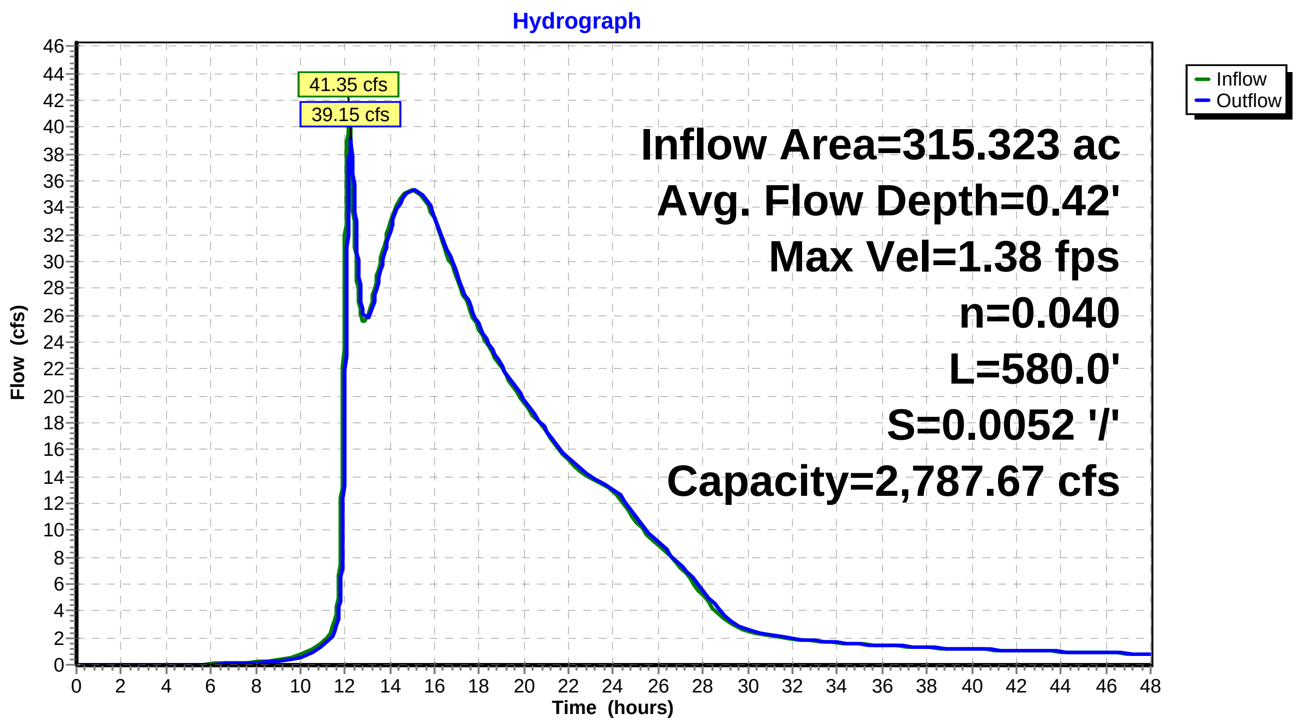
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 15.6 min

Peak Storage= 16,462 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 4.00' Flow Area= 560.0 sf, Capacity= 2,787.67 cfs

60.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 20.0 '/' Top Width= 220.00'
Length= 580.0' Slope= 0.0052 '/'
Inlet Invert= 298.00', Outlet Invert= 295.00'

‡

Reach R3: Reach through OS3



Summary for Reach R4: Reach through OS4

Inflow Area = 269.367 ac, 2.03% Impervious, Inflow Depth > 1.11" for 10 Year Storm event
Inflow = 31.91 cfs @ 15.00 hrs, Volume= 24.907 af
Outflow = 31.86 cfs @ 15.13 hrs, Volume= 24.863 af, Atten= 0%, Lag= 8.2 min

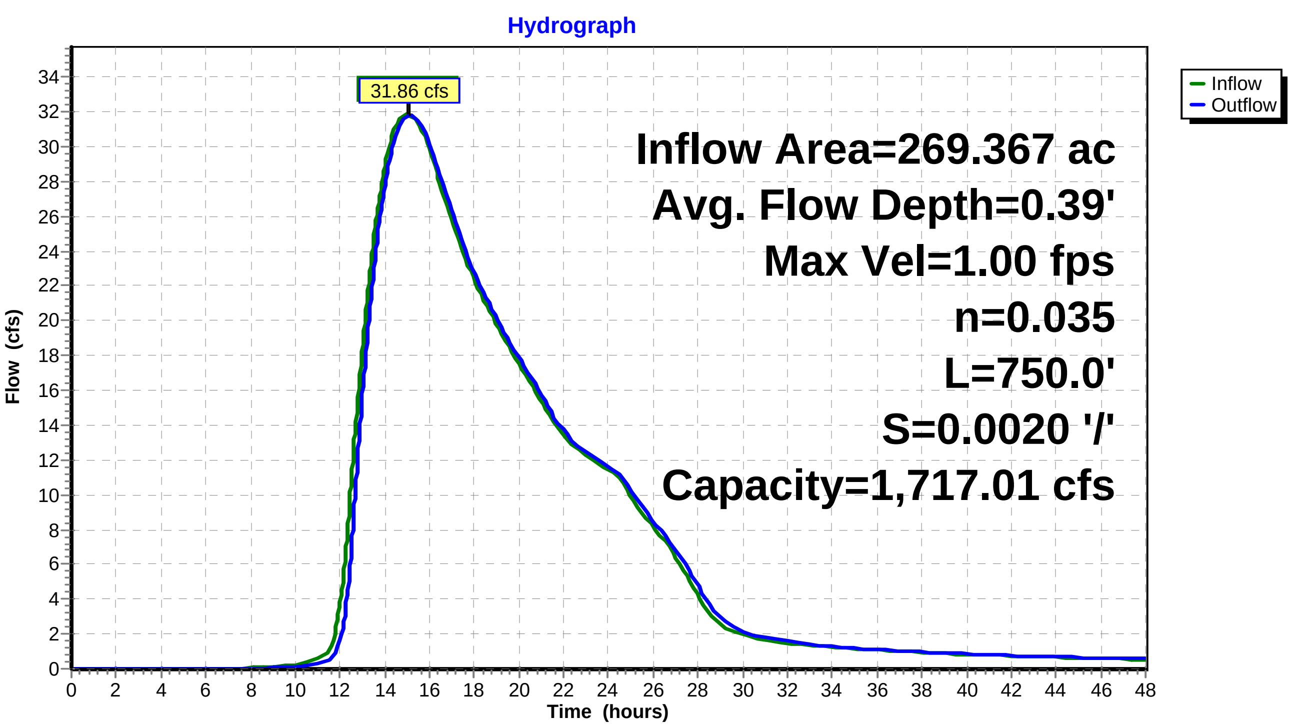
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.00 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 28.9 min

Peak Storage= 24,015 cf @ 15.13 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 4.00' Flow Area= 412.0 sf, Capacity= 1,717.01 cfs

80.00' x 4.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 6.5 '/' Top Width= 126.00'
Length= 750.0' Slope= 0.0020 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'

‡

Reach R4: Reach through OS4



Summary for Reach R5: Ditch behind Spare Time

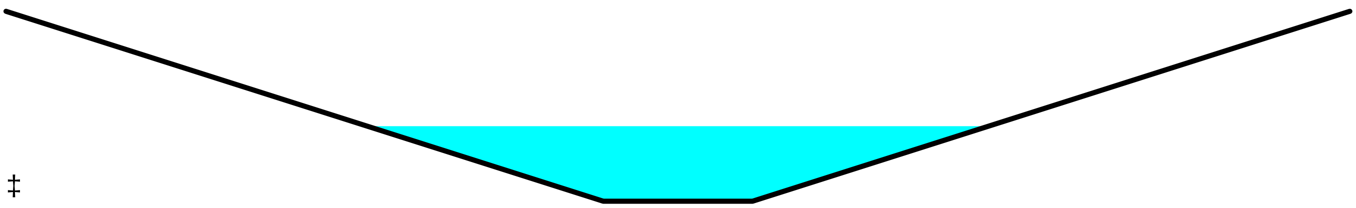
Inflow Area = 22.431 ac, 0.00% Impervious, Inflow Depth = 0.75" for 10 Year Storm event
Inflow = 5.16 cfs @ 13.27 hrs, Volume= 1.411 af
Outflow = 5.13 cfs @ 13.31 hrs, Volume= 1.411 af, Atten= 1%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 9.1 min

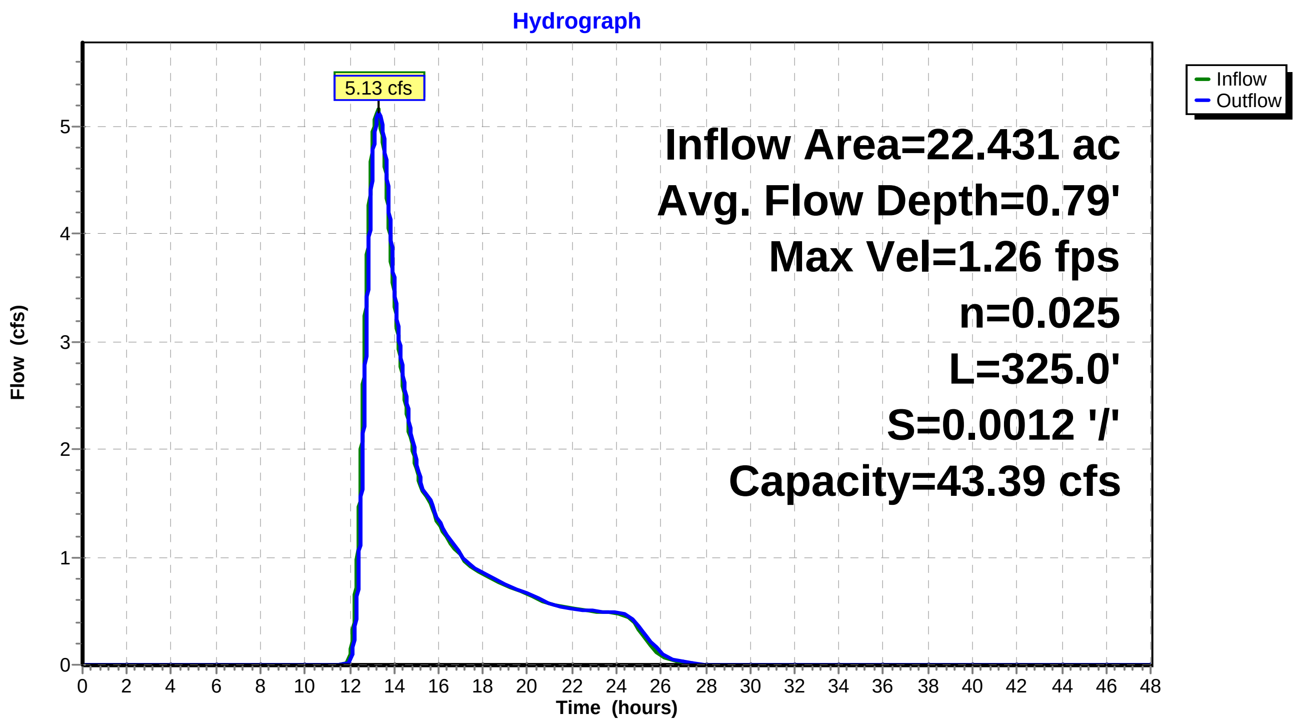
Peak Storage= 1,324 cf @ 13.31 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 43.39 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 325.0' Slope= 0.0012 '/'
Inlet Invert= 312.00', Outlet Invert= 311.61'

‡



Reach R5: Ditch behind Spare Time



Summary for Pond 1P: Hercules Drive / S/N 005

Inflow Area = 269.367 ac, 2.03% Impervious, Inflow Depth > 1.11" for 10 Year Storm event
Inflow = 32.49 cfs @ 14.57 hrs, Volume= 24.914 af
Outflow = 31.91 cfs @ 15.00 hrs, Volume= 24.907 af, Atten= 2%, Lag= 25.4 min
Primary = 31.91 cfs @ 15.00 hrs, Volume= 24.907 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 300.01' Surf.Area= 698 sf Storage= 262 cf
Peak Elev= 302.19' @ 15.00 hrs Surf.Area= 37,662 sf Storage= 31,283 cf (31,021 cf above start)

Plug-Flow detention time= 12.8 min calculated for 24.895 af (100% of inflow)
Center-of-Mass det. time= 11.7 min (1,174.5 - 1,162.8)

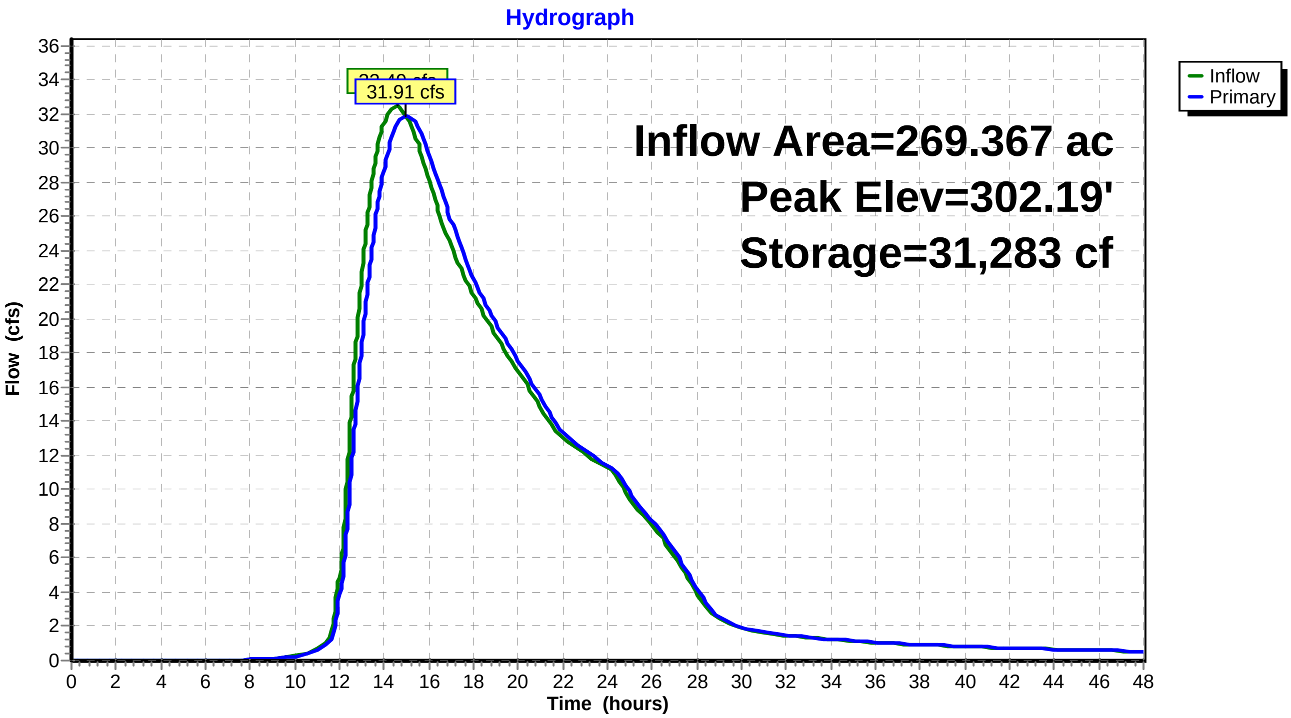
Volume	Invert	Avail.Storage	Storage Description
#1	299.00'	289,977 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
299.00	12	38.0	0	0	12
300.00	664	524.0	255	255	21,749
301.00	8,419	934.0	3,816	4,071	69,324
302.00	34,889	1,232.0	20,149	24,220	120,701
303.00	50,252	1,311.0	42,338	66,557	136,738
304.00	63,333	1,347.0	56,667	123,224	144,468
306.00	105,180	1,900.0	166,753	289,977	287,393

Device	Routing	Invert	Outlet Devices
#1	Primary	300.01'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.01' / 299.50' S= 0.0067 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf
#2	Primary	300.07'	**36.0" Round Culvert** L= 76.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 299.72' / 300.07' S= -0.0046 '/' Cc= 0.900 n= 0.025, Flow Area= 7.07 sf

Primary OutFlow Max=31.91 cfs @ 15.00 hrs HW=302.19' TW=299.89' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 16.71 cfs @ 4.23 fps)
└─**2=Culvert** (Barrel Controls 15.20 cfs @ 3.31 fps)

Pond 1P: Hercules Drive / S/N 005



Summary for Pond 2P: Lower Mtn View Dr

Inflow Area = 110.396 ac, 4.77% Impervious, Inflow Depth > 1.28" for 10 Year Storm event
Inflow = 64.20 cfs @ 12.13 hrs, Volume= 11.739 af
Outflow = 13.93 cfs @ 12.76 hrs, Volume= 11.735 af, Atten= 78%, Lag= 37.5 min
Primary = 13.93 cfs @ 12.76 hrs, Volume= 11.735 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 1,916 sf Storage= 898 cf
Peak Elev= 309.96' @ 13.15 hrs Surf.Area= 96,059 sf Storage= 92,367 cf (91,468 cf above start)

Plug-Flow detention time= 51.4 min calculated for 11.714 af (100% of inflow)
Center-of-Mass det. time= 46.1 min (1,136.3 - 1,090.2)

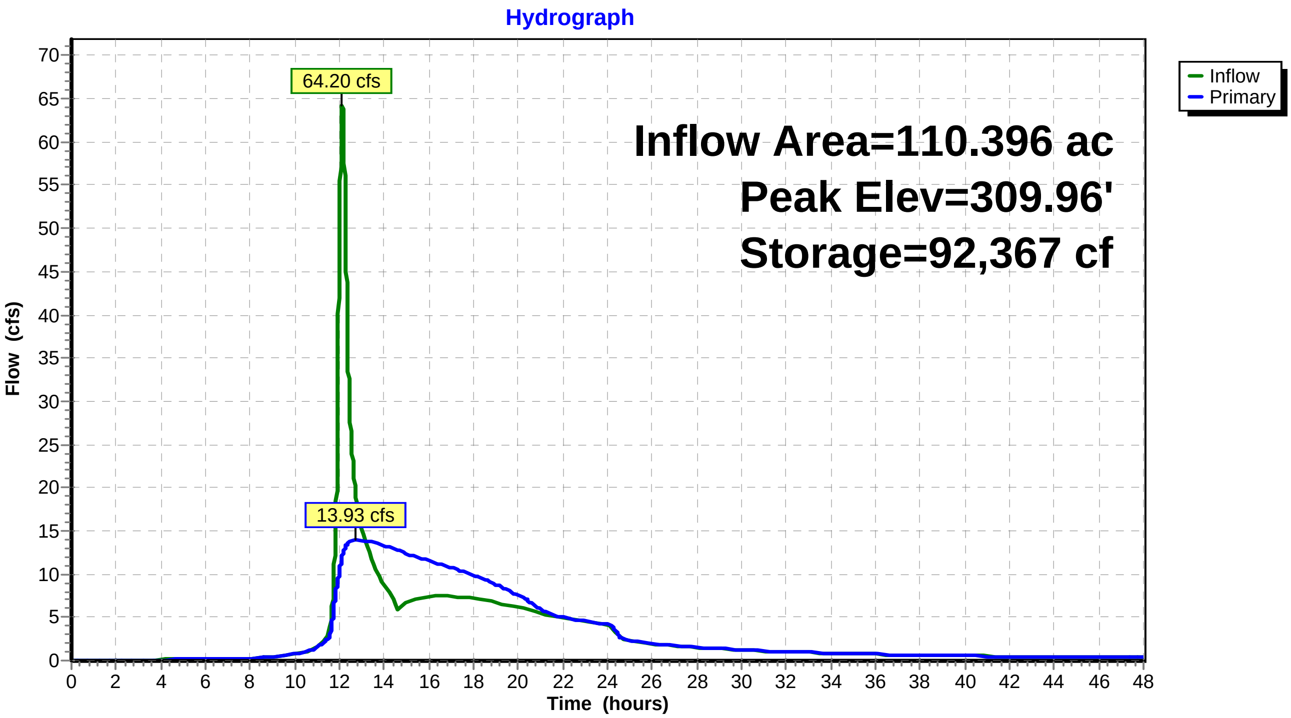
Volume	Invert	Avail.Storage	Storage Description
#1	305.81'	2,697,851 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.81	0	20.0	0	0	0
306.00	86	86.0	5	5	557
307.00	523	295.0	274	279	6,896
308.00	3,791	669.0	1,907	2,187	35,591
309.00	48,653	2,441.0	22,008	24,195	474,139
310.00	98,391	2,208.0	72,077	96,272	560,370
312.00	463,287	3,621.0	516,787	613,059	1,215,826
316.50	463,287	3,621.0	2,084,792	2,697,851	1,232,120

Device	Routing	Invert	Outlet Devices
#1	Primary	305.81'	**24.0" Round Culvert** L= 102.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 305.81' / 304.74' S= 0.0105 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Primary	316.13'	**190.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=13.92 cfs @ 12.76 hrs HW=309.93' TW=307.92' (Dynamic Tailwater)
1=Culvert (Outlet Controls 13.92 cfs @ 4.43 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: Lower Mtn View Dr

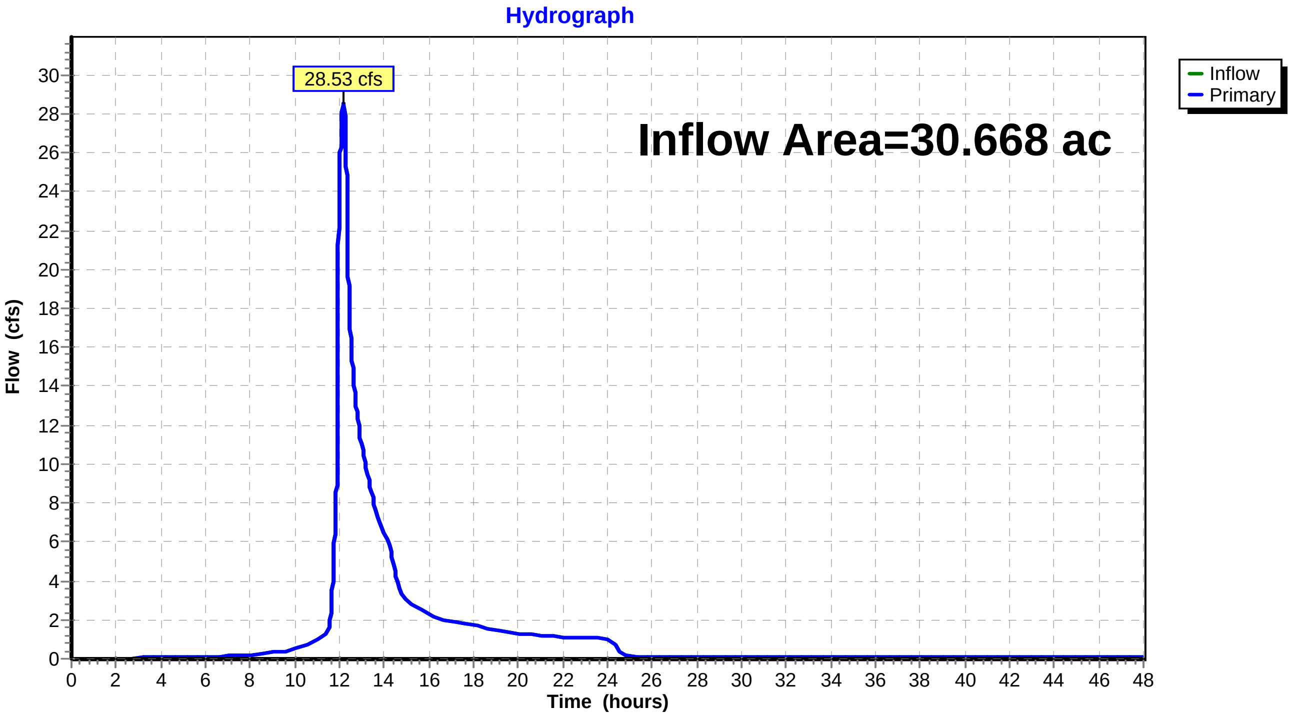


Summary for Pond 008: POI 008

Inflow Area = 30.668 ac, 7.96% Impervious, Inflow Depth > 1.77" for 10 Year Storm event
Inflow = 28.53 cfs @ 12.16 hrs, Volume= 4.521 af
Primary = 28.53 cfs @ 12.16 hrs, Volume= 4.521 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Pond 008: POI 008



Summary for Pond 8D: Detention

Inflow Area = 29.932 ac, 6.80% Impervious, Inflow Depth > 1.76" for 10 Year Storm event
Inflow = 30.07 cfs @ 12.09 hrs, Volume= 4.385 af
Outflow = 28.20 cfs @ 12.17 hrs, Volume= 4.385 af, Atten= 6%, Lag= 4.3 min
Primary = 28.20 cfs @ 12.17 hrs, Volume= 4.385 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 325.08' @ 12.17 hrs Surf.Area= 4,508 sf Storage= 8,880 cf

Plug-Flow detention time= 8.0 min calculated for 4.384 af (100% of inflow)
Center-of-Mass det. time= 7.9 min (914.0 - 906.1)

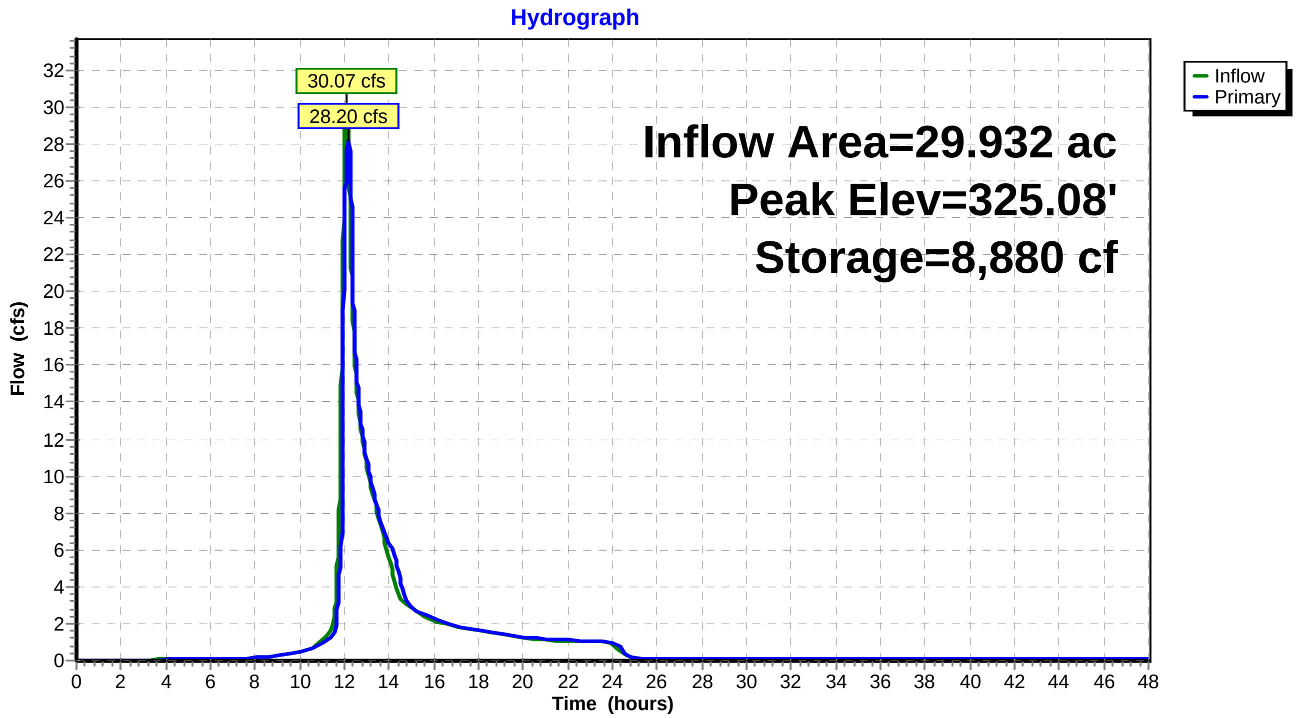
Volume	Invert	Avail.Storage	Storage Description
#1	320.00'	37,593 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
320.00	0	0	0
321.00	312	156	156
322.00	1,044	678	834
322.50	1,583	657	1,491
323.00	1,895	870	2,360
324.00	3,015	2,455	4,815
325.00	4,374	3,695	8,510
326.00	5,977	5,176	13,685
330.00	5,977	23,908	37,593

Device	Routing	Invert	Outlet Devices
#1	Primary	324.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	320.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	322.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=28.20 cfs @ 12.17 hrs HW=325.08' TW=0.00' (Dynamic Tailwater)
—**1=Orifice/Grate** (Orifice Controls 20.04 cfs @ 5.01 fps)
—**2=Orifice/Grate** (Orifice Controls 2.08 cfs @ 10.59 fps)
—**3=Orifice/Grate** (Orifice Controls 6.08 cfs @ 7.74 fps)

Pond 8D: Detention



Summary for Pond 48: Pipe 48

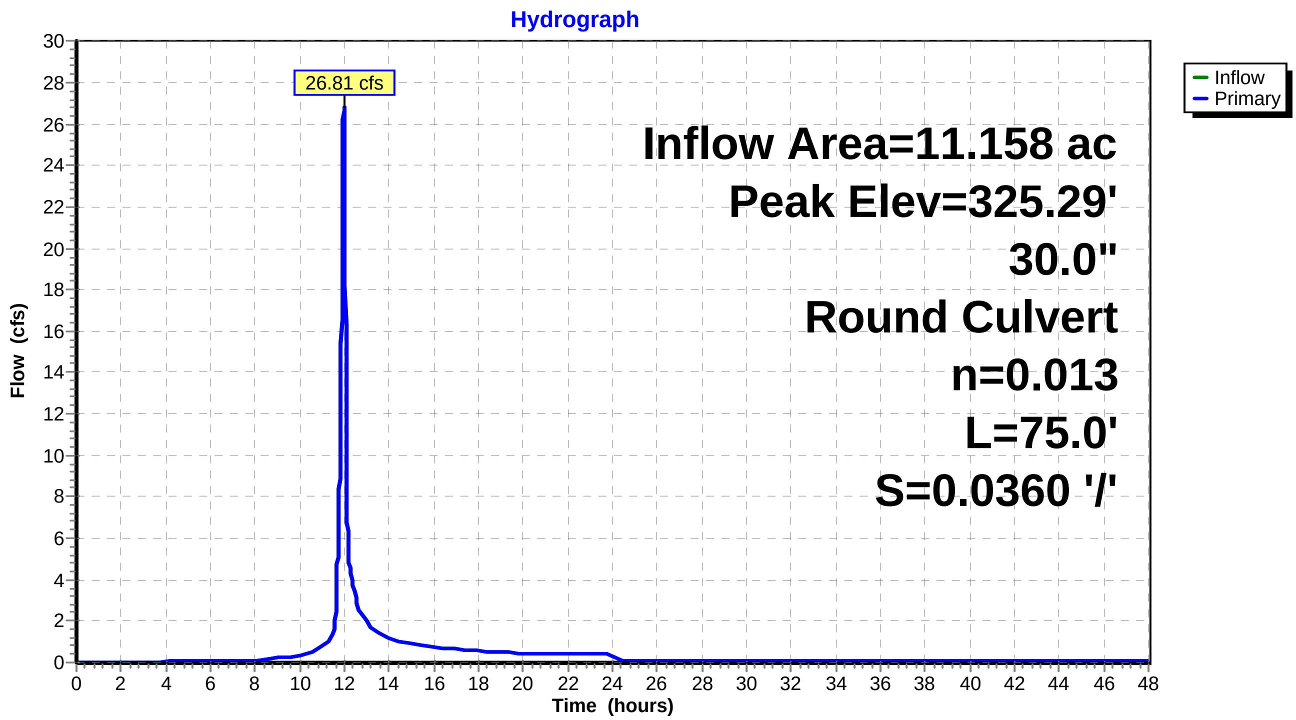
Inflow Area =	11.158 ac,	14.99% Impervious,	Inflow Depth > 1.87"	for 10 Year Storm event
Inflow =	26.81 cfs @	11.97 hrs, Volume=	1.739 af	
Outflow =	26.81 cfs @	11.97 hrs, Volume=	1.739 af,	Atten= 0%, Lag= 0.0 min
Primary =	26.81 cfs @	11.97 hrs, Volume=	1.739 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 325.29' @ 11.97 hrs
Flood Elev= 326.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	322.75'	**30.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 322.75' / 320.05' S= 0.0360 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=26.78 cfs @ 11.97 hrs HW=325.28' TW=321.53' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 26.78 cfs @ 5.46 fps)

Pond 48: Pipe 48



Summary for Pond 49: Pipe 49

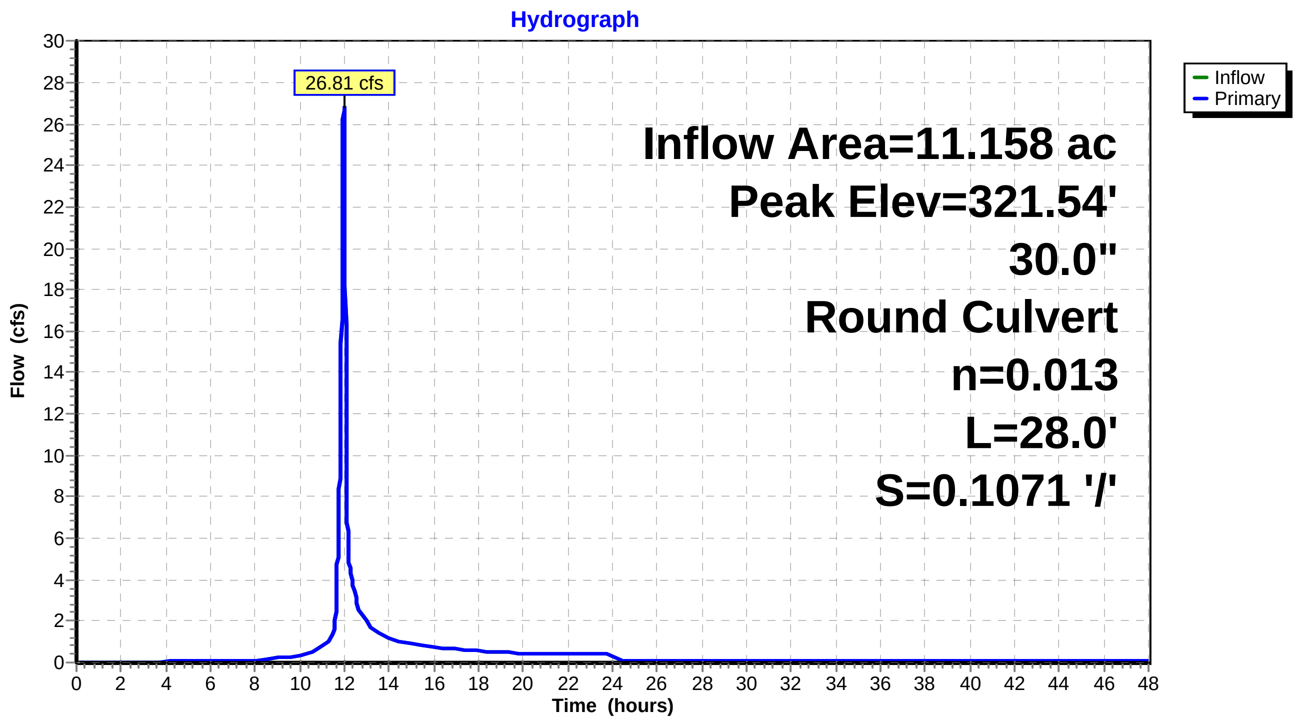
Inflow Area =	11.158 ac, 14.99% Impervious,	Inflow Depth > 1.87"	for 10 Year Storm event
Inflow =	26.81 cfs @ 11.97 hrs,	Volume=	1.739 af
Outflow =	26.81 cfs @ 11.97 hrs,	Volume=	1.739 af, Atten= 0%, Lag= 0.0 min
Primary =	26.81 cfs @ 11.97 hrs,	Volume=	1.739 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 321.54' @ 11.97 hrs
Flood Elev= 324.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**30.0" Round Culvert** L= 28.0' Ke= 0.500 Inlet / Outlet Invert= 319.00' / 316.00' S= 0.1071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=26.78 cfs @ 11.97 hrs HW=321.53' TW=318.05' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 26.78 cfs @ 5.46 fps)

Pond 49: Pipe 49



Summary for Pond P: Pond 98

Inflow Area = 11.158 ac, 14.99% Impervious, Inflow Depth > 1.87" for 10 Year Storm event
Inflow = 26.81 cfs @ 11.97 hrs, Volume= 1.739 af
Outflow = 2.67 cfs @ 12.59 hrs, Volume= 1.488 af, Atten= 90%, Lag= 37.4 min
Primary = 2.67 cfs @ 12.59 hrs, Volume= 1.488 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 319.00' @ 12.59 hrs Surf.Area= 0 sf Storage= 34,517 cf

Plug-Flow detention time= 656.8 min calculated for 1.488 af (86% of inflow)
Center-of-Mass det. time= 509.3 min (1,451.3 - 942.0)

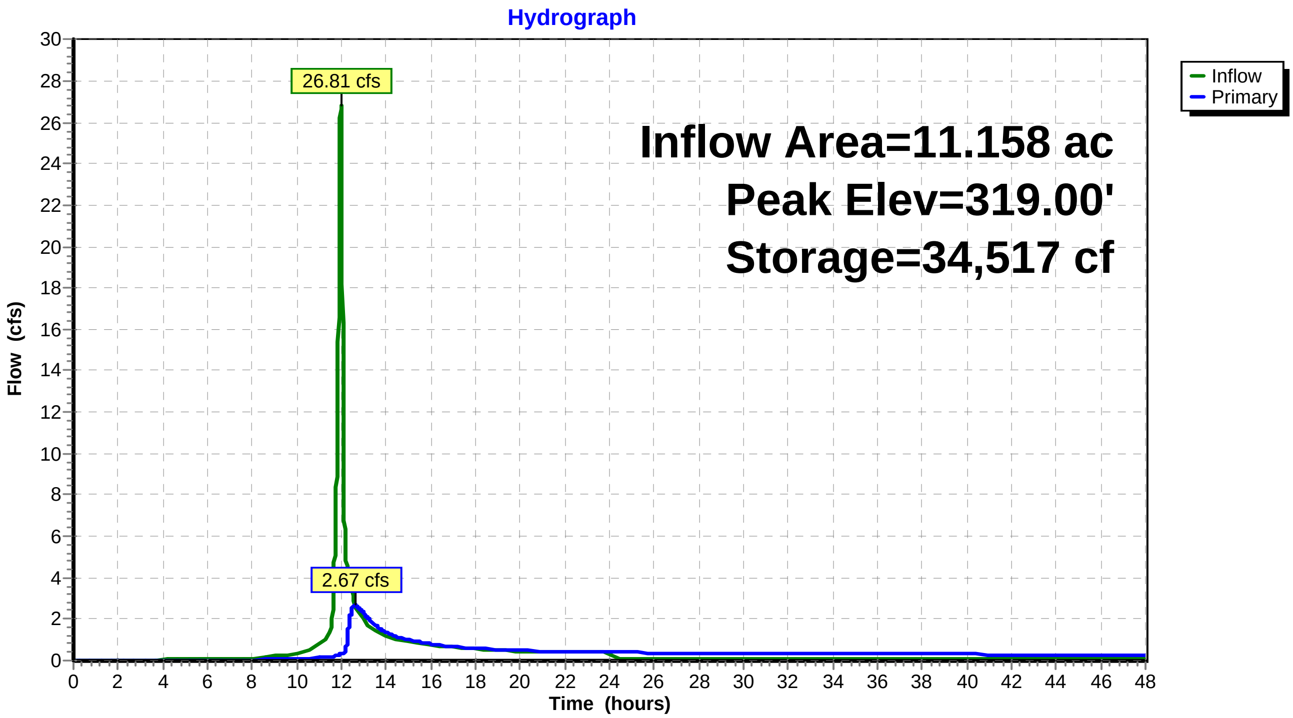
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	87,679 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
316.00	0
317.00	8,893
317.50	13,961
318.50	26,849
319.00	34,580
320.00	51,060
321.00	68,835
322.00	87,679

Device	Routing	Invert	Outlet Devices
#1	Primary	319.00'	**10.0' long Spillway** 2 End Contraction(s) 2.0' Crest Height
#2	Device 4	318.80'	**24.0" x 24.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads
#3	Device 4	316.00'	**3.0" Vert. Low Flow** C= 0.600
#4	Primary	315.25'	**18.0" Round Culvert** L= 39.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 315.25' / 315.00' S= 0.0064 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.67 cfs @ 12.59 hrs HW=319.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Spillway** (Controls 0.00 cfs)
└—**4=Culvert** (Passes 2.67 cfs of 12.99 cfs potential flow)
  ↑—**2=Overflow** (Weir Controls 2.27 cfs @ 1.45 fps)
  └—**3=Low Flow** (Orifice Controls 0.40 cfs @ 8.16 fps)

Pond P: Pond 98



Summary for Pond P1: Behind Health Lab

Inflow Area = 8.195 ac, 0.00% Impervious, Inflow Depth = 0.83" for 10 Year Storm event
Inflow = 4.73 cfs @ 12.32 hrs, Volume= 0.566 af
Outflow = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 11.47 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.17' @ 25.92 hrs Surf.Area= 141,660 sf Storage= 24,634 cf

Plug-Flow detention time= 3.3 min calculated for 0.000 af (0% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

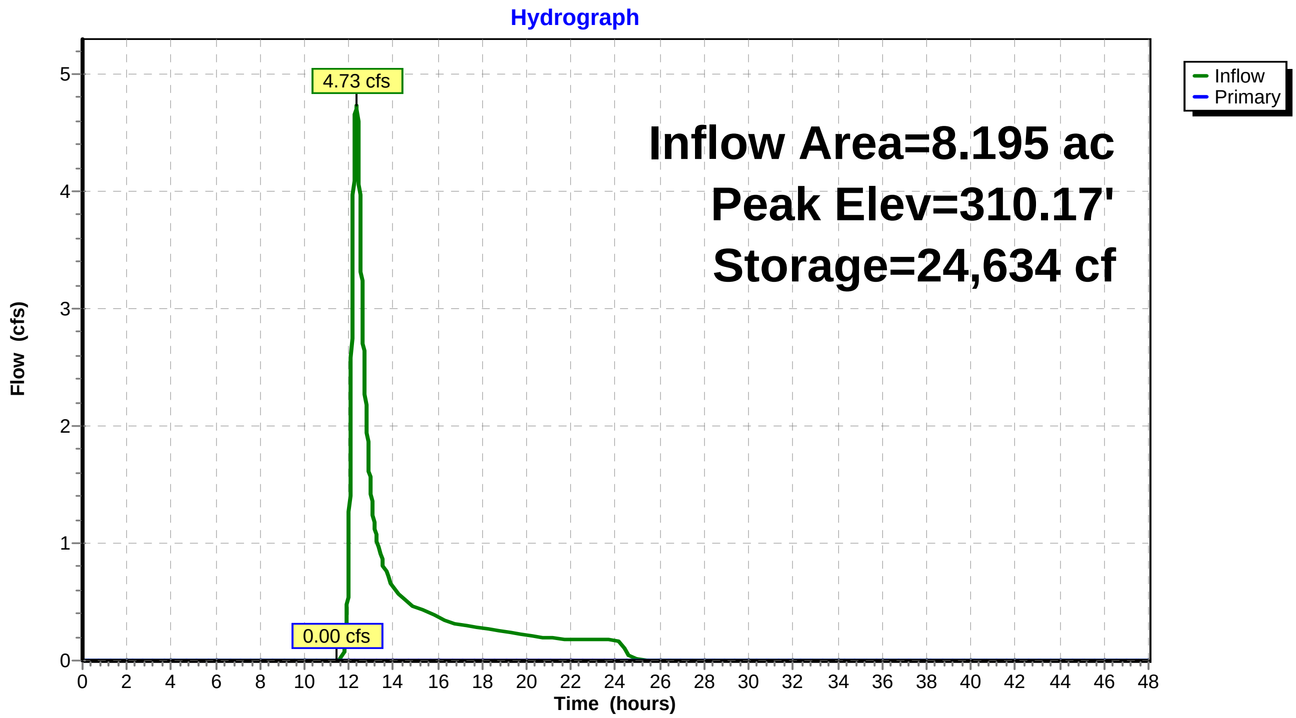
Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	372,741 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	140,477	1,706.0	0	0	140,477
312.50	157,885	1,775.0	372,741	372,741	160,080

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 3.00 9.00

Primary OutFlow Max=0.00 cfs @ 11.47 hrs HW=310.00' TW=310.03' (Dynamic Tailwater)
└─**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond P1: Behind Health Lab



Summary for Pond P10: Reach between LMV and Hercules

Inflow Area = 269.065 ac, 1.96% Impervious, Inflow Depth > 1.12" for 10 Year Storm event
Inflow = 32.65 cfs @ 14.32 hrs, Volume= 25.021 af
Outflow = 32.46 cfs @ 14.57 hrs, Volume= 24.855 af, Atten= 1%, Lag= 15.3 min
Primary = 32.46 cfs @ 14.57 hrs, Volume= 24.855 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 307.54' Surf.Area= 88,869 sf Storage= 3,516 cf
Peak Elev= 308.04' @ 14.57 hrs Surf.Area= 115,552 sf Storage= 54,690 cf (51,174 cf above start)

Plug-Flow detention time= 48.9 min calculated for 24.769 af (99% of inflow)
Center-of-Mass det. time= 31.4 min (1,163.8 - 1,132.4)

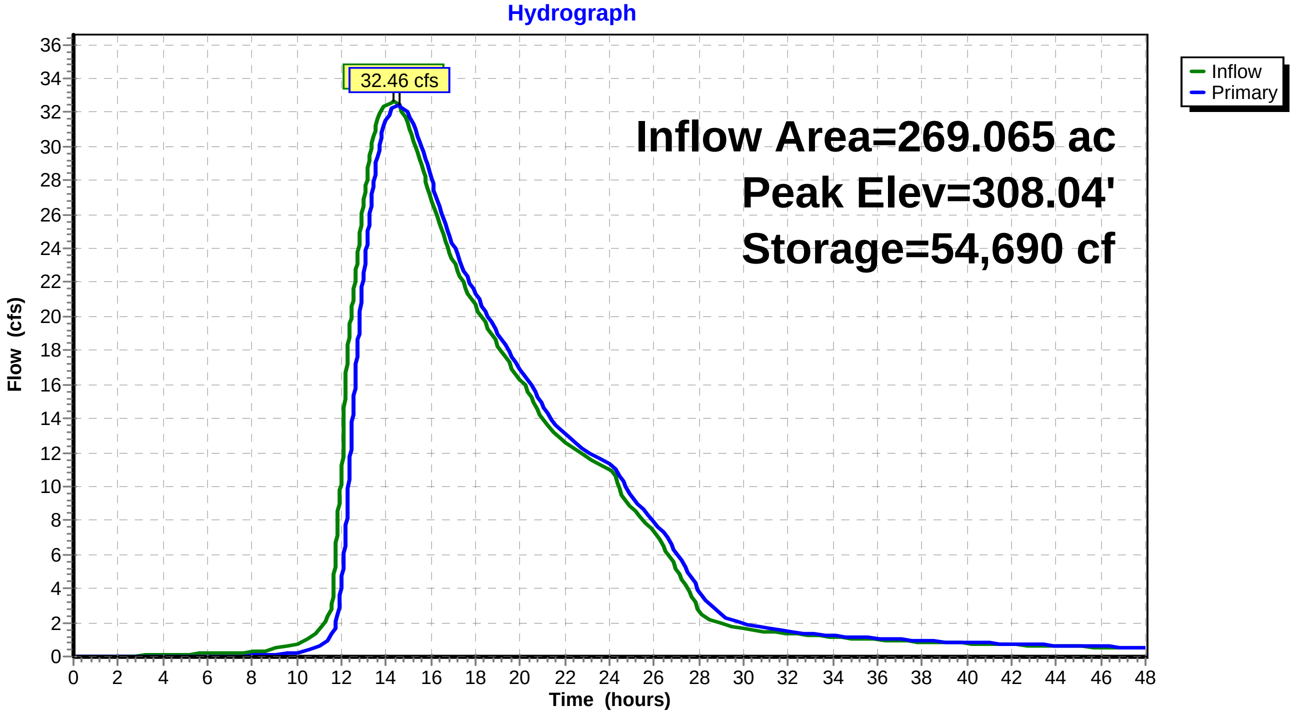
Volume	Invert	Avail.Storage	Storage Description
#1	307.50'	114,777 cf	**Storage 1066' DS of LMV (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
307.50	86,932	3,099.0	0	0	86,932
308.00	112,678	3,270.0	49,764	49,764	173,614
308.50	148,186	3,641.0	65,014	114,777	377,657

Device	Routing	Invert	Outlet Devices
#1	Primary	307.54'	**Asymmetrical Weir, C= 3.27** Offset (feet) -143.00 -133.00 -52.00 -41.00 -21.00 -11.00 0.00 21.00 38.00 60.00 88.00 Elev. (feet) 310.00 309.18 309.07 309.34 308.76 307.71 307.54 307.67 308.66 309.24 310.00

Primary OutFlow Max=32.46 cfs @ 14.57 hrs HW=308.04' TW=302.17' (Dynamic Tailwater)
└─**1=Asymmetrical Weir** (Weir Controls 32.46 cfs @ 1.66 fps)

Pond P10: Reach between LMV and Hercules



Summary for Pond P2/3: Upstream of Park Drive

Inflow Area = 29.664 ac, 0.00% Impervious, Inflow Depth = 0.88" for 10 Year Storm event
Inflow = 46.37 cfs @ 11.98 hrs, Volume= 2.168 af
Outflow = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af, Atten= 97%, Lag= 219.0 min
Primary = 1.21 cfs @ 15.63 hrs, Volume= 1.790 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.77' @ 15.63 hrs Surf.Area= 84,106 sf Storage= 57,533 cf

Plug-Flow detention time= 647.0 min calculated for 1.790 af (83% of inflow)
Center-of-Mass det. time= 568.5 min (1,417.6 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	310.00'	128,517 cf	**Pond 2 (Irregular)** Listed below (Recalc)
#2	310.00'	83,492 cf	**Pond 3 (Irregular)** Listed below (Recalc)
		212,008 cf	Total Available Storage

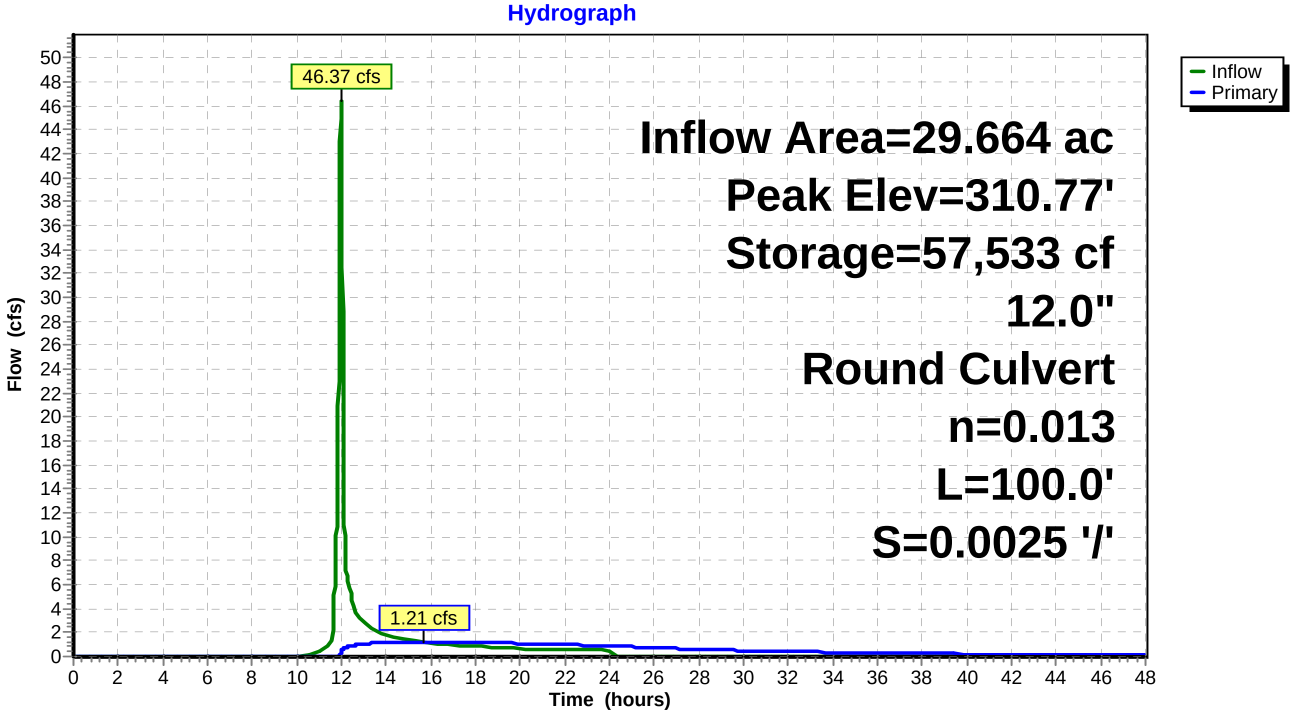
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	39,781	975.0	0	0	39,781
312.25	76,433	1,197.0	128,517	128,517	78,230

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
310.00	25,767	687.0	0	0	25,767
312.25	49,751	855.0	83,492	83,492	46,455

Device	Routing	Invert	Outlet Devices
#1	Primary	310.00'	**12.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 310.00' / 309.75' S= 0.0025 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 15.63 hrs HW=310.77' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.21 cfs @ 2.57 fps)

Pond P2/3: Upstream of Park Drive



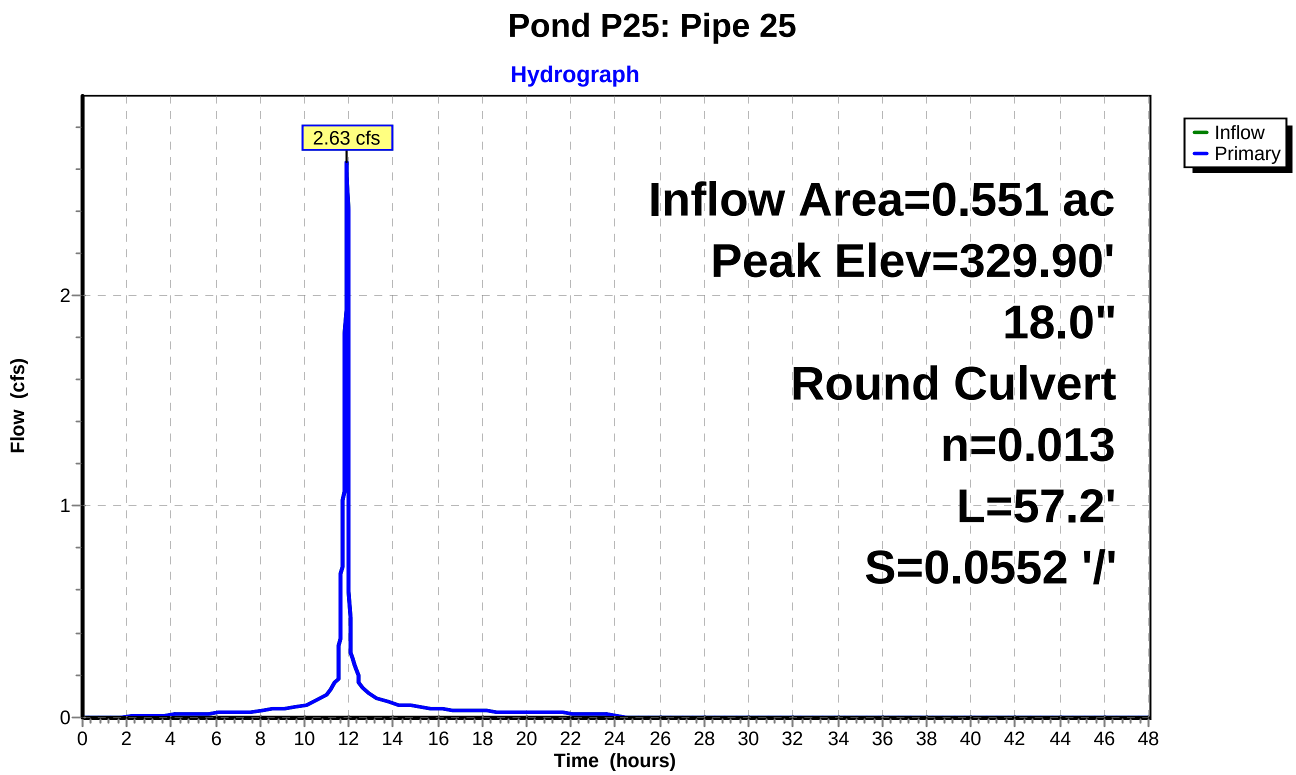
Summary for Pond P25: Pipe 25

Inflow Area =	0.551 ac,	90.20% Impervious,	Inflow Depth = 2.76"	for 10 Year Storm event
Inflow =	2.63 cfs @	11.92 hrs, Volume=	0.127 af	
Outflow =	2.63 cfs @	11.92 hrs, Volume=	0.127 af, Atten= 0%, Lag= 0.0 min	
Primary =	2.63 cfs @	11.92 hrs, Volume=	0.127 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.90' @ 11.92 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	329.15'	**18.0" Round Culvert** L= 57.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 329.15' / 325.99' S= 0.0552 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.62 cfs @ 11.92 hrs HW=329.90' TW=327.97' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.62 cfs @ 2.95 fps)



Summary for Pond P26: Pipe 26

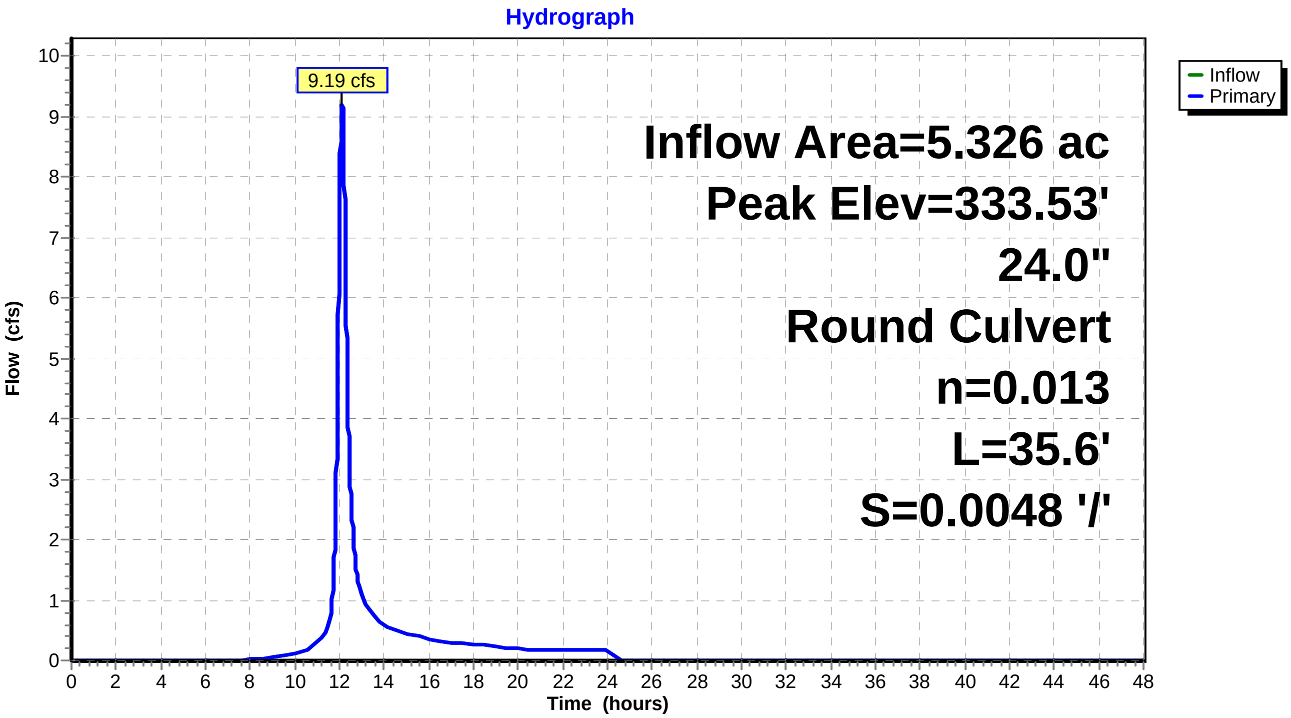
Inflow Area =	5.326 ac,	4.56% Impervious,	Inflow Depth = 1.72"	for 10 Year Storm event	
Inflow =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af	
Outflow =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.19 cfs @	12.12 hrs,	Volume=	0.764 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 333.53' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	329.02'	**24.0" Round Culvert** L= 35.6' Ke= 0.500 Inlet / Outlet Invert= 329.02' / 328.85' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.35 cfs @ 12.12 hrs HW=333.52' TW=333.14' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 9.35 cfs @ 2.98 fps)

Pond P26: Pipe 26



Summary for Pond P27: Pipe 27

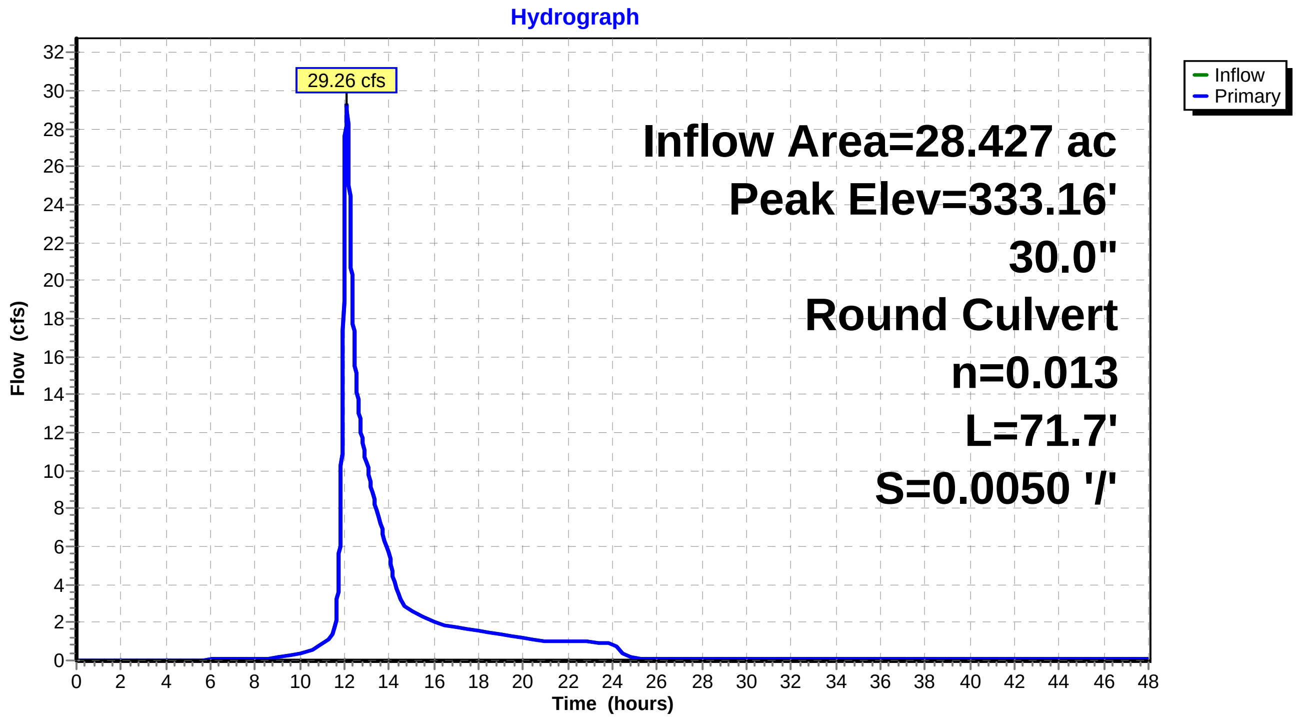
Inflow Area = 28.427 ac, 3.86% Impervious, Inflow Depth > 1.73" for 10 Year Storm event
Inflow = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af
Outflow = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af, Atten= 0%, Lag= 0.0 min
Primary = 29.26 cfs @ 12.10 hrs, Volume= 4.090 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 333.16' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	328.75'	**30.0" Round Culvert** L= 71.7' Ke= 0.500 Inlet / Outlet Invert= 328.75' / 328.39' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=28.79 cfs @ 12.10 hrs HW=333.11' TW=331.62' (Dynamic Tailwater)
↑1=Culvert (Inlet Controls 28.79 cfs @ 5.87 fps)

Pond P27: Pipe 27



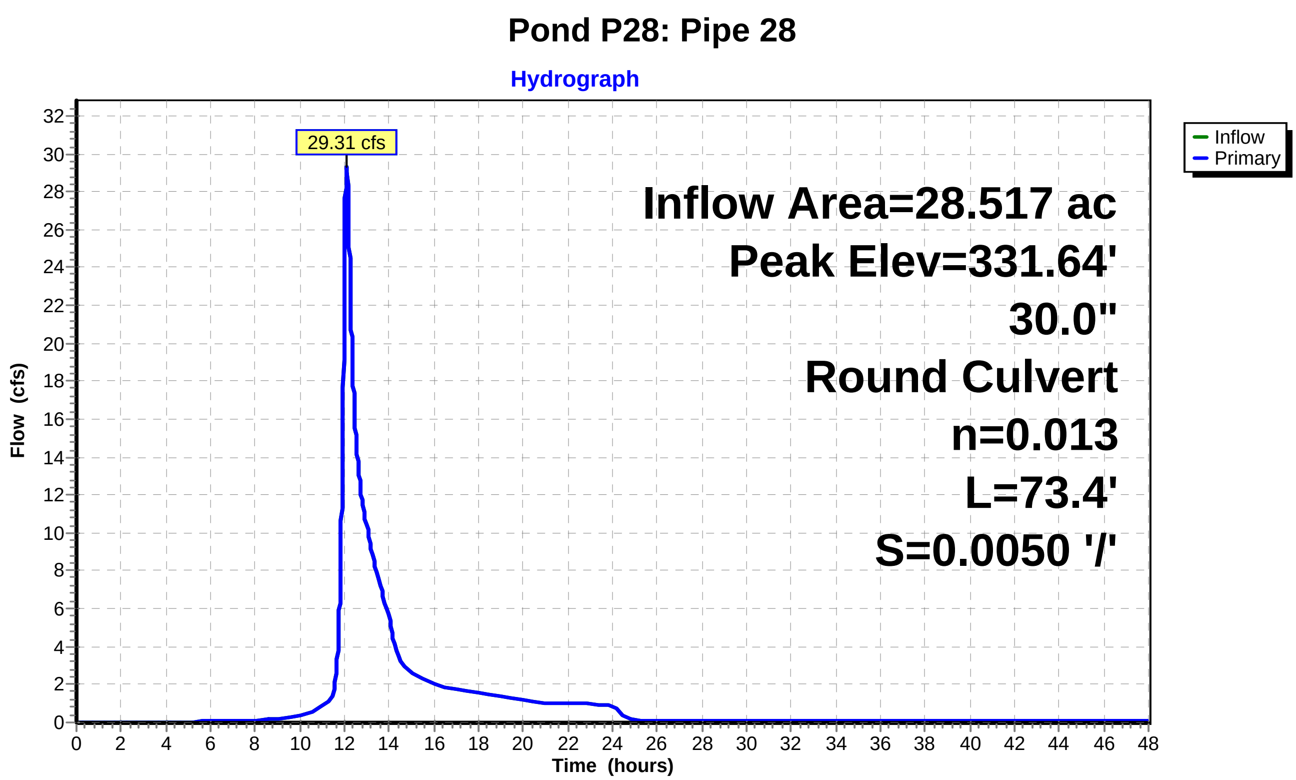
Summary for Pond P28: Pipe 28

Inflow Area =	28.517 ac,	4.15% Impervious, Inflow Depth > 1.73"	for 10 Year Storm event	
Inflow =	29.31 cfs @	12.10 hrs, Volume=	4.111 af	
Outflow =	29.31 cfs @	12.10 hrs, Volume=	4.111 af,	Atten= 0%, Lag= 0.0 min
Primary =	29.31 cfs @	12.10 hrs, Volume=	4.111 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 331.64' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	328.29'	**30.0" Round Culvert** L= 73.4' Ke= 0.500 Inlet / Outlet Invert= 328.29' / 327.92' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=29.06 cfs @ 12.10 hrs HW=331.62' TW=330.11' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 29.06 cfs @ 5.92 fps)



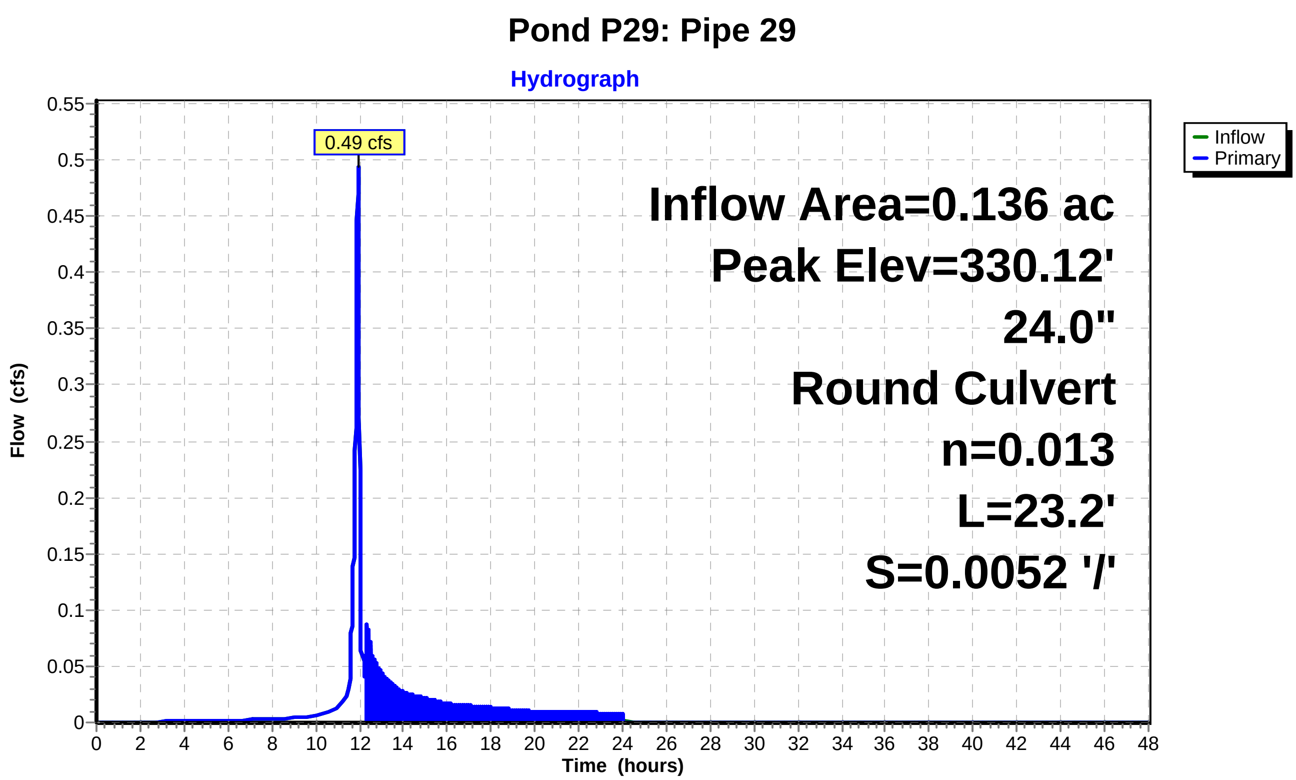
Summary for Pond P29: Pipe 29

Inflow Area =	0.136 ac, 33.09% Impervious, Inflow Depth = 1.92"	for 10 Year Storm event	
Inflow =	0.49 cfs @ 11.93 hrs, Volume=	0.022 af	
Outflow =	0.49 cfs @ 11.93 hrs, Volume=	0.022 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.49 cfs @ 11.93 hrs, Volume=	0.022 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 330.12' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.67'	**24.0" Round Culvert** L= 23.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 326.67' / 326.55' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.00 cfs @ 11.93 hrs HW=328.70' TW=328.78' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Summary for Pond P30: Pipe 30

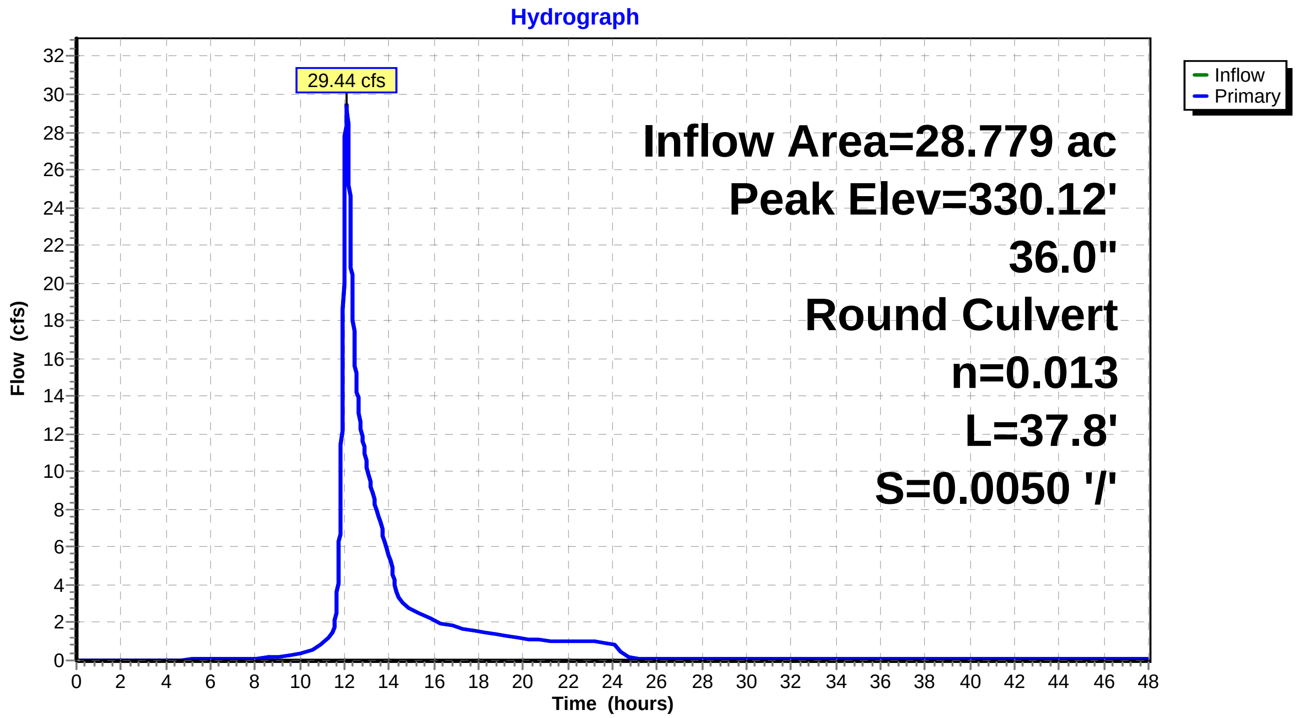
Inflow Area = 28.779 ac, 4.58% Impervious, Inflow Depth > 1.73" for 10 Year Storm event
Inflow = 29.44 cfs @ 12.10 hrs, Volume= 4.159 af
Outflow = 29.44 cfs @ 12.10 hrs, Volume= 4.159 af, Atten= 0%, Lag= 0.0 min
Primary = 29.44 cfs @ 12.10 hrs, Volume= 4.159 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 330.12' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.45'	**36.0" Round Culvert** L= 37.8' Ke= 0.500 Inlet / Outlet Invert= 326.45' / 326.26' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.20 cfs @ 12.10 hrs HW=330.11' TW=329.37' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 29.20 cfs @ 4.13 fps)

Pond P30: Pipe 30



Summary for Pond P31: Pipe 31

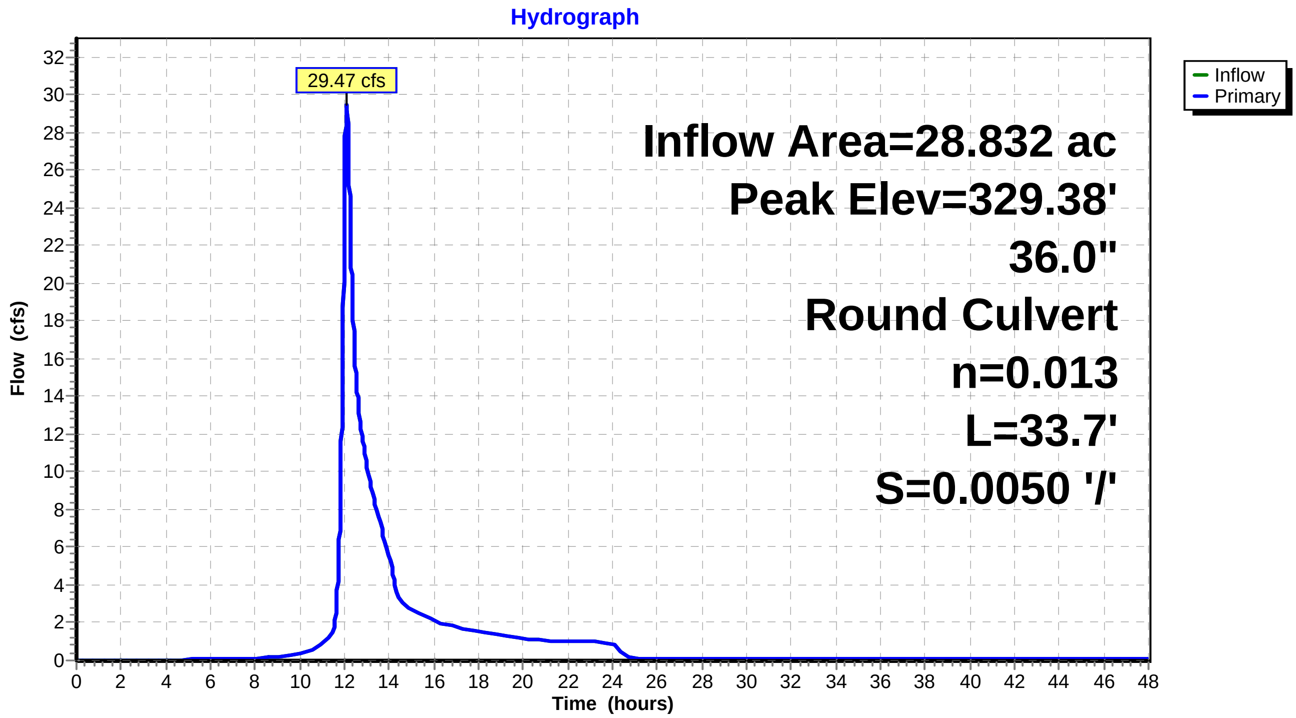
Inflow Area = 28.832 ac, 4.75% Impervious, Inflow Depth > 1.74" for 10 Year Storm event
Inflow = 29.47 cfs @ 12.10 hrs, Volume= 4.173 af
Outflow = 29.47 cfs @ 12.10 hrs, Volume= 4.173 af, Atten= 0%, Lag= 0.0 min
Primary = 29.47 cfs @ 12.10 hrs, Volume= 4.173 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 329.38' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.16'	**36.0" Round Culvert** L= 33.7' Ke= 0.500 Inlet / Outlet Invert= 326.16' / 325.99' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.40 cfs @ 12.10 hrs HW=329.37' TW=328.63' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 29.40 cfs @ 4.16 fps)

Pond P31: Pipe 31



Summary for Pond P32: Pipe 32

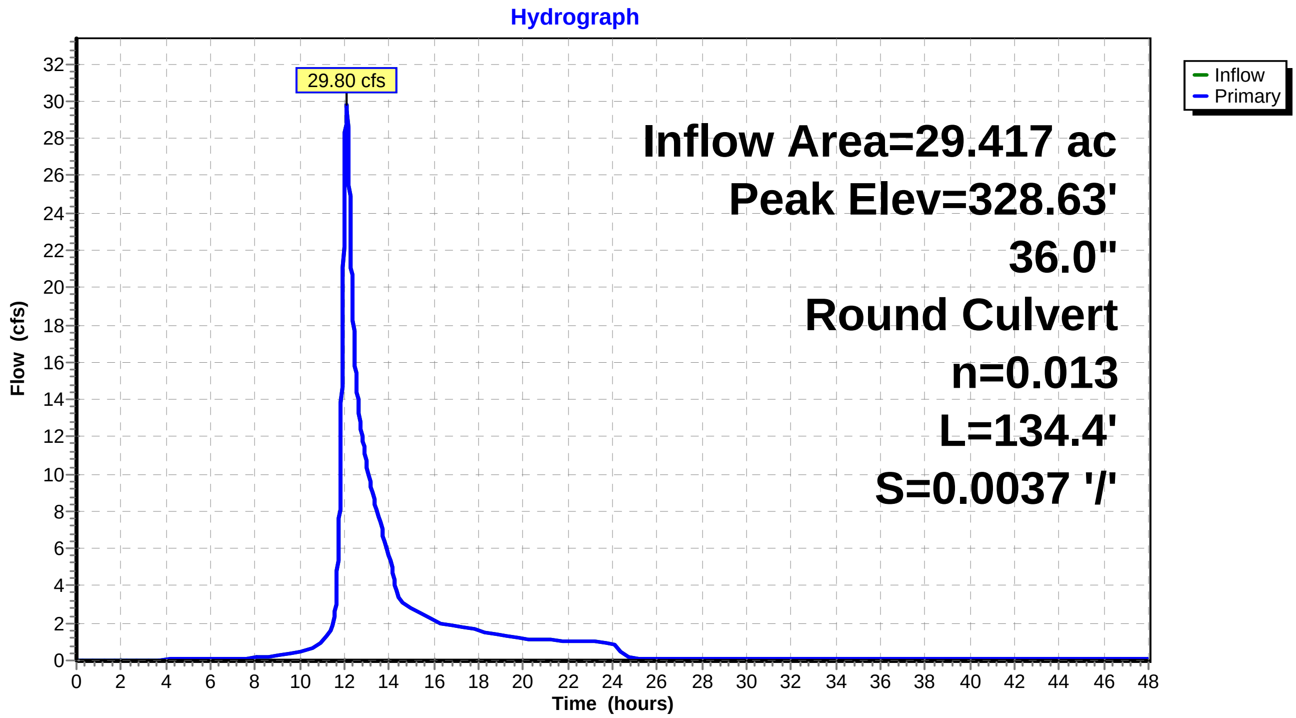
Inflow Area =	29.417 ac,	6.45% Impervious, Inflow Depth >	1.76"	for 10 Year Storm event
Inflow =	29.80 cfs @	12.10 hrs, Volume=	4.307 af	
Outflow =	29.80 cfs @	12.10 hrs, Volume=	4.307 af, Atten= 0%, Lag= 0.0 min	
Primary =	29.80 cfs @	12.10 hrs, Volume=	4.307 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 328.63' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	325.89'	**36.0" Round Culvert** L= 134.4' Ke= 0.500 Inlet / Outlet Invert= 325.89' / 325.39' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=29.78 cfs @ 12.10 hrs HW=328.63' TW=325.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 29.78 cfs @ 5.78 fps)

Pond P32: Pipe 32



Summary for Pond P4: Upstream of Interstate

Inflow Area = 51.846 ac, 4.26% Impervious, Inflow Depth > 1.05" for 10 Year Storm event
Inflow = 17.39 cfs @ 12.29 hrs, Volume= 4.533 af
Outflow = 4.29 cfs @ 17.77 hrs, Volume= 4.385 af, Atten= 75%, Lag= 329.1 min
Primary = 4.29 cfs @ 17.77 hrs, Volume= 4.385 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.74' @ 15.62 hrs Surf.Area= 124,935 sf Storage= 94,485 cf

Plug-Flow detention time= 396.8 min calculated for 4.385 af (97% of inflow)
Center-of-Mass det. time= 347.1 min (1,427.9 - 1,080.8)

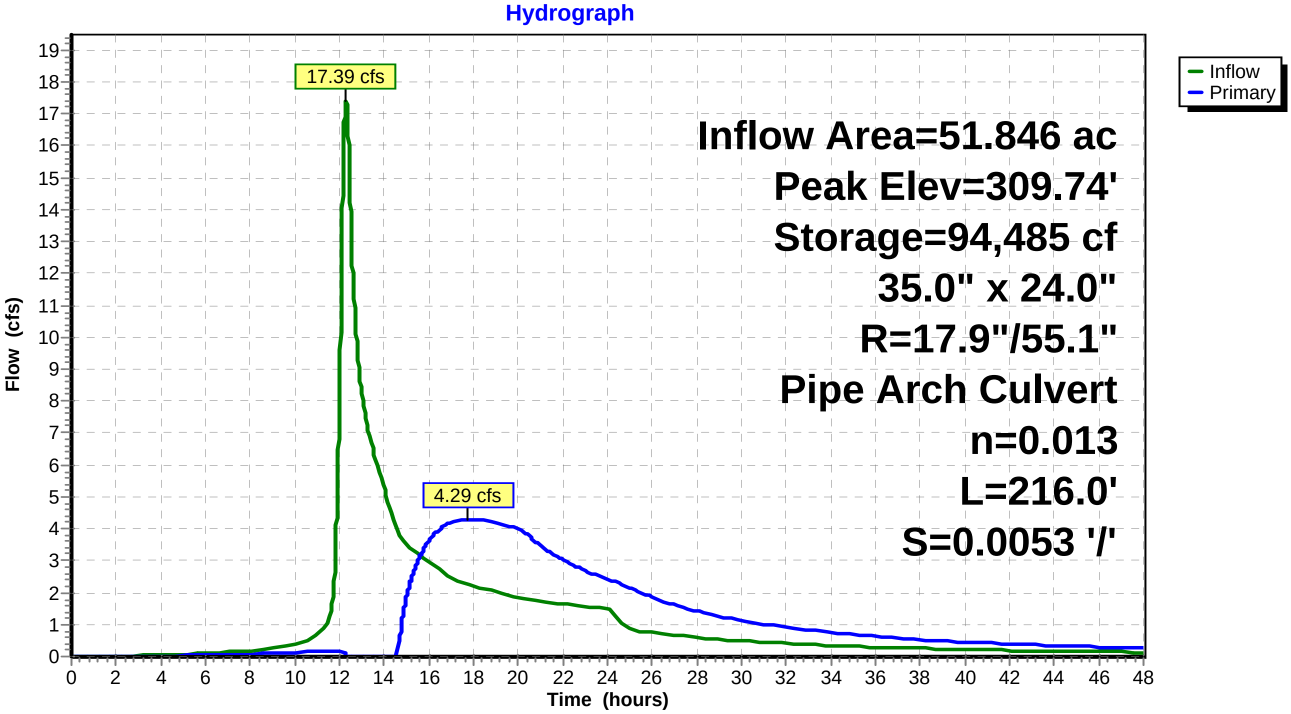
Volume	Invert	Avail.Storage	Storage Description
#1	308.84'	264,873 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.84	100	40.0	0	0	100
309.00	113,232	2,956.0	6,224	6,224	695,316
311.00	146,115	3,003.0	258,649	264,873	718,386

Device	Routing	Invert	Outlet Devices
#1	Primary	308.84'	**35.0" W x 24.0" H, R=17.9"/55.1" Pipe Arch CMP_Arch_1/2 35x24** L= 216.0' Ke= 0.500 Inlet / Outlet Invert= 308.84' / 307.69' S= 0.0053 '/' Cc= 0.900 n= 0.013 Asphalt, smooth, Flow Area= 4.63 sf

Primary OutFlow Max=4.30 cfs @ 17.77 hrs HW=309.66' TW=309.01' (Dynamic Tailwater)
1=CMP_Arch_1/2 35x24 (Outlet Controls 4.30 cfs @ 2.95 fps)

Pond P4: Upstream of Interstate



Summary for Pond P5: in Shaws Parking

Data from Champlain Consulting Engineers 8 SEP 00

Inflow Area = 17.067 ac, 0.00% Impervious, Inflow Depth = 2.26" for 10 Year Storm event
Inflow = 63.26 cfs @ 11.98 hrs, Volume= 3.212 af
Outflow = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af, Atten= 84%, Lag= 14.0 min
Primary = 10.02 cfs @ 12.22 hrs, Volume= 2.325 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 358.34' @ 12.22 hrs Surf.Area= 21,910 sf Storage= 73,624 cf

Plug-Flow detention time= 279.0 min calculated for 2.324 af (72% of inflow)
Center-of-Mass det. time= 185.0 min (985.5 - 800.5)

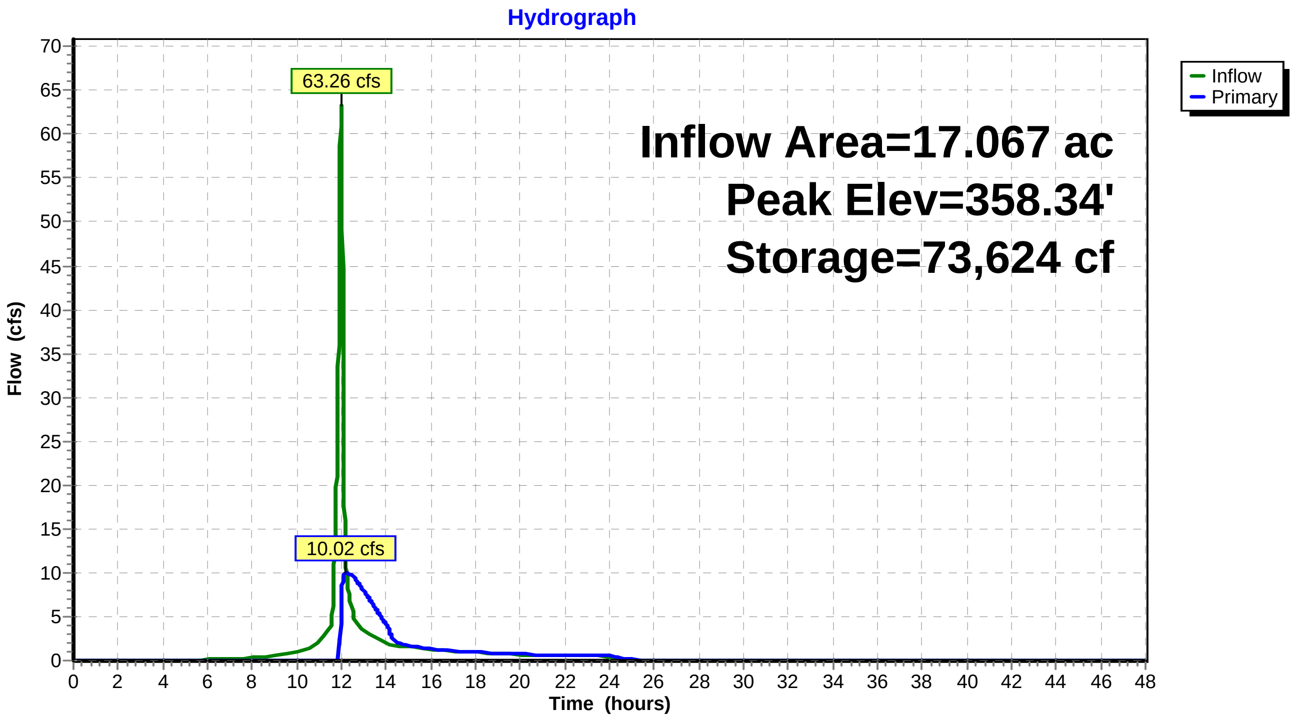
Volume	Invert	Avail.Storage	Storage Description
#1	354.50'	168,107 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16,374	0	0
356.00	18,340	26,036	26,036
358.00	21,318	39,658	65,694
360.00	24,759	46,077	111,771
362.00	31,577	56,336	168,107

Device	Routing	Invert	Outlet Devices
#1	Primary	356.10'	**2.0" Horiz. 2" ORIFICE/GRATE** C= 0.600
#2	Primary	357.00'	**6.0" Horiz. 6" HORIZONTAL ORIFICE/GRATE X9 X 9.00** C= 0.600 Limited to weir flow at low heads
#3	Primary	359.60'	**18.0" Horiz. 18" HORIZONTAL ORIFICE/GRATE** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.02 cfs @ 12.22 hrs HW=358.34' TW=343.19' (Dynamic Tailwater)
—**1=2" ORIFICE/GRATE** (Orifice Controls 0.16 cfs @ 7.21 fps)
—**2=6" HORIZONTAL ORIFICE/GRATE X9** (Orifice Controls 9.86 cfs @ 5.58 fps)
—**3=18" HORIZONTAL ORIFICE/GRATE** (Controls 0.00 cfs)

Pond P5: in Shaws Parking



Summary for Pond P6: next to Spare Time

Inflow Area = 7.318 ac, 0.00% Impervious, Inflow Depth = 1.61" for 10 Year Storm event
Inflow = 20.95 cfs @ 11.98 hrs, Volume= 0.981 af
Outflow = 0.41 cfs @ 16.49 hrs, Volume= 0.887 af, Atten= 98%, Lag= 270.9 min
Primary = 0.41 cfs @ 16.49 hrs, Volume= 0.887 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 310.49' @ 16.49 hrs Surf.Area= 14,614 sf Storage= 28,585 cf

Plug-Flow detention time= 844.7 min calculated for 0.887 af (90% of inflow)
Center-of-Mass det. time= 795.3 min (1,625.2 - 829.8)

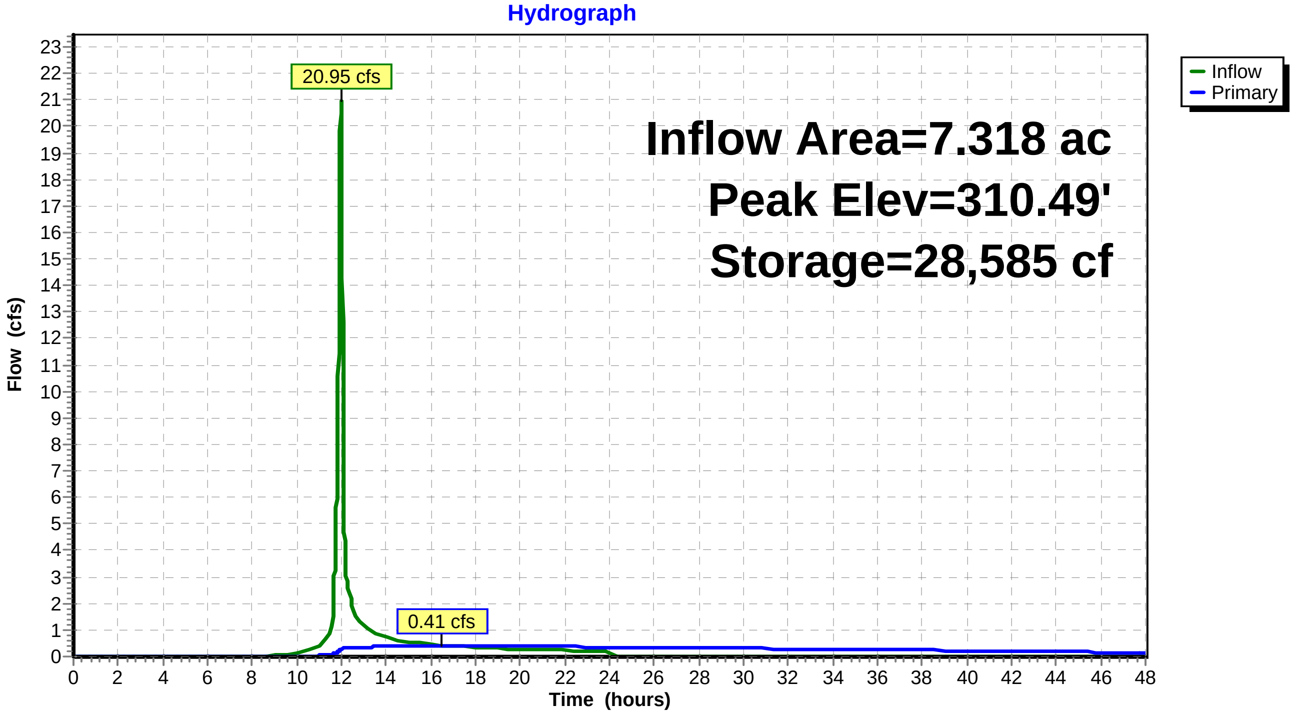
Volume	Invert	Avail.Storage	Storage Description
#1	308.00'	52,935 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
308.00	8,207	459.0	0	0	8,207
310.00	13,684	465.0	21,659	21,659	9,231
312.00	17,677	465.0	31,276	52,935	10,161

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	310.14'	**18.0" Round Culvert** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 310.14' / 310.09' S= 0.0015 '/' Cc= 0.900 n= 0.120, Flow Area= 1.77 sf

Primary OutFlow Max=0.41 cfs @ 16.49 hrs HW=310.49' TW=307.99' (Dynamic Tailwater)
├─**1=Orifice/Grate** (Orifice Controls 0.36 cfs @ 7.40 fps)
└─**2=Culvert** (Barrel Controls 0.05 cfs @ 0.23 fps)

Pond P6: next to Spare Time



Summary for Pond P7: Small Pond across Hercules

Inflow Area = 2.744 ac, 0.00% Impervious, Inflow Depth = 0.60" for 10 Year Storm event
Inflow = 0.76 cfs @ 12.60 hrs, Volume= 0.137 af
Outflow = 0.11 cfs @ 15.57 hrs, Volume= 0.053 af, Atten= 85%, Lag= 178.6 min
Primary = 0.11 cfs @ 15.57 hrs, Volume= 0.053 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 313.51' @ 15.57 hrs Surf.Area= 3,312 sf Storage= 3,714 cf

Plug-Flow detention time= 402.5 min calculated for 0.053 af (38% of inflow)
Center-of-Mass det. time= 230.1 min (1,163.1 - 932.9)

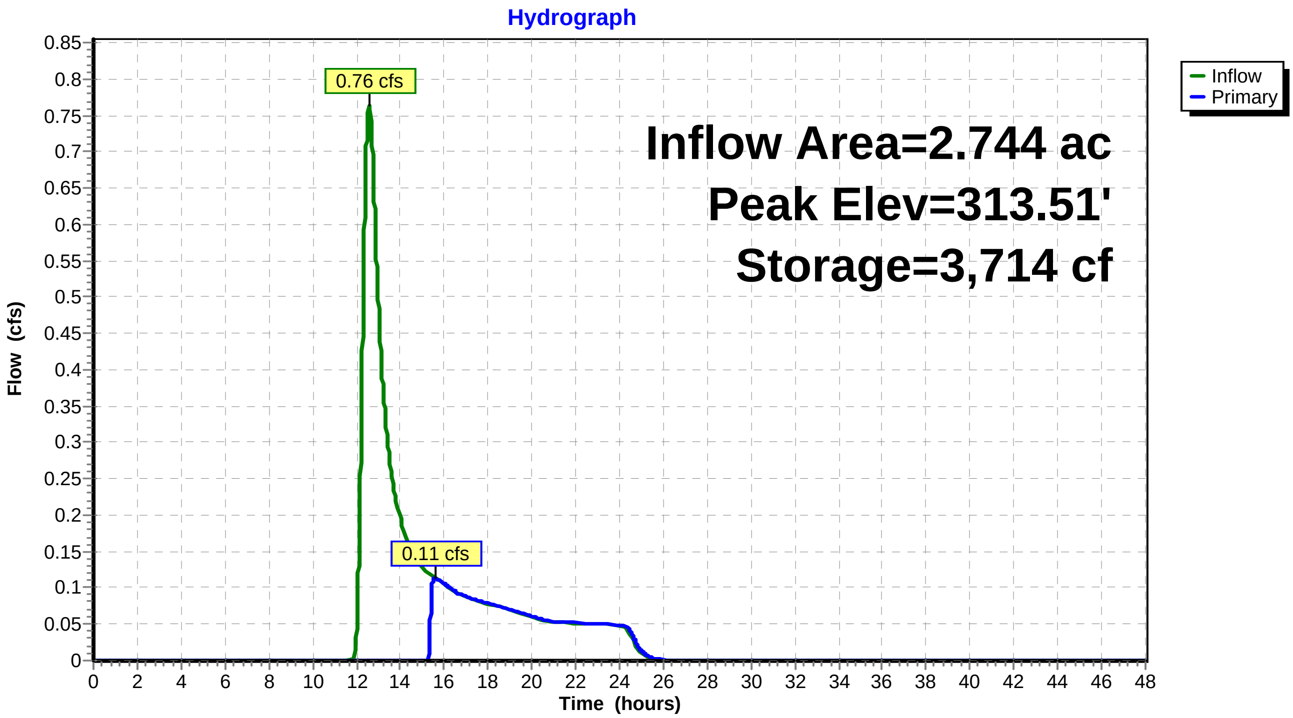
Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	5,495 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
312.00	1,699	250.0	0	0	1,699
314.00	3,952	313.0	5,495	5,495	4,577

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**50.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.11 cfs @ 15.57 hrs HW=313.51' TW=312.45' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.25 fps)

Pond P7: Small Pond across Hercules



Summary for Pond P8: Nat'l Guard Wetland

Inflow Area = 66.948 ac, 0.00% Impervious, Inflow Depth = 1.04" for 10 Year Storm event
Inflow = 45.62 cfs @ 12.39 hrs, Volume= 5.788 af
Outflow = 4.79 cfs @ 16.82 hrs, Volume= 5.629 af, Atten= 90%, Lag= 265.6 min
Primary = 4.79 cfs @ 16.82 hrs, Volume= 5.629 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 309.65' @ 14.69 hrs Surf.Area= 209,274 sf Storage= 123,625 cf

Plug-Flow detention time= 295.5 min calculated for 5.629 af (97% of inflow)
Center-of-Mass det. time= 279.8 min (1,170.2 - 890.4)

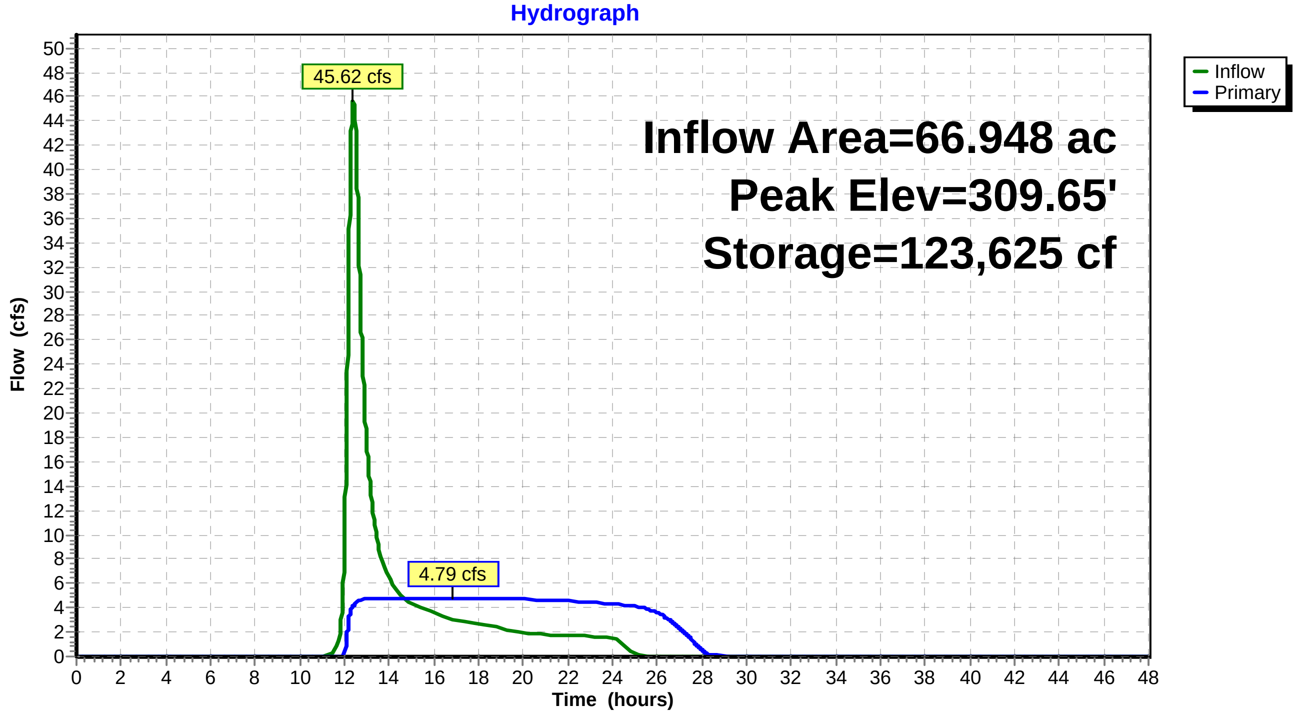
Volume	Invert	Avail.Storage	Storage Description
#1	306.60'	2,725,483 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
306.60	3,900	2,500.0	0	0	3,900
308.60	19,200	7,100.0	21,169	21,169	3,518,054
312.60	1,822,000	6,500.0	2,704,314	2,725,483	4,167,976

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 306.60' / 306.50' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	312.30'	**60.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.79 cfs @ 16.82 hrs HW=309.62' TW=307.98' (Dynamic Tailwater)
├─**1=Culvert** (Outlet Controls 4.79 cfs @ 6.10 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P8: Nat'l Guard Wetland



Summary for Pond P9: Charlebois Pond

Inflow Area = 1.860 ac, 0.00% Impervious, Inflow Depth = 2.45" for 10 Year Storm event
Inflow = 7.66 cfs @ 11.97 hrs, Volume= 0.379 af
Outflow = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af, Atten= 90%, Lag= 22.4 min
Primary = 0.80 cfs @ 12.34 hrs, Volume= 0.357 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 331.00' Surf.Area= 0.050 ac Storage= 0.082 af
Peak Elev= 333.57' @ 12.34 hrs Surf.Area= 0.119 ac Storage= 0.296 af (0.214 af above start)

Plug-Flow detention time= 979.3 min calculated for 0.274 af (72% of inflow)
Center-of-Mass det. time= 670.0 min (1,459.3 - 789.3)

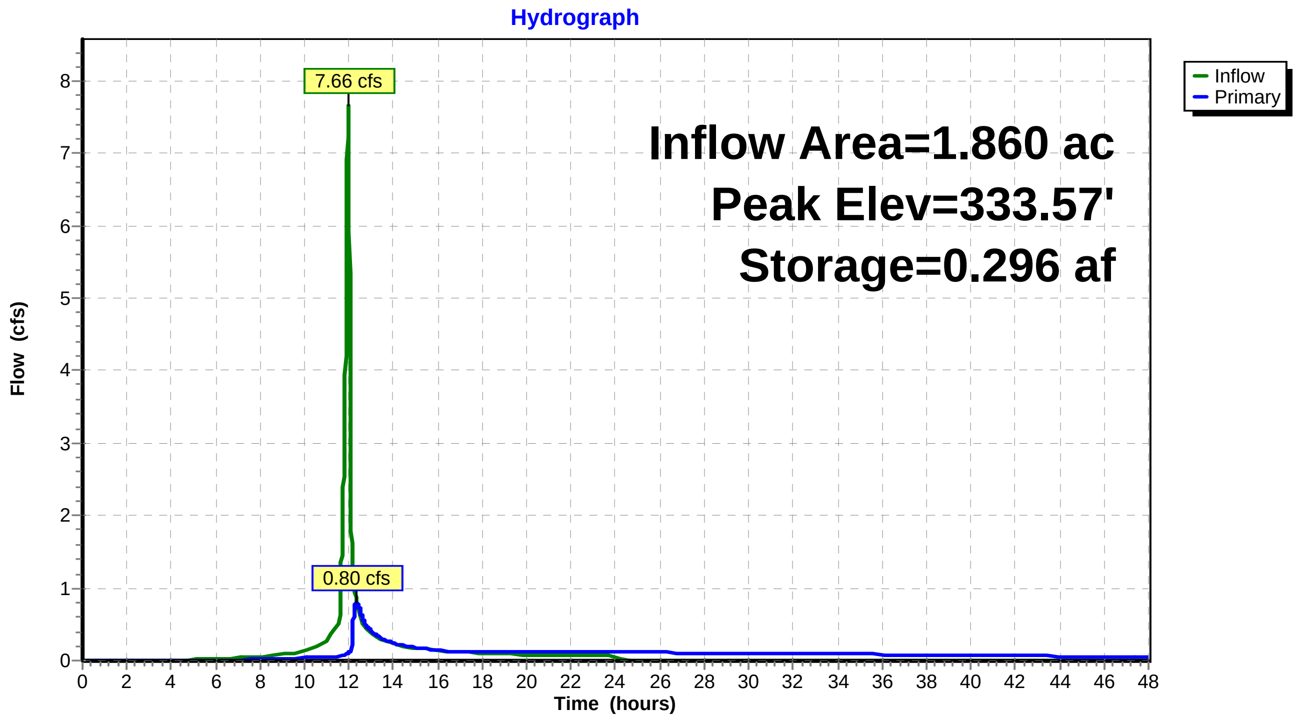
Volume	Invert	Avail.Storage	Storage Description
#1	327.00'	0.351 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
327.00	0.003	0.000	0.000
328.00	0.009	0.006	0.006
329.00	0.018	0.014	0.020
330.00	0.029	0.024	0.043
331.00	0.050	0.039	0.082
332.00	0.075	0.062	0.145
333.00	0.102	0.088	0.233
334.00	0.132	0.117	0.351

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	**15.0" Round Culvert** L= 45.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 331.00' / 330.00' S= 0.0220 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	331.00'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Primary	333.50'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 12.34 hrs HW=333.57' TW=323.54' (Dynamic Tailwater)
1=Culvert (Passes 0.12 cfs of 8.23 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.12 cfs @ 7.61 fps)
3=Orifice/Grate (Weir Controls 0.68 cfs @ 0.85 fps)

Pond P9: Charlebois Pond



Summary for Link 3L: Tailwater

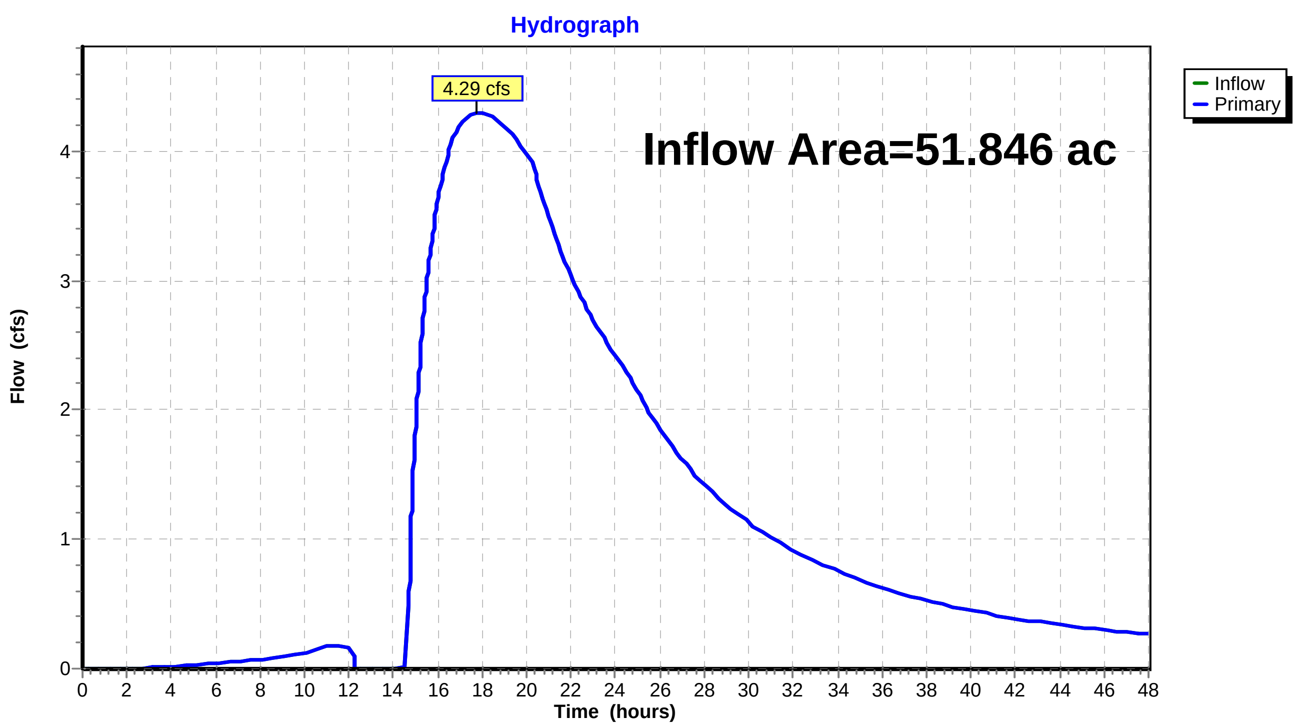
Inflow Area = 51.846 ac, 4.26% Impervious, Inflow Depth > 1.01" for 10 Year Storm event
Inflow = 4.29 cfs @ 17.77 hrs, Volume= 4.385 af
Primary = 4.29 cfs @ 17.77 hrs, Volume= 4.385 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

49 Point manual elevation table, To= 0.00 hrs, dt= 1.00 hrs, feet =

307.54	307.54	307.54	307.54	307.55	307.55	307.56	307.56	307.57
307.59	307.61	307.66	308.85	309.96	309.87	309.63	309.39	309.17
308.96	308.73	308.48	308.21	308.11	308.06	308.03	307.88	307.84
307.80	307.75	307.72	307.70	307.68	307.68	307.67	307.66	307.66
307.65	307.65	307.65	307.64	307.64	307.64	307.63	307.63	307.63
307.63	307.63	307.62	307.62					

Link 3L: Tailwater

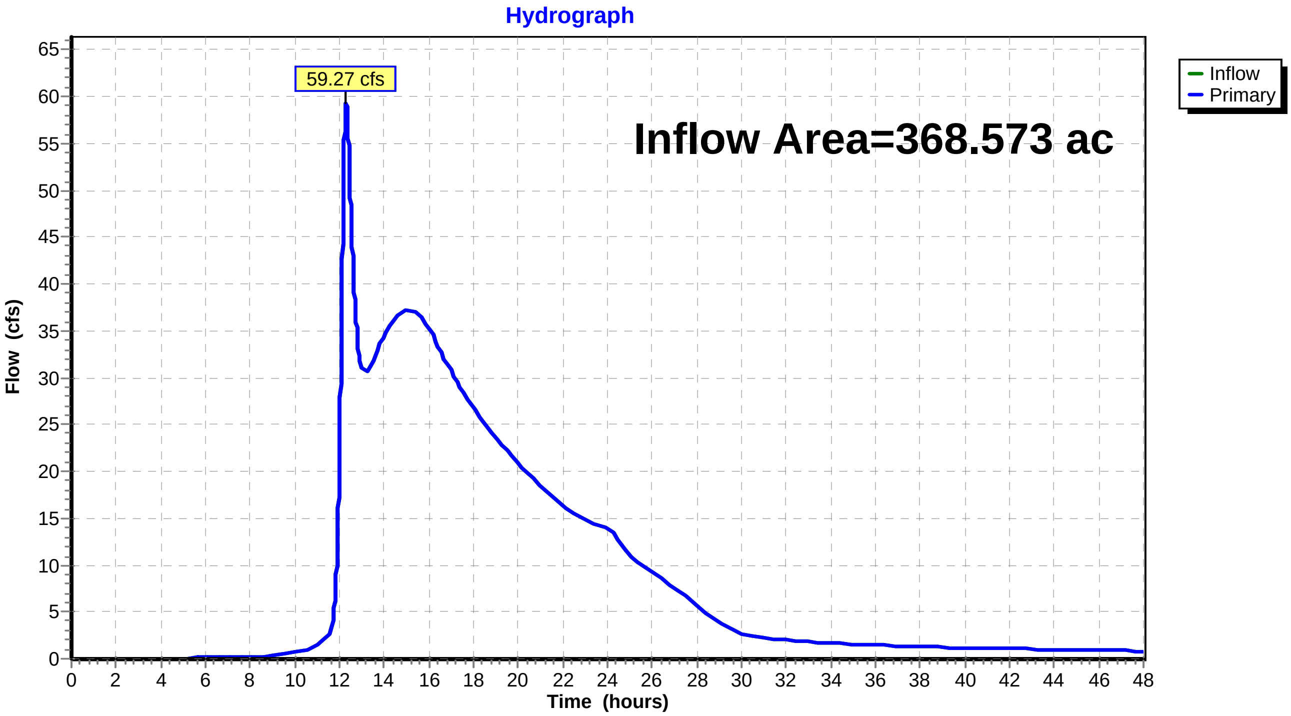


Summary for Link SN1: SN001

Inflow Area =	368.573 ac,	2.69% Impervious,	Inflow Depth > 1.08"	for 10 Year Storm event		
Inflow =	59.27 cfs @	12.30 hrs,	Volume=	33.083 af		
Primary =	59.27 cfs @	12.30 hrs,	Volume=	33.083 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

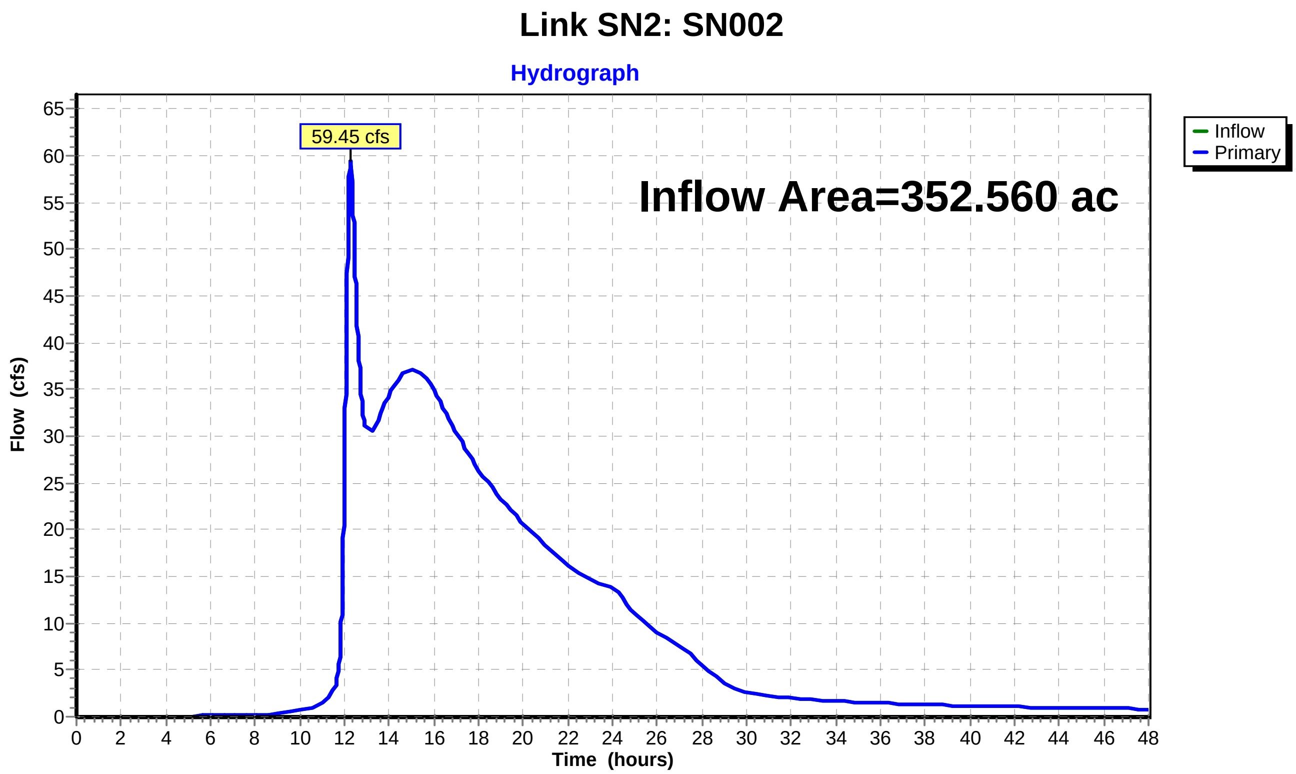
Link SN1: SN001



Summary for Link SN2: SN002

Inflow Area = 352.560 ac, 2.71% Impervious, Inflow Depth > 1.12" for 10 Year Storm event
Inflow = 59.45 cfs @ 12.27 hrs, Volume= 32.917 af
Primary = 59.45 cfs @ 12.27 hrs, Volume= 32.917 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

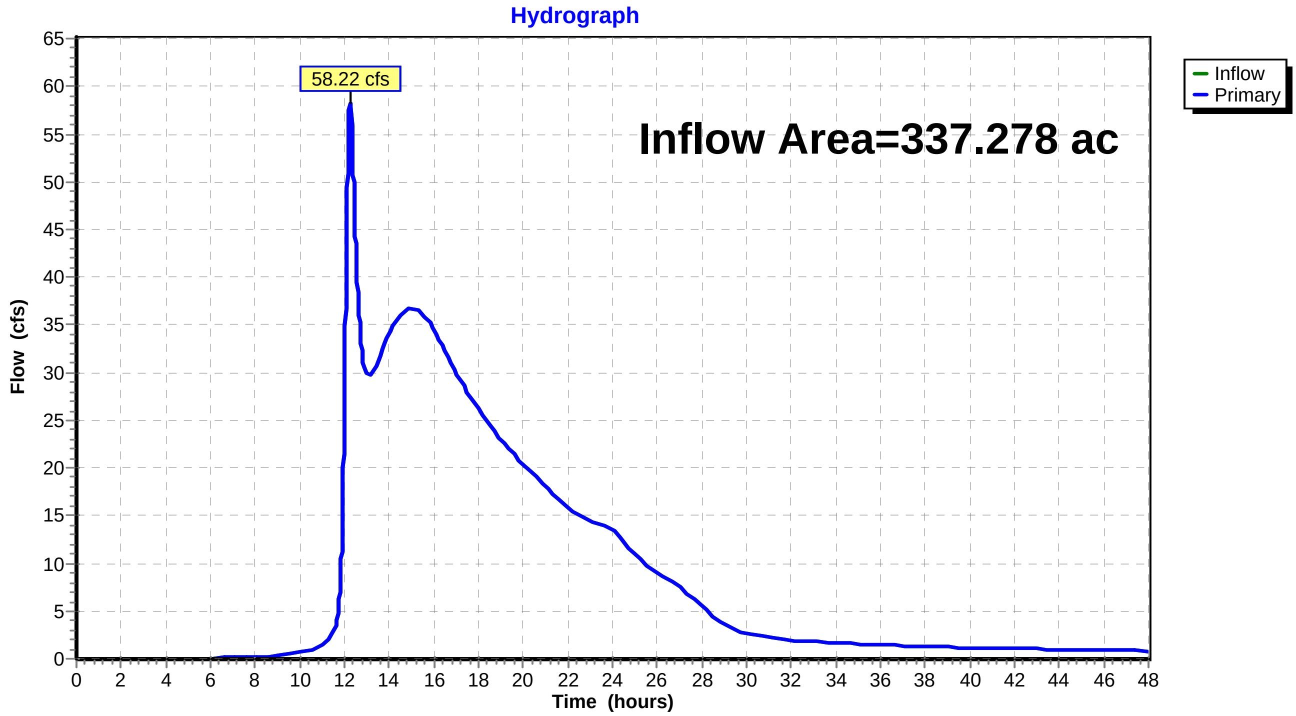


Summary for Link SN3: SN003

Inflow Area = 337.278 ac, 2.67% Impervious, Inflow Depth > 1.15" for 10 Year Storm event
Inflow = 58.22 cfs @ 12.25 hrs, Volume= 32.461 af
Primary = 58.22 cfs @ 12.25 hrs, Volume= 32.461 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN3: SN003

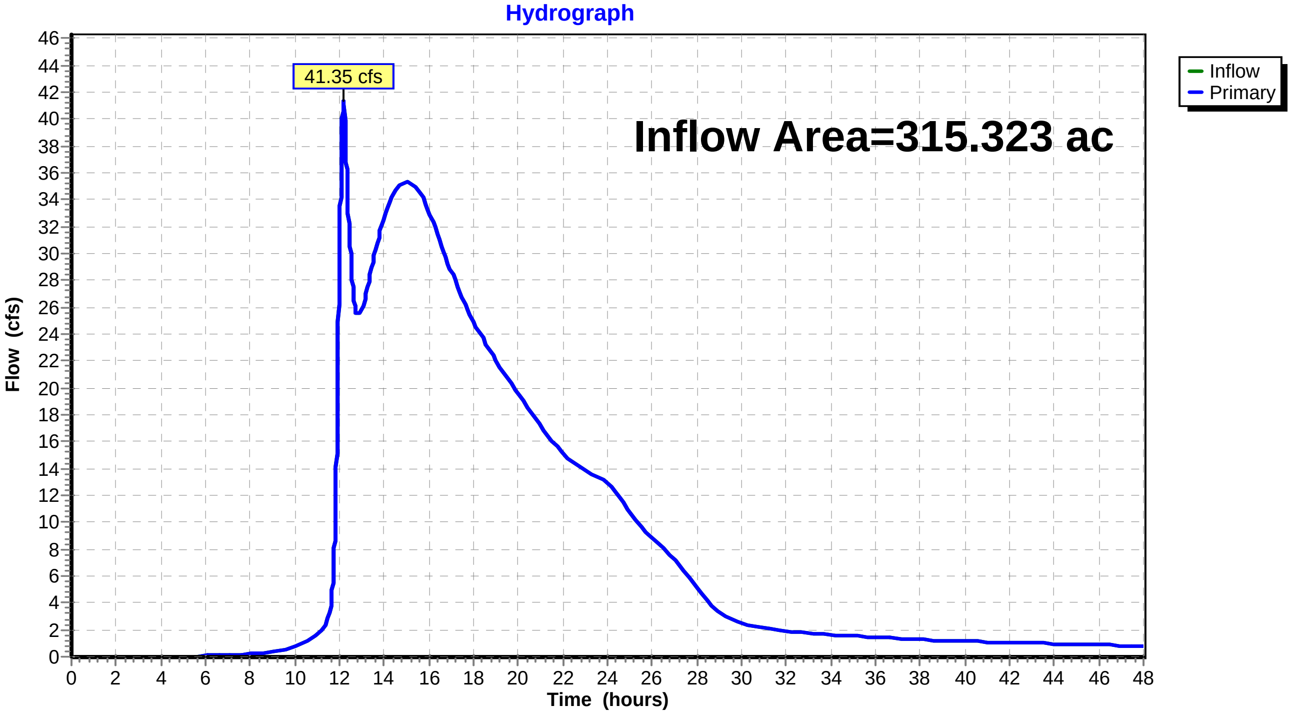


Summary for Link SN4: SN004

Inflow Area =	315.323 ac,	2.65% Impervious, Inflow Depth > 1.16"	for 10 Year Storm event
Inflow =	41.35 cfs @ 12.18 hrs,	Volume=	30.507 af
Primary =	41.35 cfs @ 12.18 hrs,	Volume=	30.507 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN4: SN004

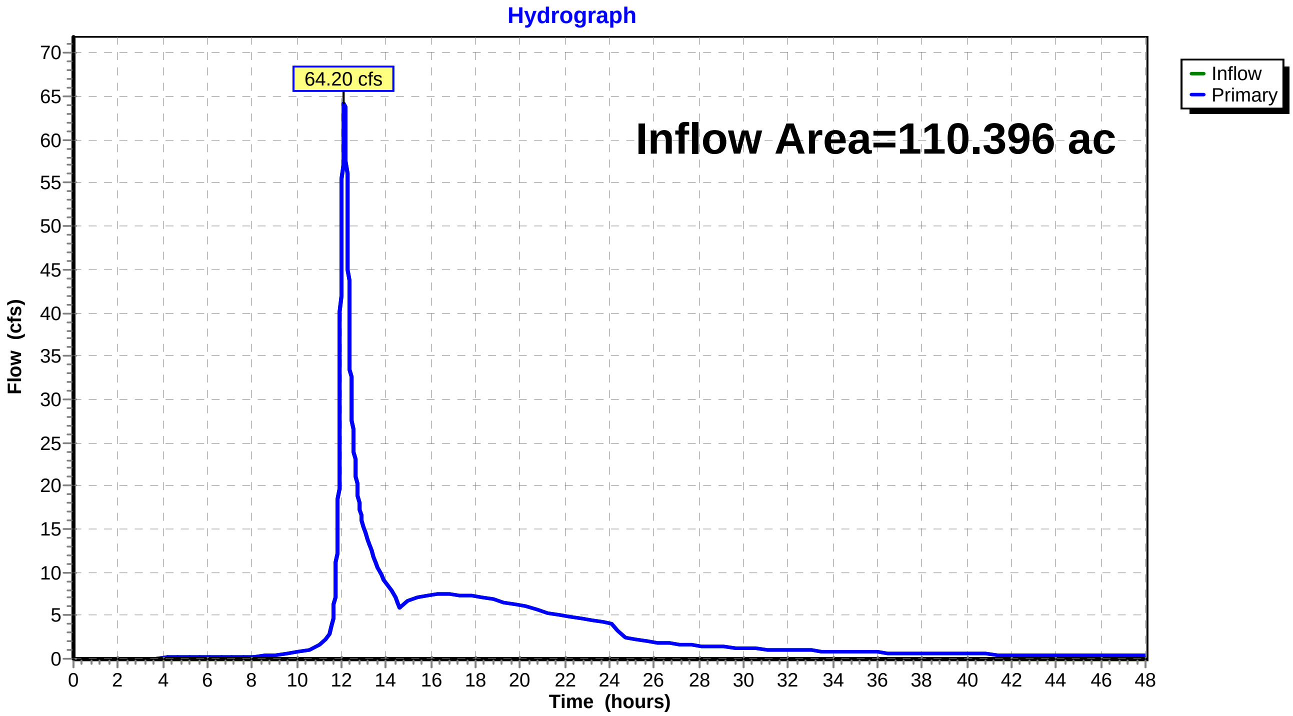


Summary for Link SN6: SN006

Inflow Area =	110.396 ac,	4.77% Impervious, Inflow Depth > 1.28"	for 10 Year Storm event	
Inflow =	64.20 cfs @	12.13 hrs, Volume=	11.739 af	
Primary =	64.20 cfs @	12.13 hrs, Volume=	11.739 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN6: SN006



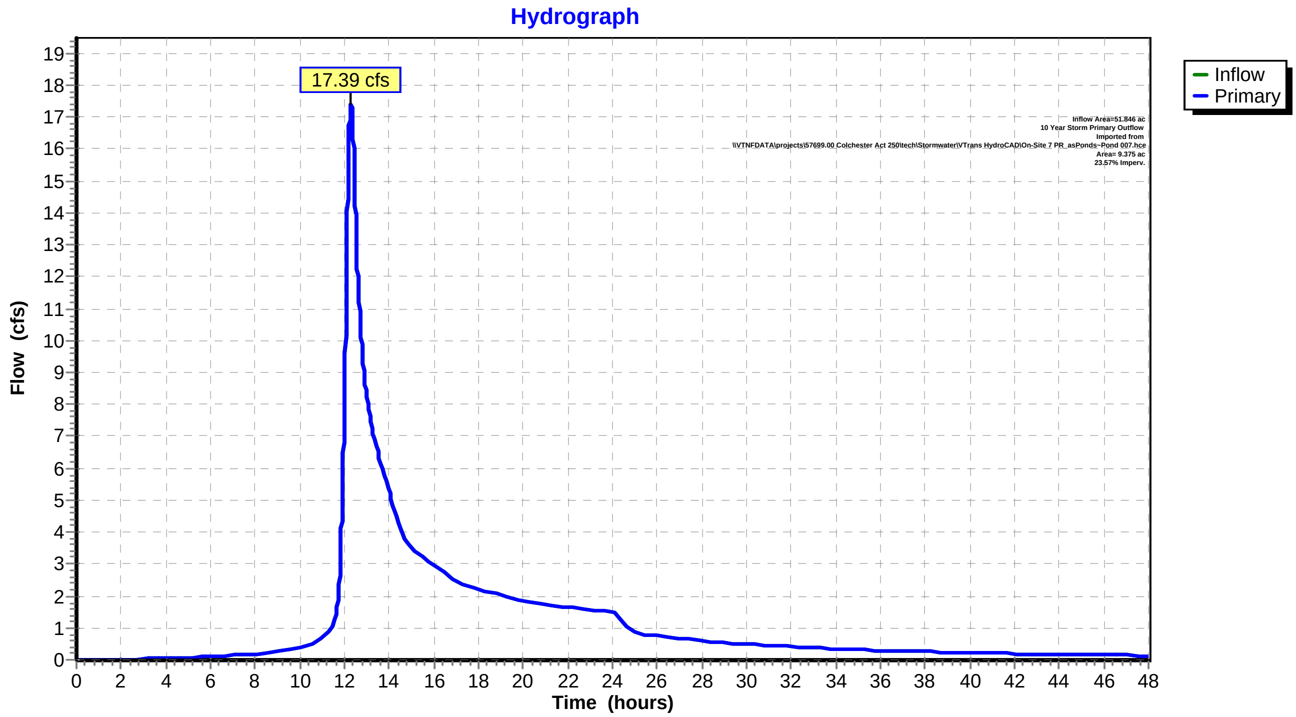
Summary for Link SN7: SN007

Inflow Area = 51.846 ac, 4.26% Impervious, Inflow Depth > 1.05" for 10 Year Storm event
Inflow = 17.39 cfs @ 12.29 hrs, Volume= 4.533 af
Primary = 17.39 cfs @ 12.29 hrs, Volume= 4.533 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

10 Year Storm Primary Outflow Imported from \\VTNFDATA\projects\57699.00 Colchester Act 250\tech\Stormwater\V

Link SN7: SN007

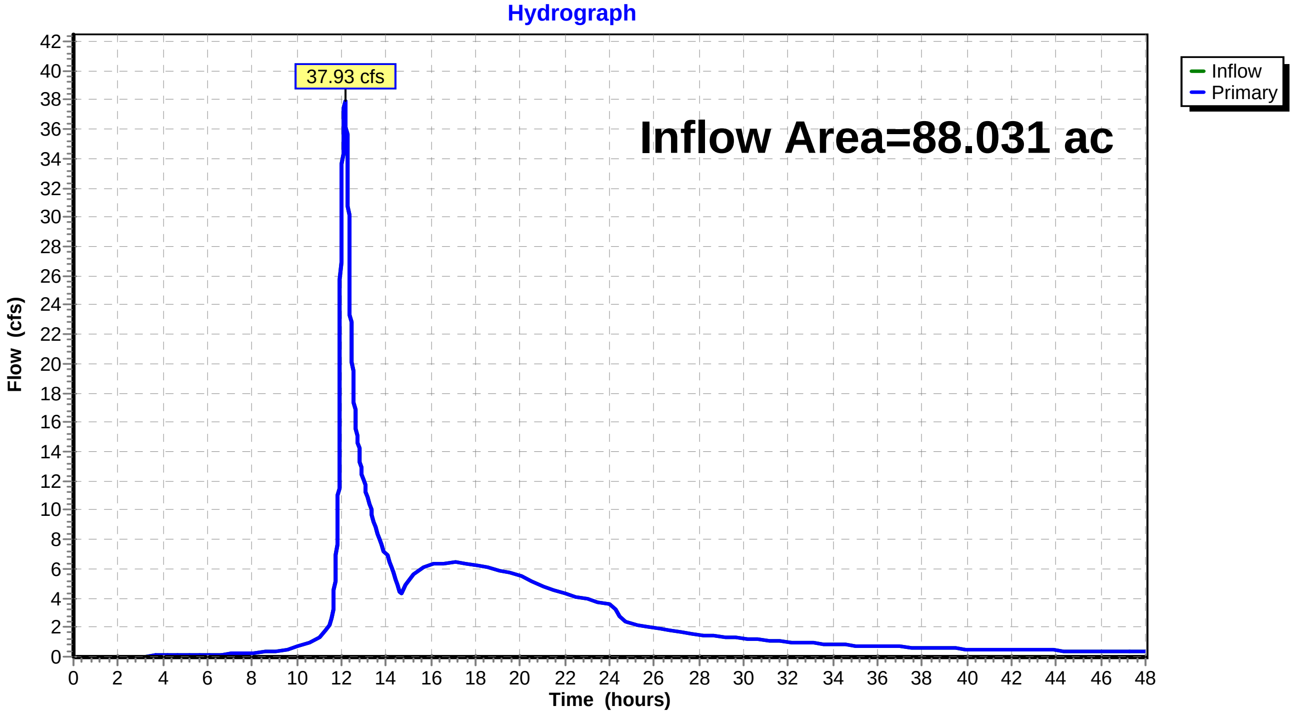


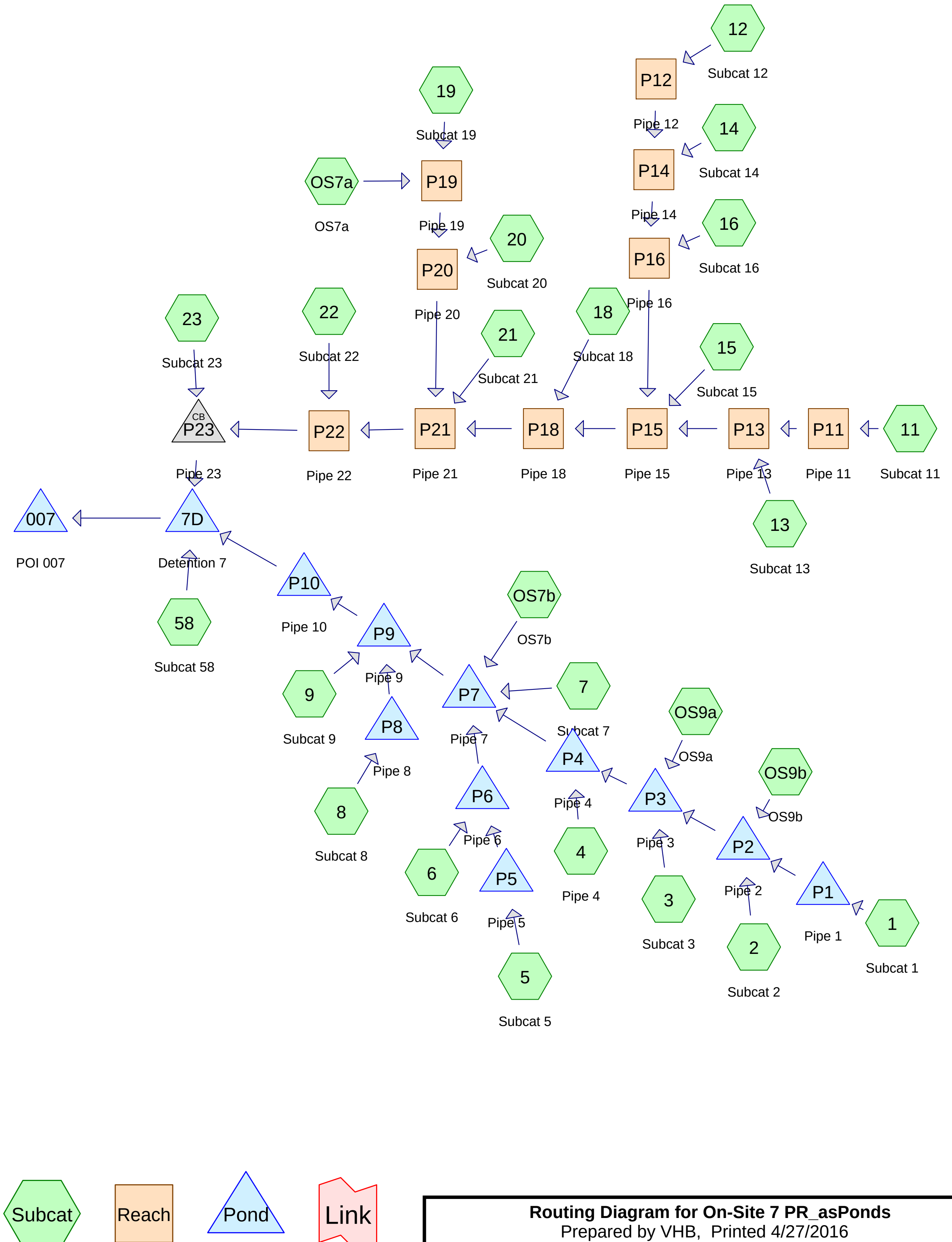
Summary for Link SN8: SN008

Inflow Area = 88.031 ac, 5.28% Impervious, Inflow Depth > 1.31" for 10 Year Storm event
Inflow = 37.93 cfs @ 12.15 hrs, Volume= 9.613 af
Primary = 37.93 cfs @ 12.15 hrs, Volume= 9.613 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SN8: SN008





Routing Diagram for On-Site 7 PR_asPonds
Prepared by VHB, Printed 4/27/2016
HydroCAD® 10.00 s/n 01038 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=0.324 ac 90.74% Impervious Runoff Depth=2.82"
Flow Length=345' Slope=0.0067 '/' Tc=3.5 min CN=80/98 Runoff=1.52 cfs 0.076 af

Subcatchment 2: Subcat 2 Runoff Area=0.139 ac 92.81% Impervious Runoff Depth=2.85"
Flow Length=123' Slope=0.0065 '/' Tc=1.3 min CN=80/98 Runoff=0.70 cfs 0.033 af

Subcatchment 3: Subcat 3 Runoff Area=0.233 ac 91.85% Impervious Runoff Depth=2.84"
Flow Length=240' Slope=0.0077 '/' Tc=2.2 min CN=80/98 Runoff=1.14 cfs 0.055 af

Subcatchment 4: Pipe 4 Runoff Area=0.269 ac 57.25% Impervious Runoff Depth=2.30"
Flow Length=189' Slope=0.0089 '/' Tc=1.6 min CN=80/98 Runoff=1.14 cfs 0.052 af

Subcatchment 5: Subcat 5 Runoff Area=0.212 ac 48.11% Impervious Runoff Depth=2.16"
Flow Length=206' Tc=2.1 min CN=80/98 Runoff=0.84 cfs 0.038 af

Subcatchment 6: Subcat 6 Runoff Area=0.091 ac 83.52% Impervious Runoff Depth=2.71"
Flow Length=115' Slope=0.0088 '/' Tc=1.0 min CN=80/98 Runoff=0.45 cfs 0.021 af

Subcatchment 7: Subcat 7 Runoff Area=0.116 ac 70.69% Impervious Runoff Depth=2.51"
Flow Length=119' Slope=0.0096 '/' Tc=1.0 min CN=80/98 Runoff=0.53 cfs 0.024 af

Subcatchment 8: Subcat 8 Runoff Area=0.142 ac 98.59% Impervious Runoff Depth=2.95"
Flow Length=192' Slope=0.0036 '/' Tc=2.6 min CN=80/98 Runoff=0.71 cfs 0.035 af

Subcatchment 9: Subcat 9 Runoff Area=0.173 ac 92.49% Impervious Runoff Depth=2.85"
Flow Length=182' Tc=2.5 min CN=80/98 Runoff=0.84 cfs 0.041 af

Subcatchment 11: Subcat 11 Runoff Area=0.015 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=46' Slope=0.0211 '/' Tc=0.3 min CN=0/98 Runoff=0.08 cfs 0.004 af

Subcatchment 12: Subcat 12 Runoff Area=0.016 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=47' Slope=0.0189 '/' Tc=0.3 min CN=0/98 Runoff=0.09 cfs 0.004 af

Subcatchment 13: Subcat 13 Runoff Area=0.074 ac 91.89% Impervious Runoff Depth=2.84"
Flow Length=124' Tc=1.5 min CN=80/98 Runoff=0.37 cfs 0.018 af

Subcatchment 14: Subcat 14 Runoff Area=0.063 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=116' Slope=0.0203 '/' Tc=0.7 min CN=0/98 Runoff=0.33 cfs 0.016 af

Subcatchment 15: Subcat 15 Runoff Area=0.062 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=114' Slope=0.0242 '/' Tc=0.6 min CN=0/98 Runoff=0.33 cfs 0.015 af

Subcatchment 16: Subcat 16 Runoff Area=0.064 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=118' Slope=0.0331 '/' Tc=0.5 min CN=0/98 Runoff=0.34 cfs 0.016 af

Subcatchment 18: Subcat 18 Runoff Area=0.070 ac 100.00% Impervious Runoff Depth=2.97"
Flow Length=81' Slope=0.0293 '/' Tc=0.4 min CN=0/98 Runoff=0.37 cfs 0.017 af

Subcatchment 19: Subcat 19 Runoff Area=0.325 ac 29.54% Impervious Runoff Depth=1.86"
Flow Length=213' Tc=2.7 min CN=80/98 Runoff=1.13 cfs 0.050 af

Subcatchment 20: Subcat 20 Runoff Area=0.109 ac 88.99% Impervious Runoff Depth=2.80"
Flow Length=107' Slope=0.0206 '/' Tc=0.6 min CN=80/98 Runoff=0.55 cfs 0.025 af

Subcatchment 21: Subcat 21 Runoff Area=0.028 ac 89.29% Impervious Runoff Depth=2.80"
Flow Length=61' Slope=0.0047 '/' Tc=0.7 min CN=80/98 Runoff=0.14 cfs 0.007 af

Subcatchment 22: Subcat 22 Runoff Area=0.043 ac 93.02% Impervious Runoff Depth=2.86"
Flow Length=90' Slope=0.0080 '/' Tc=0.8 min CN=80/98 Runoff=0.22 cfs 0.010 af

Subcatchment 23: Subcat 23 Runoff Area=0.342 ac 44.44% Impervious Runoff Depth=2.10"
Flow Length=272' Tc=2.8 min CN=80/98 Runoff=1.30 cfs 0.060 af

Subcatchment 58: Subcat 58 Runoff Area=0.602 ac 15.12% Impervious Runoff Depth=1.64"
Flow Length=155' Tc=3.6 min CN=80/98 Runoff=1.85 cfs 0.082 af

Subcatchment OS7a: OS7a Runoff Area=1.853 ac 0.00% Impervious Runoff Depth=1.84"
Flow Length=598' Tc=26.3 min CN=86/0 Runoff=3.22 cfs 0.283 af

Subcatchment OS7b: OS7b Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=1.47"
Flow Length=260' Slope=0.1483 '/' Tc=6.1 min CN=81/0 Runoff=3.89 cfs 0.182 af

Subcatchment OS9a: OS9a Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=1.91"
Flow Length=340' Tc=1.8 min CN=87/0 Runoff=4.74 cfs 0.194 af

Subcatchment OS9b: OS9b Runoff Area=1.309 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=470' Tc=7.6 min CN=94/0 Runoff=5.21 cfs 0.277 af

Reach P11: Pipe 11 Avg. Flow Depth=0.08' Max Vel=2.30 fps Inflow=0.08 cfs 0.004 af
18.0" Round Pipe n=0.013 L=65.5' S=0.0220 '/' Capacity=15.58 cfs Outflow=0.08 cfs 0.004 af

Reach P12: Pipe 12 Avg. Flow Depth=0.08' Max Vel=2.36 fps Inflow=0.09 cfs 0.004 af
18.0" Round Pipe n=0.013 L=65.0' S=0.0222 '/' Capacity=15.63 cfs Outflow=0.08 cfs 0.004 af

Reach P13: Pipe 13 Avg. Flow Depth=0.19' Max Vel=3.38 fps Inflow=0.45 cfs 0.021 af
18.0" Round Pipe n=0.013 L=66.0' S=0.0147 '/' Capacity=12.73 cfs Outflow=0.45 cfs 0.021 af

Reach P14: Pipe 14 Avg. Flow Depth=0.19' Max Vel=3.31 fps Inflow=0.42 cfs 0.020 af
18.0" Round Pipe n=0.013 L=66.0' S=0.0147 '/' Capacity=12.73 cfs Outflow=0.42 cfs 0.020 af

Reach P15: Pipe 15 Avg. Flow Depth=0.46' Max Vel=3.27 fps Inflow=1.52 cfs 0.072 af
18.0" Round Pipe n=0.013 L=34.8' S=0.0049 '/' Capacity=7.34 cfs Outflow=1.52 cfs 0.072 af

Reach P16: Pipe 16 Avg. Flow Depth=0.31' Max Vel=2.92 fps Inflow=0.76 cfs 0.035 af
18.0" Round Pipe n=0.013 L=3.2' S=0.0063 '/' Capacity=8.30 cfs Outflow=0.75 cfs 0.035 af

Reach P18: Pipe 18 Avg. Flow Depth=0.52' Max Vel=3.48 fps Inflow=1.88 cfs 0.089 af
18.0" Round Pipe n=0.013 L=44.7' S=0.0049 '/' Capacity=7.37 cfs Outflow=1.88 cfs 0.089 af

Reach P19: Pipe 19 Avg. Flow Depth=0.70' Max Vel=4.15 fps Inflow=3.35 cfs 0.334 af
18.0" Round Pipe n=0.013 L=13.5' S=0.0052 '/' Capacity=7.56 cfs Outflow=3.35 cfs 0.334 af

Reach P20: Pipe 20 Avg. Flow Depth=0.71' Max Vel=4.11 fps Inflow=3.40 cfs 0.359 af
18.0" Round Pipe n=0.013 L=47.9' S=0.0050 '/' Capacity=7.44 cfs Outflow=3.40 cfs 0.359 af

Reach P21: Pipe 21 Avg. Flow Depth=0.86' Max Vel=4.38 fps Inflow=4.56 cfs 0.455 af
18.0" Round Pipe n=0.013 L=36.8' S=0.0049 '/' Capacity=7.35 cfs Outflow=4.56 cfs 0.455 af

Reach P22: Pipe 22 Avg. Flow Depth=0.58' Max Vel=7.50 fps Inflow=4.77 cfs 0.465 af
18.0" Round Pipe n=0.013 L=89.6' S=0.0201 '/' Capacity=14.89 cfs Outflow=4.77 cfs 0.465 af

Pond 007: POI 007 Inflow=6.87 cfs 1.635 af
Primary=6.87 cfs 1.635 af

Pond 7D: Detention 7 Peak Elev=320.76' Storage=22,912 cf Inflow=27.15 cfs 1.635 af
Outflow=6.87 cfs 1.635 af

Pond P1: Pipe 1 Peak Elev=325.01' Storage=42 cf Inflow=1.52 cfs 0.076 af
18.0" Round Culvert n=0.013 L=67.2' S=0.0051 '/' Outflow=1.44 cfs 0.076 af

Pond P10: Pipe 10 Peak Elev=320.84' Storage=30 cf Inflow=19.34 cfs 1.028 af
30.0" Round Culvert n=0.013 L=34.6' S=0.0055 '/' Outflow=19.34 cfs 1.028 af

Pond P2: Pipe 2 Peak Elev=324.99' Storage=46 cf Inflow=6.87 cfs 0.387 af
18.0" Round Culvert n=0.013 L=74.0' S=0.0050 '/' Outflow=6.87 cfs 0.387 af

Pond P23: Pipe 23 Peak Elev=320.83' Inflow=6.04 cfs 0.525 af
24.0" Round Culvert n=0.013 L=85.2' S=0.0050 '/' Outflow=6.04 cfs 0.525 af

Pond P3: Pipe 3 Peak Elev=324.33' Storage=43 cf Inflow=12.05 cfs 0.636 af
24.0" Round Culvert n=0.013 L=186.7' S=0.0050 '/' Outflow=12.03 cfs 0.636 af

Pond P4: Pipe 4 Peak Elev=323.54' Storage=45 cf Inflow=13.13 cfs 0.687 af
24.0" Round Culvert n=0.013 L=121.4' S=0.0050 '/' Outflow=13.01 cfs 0.687 af

Pond P5: Pipe 5 Peak Elev=322.82' Storage=35 cf Inflow=0.84 cfs 0.038 af
18.0" Round Culvert n=0.013 L=56.3' S=0.0050 '/' Outflow=0.77 cfs 0.038 af

Pond P6: Pipe 6 Peak Elev=322.81' Storage=40 cf Inflow=1.19 cfs 0.059 af
18.0" Round Culvert n=0.013 L=61.9' S=0.0050 '/' Outflow=1.12 cfs 0.059 af

Pond P7: Pipe 7 Peak Elev=322.80' Storage=45 cf Inflow=17.87 cfs 0.952 af
24.0" Round Culvert n=0.013 L=96.4' S=0.0050 '/' Outflow=17.84 cfs 0.952 af

Pond P8: Pipe 8 Peak Elev=321.43' Storage=26 cf Inflow=0.71 cfs 0.035 af
18.0" Round Culvert n=0.013 L=123.6' S=0.0050 '/' Outflow=0.68 cfs 0.035 af

Pond P9: Pipe 9 Peak Elev=321.42' Storage=35 cf Inflow=19.38 cfs 1.028 af
30.0" Round Culvert n=0.013 L=33.6' S=0.0051 '/' Outflow=19.34 cfs 1.028 af

Total Runoff Area = 9.375 ac Runoff Volume = 1.635 af Average Runoff Depth = 2.09"
76.43% Pervious = 7.165 ac 23.57% Impervious = 2.210 ac

Summary for Subcatchment 1: Subcat 1

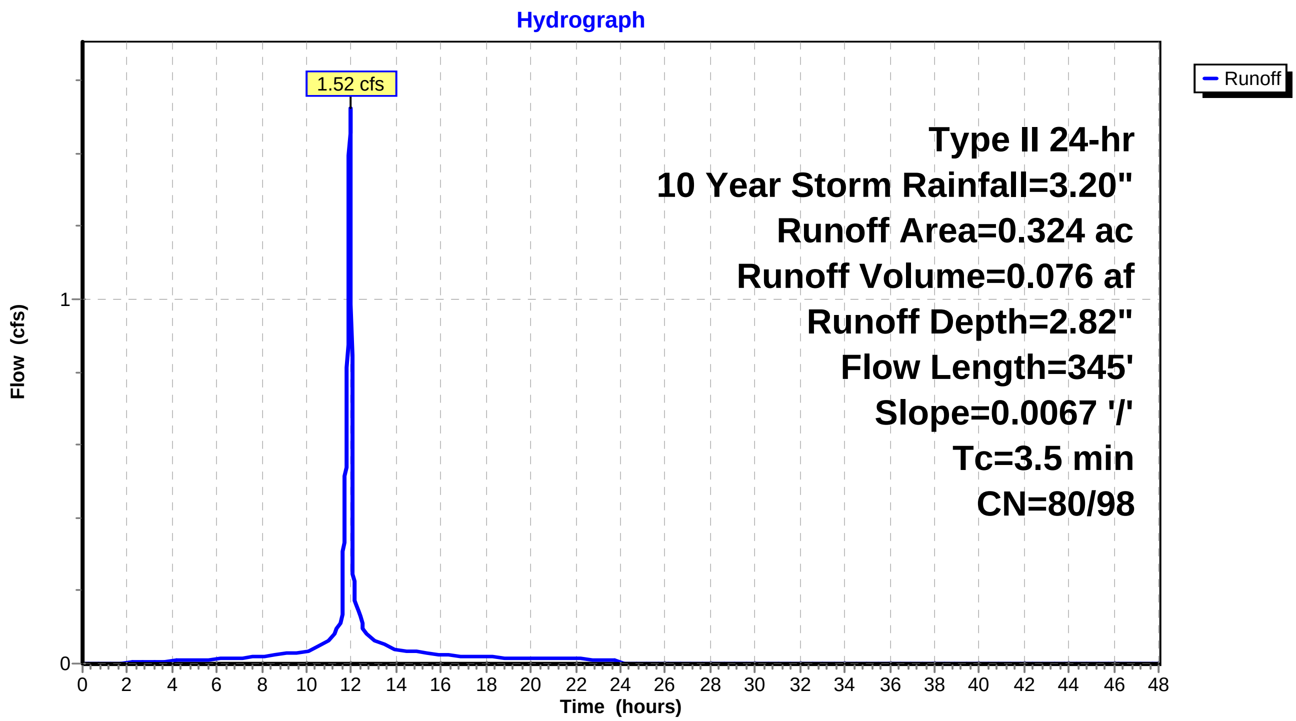
Runoff = 1.52 cfs @ 11.94 hrs, Volume= 0.076 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.294	98	Paved roads w/curbs & sewers, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.324	96	Weighted Average
0.030		9.26% Pervious Area
0.294		90.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	345	0.0067	1.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

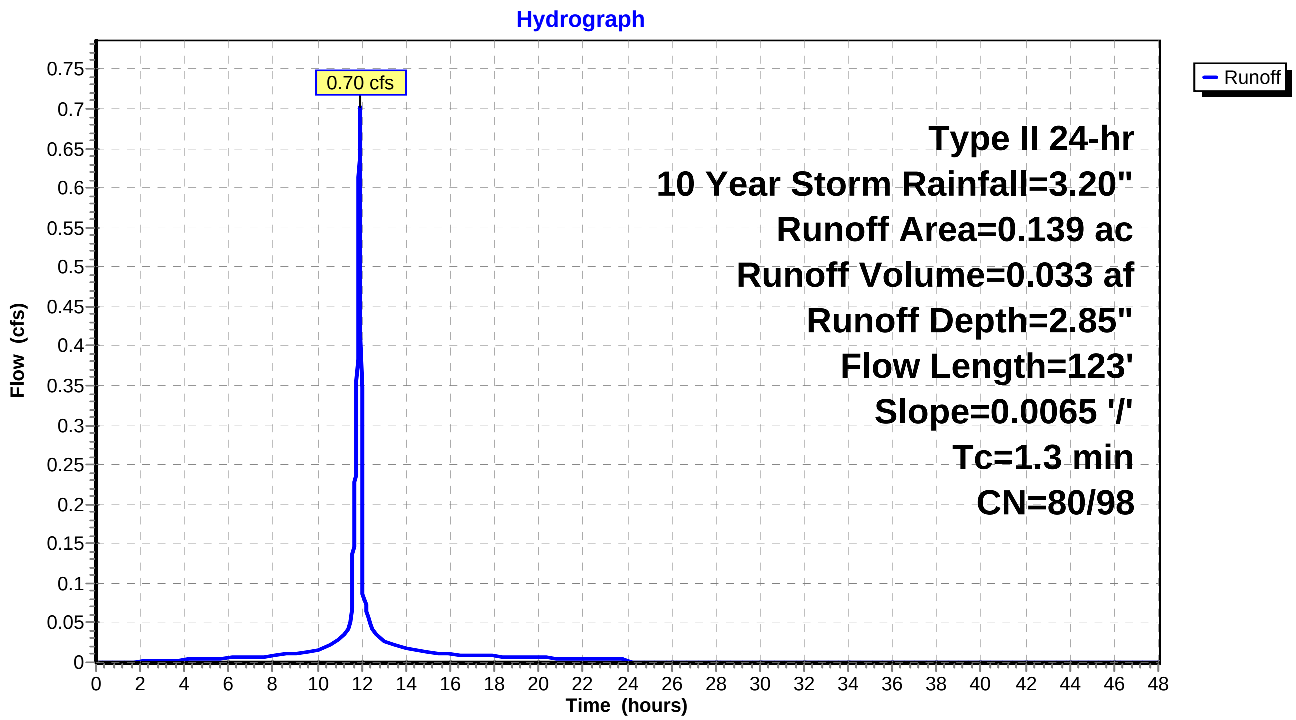
Runoff = 0.70 cfs @ 11.91 hrs, Volume= 0.033 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.089	98	Paved roads w/curbs & sewers, HSG D
0.040	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.139	97	Weighted Average
0.010		7.19% Pervious Area
0.129		92.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	123	0.0065	1.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

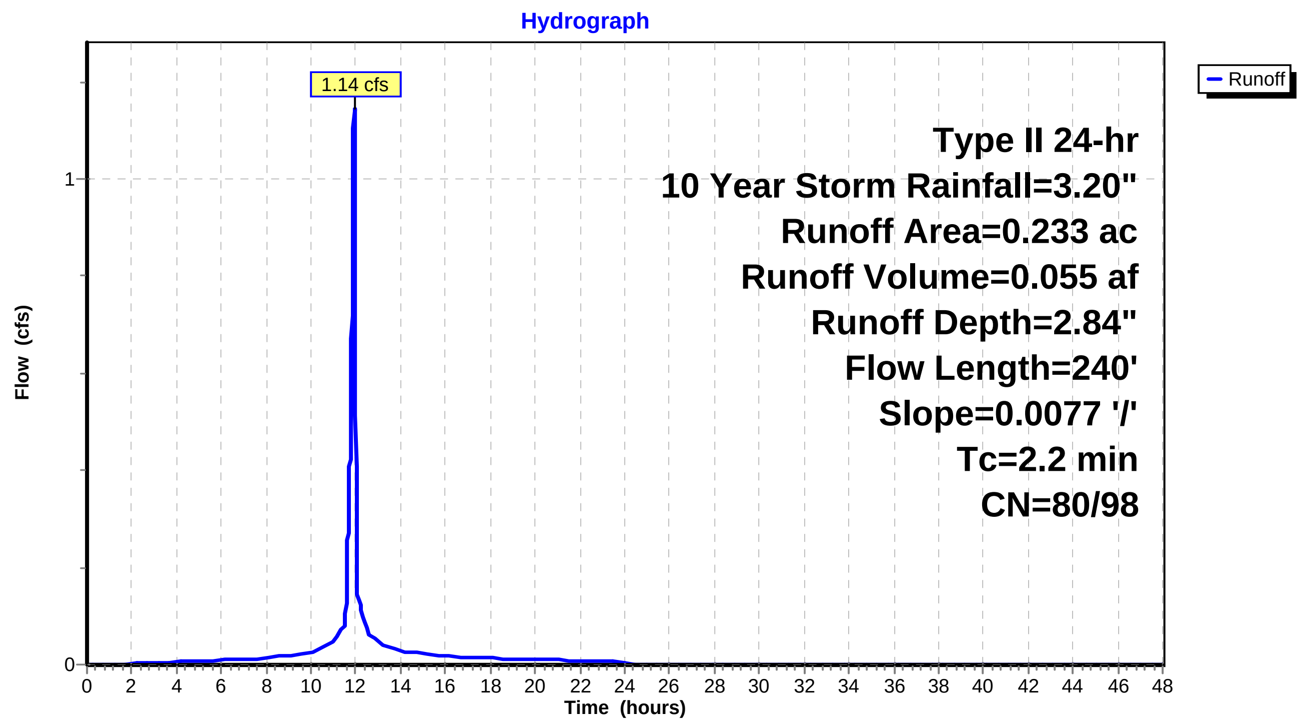
Runoff = 1.14 cfs @ 11.92 hrs, Volume= 0.055 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.201	98	Paved roads w/curbs & sewers, HSG D
0.013	98	Paved roads w/curbs & sewers, HSG D
0.011	80	>75% Grass cover, Good, HSG D
0.008	80	>75% Grass cover, Good, HSG D
0.233	97	Weighted Average
0.019		8.15% Pervious Area
0.214		91.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	240	0.0077	1.78		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Pipe 4

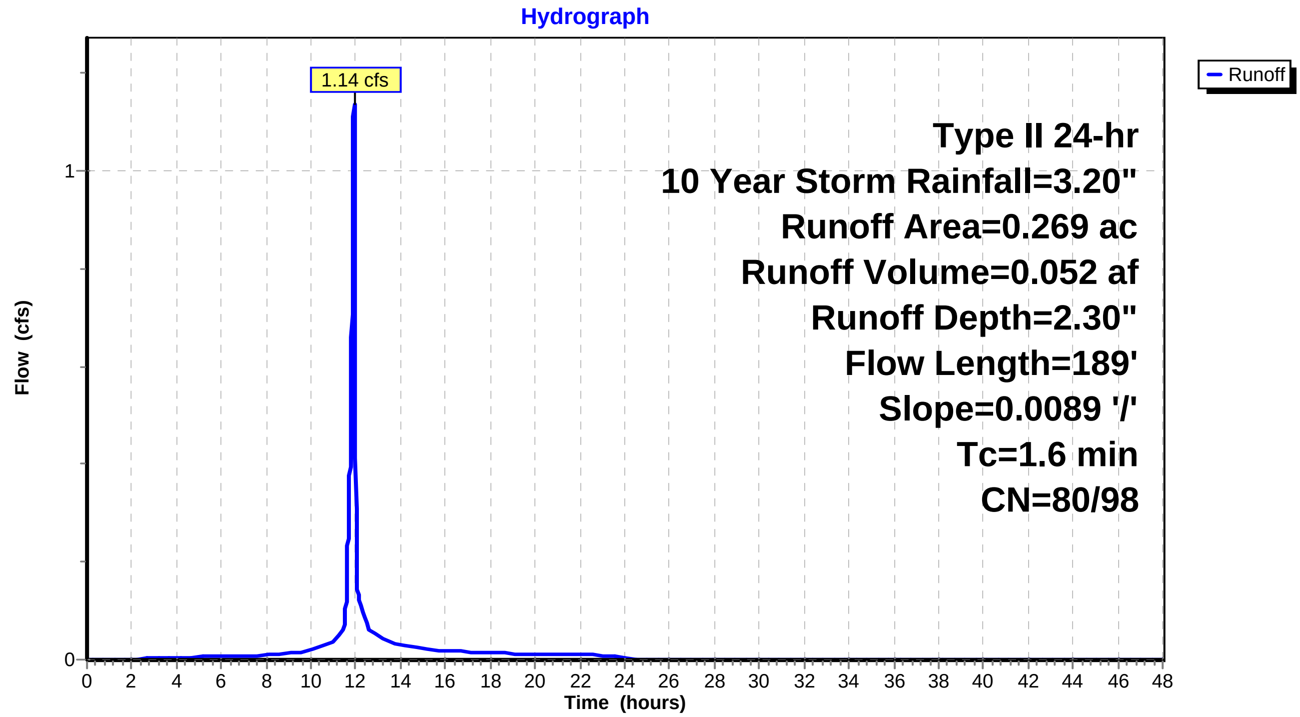
Runoff = 1.14 cfs @ 11.92 hrs, Volume= 0.052 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.128	98	Paved roads w/curbs & sewers, HSG D
0.026	98	Paved roads w/curbs & sewers, HSG D
0.010	80	>75% Grass cover, Good, HSG D
0.105	80	>75% Grass cover, Good, HSG D
0.269	90	Weighted Average
0.115		42.75% Pervious Area
0.154		57.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	189	0.0089	1.92		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 4: Pipe 4



Summary for Subcatchment 5: Subcat 5

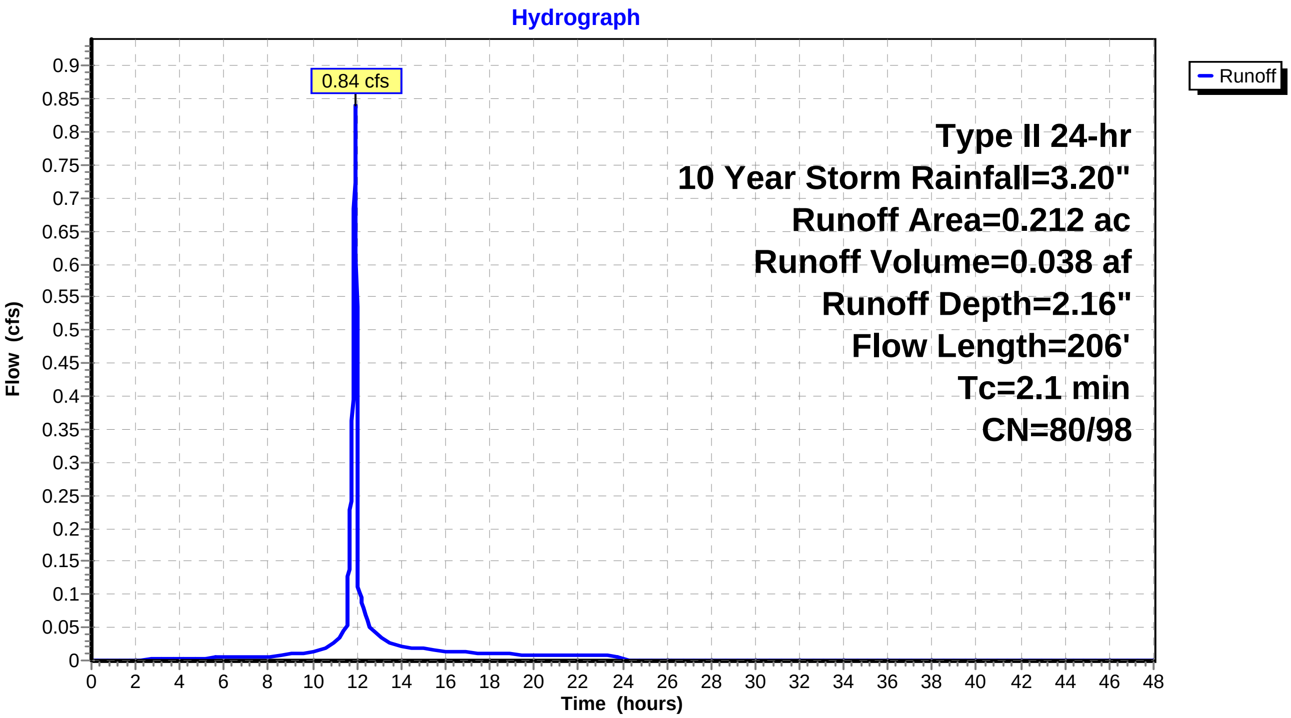
Runoff = 0.84 cfs @ 11.93 hrs, Volume= 0.038 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.102	98	Paved roads w/curbs & sewers, HSG D
0.083	80	>75% Grass cover, Good, HSG D
0.027	80	>75% Grass cover, Good, HSG D
0.212	89	Weighted Average
0.110		51.89% Pervious Area
0.102		48.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.0	194	0.0554	1.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	206	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

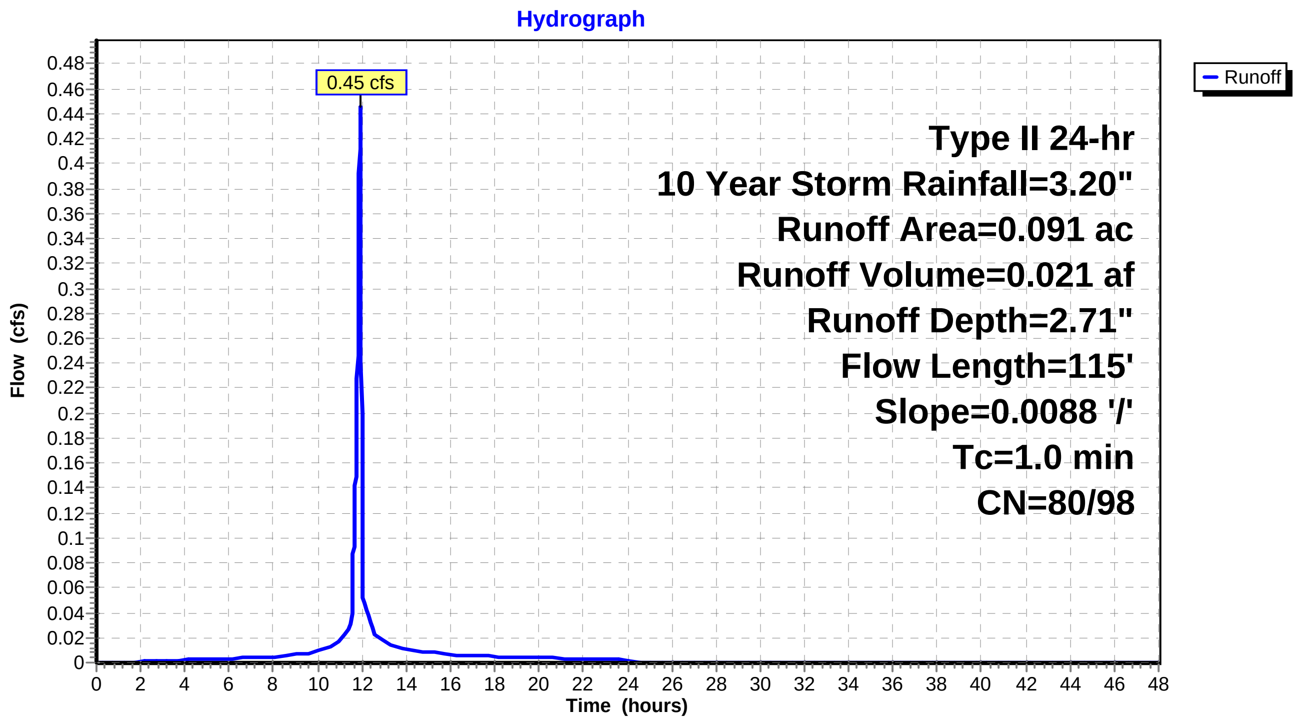
Runoff = 0.45 cfs @ 11.91 hrs, Volume= 0.021 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.072	98	Paved roads w/curbs & sewers, HSG D
0.004	98	Paved roads w/curbs & sewers, HSG D
0.009	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.091	95	Weighted Average
0.015		16.48% Pervious Area
0.076		83.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	115	0.0088	1.90		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

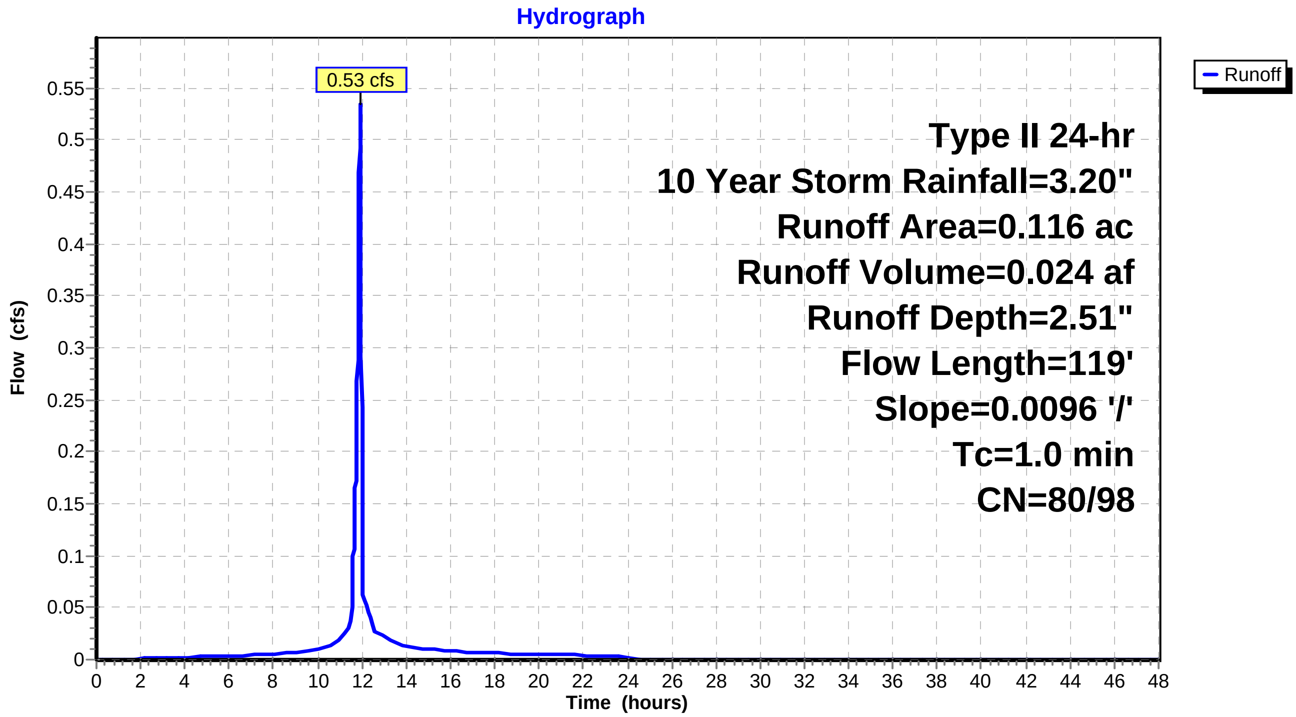
Runoff = 0.53 cfs @ 11.91 hrs, Volume= 0.024 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.070	98	Paved roads w/curbs & sewers, HSG D
0.012	98	Paved roads w/curbs & sewers, HSG D
0.005	80	>75% Grass cover, Good, HSG D
0.029	80	>75% Grass cover, Good, HSG D
0.116	93	Weighted Average
0.034		29.31% Pervious Area
0.082		70.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	119	0.0096	1.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

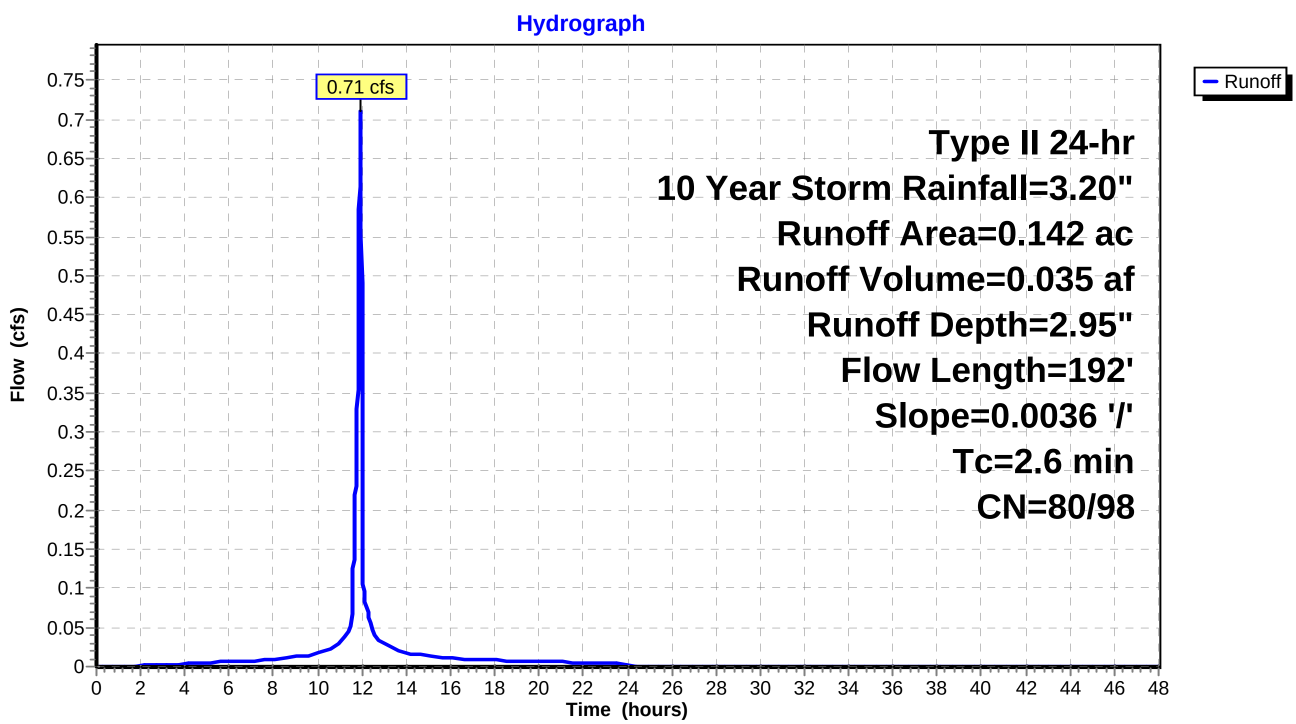
Runoff = 0.71 cfs @ 11.93 hrs, Volume= 0.035 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.129	98	Paved roads w/curbs & sewers, HSG D
0.011	98	Paved roads w/curbs & sewers, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.142	98	Weighted Average
0.002		1.41% Pervious Area
0.140		98.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	192	0.0036	1.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

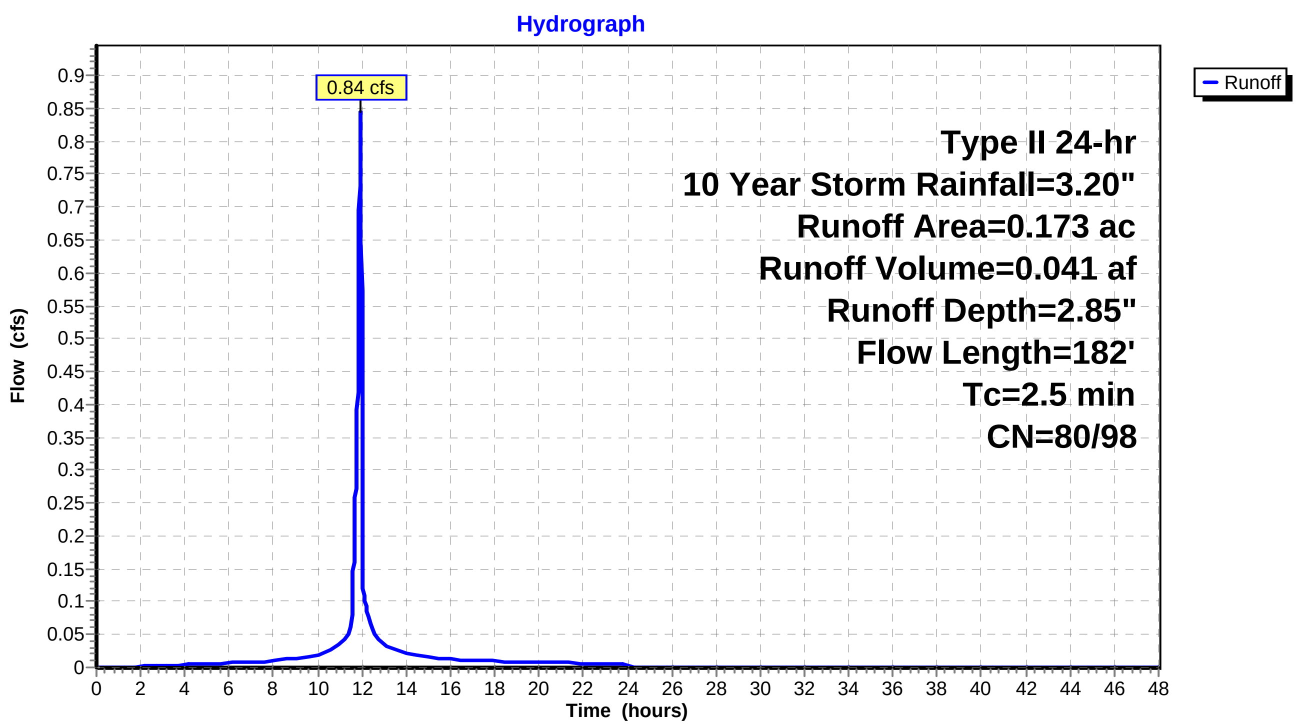
Runoff = 0.84 cfs @ 11.93 hrs, Volume= 0.041 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.160	98	Paved roads w/curbs & sewers, HSG D
0.013	80	>75% Grass cover, Good, HSG D
0.173	97	Weighted Average
0.013		7.51% Pervious Area
0.160		92.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	73	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	109	0.0039	1.27		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	182	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 11: Subcat 11

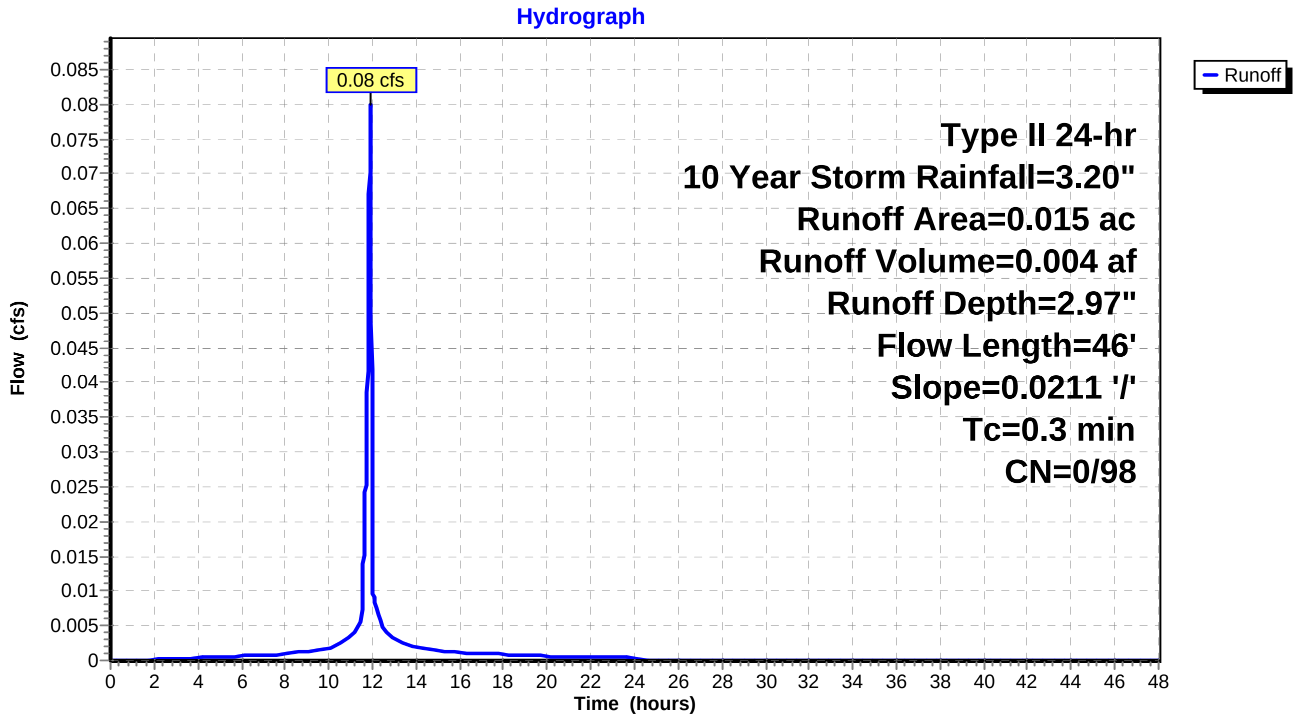
Runoff = 0.08 cfs @ 11.90 hrs, Volume= 0.004 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.015	98	Paved roads w/curbs & sewers, HSG D
0.015		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	46	0.0211	2.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 11: Subcat 11



Summary for Subcatchment 12: Subcat 12

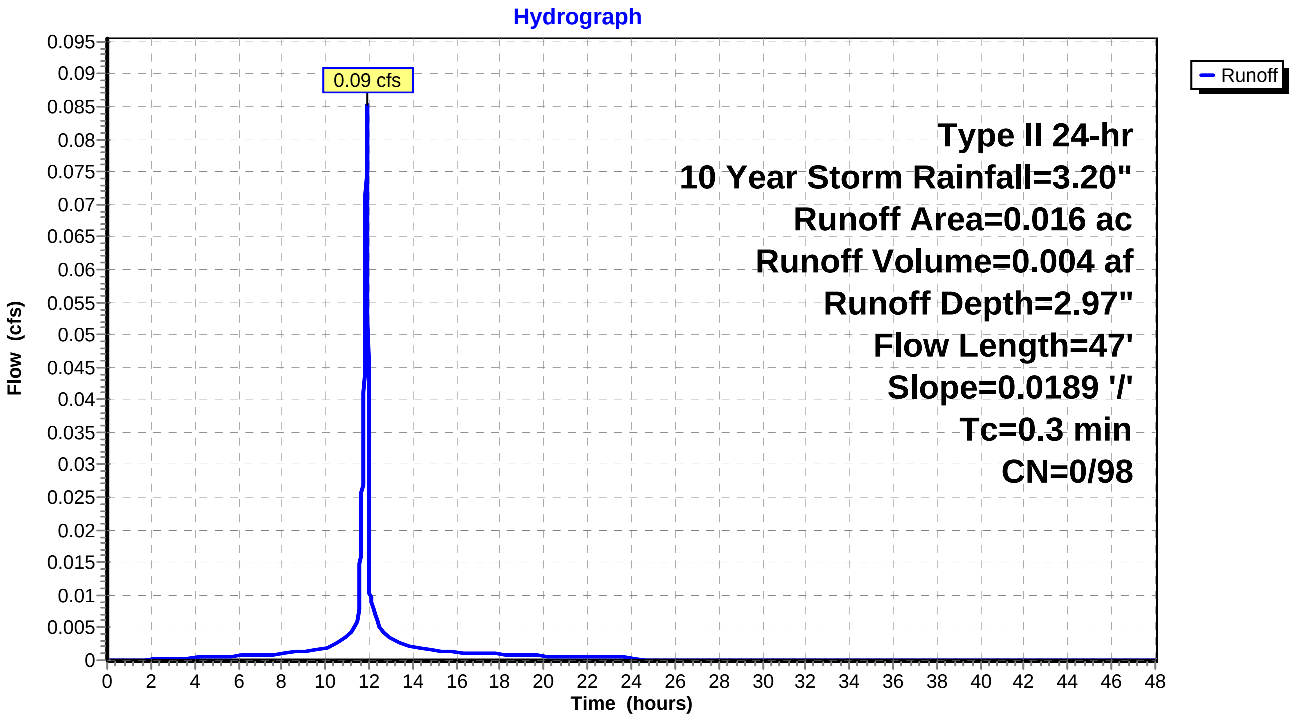
Runoff = 0.09 cfs @ 11.90 hrs, Volume= 0.004 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.016	98	Paved roads w/curbs & sewers, HSG D
0.016		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	47	0.0189	2.79		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 12: Subcat 12



Summary for Subcatchment 13: Subcat 13

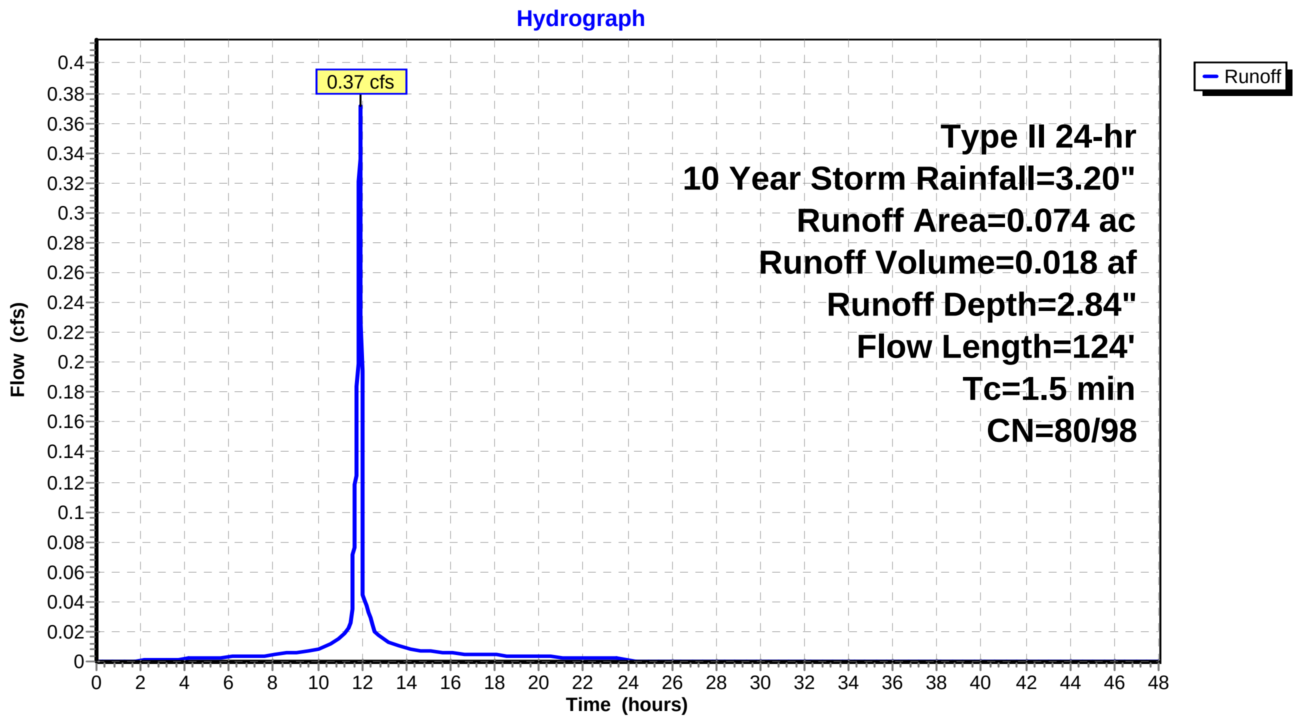
Runoff = 0.37 cfs @ 11.92 hrs, Volume= 0.018 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.060	98	Paved roads w/curbs & sewers, HSG D
0.008	98	Paved roads w/curbs & sewers, HSG D
0.006	80	>75% Grass cover, Good, HSG D
0.074	97	Weighted Average
0.006		8.11% Pervious Area
0.068		91.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0065	1.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	54	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	62	0.0329	3.68		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	124	Total			

Subcatchment 13: Subcat 13



Summary for Subcatchment 14: Subcat 14

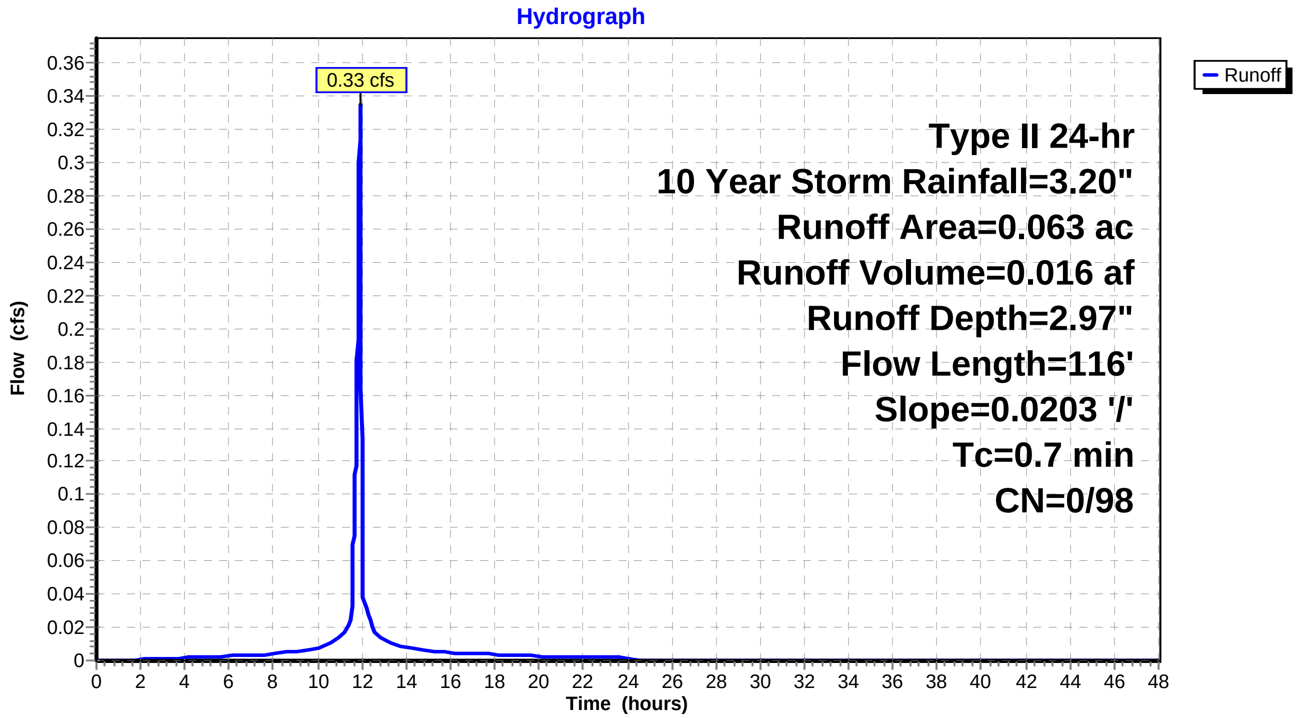
Runoff = 0.33 cfs @ 11.91 hrs, Volume= 0.016 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.063	98	Paved roads w/curbs & sewers, HSG D
0.063		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	116	0.0203	2.89		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 14: Subcat 14



Summary for Subcatchment 15: Subcat 15

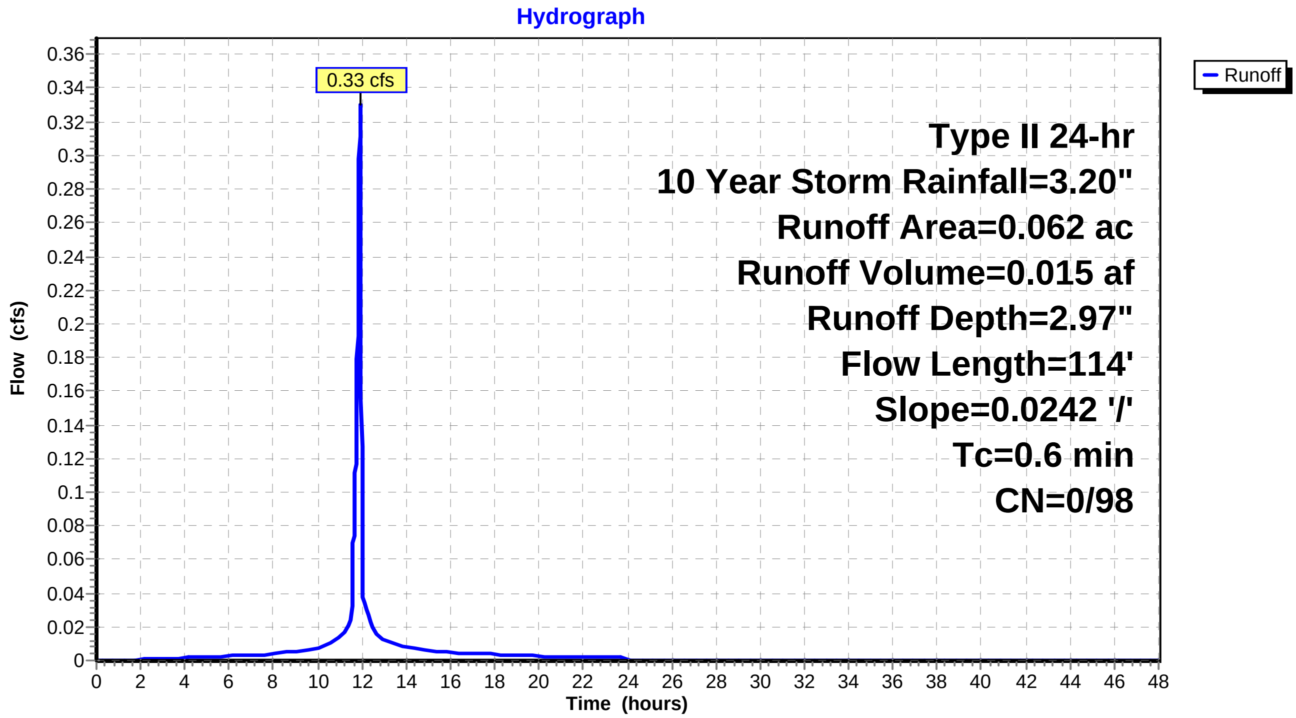
Runoff = 0.33 cfs @ 11.91 hrs, Volume= 0.015 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.062	98	Paved roads w/curbs & sewers, HSG D
0.062		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	114	0.0242	3.16		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 15: Subcat 15



Summary for Subcatchment 16: Subcat 16

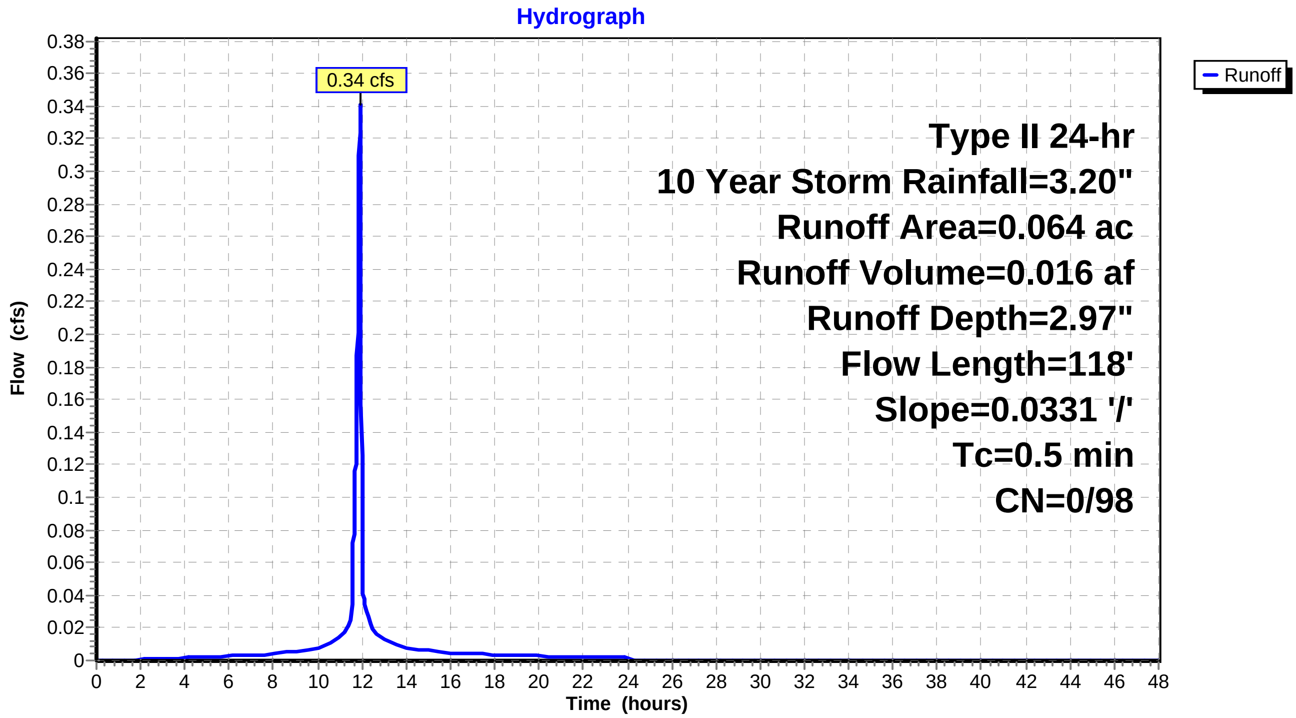
Runoff = 0.34 cfs @ 11.91 hrs, Volume= 0.016 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.064	98	Paved roads w/curbs & sewers, HSG D
0.064		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	118	0.0331	3.69		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 16: Subcat 16



Summary for Subcatchment 18: Subcat 18

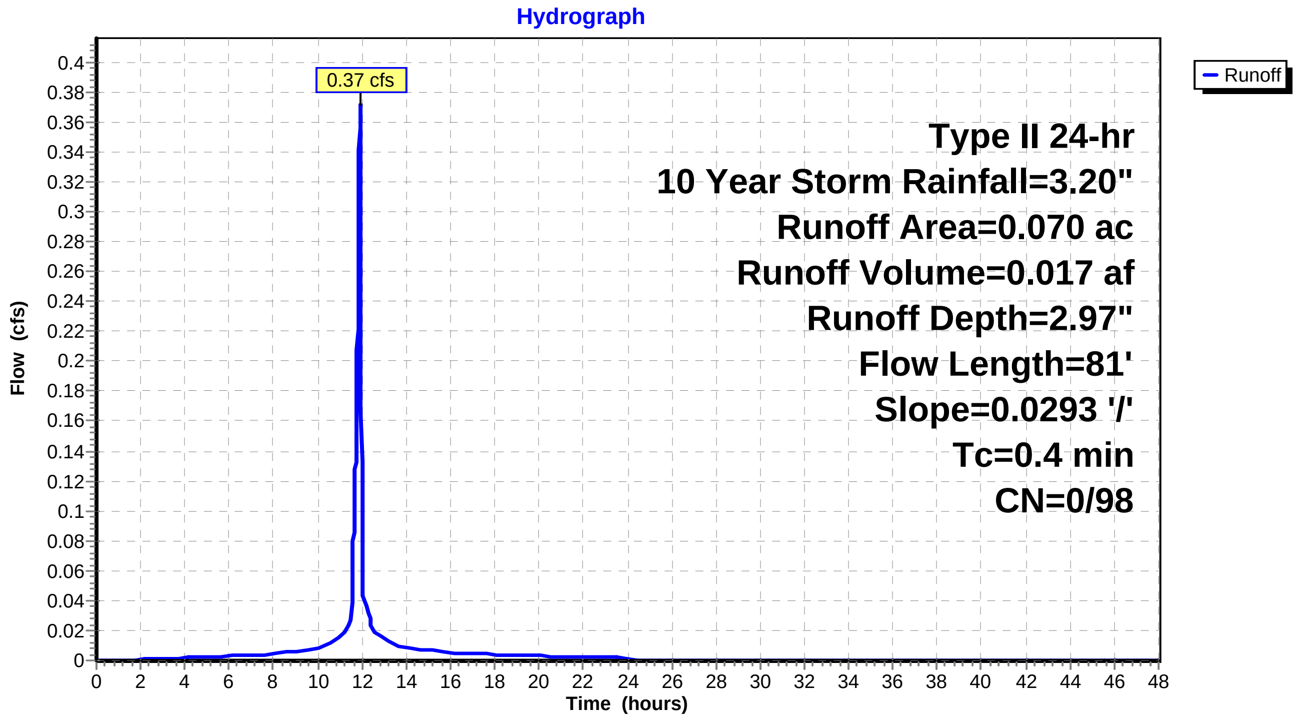
Runoff = 0.37 cfs @ 11.90 hrs, Volume= 0.017 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.070	98	Paved roads w/curbs & sewers, HSG D
0.070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	81	0.0293	3.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 18: Subcat 18



Summary for Subcatchment 19: Subcat 19

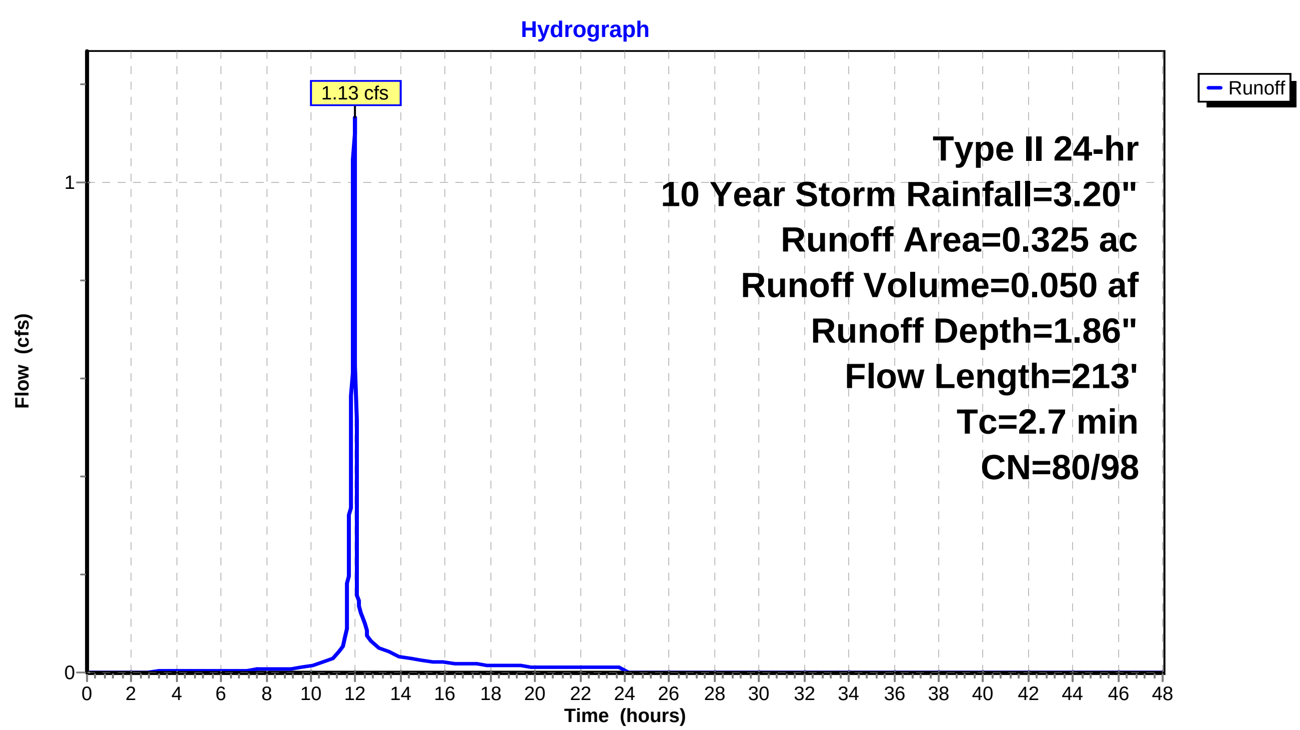
Runoff = 1.13 cfs @ 11.93 hrs, Volume= 0.050 af, Depth= 1.86"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.044	98	Paved roads w/curbs & sewers, HSG D
0.052	98	Paved roads w/curbs & sewers, HSG D
0.214	80	>75% Grass cover, Good, HSG D
0.015	80	>75% Grass cover, Good, HSG D
0.325	85	Weighted Average
0.229		70.46% Pervious Area
0.096		29.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	198	0.0321	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	213	Total			

Subcatchment 19: Subcat 19



Summary for Subcatchment 20: Subcat 20

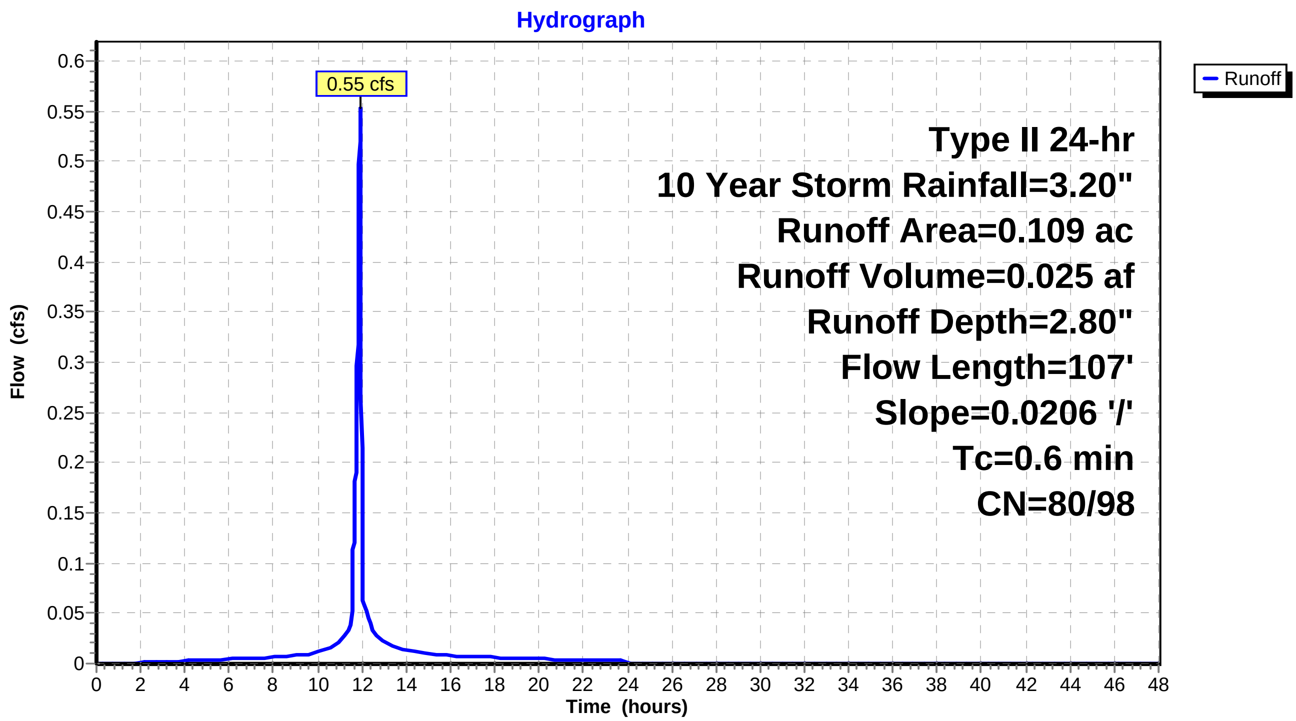
Runoff = 0.55 cfs @ 11.91 hrs, Volume= 0.025 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.097	98	Paved roads w/curbs & sewers, HSG D
0.012	80	>75% Grass cover, Good, HSG D
0.109	96	Weighted Average
0.012		11.01% Pervious Area
0.097		88.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	107	0.0206	2.91		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 20: Subcat 20



Summary for Subcatchment 21: Subcat 21

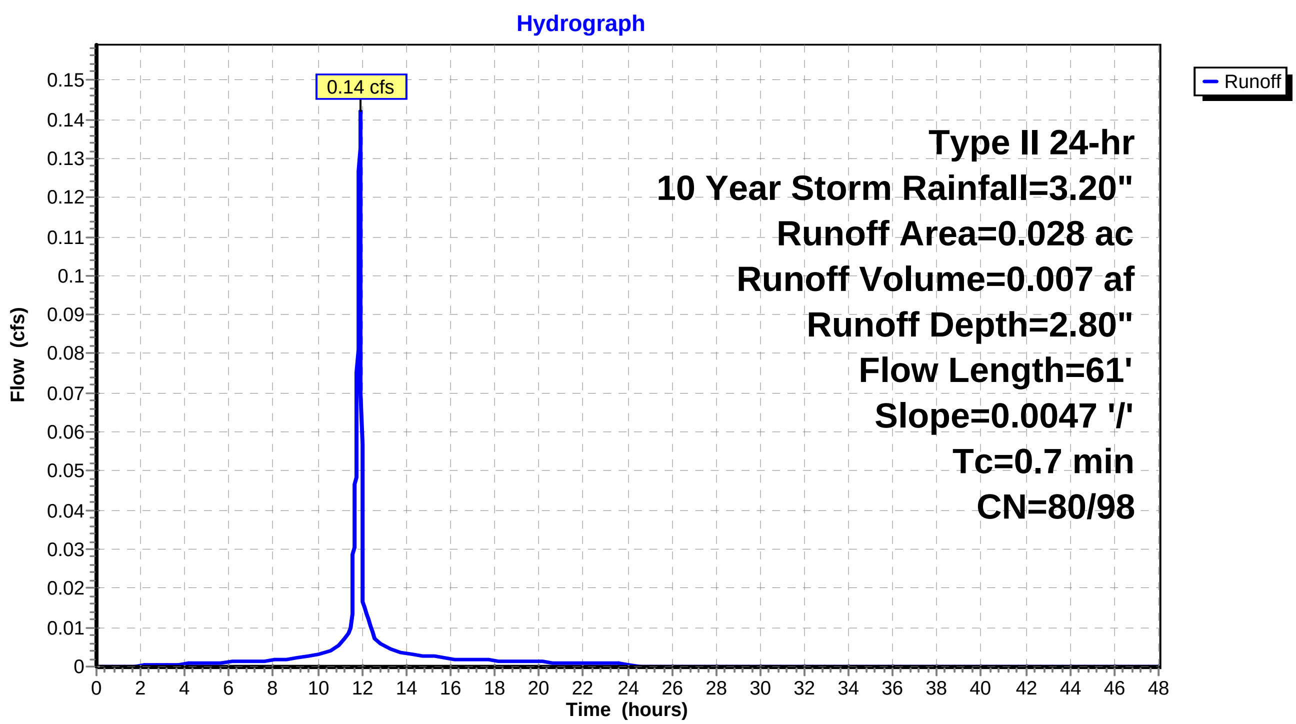
Runoff = 0.14 cfs @ 11.91 hrs, Volume= 0.007 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.023	98	Paved roads w/curbs & sewers, HSG D
0.002	98	Paved roads w/curbs & sewers, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.028	96	Weighted Average
0.003		10.71% Pervious Area
0.025		89.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	61	0.0047	1.39		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 21: Subcat 21



Summary for Subcatchment 22: Subcat 22

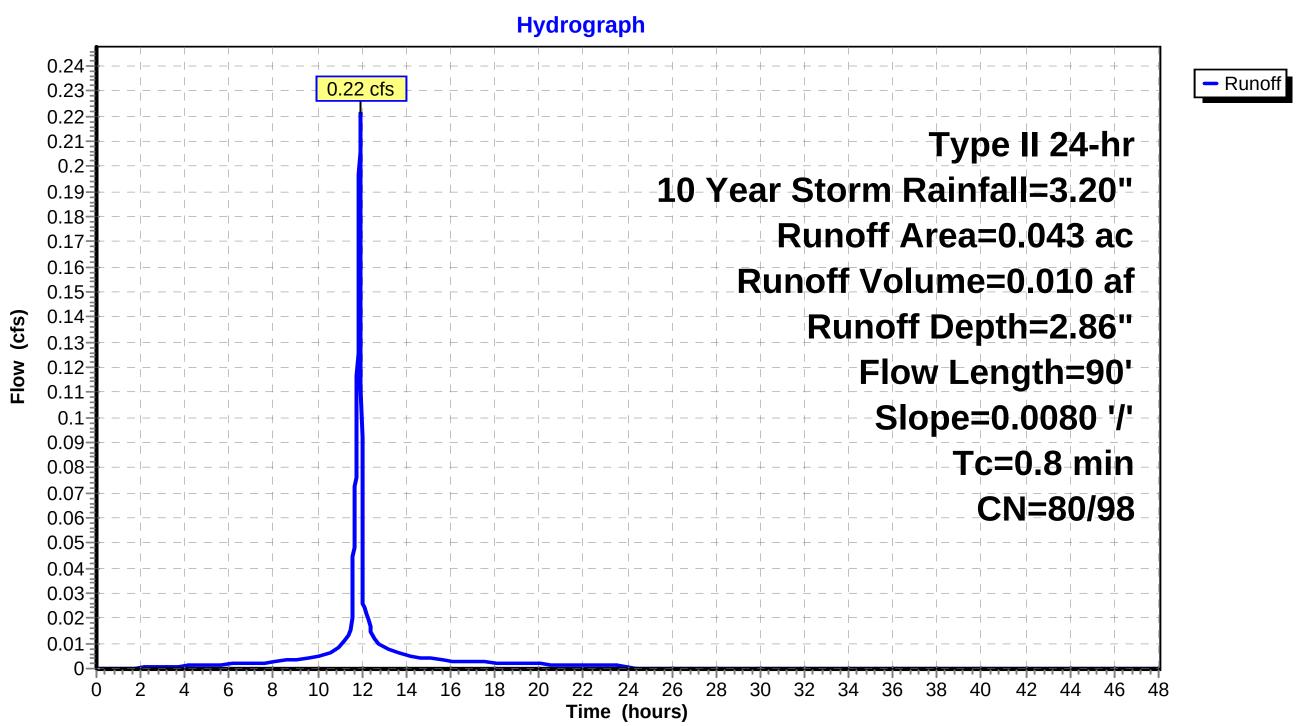
Runoff = 0.22 cfs @ 11.91 hrs, Volume= 0.010 af, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.040	98	Paved roads w/curbs & sewers, HSG D
0.003	80	>75% Grass cover, Good, HSG D
0.043	97	Weighted Average
0.003		6.98% Pervious Area
0.040		93.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	90	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 22: Subcat 22



Summary for Subcatchment 23: Subcat 23

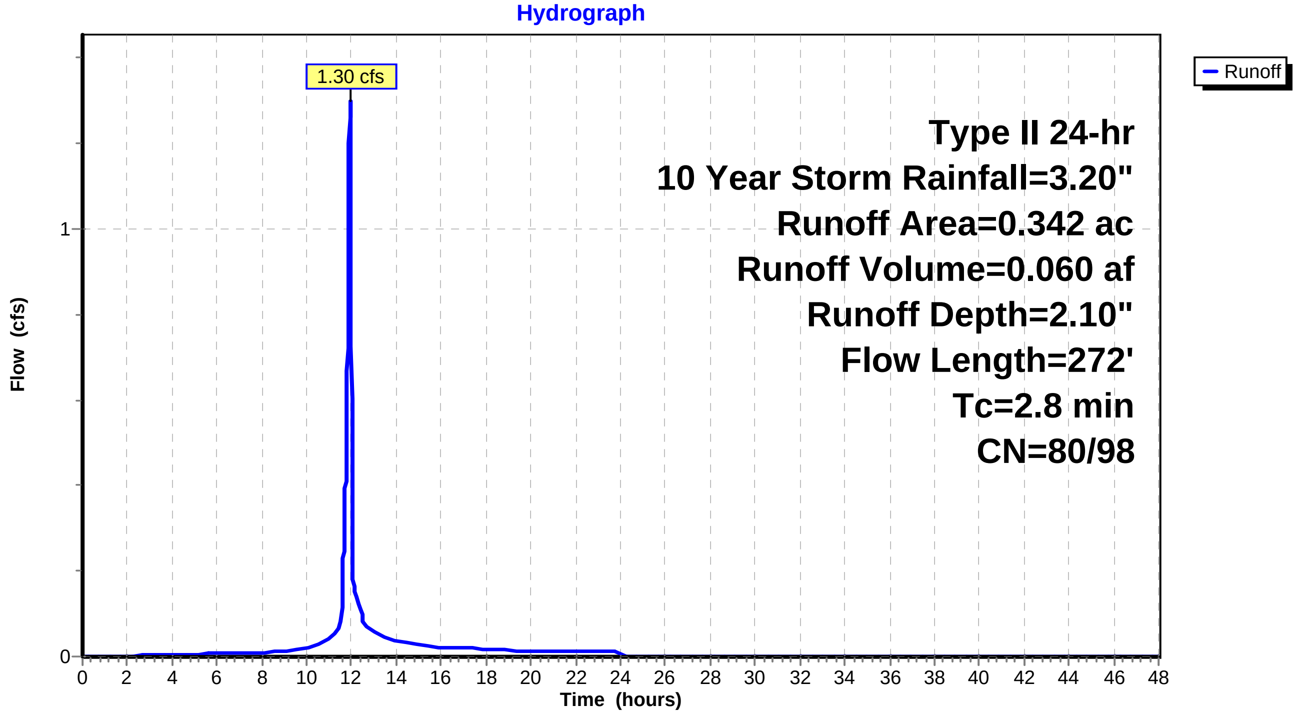
Runoff = 1.30 cfs @ 11.93 hrs, Volume= 0.060 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.064	98	Paved roads w/curbs & sewers, HSG D
0.062	98	Paved roads w/curbs & sewers, HSG D
0.008	80	>75% Grass cover, Good, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.095	80	>75% Grass cover, Good, HSG D
0.067	80	>75% Grass cover, Good, HSG D
0.026	98	Paved roads w/curbs & sewers, HSG D
0.342	88	Weighted Average
0.190		55.56% Pervious Area
0.152		44.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	253	0.0462	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	19	0.0298	10.26	18.13	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.8	272	Total			

Subcatchment 23: Subcat 23



Summary for Subcatchment 58: Subcat 58

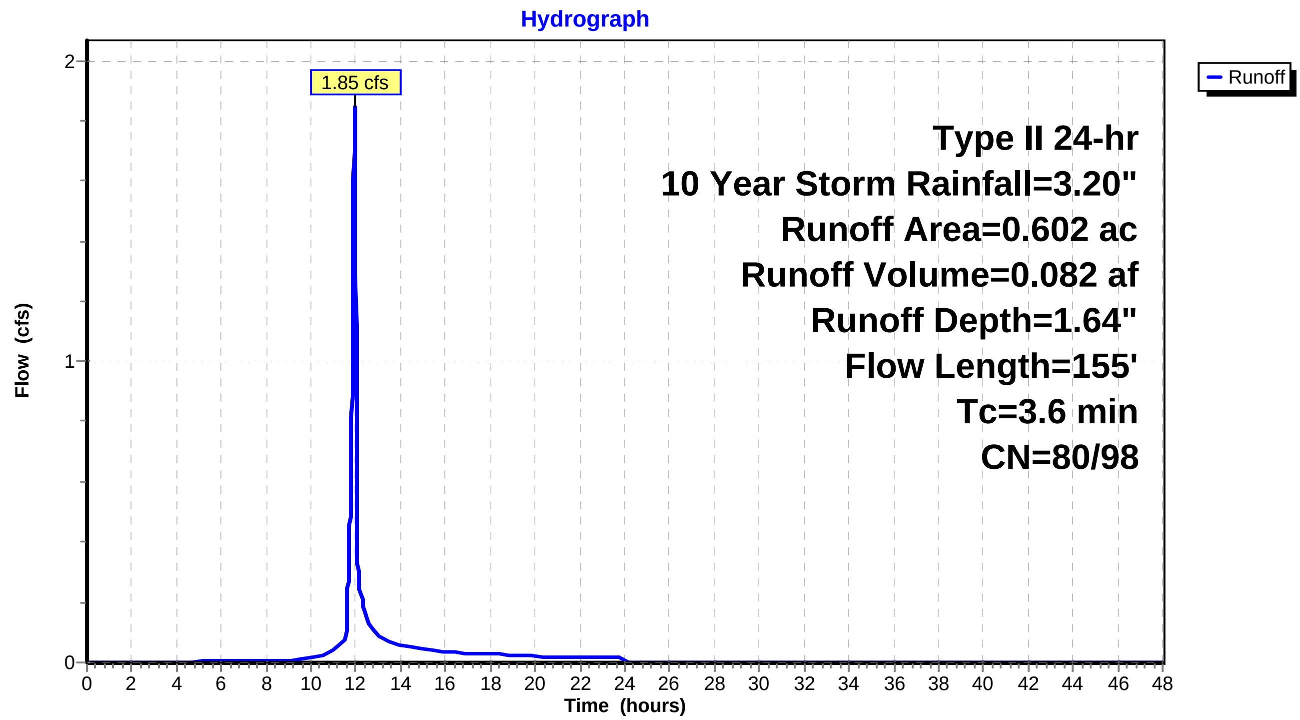
Runoff = 1.85 cfs @ 11.95 hrs, Volume= 0.082 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

Area (ac)	CN	Description
0.091	98	Paved roads w/curbs & sewers, HSG D
0.004	80	>75% Grass cover, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
0.029	80	>75% Grass cover, Good, HSG D
0.374	80	>75% Grass cover, Good, HSG D
0.602	83	Weighted Average
0.511		84.88% Pervious Area
0.091		15.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	97	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0389	4.00		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	40	0.1630	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	155	Total			

Subcatchment 58: Subcat 58



Summary for Subcatchment OS7a: OS7a

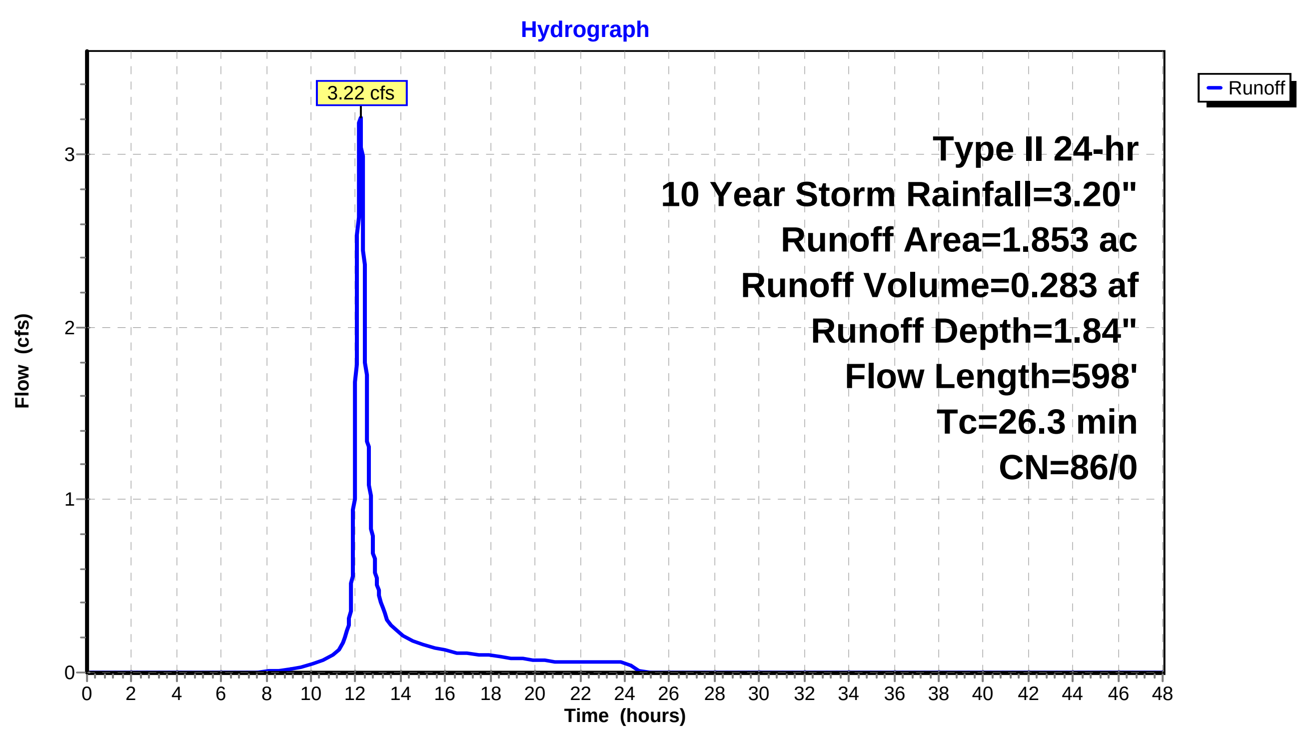
Runoff = 3.22 cfs @ 12.19 hrs, Volume= 0.283 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.853	86	weighted CN
	1.853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	50	0.0132	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.30"
8.5	410	0.0132	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	78	0.0256	9.51	16.81	**Pipe Channel, CMP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	60	0.1455	5.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
26.3	598	Total			

Subcatchment OS7a: OS7a



Summary for Subcatchment OS7b: OS7b

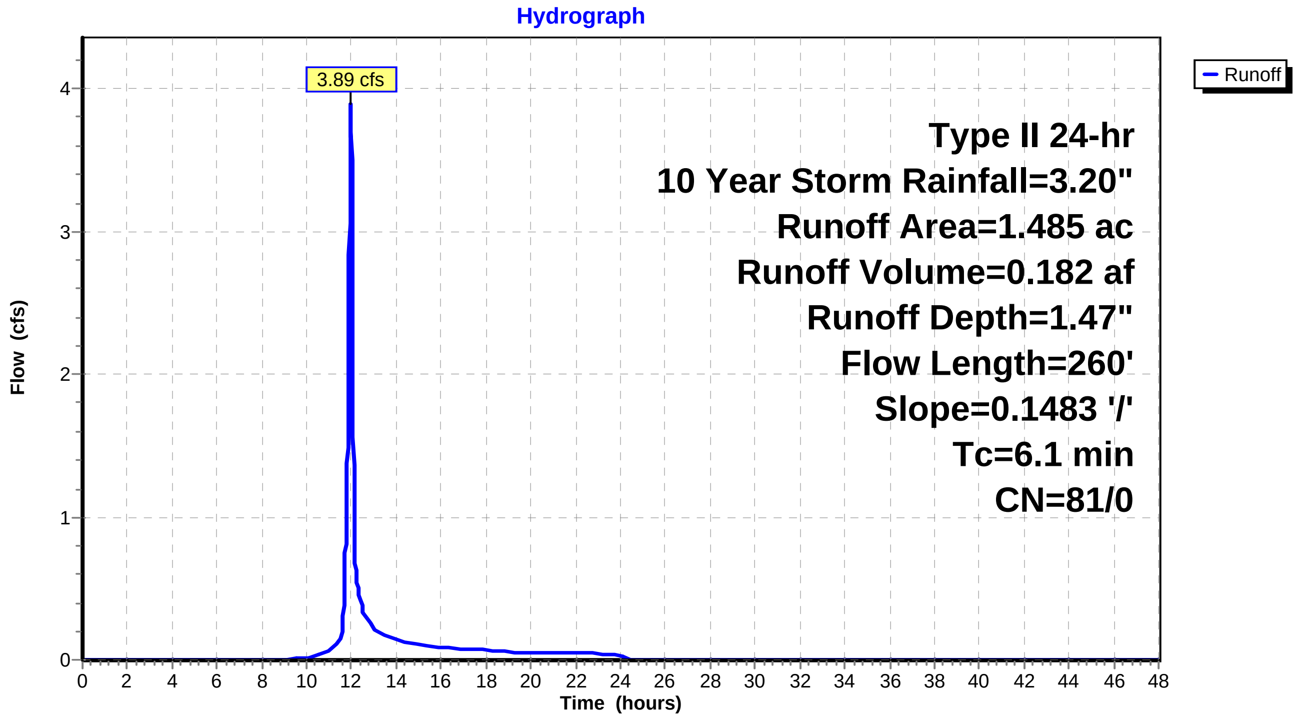
Runoff = 3.89 cfs @ 11.98 hrs, Volume= 0.182 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.485	81	weighted CN
	1.485		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.1483	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.8	210	0.1483	1.93		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.1	260	Total			

Subcatchment OS7b: OS7b



Summary for Subcatchment OS9a: OS9a

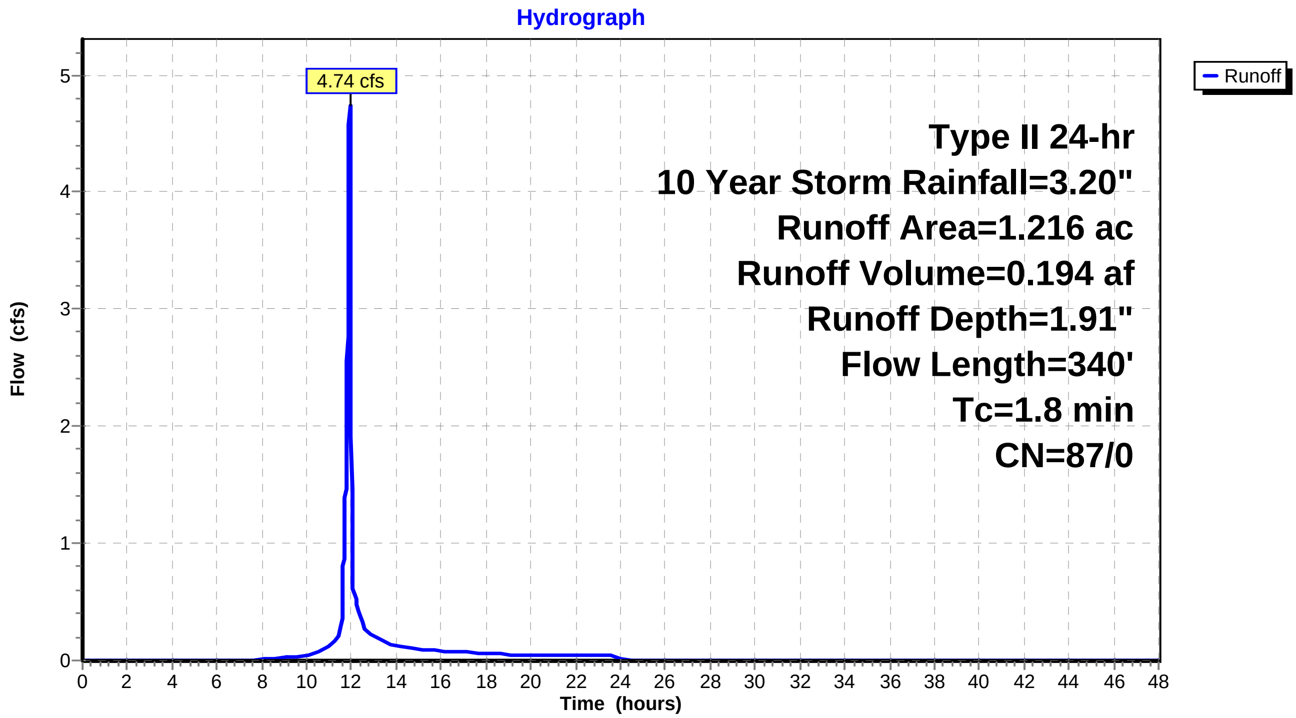
Runoff = 4.74 cfs @ 11.92 hrs, Volume= 0.194 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.216	87	weighted CN
	1.216		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0649	1.63		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.1	30	0.0649	5.17		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	160	0.1290	7.29		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	100	0.0211	2.18		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.8	340	Total			

Subcatchment OS9a: OS9a



Summary for Subcatchment OS9b: OS9b

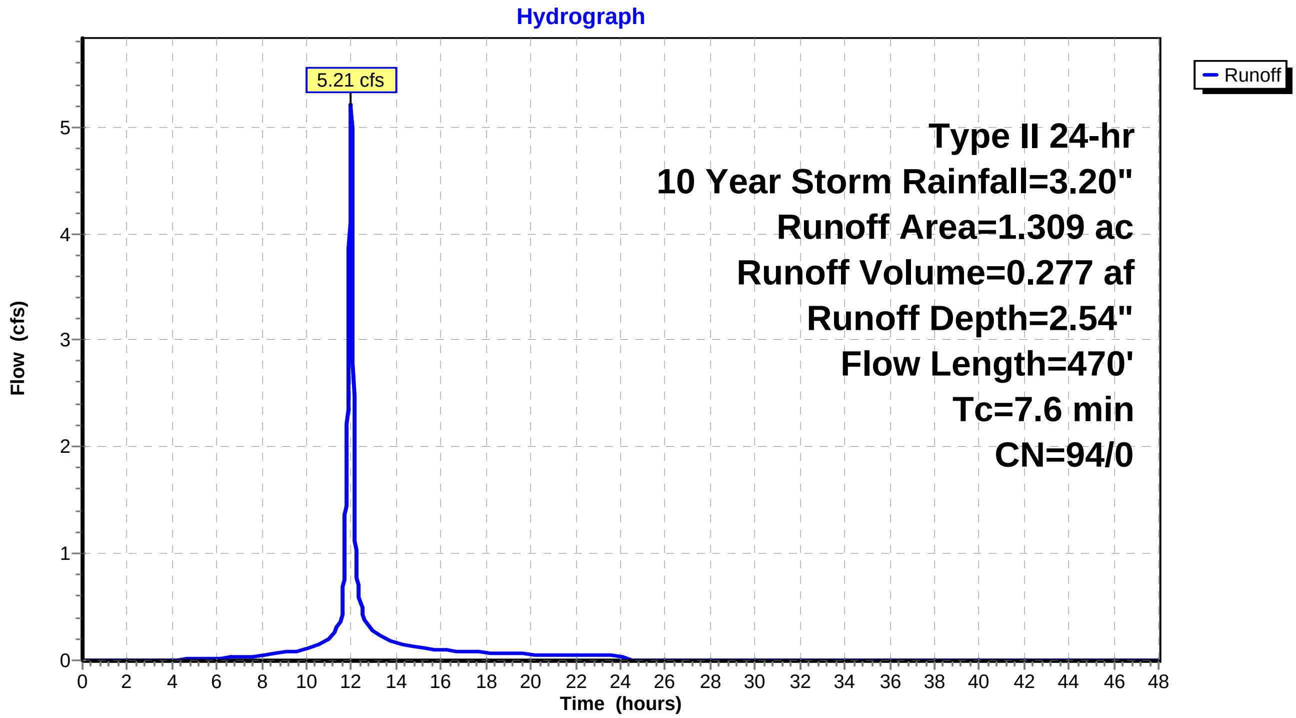
Runoff = 5.21 cfs @ 11.99 hrs, Volume= 0.277 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 Year Storm Rainfall=3.20"

	Area (ac)	CN	Description
*	1.309	94	weighted CN
	1.309		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0606	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.2	20	0.0606	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	400	0.0732	5.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.6	470	Total			

Subcatchment OS9b: OS9b



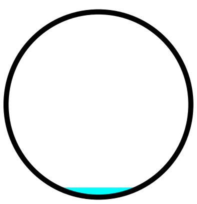
Summary for Reach P11: Pipe 11

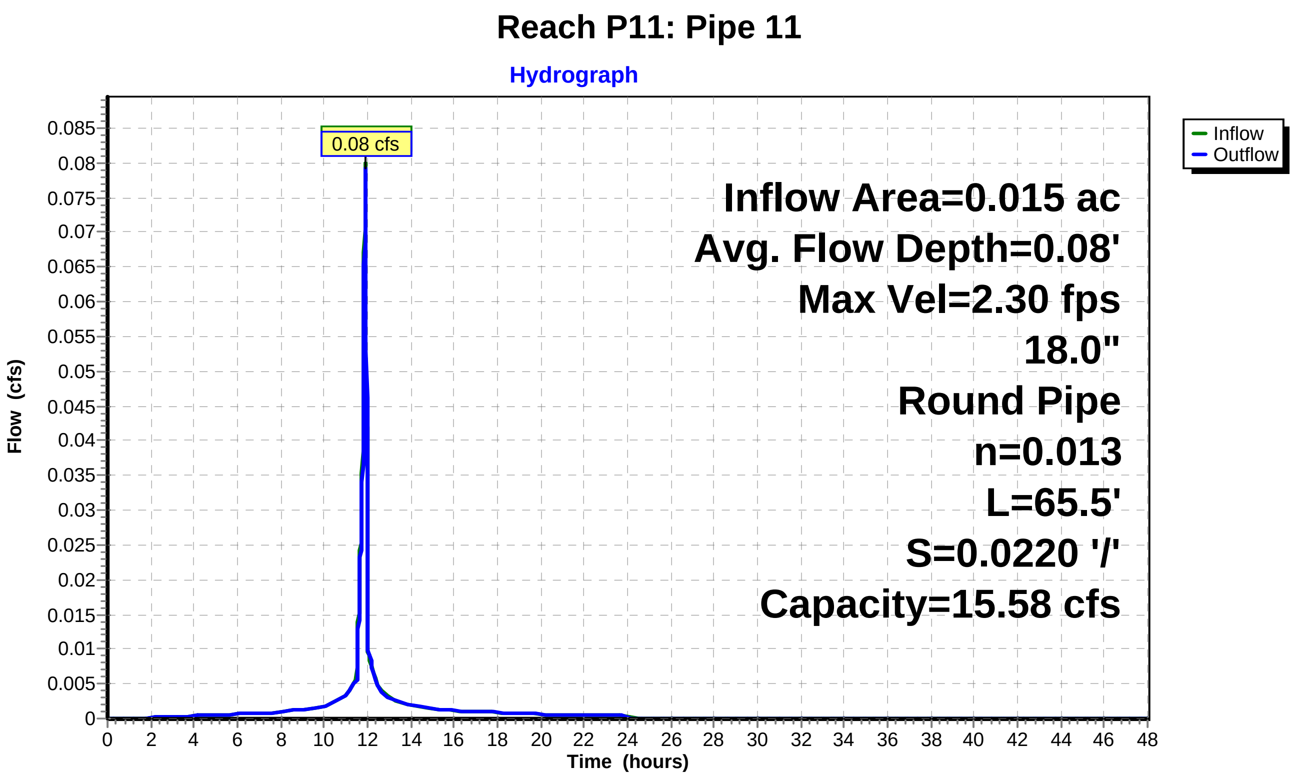
Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth = 2.97" for 10 Year Storm event
Inflow = 0.08 cfs @ 11.90 hrs, Volume= 0.004 af
Outflow = 0.08 cfs @ 11.91 hrs, Volume= 0.004 af, Atten= 1%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.30 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 1.3 min

Peak Storage= 2 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 15.58 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 65.5' Slope= 0.0220 '/'
Inlet Invert= 326.66', Outlet Invert= 325.22'





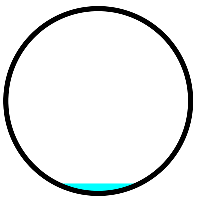
Summary for Reach P12: Pipe 12

Inflow Area = 0.016 ac,100.00% Impervious, Inflow Depth = 2.97" for 10 Year Storm event
Inflow = 0.09 cfs @ 11.90 hrs, Volume= 0.004 af
Outflow = 0.08 cfs @ 11.91 hrs, Volume= 0.004 af, Atten= 1%, Lag= 0.3 min

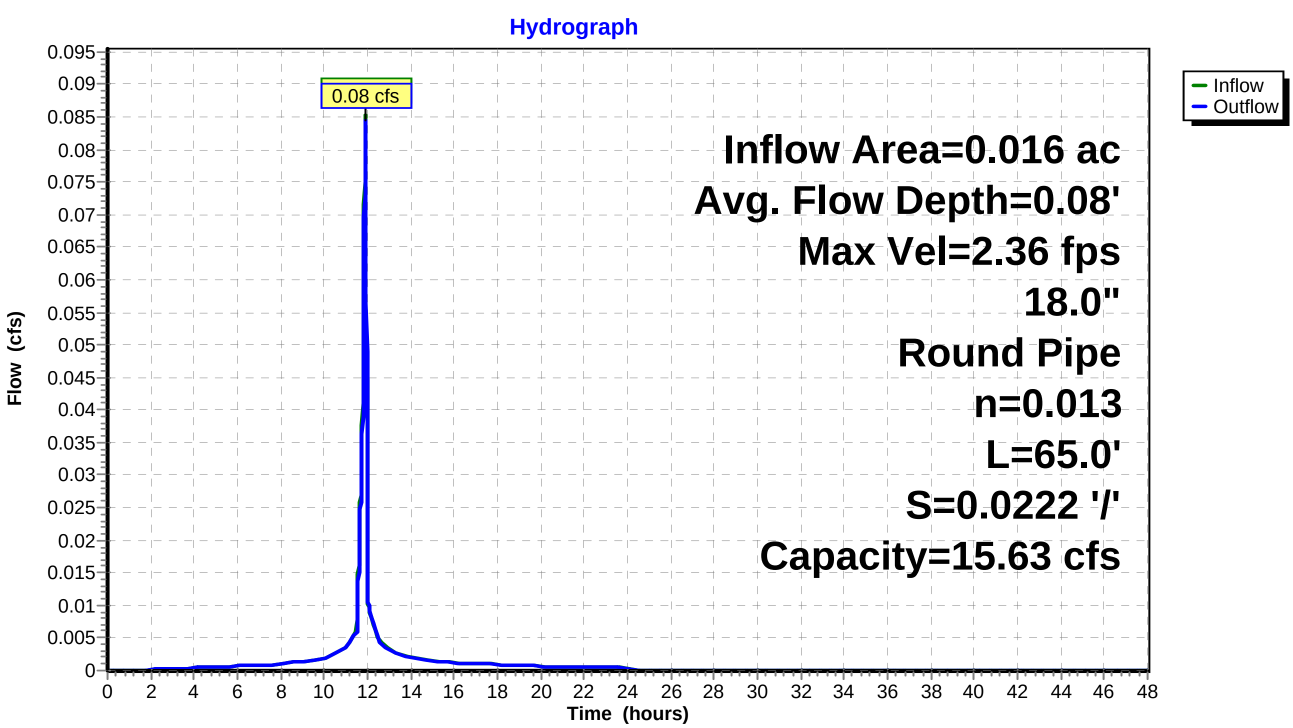
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.36 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 1.3 min

Peak Storage= 2 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 15.63 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 65.0' Slope= 0.0222 '/'
Inlet Invert= 326.66', Outlet Invert= 325.22'



Reach P12: Pipe 12



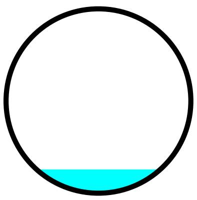
Summary for Reach P13: Pipe 13

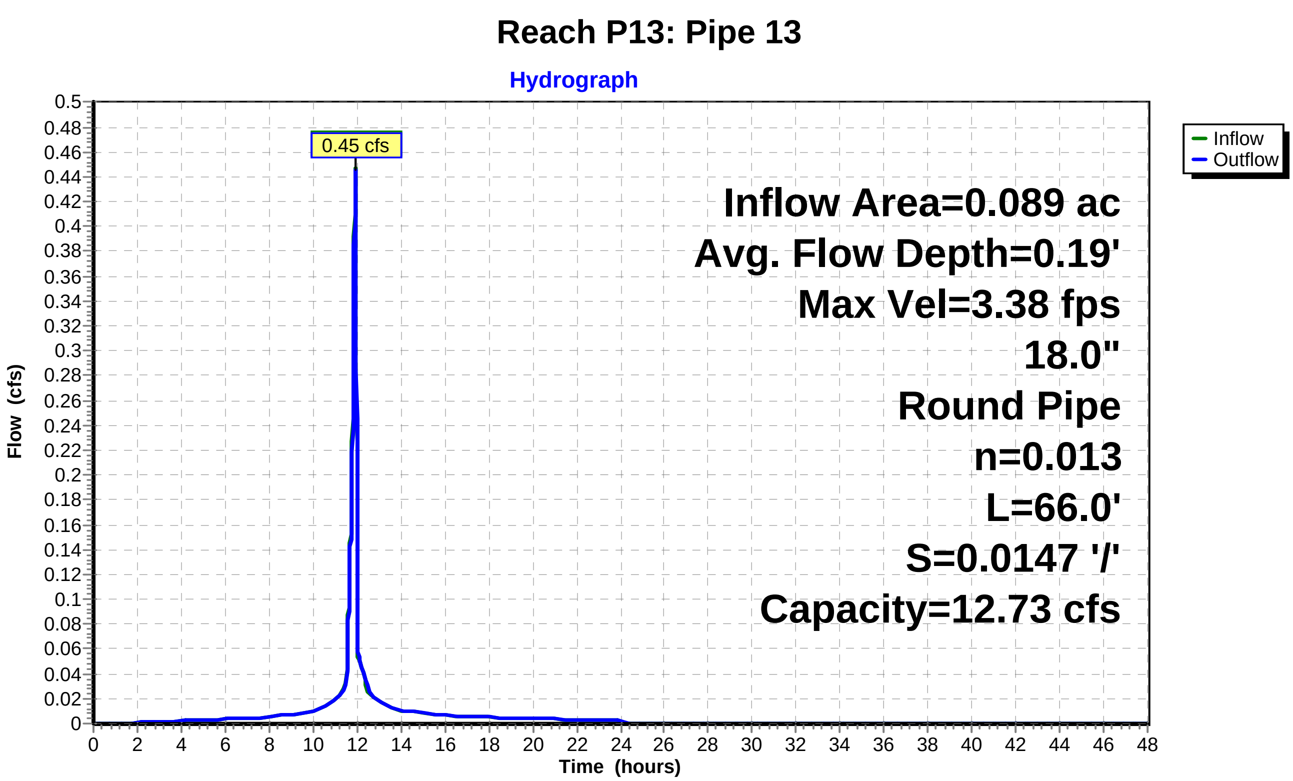
Inflow Area = 0.089 ac, 93.26% Impervious, Inflow Depth = 2.86" for 10 Year Storm event
Inflow = 0.45 cfs @ 11.91 hrs, Volume= 0.021 af
Outflow = 0.45 cfs @ 11.92 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.38 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 1.2 min

Peak Storage= 9 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.73 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 66.0' Slope= 0.0147 '/'
Inlet Invert= 325.12', Outlet Invert= 324.15'





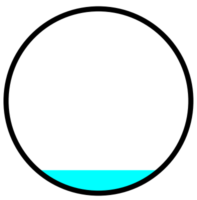
Summary for Reach P14: Pipe 14

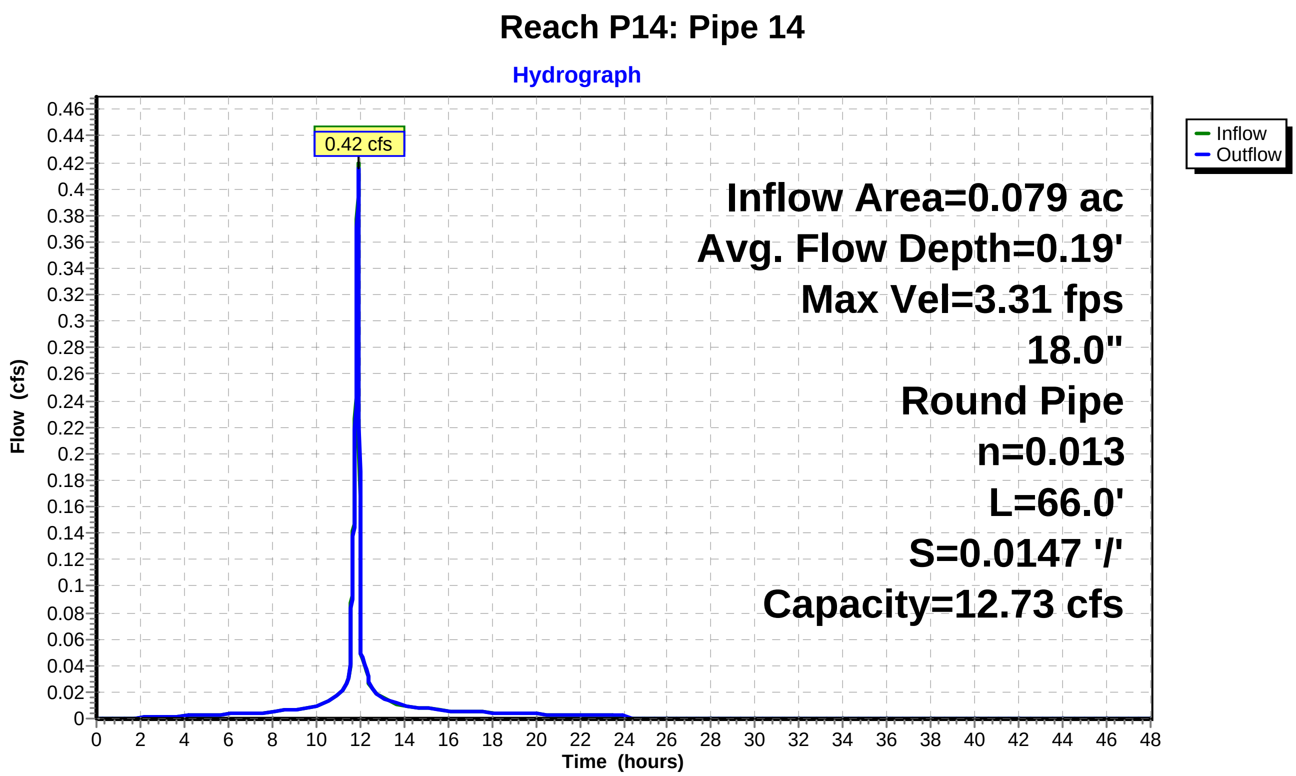
Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth = 2.97" for 10 Year Storm event
Inflow = 0.42 cfs @ 11.91 hrs, Volume= 0.020 af
Outflow = 0.42 cfs @ 11.91 hrs, Volume= 0.020 af, Atten= 1%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 1.2 min

Peak Storage= 8 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.73 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 66.0' Slope= 0.0147 '/'
Inlet Invert= 325.12', Outlet Invert= 324.15'





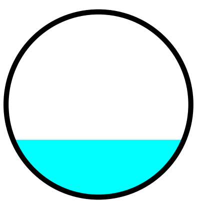
Summary for Reach P15: Pipe 15

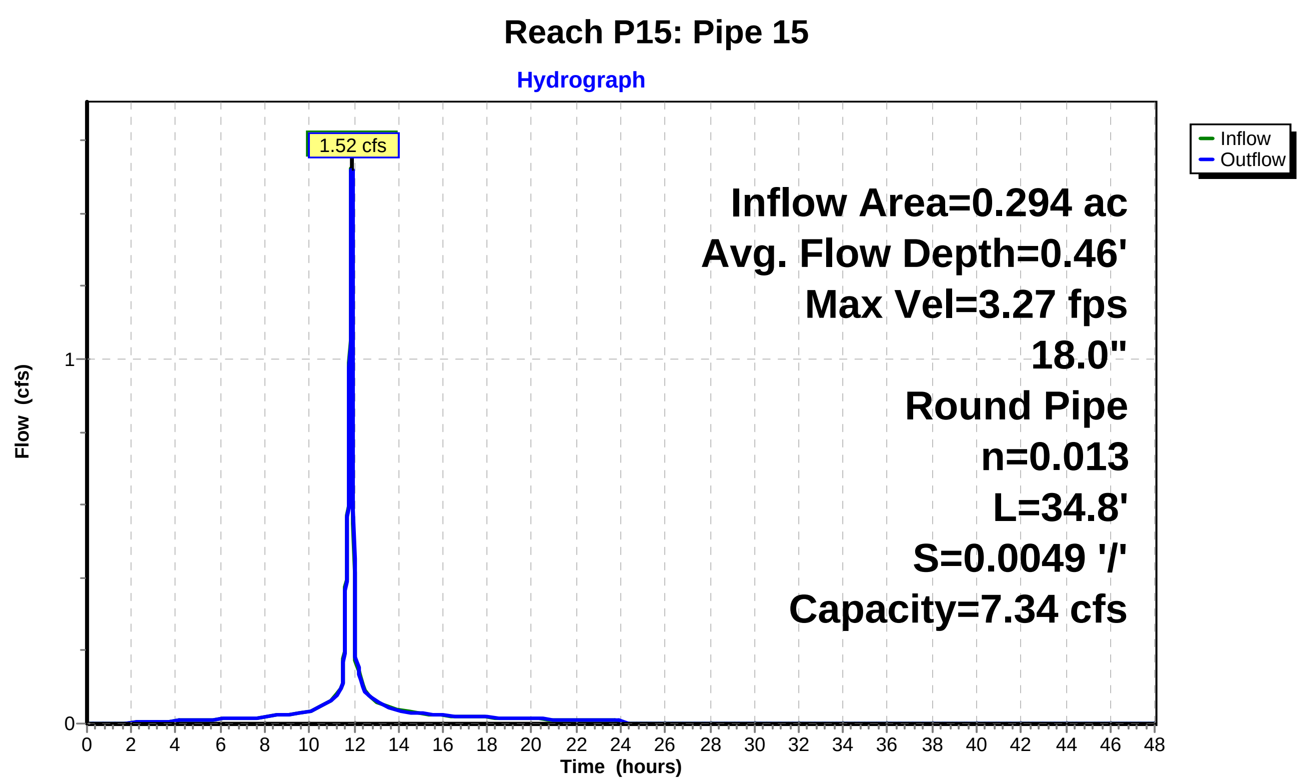
Inflow Area = 0.294 ac, 97.96% Impervious, Inflow Depth = 2.94" for 10 Year Storm event
Inflow = 1.52 cfs @ 11.91 hrs, Volume= 0.072 af
Outflow = 1.52 cfs @ 11.91 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.27 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 0.6 min

Peak Storage= 16 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.34 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.8' Slope= 0.0049 '/'
Inlet Invert= 323.93', Outlet Invert= 323.76'





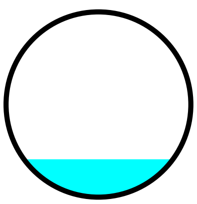
Summary for Reach P16: Pipe 16

Inflow Area = 0.143 ac,100.00% Impervious, Inflow Depth = 2.97" for 10 Year Storm event
Inflow = 0.76 cfs @ 11.91 hrs, Volume= 0.035 af
Outflow = 0.75 cfs @ 11.91 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

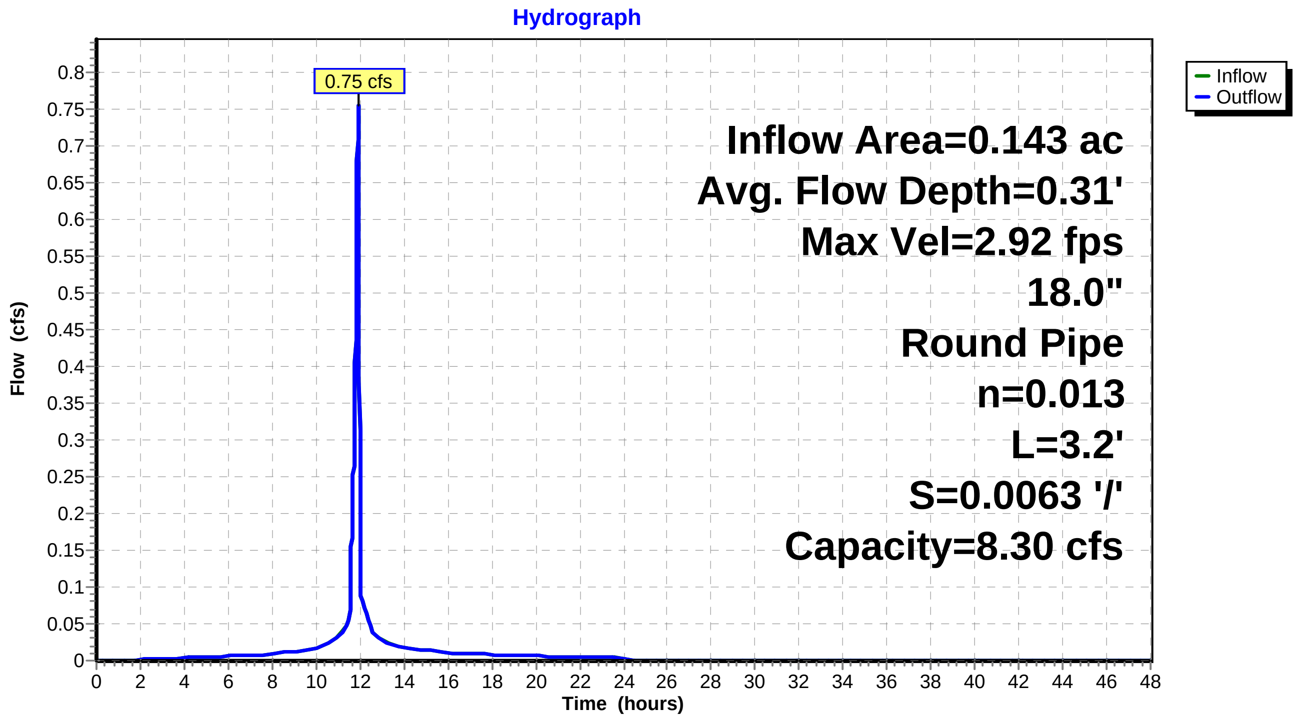
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.92 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.30 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 3.2' Slope= 0.0063 '/'
Inlet Invert= 324.05', Outlet Invert= 324.03'



Reach P16: Pipe 16



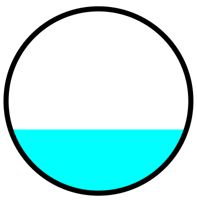
Summary for Reach P18: Pipe 18

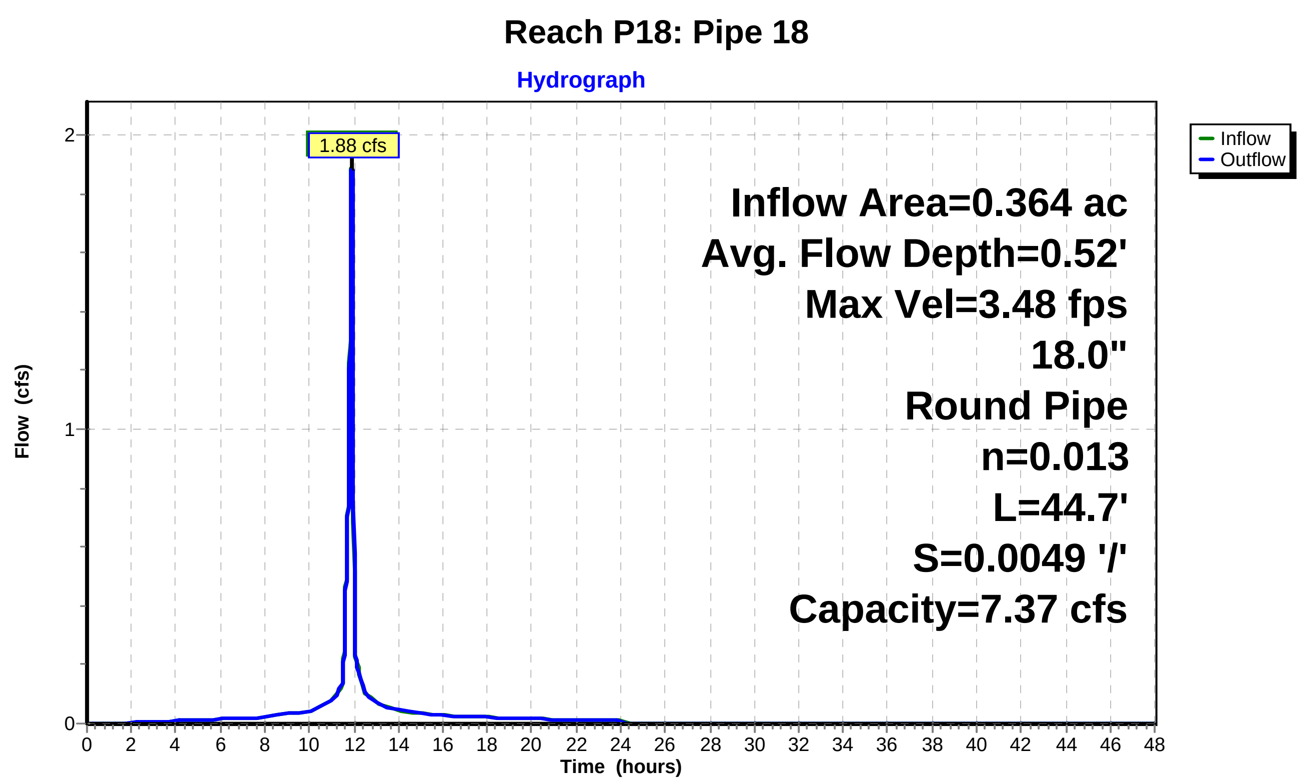
Inflow Area = 0.364 ac, 98.35% Impervious, Inflow Depth = 2.94" for 10 Year Storm event
Inflow = 1.88 cfs @ 11.91 hrs, Volume= 0.089 af
Outflow = 1.88 cfs @ 11.91 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 0.8 min

Peak Storage= 24 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.37 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 44.7' Slope= 0.0049 '/'
Inlet Invert= 323.04', Outlet Invert= 322.82'





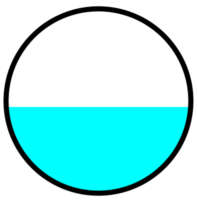
Summary for Reach P19: Pipe 19

Inflow Area = 2.178 ac, 4.41% Impervious, Inflow Depth = 1.84" for 10 Year Storm event
Inflow = 3.35 cfs @ 12.19 hrs, Volume= 0.334 af
Outflow = 3.35 cfs @ 12.19 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min

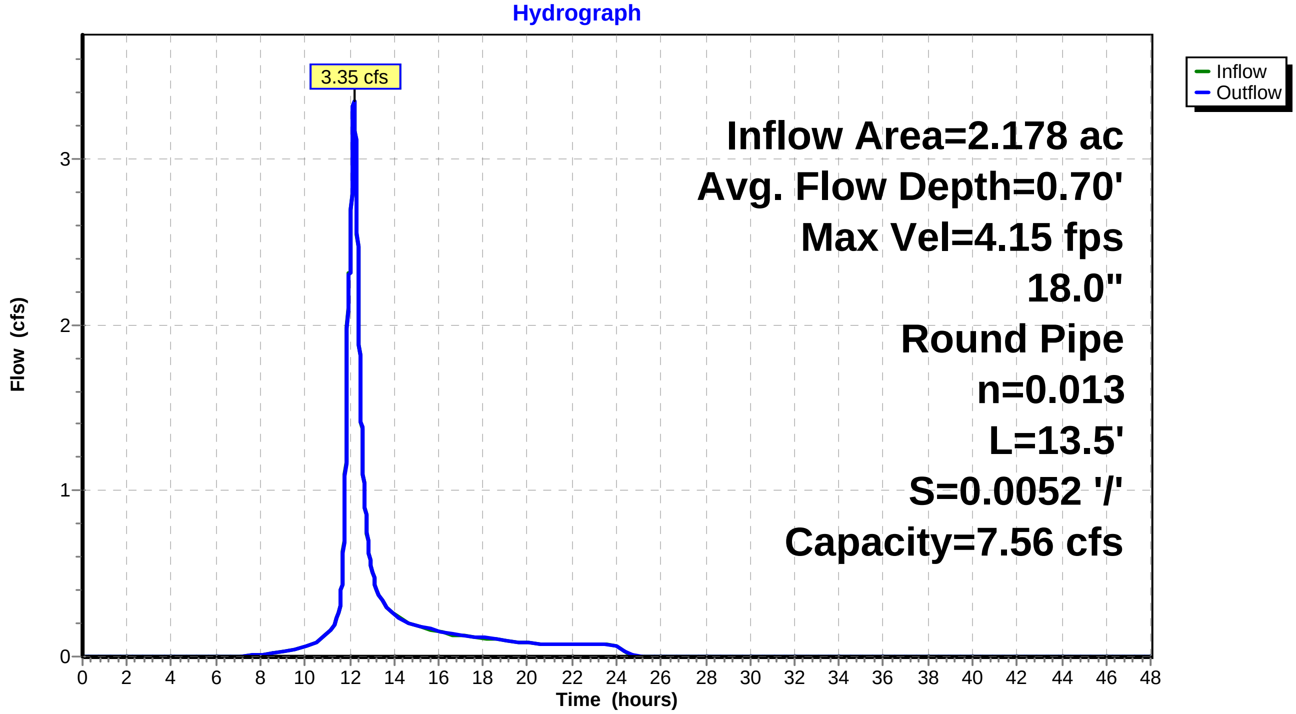
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.15 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 0.2 min

Peak Storage= 11 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.56 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 13.5' Slope= 0.0052 '/'
Inlet Invert= 322.97', Outlet Invert= 322.90'



Reach P19: Pipe 19



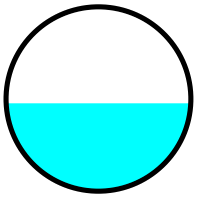
Summary for Reach P20: Pipe 20

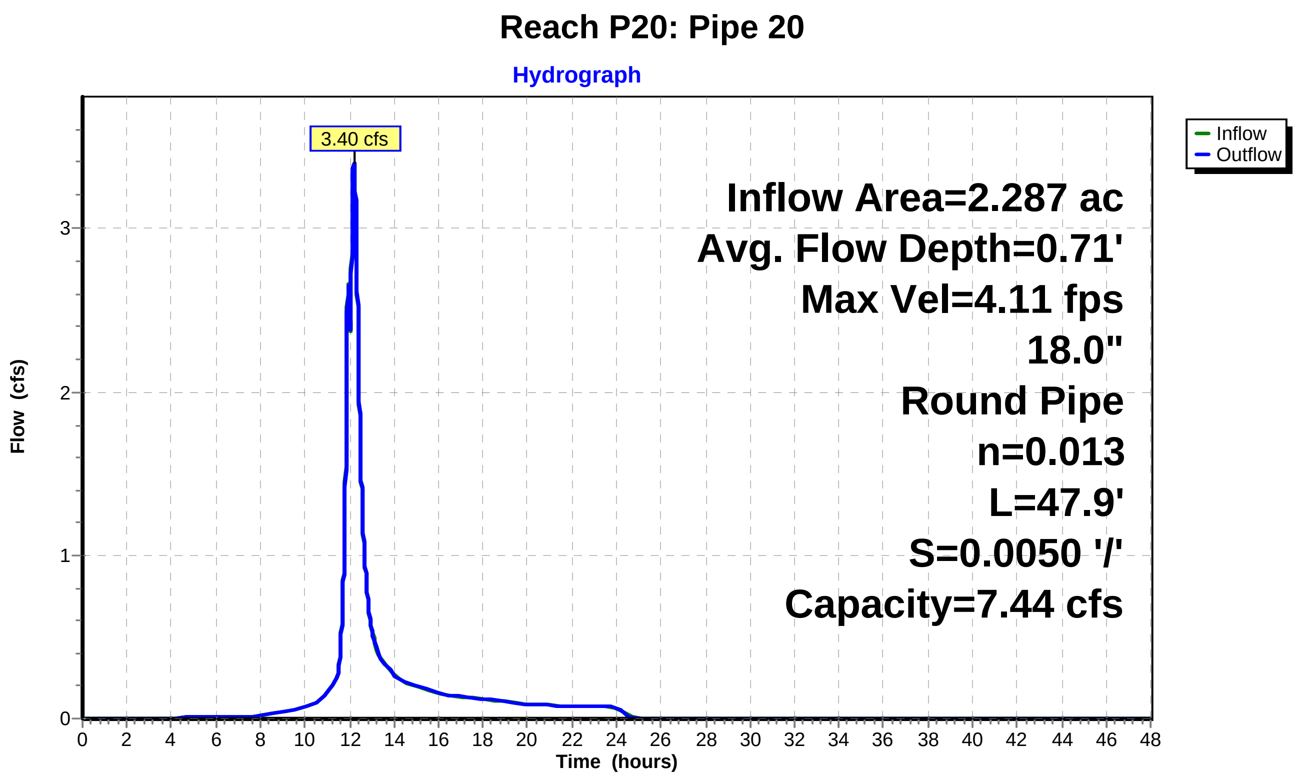
Inflow Area = 2.287 ac, 8.44% Impervious, Inflow Depth = 1.89" for 10 Year Storm event
Inflow = 3.40 cfs @ 12.19 hrs, Volume= 0.359 af
Outflow = 3.40 cfs @ 12.19 hrs, Volume= 0.359 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.11 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 0.6 min

Peak Storage= 40 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.44 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 47.9' Slope= 0.0050 '/'
Inlet Invert= 322.40', Outlet Invert= 322.16'





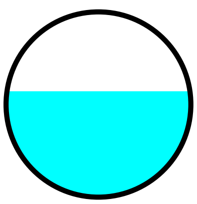
Summary for Reach P21: Pipe 21

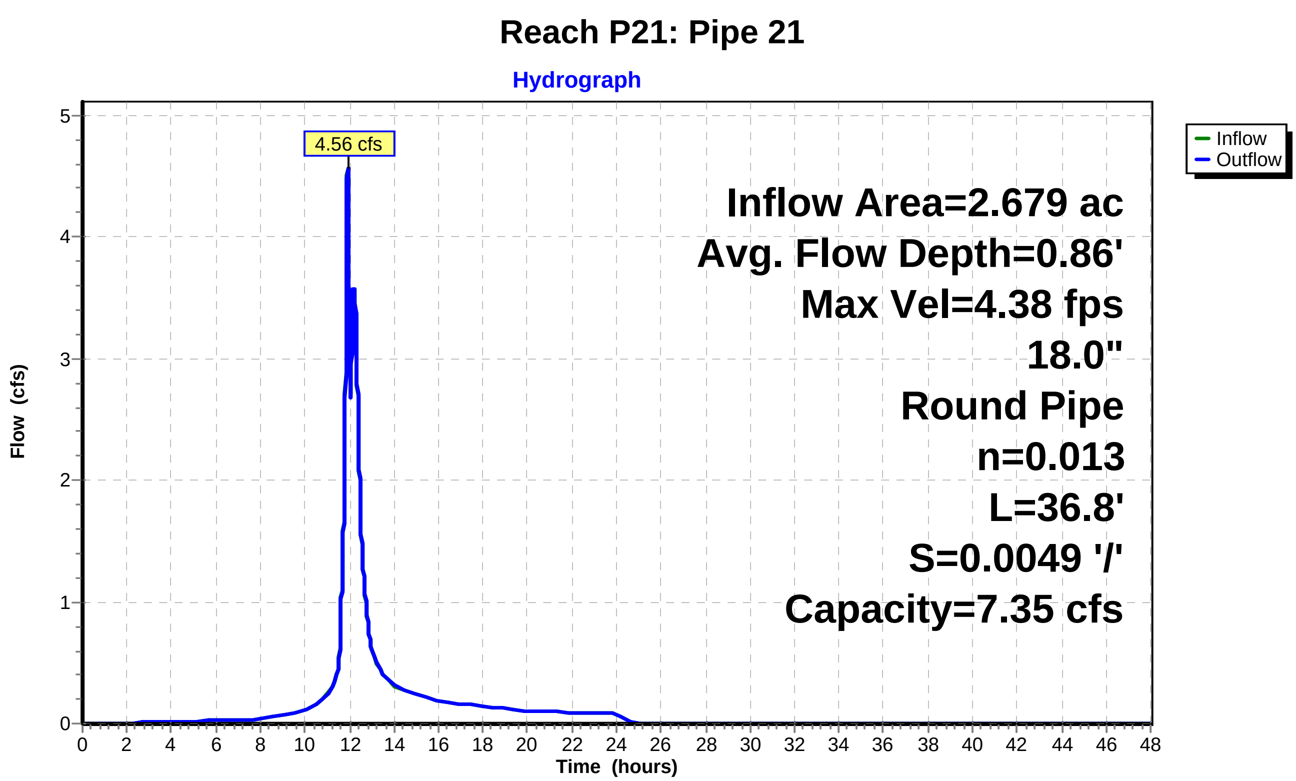
Inflow Area = 2.679 ac, 21.50% Impervious, Inflow Depth = 2.04" for 10 Year Storm event
Inflow = 4.56 cfs @ 11.92 hrs, Volume= 0.455 af
Outflow = 4.56 cfs @ 11.92 hrs, Volume= 0.455 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 0.4 min

Peak Storage= 38 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.86'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.35 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 36.8' Slope= 0.0049 '/'
Inlet Invert= 321.66', Outlet Invert= 321.48'





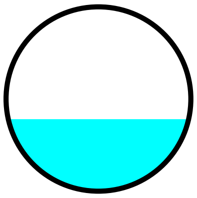
Summary for Reach P22: Pipe 22

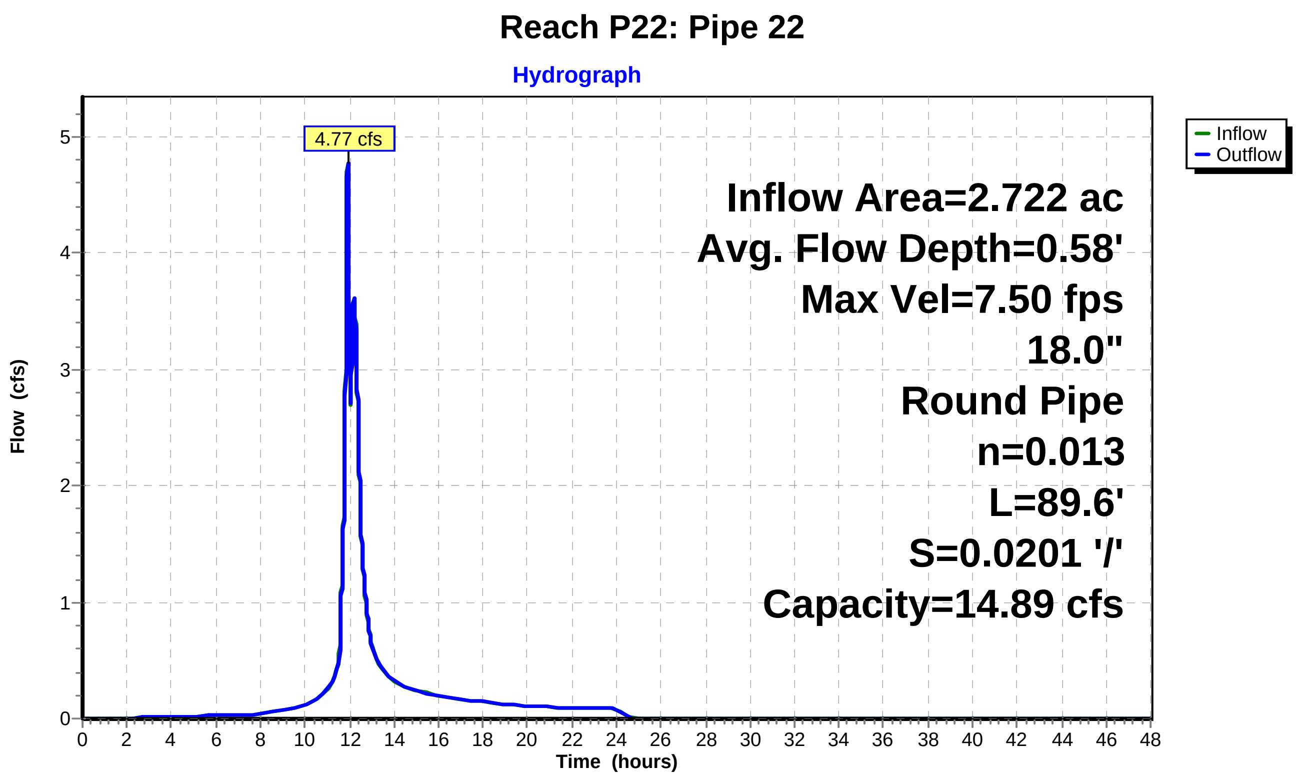
Inflow Area = 2.722 ac, 22.63% Impervious, Inflow Depth = 2.05" for 10 Year Storm event
Inflow = 4.77 cfs @ 11.92 hrs, Volume= 0.465 af
Outflow = 4.77 cfs @ 11.92 hrs, Volume= 0.465 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.50 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.44 fps, Avg. Travel Time= 0.6 min

Peak Storage= 57 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 14.89 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 89.6' Slope= 0.0201 '/'
Inlet Invert= 320.98', Outlet Invert= 319.18'



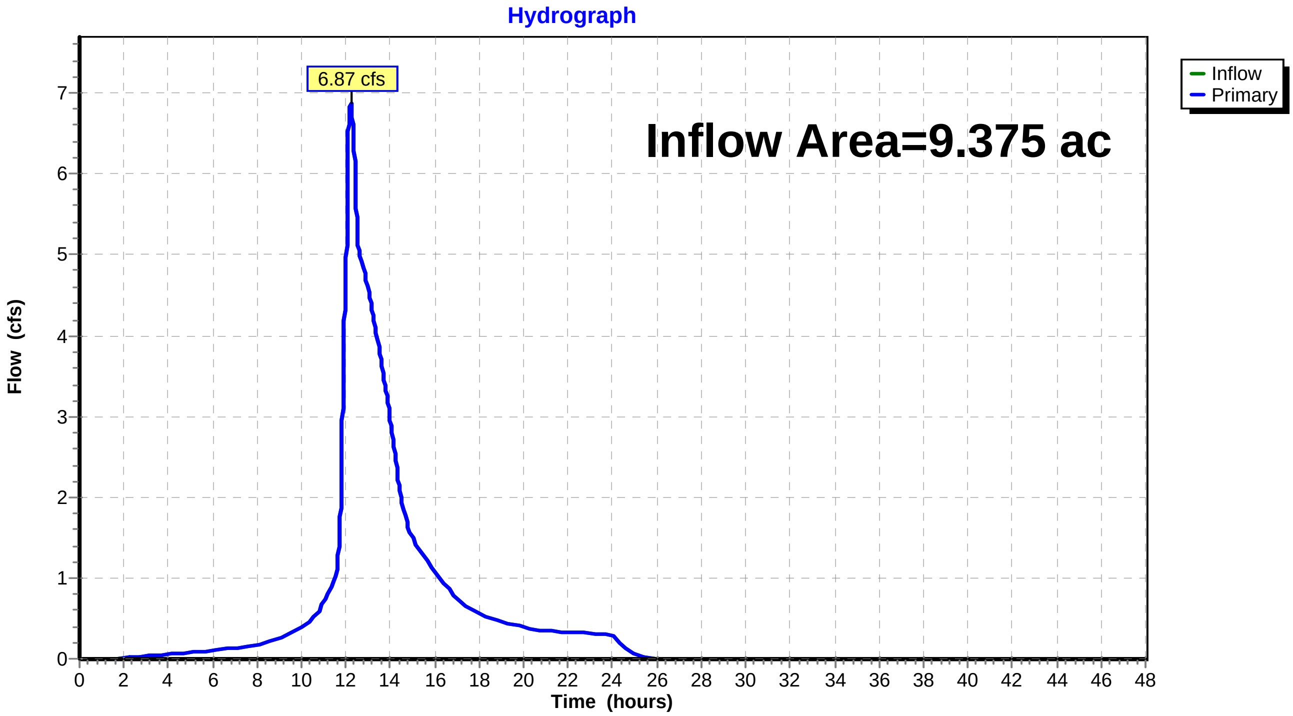


Summary for Pond 007: POI 007

Inflow Area = 9.375 ac, 23.57% Impervious, Inflow Depth = 2.09" for 10 Year Storm event
Inflow = 6.87 cfs @ 12.20 hrs, Volume= 1.635 af
Primary = 6.87 cfs @ 12.20 hrs, Volume= 1.635 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Pond 007: POI 007



Summary for Pond 7D: Detention 7

Inflow Area = 9.375 ac, 23.57% Impervious, Inflow Depth = 2.09" for 10 Year Storm event
Inflow = 27.15 cfs @ 11.93 hrs, Volume= 1.635 af
Outflow = 6.87 cfs @ 12.20 hrs, Volume= 1.635 af, Atten= 75%, Lag= 16.1 min
Primary = 6.87 cfs @ 12.20 hrs, Volume= 1.635 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 320.76' @ 12.20 hrs Surf.Area= 10,255 sf Storage= 22,912 cf

Plug-Flow detention time= 48.6 min calculated for 1.635 af (100% of inflow)
Center-of-Mass det. time= 48.5 min (845.3 - 796.8)

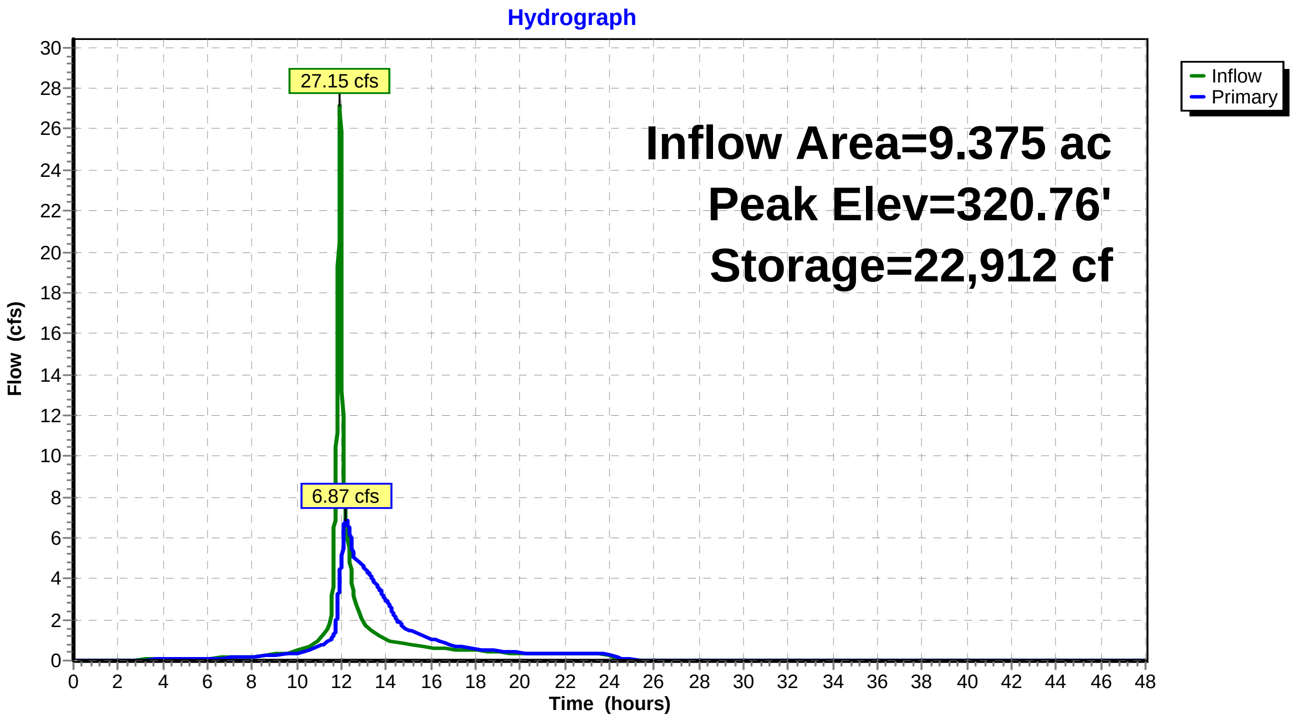
Volume	Invert	Avail.Storage	Storage Description
#1	317.50'	36,943 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
317.50	50	0	0
318.00	4,851	1,225	1,225
319.00	7,436	6,144	7,369
320.00	9,016	8,226	15,595
321.00	10,648	9,832	25,427
322.00	12,385	11,517	36,943

Device	Routing	Invert	Outlet Devices
#1	Device 4	320.60'	**24.0" x 24.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads
#2	Device 4	317.50'	**8.0" Vert. Low Flow** C= 0.600
#3	Device 4	318.50'	**8.0" Vert. Mid Flow** C= 0.600
#4	Primary	317.50'	**24.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 317.50' / 317.25' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Primary OutFlow Max=6.87 cfs @ 12.20 hrs HW=320.76' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 6.87 cfs of 21.26 cfs potential flow)
  ├─**1=Overflow** (Weir Controls 1.66 cfs @ 1.31 fps)
  ├─**2=Low Flow** (Orifice Controls 2.88 cfs @ 8.24 fps)
  └─**3=Mid Flow** (Orifice Controls 2.33 cfs @ 6.68 fps)

Pond 7D: Detention 7



Summary for Pond P1: Pipe 1

Inflow Area =	0.324 ac, 90.74% Impervious,	Inflow Depth = 2.82"	for 10 Year Storm event	
Inflow =	1.52 cfs @	11.94 hrs, Volume=	0.076 af	
Outflow =	1.44 cfs @	11.95 hrs, Volume=	0.076 af,	Atten= 6%, Lag= 0.6 min
Primary =	1.44 cfs @	11.95 hrs, Volume=	0.076 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 325.01' @ 11.98 hrs Surf.Area= 13 sf Storage= 42 cf

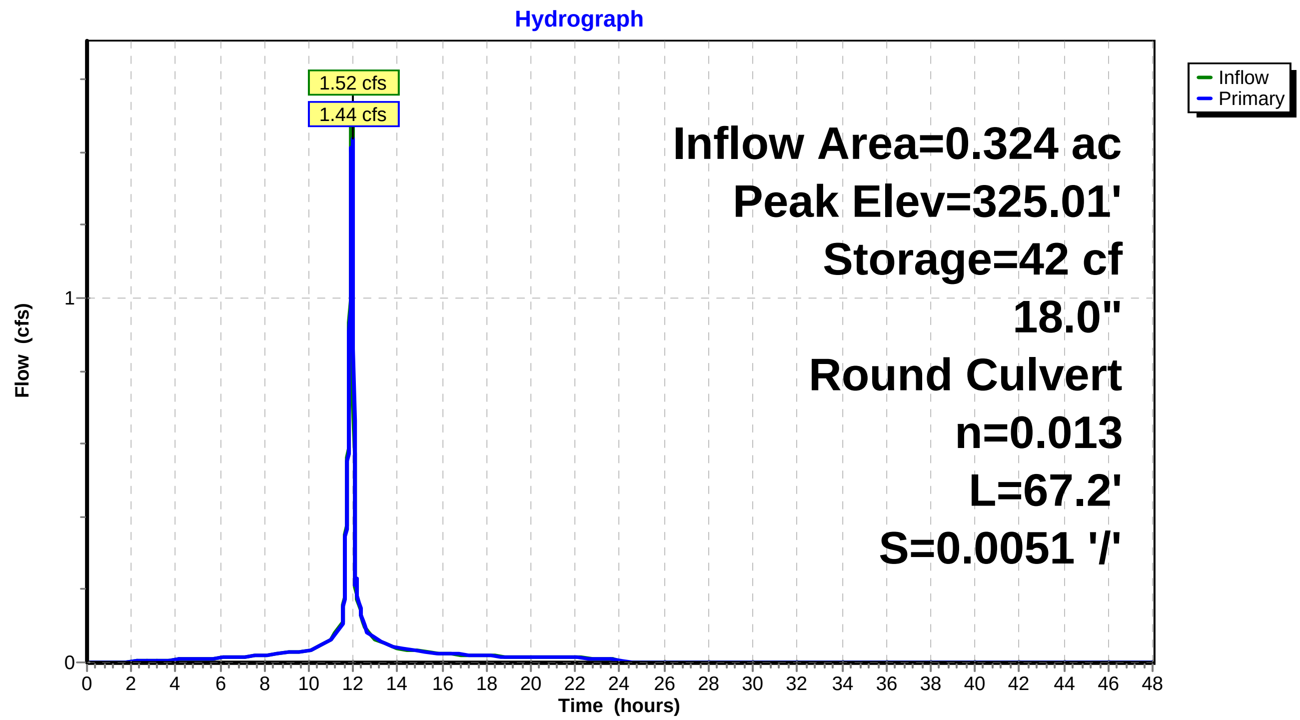
Plug-Flow detention time= 0.7 min calculated for 0.076 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (754.8 - 754.2)

Volume	Invert	Avail.Storage	Storage Description
#1	321.64'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	321.64'	**18.0" Round Culvert** L= 67.2' Ke= 0.500 Inlet / Outlet Invert= 321.64' / 321.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.95 hrs HW=324.56' TW=324.79' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond P1: Pipe 1



Summary for Pond P10: Pipe 10

Inflow Area = 5.709 ac, 23.66% Impervious, Inflow Depth = 2.16" for 10 Year Storm event
Inflow = 19.34 cfs @ 11.94 hrs, Volume= 1.028 af
Outflow = 19.34 cfs @ 11.94 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.0 min
Primary = 19.34 cfs @ 11.94 hrs, Volume= 1.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 320.84' @ 11.99 hrs Surf.Area= 13 sf Storage= 30 cf

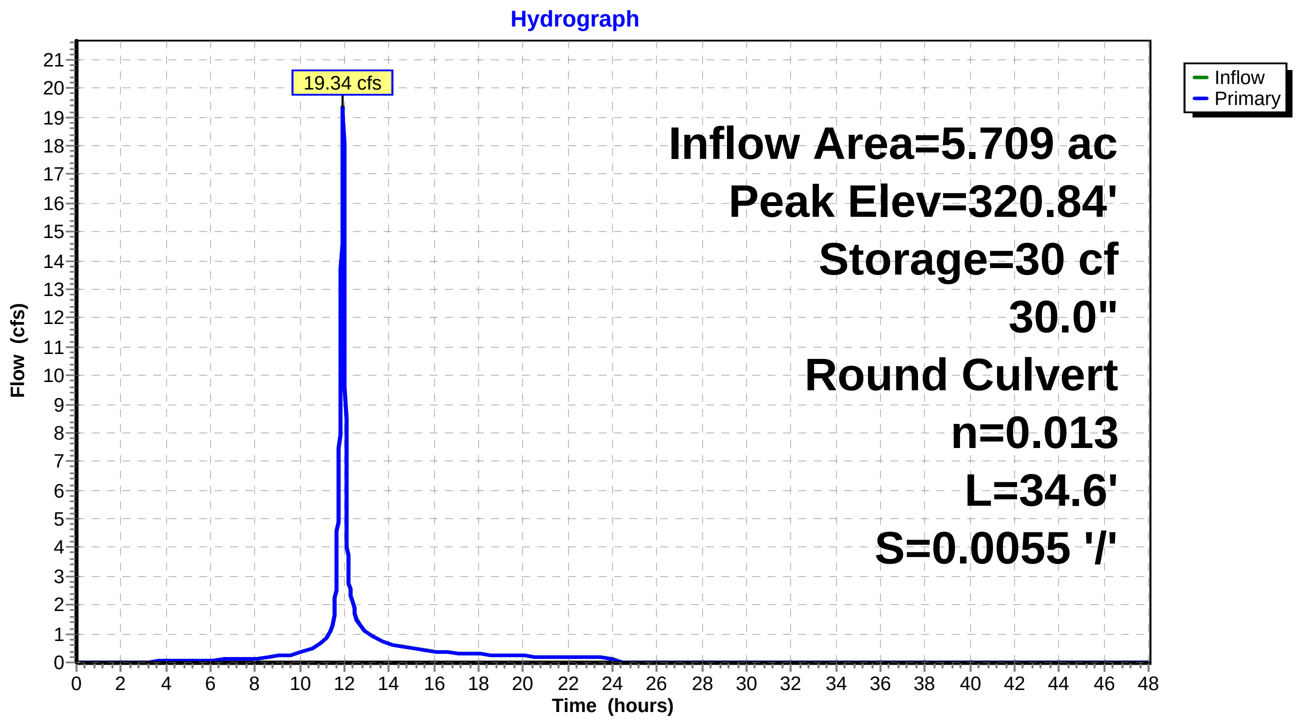
Plug-Flow detention time= 0.1 min calculated for 1.028 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (790.4 - 790.3)

Volume	Invert	Avail.Storage	Storage Description
#1	318.44'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	318.44'	**30.0" Round Culvert** L= 34.6' Ke= 0.500 Inlet / Outlet Invert= 318.44' / 318.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=19.32 cfs @ 11.94 hrs HW=320.76' TW=319.98' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 19.32 cfs @ 5.31 fps)

Pond P10: Pipe 10



Summary for Pond P2: Pipe 2

Inflow Area = 1.772 ac, 23.87% Impervious, Inflow Depth = 2.62" for 10 Year Storm event
Inflow = 6.87 cfs @ 11.97 hrs, Volume= 0.387 af
Outflow = 6.87 cfs @ 11.97 hrs, Volume= 0.387 af, Atten= 0%, Lag= 0.2 min
Primary = 6.87 cfs @ 11.97 hrs, Volume= 0.387 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 324.99' @ 11.97 hrs Surf.Area= 13 sf Storage= 46 cf

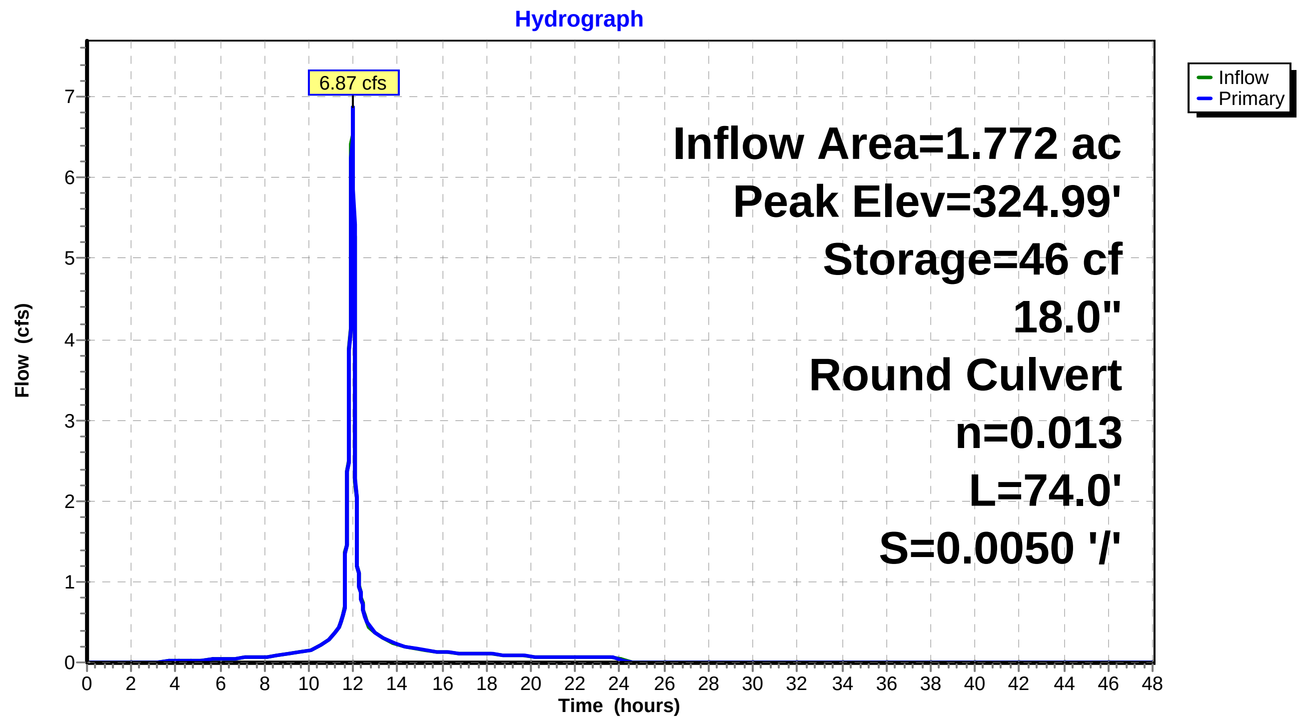
Plug-Flow detention time= 0.3 min calculated for 0.387 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (776.6 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	321.30'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	321.30'	**18.0" Round Culvert** L= 74.0' Ke= 0.500 Inlet / Outlet Invert= 321.30' / 320.93' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.42 cfs @ 11.97 hrs HW=324.96' TW=324.18' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 7.42 cfs @ 4.20 fps)

Pond P2: Pipe 2



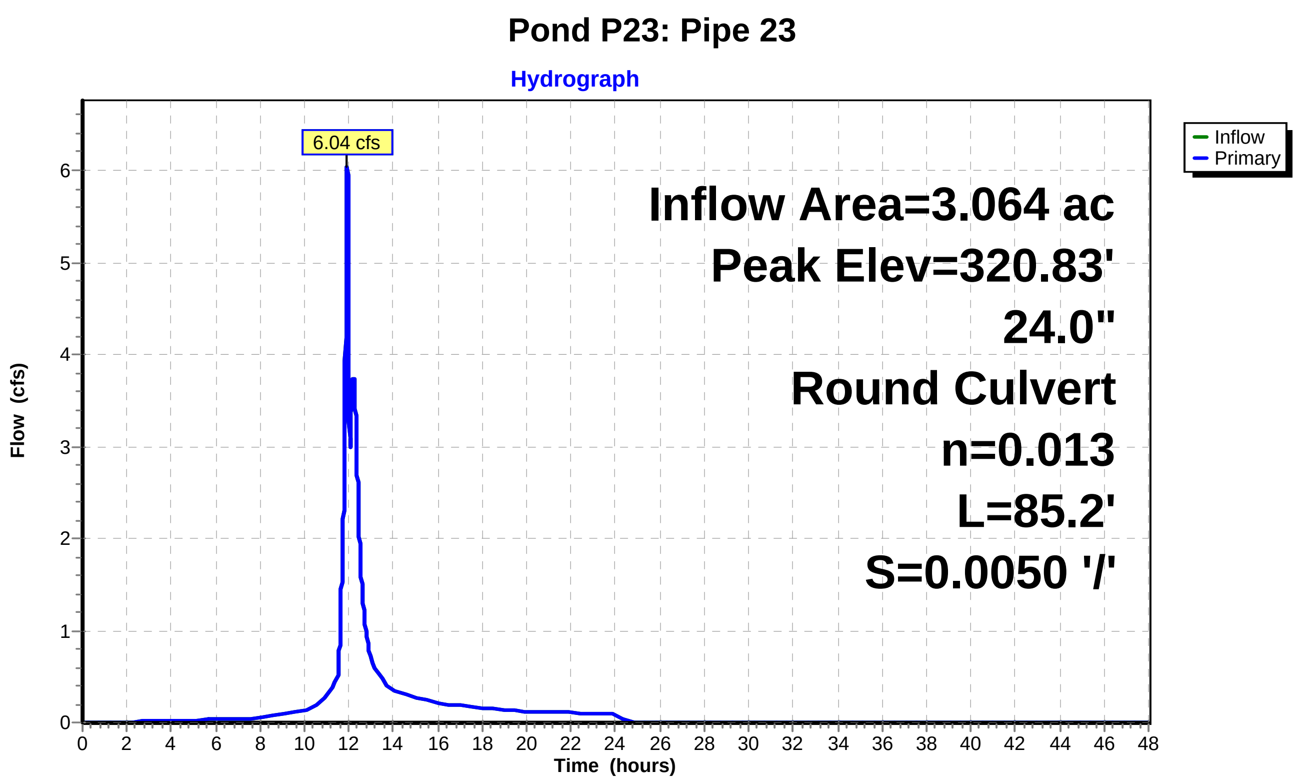
Summary for Pond P23: Pipe 23

Inflow Area =	3.064 ac,	25.07% Impervious,	Inflow Depth = 2.06"	for 10 Year Storm event
Inflow =	6.04 cfs @	11.92 hrs, Volume=	0.525 af	
Outflow =	6.04 cfs @	11.92 hrs, Volume=	0.525 af, Atten= 0%, Lag= 0.0 min	
Primary =	6.04 cfs @	11.92 hrs, Volume=	0.525 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 320.83' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	318.68'	**24.0" Round Culvert** L= 85.2' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 318.68' / 318.25' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.31 cfs @ 11.92 hrs HW=320.19' TW=319.87' (Dynamic Tailwater)
1=Culvert (Outlet Controls 5.31 cfs @ 2.89 fps)



Summary for Pond P3: Pipe 3

Inflow Area = 3.221 ac, 19.78% Impervious, Inflow Depth = 2.37" for 10 Year Storm event
Inflow = 12.05 cfs @ 11.93 hrs, Volume= 0.636 af
Outflow = 12.03 cfs @ 11.93 hrs, Volume= 0.636 af, Atten= 0%, Lag= 0.0 min
Primary = 12.03 cfs @ 11.93 hrs, Volume= 0.636 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 324.33' @ 11.96 hrs Surf.Area= 13 sf Storage= 43 cf

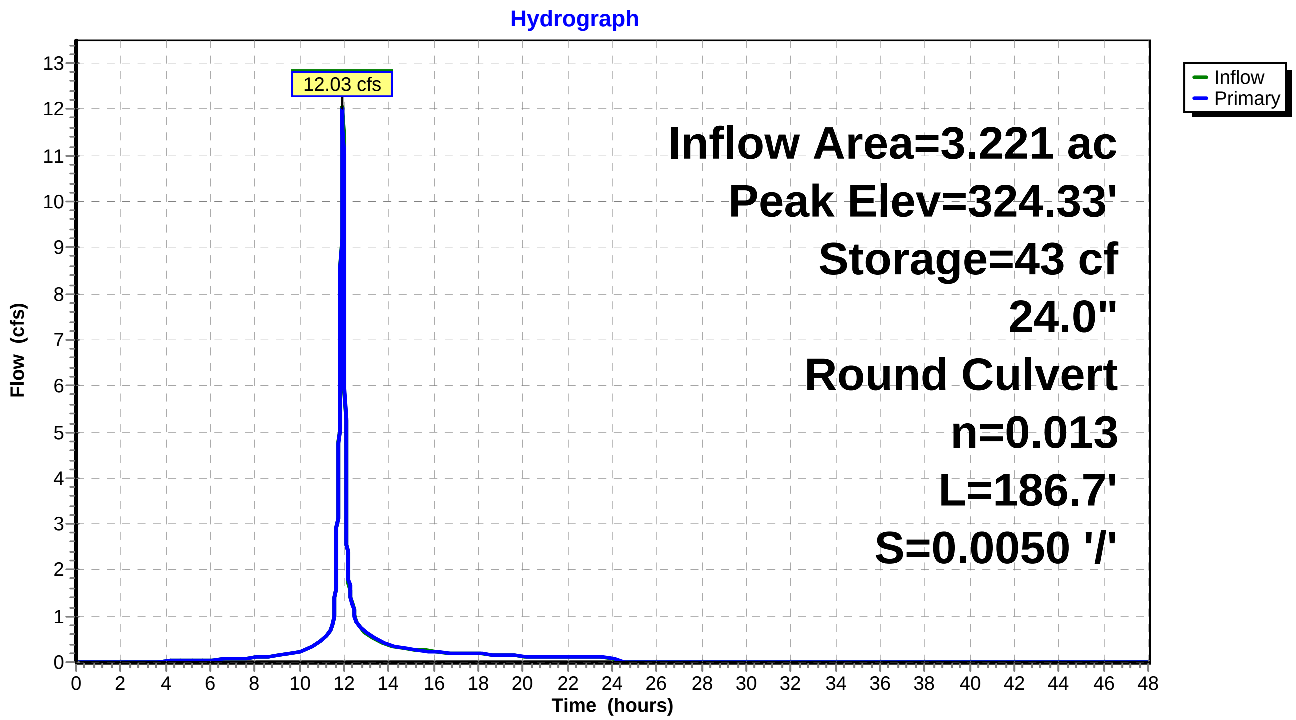
Plug-Flow detention time= 0.1 min calculated for 0.636 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (785.4 - 785.3)

Volume	Invert	Avail.Storage	Storage Description
#1	320.93'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.93'	**24.0" Round Culvert** L= 186.7' Ke= 0.500 Inlet / Outlet Invert= 320.93' / 320.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.27 cfs @ 11.93 hrs HW=323.98' TW=323.34' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 10.27 cfs @ 3.27 fps)

Pond P3: Pipe 3



Summary for Pond P4: Pipe 4

Inflow Area = 3.490 ac, 22.66% Impervious, Inflow Depth = 2.36" for 10 Year Storm event
Inflow = 13.13 cfs @ 11.93 hrs, Volume= 0.687 af
Outflow = 13.01 cfs @ 11.93 hrs, Volume= 0.687 af, Atten= 1%, Lag= 0.1 min
Primary = 13.01 cfs @ 11.93 hrs, Volume= 0.687 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 323.54' @ 11.95 hrs Surf.Area= 13 sf Storage= 45 cf

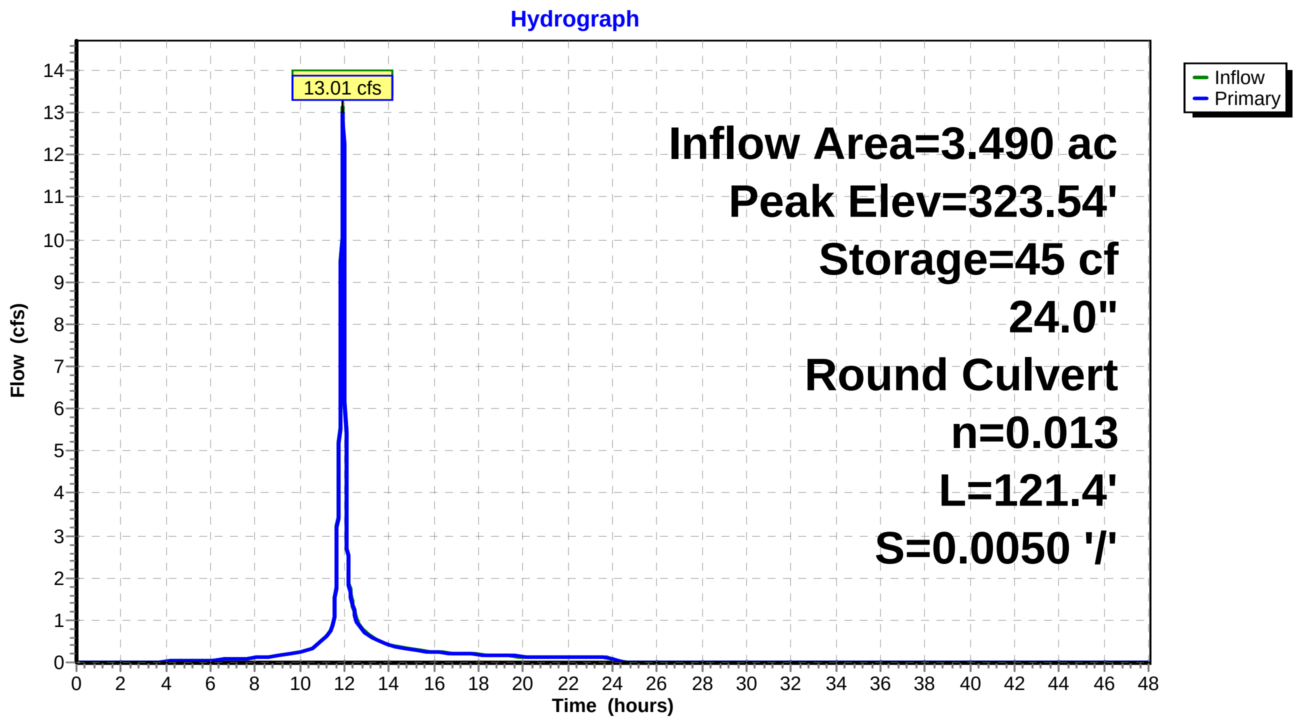
Plug-Flow detention time= 0.2 min calculated for 0.687 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (784.5 - 784.3)

Volume	Invert	Avail.Storage	Storage Description
#1	320.00'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.00'	**24.0" Round Culvert** L= 121.4' Ke= 0.500 Inlet / Outlet Invert= 320.00' / 319.39' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.58 cfs @ 11.93 hrs HW=323.33' TW=322.70' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 11.58 cfs @ 3.69 fps)

Pond P4: Pipe 4



Summary for Pond P5: Pipe 5

Inflow Area = 0.212 ac, 48.11% Impervious, Inflow Depth = 2.16" for 10 Year Storm event
Inflow = 0.84 cfs @ 11.93 hrs, Volume= 0.038 af
Outflow = 0.77 cfs @ 11.93 hrs, Volume= 0.038 af, Atten= 8%, Lag= 0.1 min
Primary = 0.77 cfs @ 11.93 hrs, Volume= 0.038 af

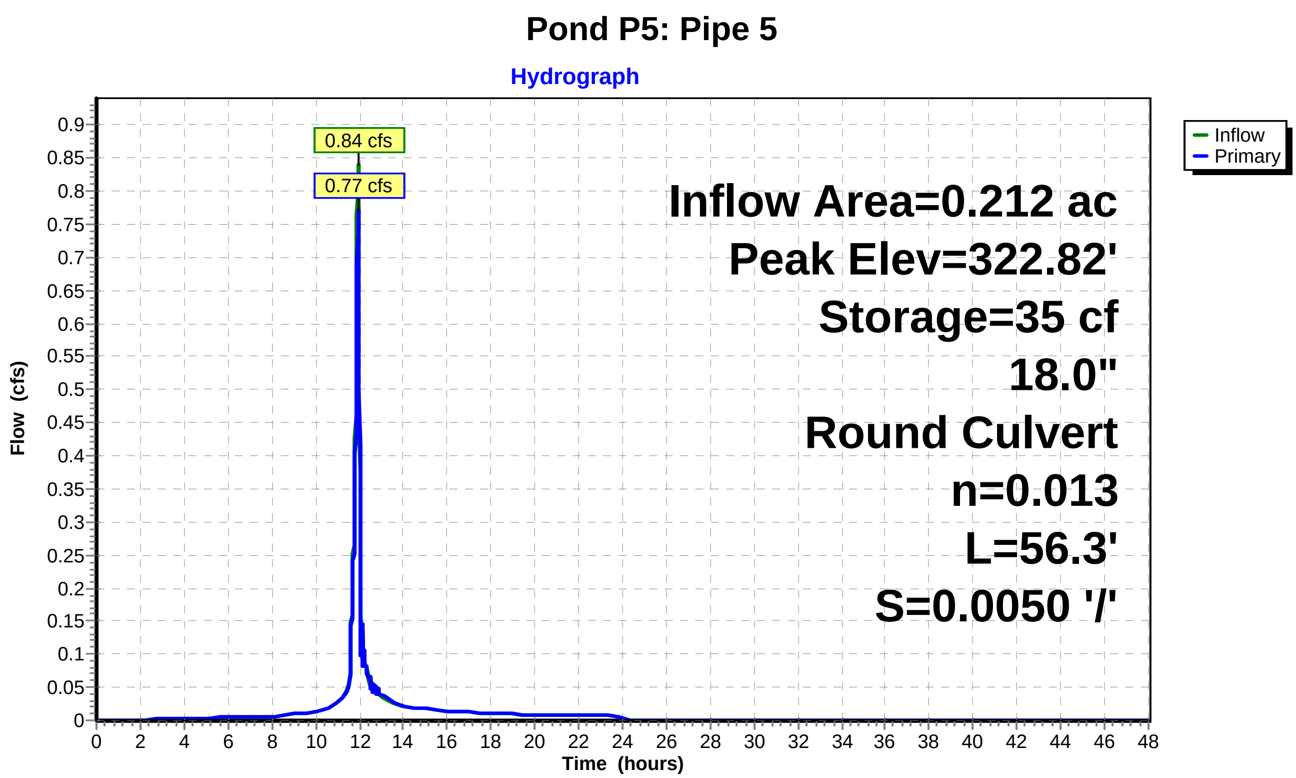
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 322.82' @ 11.97 hrs Surf.Area= 13 sf Storage= 35 cf

Plug-Flow detention time= 1.1 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (779.3 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1	320.00'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	320.00'	**18.0" Round Culvert** L= 56.3' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 320.00' / 319.72' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.93 hrs HW=322.26' TW=322.47' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Summary for Pond P6: Pipe 6

Inflow Area =	0.303 ac,	58.75% Impervious,	Inflow Depth = 2.32"	for 10 Year Storm event	
Inflow =	1.19 cfs @	11.92 hrs,	Volume=	0.059 af	
Outflow =	1.12 cfs @	11.92 hrs,	Volume=	0.059 af,	Atten= 6%, Lag= 0.1 min
Primary =	1.12 cfs @	11.92 hrs,	Volume=	0.059 af	

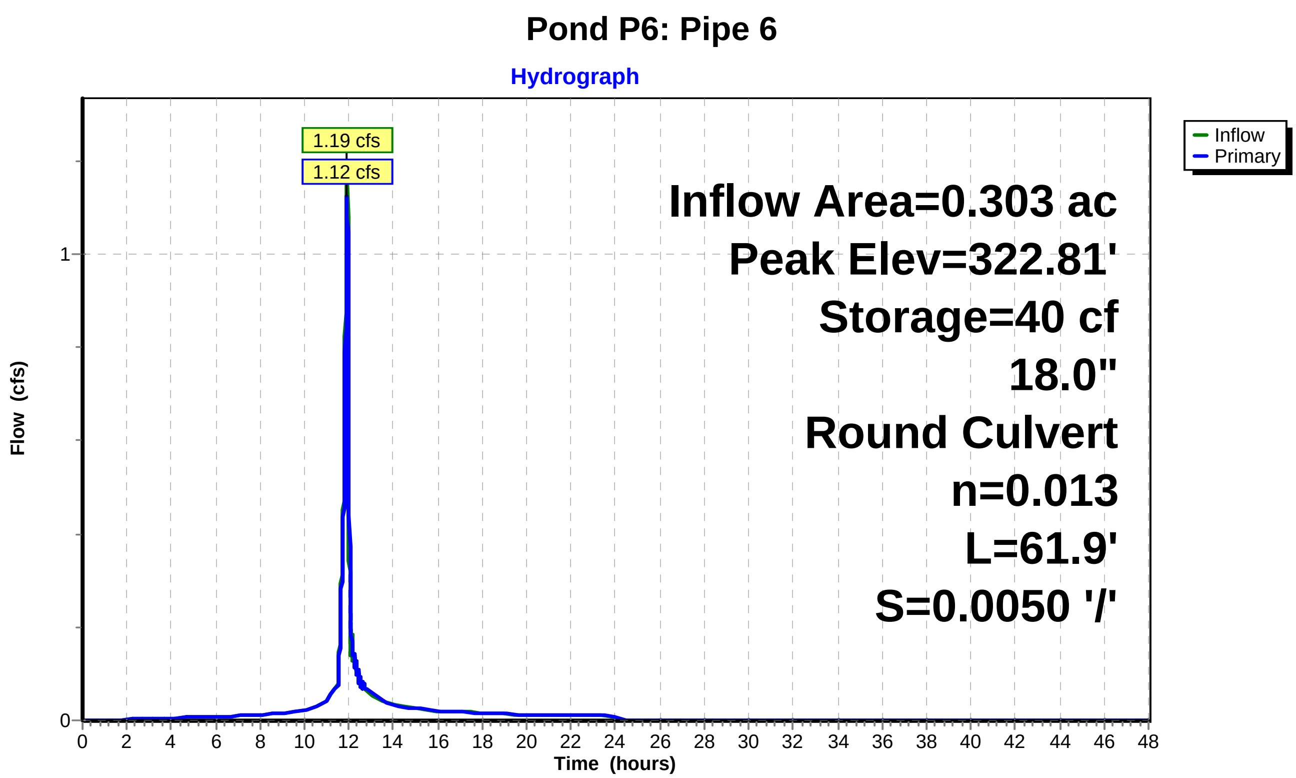
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 322.81' @ 11.96 hrs Surf.Area= 13 sf Storage= 40 cf

Plug-Flow detention time= 1.0 min calculated for 0.059 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (771.9 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1	319.65'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.65'	**18.0" Round Culvert** L= 61.9' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 319.65' / 319.34' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.92 hrs HW=322.27' TW=322.48' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Summary for Pond P7: Pipe 7

Inflow Area = 5.394 ac, 19.48% Impervious, Inflow Depth = 2.12" for 10 Year Storm event
Inflow = 17.87 cfs @ 11.94 hrs, Volume= 0.952 af
Outflow = 17.84 cfs @ 11.94 hrs, Volume= 0.952 af, Atten= 0%, Lag= 0.0 min
Primary = 17.84 cfs @ 11.94 hrs, Volume= 0.952 af

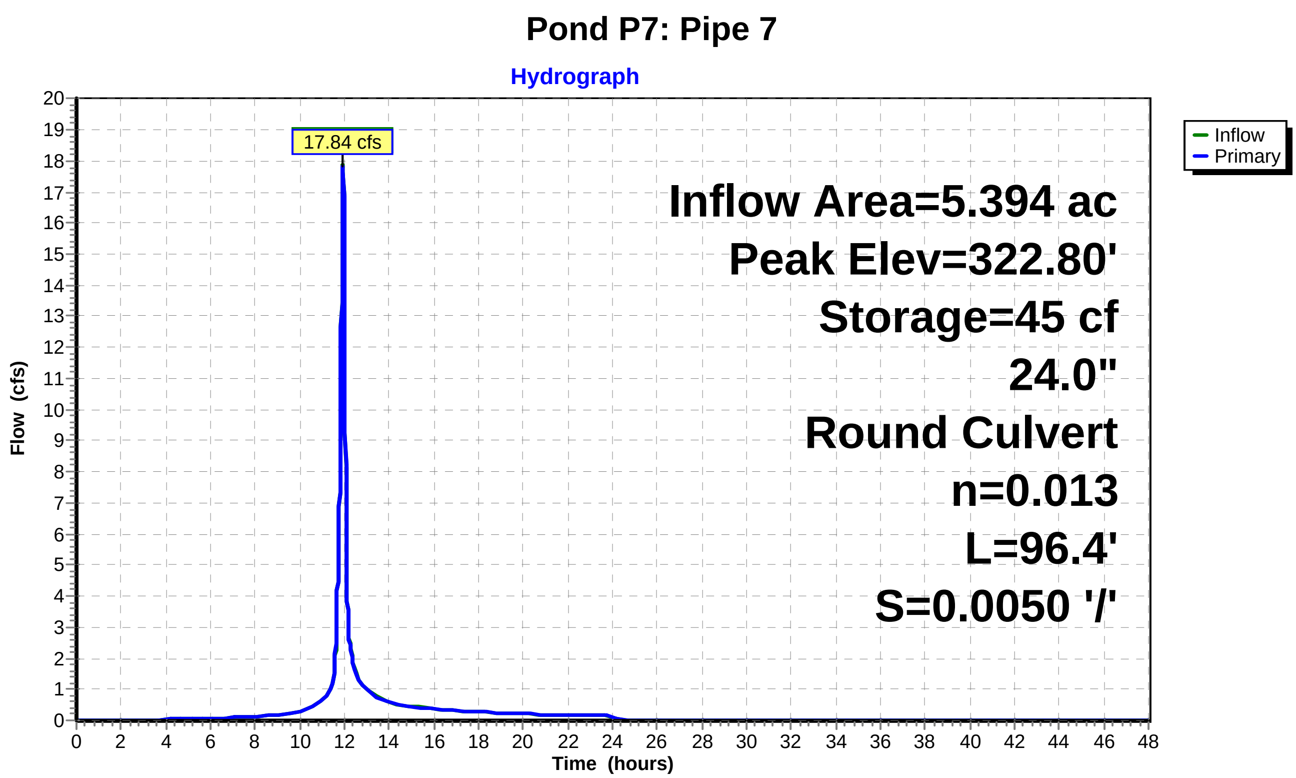
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 322.80' @ 11.95 hrs Surf.Area= 13 sf Storage= 45 cf

Plug-Flow detention time= 0.1 min calculated for 0.952 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (793.2 - 793.0)

Volume	Invert	Avail.Storage	Storage Description
#1	319.19'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.19'	**24.0" Round Culvert** L= 96.4' Ke= 0.500 Inlet / Outlet Invert= 319.19' / 318.71' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=17.51 cfs @ 11.94 hrs HW=322.75' TW=321.41' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 17.51 cfs @ 5.57 fps)



Summary for Pond P8: Pipe 8

Inflow Area = 0.142 ac, 98.59% Impervious, Inflow Depth = 2.95" for 10 Year Storm event
Inflow = 0.71 cfs @ 11.93 hrs, Volume= 0.035 af
Outflow = 0.68 cfs @ 11.93 hrs, Volume= 0.035 af, Atten= 4%, Lag= 0.2 min
Primary = 0.68 cfs @ 11.93 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 321.43' @ 11.95 hrs Surf.Area= 13 sf Storage= 26 cf

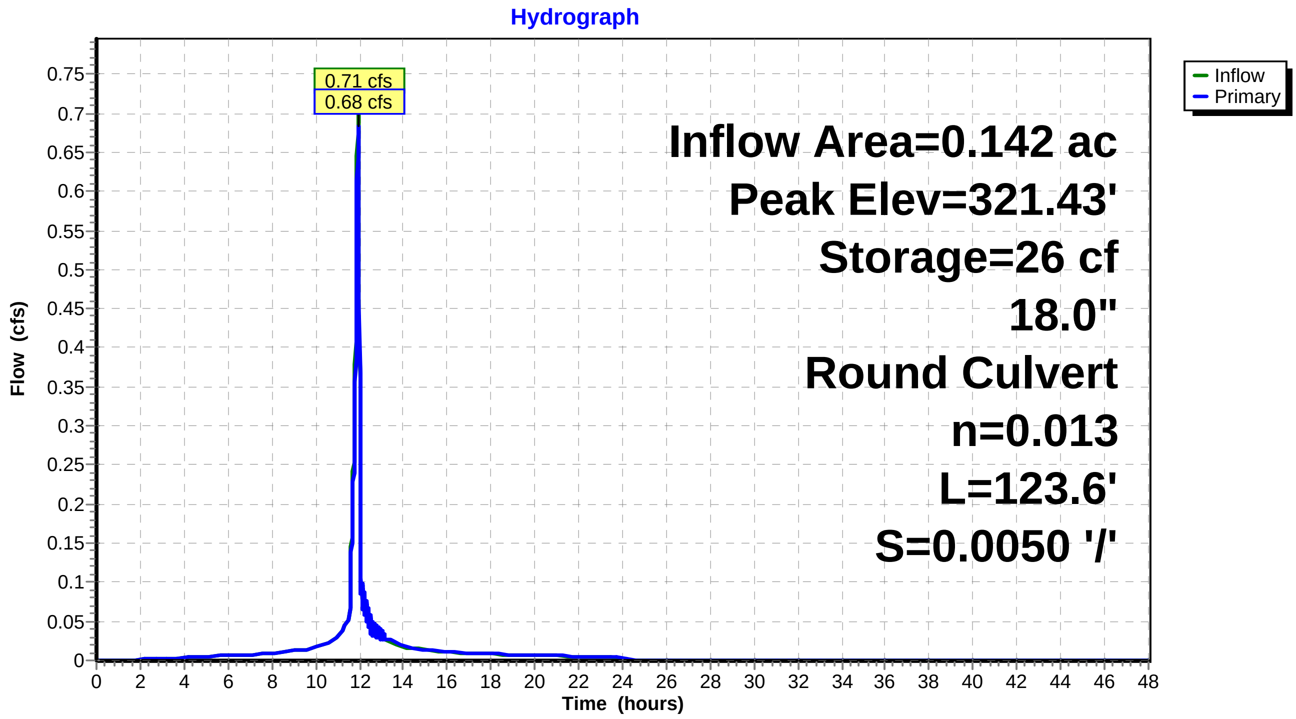
Plug-Flow detention time= 1.7 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (751.5 - 749.9)

Volume	Invert	Avail.Storage	Storage Description
#1	319.33'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	319.33'	**18.0" Round Culvert** L= 123.6' Square-edged headwall, Ke= 0.500 Inlet / Outlet Invert= 319.33' / 318.71' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 11.93 hrs HW=321.33' TW=321.40' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond P8: Pipe 8



Summary for Pond P9: Pipe 9

Inflow Area = 5.709 ac, 23.66% Impervious, Inflow Depth = 2.16" for 10 Year Storm event
Inflow = 19.38 cfs @ 11.93 hrs, Volume= 1.028 af
Outflow = 19.34 cfs @ 11.94 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.1 min
Primary = 19.34 cfs @ 11.94 hrs, Volume= 1.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 321.42' @ 11.94 hrs Surf.Area= 13 sf Storage= 35 cf

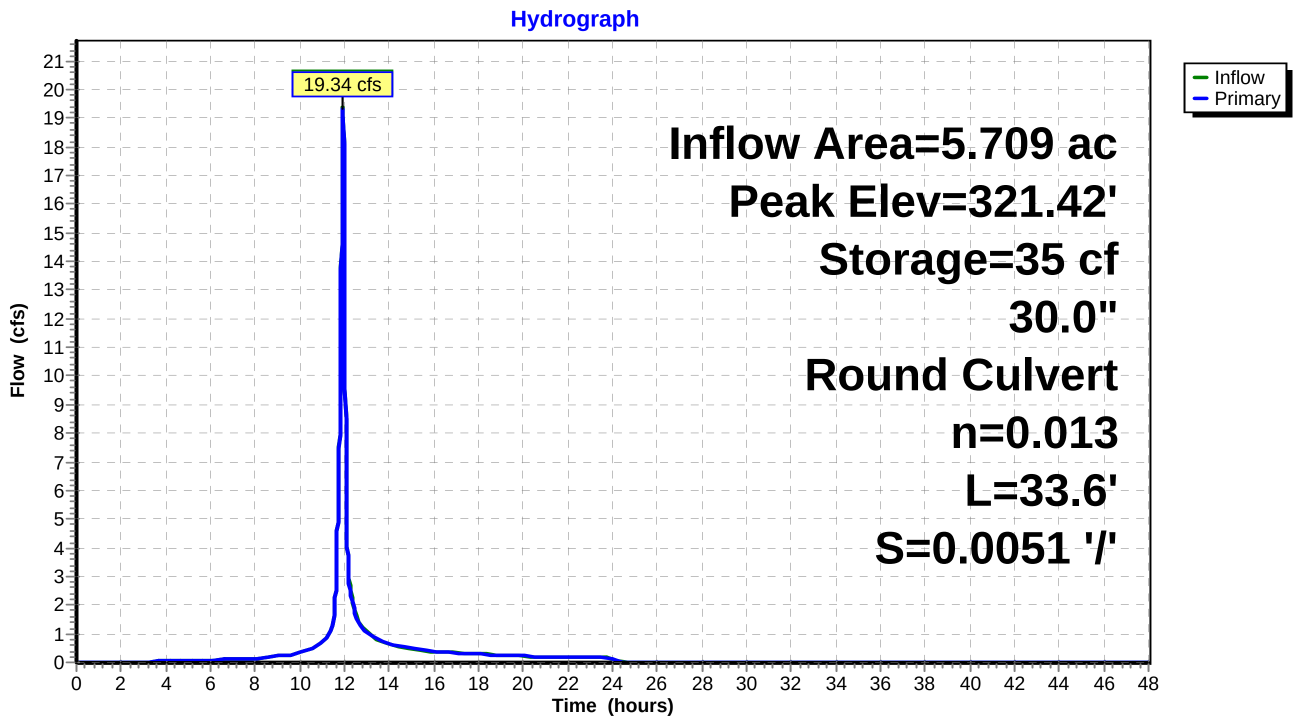
Plug-Flow detention time= 0.1 min calculated for 1.028 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (790.3 - 790.1)

Volume	Invert	Avail.Storage	Storage Description
#1	318.61'	50 cf	**4.00'D x 4.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	318.61'	**30.0" Round Culvert** L= 33.6' Ke= 0.500 Inlet / Outlet Invert= 318.61' / 318.44' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=19.14 cfs @ 11.94 hrs HW=321.41' TW=320.76' (Dynamic Tailwater)
1=Culvert (Inlet Controls 19.14 cfs @ 3.90 fps)

Pond P9: Pipe 9



VERMONT

State of Vermont
Agency of Transportation

Highway Division
Highway, Safety & Design Section
Traffic Design Unit

Colchester HES NH 5600(14)
Chloride Management Plan

Compiled by:
Vermont Agency of Transportation, Traffic Design Unit
in coordination with VTrans Maintenance and Operations Bureau &
Town of Colchester Department of Public Works

Table of Contents

Executive Summary

This Chloride Management Plan (CMP) was developed for the Colchester US Routes 2 & 7 Corridor project Colchester HES NH 5600(14). This CMP outlines strategies and best management practices that will be implemented to minimize Chloride loading to Sunnyside Brook from the above-noted roadway corridor.

This CMP has been prepared in accordance with VTrans' *Snow and Ice Control Plan*, dated November, 2013 and with the Town of Colchester's *Snow and Ice Removal Plan*, dated July, 2013. Each of these documents outlines the procedures, equipment and materials each agency uses for winter maintenance of travel surfaces. This plan relies on these documents to describe how the project will minimize potential impacts to Sunnyside Brook resulting from winter Chloride usage.

1.0 – Project Location & Background Information

1.1. Location

The proposed project consists of the implementation of traffic congestion relieving measures along the entire length of a 1.05-mile stretch of US Routes 2 & 7 in the town of Colchester, Vermont (MM 0.00 to MM 1.05). Figure 1 shows the location of the project in relation to the region.

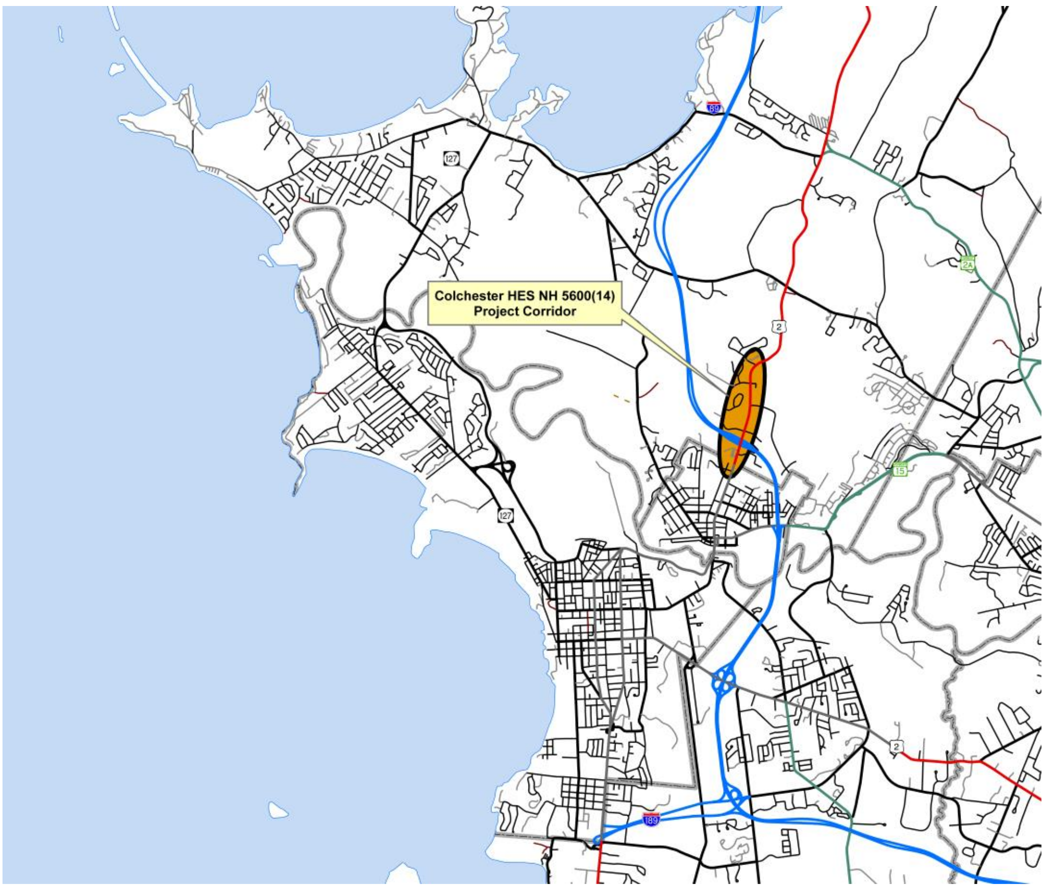


Figure 1: Vicinity Map

1.2. Background

The Colchester HES NH 5600(14) project lies entirely within the Sunnyside Brook watershed. The watershed has a drainage area of 1.37 square miles (877 acres) in Colchester, Vermont (see Figure 2). The project impacts only a portion of the entire watershed, 0.91 square miles (582 acres). The Vermont Agency of Natural Resources lists Sunnyside Brook and watershed on the 2014 303(d) Part C List: Surface Waters in Need of Further Assessment. Waters on this list are classified as being "stressed," in that they are considered high priority waters for assessment and monitoring. However, waters included on the Part C list are <u>not</u> considered impaired.

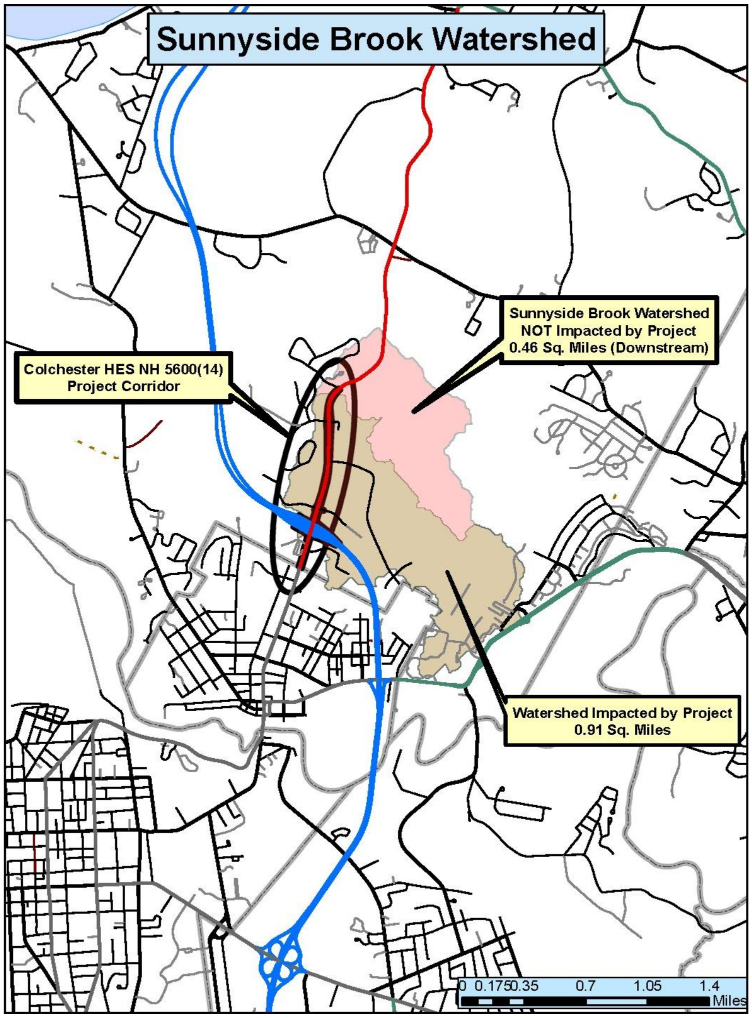


Figure 2: Watershed Map

Sunnyside Brook is identified by the Waterbody ID VT08-02. On the 2014 303(d) Part C List, the possible pollutants are listed as "Undefined" and "Org. Enrichment, Toxics, Sediment." The problems associated with these pollutants are listed as "Potential Impacts from land development and runoff," and "Potential impact surface water by past dumping; Land development," respectively. In both cases, Aquatic Life Support is listed as the impaired use in the stream. More specifically, the Vermont Agency of Natural Resources (VANR) has identified Chlorides as the chemical responsible for the listing.

1.3. VTrans MS4

The Colchester HES NH 5600(14) project falls in an urbanized area covered under an existing Small Municipal Separate Storm Sewer System (MS4). VTrans has developed a Stormwater Management Program (SWMP) as part of coverage under General Permit 3-9014, administered by VANR. The Program is committed to stewardship of the natural resources in Vermont and has developed a robust plan consisting of appropriate best management practices (BMPs) to reduce adverse impacts to the environment, including streams and other water courses, to the maximum extent practicable. A highly condensed list of example BMPs VTrans' MS4 permits is:

- All VTrans garages located within the MS4 area will be required to develop a Stormwater Pollution Prevention Plan (SWPPP) and a Spill Prevention Plan (SPP). VTrans will have annual trainings on these plans and the facilities will be inspected annually.
- Implement a Four-Level Winter Maintenance Priority Plan with a goal to be more efficient with winter maintenance and the usage of snow and ice controls and reduce sand and salt distribution. This plan consists of a highway corridor prioritization scheme that dictates the order and magnitude of roadway clearing. See VTrans *Snow and Ice Control Plan* for more information.
- Properly dispose of materials collected during street sweeping and storm drain cleaning.
- Conduct street sweeping and storm drain inspection and cleaning operations on VTrans assets within the MS4 area.
- Report annually on inspections and training conducted at VTrans garages.
- Report annually on salt and sand usage for winter road maintenance.
- Report annually on the total volume of material removed from street sweeping and storm drain cleaning.

The current GP 3-9014 permit for VTrans expires at the end of 2018.

1.4. Guiding Principles

As the Colchester HES NH 5600(14) project is a roadway reconstruction project, it is expected that any Chlorides resulting from the project's implementation would be from winter maintenance activities. The plowing and de-icing of US Routes 2 & 7 and I-89 in conjunction with the Exit 16 on- and off-ramps are responsibilities of the VTrans. VTrans recognizes several primary benefits to managing Chlorides for its winter maintenance activities: Safety, Vehicle Mobility, Environmental Protection and Fiscal Responsibility.

1.4.1. Safety. Effective roadway winter maintenance has a direct correlation with the reduction of vehicular collisions and off-road running.

1.4.2. Vehicle Mobility. Effective roadway winter maintenance has a direct correlation with the mobility of traffic as measured by delay and roadway and intersection capacity.

1.4.3. Environmental Protection. Excessive usage of various types of salts to melt roadway surface ice and snow creates an adverse effect to nearby natural resources.

1.4.4. Fiscal Responsibility. Efficient usage of road salt has a direct positive impact to the Agency's budget for winter maintenance by consuming less material and more efficient usages of labor and equipment.

This plan seeks to outline how Chloride usage will be managed as part of the Colchester HES NH 5600(14) project as guided by these three principles.

2.0 – Existing Winter Maintenance Activities

VTrans is responsible for maintaining safe roads at safe speeds on the following roadways within the Colchester HES NH 5600(14) project limits:

- US Routes 2 & 7
- Interstate 89 Exit 16
    - Southbound on-ramp
    - Southbound off-ramp
    - Northbound on-ramp
    - Northbound off-ramp

The Town of Colchester is responsible for maintaining the following roadways within the Colchester HES NH 5600(14) project limits:

- South Park Drive
- Mountain View Drive
- Lower Mountain View Drive
- Hercules Drive
- Champlain Drive
- Rathe Road
- Sunderland Woods

Both VTrans and the Town of Colchester use various methods of snow and ice removal from roadway surfaces depending on different circumstance including: time of day, storm duration, storm intensity, type of precipitation and ambient temperature. The methods used are described in greater detail in the *VTrans Snow and Ice Control Plan* (*2013 VTrans SIC Plan*) and the *Colchester Snow and Ice Removal Plan* (*2013 Town of Colchester SIR Plan*), attached as appendices to this document, but includes the use of rock salt, salt brine, winter sand, other types of Chlorides, proprietary de-icing chemicals and plowing.

3.0 – Post-Construction Winter Maintenance Activities

Winter maintenance on roadways VTrans is responsible for will abide by the *2013 VTrans SIC Plan*. Likewise, road clearing on town highways by the Town of Colchester will abide by the *2013 Town of Colchester SIR Plan*.

It is not anticipated that snow and ice removal methods would change as a result of the project's construction. It is, however, expected that additional runs of plow trucks and other snow removal equipment will be needed due to the addition of new traffic turning lanes. These added runs will add to the overall lane miles needed for winter maintenance. The chart (next page) outlines these new areas requiring winter maintenance.

Lane Mileage for Winter Maintenance Activities			
Roadway	**Agency Responsible**	**Pre-Construction Lane Miles**	**Post-Construction Lane Miles**
US Routes 2 & 7	VTrans	4.24	4.44
Exit 16 NB On-Ramp	VTrans	0.04	0.10
Exit 16 NB Off-Ramp	VTrans	0.18	0.20
Exit 16 SB On-Ramp	VTrans	0.07	0.06
Exit 16 SB Off-Ramp	VTrans	0.09	0.11
South Park Drive	Town of Colchester	0.02	0.02
Mountain View Drive	Town of Colchester	0.17	0.21
Lower Mountain View Drive	Town of Colchester	0.16	0.21
Hercules Drive	Town of Colchester	0.09	0.09
Champlain Drive	Town of Colchester	0.07	0.07
Rathe Road	Town of Colchester	0.10	0.10
Sunderland Woods	Town of Colchester	0.02	0.02
	Total Mileage =	**5.25**	**5.63**

While there is a slight increase in lane-miles requiring winter maintenance, this factor does not guarantee there will be an increase salt usage. The chief factor in determining the quantity of salt usage is the number of storms significant enough over the season to require roadway de-icing.

4.0 – Chloride Management Strategies

This section focuses on management strategies from the *VTrans SIC Plan* and the *Colchester SIR Pla*n that are applicable to the Colchester HES NH 5600(14) project area.

4.1. Best Management Practices (BMPs)

The *VTrans SIC Plan* describes in great detail the equipment and materials involved with controlling snow and ice on roadways for the purposes of winter maintenance. Please refer to Section E of the *SIC Plan* for more information. The *Colchester SIR Plan* lists the equipment and materials the Colchester Department of Public Works uses for its activities. Please refer to Section 3 of the *SIR Plan* for more information.

While this information will not be reiterated herein, a list (next page) contains BMPs that are most readily available for achievable reductions without sacrificing levels of service. These will be used by the appropriate Agencies along this project corridor.

Best Management Practices for Chloride Reduction		
Chloride Reduction BMP	**Definition**	**Potential % Chloride Reduction**
Pre-Wetting	Application of salt brine or proprietary chemical to dry salt as it is being applied to the roadway.	20% - 30%
Pre-Treating	Application of salt brine or proprietary chemical to dry salt either before, during, or after it has been loaded into the truck.	10% - 30%
Anti-Icing	Application of salt brine or proprietary chemical up to 48 hours in advance of onset of winter storm.	10% - 30%
Equipment Calibration	Ensures equipment application of Chlorides is accurate.	5% - 20%
In-Cab Air/Ground Temperature Sensor	Installation and monitoring of pavement and air temperature sensors with in-cab readout.	1% - 10%
Training, Storage and Handling	Annual training of staff about various BMPs, improving storage and handling practices for loading and unloading salt.	10% - 25%

The reduction percentages are dependent on several factors including storm severity, equipment type, accurate calibration and operator skill.

5.0 – Conclusion

The Vermont Agency of Transportation is committed to the stewardship of natural resources in Colchester and in the rest of Vermont. In addition to being fiscally responsible, VTrans developed its *SIC Plan* to be more sensitive to these natural resources by creating and executing best management practices for winter maintenance, including the usage of salt. The *SIC Plan* and Colchester's *SIR Plan* will be followed for winter maintenance after this project is constructed.

While the leaching of Chloride from winter salt into Sunnyside Brook is very dependent on the number and the severity of winter storm events, the agencies are committed to these plans which are designed to positively impact the brook and other natural resources.

6.0 – Appendices

Appendix A: VTrans *Snow and Ice Control Plan* (2013)
Appendix B: Town of Colchester *Snow and Ice Removal Plan* (2013)

Appendix C: VTrans MS4 Permit (General Permit 3-9014)
-Not included in this plan; located on ANR Website:
http://www.vtwaterquality.org/stormwater/docs/ms4/sw_VTrans_MS4_SWMP.pdf

VERMONT AGENCY OF TRANSPORTATION

SNOW AND ICE CONTROL PLAN

FOR STATE AND INTERSTATE HIGHWAYS

A. PURPOSE AND NEED

The purpose of this plan is to define the operational procedures and best management practices (BMPs) for storing and utilizing snow and ice control materials, and for performing winter maintenance activities. It defines the levels of service that the Vermont Agency of Transportation (VTrans) will strive to provide at our facilities and on our highways. This plan allows for and encourages improvement in operational efficiency in providing the desired levels of service. It also provides guidance to help minimize leaching of salt-laden and other winter maintenance material runoff from state-owned paved surfaces and storage facilities into the ground or into surface waters.

Since storms vary dramatically across the state and occur over a variety of paved surfaces and traffic conditions, this Snow and Ice Control Plan (SIC Plan) is intended to be flexible. It is a guide structured to fit average conditions, but able to accommodate the wide variety of conditions that will be encountered by maintenance crews who are working to maintain safe roads at safe speeds.

B. LEVEL OF SERVICE – GENERAL INFORMATION

VTrans Maintenance District snow and ice control operations are limited by the resources (budget, personnel, equipment and materials) available for winter maintenance. Consequently, VTrans' SIC Plan calls for "safe roads as safe speeds", and not "bare roads". This means that roads during a storm are maintained to allow safe travel at safe speeds, but that drivers should expect to see snow on the roadway during a storm. Most travel takes place during the day, so the majority of VTrans resources are used between 4 a.m. and 10 p.m. During those hours, the average plow routes will be between 2 to 2 ½ hours. However, motorists should anticipate reduced coverage and varying road conditions at night, and should drive accordingly.

C. CORRIDOR PRIORITIES

Four color-coded levels of service have been established and are shown on the attached "Corridor Priority Map". Priorities were established based on winter traffic volumes, roadway classification, and expected truck traffic. Note that critical areas such as intersections, areas of extreme curvature and problem grades may have to be treated differently to retain proper mobility and safety regardless of the corridor designation assigned to the balance of the route.

1. **CORRIDOR PRIORITY 1 – INTERSTATE AND LIMITED ACCESS HIGHWAYS (ORANGE ROADS).**

   Snow will be removed between 3 am and 10 pm. Equipment such as tow plows and graders will be utilized to facilitate snow removal activities. During off hours, resources will be shifted to prioritize coverage on these routes. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. After the storm has subsided, bare travel lanes shall be provided as soon as practical and on these roads before all others. In most cases, this will occur within 4 daylight hours. A bare pavement shoulder to shoulder will be provided as soon as practical. The suggested maximum travel speed during the storm for "Orange Roads" is 50 mph, or 10 mph below the posted speed limit, whichever is less.

2. **CORRIDOR PRIORITY 2 – HIGH TRAFFIC HIGHWAYS & TRUCK ROUTES (BLUE ROADS)**

   Snow will be removed between 4 am and 10 pm. During off hours a skeleton crew will be used as needed. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. After the storm has subsided, a bare pavement shoulder to shoulder will be provided as soon as practical. The suggested maximum travel speed for "Blue Roads" is 45 mph, or 10 mph below the posted speed limit, whichever is less.

3. **CORRIDOR PRIORITY 3 - MEDIUM TRAFFIC HIGHWAYS (GREEN ROADS)**

   Snow will be removed between 4 am and 10 pm. During off hours a skeleton crew will be used as needed. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. During the next regular working day after the storm has subsided, a bare pavement shoulder to shoulder will be provided as soon as practical. The suggested maximum travel speed for "Green Roads" is 40 mph, or 10 mph below the posted speed limit, whichever is less.

4. **CORRIDOR PRIORITY 4 – LOW TRAFFIC HIGHWAYS (YELLOW ROADS)**

   Snow will be removed between 4 am and 10 pm. During off hours a skeleton crew will be used as needed. Materials noted under Section E will be applied as needed to keep the roads open to traffic and provide a safe surface on which to operate. Road surface may be snow covered during and immediately following the storm. During the next regular working day after the storm has subsided, one third bare pavement, in the middle of the road, will be provided as soon as practical. As soon thereafter as practical, a bare pavement shoulder to shoulder will be provided. The suggested maximum travel speed for "Yellow Roads" is 35 mph, or 10 mph below the posted speed limit, whichever is less.

D. PERFORMANCE MEASUREMENT & PROGRAM EFFECTIVENESS ASSESSMENT

Performance during and immediately following individual storm events will be periodically monitored by the District General Manager and the Area Maintenance Supervisors to ensure VTrans is providing safe roads at safe speeds and performing snow and ice removal in accordance with established Corridor Priorities noted under Section C.

In addition, to monitor performance, the following information will be reviewed by the Director of Operations, the Maintenance Transportation Administrator (MTA) and the District Transportation Administrators ("DTAs") annually to gage program effectiveness:

- Material application rates
- Vehicle speeds during and after storm events
- Condition of travel lanes and shoulders during and after storm events
- Storm data (precipitation, air temperature, road surface temperature, wind speed, etc)
- Plowing frequency

Overall performance during and following the winter season will be measured by monitoring material usage, labor costs, and equipment costs with respect to the number of lane miles maintained and the number of storm events addressed. Assessments will be made based upon consideration of the resources used versus the winter severity encountered, as well as through comparisons between adjacent and nearby geographical areas that have encountered similar winter conditions.

VTrans Operations Division will publish an annual report each spring which summarizes the previous winter, and VTrans' performance according to the above mentioned metrics.

E. MATERIALS AND APPLICATION PROCEDURES

The materials in this section are those that are primarily used by VTrans for snow and ice control on highways throughout Vermont. This section describes the general purpose of each material, the typical use that is expected under normal conditions, and the application procedure. Choice of materials will depend on experienced consideration of the following variables: pavement temperature, nature of the particular snow and ice event, forecast storm conditions, air temperature and wind velocity, traffic volume, time of day/year, and the availability of resources.

Procedures for determining application rates and methods will be the responsibility of District Personnel based on this SIC Plan, available material application technology, and other factors that vary across the state from region to region.

1. Salt (NaCl)

Unless otherwise designated for specific routes, salt is the primary material used on the majority of roads maintained by VTrans. Salt is used to prevent the bonding of snow and ice onto the pavement surface, and to melt snow and ice that cannot be removed by plowing. Unless salt is pre-wetted with a liquid having a lower working temperature than sodium chloride, the lowest effective working temperature is approximately 15 degrees F.

Application Rates shall normally be selected from the attached "Salt Application Quick Reference Guideline" (Appendix A) and shall be based upon the pavement temperature; snow-ice conditions encountered, and anticipated trends. Initial applications should normally be 25% higher than the average rate indicated by the chart. Generally, salt will be used when the pavement temperatures are 15 degrees F or higher. When pavement temperatures are less than 15 degrees F and not rising, winter sand may be used when necessary for temporary traction. During cold storms, when the pavements are dry and the snow is blowing off the travel lanes, the application of salt or winter sand is to be avoided for as long as possible since it will hasten the formation of ice on the pavement. When ice does begin to form under these conditions, considerable judgment will be required on whether to use salt that is pre-wetted with liquid or spot applications of winter sand.

Appendix B (Application Rates vs. Miles You Can Treat) is provided as a quick reference guide for maintenance workers and supervisors.

2. Winter Sand

Winter sand shall consist of coarse, clean, sharp sand or other granular material. Sand is generally used to provide traction at intersections and corners during icy conditions. When conditions warrant, salt may be mixed with sand to break the bond between the ice pack and road surface.

Sand should generally be used in the following situations:

- On hills, curves and intersections where the supervisor determines that temporary traction is needed
- In situations where salt can not work fast enough (i.e. accident scenes involving excessive ice)
- When pavement temperatures are too low for salt to work properly
- When wet pavements exist on lower-volume corridors and falling nighttime temperatures may cause glazing

3. Liquids

A variety of liquids are used to either "pre-wet" solid materials that are applied from the plow trucks or to "anti-ice" the highways in advance of a storm event. Following are descriptions of the types of liquids used by VTrans, and descriptions of the "anti-icing" and "pre-wetting" process.

a) **Salt Brine** - Salt brine is a 23% solution of salt in water. It can be used to either "pre-wet" solid materials that are applied from the plow trucks or to "pre-treat" the highways in advance of a storm event. However, unless salt brine is mixed with additives, the effective working temperature is the same as salt in its solid form – approximately 15 degrees F or greater.

b) **Chemical Additives** – Chemical additives are used to pre-wet the solid materials that are applied by the plow trucks to lower the effective working temperature of salt and to help keep the solid materials on the road during the application process. Examples of such chemicals may include magnesium chloride ($MgCl_2$), calcium chloride ($CaCl$) and a number of proprietary products.

c) **Liquid Chloride Blends** – Liquid Chloride blends are used to stretch the working range of salt brine without incurring the full cost of a chemical product.

d) **Anti-icing** - For anti-icing with salt brine, the application rates per lane mile may vary when pavement temperatures *during the storm* are anticipated to be 15 degrees F or greater. Application will generally occur on designated routes 6 to 8 hours prior to the projected start of the storm, however, up to 12 hours may be permissible based on timing of the storm. Anti-icing may also be used to spot treat bridge decks and other problem areas located on any priority corridor whenever weather forecasts indicate the possibility of glazing. When anti-icing the roads with a blend, application rates may be cut back.

e) **Pre-wetting** - Pre-wetting is the application of liquids onto solid materials. In general, salt brine shall normally be used when the pavement temperatures are above approximately 15 degrees F and chemical additive or blend shall be used when below.

F. EQUIPMENT

1. Washing Equipment

Snow and ice control equipment are to be thoroughly washed during regular working hours as soon after use as practicable. Particular attention is to be paid to the areas of equipment in contact with sand, salt and liquid chlorides. With heated power washers, truck washing will normally be accomplished outdoors in designated areas.

2. Overnight Loads

In general, trucks should not be left loaded overnight since it subjects the equipment to unnecessary wear. However, in the event that a winter storm is forecast at some point during the approaching night, a crew may load trucks to enable a quicker response to the storm. Such loading shall be in compliance with the following:

a) Load size shall not exceed a level-load.

b) If the storm does not occur, the truck(s) loaded in advance shall be unloaded and washed out the following working day.

3. Spreaders

Each spreading unit shall be calibrated annually, and after any spreader or hydraulic maintenance, to insure that selected rates of application are attained.

G. OPERATIONS

1. Mailboxes And Other Structures Within The Highway Right-Of-Way

Occasionally mailboxes or other devices are damaged by snow plowing operations due to poor visibility, the mailbox being buried in a snow bank or the weight/volume of the snow being plowed. This damage is not deliberate and in most cases is unavoidable. VTrans is not responsible for damage and does not repair, replace or re-erect boxes that are located within the highway right-of-way unless physically struck by a VTrans plow truck. In these cases, VTrans will replace the mailbox at no cost to the property owner with a generic United States Post Office approved box.

2. **Widening or Pushing Back Snow Banks**

Following storms with heavy snowfall or when several storms result in substantial snow bankings, VTrans will undertake a roadway widening procedure, which will push back the snow banks. This is generally done during normal working hours, and is a necessary operation because it accomplishes the following:

a) Provides room for future snow storage.
b) Reduces or prevents melted snow from running out onto the roadway pavement and creating icing conditions.
c) Increases safe sight distance at intersections and driveways.
d) Maintains a uniform line by eliminating protrusions at driveways and intersections.

Unfortunately there is no way to prevent depositing snow in previously cleaned driveways or walkways except to leave a hazardous projecting mound of snow. With thousands of driveways of all sizes and descriptions along our highway system it is impossible to clear these individual drives as the cost would be prohibitive.

3. **Sidewalks**

The maintenance of the sidewalks, including snow removal, is the responsibility of the local community. This is firm and longstanding statewide. In addition, in those communities where on-street parking is permitted, snow removal from the parking areas, including plowing and or hauling away, is a local responsibility.

4. **Tow Plows**

Tow plows will be used primarily on limited access facilities and interchanges to clear multiple lanes at the same time. An effort will be made to avoid impacts to traffic during morning and evening commute times.

H. STATE AND FEDERAL REGULATORY OVERSIGHT

1. **Winter Maintenance Practices located within designated National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) areas, including Watersheds of Sediment Impaired Waterways, and in the Lake Champlain Watershed Basin:**

Winter maintenance activities in these areas have and will continue to be regulated and addressed under the VTrans MS4 Stormwater Management Plan. Please refer to the VTrans Operations Environmental Program web site for more information regarding the above referenced designations as they may change from time to time and for information regarding the VTrans MS4 Stormwater Management Plan. Link to this site at: http://www.aot.state.vt.us/ops/TechnicalServices/stormwater/MS4GP3-9014.htm

2. **Winter Maintenance Practices - Statewide Implementation and Jurisdiction:**

   VTrans SIC Plan has and will continue to be implemented across the state and will not be subject to ANR jurisdiction outside the designated MS4 & Lake Champlain Basin areas. The Operations Environmental Program will forward to the State Agency of Natural Resources (ANR) the SIC Plan as often as updates are made.

I. BEST MANAGEMENT PRACTICES, TRACKING AND REPORTING

Best management practices associated with winter maintenance activities in conformance with the provisions of the VTrans SIC Plan include, but are not limited to:

1. Normal winter maintenance will conform to the provisions of the current VTrans winter maintenance standards included in this SIC Plan.

2. VTrans shall disseminate the SIC Plan statewide to employees involved in the application and storage of winter snow and ice control materials and train such employees in the proper performance of these standards. The Operations Environmental Program Manager will ensure that this information is posted on the VTrans Web Site, kept current, and made available to ANR.

3. Low salt and no salt roads (zones) will be signed in the field accordingly.

4. Weekly internal reporting of salt/sand usage will be completed by Operations Division staff commencing on the first week of November and terminating 26 weeks later, typically with the last week of April. VTrans shall make note of any single de-icing salt application in excess of 800 pounds per two-lane mile and report such incidents as part of the weekly reporting. The Director of Operations will make this information available to ANR upon request.

5. VTrans shall fully cover with impervious material all bulk salt storage areas under their control to reduce the amount and concentration of salt to the runoff of stormwater from these storage areas. All bulk salt storage shall be situated on an impervious material so as to minimize leaching of salt-laden runoff into the ground.

6. VTrans shall locate sand piles at District Maintenance Facilities in areas that will not result in sediment-laden runoff into surface waters. If sand piles are located in close proximity to surface waters then VTrans shall install adequate erosion prevention and sediment control practices to ensure sediment-laden runoff will not impact surface waters.

7. When it is desirable to charge sand piles with salt to prevent freezing (resulting in mixes or blends), the percentage of salt in the pile shall not exceed 5%.

8. VTrans will implement these activities on a statewide basis in accordance with the protocols and best management practices established within the MS4 and Lake Champlain Basin areas for seamless operational efficiencies across the state and to support the stated purpose of this SIC Plan. The Operations Environmental Program will report on these tasks as a part of each annual MS4 report to ANR.

9. VTrans will plan, organize and conduct an annual PR campaign associated with safe winter driving, as funding allows.

10. Nothing in this SIC Plan shall preclude the Agency from utilizing experimental and new technologies to achieve higher efficiency in a cost effective and environmentally sensitive manner. VTrans actively supports innovation and promotes the idea of finding new and better ways to reach our goals.

Approved: 11-12-13
Date

By:
Brian Searles, Secretary of Transportation

Attachments:

- APPENDIX A – Salt Application Quick Reference Guideline
- APPENDIX B – Application Rates vs. Miles You Can Treat
- Corridor Priority Map

Town of Colchester
SNOW AND ICE REMOVAL PLAN

Developed by the Colchester Public Works Department
For the Town of Colchester
Updated and Adopted on July 9, 2013
By the:

COLCHESTER SELECT BOARD
Nadine Scibek, Chair
Marc Landry, Vice Chair
Herb Downing
Kathrine Niquette
Tom Mulcahy

TOWN MANAGER
Dawn Francis

DIRECTOR OF PUBLIC WORKS
Bryan K.Osborne

OPERATIONS MANAGER
Floyd Sheesley

"Please Drive Safely"

www.colchestervt.gov

SECTION 1.0 - GENERAL

1.1 Purpose and Need

Snow and ice covered roads are more than an inconvenience. Vehicle mobility is reduced, and the potential for accidents increases. Besides substantial economic losses, accidents produce the likelihood of injuries and fatalities. Clearing snow and ice from roads through an effective winter maintenance operation may help reduce storm related accidents.

Mobility is imperative to our community. People need to travel to work, to shop, or go to church. Children must ride buses to attend school, sporting events, or other activities. Businesses must deliver goods and services. Controlling hazardous conditions created by winter storms as quickly as possible and keeping roads open is essential to maintaining public mobility.

Mobility for emergency vehicles is a priority too. During winter snow storms people still have heart attacks, law enforcement is needed, and homes catch on fire. Response time for paramedics, police, and fire fighters is measured in minutes and seconds when lives and property hang in the balance. Road crews need to strive toward keeping roadways as clear as possible to minimize any delays for emergency vehicles.

Snow and ice covered roads produce some hidden costs in terms of the environment and the economy. Clogged roads cause disruptions in the flow of traffic and reduced travel speeds, thereby increasing fuel consumption. There are other economic factors to be considered as well. People may be late for work; absenteeism may increase; goods and services may not be delivered and production may decrease. To minimize the negative effects inherent to winter storms, an effective snow and ice removal plan is necessary.

1.2 Goals and Objectives

The primary goal and objective of the Town's Snow and Ice Removal Plan is to maintain safety and mobility on the Town's transportation system for motor vehicles and their operators that are properly equipped for travel in inclement weather conditions. The Town's transportation system consists of 88.61 miles of public roadways, 20.13 miles of private roadways and 37.92 miles of sidewalks and bikepaths. Additional goals and objectives include the following:

1. *Maintain mobility on the Town's transportation system within the fiscal constraints of the approved operating budget.* It is recognized that there are limitations to the Town's resources, and that these resource limitations may at times limit the Town's ability to meet this objective.

2. *Maintain mobility on the Town's transportation system while preserving and protecting the Town's natural resources.* It is recognized that some commonly accepted materials and practices associated with snow and ice removal operations are potentially harmful to natural resources, and that the use of these materials and practices may at times limit the Town's ability to meet this objective.

3. *Provide a higher level of service during peak demand traffic periods.* It is recognized that traffic volumes vary significantly over the course of any twenty-four hour period. The Town will attempt to manage its available resources to provide a higher level of service between the hours of 6:00am and 7:00pm when traffic volumes are typically at their highest.

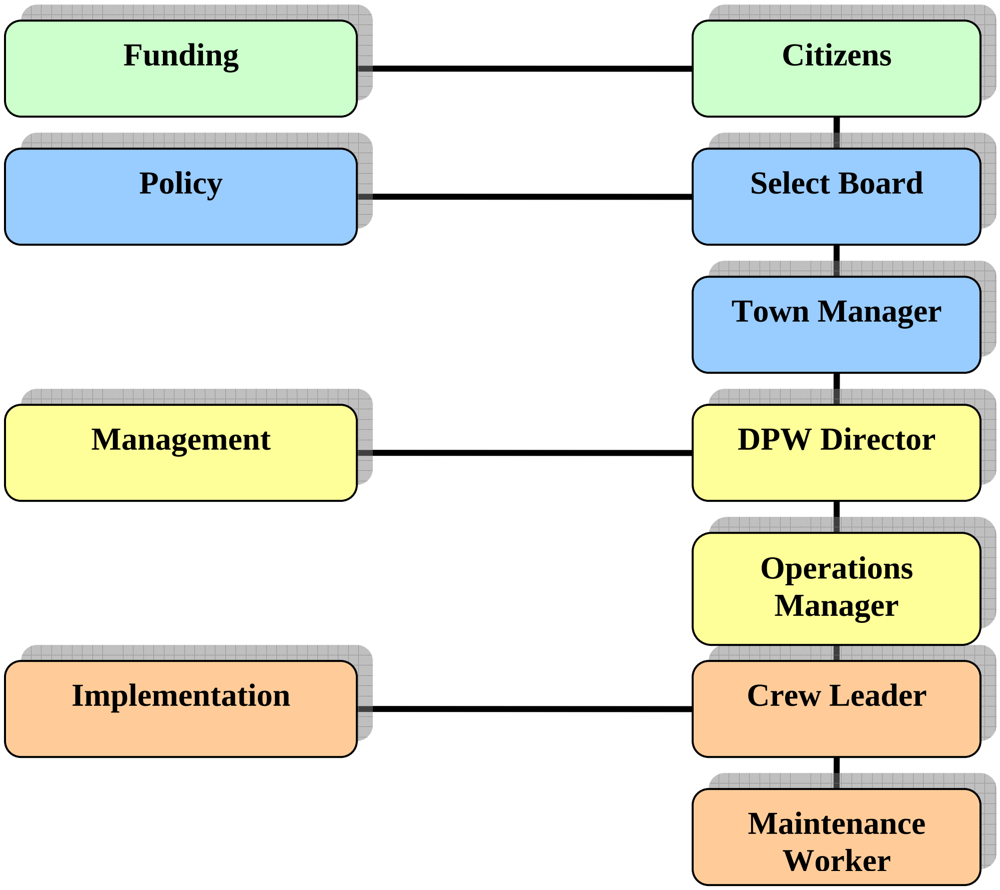
4. *Implementation of snow removal operations consistent with established priorities.* Due to their function, higher traffic speeds, and higher volumes, primary arterial and collector roadways shall be given priority over local residential streets for all snow and ice removal operations.

5. *Strive toward established performance measures.* The following data indicates the general performance goals that the Department of Public Works strives for to complete each task. These estimated hours may vary significantly depending on storm conditions, traffic volumes, and the availability of resources.

Mobilization	1 hour
Plow major arterials	2 hours
Plow secondary roads	4 hours
Plow sidewalks	7 hours
Salt/sand major arterials	2 hours
Salt/sand secondary roads	2 hours
Blow sidewalks	48 hours

1.3 Organizational Structure

Recognizing the far reaching circumstances associated with the Town's snow and ice removal operations, the organizational structure as described in this section is based upon a holistic approach. The Town Manager, reporting to the Select Board, works collaboratively to develop both policy and funding plans based upon specific recommendations from the Director of Public Works. The Select Board ultimately adopts the program policy and then forwards supporting funding recommendations to the voting public. With funding authorization, the Director of Public Works assumes primary management responsibility for the Town's snow and ice removal operations and works within the established funding and policy guidelines. The responsibility for daily operations is assigned by the Director to the department's Operations Manager, who in turn, works with crew leaders and maintenance staff to implement the plan. A flow chart illustrating this organizational structure is illustrated below:



1.4 Management Philosophy

The management philosophy of our snow and ice removal plan is based upon a balance of the basic principles of public safety, cost containment, and environmental sensitivity. We recognize that the public safety of our residents, guests, and travelers is paramount. At the same time however, we acknowledge that the community has financial limitations which ultimately shape the level of service that is provided. Finally, we understand the environmental impacts from both excessive vehicle emissions and the use of de-icers and abrasives in a lakeshore community, and strive to limit these factors through our snow and ice removal program. Although we have no control over the weather, we can control the management of our program which involves the assessment of each action to be taken before, during and after a storm, and evaluate them against our basic management principles to ensure their consistency with our philosophy.

1.5 Management Approach

This Snow and Ice Removal Plan identifies resources and procedural guidelines associated with the management of winter storms. These resources and guidelines serve as tools that are applied to complex and unpredictable weather conditions consisting of rapidly changing variables. Although preparation and planning are key elements of the plan, these steps alone can not ensure that a pre-determined plan will fully address the circumstances a winter storm may create. Consequently, working within the frame work of the plan, the Town will rely upon an adaptive management approach whereby management decisions may be made that involve revising the plan to produce the desired outcome. This adaptive management approach may result in variations of the basic operational phases of this plan in an attempt to maximize the efficiency and effectiveness of the Town's resources, and achieve to the greatest extent practical, the overall goals and objectives of this plan.

1.6 Personnel Policy

This Snow and Ice Removal Plan incorporates by reference the Town of Colchester's Comprehensive Personnel Policy Manual as most recently adopted or amended by the Colchester Select Board. In the event of conflicting provisions between these two documents, the stricter shall prevail.

1.7 Disclaimer

The Town of Colchester is dedicated to maintaining both mobility and safety on its transportation system. However, the Town of Colchester has a finite level of available resources to perform the tasks associated with its Snow and Ice Removal Program, and it is recognized that winter storms create rapidly changing weather conditions that are inherently dangerous, unpredictable, and uncontrollable, requiring independent judgment and decisions from Town employees. Consequently, the Town of Colchester makes no representation, or offers no guarantees, and assumes no liability that through the implementation of this Snow and Ice Removal Plan, the Town's transportation system will always be safe for public travel, and that there will not be incidents of property damage, injury or death related to road conditions. All individuals operating motor vehicles on Colchester Town roadways are encouraged to be mentally prepared for operating a motor vehicle in inclement weather conditions and do so at their own risk, and as well, ensure that their motor vehicle is mechanically and adequately equipped to operate in inclement weather conditions.

SECTION 2.0 – REGULATIONS AND POLICIES

2.1 Ordinances

Chapter 12 - Traffic - Article III, Parking, Standing and Stopping

Sec. 12-32. Parking without authorization on public grounds.

(a) *Designation of areas.* No automobile shall be parked without authorization on publicly owned land within the Town and including, by way of illustration and not limitation, public and municipal parking lots, drives and ways, including the highways of the said Town, between the hours of 10:00 p.m. and 6:00 a.m. from the 15th day of November in each year until the following 15th day of March.

(b) *Penalty.* Any motor vehicle parked in violation of subsection (a) shall be ticketed, which ticket shall constitute a penalty of five dollars ($5.00) for the first violation. The penalty shall increase to fifteen dollars ($15.00) for the second or subsequent violation within thirty (30) days of previous violation; said ticket is payable within three (3) days of the offense as provided for in Title 23, Section 1746, V.S.A. Any police officer of the Town and the Town Manager are hereby authorized to cause vehicles parked in violation of this section to be removed and the owner of any vehicle so removed shall be required to pay a reasonable towing charge not to exceed forty-five dollars ($45.00) for such removal as well as storage charges not to exceed five dollars ($5.00) a day and there is hereby imposed a lien against such vehicle so removed for the payment of the said towing and storage charges.

Chapter 13 - Streets and Sidewalks - Article III, Snow and Ice Removal

Sec. 13-29. Dumping ice and snow in public areas.

(a) Placing prohibited without permission. No person, by their own act, or through their agents or employees, shall throw, put, push, or otherwise deposit snow, or ice, in the following public areas without written permission from the Director of Public Works or his/her designated representative.

(1) On the paved or traveled portion of any public street;

(2) On any Town sidewalk.

(b) Restrictions may accompany permission. In granting written permission under the previous section, the Director or his/her representatives may impose such restrictions as are necessary to protect the safety and welfare of the public, and such permission may be revoked at any time.

Chapter 1 - General Provisions

Sec. 1-9. General penalty; violations.

Civil Ordinance Violations Jurisdiction.

Enforcement of Civil Ordinance Violations

(1) A civil penalty (a fine not more than that allowed by law) may be imposed for a violation of a civil ordinance. Each day the violation continues shall constitute a separate violation. On all first offenses, the municipal officer shall issue a warning notice. After the first offense, if the violation continues, the municipal officer will issue a "municipal complaint". The following penalties will be assessed for all municipal complaints:

First offense	Warning notice
Second offense	\$50.00
Third and subsequent offenses	\$100.00
Waiver fee (second offense)	\$25.00
Waiver fee (third and subsequent offenses)	\$50.00

Sec. 13-30. Mailboxes.

No person shall construct and/or place a mail receptacle within the public right-of-way which does not meet all requirements including proper dimensions, heights, and distance from the road, as described by the United States Postal Service.

2.2 Policies

Emergencies - In the event of an unforeseen combination of circumstances, or an urgent need for assistance that calls for immediate action to protect the health or property of a citizen, the Town shall attempt to plow any road in order to protect and serve a citizen of Colchester.

Material Usage - At the discretion of the Town, de-icers may be used to control ice and snow accumulations on the roads when temperatures exceed 20 degrees Fahrenheit, and de-icers, abrasives or a combination of these materials when temperatures are below 20 degrees Fahrenheit.

Road Conditions - Although the Town shall strive to maintain safe driving conditions on the roadways to the greatest extent possible within the limitations of its resources, the Town can not keep roadways continuously free of ice and snow, and offers no guarantee and/or assumes any liability that roads will always be free of ice and snow, and present no hazard to the traveling public.

Sidewalk Conditions - Although the Town shall strive to maintain safe walking conditions on the sidewalks to the greatest extent possible within the limitations of its resources, the Town can not keep sidewalks continuously free of ice and snow, and offers no guarantee and/or assumes any liability that sidewalks will always be free of ice and snow, and present no hazard to the traveling public.

Hours of Work - The Town will strive to provide the highest possible level of service practical during peak traffic hours, while protecting all Town employees involved within the Town's snow and ice removal program. To ensure this condition, the Town may manage it's human resources by discontinuing snow and ice removal activities during the hours of 10:00 p.m. and 4:00 a.m. Snow and ice removal activities will only take place during these hours, which may include single operator patrol, when in the opinion of the Director of Public Works, or his designee, the work can be performed without exhausting the Town's available resources or placing the public and/or the Town's employees in danger, or if the work is considered necessary to avoid a condition where roadways are impassable to emergency services.

Complaints - The Town shall investigate any and all complaints received regarding the Town's snow and ice removal operations. If the situation can be corrected or improved it will be addressed at the first opportunity. If the complainant leaves a name and/or telephone number and request that they are contacted, they will be contacted by a public works representative within 24 hours from the time received.

Mail Boxes – The Town will investigate any reported damage to mail boxes caused by the Town’s snow removal operations. If the investigation concludes that the damage was caused by the Town’s snow removal operations, and that the mail box was properly positioned in accordance with U.S. Postal Standards, the Town will replace it in kind.

SECTION 3.0 - RESOURCES

3.1 Town Equipment

The following equipment is available for snow and ice removal operations. All equipment is located at the Public Works Garage on Blakely Road.

Plow Trucks:	6 (35,000 GVW trucks equipped with front plow, wing plow and computerized material spreader.)
One Ton Trucks:	2 (Equipped with front reversible plow and material spreader.)
Grader:	1 (Equipped with underbody plow and wing plow.)
Loader:	1 (Equipped with front bucket.)
Sidewalk Tractors:	2 (Equipped with front V-plow and blower)

3.2 Contract Equipment

The Town of Colchester does not have a contract with any local contractors for snow removal equipment, nor is any contractual equipment reserved or committed to the Town of Colchester. The following lists of contactors do have various pieces of snow removal equipment that have been made available to the Town in the past, and may be available on an as needed basis.

All Seasons Excavating	(802) 655-3976
A. Marcelino & Company	(802) 862-6383
Engineers Construction	(802) 863-6389
Ormond Bushey & Sons	(802) 872-8110

3.3 Communications

All equipment listed in section 3.1 is equipped with two-way radio systems. All systems are accessible to the Colchester Police Department and Public Works base stations. A base station is located in the Public Works office at 781 Blakely Road. There is also a base station located at the Public Works Maintenance Facility at 711 Blakely Road.

The Director of Public Works and the Department's Operations Manager also have two-way radios in their vehicles. These vehicles are designated as command vehicles within the Town's Emergency Operations Plan, and are equipped with multi-agency capability. The Director of Public Works, Operations Manager and the Highway Crew Leader also carry cellular phones.

3.4 Personnel

(8) Truck Drivers
(2) Heavy Equipment Operators
(1) Sidewalk Plow Operator
(2) Mechanics

3.5 Materials

Road Salt: 1,750 tons (200 ton storage capacity.)

Road Sand: 3,500 tons

All materials are located at the Public Works Maintenance Facility.

3.6 Weather Services

The primary advanced notification source for approaching winter storms is the internet, accessed from the Operations Managers Office and the Public Works Maintenance Facility. Selected sites are monitored on a regular basis where detailed forecasts and computer modeling are evaluated. These sites are as follows:

www.intellicast.com
www.weather.com
www.erh.noaa.gov/btv/index.php

As the storm enters the region, monitoring of these sites continues utilizing Doppler radar tools. Additionally, the National Weather Service at the Burlington International Airport is contacted where public works managers can speak to staff Meteorologist to discuss and interpret real time weather data specific to the Town of Colchester.

3.7 Fuel

The Town's fuel depot is located at the Public Works Maintenance Facility. All snow removal equipment is fueled at this facility. The facility has two separate permitted underground storage tanks which hold 10,000 gallons of unleaded fuel, and 10,000 gallons of diesel fuel. The fueling system can only be accessed through the use of a coded access card assigned to each piece of equipment. Access to the fueling system also requires the operator to enter basic usage information related to the equipment. The system then electronically transfers this information to the Department's Computerized Preventative Maintenance Program in support of overall equipment maintenance programs.

3.8 Equipment Maintenance

The Department has two full time mechanics who work out of the Public Works Maintenance Facility. This is a full service maintenance facility with two double stack service bays. The mechanics are fully trained to perform all routine maintenance and repair of both diesel and gas powered equipment. Capabilities include computer diagnostics, electrical and hydraulic systems, welding and equipment fabrication. The Department also maintains a service vehicle which allows most of these services to be preformed in the field if necessary. During off hour storm events, mechanics will be called in on an as needed basis by either the Highway Crew Leader or the Operations Manager. During severe storms, the Operation Manager may elect to call in mechanics on a standby basis. For efficiency, normal routine work is performed by the mechanics while operating under standby conditions.

SECTION 4.0 – INTER-AGENCY COORDINATION

4.1 Colchester Police Department

During regular working hours, or other times when snow removal operations have been implemented, the Police Department advises the Public Works Department of hazardous road conditions. It is the responsibility of the Public Works Department to have management control over all snow removal operations at all times. In response to communications from the Police Department advising of hazardous road conditions, the Highway Crew Leader in charge shall evaluate the situation, may consult with the Operations Manager, and then determine the appropriate response.

During non-working hours, the Highway Crew Leader shall rely on notification from the Police Department that precipitation has begun, or that in their opinion, driving conditions are becoming hazardous. Notification will be made by the Police dispatch utilizing either a direct dial to the Crew Leader's residence or their cellular phone. Updated contact numbers and schedules are provided to the Police Department on November 1 of each year. After notification is received, the Crew Leader shall evaluate each situation, may consult with the Operations Manager, and then determine the appropriate response.

In each case, the evaluation may include, but may not be limited to, time of day, day of week, special events, temperature, snow intensity and characteristics, weather forecasts, availability of resources, and whether the situation can be improved consistent with the Department's basic management principles. In the event the Police Department is not satisfied with the decision, the Police may contact the Director of Public Works who will assess the situation, may consult with the Town Manager, and then make a final decision.

The Department of Public Works shall keep the Police Department fully advised on the status of the snow and ice removal operations, as well as any plans that will be implemented in response to the storm that may have an impact on road conditions.

4.2 Colchester Fire Departments

Fire fighting during freezing weather often results in ice accumulations along portions of the transportation system. The Department of Public Works closely monitors fire scenes to ensure that these sections of roadways are properly treated with de-icers during and following a fire event. In the event that the response by the Fire Department to a scene is prevented or significantly hindered by poor road conditions, the Public Works Department will divert the necessary equipment from its normal routing to facilitate the response by fire equipment.

4.3 Colchester Rescue Department

In the event that the response by the Rescue Department to a scene is prevented or significantly hindered by poor road conditions, the Public Works Department will divert the necessary equipment from its normal routing to facilitate the response by rescue equipment.

4.4 Colchester School District

The School District relies primarily on bussing to accommodate their student transportation needs. The current arrangement is with a private contractor. Road conditions are an important consideration when the School District decides to close schools due to unfavorable weather conditions. Upon request, the Public Works Department shall provide to the School District, or their transportation contractor, any available information that will assist them in their decision process. Information may include, but may not be limited to road conditions, weather forecasts, and any plans that will be implemented in response to the storm that will have an impact on road conditions. The Department of Public Works shall not provide recommendations on school closures. This responsibility lies solely with the School District.

4.5 Colchester Water Departments

Water line breaks during freezing weather often result in ice accumulations along portions of the transportation system. The Department of Public Works closely monitors these scenes to ensure that these sections of roadways are properly treated with de-icers during and following a water break.

4.6 Vermont Agency of Transportation

The Vermont Agency of Transportation, through the District #5 Maintenance Facility located at Exit 17 in Colchester, is responsible for all state and federal highways within the Town of Colchester. These include Rt. 2, Rt. 2a, Rt. 7, Rt. 15 and I-89. Although both the state and the Town have their respective snow and ice removal responsibilities, both agencies are willing to assist the other in an emergency situation if possible. Because these state highways are an important component of the Town's overall transportation system, the state is advised of any dangerous road conditions that are encountered on these roadways by the Town.

SECTION 5.0 – ADMINISTRATIVE PROCEDURES

5.1 Storm Preparation

Upon arrival of a winter storm, driving conditions deteriorate rapidly, requiring a rapid response from the Town's snow and ice removal program. To improve the readiness and reliability of the Town's resources, careful preparations are made for each storm. Although there are many preparatory steps to be considered, certainly the development of a management plan is one of the most critical.

A management briefing between the Operations Manager and the Highway Crew Leader will take place to evaluate weather data and other storm variables, as well as the availability of resources when winter storm events are predicted. In the event of major winter storms, the Director of Public Works may also participate in this planning process. In any case, the Highway Crew Leader's goal is to implement a specific management strategy developed for each storm that is matched to the variables expected from the event. Contingency plans may also be developed to accommodate various outcomes that are not consistent with the expected event.

The 10 year mean snowfall average in Colchester, Vermont is approximately 80 inches. Snowfall accumulation alone however, cannot be the only judge of costs, public perceptions, hardships, and other problems associated with winter weather. The following information outlines some of the more significant winter weather variables that are considered during the planning process for each storm.

Moisture Content: Depending on climatic conditions, the moisture content of snow may vary significantly. From the standpoint of snow and ice removal operations, the less moisture there is in the snow, the better. As the moisture content increases, several negative effects begin to develop.

(a) A high moisture content indicates that there is a significant amount of water in the snow. The water accelerates the dilution of the de-icers applied to the roadway, and thereby, reduces the effectiveness of the de-icers. Subsequently, increased de-icing becomes necessary which increases the cost of the storm.

(b) Water can be thought of as a lubricant. Subsequently, the higher the moisture content in the snow, the more slippery the roads will become.

(c) High moisture contents add mass or weight to the snow. As the moisture content increases, the snow becomes increasingly more difficult to push with the plows. This results in slower plow speeds, increased fuel consumption, and increased wear on the equipment.

(d) High moisture contents allow the snow to bond more easily to both the roadway and to itself. Under traffic, the snow is packed down on the roadway, and becomes difficult and expensive to remove.

(e) Winter storms that produce snow with high moisture contents are typically referred to as "wet storms". These types of storms are often followed by cold fronts resulting in rapidly falling temperatures. Under these conditions, it becomes imperative that accumulated snow be removed as soon as possible to avoid freezing.

Timing: The period of time in which snow fall occurs is critical. With storms that occur during the off peak traffic hours, such as 7:00 p.m. to 4:00 a.m.; major arterial roads can usually be sufficiently cleared before peak traffic times. However, when storms develop during peak traffic hours, significantly more cars will be impacted by poor road conditions. The morning and evening commuting hours are the worst time for storms to develop.

Duration: The storm duration refers to the length of time snowfall continues. Generally, the faster a storm comes in and leaves the better. Three inches of snow that falls in 24 hours may cost twice as much as twelve inches of snow that falls in 8 hours. Storms of long duration increase salt use, equipment, and labor hours. Storms of extended duration severely tax available resources to maintain the roads over a prolonged period of time.

Freezing Rain: Freezing rain occurs when warm upper level air masses ride over colder air near the surface. As precipitation begins within the warm air in the form of rain, it eventually falls through the colder air near the surface, causing it to freeze. This weather condition presents the most hazardous driving conditions encountered during winter storms. This type of weather condition requires significant amounts of de-icers and abrasives to keep the roads passable.

Blowing Snow: Blowing snow occurs when high winds are present in open areas. Winds blow snow onto the roads creating isolated areas of poor road conditions. These conditions can exist for extended durations long after precipitation has ended.

Intensity: The intensity is a measure of how fast the snow is falling or accumulating. With storms of high intensity, the rate of accumulation may exceed the rate in which the equipment can remove the accumulated snow from the roadway within established performance parameters. Under this condition, snow removal efforts may fall behind, and roadways may become obstructed with snow.

In addition to assessing the various weather variables, ensuring that the necessary resources are available and in place is critical to the successful implementation of the management plan. All equipment should be fully prepared to execute the management plan. This should include such things as mechanical readiness, fueling, the attachment of plow equipment, pre-loading with sand or de-icers, and storage of equipment inside to ensure quick starts in inclement weather conditions. Sufficient materials should be on hand such as salt, sand, fuel, tire chains, wiper blades, and repair parts. All operational staff should be advised of the approaching event, and be adequately rested and prepared. Field preparations should be made to avoid any impediments to the operation. This may include such things as adequate snow storage areas, the removal of any barriers or obstructions, or the clearing of key drainage structures when heavy rains are expected.

5.2 Activation of Plan

Activation of the Town's Snow and Ice Removal Plan is defined by the deployment of resources that directly mitigate poor road conditions. As outlined later in the Operations Section of this plan, this point is referred to as Phase 3. The plan is activated when in the opinion of the Department of Public Works; road conditions have become, or are expected to become hazardous, and can reasonably be improved through the activation of the plan.

The authority to activate the plan shall vary depending upon the level of deployment. The Operations Manager and Highway Crew Leader are authorized to activate Phases 3 – 6 of the Snow and Ice Removal Plan. Phases 7 and 8 must be authorized by the Director of Public Works.

5.3 Monitoring and Management Decisions

Ongoing monitoring of storms in progress, and subsequent management decisions are critical activities of the overall plan. The characteristics of the storm and the condition and availability of resources are monitored throughout the storm event, and measured against the management plan that was developed for the storm. Because of the inherent unpredictability of weather events, and numerous other circumstances beyond the departments control, management decisions are often required that involve revising the plan to produce the desired outcome. This adaptive management approach may result in variations of the basic operational phases of this plan in an attempt to maximize the efficiency of the Town's resources. This process is the responsibility of the supervisor in charge of the storm, who may consult with their supervisor before making a decision. Although the Highway Crew Leader is considered the first line of supervision, both the Operations Manger and Director of Public Works may assume responsibility at any time. The level of supervision is determined by factors such as, but not limited to, the severity of the storm, availability of resources, overall roadway conditions, the level of resource deployment, or the general overall complexity of the operations.

5.4 News Releases

All news releases to newspapers, radio, and television will be provided by the Director of Public Works, or his designated representative. It will be the responsibility of the Operations Manager and Highway Crew Leaders to supply accurate information so that reports can be made to the public. The department shall be responsive to inquires from the media, and shall endeavor to keep the media informed if there is information that will benefit the residents and traveling public within the Town of Colchester.

5.5 Records

The Operations Manager shall be responsible for maintaining all records related to the Town's snow and ice removal operations. These records shall include all weather forecast information, labor, materials and equipment used during the storm and a log of events that document the times that various actions were taken by the Town. This information will be entered into a Storm Activity Log Sheet and be retained within the Public Works Departments files for a period of 5 years. (A sample of the Storm Activity Log Sheet is located in Section 7.0 – Appendix.)

5.6 Accident Procedures

When an employee or other person has been injured or there has been damage to Town or private property while on the job, a properly completed accident report must be submitted within twenty-four (24) hours of the accident. The employee’s supervisor and Department Head shall be responsible for signing and forwarding the properly completed report to Human Resources. Human Resources will report the incident to the Town Manager. If an employee is injured in a work related accident, he or she should follow the procedures for worker’s compensation as outlined in the Town’s Comprehensive Personnel Policy Manual. Any accident or incident which involves any piece of Town equipment and a private motor vehicle or individual, shall be reported to the Police Department immediately, regardless of the amount of damage.

5.7 Damage Claims

In the event that any departmental employee is contacted by an individual making a claim against the Town of Colchester associated with private property damage or personnel injury, or any individual associated with, or inquiring about a claim against the Town of Colchester, the employee shall make no representation or express any opinion relative to the claim, and immediately forward the claim to Human Resources.

SECTION 6.0 – OPERATIONS

6.1 Equipment Procedures

Equipment Fueling: Operators shall utilize the card system at the Public Works Maintenance Facility for fueling. All cards shall be coded to record fuel consumption, as well as odometer or hour meter readings for preventative maintenance purposes. For equipment that is equipped with hour meters, operators shall enter the hour meter readings into the fueling system each time fueling occurs. For all other equipment, operators shall enter odometer readings at the time of fueling. For equipment that is powered by diesel engines, only diesel fuel shall be used for fueling. All gasoline powered equipment shall use only gasoline. All equipment being fueled shall have all motors and electrical systems turned off. No burning cigarettes or other sources of ignition shall be allowed within a 50 ft. radius of the fueling facility. Any problems encountered during fueling operations, including accidental spills of fuel, shall be reported to the Operations Manager immediately.

Equipment Inspection: Inspection of equipment by the operator shall be done daily. Inspection shall include all applicable items on the Operator Daily Equipment and Safety and Security Checklist. Any and all damage and/or service requirements shall be reported to the Garage Foreman or his/her appointed designee on a service request form as soon as possible.

Equipment Greasing: All equipment requires greasing at regular intervals. These include daily, intermediate, and full service greasing. Greasing procedures are outlined in the equipment greasing file located in the Garage Foreman's office within the Public Works Garage.

Equipment Cleaning: The operator of the equipment shall be responsible for keeping the equipment cleaned inside and out. Special attention should be given to properly removing all de-icing agents from the equipment after use.

Energy Conservation: To minimize fuel consumption and harmful environmental impacts, any unnecessary idling of equipment shall be avoided. When operating equipment, the quickest and most direct route should be used whenever possible. All operators shall drive within the legal speed limits and shall avoid any unnecessary excessive acceleration.

Equipment Operations: All equipment operators shall be knowledgeable of all operating and safety requirements and must have valid appropriate licensing before operating any Town equipment. Equipment shall not be unnecessarily abused at any time and shall be operated within design performance ranges at all times. Equipment should not be used for purposes that it was not designed for. Wearing of all safety belts and harnesses provided is required at all times. Whenever equipment is backed into or out of the garage, a second employee should guide the operator from a safe vantage point. If a second employee is not available, the operator shall walk to the rear of the vehicle and visually inspect the area before attempting to back the equipment up.

Tarps: All trucks that are equipped with tarps are required to cover all loads before traveling over the roadway. After trucks have been loaded with material, operators shall take reasonable measures to ensure that no loose material exists on the vehicle that could potentially become dislodged while traveling over the roadway.

6.2 Salting Procedures

Required Resources: (6) 35,000gvw plow trucks with operators.
De-icers as required.

Salting operations should begin very early on in a storm with the most effective and efficient times being just moments before the roads become slippery. The optimal temperature range for use is above 20 degrees Fahrenheit. The effectiveness of salt begins to decline rapidly below these temperatures. Operators are responsible for assigned routes, which are salted in a priority sequence. Although the sequencing may change from one storm to another depending on storm variables, the priority is generally dictated by factors such as steep grades, curves, intersections, and traffic volumes. Salt rates, as well as methods of application, will be determined by the Operations Manager and Highway Crew Leader depending on the severity and conditions of the storm. Once determined and programmed salt application rates are continually monitored and controlled by on-board computer systems within each truck. Typical salting situations are as follows:

MAJOR ARTERIALS:	Suggested Salt Application Rates (Rates may vary with conditions.)
Normal Storms:	500 lbs. per 2 lane mile (Beginning of storm)
Freezing Rain:	300 lbs. per 2 lane mile (During storm, windrowed)
Post Storm:	300 lbs. per 2 lane mile (After storm)
Heavy Wet Snow:	800 lbs. per 2 lane mile (Beginning of storm)
Compacted Wet Snow: (Temperature dropping)	800 lbs. per 2 lane mile (After storm)
SECONDARY ROADS:	
Freezing Rain:	300 lbs. per 2 lane mile (During storm, windrowed)
Post Storm:	300 lbs. per 2 lane mile (After storm, Temp. above 32 F.)
Compacted Wet Snow: (Temperature dropping)	800 lbs. per 2 lane mile (After storm, Temp. above 32F.)

Special Note: Post storm and compacted wet snow salting should be done in conjunction with plowing if necessary to remove any residual snow and ice.

6.3 Sanding Procedures

Required Resources: (6) 35,000gvw plow trucks with operators.
(2) One ton trucks with operators.
Abrasives as required.

Sand is used as an abrasive and is considered an alternative to de-icers when storms, weather conditions, or road conditions do not favor the use of road salt. Typical situations where sand would be used are as follows:

Gravel Roads: Sand is the only material that is used on gravel roads. De-icers thaw the frozen gravel, which causes the road bed to become unstable. Because sand does not act as a de-icing agent, it is not applied at the beginning of a storm. Sand is typically applied to gravel roads after they have been plowed, or when ever they become slippery on a post storm basis. During periods of freezing rain, the rain easily washes the sand off the roadway, which requires frequent re-applications of sand.

Special Note: Under storm conditions where a transition from snow to rain occurs, and accumulated snows do not prevent roads from being traveled, the Operations Manager or Crew Leader may avoid removing the snow until the rain has stopped. The snow has some absorption qualities which absorb the rain. If gravel roads are plowed off, the rain quickly turns the surface to ice.

Major Arterials: Sand may be used during and after storms to improve poor driving conditions when temperatures are below 20 degrees Fahrenheit. Sanding during storms should only occur after plowing.

Secondary Roads: Sand may be used after storms to improve poor driving conditions when temperatures are below 20 degrees Fahrenheit.

6.4 Plowing Procedures

Required Resources: (6) 35,000gvw plow trucks with operators.
(2) One ton trucks with operators.
(1) Motor Grader with operator.
(2) Sidewalk plows with operators.

Plowing operations may be used to remove accumulating snow from the roadways following the applications of de-icers. Plowing is the most cost effective way of removing accumulated snow from the roadway, and is also the most favorable environmental approach. It provides a smooth driving surface for motorists.

Typical situations where plowing would be used are as follows:

Major Arterials: Plowing will usually begin on the major arterials when accumulations reach approximately 2". While snow is continuing to accumulate, plowing of major arterials should continue during normal snow removal hours.

Secondary Roads: The plowing of secondary roads usually will begin after accumulations have stopped, and/or all of the major arterials have been cleared. If accumulations of snow on secondary streets begin to exceed 6" then secondary streets may be plowed in conjunction with major arterial plowing. Under these conditions, secondary streets will be plowed as they are reached during the major arterial plowing process, and may not receive multiple passes to clear snow from curb to curb. In the interest of time and maintaining adequate clearing of major arterials, only a sufficient width to allow vehicles to pass will be cleared on secondary streets.

Gravel Roads: Gravel roads shall be treated generally as major arterials during a plowing operation.

Special Note: Special care must be taken in plowing gravel roads when they are soft. This typically occurs in the early and late portion of the winter when the road bed is not frozen. This can also occur during mid-winter thaws. To avoid damage to the roadway, the equipment, and the operators, gravel roads should be plowed with one ton dump trucks or the grader under these conditions.

Sidewalks: Although sidewalks are considered an important component to the overall transportation system, there are distinctly different risks associated with the use of snow covered sidewalks versus snow covered roadways. Accordingly, the following guidelines have been developed for the winter maintenance of the Town's sidewalk system. Depending upon conditions, it may become necessary to deviate from these guidelines as conditions require.

General Goals

The department shall strive to achieve the following goals within the fiscal constraints of the approved operating budget:

- Maintain mobility on the Town's pedestrian system.
- Provide increased priority to high pedestrian traffic areas such as around schools while school is in session, or other highly used pedestrian areas such as, but not limited to, the Route 15 sidewalks.
- Provide highest level of service during periods of highest use.
- Provide service as efficiently as possible.

Regular Time Operating Guidelines

- Sidewalks shall be plowed whenever conditions can be improved by plowing (generally greater than 1”).

- Plowing shall not commence when temperatures are expected to rise, resulting in the melting of any accumulated snow within 24 hours.

Overtime Operating Guidelines

- Sidewalks shall be plowed when total accumulations have reached 3 or more inches, with plowing beginning at 4:00 AM.
- Plowing shall not commence when temperatures are expected to rise, resulting in the melting of any accumulated snow within 24 hours.

Additional Operating Guidelines

- Whenever practical, sidewalk plowing will commence as close as possible to the end of a storm to avoid the need for repeated plowing.
- When any amount of wet snow has accumulated on the sidewalks and temperatures are expected to fall sharply, resulting in the freezing of wet snow, plowing shall proceed at any time to avoid this condition.
- Storms with significant snow accumulations or high moisture content may result in the need to deviate from these guidelines.

6.5 Operational Phases

The department’s Snow and Ice Removal Plan is organized into a total of eight operational phases. Each step involves a different level of activity or deployment of resources, depending upon the advancement of the storm and its relative severity. Generally, more significant storms will require a higher operational phase.

Phase 1 – Planning: Phase 1 involves pre-storm planning intended to develop a specific strategy for managing the expected storm event. This phase also involves the assessment and preparation of various resources that will be required to implement the management strategy. Phase 1 operations are outlined in more detail in Section *5.1 Storm Preparation*.

Phase 2 – Pre-Storm Monitoring: Phase 2 involves the deployment of one supervisor to monitor the early developmental stages of a storm, and the resulting road conditions. The objective of this phase is to anticipate deteriorating road conditions and facilitate a rapid response to the event, or, alternatively, to identify a deviation from a predicted event, and thereby avoid an unnecessary deployment of resources. Storm monitoring in general is discussed in more detail within Section *5.3 Monitoring and Management Decisions*.

Phase 3 – Advanced De-icing: Phase 3 involves the application of de-icers at the very onset of precipitation. The objective of this phase to create a salt brine on the road surface to prevent the snow from bonding to the pavement, and to reduce the number of accidents which are most common during the first hour of precipitation while motorists are attempting to adjust to rapidly changing driving conditions. Phase 3 is typically the first operational step for most storm events. Phase 3 utilizes the procedures outlined in Section *6.2 Salting Procedures*.

Phase 4 – Arterial Plowing: Phase 4 involves the scraping and plowing of accumulating snow along arterial and collector roadways within the Town's overall transportation system. The objective of this phase is to maintain safety and mobility along the portions of the transportation system carrying the majority of all traffic volumes, by removing accumulating snow and ice from the roadways, subsequent to advanced de-icing. Depending upon storm conditions and road surface types, de-icers and/or abrasives may be applied concurrently with this phase. Phase 4 utilizes the procedures outlined in Section *6.4 Plowing Procedures for Major Arterials* with an equipment deployment consistent with Section *6.2 Salting Procedures*.

Phase 5 – Full Scale Plowing: Phase 5 involves plowing of accumulating snow along all roadways under the Town's responsibility. The objective of this phase is to maintain safety and mobility along the portions of the transportation system carrying the majority of all traffic volumes, and as well to provide access to all lower functional local roadways along the transportation system and the Town's pedestrian network. To ensure that plowing operations keep pace with snow accumulations, roadways are cleared only to the necessary width to allow vehicles to safely pass. Depending upon storm conditions and road surface types, de-icers and/or abrasives may be applied concurrently with this phase. Phase 5 utilizes all of the procedures and resources outlined in Section *6.4 Plowing Procedures*.

Phase 6 - Post Storm Clean Up: Phase 6 involves both plowing and material application activities following the end of precipitation. The objective of this phase is to restore the roadways travel width and surface condition to the extent practical. Phase 6 utilizes all of the procedures and resources outlined in *Sections 6.2 - 6.4*.

Phase 7 – Contractual Assistance: Phase 7 involves the use of contractual snow removal equipment to assist in clearing snow accumulations from the Town's transportation system. This phase can only be implemented with authorization by the Director of Public Works. The Director may authorize this phase when in his opinion, the Town's resources are incapable of maintaining the Town's transportation system to an acceptable level of functionability. For purposes of this phase, functional is defined by an overall roadway condition that does not unreasonably impede the Town's ability to deliver emergency services, or threaten the overall public health and safety of the community. Resources associated with this phase are located in Section *3.2* of the plan.

Phase 8 – Disaster Declaration: Phase 8 involves a wide spread weather related disaster that has resulted in a State emergency declaration by the Governor, and then subsequently, a Federal Disaster Declaration by the President. Operating under this phase, and/or with the expectation of proceeding to this phase, special administrative protocols and procedures will be implemented in support of state and federal assistance. These protocols and procedures relate primarily to increased efforts associated with record keeping, to include detailed tracking of all disaster related costs, photo documentation, and attendance to any and all applicant briefings scheduled by state or federal officials. While under this phase, it is recognized that there may likely be resources that would otherwise be unavailable to the Town. These include, but may not be limited to, the Vermont Army National Guard, or the full or partial reimbursement for contractual assistance. Close contact must be maintained through the Vermont Agency of Transportation and the Vermont State Emergency Management Office while operating under this phase. Additionally, while under Phase 8, the Director of Public Works may elect to recommend activation of the Town's Emergency Operations Plan and open the Town's Emergency Operations Center.