STORMWATER REPORT

SITE DEVELOPMENT PERMITTING
14 STERLING ROAD
BILLERICA, MA 01862

Prepared For:

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CEC Project 347-159

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1.0 PROJECT NARRATIVE

1.1 INTRODUCTION

On behalf of Sterling Road, LLC (the "Applicant"), Civil & Environmental Consultants, Inc. (CEC) has prepared this stormwater report and analysis to demonstrate compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Billerica Stormwater Management Policy. This Stormwater Management Report describes the proposed design as depicted on the Site Plans prepared by CEC, dated March 2026.

The Applicant plans to develop a portion of a parcel of land located at 14 Sterling Road, in Billerica, Massachusetts (the "Site"). The project includes importing soil fill to expand the existing gravel contractor yard (construction equipment staging area) and construct associated stormwater improvements (the "Project").

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1.2 EXISTING CONDITIONS

1.2.1 Site Overview

The approximately 23-acre site is located at 14 Sterling Road in Billerica, Massachusetts (Parcel ID 38-28-3), and is located within the Industrial Zoning District as identified on the Town of Billerica Zoning Map. The Applicant previously developed a portion of the Site into a Contractors Yard by constructing the corporate headquarters and operations facility that exists today, which consists of two commercial/industrial buildings, a fueling station, outdoor equipment staging areas, and associated features such as paved drives, paved employee parking, gravel construction equipment staging areas, a soil absorption system (SAS), a stormwater management system including two infiltration basins and other ancillary subsurface utilities. The existing site conditions include approximately 1.3 acres of roof area associated with the two existing buildings, approximately 2.6 acres of paved impervious areas associated with the access drives and pedestrian walkways, and gravel surfaces within the outdoor equipment staging areas.

Bordering vegetated wetland (BVW) resource areas and intermittent streams exist on the site and nearby on the abutting property to the west. In general, the BVW and associated buffer zones extend along the western property boundary. The existing wetland resource area was initially delineated by Tighe & Bond, Inc. in 2016 and approved by the Billerica Conservation Commission (BCC) with the issuance of an Order of Resource Area Delineation (ORAD) on October 31, 2016 (DEP #109-1304/BBL #1304). The initial site development included filing a Notice of Intent with the BCC due to proposed disturbances within the 100-foot buffer zone to the BVW. Site features originally permitted within the 100-foot buffer zone include the western stormwater management basin, a concrete block retaining wall, and 2H:1V fill slopes abutting the wall on either side. The BCC approved the project and issued an Order of Conditions (OOC) on February 14, 2018. The certificate of compliance for the aforementioned OOC was issued on April 16, 2025. Subsequently, an additional study of the existing resource area was performed by Three Oaks Environmental in 2025 and an updated resource area delineation was submitted to the BCC in an Abbreviated Notice of Resource Area Delineation (ANRAD) submittal prepared by CEC and dated July 22, 2025. Following peer review, the BCC approved the updated delineation with the issuance of an ORAD dated November 17, 2025 (DEP #109-1603/BBL #1603). This updated, and approved, resource area delineation is shown on the accompanying Site Plans prepared by CEC.

Currently, stormwater runoff from the undeveloped portion of the site flows westerly overland and off-site towards the abutting wooded area and the BVW to the southwest of the Site. Stormwater runoff from the developed eastern portion of the site flows through the existing on-site stormwater management system. Deep sump and hooded catch basins, located throughout the Site, collect surface runoff and convey the flow to the existing stormwater basins. Stormwater runoff from existing paved areas flows through these catch basins and through water quality units before discharging into the stormwater basins. The existing eastern stormwater basin stores and infiltrates all incoming flow. The existing western stormwater basin infiltrates incoming flow and also includes an outlet control structure (OCS) to attenuate peak flows. Stormwater in excess of the storage and infiltration capacity of the existing western basin is discharged through the OCS towards the wooded area and BVW to the south of the Site.

1.2.2 Geotechnical Conditions

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the surficial soils at the site are classified as Urban Land (#602) and a variety of fine sandy loams (Ridgebury, Paxton, and Woodbridge, #71B, #307B, and #311B, respectively). Urban land refers to land that has been excavated and filled. The fine sandy loam profiles refer to coarse-loamy lodgment till derived from gneiss, granite, and/or schist.

Based on the review of the geotechnical conditions for the Site, two hydrologic soil groups (HSGs) were utilized in the hydrologic analysis, HSG C and HSG D. HSG C was only utilized in areas classified as Paxton fine sandy loam (#307B), as indicated on the NRCS soil report.

Test pits were previously completed by Tighe & Bond to verify the estimated seasonal high groundwater elevation as well as characteristics of the in-situ soil. The results of the test pit observations were included on the Notice of Intent site plans prepared by Tighe & Bond and approved by the BCC with the issuance of the order of conditions, as described in Section 1.2.1. The data indicates that the in-situ soil is classified as loamy sand; therefore, an infiltration rate of 2.41 inches per hour (i.e. the Rawl's rate for loamy sand) was utilized for design purposes in accordance with the Massachusetts Stormwater Handbook. Groundwater elevations were determined to be approximately 36 inches to 48 inches below existing grade based on redoximorphic features observed in the in-situ soil.

Refer to Appendix D for the NRCS Soil Information and Test Pit Logs. The test pit locations and the results of the soil test pit logs are shown on CEC's Site Plans (sheets C400 & C401)for reference.

1.2.3 Flood Zone

The Site is not located within any Special Flood Hazard Areas (SFHA) as shown on the Federal Emergency Agency (FEMA) Flood Insurance Rate Map (FIRM) for Middlesex County, Map #25017C0258F, effective July 7, 2014. Refer to Figure 3 for the FEMA Flood Insurance Rate Map Firmette.

1.2.4 Watershed Basin

The Site is located within the watershed of the Concord River (MA82A-07). Stormwater runoff from the site, after being routed through the on-site stormwater management system, generally flows to the south and through a series of tributary wetlands, streams, and brooks before flowing through Greenough Pond in Carlisle and joining the Concord River. The EPA classifies the Concord River as an impaired waterbody, and the MassDEP has imposed total maximum daily load (TMDL) for the impairment related to pathogens (*E. coli*, fecal coliform).

The project does not include any untreated discharges from sanitary sewer waste; therefore, we do not anticipate the proposed project would contribute to any existing impairments of the Concord River watershed. Stormwater discharges associated with the project are treated in accordance with applicable MassDEP and Billerica stormwater performance standards and requirements, as described in Section 4.0 of this report.

1.3 PROPOSED PROJECT

The Project includes clearing approximately 5.3 acres of wooded area and importing an estimated 91,200 cubic yards of fill soil in order to construct an earthen pad, to be used to expand the existing Contractor Yard area, and associated stormwater management infrastructure. The earthen pad will include a compacted gravel surface and will be used to expand the existing contractor yard for general equipment and material staging. There are no new paved areas proposed as a part of this project; however, the proposed gravel surface is expected to consist of a densely graded aggregate designed to minimize rutting and therefore has been modeled as an impervious surface for the purposes of the stormwater analysis and supporting calculations. The slope of the proposed ground surface within the land use area will vary from a minimum slope of one percent to a maximum slope of five percent. The exterior sides of the earthen pad will extend downward to existing grade at a maximum slope of 2H:1V, which will be stabilized with compacted rip-rap. The project also involves the filling of the existing western stormwater basin; therefore, the proposed stormwater management system also includes the installation of 240 subsurface pre-cast concrete infiltration chambers, located within the footprint of the now filled in western stormwater basin. Vehicular access to the Site and the newly developed area will be provided by the existing paved facility entrance drive located at 14 Sterling Road and the existing paved and unpaved access routes throughout the existing facility.

Similar to the previously permitted site development, the proposed project will include alterations and associated disturbances within the 100-foot buffer zone to the nearby BVW. To ensure that the Project is in compliance with the BCC fifty-foot no-disturbance wetland buffer, no work or disturbance is proposed within fifty feet of the existing resource areas. The proposed site features which are located within the 100-foot buffer zone include portions of the new stormwater infiltration basin and associated outlet control structure, as well as portions of the proposed earthen pad and gravel areas, including the perimeter 2H:1V slopes which will be stabilized with compacted rip-rap.

New stormwater management improvements will be constructed as part of the proposed development that will provide stormwater quality improvements and provide stormwater detention and recharge, meeting the Massachusetts Department of Environmental Protection Stormwater Standards and the Town of Billerica Stormwater Requirements as described herein.

2.0 STORMWATER MANAGEMENT SYSTEMS

2.1 DESCRIPTION OF RUNOFF CONTROLS

The stormwater management improvements consist of components designed to manage runoff from the Site. These components attenuate runoff discharge peaks, provide groundwater recharge, minimize erosion, minimize the transport of sediments, improve water quality, and minimize impacts to downstream resource areas.

The stormwater management system implements treatment trains of the Best Management Practices designed to meet an average annual pollutant removal equivalent of ninety (90) percent of the average annual load of total suspended solids (TSS) and sixty (60) percent of the average annual load of Total Phosphorous (TP) related to the total postconstruction impervious surface area on the site, in accordance with the Massachusetts Department of Environmental Protection Stormwater Management Standards and Billerica Stormwater Management Regulations. The proposed stormwater management system will implement the following specific control measures:

- Proprietary particle separators (Contech Cascade Separator® water quality units): The Cascade Separator® Water Quality Units provide efficient removal of free oils, debris, and total suspended solids (TSS). Although not the main objective of the water quality unit, some removal of heavy metals and other nutrients is also achieved. Runoff from the compacted gravel and impervious areas of the Site will be directed to the water quality units to receive the required pre-treatment before being routed through the infiltration features (either the subsurface concrete infiltration chambers or the infiltration basin) before eventually discharging off-site. The water quality units allow for safe and easy removal of collected material and should be inspected and cleaned in accordance with the Operations and Maintenance (O&M) Plan and per manufacturer's recommendations. See the O&M Plan included in Appendix A of this report for supporting information.

- Subsurface Pre-Cast Concrete Storage and Infiltration Chambers: Stormwater runoff, which currently flows to the existing western stormwater basin, consists of clean runoff from the roof of the maintenance facility and runoff from the impervious areas surrounding the facility, will be routed to an open bottom, subsurface infiltration system comprised of pre-cast concrete chambers and crushed stone. The pre-cast concrete chambers are manufactured by Retain-It®. These pre-cast concrete subsurface infiltration chambers are proposed to be located within the approximate footprint of the existing western stormwater basin. The runoff from the Project will be conveyed to these subsurface pre-cast concrete chambers through a series of deep sump and hooded catch basins and culvert pipes. Runoff from the impervious areas around the facility will be routed through the existing water quality unit (WQU-P4) before discharging into the pre-cast concrete infiltration chambers.

Similarly, runoff from the northern portion of the proposed compacted gravel area will be collected within deep sump and hooded catch basins and routed through a new water quality unit (WQU-P6) before discharging into the subsurface concrete infiltration chamber system. The subsurface concrete infiltration chamber system has been sized for design storm events up to and including the 24-hour, 100-year storm event. Stormwater flow in excess of the infiltration capacity of the chamber system will discharge off-site through a new outlet control structure, associated piping, and a flared end section with a rip-rap level spreader. The use of these pre-cast concrete chambers for treatment of stormwater is accepted as a good practice and is in accordance with sound professional standards. See Appendix F6 of this report for supporting information.

- Infiltration basin: Infiltration basins reduce runoff volume, remove fine sediment and associated pollutants, recharge groundwater, and provide attenuation of peak flows. Infiltration basins are stormwater impoundments designed to capture and infiltrate, at a minimum, the water quality volume over several days, but do not retain a permanent pool. The proposed infiltration basin will be vegetated with loam and vegetative cover to reduce soil erosion and scouring of the basin.

  One new infiltration basin is proposed for the Project, located at the southern edge of the new development area, north of the existing SAS leaching field. Water quality and pre-treatment will be provided by deep sump hooded catch basins and the proposed proprietary water quality unit (WQU-P5) prior to discharge into the proposed infiltration basin. The bottom of the infiltration basin has been designed to provide a minimum of 2-feet of separation from the estimated seasonal high groundwater elevation. The basin has been sized to contain design storm events up to and including the 24-hour, 100-year storm event with runoff discharging through a new outlet control structure, associated piping, and flared end section with a rip-rap level spreader. An emergency rip-rap spillway channel has been provided to safely pass stormwater in the event the outlet control structures become clogged or otherwise fail, or in the event of an extreme storm which produces runoff in excess of the 24-hour, 100-year design storm event or the outlet structure capacity.

- Rip-rap Outlet Protection/Lever Spreaders: Rip-rap outlet protection will be placed at each stormwater outfall to reduce flow rates and velocities to non-erosive velocities to prevent erosion to the adjacent undisturbed lands and to transition the outlet flow to the natural topography where appropriate.

2.2 CONSTRUCTION SEQUENCE PLAN

The purpose of the Construction Sequence Plan is to develop an approximate working schedule for the implementation of the proposed stormwater improvements. Prior to initiating work, the

siltation control barriers will be installed along the limit of work. After the appropriate permits are obtained, and the siltation control barriers are inspected and approved by the appropriate entities, the construction project will commence in the following sequence:

1. Install necessary siltation barriers as shown on the design drawings, installed before any work commences.
2. Perform tree clearing, grubbing, and topsoil removal as shown on the Site Plans.
3. Relocate the existing post and rail fence with conservation signage to the limit of work as shown on the Site Plans.
4. Construct the temporary sediment basin as shown on the interim stormwater control plan.
5. Install the proposed stormwater infrastructure necessary to re-route stormwater flow from the existing infiltration basin to the temporary sediment basin as shown on the interim stormwater control plan.
6. Install the subsurface concrete infiltration chamber system, outlet control structure, outlet culvert pipe, flared end section and rip-rap level spreader, placing fill as needed along the outlet culvert alignment.
7. Construct the new infiltration basin and associated pre-treatment infrastructure as shown on the design drawings.
8. Install the outlet control structure, outlet culvert pipe, flared end section and rip-rap level spreader, placing fill as needed along the outlet culvert alignment.
9. Place fill soils and install the dense-grade gravel surface to achieve the finish grades of the earthen pad, as shown on the Site Plans.
10. Install proposed final landscaping, including topsoil and seed within grassed areas and compacted riprap stabilization on the 2H:1V slope along the perimeter of the earthen pad.
11. Only with approval from the appropriate entities, remove existing erosion control measures upon achieving site stabilization.

Construction-period runoff will be collected and treated in accordance with the Construction Period Pollution Prevention and Erosion & Sediment Control Plan included in Appendix B of this report.

2.3 DEWATERING

Groundwater is not anticipated to be encountered during earthwork operations at the site and dewatering is not expected to be necessary. However, should dewatering be required, the contractor is to perform dewater in accordance with local, state and federal dewatering requirements.

3.0 STORMWATER ANALYSIS

3.1 METHOD OF ANALYSIS

A hydrologic analysis has been performed for the Site comparing existing conditions (pre-development) and proposed conditions (post-development) conditions using a software program developed by HydroCAD. This program analyzes site hydrology by the graphic peak discharge method documented in Technical Release No. 20 and Technical Release No. 55 published by the United States Department of Agriculture (USDA) Soil Conservation Service.

The following variables were developed for the contributing watersheds (drainage areas) in order to complete the analysis:

- **Rainfall Depth:** A hydrologic analysis was performed for the 24-hour 2-year, 10-year, 25-year, and 100-year, using the Atlas-14, Type III storm events (3.19, 4.99, 6.11, and 7.85 inches respectively) for each drainage area. Refer to Atlas Rainfall Data in Appendix F1 of this report for additional information.

- **Runoff Curve Number (RCN):** The RCN is a hydrologic characteristic that contributes to the peak rate of runoff and volume from a given storm event. It is dependent upon soil conditions and land use. Generally, higher curve numbers are associated with less pervious soils and, hence, greater amounts of runoff. As previously noted in this report, based on the review of the NRCS Web Soil Survey and results of the onsite geotechnical soil borings, Hydrologic Soil Groups C and D were used in determining RCNs for the existing onsite soils. The HSG is not relevant within existing and proposed impervious areas as the runoff curve number of 98 is controlled by surface conditions and is not impacted by the underlying soil conditions.

- **Time of Concentration (Tc):** The Tc is defined as the time it takes runoff to travel from the hydraulically most distant part of the watershed to the downstream point of interest. This parameter is dependent on the characteristics of the ground surface and condition of the travel path. Times of concentration were calculated for the various drainage areas using the HydroCAD program, with a minimum Tc of six (6) minutes used in accordance with the protocol outlined in Technical Release No. 55.

3.2 DRAINAGE AREAS

To perform the stormwater analysis, the contributing drainage areas for pre-development (existing) and post-development (proposed) conditions were delineated. The delineation of the drainage areas was determined by the topography depicted on the Existing Conditions Plan and on the

Proposed Site Plans. Descriptions of the pre-development and post-development drainage areas are as follows:

- **Pre-Development:** The Site was evaluated for pre-development conditions prior to the commencement of the construction of the Project. Available aerial imagery and topographic information from the Existing Conditions Plan were used to identify the cover types and pre-development drainage patterns. The Site is comprised of four (4) pre-development drainage areas and the stormwater runoff was evaluated for one (1) design point; the existing intermittent stream located southwest of the Site (Design Point A). The existing infiltration basin was modeled using available record and as-built information of the basin geometry and outlet control structure. Refer to Figure HYD-PRE, Appendix E1 of this report, for the pre-development conditions drainage areas. A summary of pre-development drainage areas are listed below:

Table 3-1: Pre-Development Conditions

PRE -DEVELOPMENT CONDITIONS				
Drainage Area	**Design Point**	**Area (ac.)**	**Weighted Curve Number**	**Time of Concentration (minutes)**
X-A1	DP-A (Existing Intermittent Stream)	4.841	91	5.7
X-A2		2.371	71	12.4
X-A3		3.046	72	20.0
X-A4		2.647	76	9.8

- **Proposed Conditions:** The Site was evaluated under proposed conditions following the completion of the proposed project. Proposed information and topography from the proposed Site Plans was used to identify the cover types and the post-development drainage patterns. As proposed, the Site is comprised of twelve (12) post-development drainage areas. Stormwater runoff from the perimeter portions of the Site will remain unchanged and will either continue to flow unmitigated or will be collected and routed through the new infiltration basin or through the proposed subsurface pre-cast concrete chamber infiltration system prior to discharging off-site to the intermittent stream (Design Point A). Stormwater runoff from the roof of the existing maintenance facility will be routed directly to the proposed subsurface pre-cast concrete chamber infiltration system. Runoff from existing paved areas around the facility will continue to be routed through the existing deep sump hooded catch basins and the existing water quality unit (WQU-P2) before discharging to the proposed subsurface pre-cast concrete chamber

infiltration system. Refer to Figure HYD-POST, Appendix E2 of this report, for the proposed conditions drainage areas map. A summary of post-development drainage areas are listed below:

Table 3-2: Post-Development Conditions

POST -DEVELOPMENT CONDITIONS				
Drainage Area	**Design Point**	**Area (ac.)**	**Curve Number**	**Time of Concentration (minutes)**
P-A1	DP-A (Existing Intermittent Stream)	2.999	97	6.0
P-A2a		0.275	97	6.0
P-A2b		0.589	98	6.0
P-A2c		0.903	98	6.3
P-A3a		0.860	98	6.3
P-A3b		0.311	97	6.0
P-A3c		0.991	98	6.6
P-A3d		1.023	98	6.5
P-A3e		0.787	98	6.0
P-A4		1.322	89	6.0
P-A5		2.003	85	6.0
P-A6		0.844	79	6.0

3.3 RESULTS OF ANALYSIS

A stormwater analysis was performed for the 24-hour 2-year, 10-year, 25-year, and 100-year storm events. Based on the calculations, it has been determined that there will not be an increase in stormwater runoff discharge rates off-site after the proposed construction is complete and after the stormwater management system components, including the subsurface infiltration system, are properly installed. Detailed stormwater calculations are included in Appendix E of this report. Compliance for pre-development and post-development conditions was evaluated at Design Point A. Peak stormwater rates of runoff for pre- and post-development conditions are summarized in Table 3.3 below.

Table 3-3: Project Stormwater Runoff Rates

PEAK RUNOFF RATES (cfs)								
	2-Year		10-Year		25-Year		100-Year	
Design Point	Ex.	Prop.	Ex.	Prop.	Ex.	Prop.	Ex.	Prop.
DP-A	6.39	4.03	16.25	7.93	25.82	16.43	38.34	32.02

3.3.1 Hydrology

The proposed drainage infrastructure has been designed to convey storm events up to and including the 24-hour, 100-year storm event. Refer to the post-development HydroCAD report output provided in Appendix E2 of this report for supporting calculations.

3.3.2 Interim Conditions

As described in Section 2.2 of this report, interim stormwater controls are proposed as part of the proposed development to manage stormwater flows from the existing maintenance facility area during construction of the new subsurface concrete infiltration chamber system. The interim stormwater design consists of installing several drainage manholes and a combination of permanent and temporary culvert pipes to re-direct stormwater flows from the existing basin to a temporary sediment basin located to the southeast of the proposed expanded contractor yard. The interim stormwater basin has been designed to control and attenuate peak flow rates from the design storm events up to and including the 25-year, 24-hour storm event. Supporting calculations for the design of the interim stormwater basin are provided in Appendix E3 of this report.

3.3.3 Future Conditions

The proposed stormwater management system has been designed and sized to accommodate potential future development of the facility, which would not expand the limits of disturbance beyond those shown on the accompanying Site Plans, while still maintaining peak rates of runoff below the proposed post-development conditions shown in these calculations. At this time, the Applicant does not have any immediate plans to proceed with the future development of the Site.

4.0 STORMWATER CONTROL SYSTEM DESIGN CRITERIA

4.1 MASSDEP STORMWATER MANAGEMENT POLICY

Stormwater discharge from the proposed Project is subject to the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Policy (the Policy). The Policy is designed "to protect the wetlands and waters of the Commonwealth from adverse impacts of storm water runoff." To accomplish this goal, the Policy establishes ten performance standards to control stormwater quantity and quality. These standards establish the level of required controls that can be achieved with site planning, structural and non-structural controls, and other best management practices (BMPs). The MassDEP Stormwater Checklist is provided in Appendix C of this report. Stormwater modeling methodology is discussed in detail in Section 3.0 of this report. Results of the stormwater modeling of the existing and proposed conditions are provided in Appendix E of this report.

4.1.1 MassDEP Stormwater Management Standards

The following section documents compliance with the MassDEP Stormwater Management Standards.

Standard 1
No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The project is designed so that there are no new stormwater conveyances that could discharge untreated stormwater into, or cause erosion to, wetlands or waters of the Commonwealth. Outlet protection from pipe discharges have been designed to provide non-erosive velocities prior to discharging to natural grade or vegetated surfaces. The stormwater management system has been designed to provide water quality treatment providing TSS removal for impervious areas in accordance with the Policy.

Standard 2
Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The post-development peak discharge rates do not exceed pre-development peak discharge rates for the 24-hour, 2-, 10-, 25-, and 100-year design storm events. Stormwater modeling methodology is discussed in detail in Section 3.0 of this report. The model outputs are provided in Appendix E

of this report. Summaries of the model results are provided above in Table 3-3 Project Stormwater Runoff Rates.

Standard 3

Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

The project is designed to comply with this criterion. The Project will result in the addition of approximately 5.6 acres of new compacted dense grade gravel area, which, to be conservative, was modeled and treated as impervious areas for the purposes of demonstrating compliance with the Policy. In accordance with the stormwater standards, 0.25-inches of recharge must be provided for the increase in impervious areas on the Site for HSG C soils and 0.10-inches for HSG D soils. Accordingly, a total of 13,129 cubic feet (cf) of groundwater recharge is required based on the increase of 'impervious areas' within each HSG. The proposed subsurface pre-cast concrete infiltration chambers provide a total of 36,642 cf of groundwater recharge, which exceeds the regulatory minimum requirement. Refer to the Groundwater Recharge Calculations in Appendix F3 of this report for supporting calculations.

Based on the soil analysis, an infiltration rate of 2.41 inches per hour was utilized for the proposed subsurface pre-cast concrete infiltration chamber system as well as the infiltration basin. Each of the infiltration systems have been designed to provide the drawdown of stormwater below the low flow outlets in less than 72 hours. Refer to the Groundwater Recharge Calculations in Appendix F3 of this report for supporting calculations.

Standard 4

For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:

A. *Suitable nonstructural practices for source control and pollution prevention are implemented;*
B. *Stormwater management best practices (BMPs) are sized to capture the prescribed runoff volume; and*
C. *Stormwater management BMPs are maintained as designed.*

In accordance with Massachusetts Stormwater Standards and with the Town of Billerica Stormwater Management Regulations for new development, the project has been designed to remove a minimum of ninety (90) percent of the average annual load of TSS. The project utilizes several methods of storm water management devices to reduce TSS generation including existing

deep sump hooded catch basins, an existing proprietary water quality unit, new proprietary Contech water quality units, new subsurface pre-cast concrete infiltration chambers, and a new infiltration basin, consistent with the regulations set forth in the Policy. The estimated TSS removal rate from the proposed BMP treatment train for each system meets or exceeds the ninety (90) percent requirement. Refer to the TSS Removal Calculation Worksheets in Appendix F4 of this report for supporting calculations.

A comprehensive Stormwater Management Operations and Maintenance Plan (O&M) has been developed and is included in Appendix A of this report.

In accordance with Massachusetts Stormwater Standards and with the Town of Billerica Stormwater Management Regulations, the project has been designed to meet the annual pollutant removal requirements by removing a minimum of ninety (90) percent of the average annual load of TSS, as described above, and by infiltrating one (1) inch of runoff from impervious areas, as detailed under Standard 3 of this report. Refer to the Groundwater Recharge Calculations, in Appendix F3 of this report for supporting calculations.

Standard 5

Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pre-treatment is prohibited.

The Site includes uses that may be considered Land Uses with Higher Potential Pollutant Loads (LUHPPL). Accordingly, the proposed stormwater management system has been designed to treat the one (1) inch Water Quality Volume and provide forty-four (44) percent TSS removal pre-treatment prior to infiltration. Pretreatment for the subsurface pre-cast concrete infiltration chamber system is provided by utilizing deep sump hooded catch basins and proprietary water quality units (WQU-P2, existing, and proposed WQU-P6). Pretreatment for the proposed infiltration basin is provided by the implementation of a sediment forebay and new proprietary water quality unit (WQU-P5). Refer to the Water Quality Flow Rate Calculations and the TSS Calculation Worksheets, in Appendix F2 and F4 of this report, respectively, for supporting calculations.

Standard 6

Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resources Waters (ORWs), shellfish beds, bathing beaches, cold water fisheries, and recharge areas for public water supplies.

This project does not discharge to critical areas.

Standard 7

Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. Where it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

The project fully complies with the MassDEP Stormwater Standards.

Standard 8

Erosion and sediment controls must be implemented to prevent impacts during construction, or land disturbance activities.

Erosion and sediment controls are integral to the Project improvements. The erosion control plan includes silt fence with straw bales which will be installed down-gradient of the proposed work area as well as around the perimeter of the work area. Catch basin silt sacks will also be installed within existing catch basins located on-site and adjacent to the work area that could potentially receive stormwater flows during construction. Additionally, temporary stabilized construction exits will also be installed at the access points between the proposed work area and the existing Site. The Project's Erosion and Sediment Control Plan will be followed throughout the duration of construction. The measures contained therein will be utilized to prevent erosion, control sediments, and stabilize exposed soils. Refer to the Construction Period Pollution Prevention and Erosion & Sediment Control Plan, in Appendix B of this report as well as the accompanying Site Plans for detailed erosion control information.

Standard 9

All stormwater management systems must have an operations and maintenance plan to ensure that systems function as designed.

A comprehensive Stormwater Management Operations and Maintenance Plan (O&M) has been developed. The Manufacturer's O&M Procedures for the proprietary water quality units and stormwater chambers are included in the O&M Plan for reference. Refer to the Stormwater Management Operations and Maintenance Plan, in Appendix A of this report for additional information pertaining to the Site's O&M Plan.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

There are no illicit discharges at the Site. If found, any illicit discharges will be eliminated, and the Project will not be constructed with any illicit connections. A draft of the Illicit Discharge Statement is provided in Appendix F7 of this report.

4.2 BILLERICA STORMWATER MANAGEMENT POLICY

In addition to compliance with the MassDEP Policy, described above in Section 4.1.1, the Project's stormwater discharge is also subject to the Town of Billerica stormwater regulations, promulgated under the Board of Health Rules and Regulations, Chapter 6: Stormwater Management Regulations. Performance standards for stormwater management systems are specified in §6.7.

The following section documents compliance with the Town of Billerica stormwater performance standards.

§6.7.001 *At a minimum, stormwater management shall be designed in accordance with the requirements of the NPDES Small MS4 General Permit for Massachusetts and the Stormwater Management Standards described in the Stormwater Handbook using current Best Management Practices (BMP). In case of conflicting requirements with applicable federal and state statutes and regulations, the more restrictive or more protective of human health and the environment shall take precedence. The applicant must submit the computations required to document compliance with the Standards as described in Volume 3, Chapter 1 of the Stormwater Handbook as amended.*

Refer to Section 4.1.1 for descriptions of how the proposed project complies with the Massachusetts Stormwater Management Standards. Supporting calculations for compliance with these standards are provided in Appendix F of this report.

§6.7.002 *The applicant may propose alternative BMPs not listed in the Stormwater Handbook, subject to a full technical review and approval by the Board of Health and/or its agent. The performance of specific proprietary commercial devices and systems must be provided by the manufacturer and shall be verified by independent third-party sources and data, such as through International Stormwater BMP Database. The Board of Health and/or its agent will use the process established by the D.E.P. in the Stormwater Handbook to approve or deny the use of proprietary BMPs.*

The proposed project utilizes proprietary stormwater treatment devices consisting of Cascade Separators manufactured by Contech. Performance and design criteria for each device are provided in the Contech Water Quality Unit Documentation section in Appendix F6 of this report.

§6.7.003 *All stormwater from public rights of way, LUHPPLs, impervious areas within Industrial, Industrial Park, Commercial, and Highway Business Zoning Districts, and where a potential pollution problem exists, as deemed by the Board of Health and/or its agent, shall pass through a pre-treatment device to reduce oil, sediment, and trash loadings. All stormwater treatment devices within LUHPPL's shall be fitted with emergency shut-off valves where appropriate to isolate the*

system in the event of an emergency spill or other unexpected event. All stormwater treatment devices shall have a convenient vehicular access and if necessary a twenty foot (20') wide access easement. All stormwater shall be conveyed in ditches or storm drain lines to stormwater BMPs for water quality treatment, infiltration, and/or flow attenuation. Permanent easements and provisions for vehicular access shall be provided along the entire length of ditches and storm drain lines.

The proposed land use is classified as a LUHPPL; therefore, stormwater runoff is routed through pre-treatment devices prior to discharge into the proposed subsurface pre-cast concrete chamber infiltration system or the two infiltration basins. Emergency shut-off valves are proposed to be installed in select stormwater structures, where appropriate, and located to provide for convenient vehicular access. Refer to the accompanying Site Plans for the types and locations of these emergency shut-off valves.

§6.7.004 Lot Drainage

(1) Lots shall be prepared and graded in such a manner that development of one shall not cause detrimental drainage on another, into the Right-of-Way, or add runoff to the MS4; if provision is necessary to carry drainage to or across a lot, an easement or drainage right-of-way of a minimum width of twenty feet (20') with additional allowance as needed for proper side slope shall be provided.

(2) The Applicant shall furnish evidence that adequate provision has been made for the proper drainage of surface and underground waters from any lot or lots. Use of on-lot drywells for disposal of roof runoff is encouraged. Stormwater shall not discharge overland across lot lines. Drainage conveyances and easements shall be provided to convey stormwater to the nearest permanent stream or municipal drainage system after being treated for impairments. Any connection to the MS4 will require a stormwater review by the DPW and associated permits.

As previously described in Section 2.1 of this report, the proposed project includes various stormwater management features to control runoff and attenuate peak stormwater runoff rates and flows prior to discharging off-site. The project does not discharge stormwater directly into a municipal right-of-way or an MS4.

§6.7.005 General Criteria

All projects and activities that meet the Scope and Applicability of Section 1 of the Stormwater Management By-law must meet the following general performance criteria unless otherwise provided for in these Regulations:

(1) LID site planning and design strategies must be utilized to the maximum extent feasible.

(2) The selection, design and construction of all pre-treatment, treatment and infiltration BMPs shall be in accordance with Massachusetts Stormwater Handbook as amended, and

shall be consistent with all elements of the Massachusetts Stormwater Standards including but not limited to those regarding new stormwater conveyances, peak runoff rates, recharge, land uses with higher potential pollutant loads, discharges to Zone II or interim wellhead protection areas, sediment and erosion control, reduction of the creation of impervious area, and illicit discharges.

(3) Tree Protection and Preservation. Trees can be an important tool for retention and detention of stormwater runoff. Trees provide additional benefits, including cleaner air, reduction of heat island effects, carbon sequestration, reduced noise pollution, reduced pavement maintenance needs, and cooler cars in shaded parking lots. The Town therefore deems that the preservation and protection of certain trees on private property and the effort to replant trees to replace those removed to the extent practicable are public purposes that protect the public health, welfare, environment, and aesthetics.

To comply with the intent of the Billerica Stormwater Management Policy to the maximum extent feasible, implementation of LID techniques and devices, the Project proposes the installation of a subsurface pre-cast concrete chamber infiltration system. This subsurface infiltration system reduces the amount of land needed to be disturbed for the Project and reduces the impacts to the nearby natural vegetation. In addition, the proposed open air infiltration basins provide smaller footprints than the typical wet detention basins and therefore they reduce the alteration of natural vegetation required to create the Projects stormwater management system.

As described above in Section 4.1.1. of this report, the BMPs used in the Project are designed in accordance with Massachusetts Stormwater Handbook design requirements.

The Project will provide a fifty (50) foot buffer to on-site resource areas, in an attempt to preserve as much of the on-site vegetation as is practicable, while complying with applicable State and local regulations and creating a Project that meets the needs and requirements of the Applicant.

§6.7.006 Performance Standards for New Development

(1) Stormwater management systems on new development shall be designed to meet an average annual pollutant removal equivalent to 90% of the average annual load of Total Suspended Solids (TSS) related to the total post-construction impervious area on the site AND 60% of the average annual load of Total Phosphorus (TP) related to the total postconstruction impervious surface area on the site. Average annual pollutant removal requirements shall be achieved through one of the following methods:

i. installing stormwater BMPs that meet the pollutant removal percentages required in 6.7.007 (1) based on calculations developed consistent with E.P.A. Region 1's BMP Accounting and Tracking Tool (2016) or other BMP performance evaluation tool provided by E.P.A. Region 1, where available. If E.P.A. Region 1 tools do not address the planned or installed BMP performance, then any federally or State-approved

BMP design guidance or performance standards (e.g., State stormwater handbooks and design guidance manuals) may be used to calculate BMP performance; or

ii. *retaining the volume of runoff equivalent to, or greater than, one (1.0) inch multiplied by the total post-construction impervious surface area on the new development site; or meeting a combination of retention and treatment that achieves the above standards.*

The proposed infiltration features are designed to retain and infiltrate the volume of runoff equivalent to one inch of runoff from the total post-construction impervious surfaces. Refer to Section 4.1.1, Standard 4, of this report for additional information pertaining to compliance with this standard.

§6.7.007 Performance Standards for Redevelopment Sites

This section is not applicable to this Project, as this is not a Redevelopment Project.

§6.7.008 Performance Standards for Redevelopment Projects offsite Mitigation.

This section is not applicable to this Project, as this is not a Redevelopment Project.

APPENDIX E

HYDROCAD ANALYSIS

E1: Figure HYD-PRE – Existing Conditions Drainage Area Map
Pre-Development HydroCAD Report
E2: Figure HYD-POST – Proposed Conditions Drainage Area Map (Rev. 4/21/2026)
Post-Development HydroCAD Report (Rev. 4/21/2026)
E3: Figure HYD-INT – Interim Conditions Drainage Area Map
Interim Conditions HydroCAD Report

APPENDIX E2
(REV. 4/21/2026)
PROPOSED CONDITIONS DRAINAGE AREA MAP
AND
POST-DEVELOPMENT HYDROCAD ANALYSIS

SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
1	4/21/2026	REVISED DRAINAGE AREAS BASED ON REVISED GRADING ALONG WESTERN PROPERTY BOUNDARY.

NORTH

P-A2a 0.275 97
P-A2b 0.589 98
P-A2c 0.903 98
P-A3a 0.860 98
P-A3b 0.311 97
P-A3c 0.991 98
P-A3d 1.023 98
P-A3e 0.787 98
P-A1 2.999 97
P-A4 1.322 89
P-A5 2.003 85
P-A6 0.844 79

EXISTING GRAVEL AREA
PROPOSED GRAVEL AREA
EXISTING PAVEMENT
EXISTING MAINTENANCE FACILITY
PROPOSED INFILTRATION CHAMBERS
PROPOSED RIP-RAP STABILIZATION ON OUTER 2H:1V SLOPES
EXISTING INTERMITTENT STREAM
PROPOSED INFILTRATION BASIN
50BZ
A

DRAINAGE MAP LEGEND

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION PATH
- P-A1 / 3.05 / 97 — SUBCATCHMENT IDENTIFICATION / SUBCATCHMENT AREA (ACRES) / WEIGHTED CURVE NUMBER
- A — DISCHARGE DESIGN POINT
- EXISTING ROOF AREA
- EXISTING PAVED AREA
- EXISTING GRAVEL AREA
- EXISTING WOODED AREA
- PROPOSED GRAVEL AREA
- PROPOSED RIP-RAP SURFACE
- GRASS / LANDSCAPED AREA

SCALE IN FEET
0 120 240

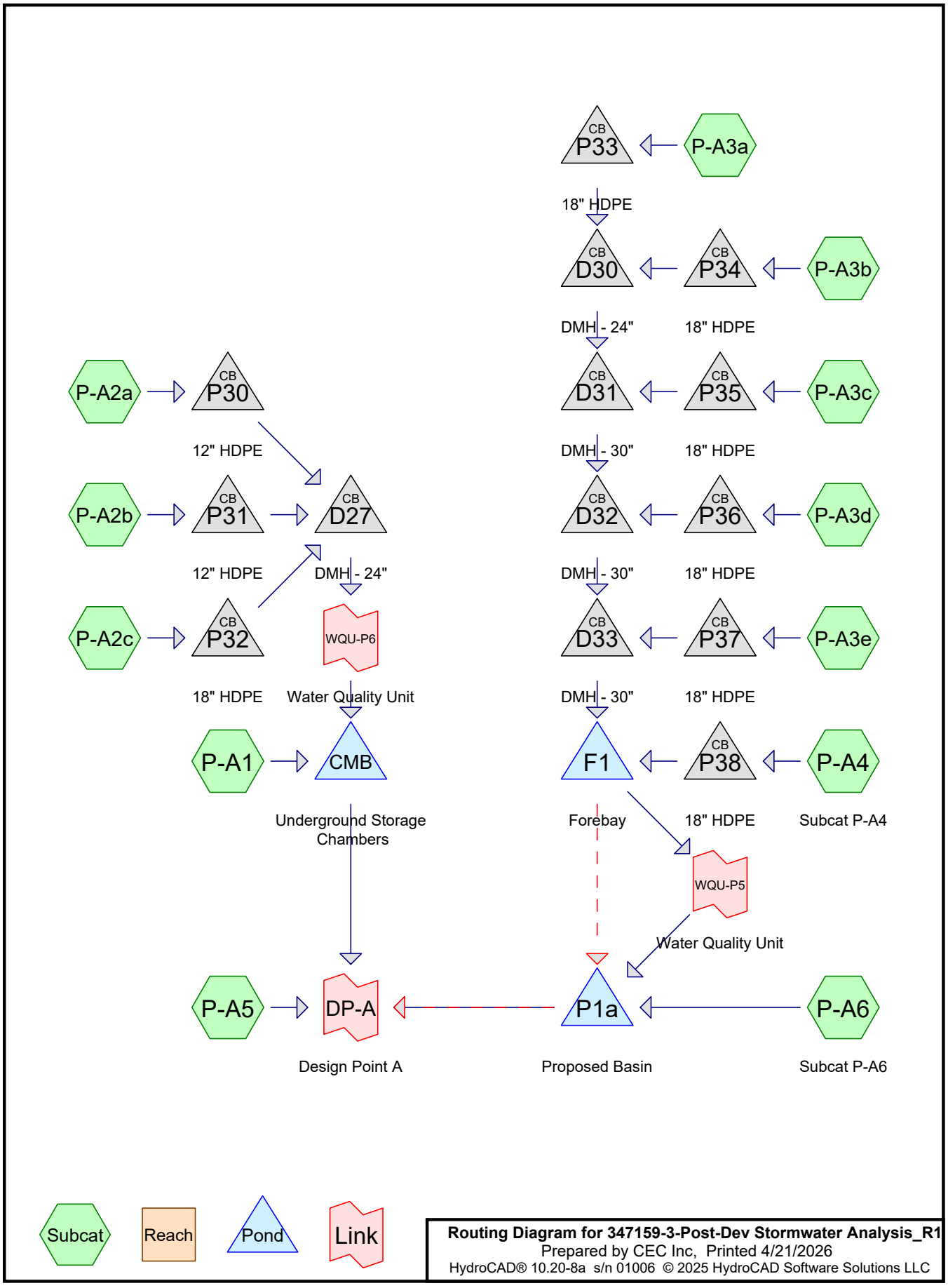
Civil & Environmental Consultants, Inc.
31 Bellows Road
Raynham, MA 02767
Ph: 774.501.2176
www.cecinc.com

SITE DEVELOPMENT PERMITTING
14 STERLING ROAD, BILLERICA, MA
W.L. FRENCH EXCAVATING CORPORATION

POST-DEVELOPMENT DRAINAGE MAP

DRAWN BY:	KFH	CHECKED BY:	DSK	APPROVED BY:	DSK	FIGURE NO.:	HYD-POST
DATE:	MARCH 2026	DWG SCALE:	1"=120'	PROJECT NO:	347-159		1

ENGINEERING, SURVEYING AND LANDSCAPE ARCHITECTURE IN THE STATE OF NORTH CAROLINA WILL BE PROVIDED BY CEC SURVEYING AND LANDSCAPE ARCHITECTS OF NC, PLLC. SERVICES IN PUERTO RICO WILL BE PROVIDED BY CEC ENGINEERS & CONSULTANTS, LLC. LANDSCAPE ARCHITECTURE SERVICES IN THE STATE OF OHIO WILL BE PROVIDED BY CEC LANDSCAPE ARCHITECTS, LLC.



Routing Diagram for 347159-3-Post-Dev Stormwater Analysis_R1
Prepared by CEC Inc, Printed 4/21/2026

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year 24hr	Type III 24-hr		Default	24.00	1	3.19	2
2	10-year 24hr	Type III 24-hr		Default	24.00	1	4.99	2
3	25-year 24hr	Type III 24-hr		Default	24.00	1	6.11	2
4	100-year 24hr	Type III 24-hr		Default	24.00	1	7.85	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.087	74	>75% Grass cover, Good, HSG C (P-A1, P-A2a, P-A2b, P-A2c, P-A3a, P-A3e, P-A4, P-A5, P-A6)
1.040	80	>75% Grass cover, Good, HSG D (P-A4, P-A5, P-A6)
2.234	98	EX Gravel Surface, Impervious, HSG C (P-A1, P-A2a, P-A2b, P-A2c, P-A3a, P-A3c, P-A3d, P-A3e, P-A4, P-A5, P-A6)
0.811	96	Gravel surface, HSG C (P-A2a, P-A2b, P-A2c, P-A3a, P-A3b, P-A3c, P-A3d, P-A5)
0.227	96	Gravel surface, HSG D (P-A3d, P-A3e, P-A4, P-A5)
5.381	98	PR Gravel Surface, Impervious, HSG C (P-A1, P-A2a, P-A2b, P-A2c, P-A3a, P-A3b, P-A3c, P-A3d, P-A3e, P-A4, P-A6)
0.259	98	PR Gravel Surface, Impervious, HSG D (P-A3d, P-A3e, P-A4, P-A6)
0.507	98	Paved parking, HSG C (P-A1)
0.933	98	Roofs, HSG C (P-A1)
0.341	70	Woods, Good, HSG C (P-A5)
0.085	77	Woods, Good, HSG D (P-A5)
12.905	**93**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
11.294	HSG C	P-A1, P-A2a, P-A2b, P-A2c, P-A3a, P-A3b, P-A3c, P-A3d, P-A3e, P-A4, P-A5, P-A6
1.611	HSG D	P-A3d, P-A3e, P-A4, P-A5, P-A6
0.000	Other	
12.905		**TOTAL AREA**

Summary for Subcatchment P-A1:

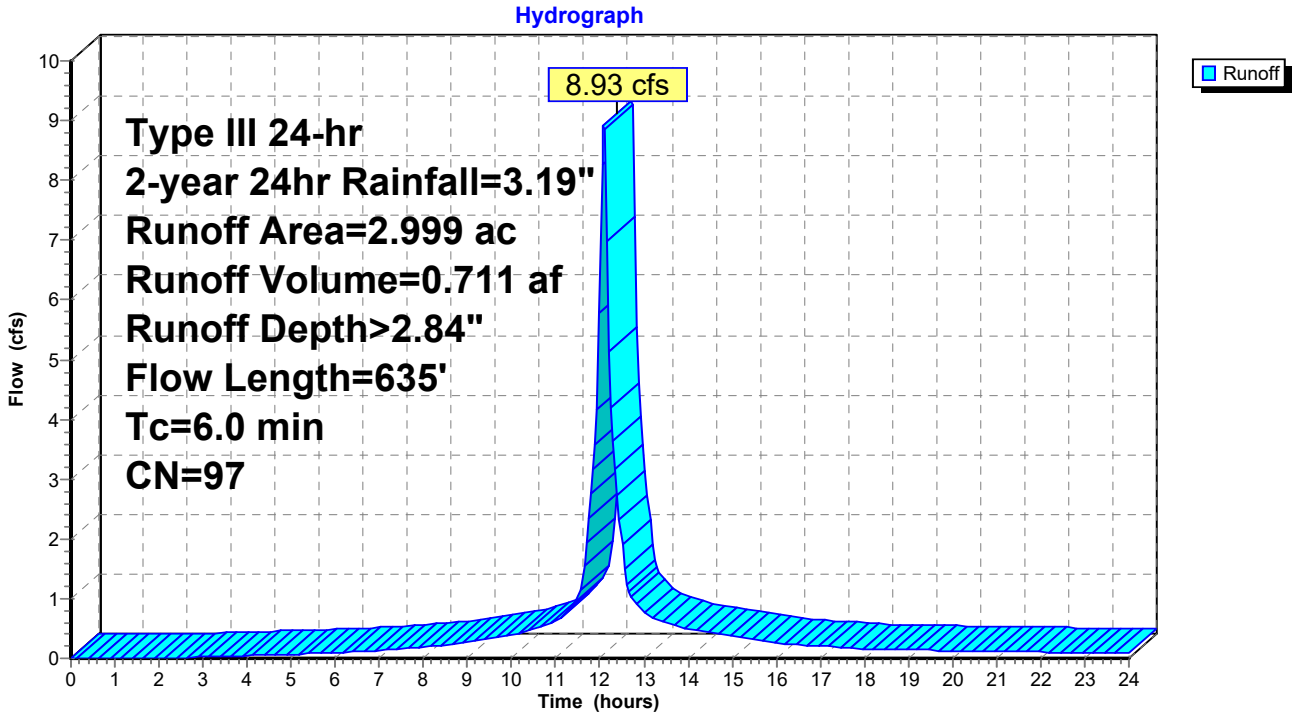
Runoff = 8.93 cfs @ 12.09 hrs, Volume= 0.711 af, Depth> 2.84"
Routed to Pond CMB : Underground Storage Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.003	98	PR Gravel Surface, Impervious, HSG C
0.007	98	PR Gravel Surface, Impervious, HSG C
0.043	98	PR Gravel Surface, Impervious, HSG C
1.360	98	EX Gravel Surface, Impervious, HSG C
0.933	98	Roofs, HSG C
0.050	98	Paved parking, HSG C
0.457	98	Paved parking, HSG C
0.069	74	>75% Grass cover, Good, HSG C
0.078	74	>75% Grass cover, Good, HSG C
2.999	97	Weighted Average
0.147		4.89% Pervious Area
2.852		95.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.19"
3.5	300	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	285	0.0060	4.60	8.14	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.7	635	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A1:



Summary for Subcatchment P-A2a:

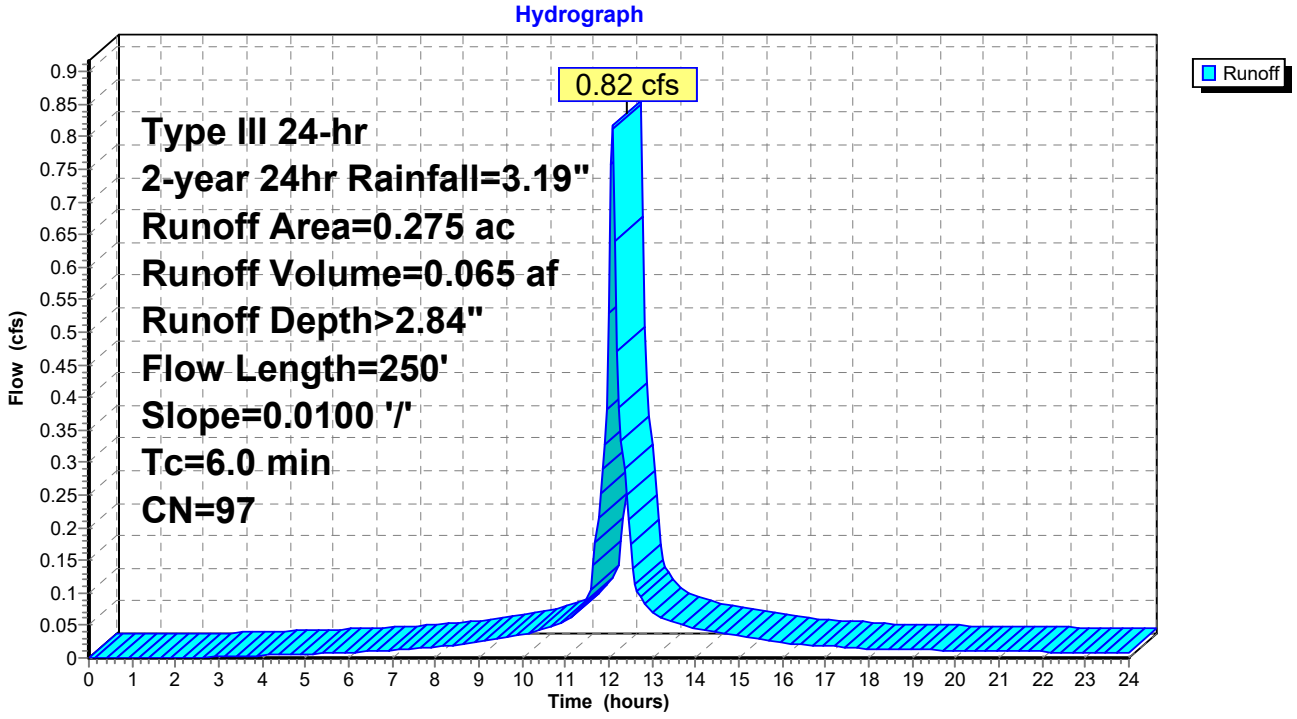
Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.065 af, Depth> 2.84"
Routed to Pond P30 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.238	98	PR Gravel Surface, Impervious, HSG C
0.016	98	EX Gravel Surface, Impervious, HSG C
0.009	96	Gravel surface, HSG C
0.275	97	Weighted Average
0.021		7.63% Pervious Area
0.254		92.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.1	200	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	250	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2a:



Summary for Subcatchment P-A2b:

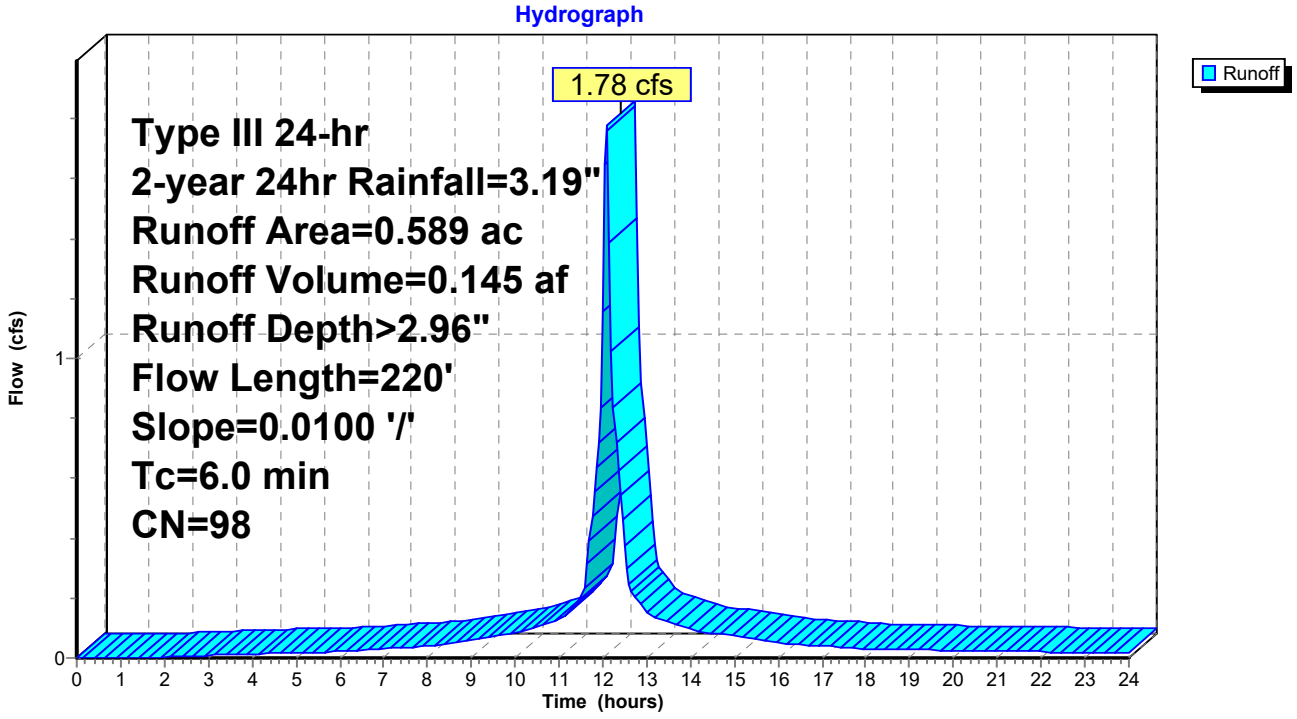
Runoff = 1.78 cfs @ 12.09 hrs, Volume= 0.145 af, Depth> 2.96"
Routed to Pond P31 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.005	74	>75% Grass cover, Good, HSG C
0.329	98	PR Gravel Surface, Impervious, HSG C
0.247	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.589	98	Weighted Average
0.012		2.08% Pervious Area
0.576		97.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.8	170	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.9	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2b:



Summary for Subcatchment P-A2c:

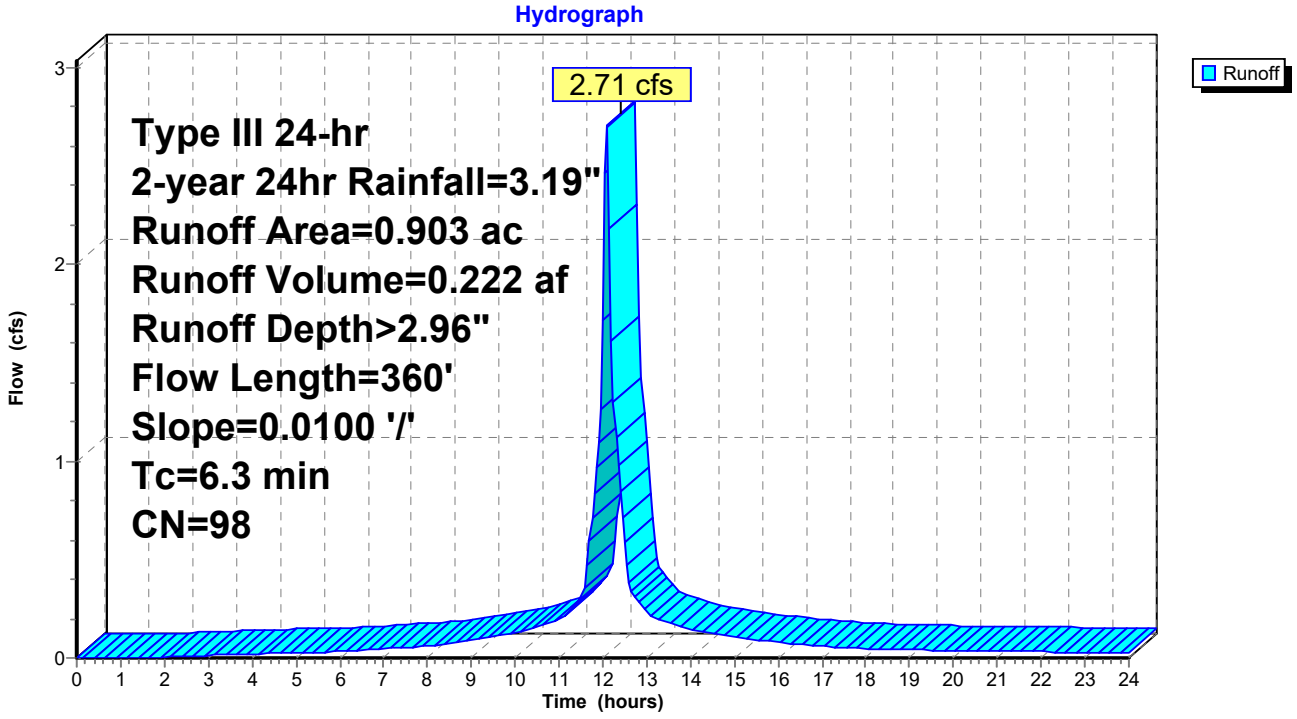
Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.222 af, Depth> 2.96"
Routed to Pond P32 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.008	74	>75% Grass cover, Good, HSG C
0.605	98	PR Gravel Surface, Impervious, HSG C
0.284	98	EX Gravel Surface, Impervious, HSG C
0.006	96	Gravel surface, HSG C
0.903	98	Weighted Average
0.014		1.55% Pervious Area
0.889		98.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A2c:



Summary for Subcatchment P-A3a:

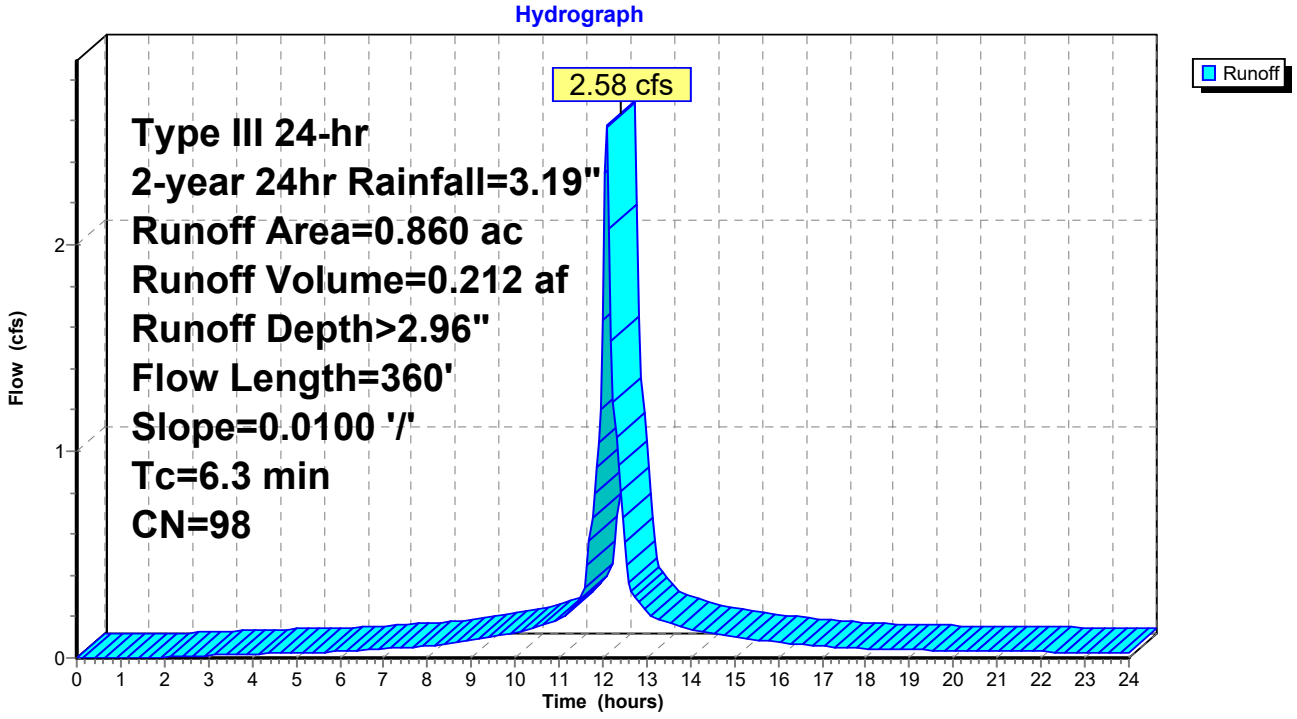
Runoff = 2.58 cfs @ 12.09 hrs, Volume= 0.212 af, Depth> 2.96"
Routed to Pond P33 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.000	74	>75% Grass cover, Good, HSG C
0.006	96	Gravel surface, HSG C
0.094	98	EX Gravel Surface, Impervious, HSG C
0.760	98	PR Gravel Surface, Impervious, HSG C
0.860	98	Weighted Average
0.006		0.72% Pervious Area
0.854		99.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A3a:



Summary for Subcatchment P-A3b:

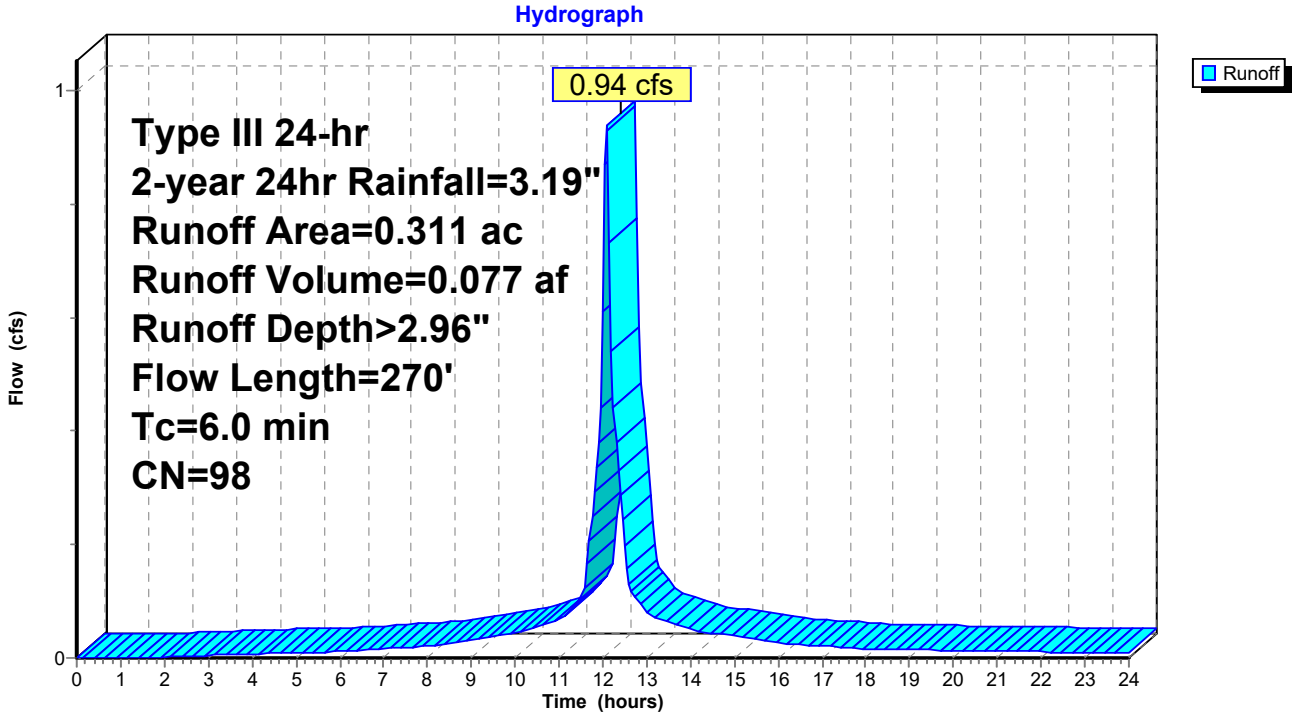
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.077 af, Depth> 2.96"
Routed to Pond P34 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.303	98	PR Gravel Surface, Impervious, HSG C
0.008	96	Gravel surface, HSG C
0.311	98	Weighted Average
0.008		2.48% Pervious Area
0.303		97.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	130	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	270	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3b:



Summary for Subcatchment P-A3c:

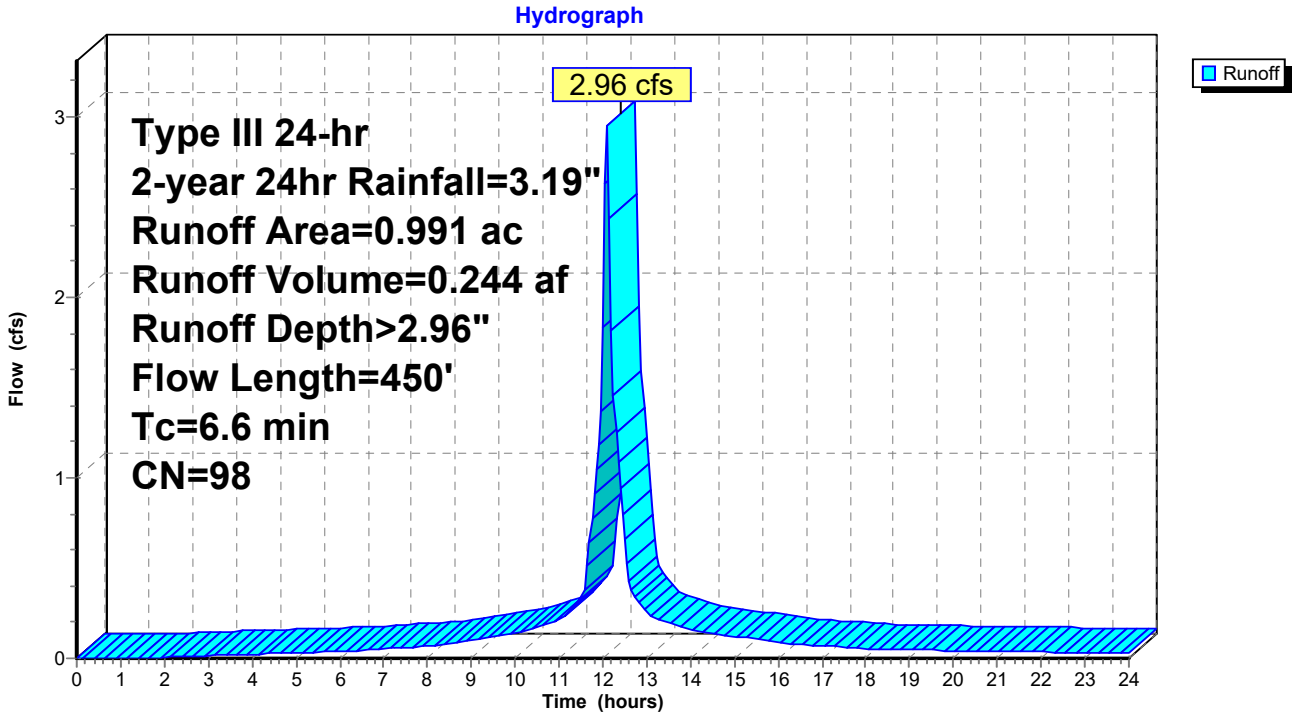
Runoff = 2.96 cfs @ 12.09 hrs, Volume= 0.244 af, Depth> 2.96"
Routed to Pond P35 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.983	98	PR Gravel Surface, Impervious, HSG C
0.001	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.991	98	Weighted Average
0.007		0.76% Pervious Area
0.983		99.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.4	230	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	100	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	70	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	450	Total			

Subcatchment P-A3c:



Summary for Subcatchment P-A3d:

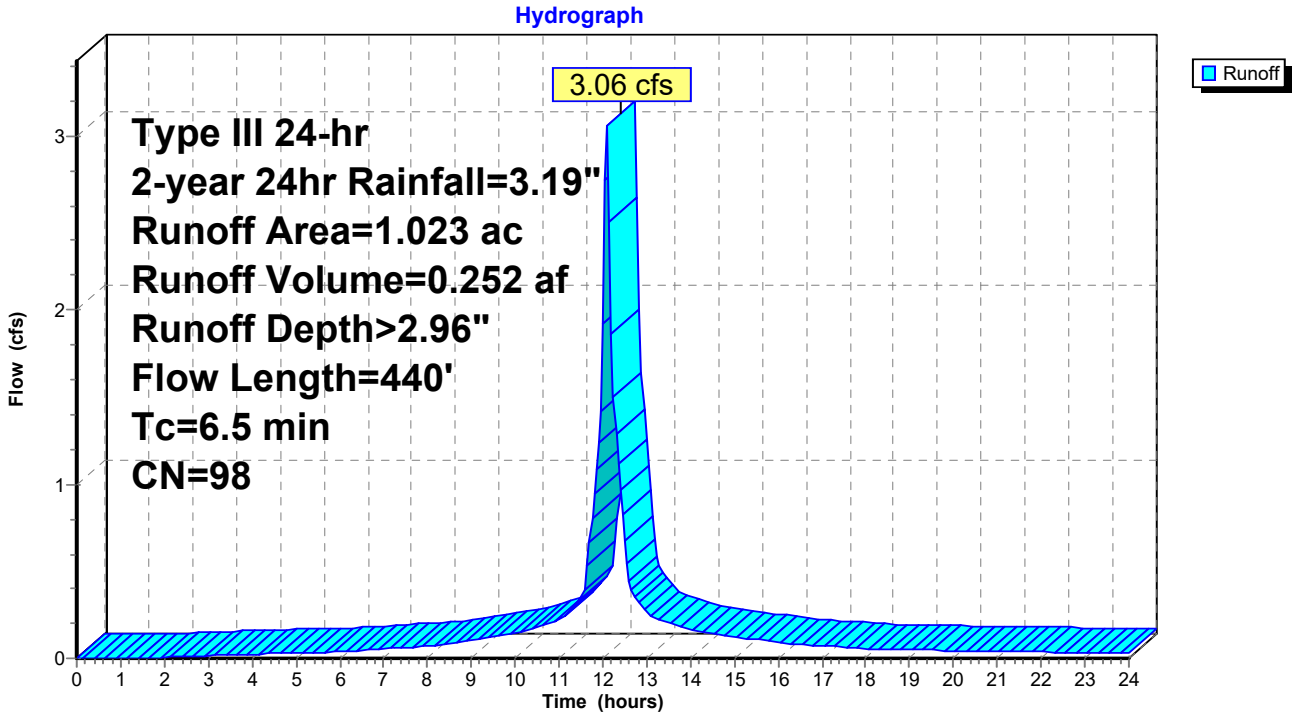
Runoff = 3.06 cfs @ 12.09 hrs, Volume= 0.252 af, Depth> 2.96"
Routed to Pond P36 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.918	98	PR Gravel Surface, Impervious, HSG C
0.018	98	EX Gravel Surface, Impervious, HSG C
0.004	96	Gravel surface, HSG C
0.004	96	Gravel surface, HSG D
0.079	98	PR Gravel Surface, Impervious, HSG D
1.023	98	Weighted Average
0.009		0.85% Pervious Area
1.015		99.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	120	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	160	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	440	Total			

Subcatchment P-A3d:



Summary for Subcatchment P-A3e:

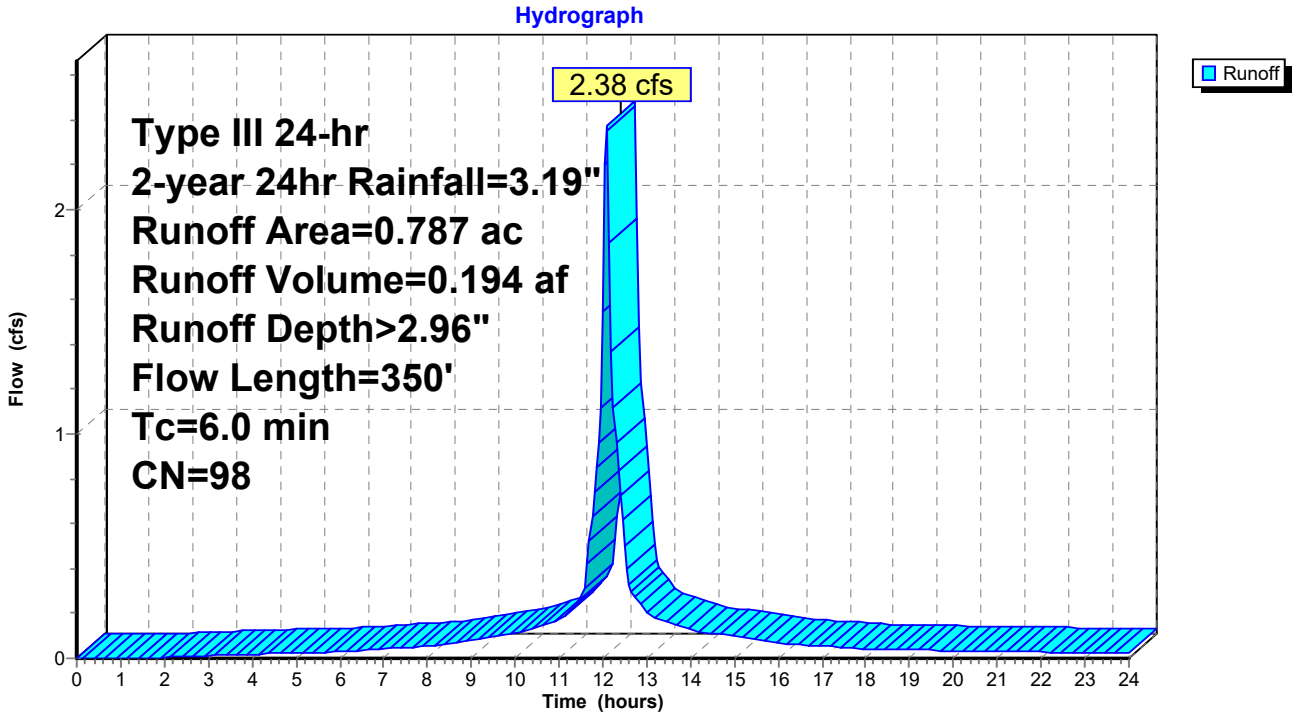
Runoff = 2.38 cfs @ 12.09 hrs, Volume= 0.194 af, Depth> 2.96"
Routed to Pond P37 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.669	98	PR Gravel Surface, Impervious, HSG C
0.031	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG D
0.068	98	PR Gravel Surface, Impervious, HSG D
0.787	98	Weighted Average
0.018		2.34% Pervious Area
0.768		97.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.7	160	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	140	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3e:



Summary for Subcatchment P-A4: Subcat P-A4

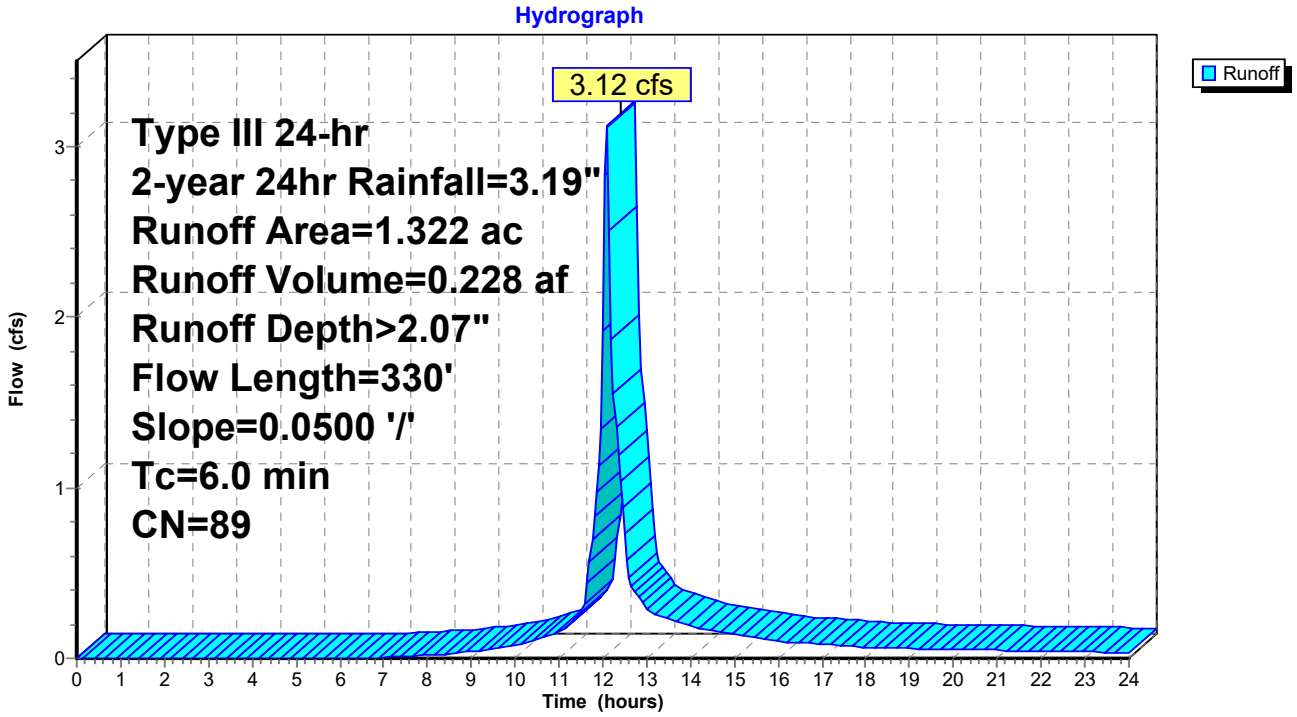
Runoff = 3.12 cfs @ 12.09 hrs, Volume= 0.228 af, Depth> 2.07"
Routed to Pond P38 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.523	98	PR Gravel Surface, Impervious, HSG C
0.123	98	EX Gravel Surface, Impervious, HSG C
0.403	74	>75% Grass cover, Good, HSG C
0.001	74	>75% Grass cover, Good, HSG C
0.084	80	>75% Grass cover, Good, HSG D
0.071	80	>75% Grass cover, Good, HSG D
0.005	96	Gravel surface, HSG D
0.112	98	PR Gravel Surface, Impervious, HSG D
1.322	89	Weighted Average
0.564		42.62% Pervious Area
0.759		57.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.0500	0.51		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.3	280	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	330	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A4: Subcat P-A4



Summary for Subcatchment P-A5:

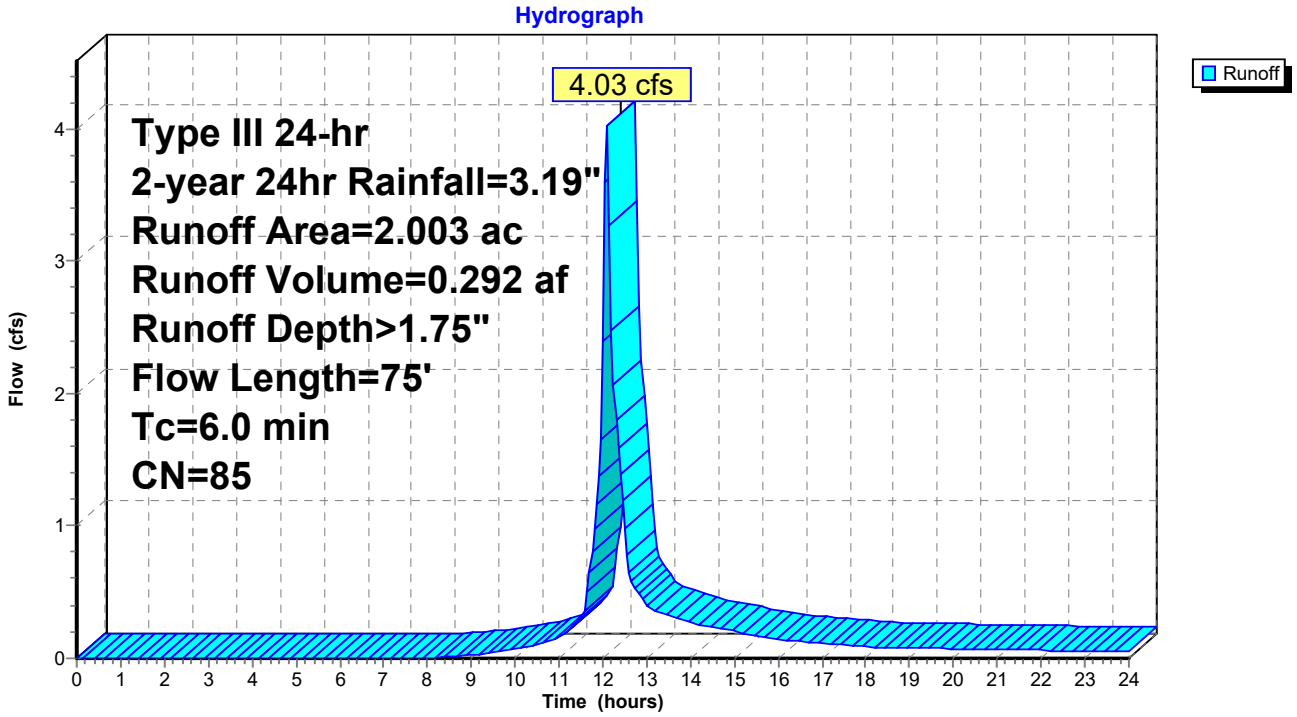
Runoff = 4.03 cfs @ 12.09 hrs, Volume= 0.292 af, Depth> 1.75"
Routed to Link DP-A : Design Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.011	98	EX Gravel Surface, Impervious, HSG C
0.211	96	Gravel surface, HSG D
0.000	96	Gravel surface, HSG D
0.763	96	Gravel surface, HSG C
0.001	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.071	77	Woods, Good, HSG D
0.002	77	Woods, Good, HSG D
0.001	77	Woods, Good, HSG D
0.009	77	Woods, Good, HSG D
0.341	70	Woods, Good, HSG C
0.018	74	>75% Grass cover, Good, HSG C
0.324	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.214	74	>75% Grass cover, Good, HSG C
0.002	80	>75% Grass cover, Good, HSG D
2.003	85	Weighted Average
1.991		99.44% Pervious Area
0.011		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	35	0.5000	0.56		**Sheet Flow,** Range n= 0.130 P2= 3.19"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A5:



Summary for Subcatchment P-A6: Subcat P-A6

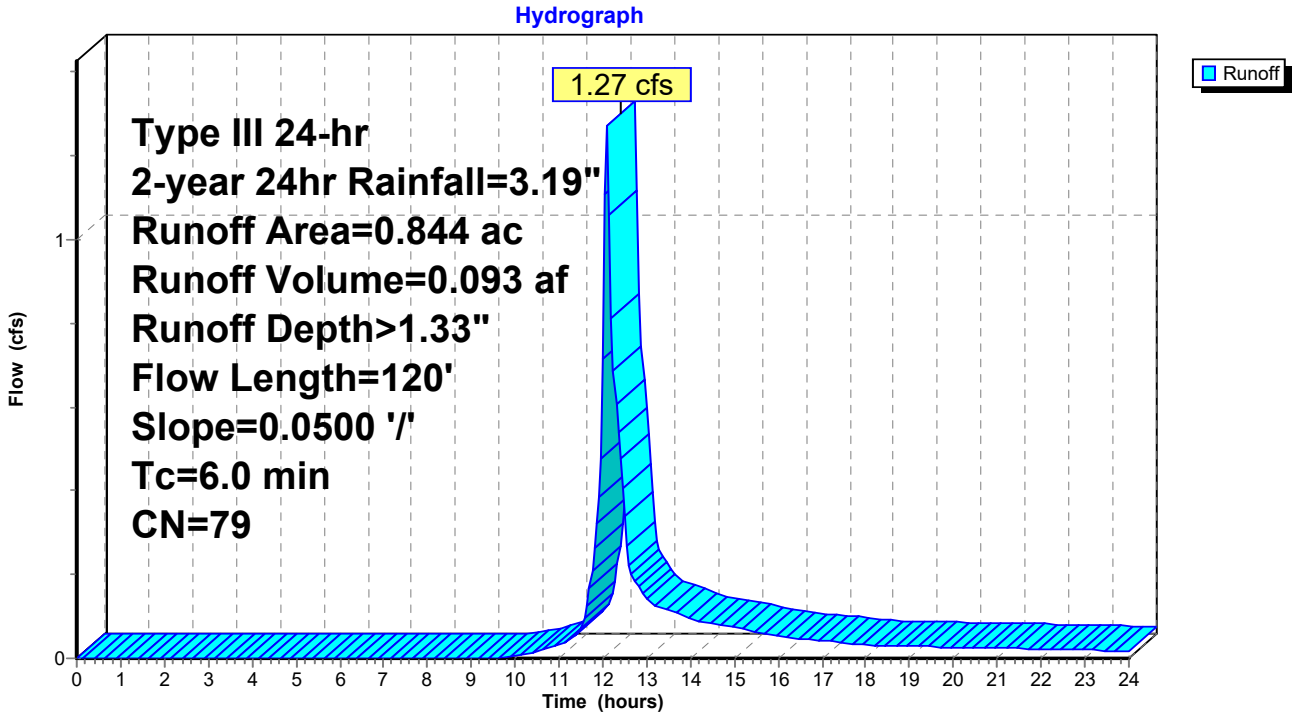
Runoff = 1.27 cfs @ 12.10 hrs, Volume= 0.093 af, Depth> 1.33"
Routed to Pond P1a : Proposed Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year 24hr Rainfall=3.19"

Area (ac)	CN	Description
0.000	98	PR Gravel Surface, Impervious, HSG C
0.050	98	EX Gravel Surface, Impervious, HSG C
0.127	74	>75% Grass cover, Good, HSG C
0.140	74	>75% Grass cover, Good, HSG C
0.425	80	>75% Grass cover, Good, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.000	98	PR Gravel Surface, Impervious, HSG D
0.844	79	Weighted Average
0.793		93.99% Pervious Area
0.051		6.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.19"
0.3	70	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	120	Total			

Subcatchment P-A6: Subcat P-A6



Summary for Pond CMB: Underground Storage Chambers

Inflow Area = 4.765 ac, 95.93% Impervious, Inflow Depth > 2.88" for 2-year 24hr event
Inflow = 14.24 cfs @ 12.09 hrs, Volume= 1.143 af
Outflow = 0.92 cfs @ 10.90 hrs, Volume= 1.142 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.92 cfs @ 10.90 hrs, Volume= 1.142 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 221.62' @ 13.61 hrs Surf.Area= 16,464 sf Storage= 20,728 cf
Flood Elev= 224.00' Surf.Area= 16,464 sf Storage= 54,255 cf

Plug-Flow detention time= 181.6 min calculated for 1.140 af (100% of inflow)
Center-of-Mass det. time= 180.6 min (943.2 - 762.6)

Volume	Invert	Avail.Storage	Storage Description
#1B	219.75'	6,779 cf	**196.00'W x 84.00'L x 4.92'H Field A** 80,948 cf Overall - 64,000 cf Embedded = 16,948 cf x 40.0% Voids
#2B	220.50'	47,770 cf	**retain_it upright 3.5'** x 240 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 24 Rows adjusted for 417.5 cf perimeter wall
		54,549 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	219.75'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	220.40'	**24.0" Round Culvert** L= 370.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 220.40' / 210.00' S= 0.0281 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	222.75'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.92 cfs @ 10.90 hrs HW=219.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=219.75' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond CMB: Underground Storage Chambers - Chamber Wizard Field A

Chamber Model = retain_it upright 3.5' (retain-it® upright)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
24 Rows adjusted for 417.5 cf perimeter wall

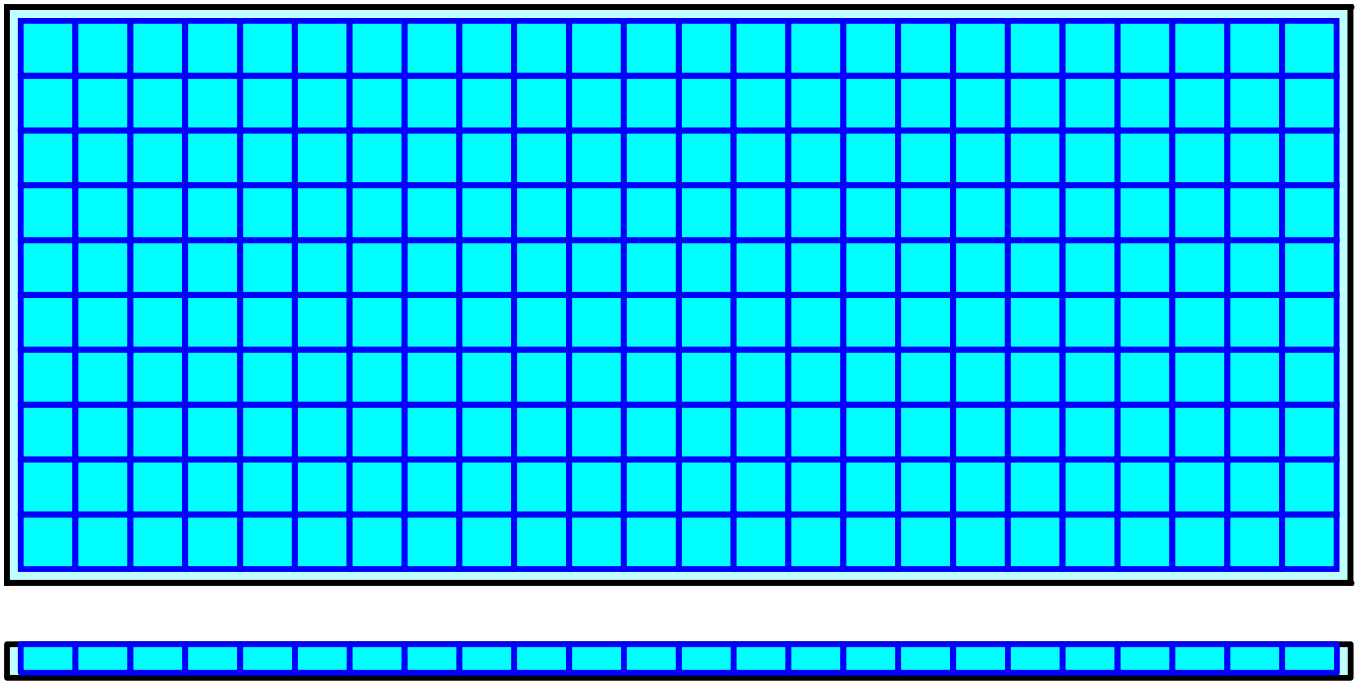
10 Chambers/Row x 8.00' Long = 80.00' Row Length +24.0" End Stone x 2 = 84.00' Base Length
24 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 196.00' Base Width
9.0" Stone Base + 50.0" Chamber Height = 4.92' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 24 x 2 = 417.5 cf Perimeter Wall
240 Chambers x 200.8 cf - 417.5 cf Perimeter wall = 47,769.8 cf Chamber Storage
240 Chambers x 266.7 cf = 64,000.0 cf Displacement

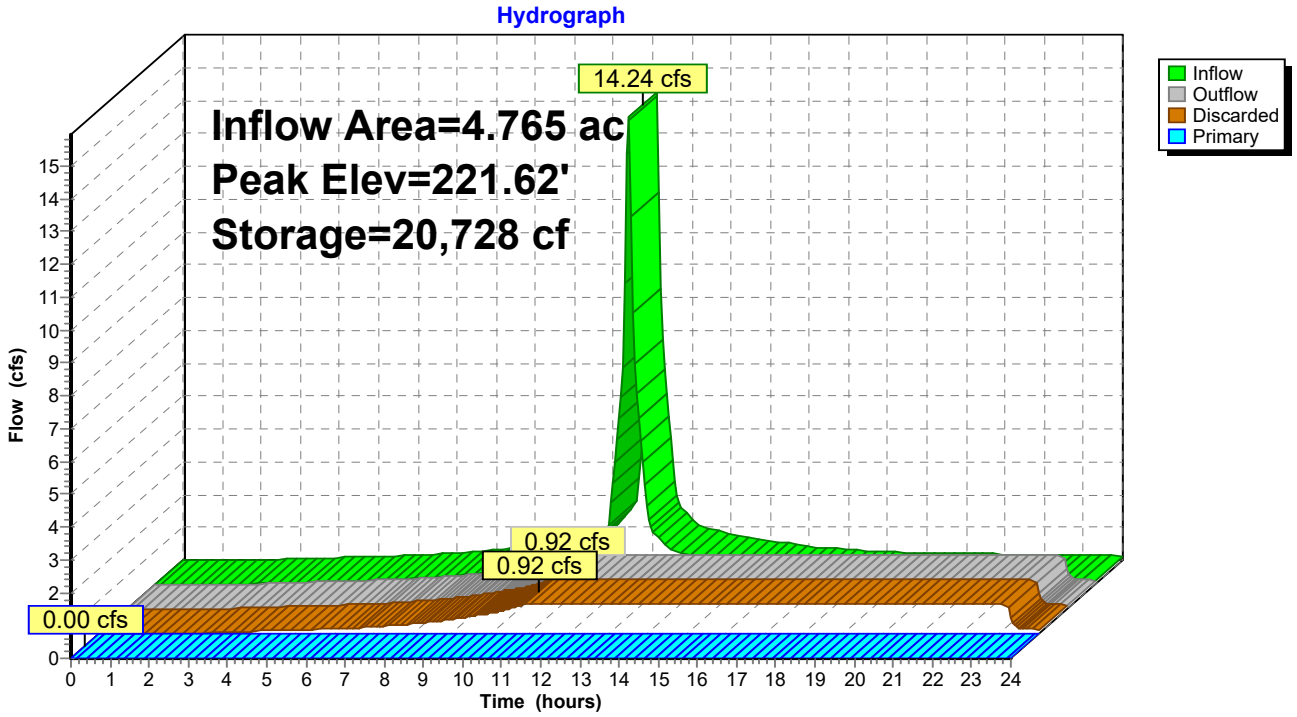
80,948.0 cf Field - 64,000.0 cf Chambers = 16,948.0 cf Stone x 40.0% Voids = 6,779.2 cf Stone Storage

Chamber Storage + Stone Storage = 54,549.0 cf = 1.252 af
Overall Storage Efficiency = 67.4%
Overall System Size = 84.00' x 196.00' x 4.92'

240 Chambers
2,998.1 cy Field
627.7 cy Stone



Pond CMB: Underground Storage Chambers



Summary for Pond D27: DMH - 24"

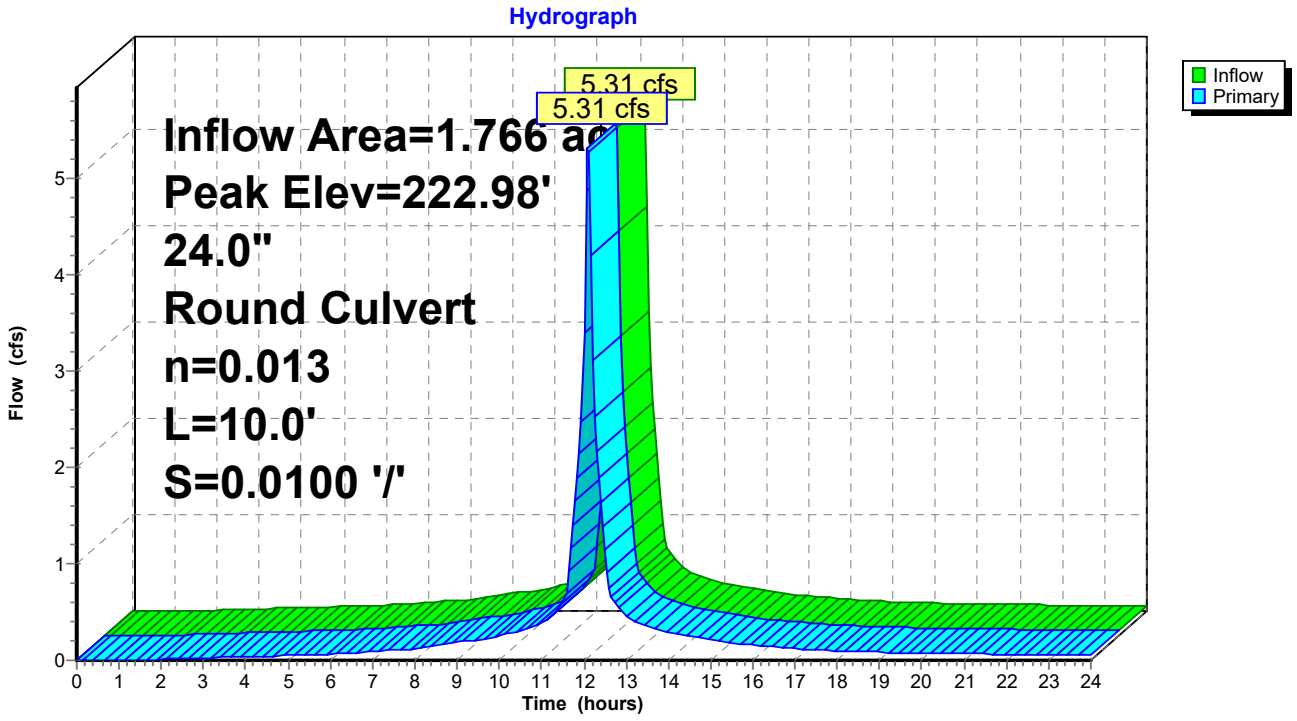
Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 2.94" for 2-year 24hr event
Inflow = 5.31 cfs @ 12.09 hrs, Volume= 0.432 af
Outflow = 5.31 cfs @ 12.09 hrs, Volume= 0.432 af, Atten= 0%, Lag= 0.0 min
Primary = 5.31 cfs @ 12.09 hrs, Volume= 0.432 af
Routed to Link WQU-P6 : Water Quality Unit

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.98' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	221.80'	**24.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 221.80' / 221.70' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.18 cfs @ 12.09 hrs HW=222.97' (Free Discharge)
1=Culvert (Barrel Controls 5.18 cfs @ 3.92 fps)

Pond D27: DMH - 24"



Summary for Pond D30: DMH - 24"

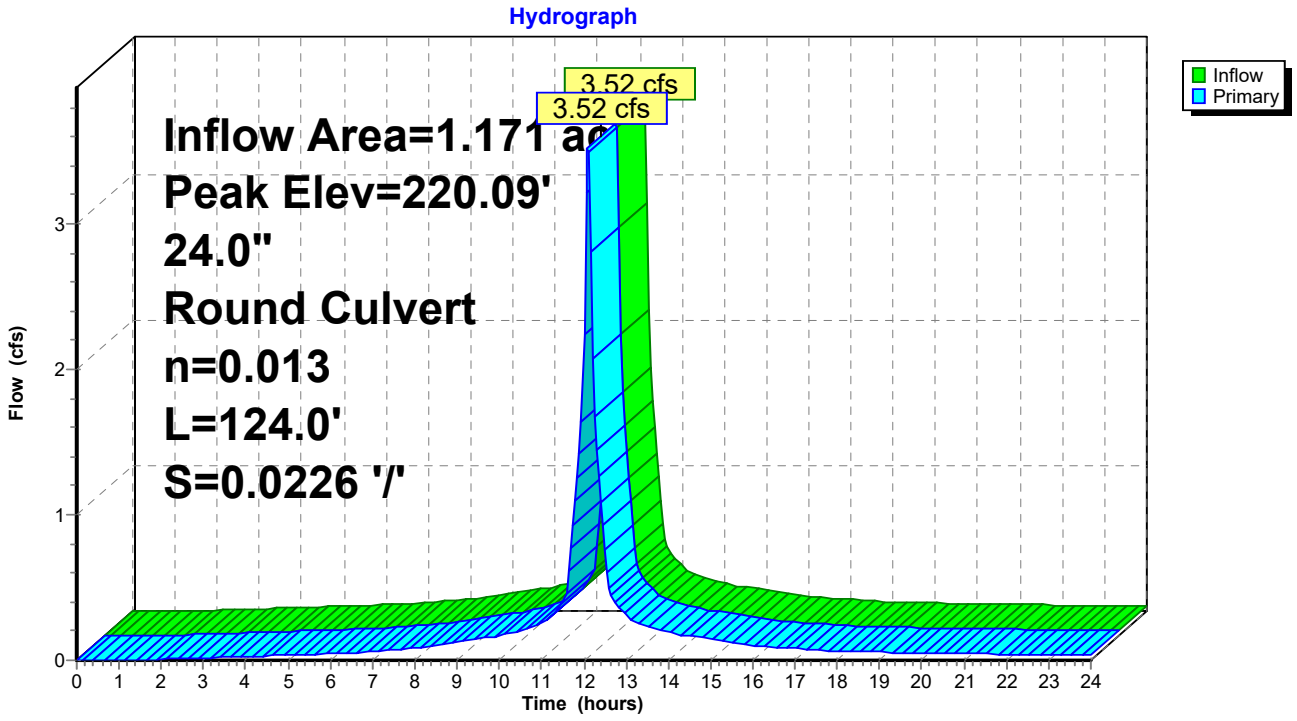
Inflow Area = 1.171 ac, 98.81% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 3.52 cfs @ 12.09 hrs, Volume= 0.288 af
Outflow = 3.52 cfs @ 12.09 hrs, Volume= 0.288 af, Atten= 0%, Lag= 0.0 min
Primary = 3.52 cfs @ 12.09 hrs, Volume= 0.288 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 220.09' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	219.30'	**24.0" Round Culvert** L= 124.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.30' / 216.50' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.44 cfs @ 12.09 hrs HW=220.08' (Free Discharge)
1=Culvert (Inlet Controls 3.44 cfs @ 3.01 fps)

Pond D30: DMH - 24"



Summary for Pond D31: DMH - 30"

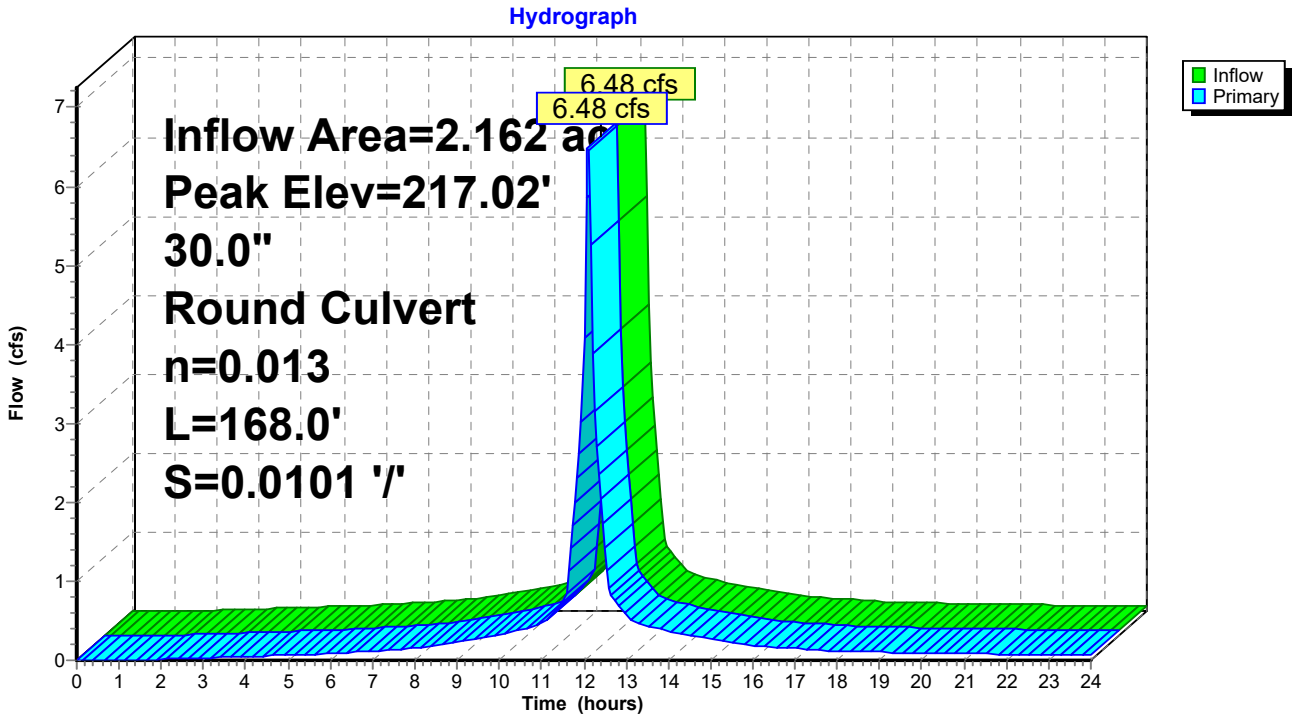
Inflow Area = 2.162 ac, 99.01% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 6.48 cfs @ 12.09 hrs, Volume= 0.532 af
Outflow = 6.48 cfs @ 12.09 hrs, Volume= 0.532 af, Atten= 0%, Lag= 0.0 min
Primary = 6.48 cfs @ 12.09 hrs, Volume= 0.532 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 217.02' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	216.00'	**30.0" Round Culvert** L= 168.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.00' / 214.30' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=6.35 cfs @ 12.09 hrs HW=217.01' (Free Discharge)
1=Culvert (Inlet Controls 6.35 cfs @ 3.42 fps)

Pond D31: DMH - 30"



Summary for Pond D32: DMH - 30"

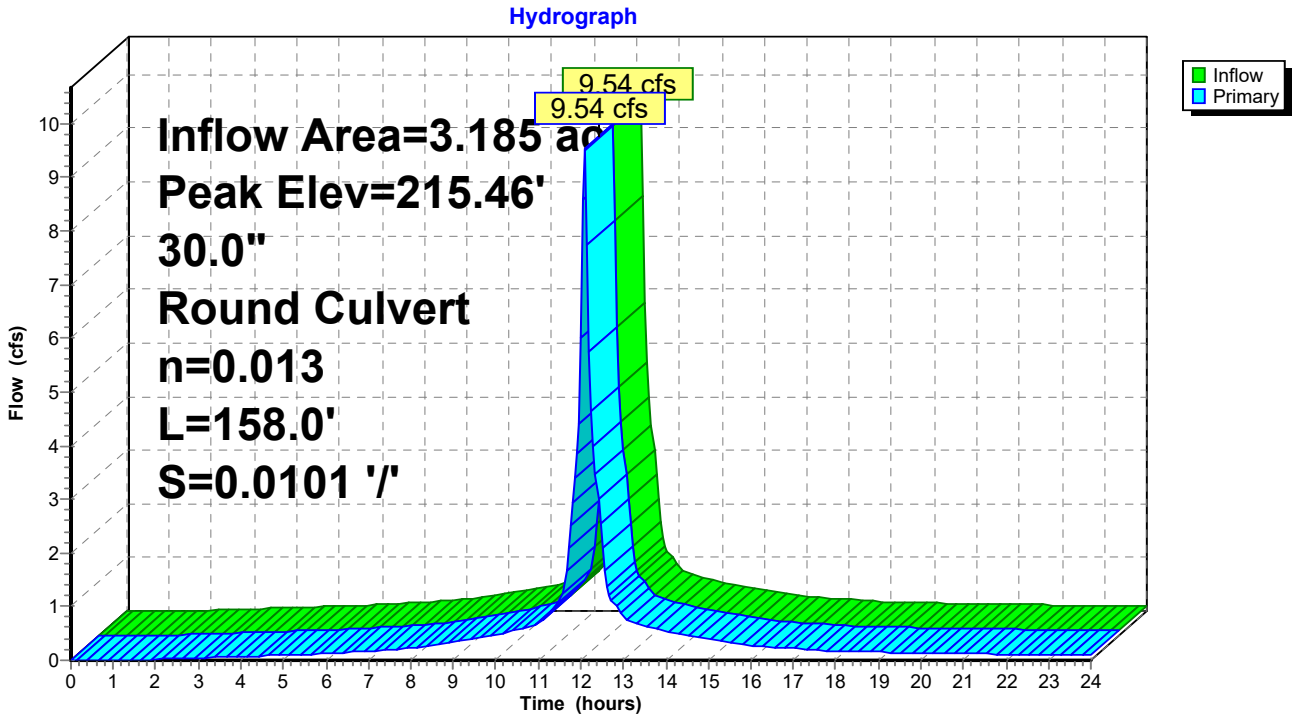
Inflow Area = 3.185 ac, 99.06% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 9.54 cfs @ 12.09 hrs, Volume= 0.784 af
Outflow = 9.54 cfs @ 12.09 hrs, Volume= 0.784 af, Atten= 0%, Lag= 0.0 min
Primary = 9.54 cfs @ 12.09 hrs, Volume= 0.784 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 215.46' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	214.20'	**30.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.20' / 212.60' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=9.36 cfs @ 12.09 hrs HW=215.45' (Free Discharge)
1=Culvert (Inlet Controls 9.36 cfs @ 3.81 fps)

Pond D32: DMH - 30"



Summary for Pond D33: DMH - 30"

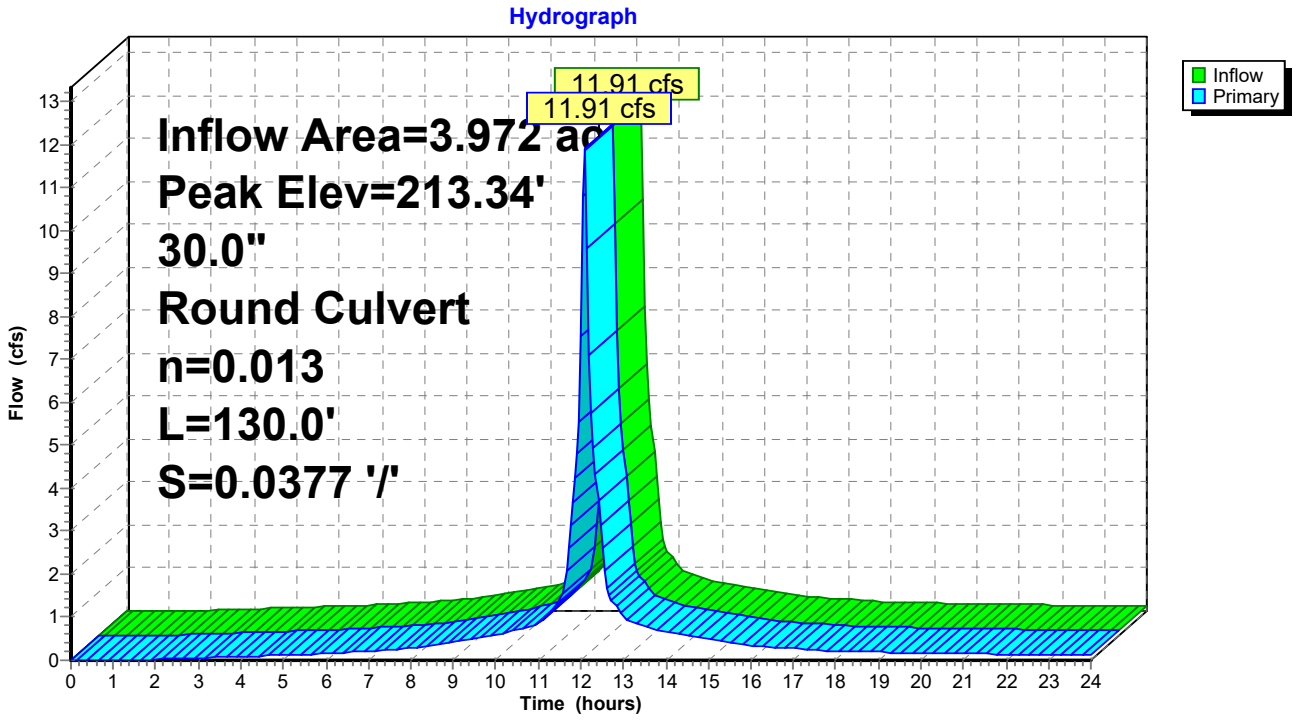
Inflow Area = 3.972 ac, 98.78% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 11.91 cfs @ 12.09 hrs, Volume= 0.978 af
Outflow = 11.91 cfs @ 12.09 hrs, Volume= 0.978 af, Atten= 0%, Lag= 0.0 min
Primary = 11.91 cfs @ 12.09 hrs, Volume= 0.978 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 213.34' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	211.90'	**30.0" Round Culvert** L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 211.90' / 207.00' S= 0.0377 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=11.66 cfs @ 12.09 hrs HW=213.32' (Free Discharge)
1=Culvert (Inlet Controls 11.66 cfs @ 4.06 fps)

Pond D33: DMH - 30"



Summary for Pond F1: Forebay

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 2.73" for 2-year 24hr event
Inflow = 15.04 cfs @ 12.09 hrs, Volume= 1.206 af
Outflow = 14.23 cfs @ 12.12 hrs, Volume= 1.206 af, Atten= 5%, Lag= 1.5 min
Primary = 14.23 cfs @ 12.12 hrs, Volume= 1.206 af
Routed to Link WQU-P5 : Water Quality Unit
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond P1a : Proposed Basin

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 206.02' @ 12.12 hrs Surf.Area= 884 sf Storage= 699 cf

Plug-Flow detention time= 0.7 min calculated for 1.204 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (767.2 - 766.6)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	3,235 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

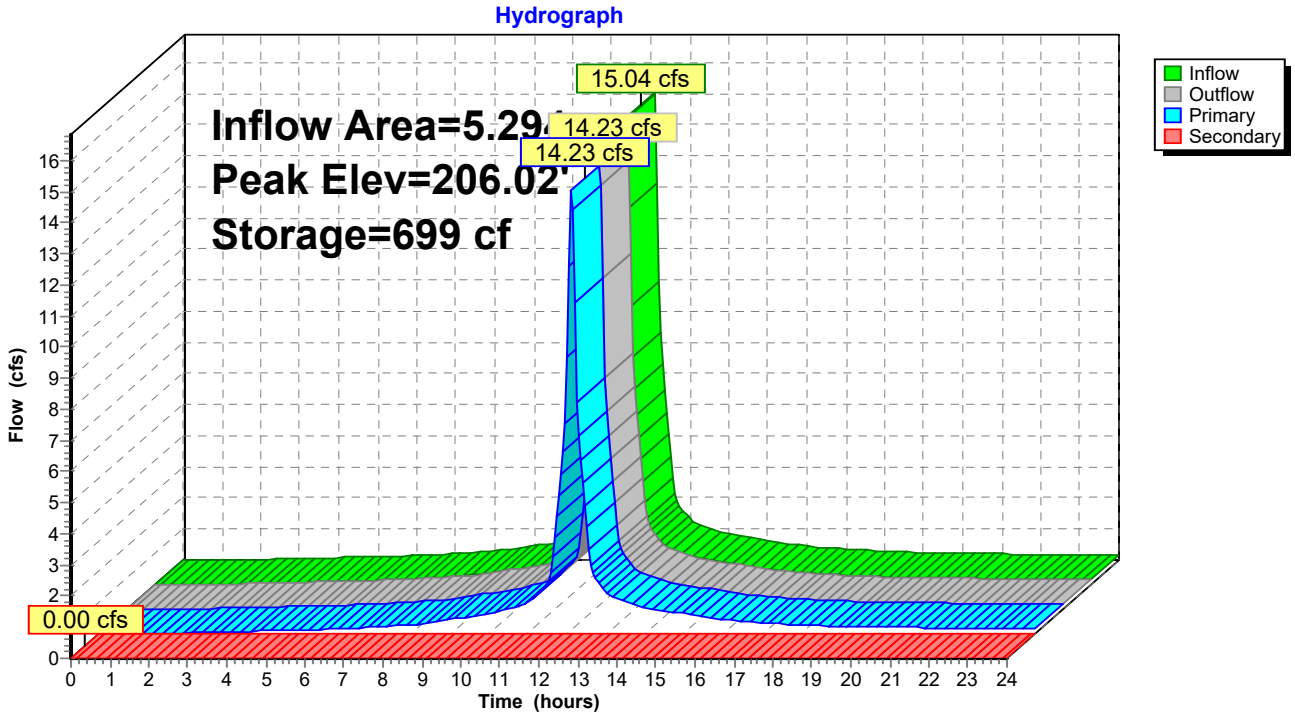
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
205.00	480	0	0
207.00	1,270	1,750	1,750
208.00	1,700	1,485	3,235

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**18.0" Round 18" Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.60' / 201.30' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	205.00'	**1.0" x 21.0" Horiz. Double Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	207.00'	**12.0' long + 2.0 '/' SideZ x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=13.93 cfs @ 12.12 hrs HW=205.98' (Free Discharge)
└**1=18" Culvert** (Passes 13.93 cfs of 16.22 cfs potential flow)
└**2=Double Grate** (Orifice Controls 13.93 cfs @ 4.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=205.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond F1: Forebay



Summary for Pond P1a: Proposed Basin

Inflow Area = 6.138 ac, 77.11% Impervious, Inflow Depth > 2.54" for 2-year 24hr event
Inflow = 15.48 cfs @ 12.11 hrs, Volume= 1.299 af
Outflow = 1.01 cfs @ 13.85 hrs, Volume= 0.900 af, Atten= 94%, Lag= 104.3 min
Discarded = 0.71 cfs @ 13.85 hrs, Volume= 0.768 af
Primary = 0.30 cfs @ 13.85 hrs, Volume= 0.133 af
Routed to Link DP-A : Design Point A
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 202.34' @ 13.85 hrs Surf.Area= 12,638 sf Storage= 31,689 cf

Plug-Flow detention time= 294.6 min calculated for 0.898 af (69% of inflow)
Center-of-Mass det. time= 199.5 min (972.3 - 772.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	90,590 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	1,180	0	0
199.00	3,950	2,565	2,565
200.00	7,100	5,525	8,090
201.00	9,950	8,525	16,615
202.00	11,950	10,950	27,565
203.00	14,000	12,975	40,540
204.00	16,000	15,000	55,540
205.00	17,500	16,750	72,290
206.00	19,100	18,300	90,590

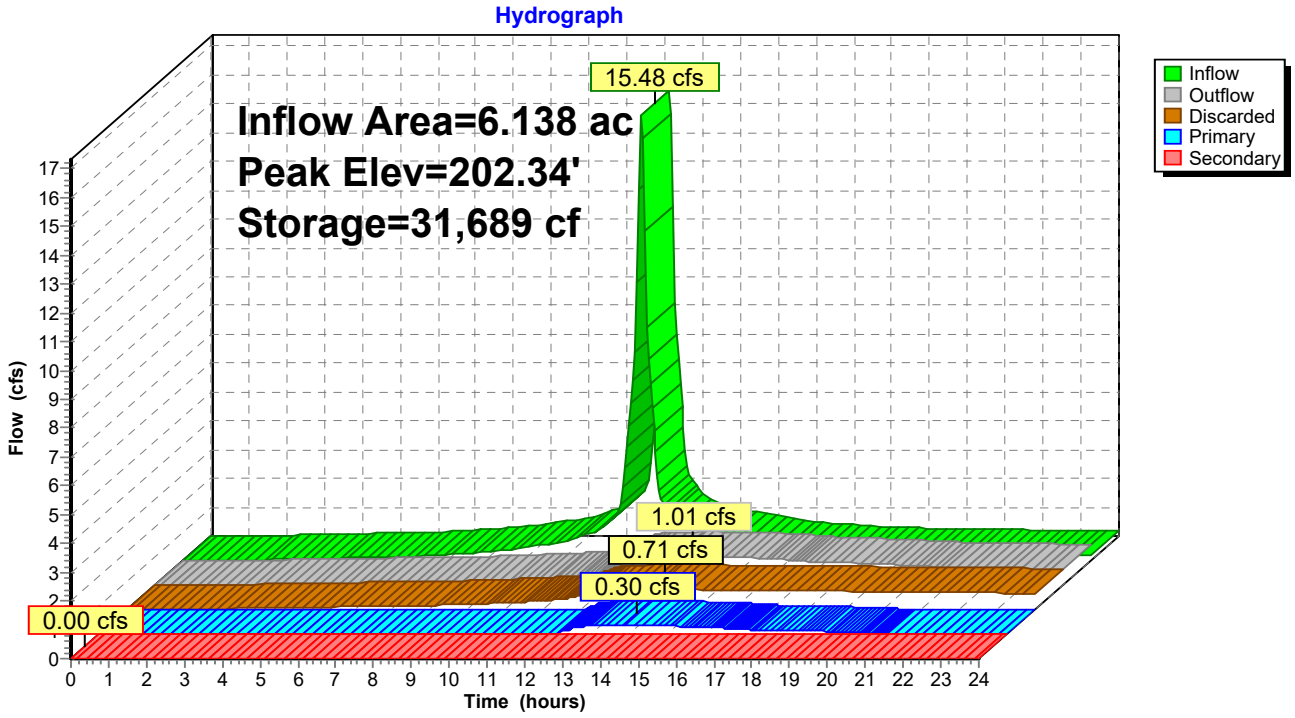
Device	Routing	Invert	Outlet Devices
#1	Secondary	205.00'	**10.0' long + 3.0 '/' SideZ x 11.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.53 2.59 2.70 2.68 2.67 2.68 2.66 2.64
#2	Primary	198.00'	**18.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 198.00' / 194.40' S= 0.0514 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	201.50'	**1.0" Vert. Orifice/Grate X 8.00 columns** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 2	203.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.71 cfs @ 13.85 hrs HW=202.34' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.71 cfs)

Primary OutFlow Max=0.30 cfs @ 13.85 hrs HW=202.34' (Free Discharge)
└**2=Culvert** (Passes 0.30 cfs of 16.11 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 3.45 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=198.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond P1a: Proposed Basin



Summary for Pond P30: 12" HDPE

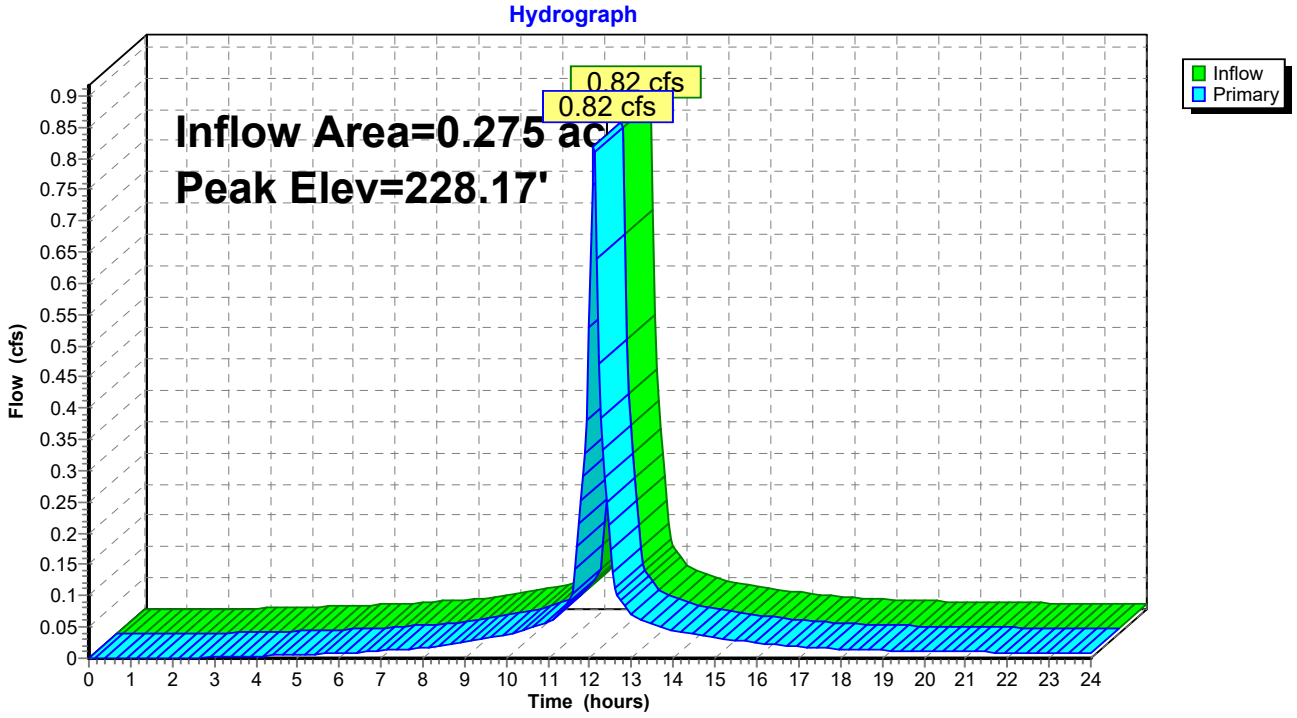
Inflow Area = 0.275 ac, 92.37% Impervious, Inflow Depth > 2.84" for 2-year 24hr event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.82 cfs @ 12.09 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min
Primary = 0.82 cfs @ 12.09 hrs, Volume= 0.065 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.17' @ 12.09 hrs
Flood Elev= 228.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	224.60'	**12.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 224.60' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.78 cfs @ 12.09 hrs HW=228.17' (Free Discharge)
└**1=Culvert** (Passes 0.78 cfs of 4.93 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.78 cfs @ 0.88 fps)

Pond P30: 12" HDPE



Summary for Pond P31: 12" HDPE

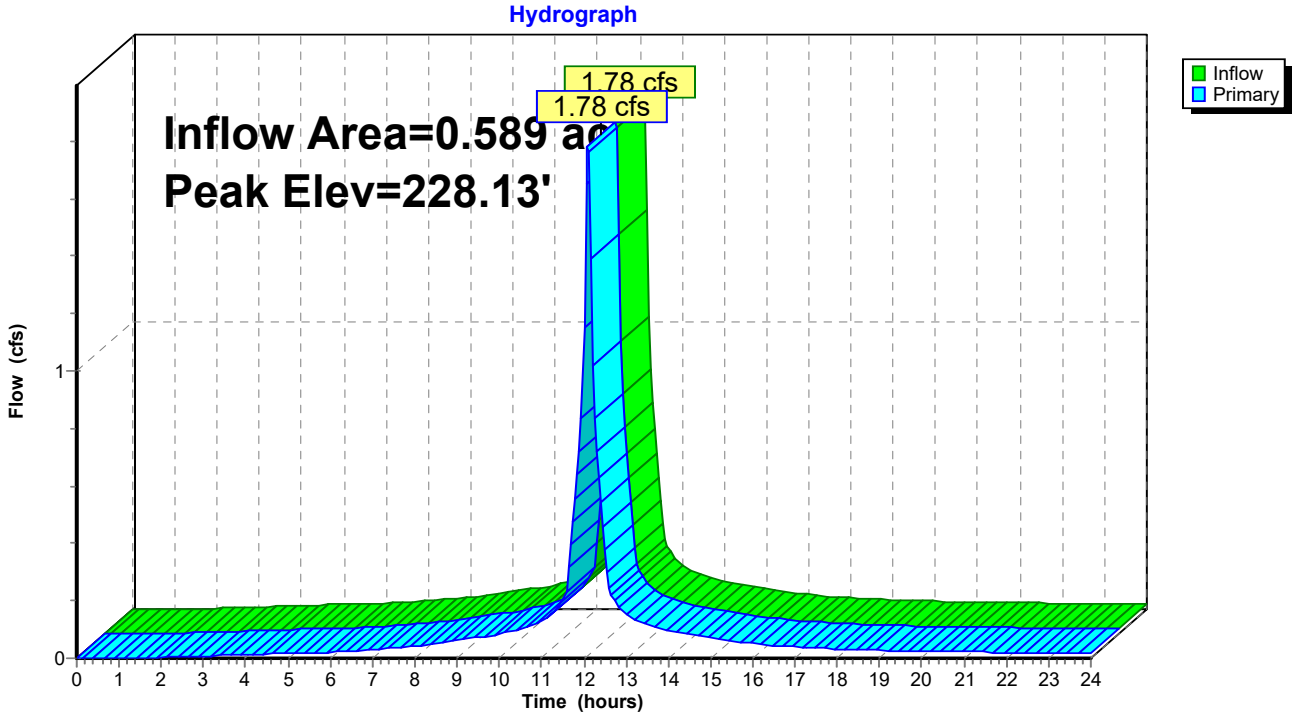
Inflow Area = 0.589 ac, 97.92% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 1.78 cfs @ 12.09 hrs, Volume= 0.145 af
Outflow = 1.78 cfs @ 12.09 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Primary = 1.78 cfs @ 12.09 hrs, Volume= 0.145 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.13' @ 12.09 hrs
Flood Elev= 228.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.00'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.00' / 222.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.72 cfs @ 12.09 hrs HW=228.12' (Free Discharge)
└─**1=Culvert** (Passes 1.72 cfs of 8.13 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 1.72 cfs @ 1.15 fps)

Pond P31: 12" HDPE



Summary for Pond P32: 18" HDPE

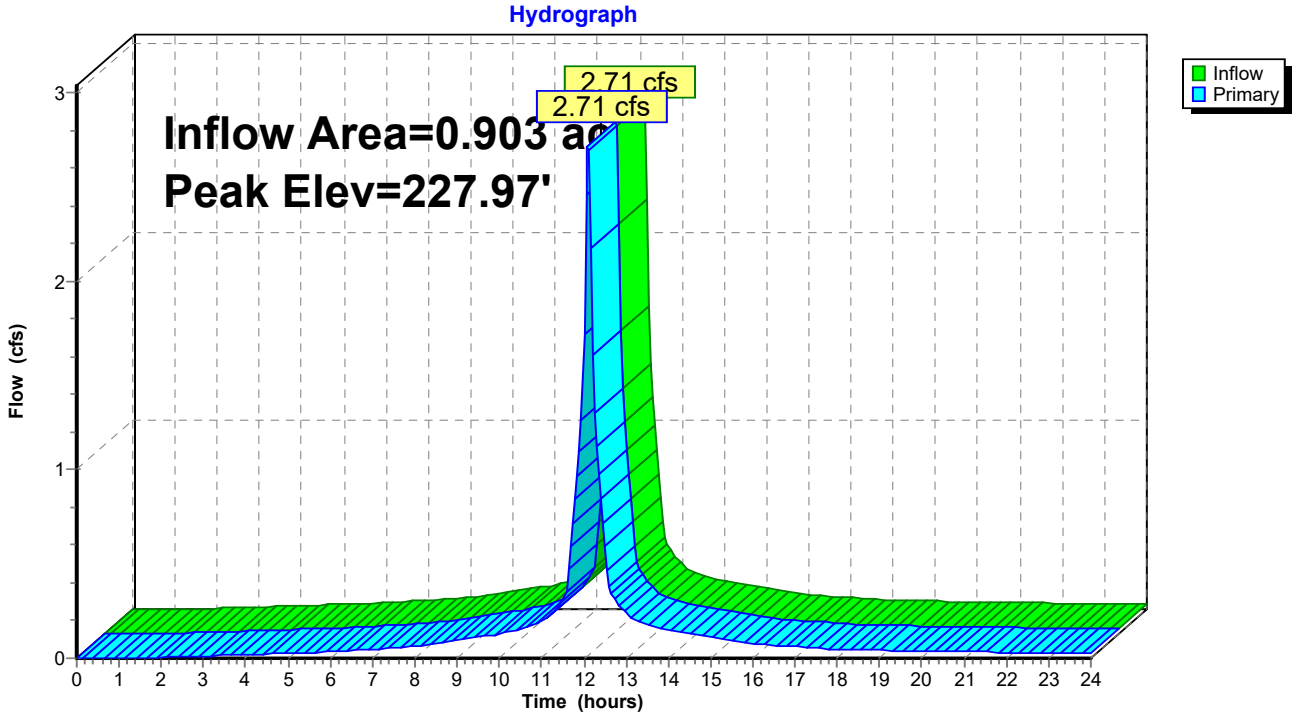
Inflow Area = 0.903 ac, 98.45% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 2.71 cfs @ 12.09 hrs, Volume= 0.222 af
Outflow = 2.71 cfs @ 12.09 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min
Primary = 2.71 cfs @ 12.09 hrs, Volume= 0.222 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 227.97' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.80'	**18.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.80' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.64 cfs @ 12.09 hrs HW=227.97' (Free Discharge)
└─**1=Culvert** (Passes 2.64 cfs of 14.88 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.64 cfs @ 1.33 fps)

Pond P32: 18" HDPE



Summary for Pond P33: 18" HDPE

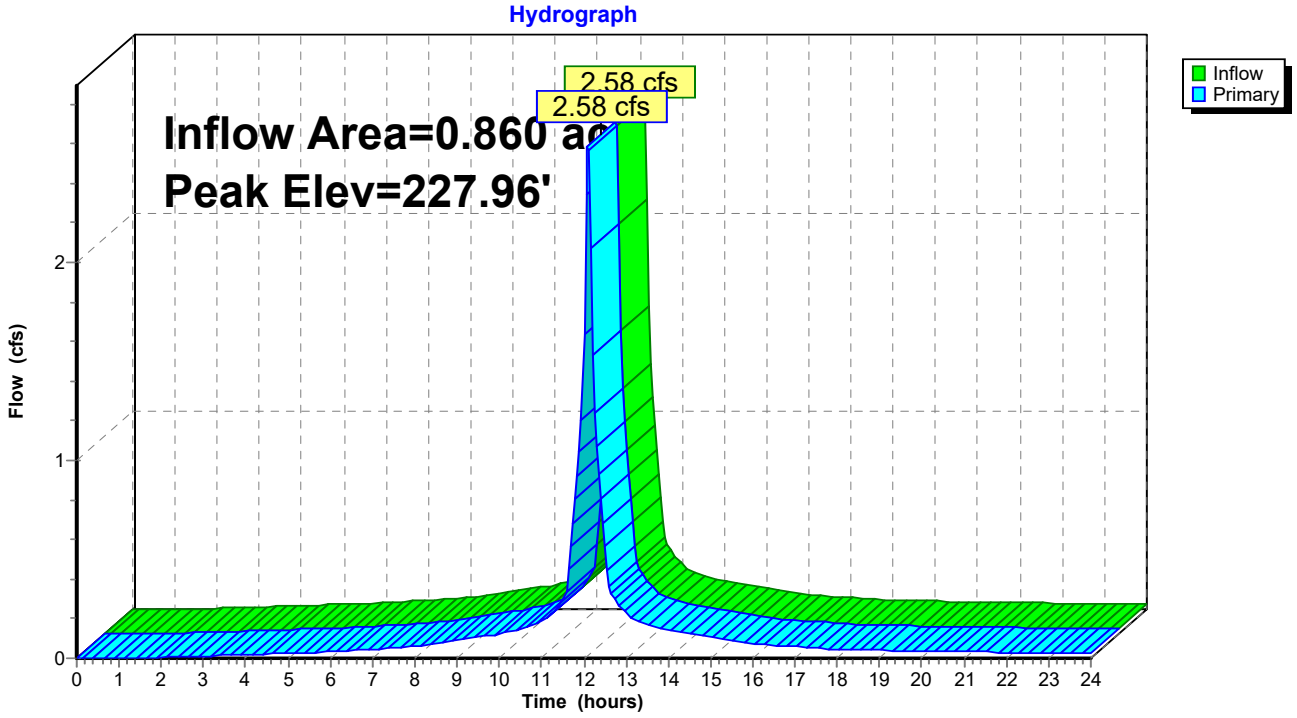
Inflow Area = 0.860 ac, 99.28% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 2.58 cfs @ 12.09 hrs, Volume= 0.212 af
Outflow = 2.58 cfs @ 12.09 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min
Primary = 2.58 cfs @ 12.09 hrs, Volume= 0.212 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 227.96' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	222.80'	**18.0" Round Culvert** L= 198.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.80' / 219.80' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.51 cfs @ 12.09 hrs HW=227.96' (Free Discharge)
└**1=Culvert** (Passes 2.51 cfs of 16.17 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 2.51 cfs @ 1.31 fps)

Pond P33: 18" HDPE



Summary for Pond P34: 18" HDPE

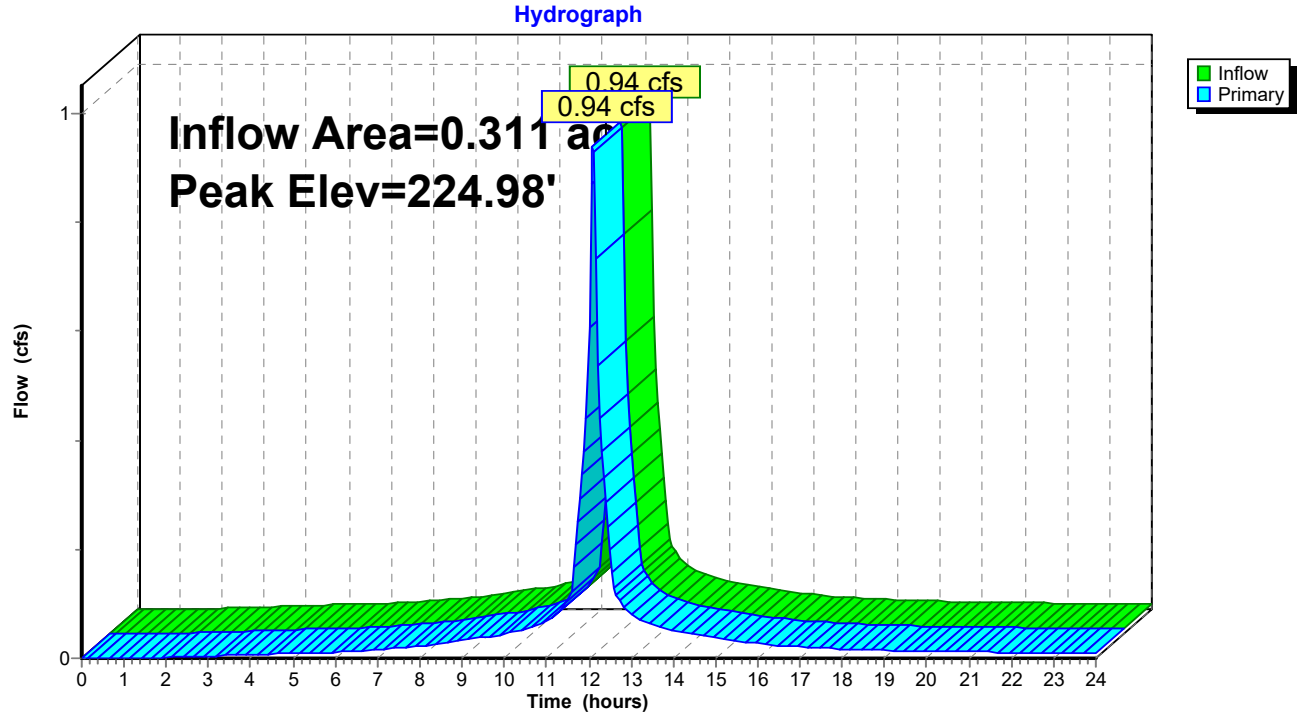
Inflow Area = 0.311 ac, 97.52% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.09 hrs, Volume= 0.077 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 224.98' @ 12.09 hrs
Flood Elev= 225.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.90'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.90' / 219.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	224.90'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.88 cfs @ 12.09 hrs HW=224.98' (Free Discharge)
└**1=Culvert** (Passes 0.88 cfs of 17.70 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.88 cfs @ 0.92 fps)

Pond P34: 18" HDPE



Summary for Pond P35: 18" HDPE

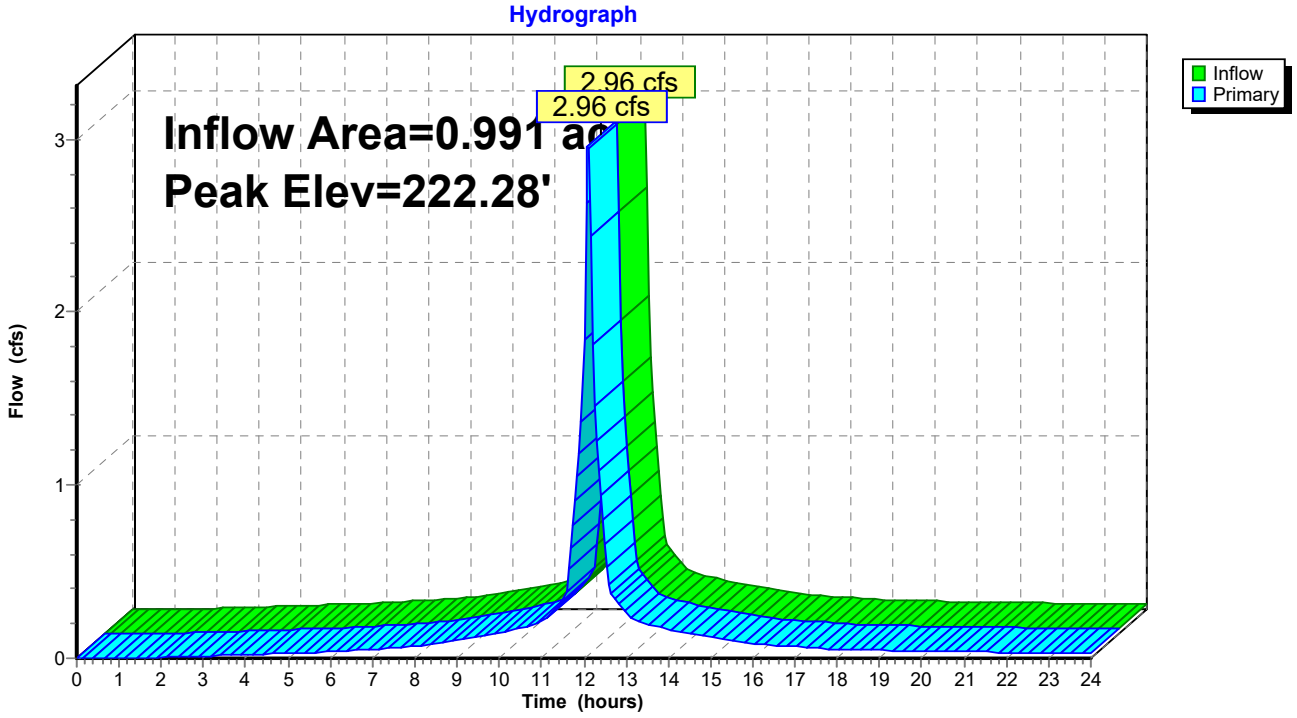
Inflow Area = 0.991 ac, 99.24% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 2.96 cfs @ 12.09 hrs, Volume= 0.244 af
Outflow = 2.96 cfs @ 12.09 hrs, Volume= 0.244 af, Atten= 0%, Lag= 0.0 min
Primary = 2.96 cfs @ 12.09 hrs, Volume= 0.244 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.28' @ 12.09 hrs
Flood Elev= 222.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 217.10' / 217.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	222.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.90 cfs @ 12.09 hrs HW=222.28' (Free Discharge)
└─**1=Culvert** (Passes 2.90 cfs of 17.90 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.90 cfs @ 1.37 fps)

Pond P35: 18" HDPE



Summary for Pond P36: 18" HDPE

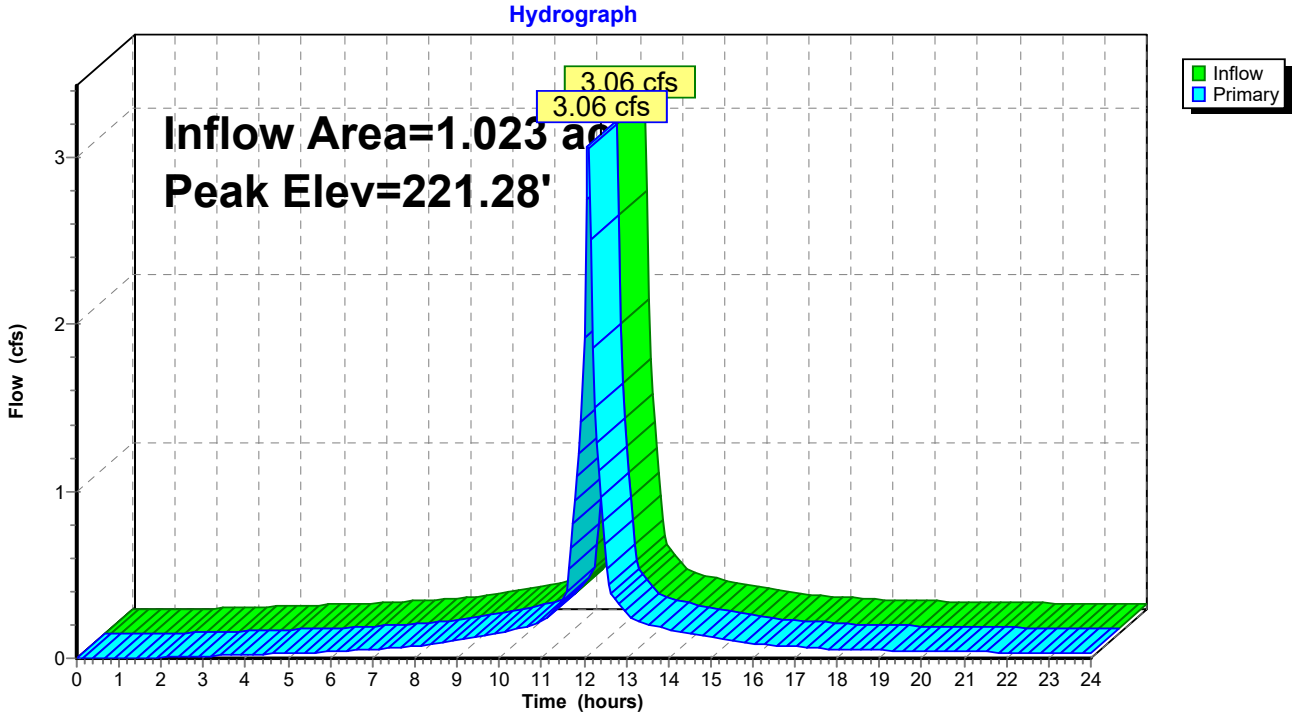
Inflow Area = 1.023 ac, 99.15% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 3.06 cfs @ 12.09 hrs, Volume= 0.252 af
Outflow = 3.06 cfs @ 12.09 hrs, Volume= 0.252 af, Atten= 0%, Lag= 0.0 min
Primary = 3.06 cfs @ 12.09 hrs, Volume= 0.252 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 221.28' @ 12.09 hrs
Flood Elev= 221.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	216.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.10' / 216.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	221.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.99 cfs @ 12.09 hrs HW=221.28' (Free Discharge)
└─**1=Culvert** (Passes 2.99 cfs of 17.91 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.99 cfs @ 1.39 fps)

Pond P36: 18" HDPE



Summary for Pond P37: 18" HDPE

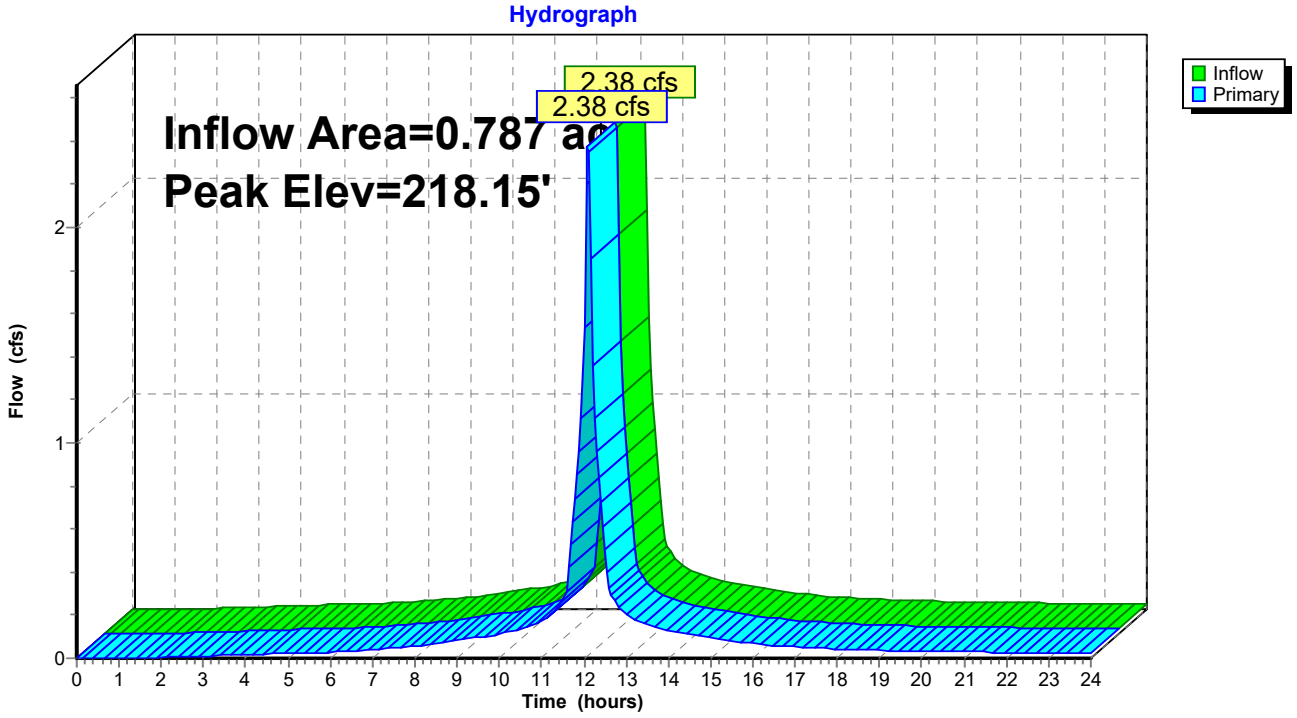
Inflow Area = 0.787 ac, 97.66% Impervious, Inflow Depth > 2.96" for 2-year 24hr event
Inflow = 2.38 cfs @ 12.09 hrs, Volume= 0.194 af
Outflow = 2.38 cfs @ 12.09 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.09 hrs, Volume= 0.194 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 218.15' @ 12.09 hrs
Flood Elev= 218.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 212.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	218.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.29 cfs @ 12.09 hrs HW=218.15' (Free Discharge)
└─**1=Culvert** (Passes 2.29 cfs of 17.85 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.29 cfs @ 1.27 fps)

Pond P37: 18" HDPE



Summary for Pond P38: 18" HDPE

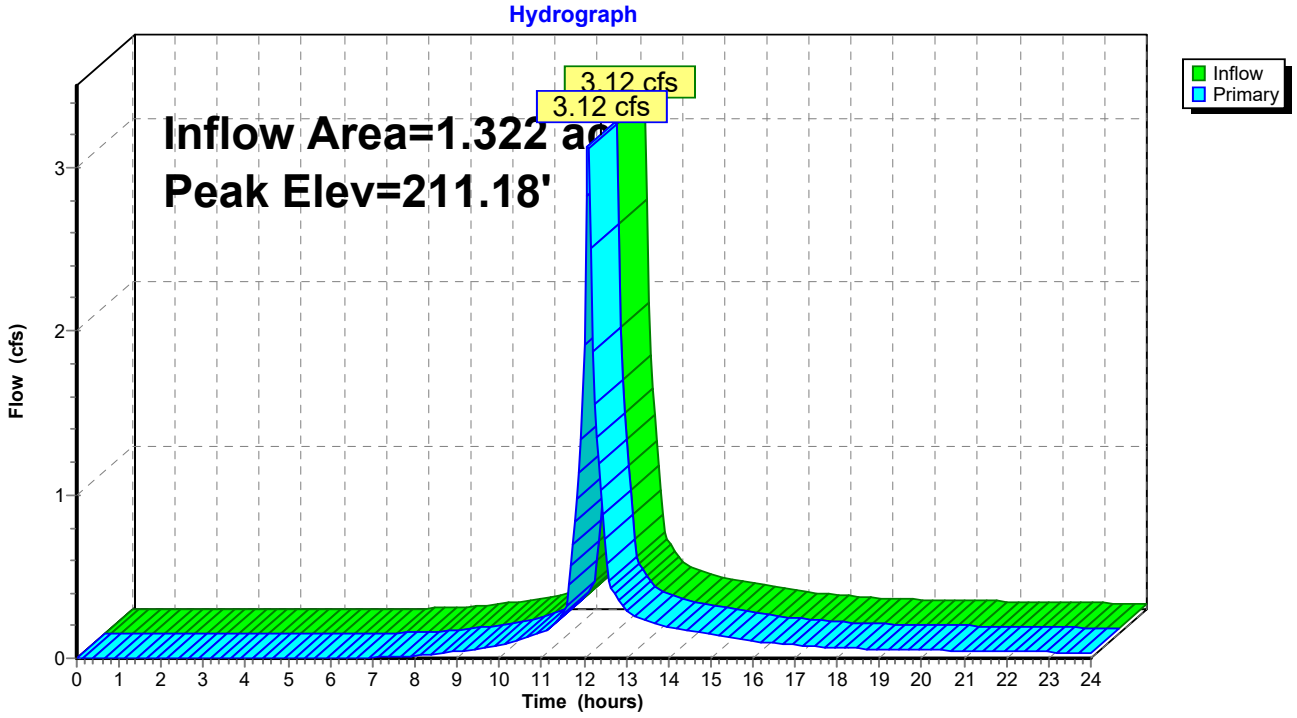
Inflow Area = 1.322 ac, 57.38% Impervious, Inflow Depth > 2.07" for 2-year 24hr event
Inflow = 3.12 cfs @ 12.09 hrs, Volume= 0.228 af
Outflow = 3.12 cfs @ 12.09 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min
Primary = 3.12 cfs @ 12.09 hrs, Volume= 0.228 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 211.18' @ 12.09 hrs
Flood Elev= 211.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	207.80'	**18.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 207.80' / 207.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	211.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.05 cfs @ 12.09 hrs HW=211.18' (Free Discharge)
└─**1=Culvert** (Passes 3.05 cfs of 13.49 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 3.05 cfs @ 1.39 fps)

Pond P38: 18" HDPE

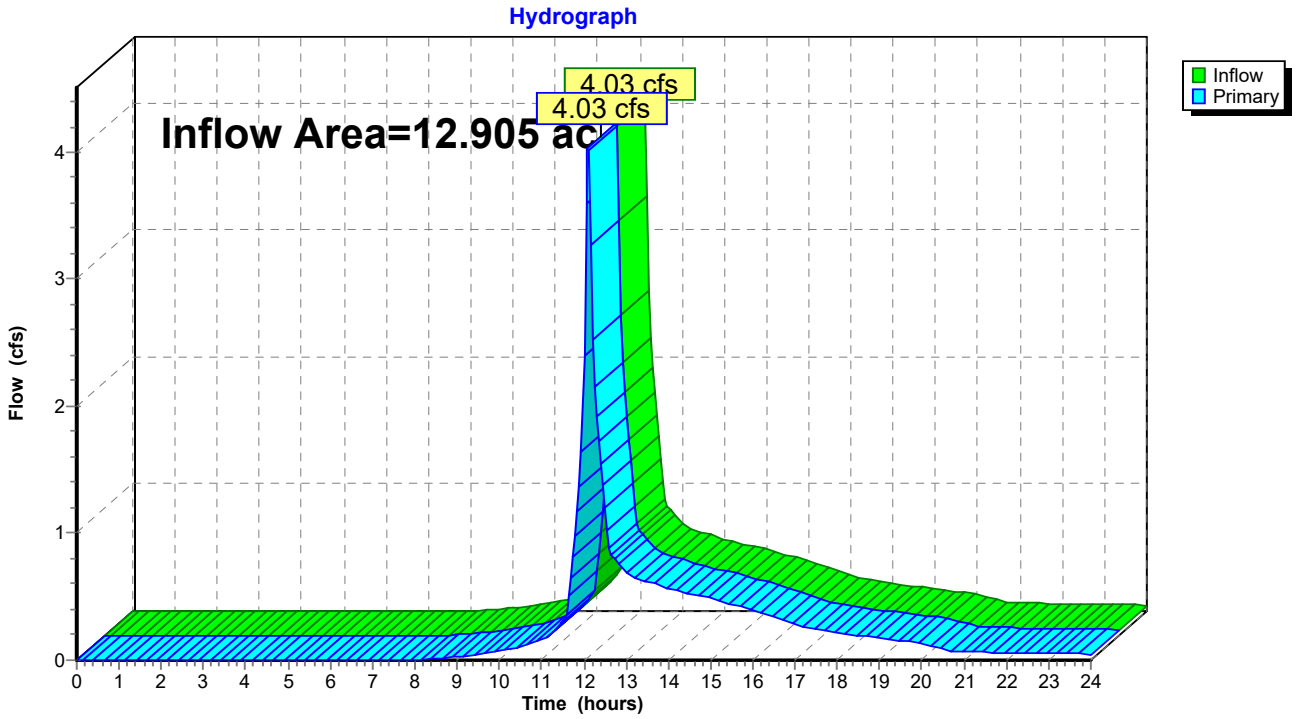


Summary for Link DP-A: Design Point A

Inflow Area = 12.905 ac, 72.18% Impervious, Inflow Depth > 0.39" for 2-year 24hr event
Inflow = 4.03 cfs @ 12.09 hrs, Volume= 0.424 af
Primary = 4.03 cfs @ 12.09 hrs, Volume= 0.424 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-A: Design Point A

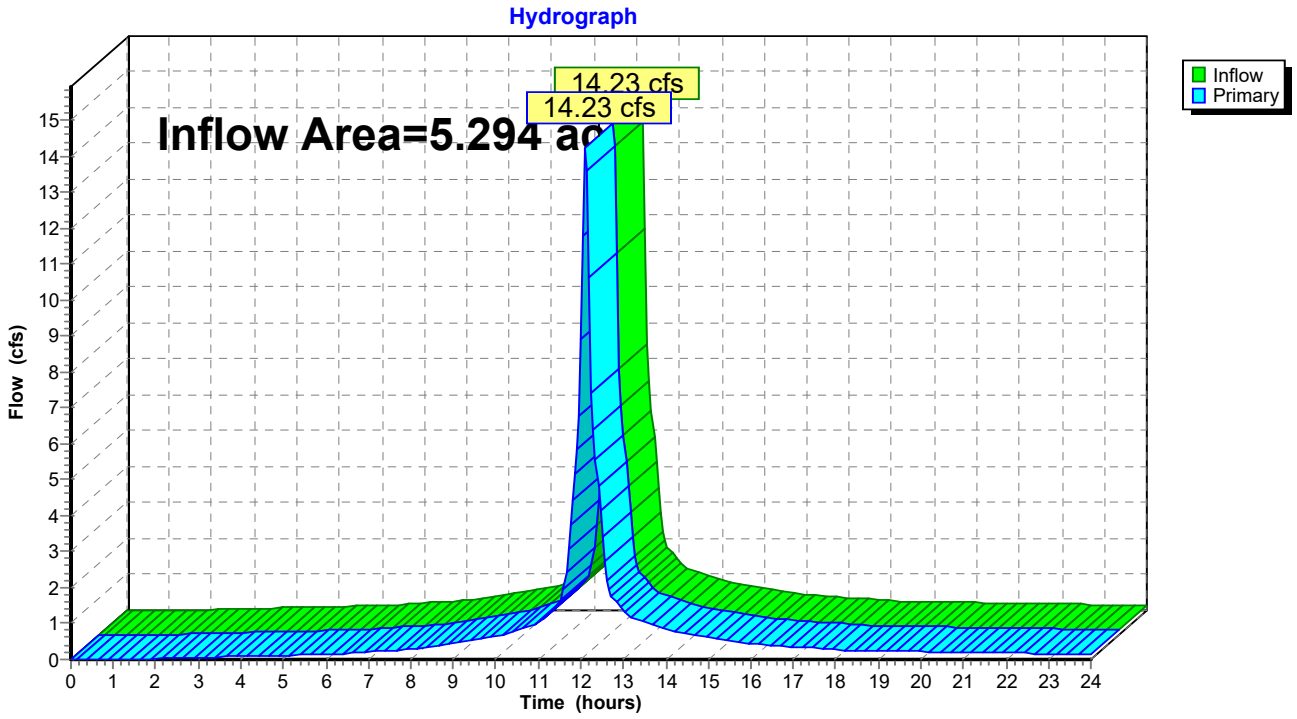


Summary for Link WQU-P5: Water Quality Unit

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 2.73" for 2-year 24hr event
Inflow = 14.23 cfs @ 12.12 hrs, Volume= 1.206 af
Primary = 14.23 cfs @ 12.12 hrs, Volume= 1.206 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P1a : Proposed Basin

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P5: Water Quality Unit

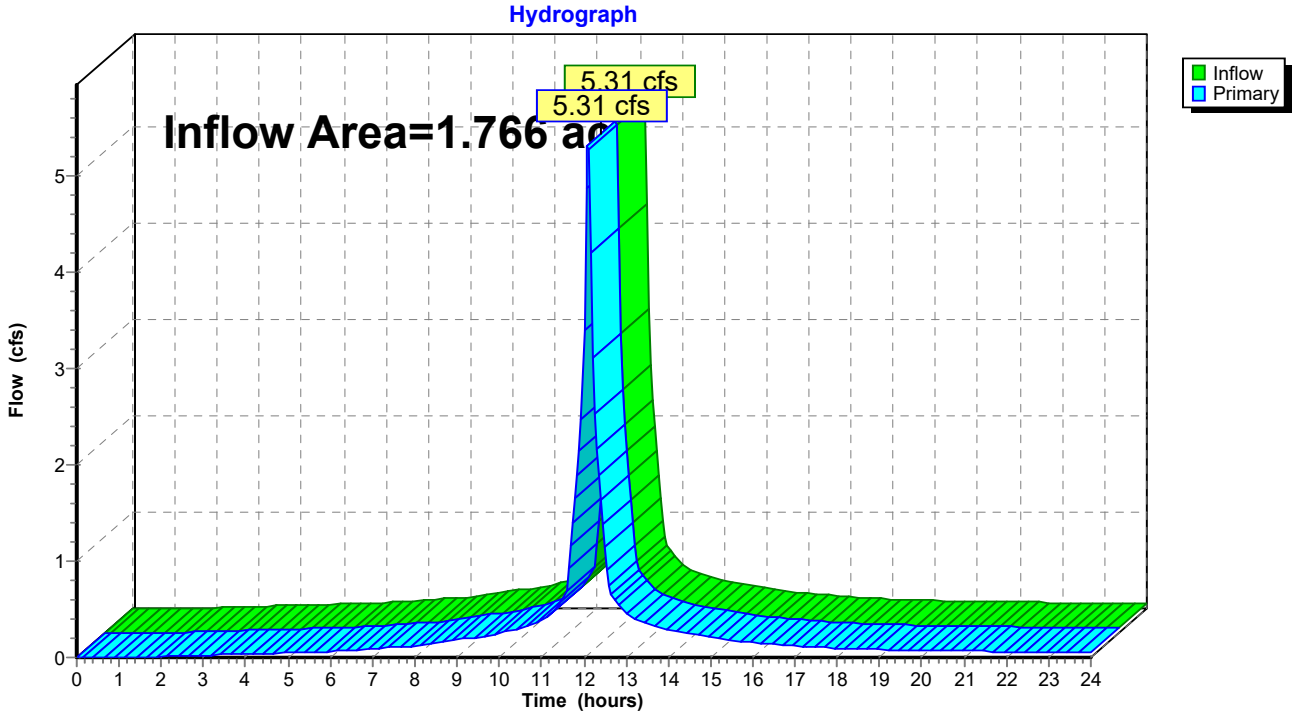


Summary for Link WQU-P6: Water Quality Unit

Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 2.94" for 2-year 24hr event
Inflow = 5.31 cfs @ 12.09 hrs, Volume= 0.432 af
Primary = 5.31 cfs @ 12.09 hrs, Volume= 0.432 af, Atten= 0%, Lag= 0.0 min
Routed to Pond CMB : Underground Storage Chambers

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P6: Water Quality Unit



Summary for Subcatchment P-A1:

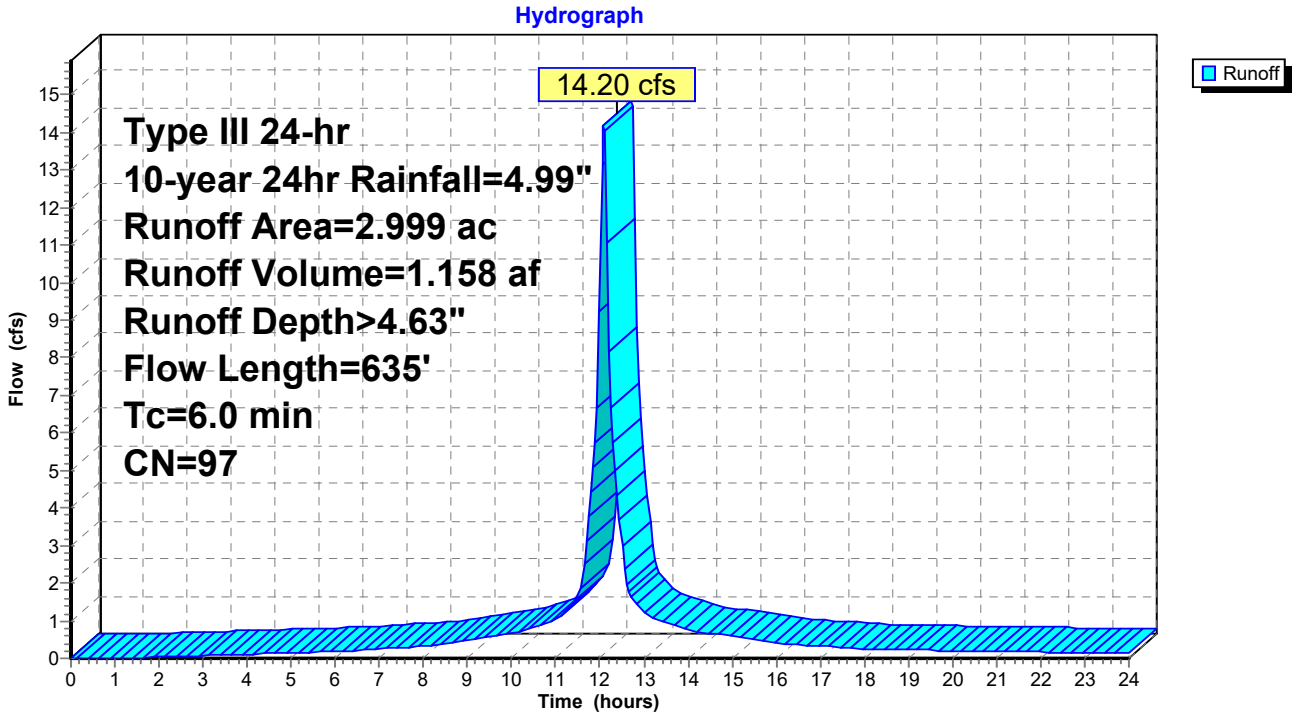
Runoff = 14.20 cfs @ 12.09 hrs, Volume= 1.158 af, Depth> 4.63"
Routed to Pond CMB : Underground Storage Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.003	98	PR Gravel Surface, Impervious, HSG C
0.007	98	PR Gravel Surface, Impervious, HSG C
0.043	98	PR Gravel Surface, Impervious, HSG C
1.360	98	EX Gravel Surface, Impervious, HSG C
0.933	98	Roofs, HSG C
0.050	98	Paved parking, HSG C
0.457	98	Paved parking, HSG C
0.069	74	>75% Grass cover, Good, HSG C
0.078	74	>75% Grass cover, Good, HSG C
2.999	97	Weighted Average
0.147		4.89% Pervious Area
2.852		95.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.19"
3.5	300	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	285	0.0060	4.60	8.14	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.7	635	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A1:



Summary for Subcatchment P-A2a:

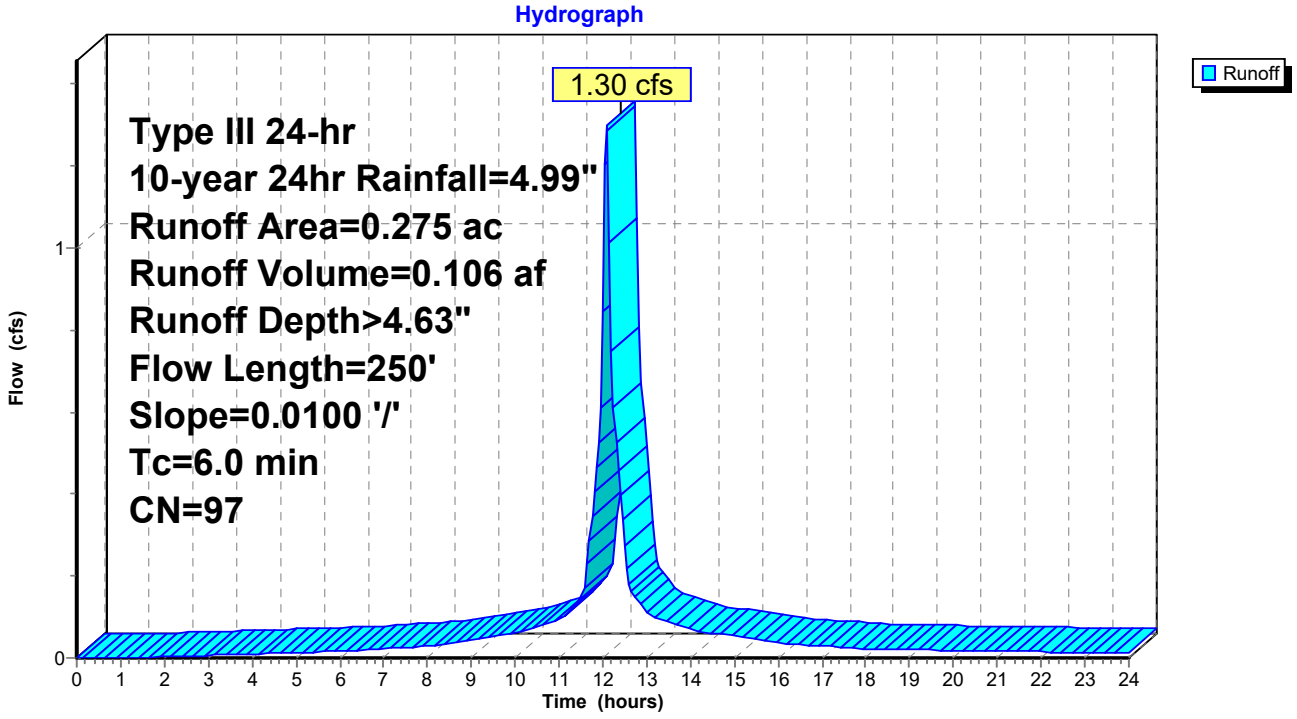
Runoff = 1.30 cfs @ 12.09 hrs, Volume= 0.106 af, Depth> 4.63"
Routed to Pond P30 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.238	98	PR Gravel Surface, Impervious, HSG C
0.016	98	EX Gravel Surface, Impervious, HSG C
0.009	96	Gravel surface, HSG C
0.275	97	Weighted Average
0.021		7.63% Pervious Area
0.254		92.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.1	200	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	250	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2a:



Summary for Subcatchment P-A2b:

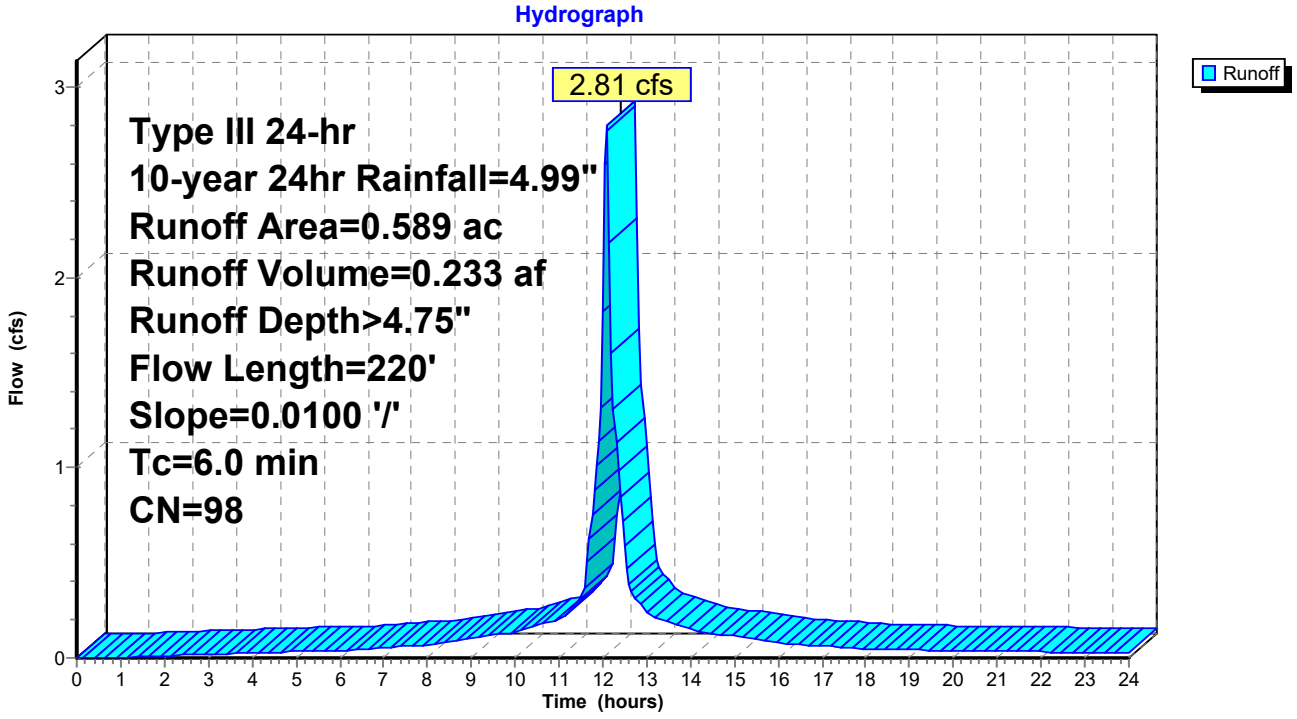
Runoff = 2.81 cfs @ 12.09 hrs, Volume= 0.233 af, Depth> 4.75"
Routed to Pond P31 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.005	74	>75% Grass cover, Good, HSG C
0.329	98	PR Gravel Surface, Impervious, HSG C
0.247	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.589	98	Weighted Average
0.012		2.08% Pervious Area
0.576		97.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.8	170	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.9	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2b:



Summary for Subcatchment P-A2c:

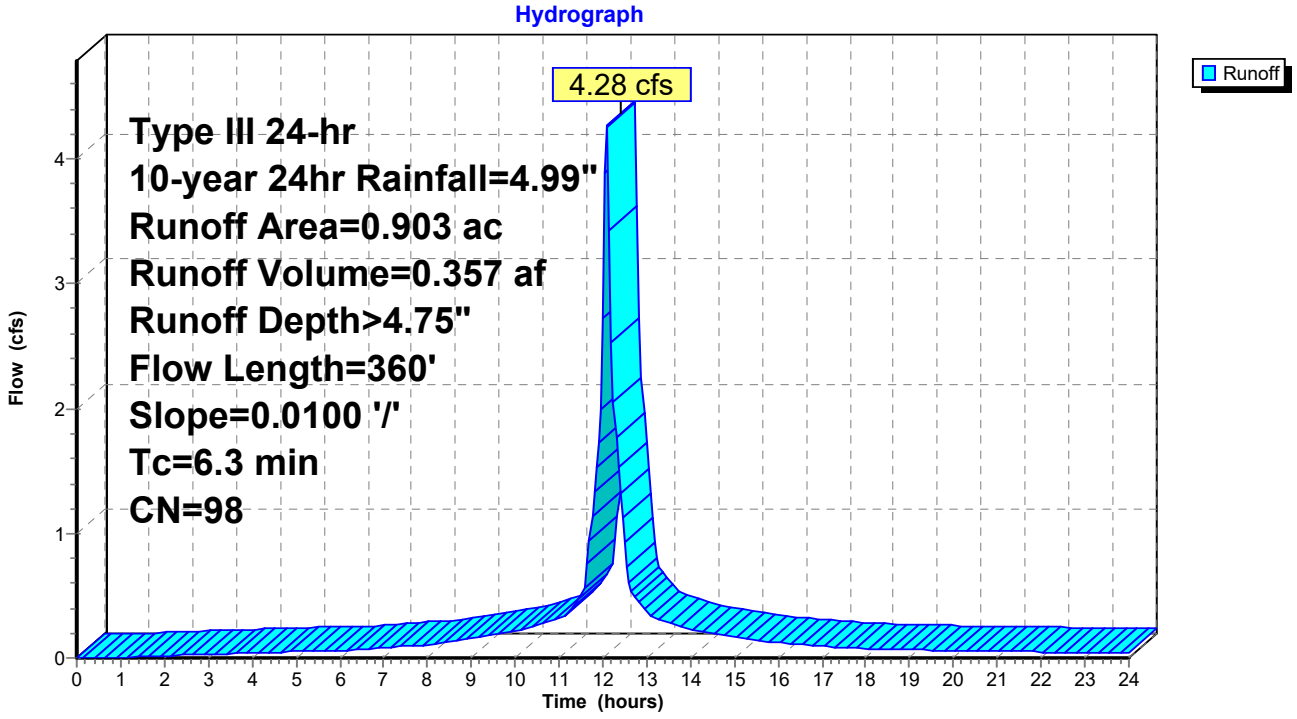
Runoff = 4.28 cfs @ 12.09 hrs, Volume= 0.357 af, Depth> 4.75"
Routed to Pond P32 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.008	74	>75% Grass cover, Good, HSG C
0.605	98	PR Gravel Surface, Impervious, HSG C
0.284	98	EX Gravel Surface, Impervious, HSG C
0.006	96	Gravel surface, HSG C
0.903	98	Weighted Average
0.014		1.55% Pervious Area
0.889		98.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A2c:



Summary for Subcatchment P-A3a:

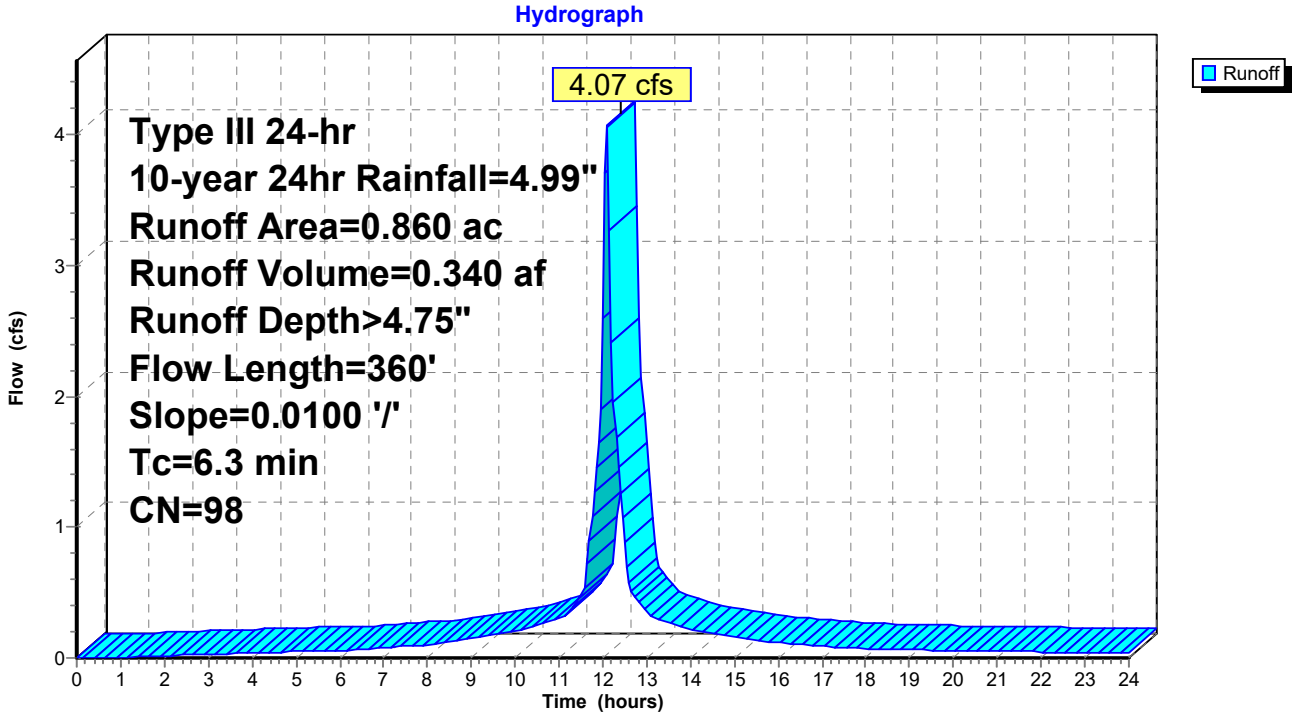
Runoff = 4.07 cfs @ 12.09 hrs, Volume= 0.340 af, Depth> 4.75"
Routed to Pond P33 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.000	74	>75% Grass cover, Good, HSG C
0.006	96	Gravel surface, HSG C
0.094	98	EX Gravel Surface, Impervious, HSG C
0.760	98	PR Gravel Surface, Impervious, HSG C
0.860	98	Weighted Average
0.006		0.72% Pervious Area
0.854		99.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A3a:



Summary for Subcatchment P-A3b:

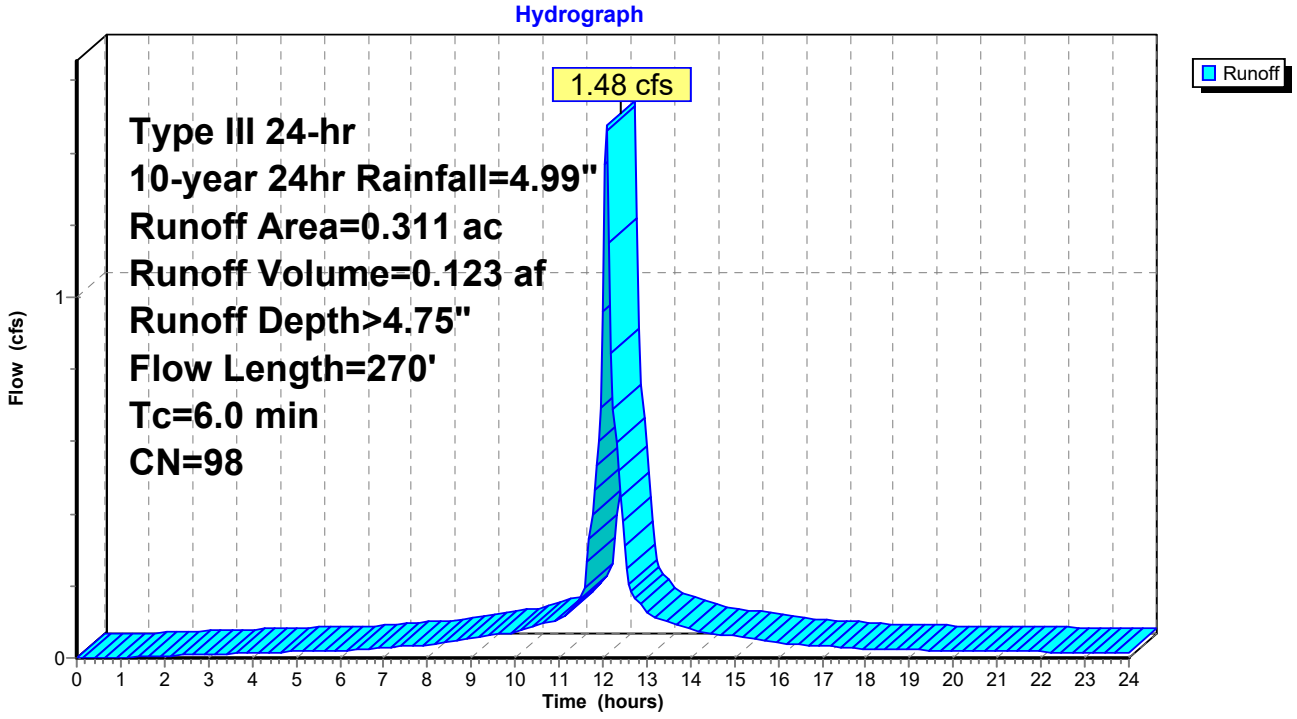
Runoff = 1.48 cfs @ 12.09 hrs, Volume= 0.123 af, Depth> 4.75"
Routed to Pond P34 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.303	98	PR Gravel Surface, Impervious, HSG C
0.008	96	Gravel surface, HSG C
0.311	98	Weighted Average
0.008		2.48% Pervious Area
0.303		97.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	130	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	270	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3b:



Summary for Subcatchment P-A3c:

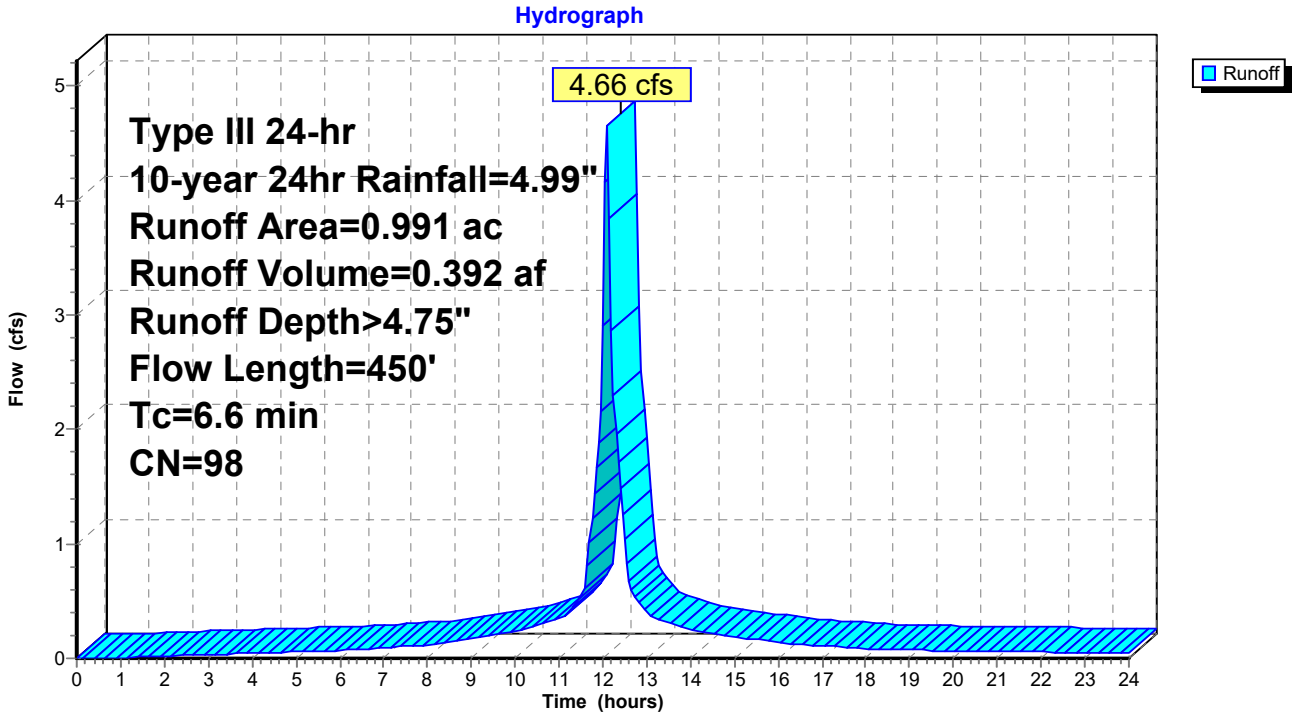
Runoff = 4.66 cfs @ 12.09 hrs, Volume= 0.392 af, Depth> 4.75"
Routed to Pond P35 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.983	98	PR Gravel Surface, Impervious, HSG C
0.001	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.991	98	Weighted Average
0.007		0.76% Pervious Area
0.983		99.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.4	230	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	100	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	70	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	450	Total			

Subcatchment P-A3c:



Summary for Subcatchment P-A3d:

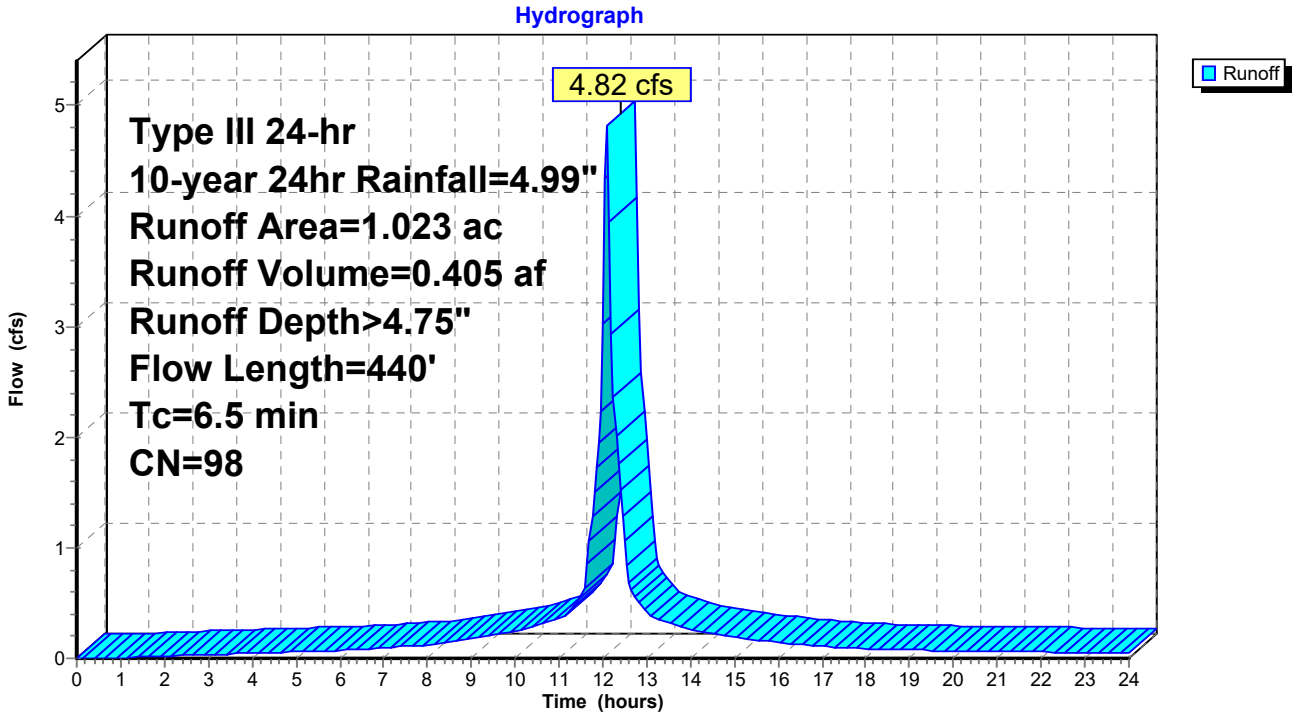
Runoff = 4.82 cfs @ 12.09 hrs, Volume= 0.405 af, Depth> 4.75"
Routed to Pond P36 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.918	98	PR Gravel Surface, Impervious, HSG C
0.018	98	EX Gravel Surface, Impervious, HSG C
0.004	96	Gravel surface, HSG C
0.004	96	Gravel surface, HSG D
0.079	98	PR Gravel Surface, Impervious, HSG D
1.023	98	Weighted Average
0.009		0.85% Pervious Area
1.015		99.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	120	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	160	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	440	Total			

Subcatchment P-A3d:



Summary for Subcatchment P-A3e:

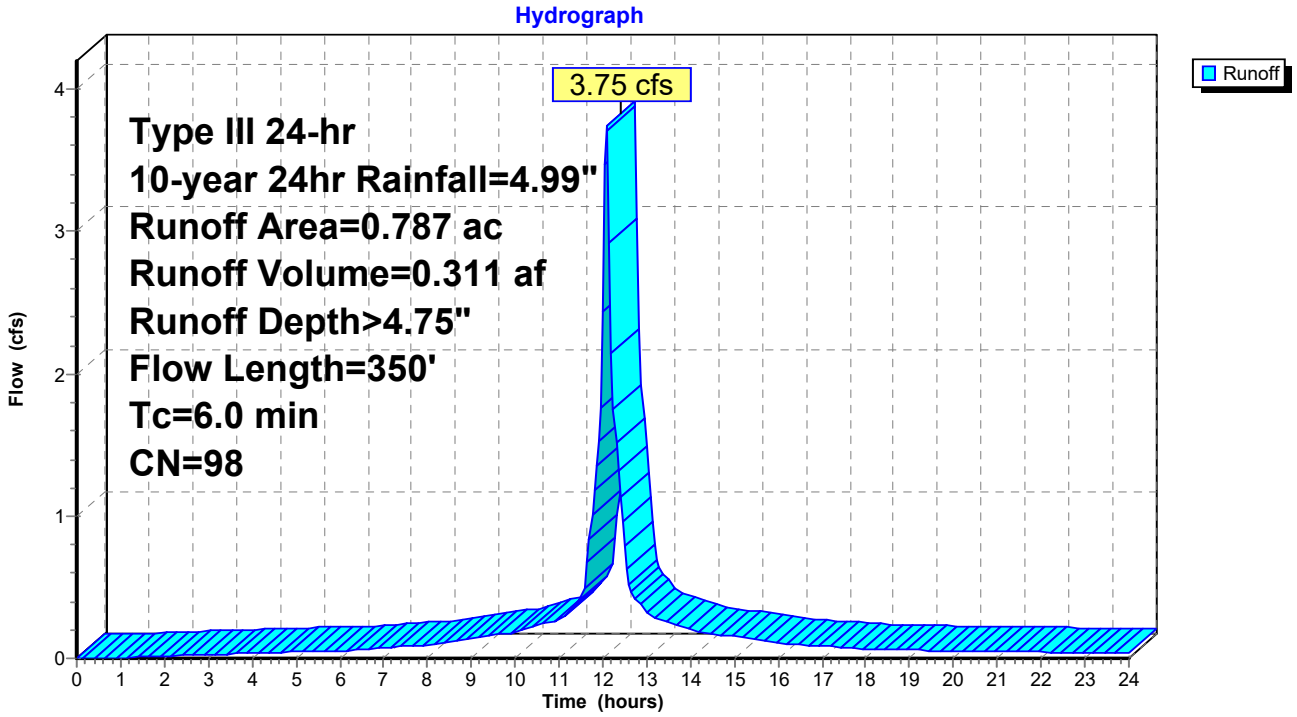
Runoff = 3.75 cfs @ 12.09 hrs, Volume= 0.311 af, Depth> 4.75"
Routed to Pond P37 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.669	98	PR Gravel Surface, Impervious, HSG C
0.031	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG D
0.068	98	PR Gravel Surface, Impervious, HSG D
0.787	98	Weighted Average
0.018		2.34% Pervious Area
0.768		97.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.7	160	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	140	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3e:



Summary for Subcatchment P-A4: Subcat P-A4

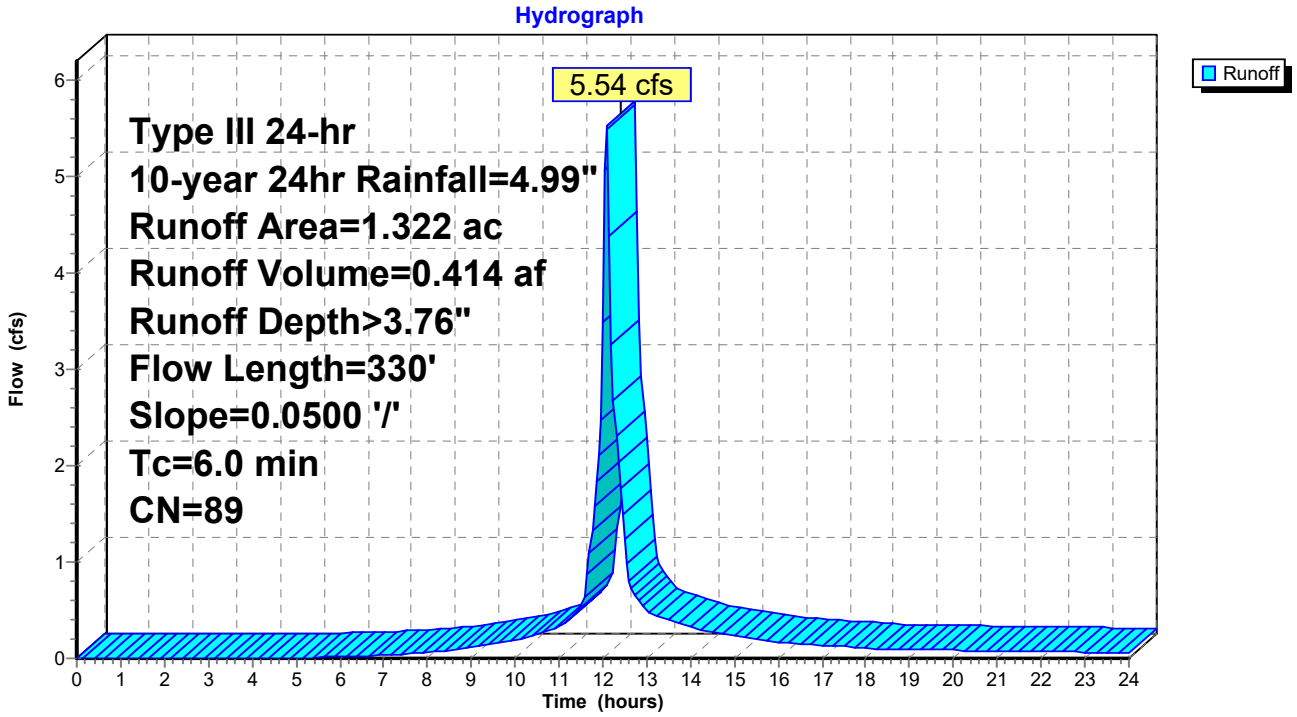
Runoff = 5.54 cfs @ 12.09 hrs, Volume= 0.414 af, Depth> 3.76"
Routed to Pond P38 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.523	98	PR Gravel Surface, Impervious, HSG C
0.123	98	EX Gravel Surface, Impervious, HSG C
0.403	74	>75% Grass cover, Good, HSG C
0.001	74	>75% Grass cover, Good, HSG C
0.084	80	>75% Grass cover, Good, HSG D
0.071	80	>75% Grass cover, Good, HSG D
0.005	96	Gravel surface, HSG D
0.112	98	PR Gravel Surface, Impervious, HSG D
1.322	89	Weighted Average
0.564		42.62% Pervious Area
0.759		57.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.0500	0.51		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.3	280	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	330	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A4: Subcat P-A4



Summary for Subcatchment P-A5:

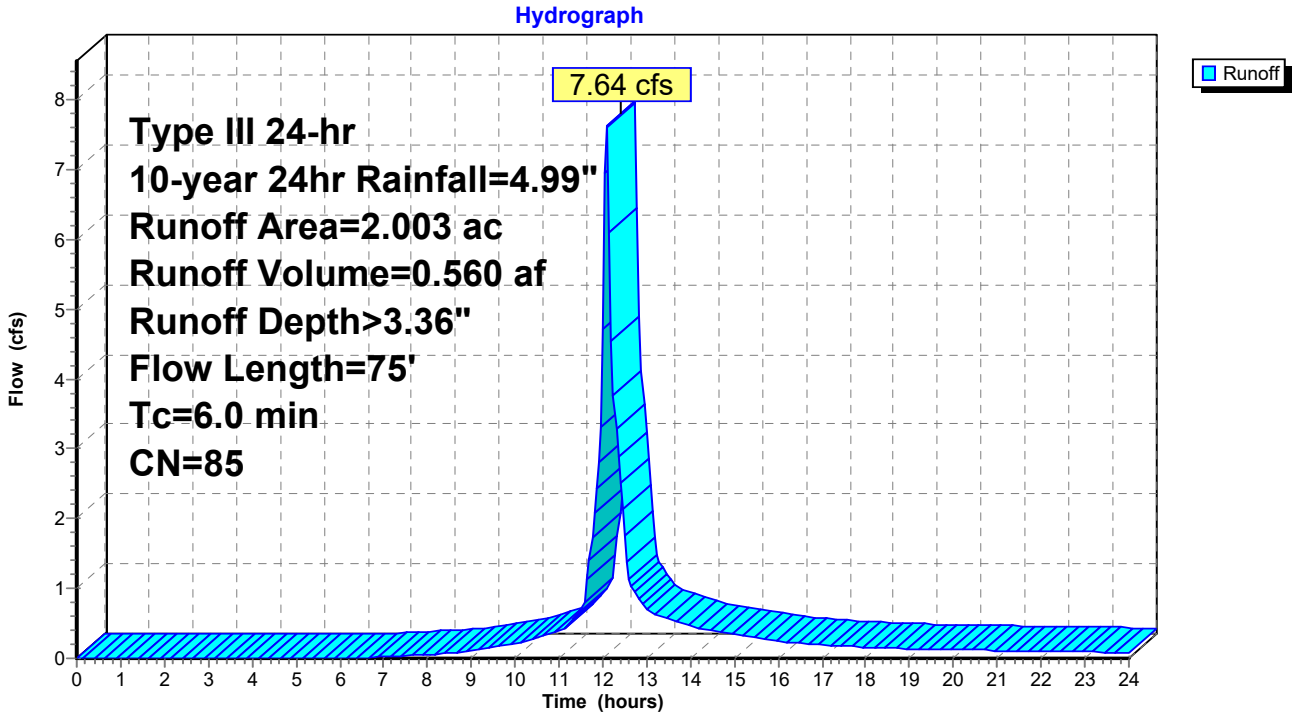
Runoff = 7.64 cfs @ 12.09 hrs, Volume= 0.560 af, Depth> 3.36"
Routed to Link DP-A : Design Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.011	98	EX Gravel Surface, Impervious, HSG C
0.211	96	Gravel surface, HSG D
0.000	96	Gravel surface, HSG D
0.763	96	Gravel surface, HSG C
0.001	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.071	77	Woods, Good, HSG D
0.002	77	Woods, Good, HSG D
0.001	77	Woods, Good, HSG D
0.009	77	Woods, Good, HSG D
0.341	70	Woods, Good, HSG C
0.018	74	>75% Grass cover, Good, HSG C
0.324	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.214	74	>75% Grass cover, Good, HSG C
0.002	80	>75% Grass cover, Good, HSG D
2.003	85	Weighted Average
1.991		99.44% Pervious Area
0.011		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	35	0.5000	0.56		**Sheet Flow,** Range n= 0.130 P2= 3.19"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A5:



Summary for Subcatchment P-A6: Subcat P-A6

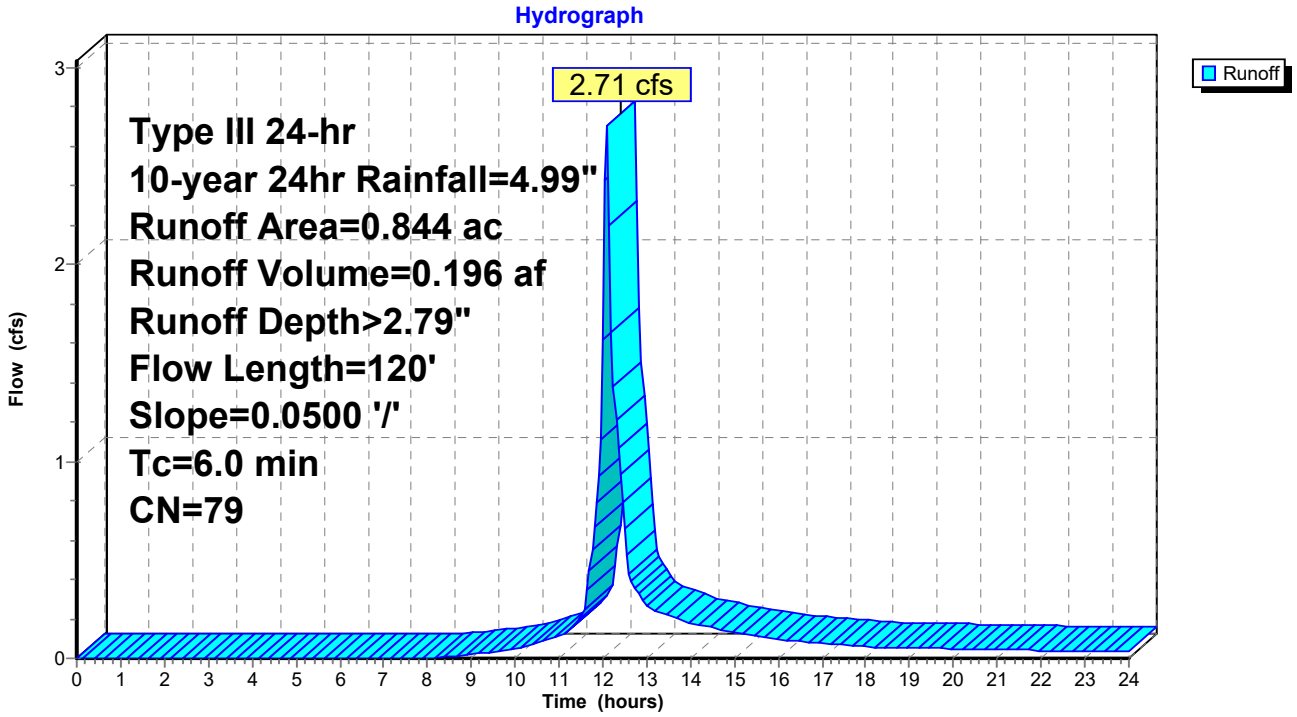
Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.196 af, Depth> 2.79"
Routed to Pond P1a : Proposed Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year 24hr Rainfall=4.99"

Area (ac)	CN	Description
0.000	98	PR Gravel Surface, Impervious, HSG C
0.050	98	EX Gravel Surface, Impervious, HSG C
0.127	74	>75% Grass cover, Good, HSG C
0.140	74	>75% Grass cover, Good, HSG C
0.425	80	>75% Grass cover, Good, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.000	98	PR Gravel Surface, Impervious, HSG D
0.844	79	Weighted Average
0.793		93.99% Pervious Area
0.051		6.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.19"
0.3	70	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	120	Total			

Subcatchment P-A6: Subcat P-A6



Summary for Pond CMB: Underground Storage Chambers

Inflow Area = 4.765 ac, 95.93% Impervious, Inflow Depth > 4.67" for 10-year 24hr event
Inflow = 22.58 cfs @ 12.09 hrs, Volume= 1.855 af
Outflow = 1.51 cfs @ 13.50 hrs, Volume= 1.396 af, Atten= 93%, Lag= 84.9 min
Discarded = 0.92 cfs @ 9.55 hrs, Volume= 1.314 af
Primary = 0.59 cfs @ 13.50 hrs, Volume= 0.082 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 222.86' @ 13.50 hrs Surf.Area= 16,464 sf Storage= 38,142 cf
Flood Elev= 224.00' Surf.Area= 16,464 sf Storage= 54,255 cf

Plug-Flow detention time= 239.0 min calculated for 1.393 af (75% of inflow)
Center-of-Mass det. time= 154.3 min (907.3 - 753.0)

Volume	Invert	Avail.Storage	Storage Description
#1B	219.75'	6,779 cf	**196.00'W x 84.00'L x 4.92'H Field A** 80,948 cf Overall - 64,000 cf Embedded = 16,948 cf x 40.0% Voids
#2B	220.50'	47,770 cf	**retain_it upright 3.5'** x 240 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 24 Rows adjusted for 417.5 cf perimeter wall
		54,549 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	219.75'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	220.40'	**24.0" Round Culvert** L= 370.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 220.40' / 210.00' S= 0.0281 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	222.75'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.92 cfs @ 9.55 hrs HW=219.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=0.58 cfs @ 13.50 hrs HW=222.86' (Free Discharge)
└**2=Culvert** (Passes 0.58 cfs of 14.41 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.58 cfs @ 0.91 fps)

Pond CMB: Underground Storage Chambers - Chamber Wizard Field A

Chamber Model = retain_it upright 3.5' (retain-it® upright)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
24 Rows adjusted for 417.5 cf perimeter wall

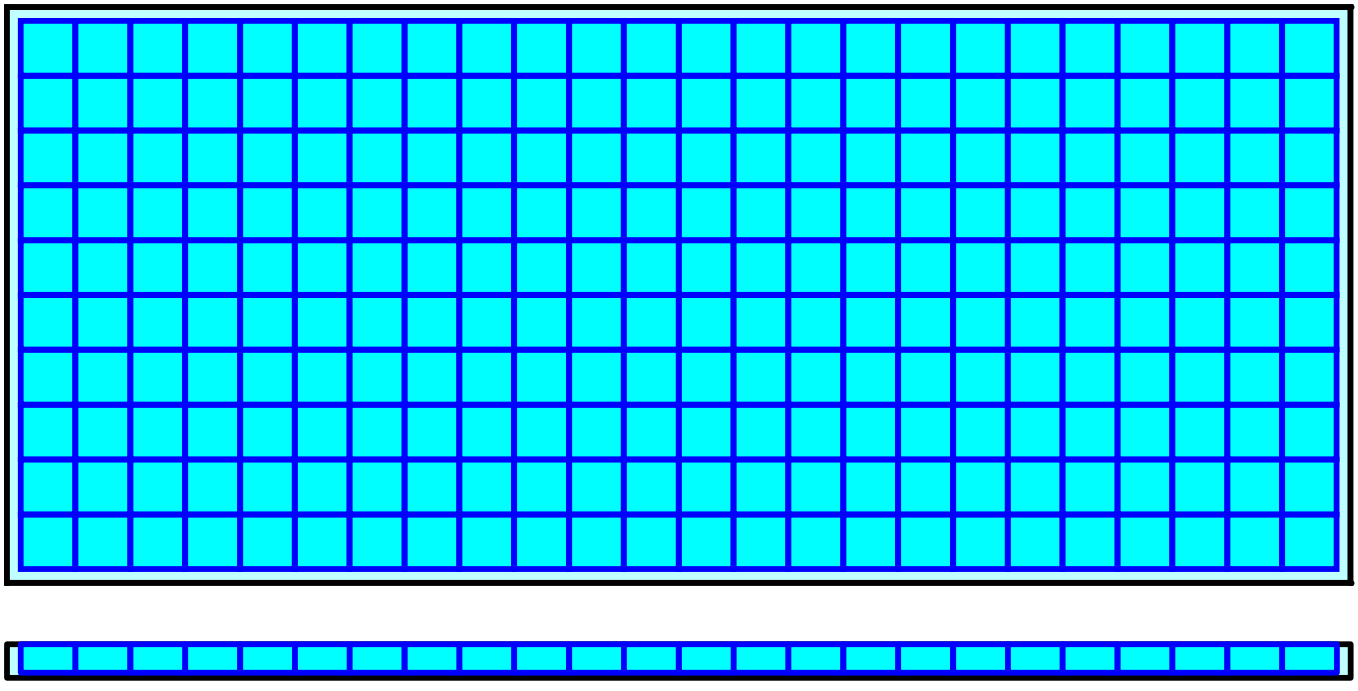
10 Chambers/Row x 8.00' Long = 80.00' Row Length +24.0" End Stone x 2 = 84.00' Base Length
24 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 196.00' Base Width
9.0" Stone Base + 50.0" Chamber Height = 4.92' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 24 x 2 = 417.5 cf Perimeter Wall
240 Chambers x 200.8 cf - 417.5 cf Perimeter wall = 47,769.8 cf Chamber Storage
240 Chambers x 266.7 cf = 64,000.0 cf Displacement

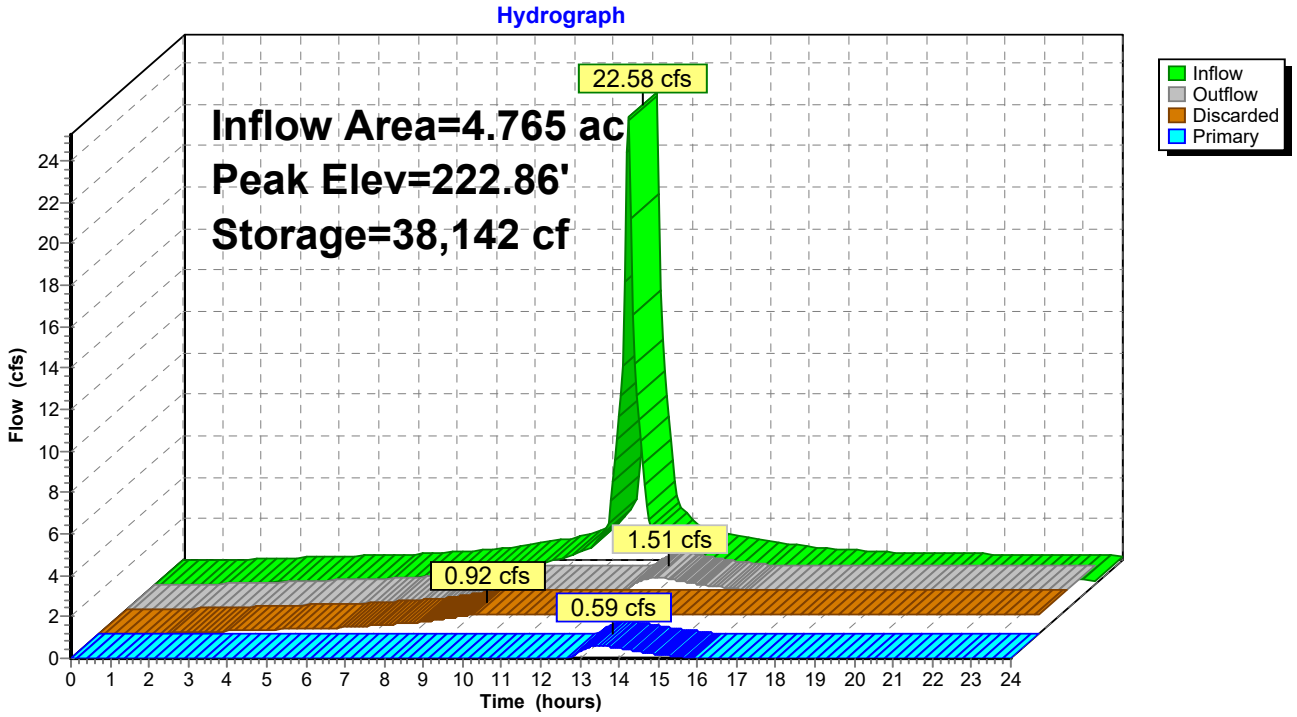
80,948.0 cf Field - 64,000.0 cf Chambers = 16,948.0 cf Stone x 40.0% Voids = 6,779.2 cf Stone Storage

Chamber Storage + Stone Storage = 54,549.0 cf = 1.252 af
Overall Storage Efficiency = 67.4%
Overall System Size = 84.00' x 196.00' x 4.92'

240 Chambers
2,998.1 cy Field
627.7 cy Stone



Pond CMB: Underground Storage Chambers



Summary for Pond D27: DMH - 24"

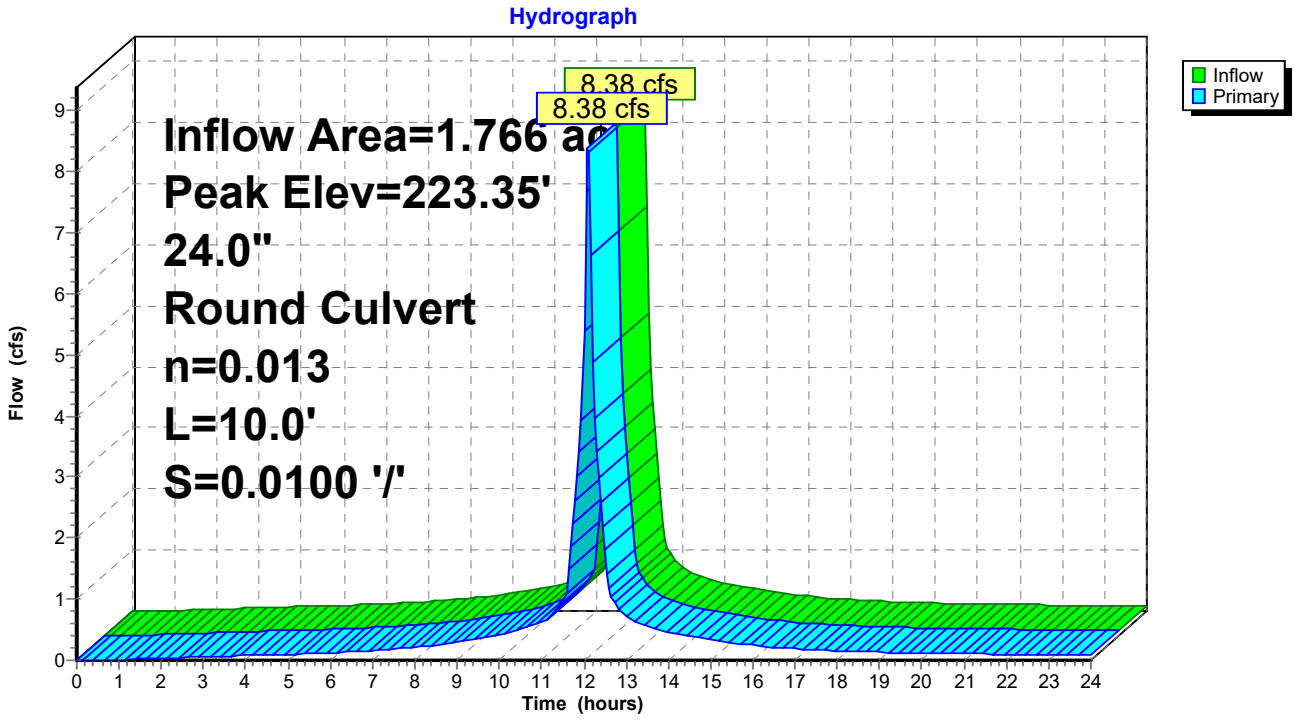
Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 4.73" for 10-year 24hr event
Inflow = 8.38 cfs @ 12.09 hrs, Volume= 0.696 af
Outflow = 8.38 cfs @ 12.09 hrs, Volume= 0.696 af, Atten= 0%, Lag= 0.0 min
Primary = 8.38 cfs @ 12.09 hrs, Volume= 0.696 af
Routed to Link WQU-P6 : Water Quality Unit

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 223.35' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	221.80'	**24.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 221.80' / 221.70' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.17 cfs @ 12.09 hrs HW=223.33' (Free Discharge)
1=Culvert (Barrel Controls 8.17 cfs @ 4.39 fps)

Pond D27: DMH - 24"



Summary for Pond D30: DMH - 24"

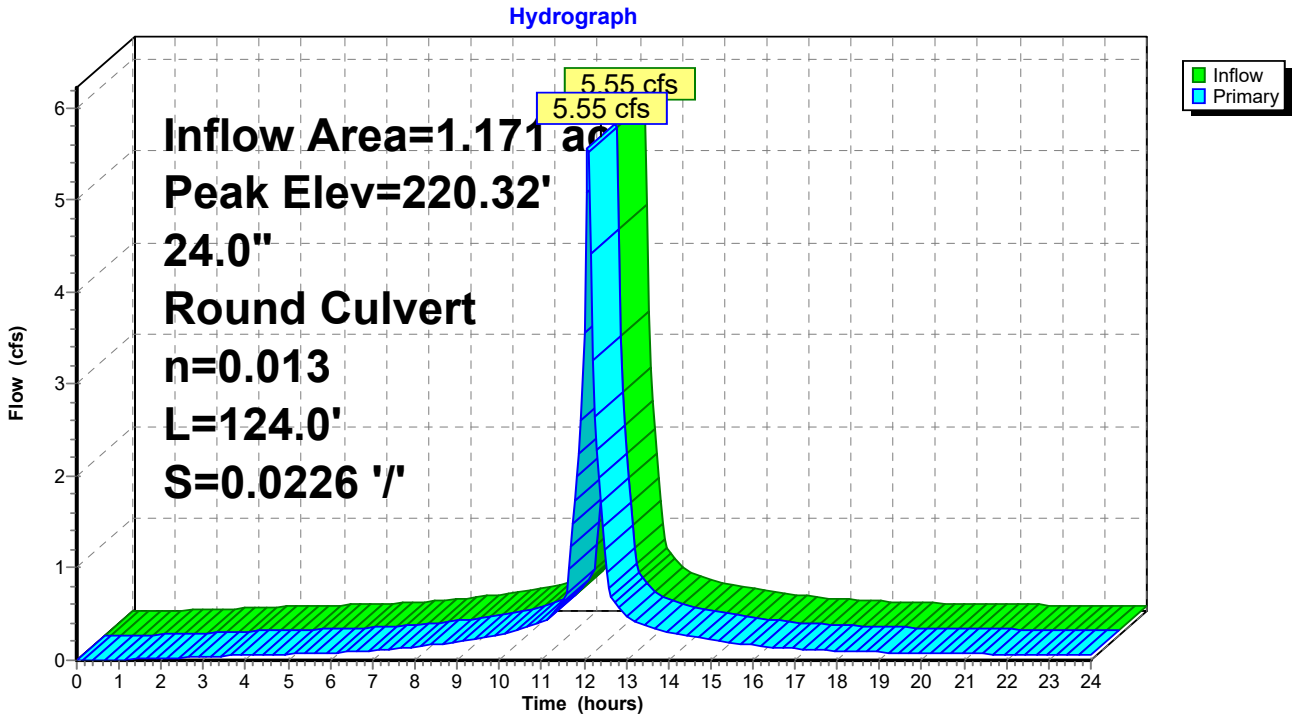
Inflow Area = 1.171 ac, 98.81% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 5.55 cfs @ 12.09 hrs, Volume= 0.463 af
Outflow = 5.55 cfs @ 12.09 hrs, Volume= 0.463 af, Atten= 0%, Lag= 0.0 min
Primary = 5.55 cfs @ 12.09 hrs, Volume= 0.463 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 220.32' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	219.30'	**24.0" Round Culvert** L= 124.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.30' / 216.50' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.42 cfs @ 12.09 hrs HW=220.31' (Free Discharge)
1=Culvert (Inlet Controls 5.42 cfs @ 3.42 fps)

Pond D30: DMH - 24"



Summary for Pond D31: DMH - 30"

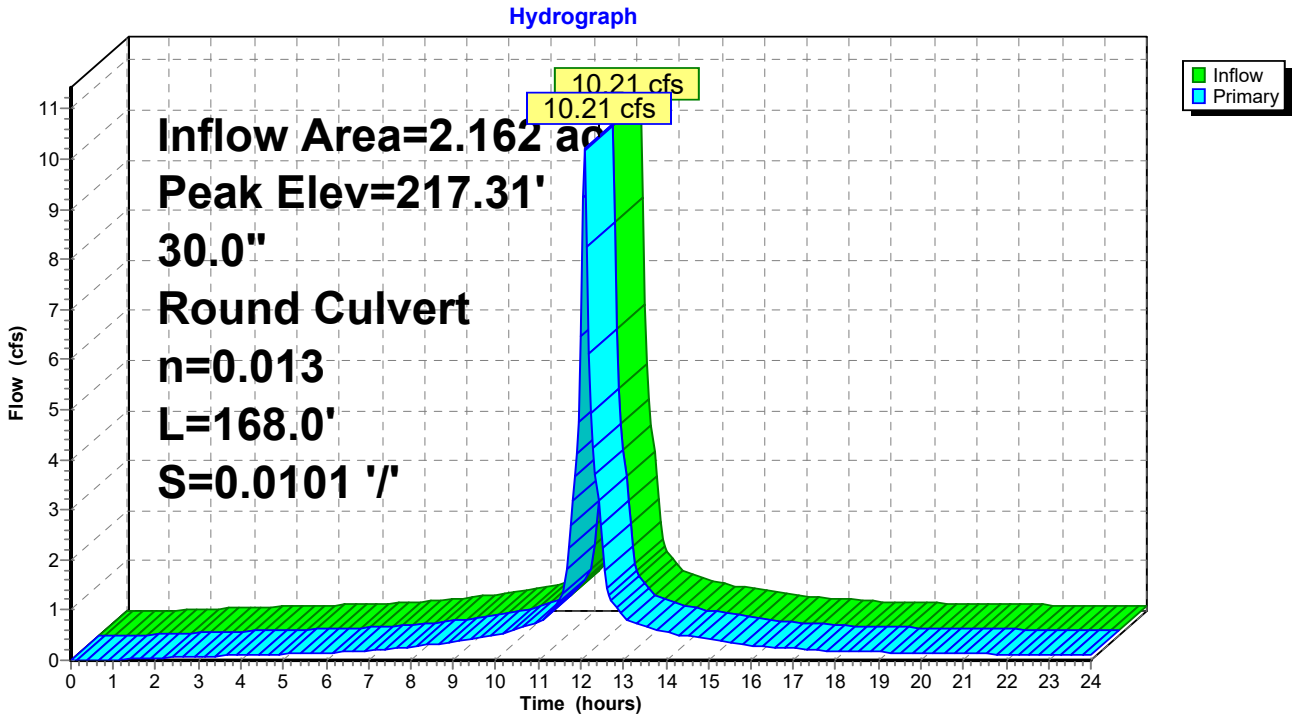
Inflow Area = 2.162 ac, 99.01% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 10.21 cfs @ 12.09 hrs, Volume= 0.856 af
Outflow = 10.21 cfs @ 12.09 hrs, Volume= 0.856 af, Atten= 0%, Lag= 0.0 min
Primary = 10.21 cfs @ 12.09 hrs, Volume= 0.856 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 217.31' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	216.00'	**30.0" Round Culvert** L= 168.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.00' / 214.30' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=10.01 cfs @ 12.09 hrs HW=217.30' (Free Discharge)
1=Culvert (Inlet Controls 10.01 cfs @ 3.88 fps)

Pond D31: DMH - 30"



Summary for Pond D32: DMH - 30"

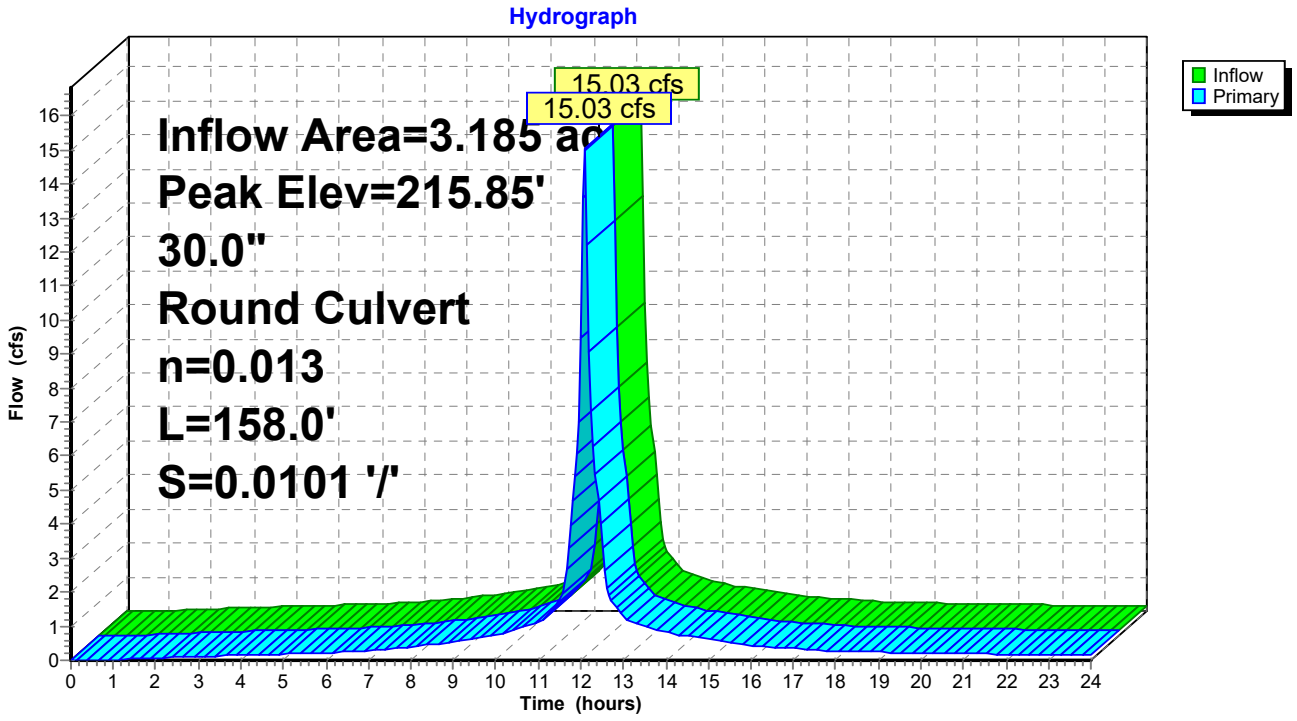
Inflow Area = 3.185 ac, 99.06% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 15.03 cfs @ 12.09 hrs, Volume= 1.261 af
Outflow = 15.03 cfs @ 12.09 hrs, Volume= 1.261 af, Atten= 0%, Lag= 0.0 min
Primary = 15.03 cfs @ 12.09 hrs, Volume= 1.261 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 215.85' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	214.20'	**30.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.20' / 212.60' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=14.75 cfs @ 12.09 hrs HW=215.83' (Free Discharge)
1=Culvert (Inlet Controls 14.75 cfs @ 4.35 fps)

Pond D32: DMH - 30"



Summary for Pond D33: DMH - 30"

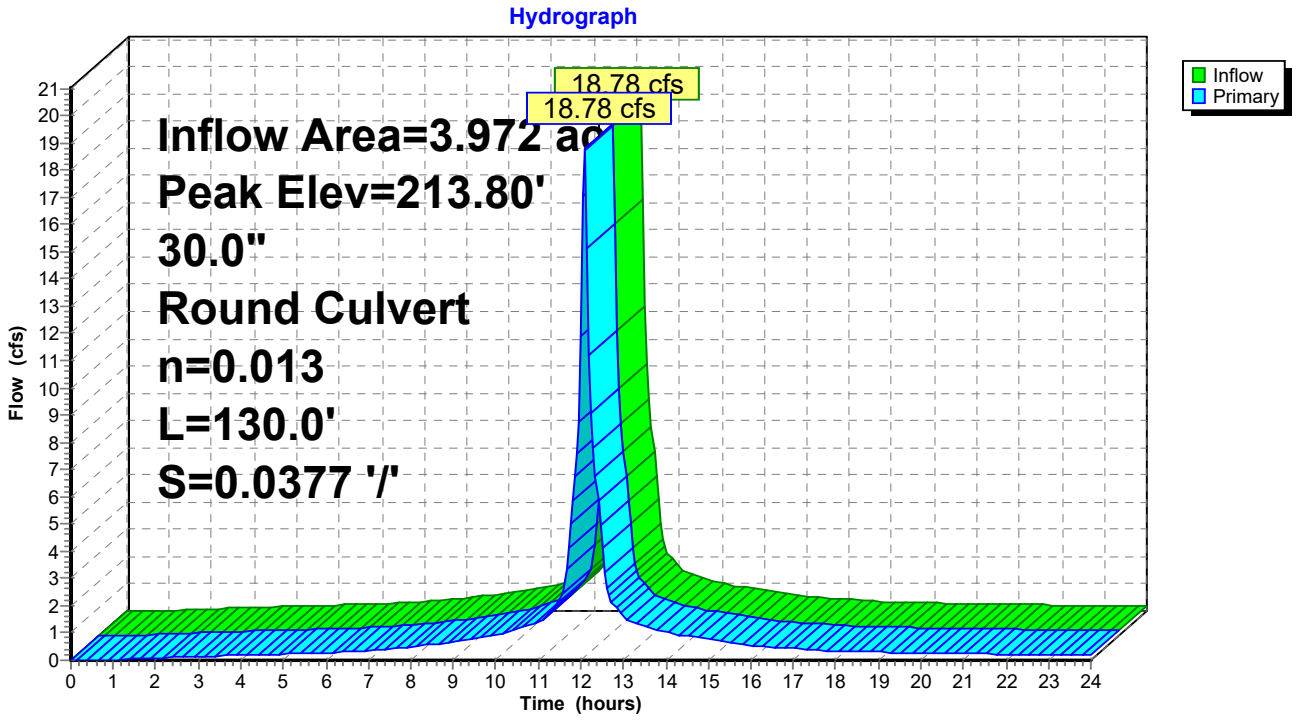
Inflow Area = 3.972 ac, 98.78% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 18.78 cfs @ 12.09 hrs, Volume= 1.572 af
Outflow = 18.78 cfs @ 12.09 hrs, Volume= 1.572 af, Atten= 0%, Lag= 0.0 min
Primary = 18.78 cfs @ 12.09 hrs, Volume= 1.572 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 213.80' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	211.90'	**30.0" Round Culvert** L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 211.90' / 207.00' S= 0.0377 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=18.39 cfs @ 12.09 hrs HW=213.77' (Free Discharge)
1=Culvert (Inlet Controls 18.39 cfs @ 4.66 fps)

Pond D33: DMH - 30"



Summary for Pond F1: Forebay

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 4.50" for 10-year 24hr event
Inflow = 24.32 cfs @ 12.09 hrs, Volume= 1.986 af
Outflow = 22.26 cfs @ 12.14 hrs, Volume= 1.986 af, Atten= 8%, Lag= 2.9 min
Primary = 18.85 cfs @ 12.13 hrs, Volume= 1.964 af
Routed to Link WQU-P5 : Water Quality Unit
Secondary = 3.41 cfs @ 12.14 hrs, Volume= 0.022 af
Routed to Pond P1a : Proposed Basin

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 207.26' @ 12.13 hrs Surf.Area= 1,381 sf Storage= 2,093 cf

Plug-Flow detention time= 0.8 min calculated for 1.986 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (758.2 - 757.5)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	3,235 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

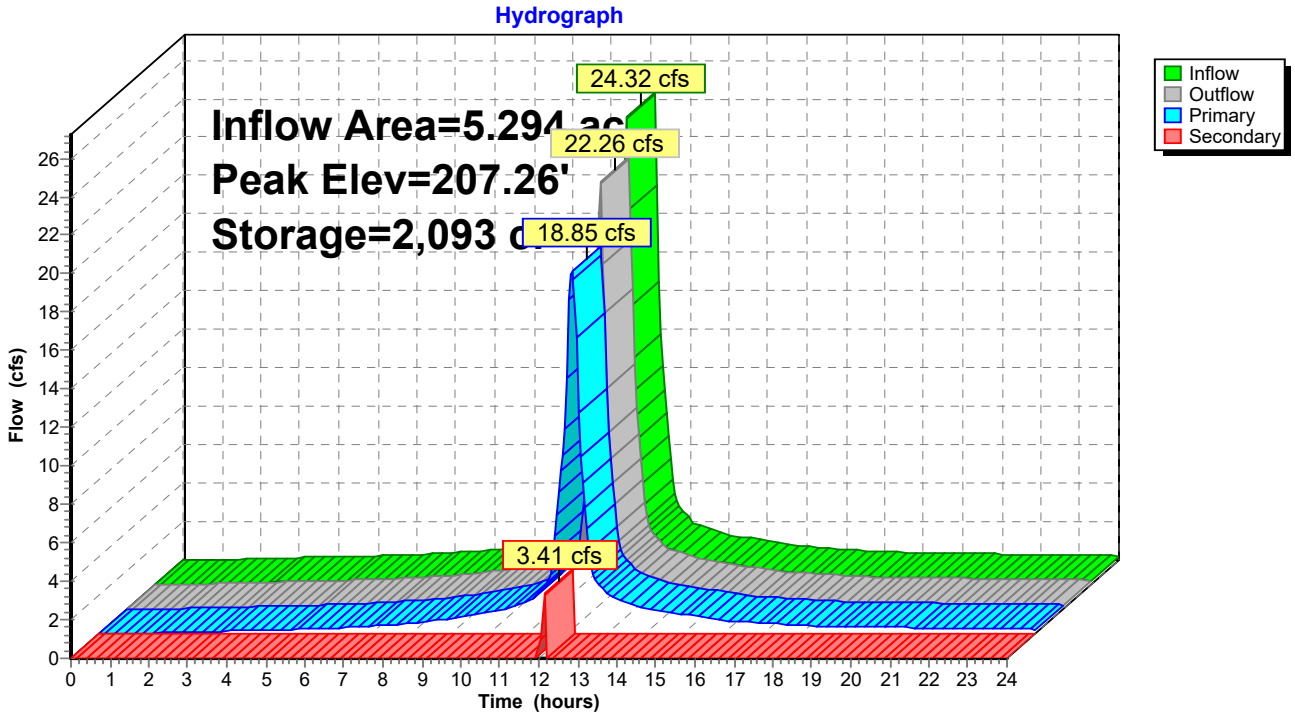
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
205.00	480	0	0
207.00	1,270	1,750	1,750
208.00	1,700	1,485	3,235

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**18.0" Round 18" Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.60' / 201.30' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	205.00'	**1.0" x 21.0" Horiz. Double Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	207.00'	**12.0' long + 2.0 '/' SideZ x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=18.74 cfs @ 12.13 hrs HW=207.20' (Free Discharge)
↑—**1=18" Culvert** (Inlet Controls 18.74 cfs @ 10.60 fps)
↑—**2=Double Grate** (Passes 18.74 cfs of 20.83 cfs potential flow)

Secondary OutFlow Max=3.00 cfs @ 12.14 hrs HW=207.21' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 3.00 cfs @ 1.14 fps)

Pond F1: Forebay



Summary for Pond P1a: Proposed Basin

Inflow Area = 6.138 ac, 77.11% Impervious, Inflow Depth > 4.27" for 10-year 24hr event
Inflow = 24.60 cfs @ 12.13 hrs, Volume= 2.182 af
Outflow = 6.43 cfs @ 12.49 hrs, Volume= 1.642 af, Atten= 74%, Lag= 21.3 min
Discarded = 0.83 cfs @ 12.49 hrs, Volume= 0.914 af
Primary = 5.59 cfs @ 12.49 hrs, Volume= 0.728 af
Routed to Link DP-A : Design Point A
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 203.46' @ 12.49 hrs Surf.Area= 14,924 sf Storage= 47,223 cf

Plug-Flow detention time= 243.0 min calculated for 1.642 af (75% of inflow)
Center-of-Mass det. time= 156.7 min (920.9 - 764.1)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	90,590 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	1,180	0	0
199.00	3,950	2,565	2,565
200.00	7,100	5,525	8,090
201.00	9,950	8,525	16,615
202.00	11,950	10,950	27,565
203.00	14,000	12,975	40,540
204.00	16,000	15,000	55,540
205.00	17,500	16,750	72,290
206.00	19,100	18,300	90,590

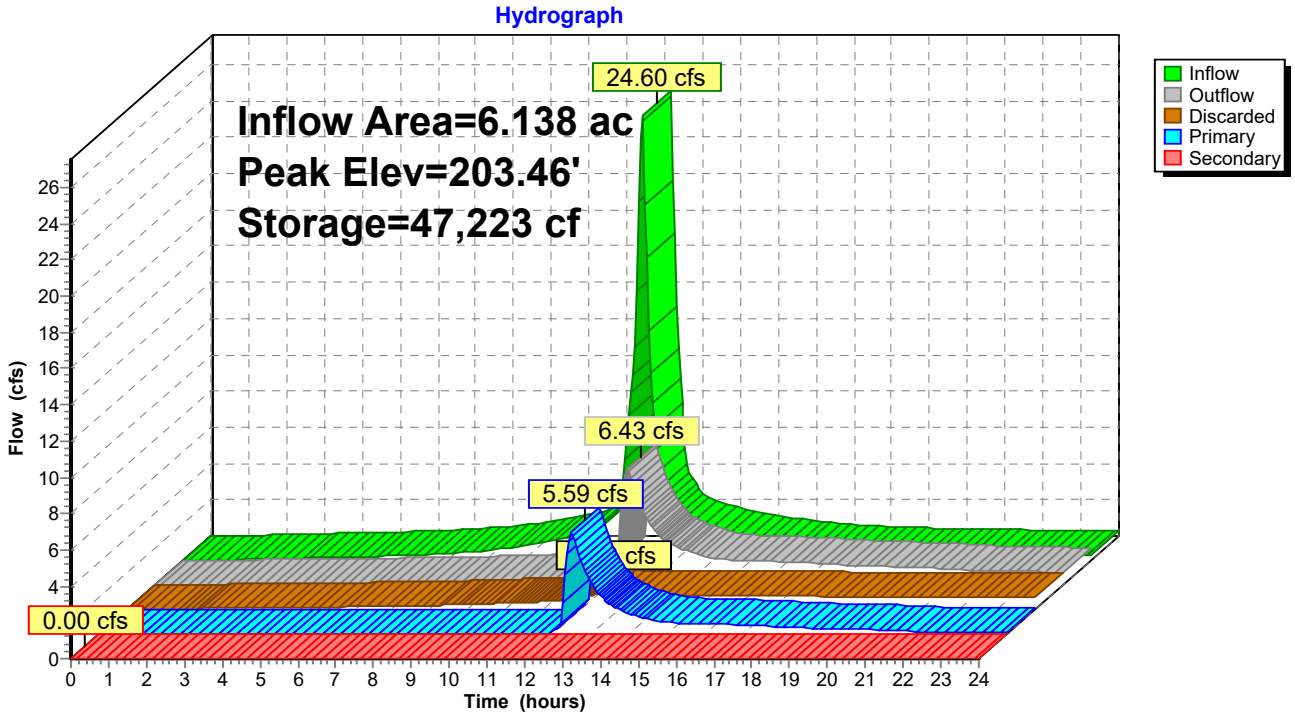
Device	Routing	Invert	Outlet Devices
#1	Secondary	205.00'	**10.0' long + 3.0 '/' SideZ x 11.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.53 2.59 2.70 2.68 2.67 2.68 2.66 2.64
#2	Primary	198.00'	**18.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 198.00' / 194.40' S= 0.0514 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	201.50'	**1.0" Vert. Orifice/Grate X 8.00 columns** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 2	203.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.83 cfs @ 12.49 hrs HW=203.46' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.83 cfs)

Primary OutFlow Max=5.56 cfs @ 12.49 hrs HW=203.46' (Free Discharge)
└**2=Culvert** (Passes 5.56 cfs of 18.47 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.74 cfs @ 5.67 fps)
  └**4=Orifice/Grate** (Weir Controls 4.82 cfs @ 2.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=198.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond P1a: Proposed Basin



Summary for Pond P30: 12" HDPE

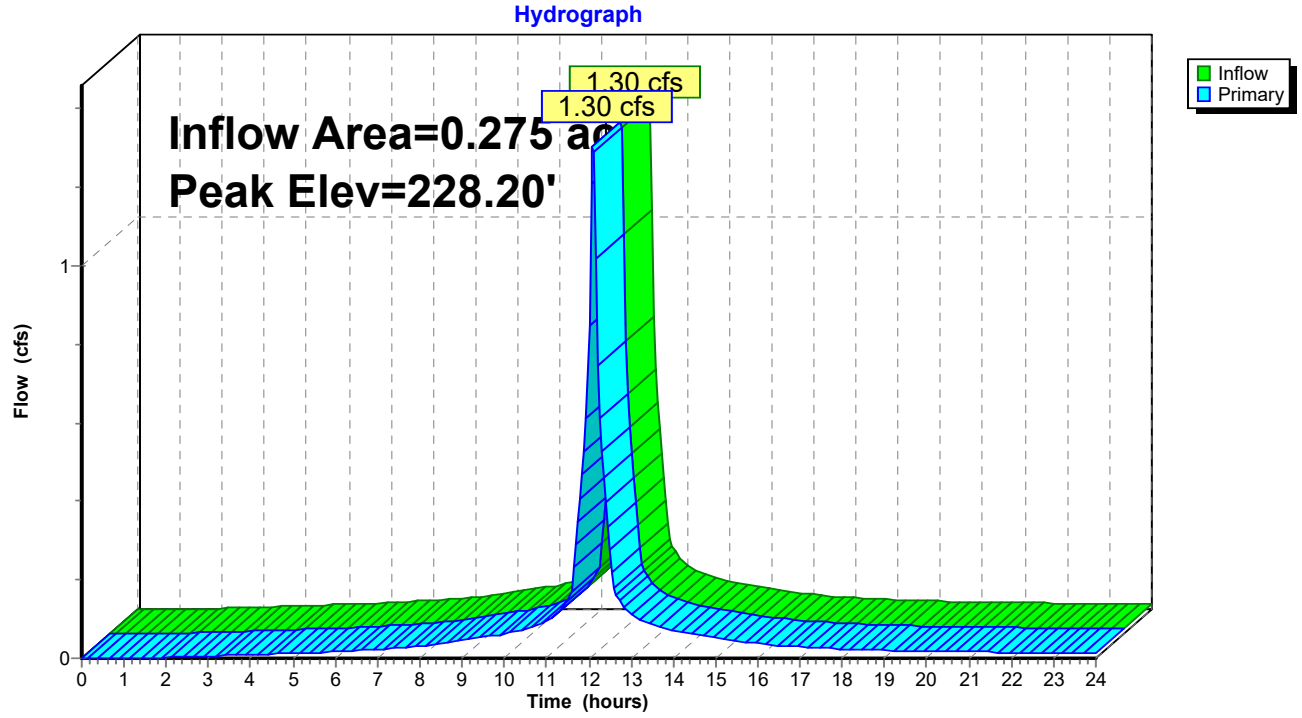
Inflow Area = 0.275 ac, 92.37% Impervious, Inflow Depth > 4.63" for 10-year 24hr event
Inflow = 1.30 cfs @ 12.09 hrs, Volume= 0.106 af
Outflow = 1.30 cfs @ 12.09 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min
Primary = 1.30 cfs @ 12.09 hrs, Volume= 0.106 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.20' @ 12.09 hrs
Flood Elev= 228.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	224.60'	**12.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 224.60' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.26 cfs @ 12.09 hrs HW=228.20' (Free Discharge)
└─**1=Culvert** (Passes 1.26 cfs of 4.94 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 1.26 cfs @ 1.04 fps)

Pond P30: 12" HDPE



Summary for Pond P31: 12" HDPE

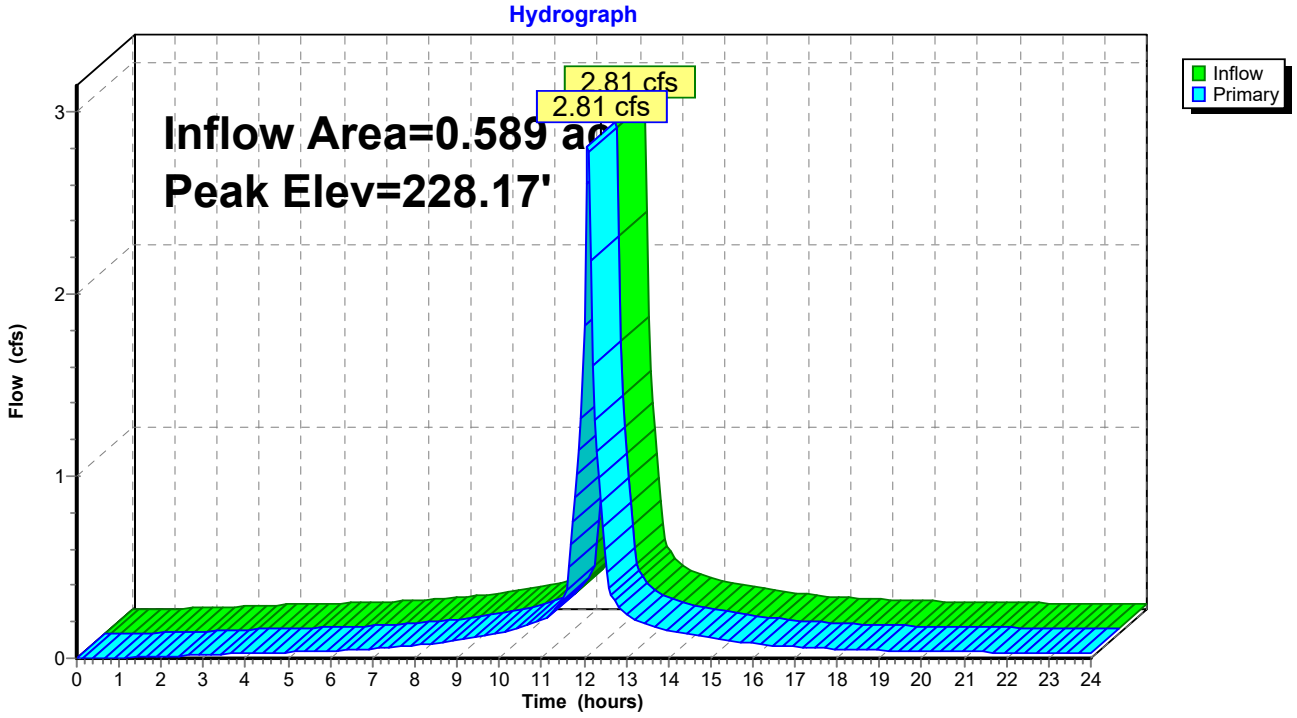
Inflow Area = 0.589 ac, 97.92% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 2.81 cfs @ 12.09 hrs, Volume= 0.233 af
Outflow = 2.81 cfs @ 12.09 hrs, Volume= 0.233 af, Atten= 0%, Lag= 0.0 min
Primary = 2.81 cfs @ 12.09 hrs, Volume= 0.233 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.17' @ 12.09 hrs
Flood Elev= 228.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.00'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.00' / 222.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.72 cfs @ 12.09 hrs HW=228.17' (Free Discharge)
└─**1=Culvert** (Passes 2.72 cfs of 8.17 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.72 cfs @ 1.34 fps)

Pond P31: 12" HDPE



Summary for Pond P32: 18" HDPE

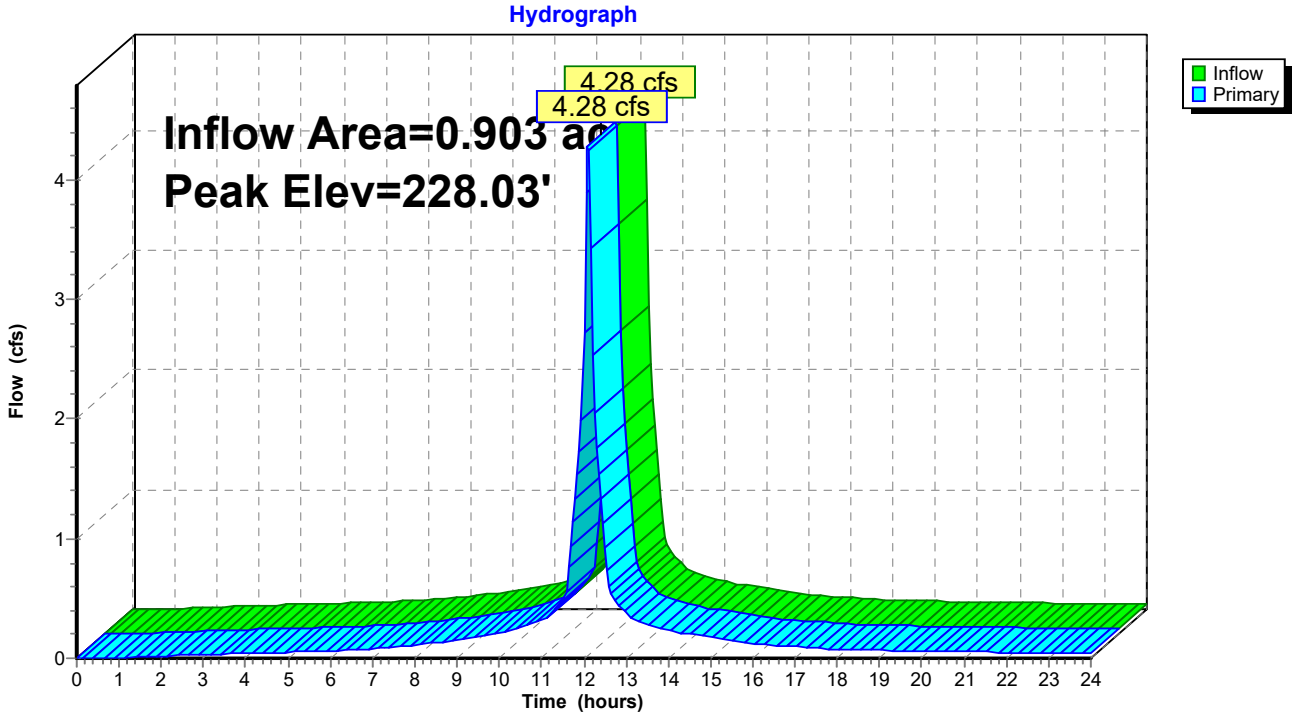
Inflow Area = 0.903 ac, 98.45% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 4.28 cfs @ 12.09 hrs, Volume= 0.357 af
Outflow = 4.28 cfs @ 12.09 hrs, Volume= 0.357 af, Atten= 0%, Lag= 0.0 min
Primary = 4.28 cfs @ 12.09 hrs, Volume= 0.357 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.03' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.80'	**18.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.80' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.18 cfs @ 12.09 hrs HW=228.02' (Free Discharge)
└─**1=Culvert** (Passes 4.18 cfs of 15.00 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 4.18 cfs @ 1.55 fps)

Pond P32: 18" HDPE



Summary for Pond P33: 18" HDPE

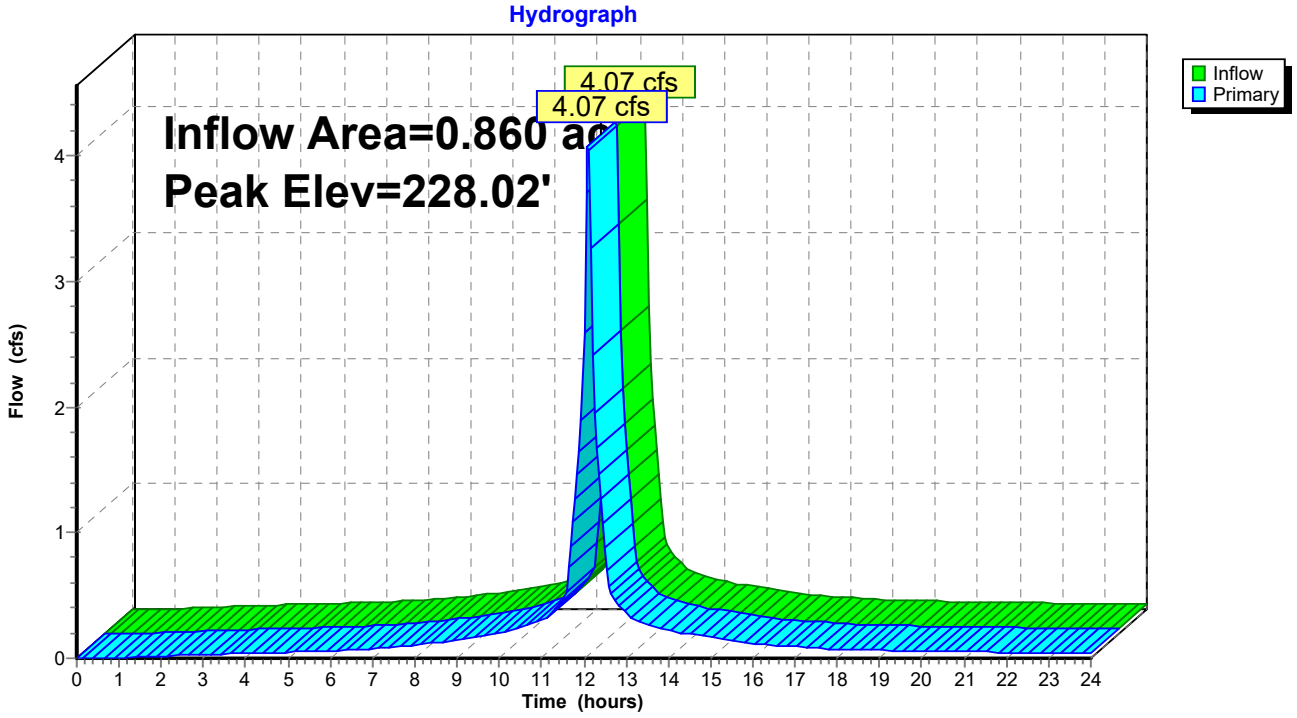
Inflow Area = 0.860 ac, 99.28% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 4.07 cfs @ 12.09 hrs, Volume= 0.340 af
Outflow = 4.07 cfs @ 12.09 hrs, Volume= 0.340 af, Atten= 0%, Lag= 0.0 min
Primary = 4.07 cfs @ 12.09 hrs, Volume= 0.340 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.02' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	222.80'	**18.0" Round Culvert** L= 198.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.80' / 219.80' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.97 cfs @ 12.09 hrs HW=228.02' (Free Discharge)
└─**1=Culvert** (Passes 3.97 cfs of 16.24 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 3.97 cfs @ 1.52 fps)

Pond P33: 18" HDPE



Summary for Pond P34: 18" HDPE

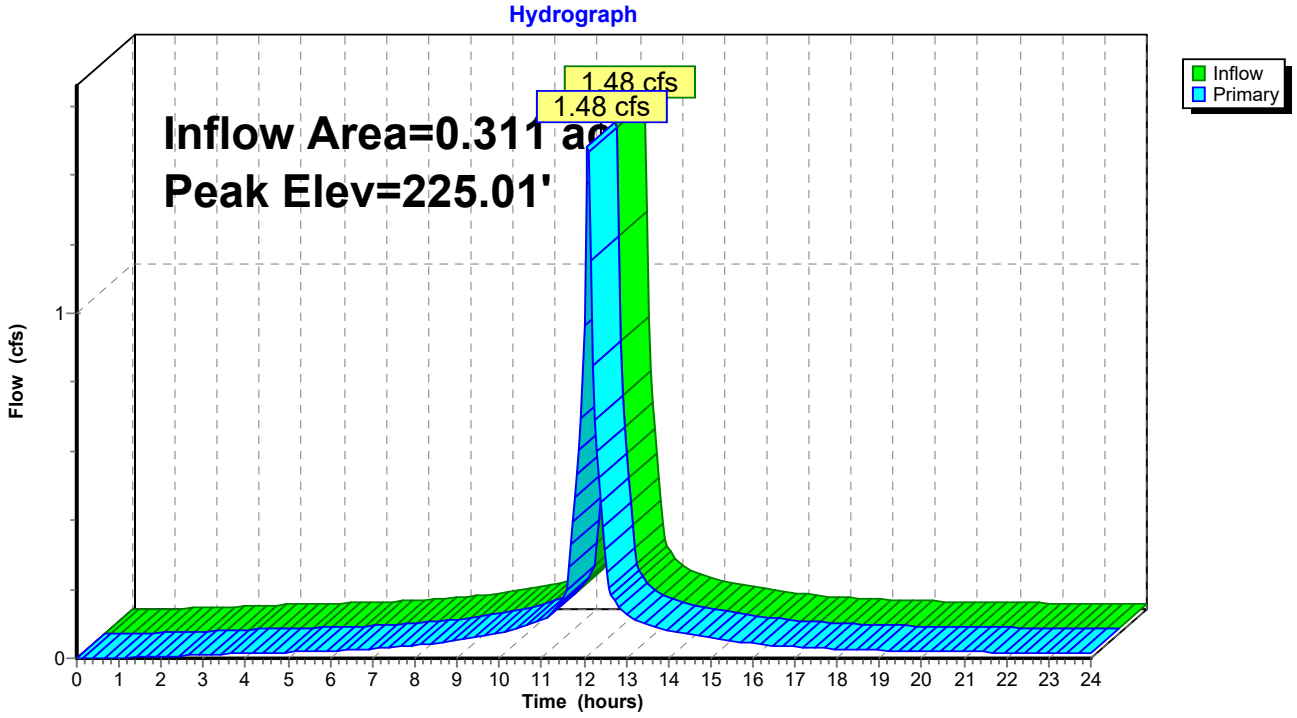
Inflow Area = 0.311 ac, 97.52% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 1.48 cfs @ 12.09 hrs, Volume= 0.123 af
Outflow = 1.48 cfs @ 12.09 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Primary = 1.48 cfs @ 12.09 hrs, Volume= 0.123 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 225.01' @ 12.09 hrs
Flood Elev= 225.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.90'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.90' / 219.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	224.90'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.43 cfs @ 12.09 hrs HW=225.01' (Free Discharge)
└**1=Culvert** (Passes 1.43 cfs of 17.77 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.43 cfs @ 1.08 fps)

Pond P34: 18" HDPE



Summary for Pond P35: 18" HDPE

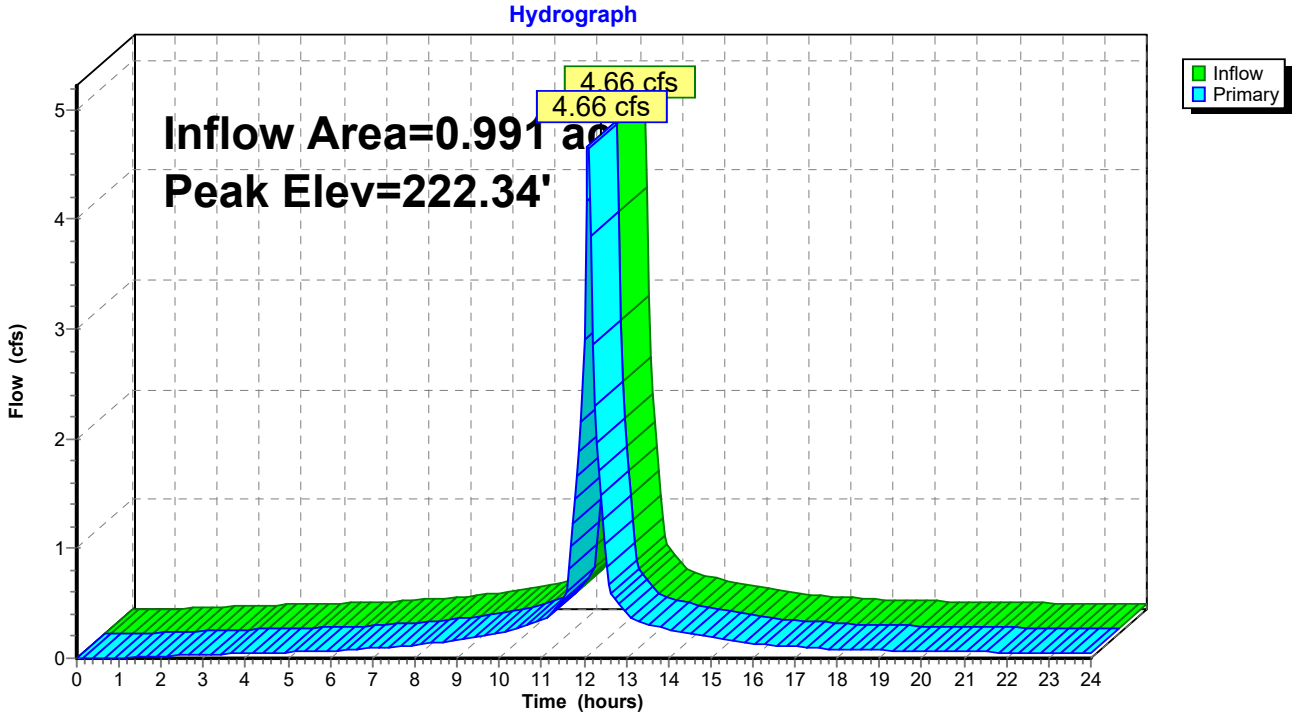
Inflow Area = 0.991 ac, 99.24% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 4.66 cfs @ 12.09 hrs, Volume= 0.392 af
Outflow = 4.66 cfs @ 12.09 hrs, Volume= 0.392 af, Atten= 0%, Lag= 0.0 min
Primary = 4.66 cfs @ 12.09 hrs, Volume= 0.392 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.34' @ 12.09 hrs
Flood Elev= 222.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 217.10' / 217.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	222.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.57 cfs @ 12.09 hrs HW=222.34' (Free Discharge)
└─**1=Culvert** (Passes 4.57 cfs of 18.03 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 4.57 cfs @ 1.60 fps)

Pond P35: 18" HDPE



Summary for Pond P36: 18" HDPE

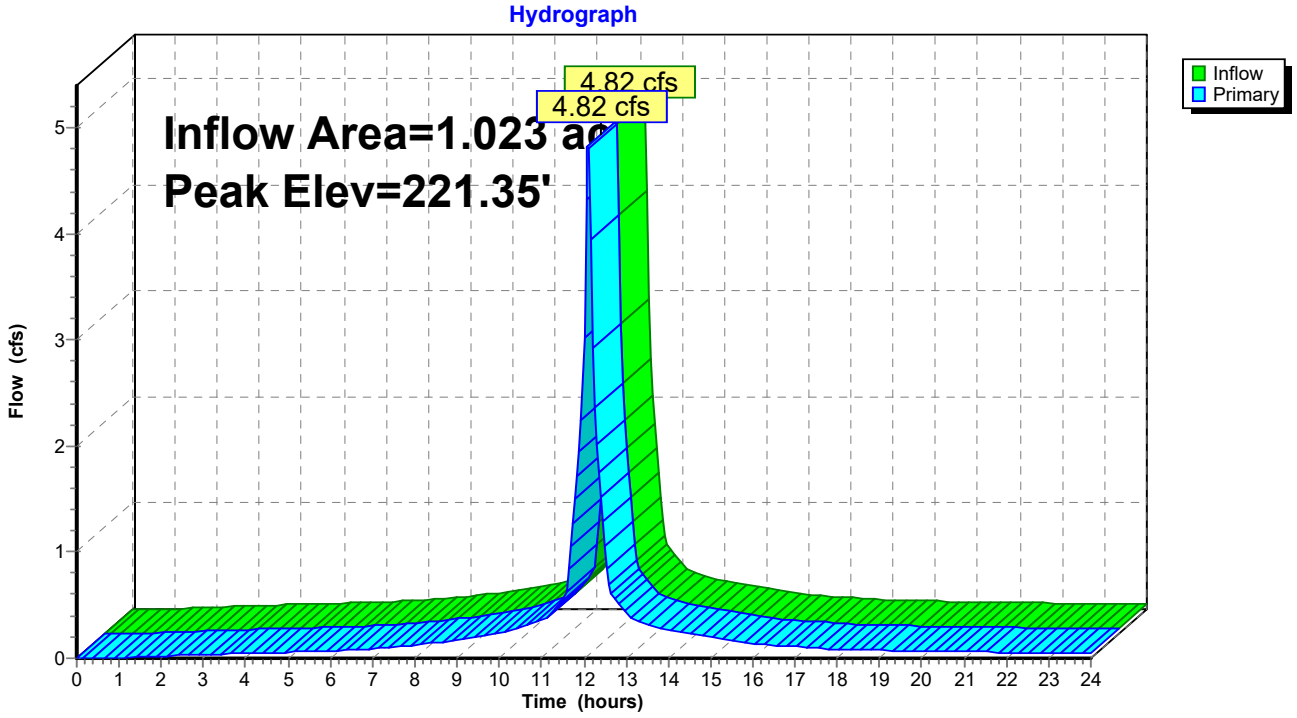
Inflow Area = 1.023 ac, 99.15% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 4.82 cfs @ 12.09 hrs, Volume= 0.405 af
Outflow = 4.82 cfs @ 12.09 hrs, Volume= 0.405 af, Atten= 0%, Lag= 0.0 min
Primary = 4.82 cfs @ 12.09 hrs, Volume= 0.405 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 221.35' @ 12.09 hrs
Flood Elev= 221.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	216.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.10' / 216.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	221.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.72 cfs @ 12.09 hrs HW=221.34' (Free Discharge)
└**1=Culvert** (Passes 4.72 cfs of 18.04 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 4.72 cfs @ 1.61 fps)

Pond P36: 18" HDPE



Summary for Pond P37: 18" HDPE

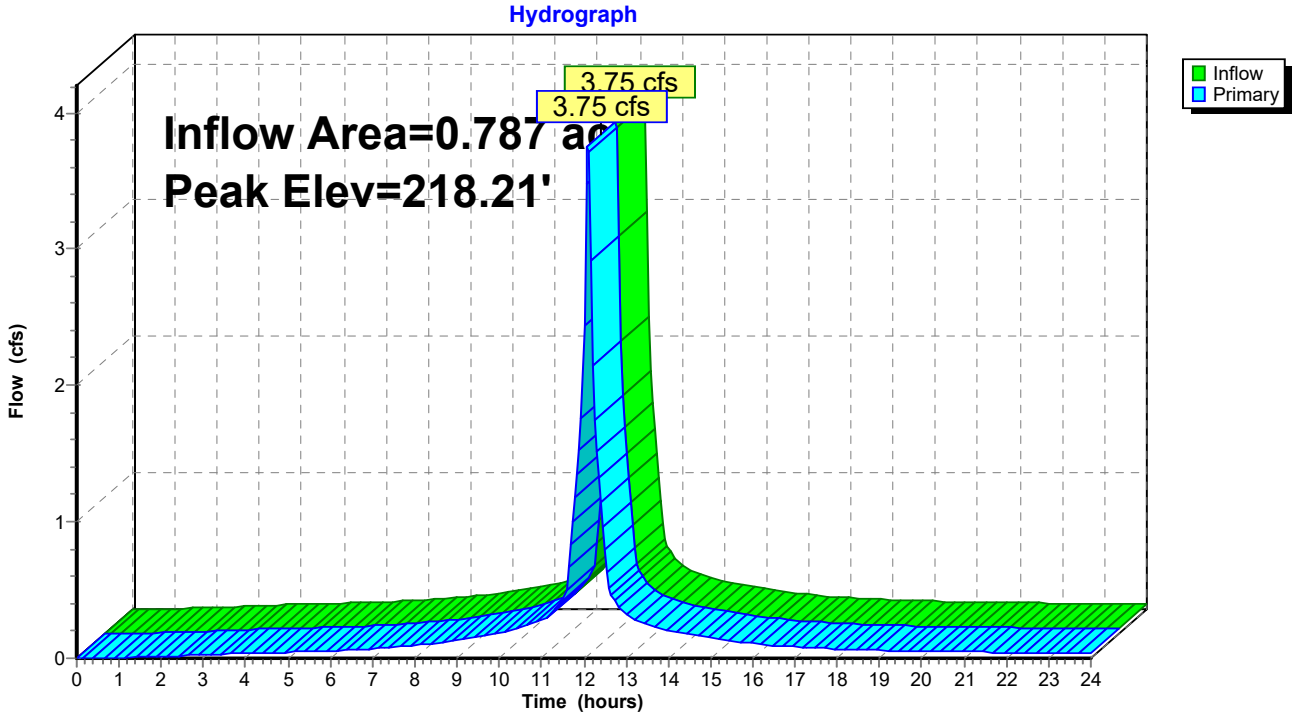
Inflow Area = 0.787 ac, 97.66% Impervious, Inflow Depth > 4.75" for 10-year 24hr event
Inflow = 3.75 cfs @ 12.09 hrs, Volume= 0.311 af
Outflow = 3.75 cfs @ 12.09 hrs, Volume= 0.311 af, Atten= 0%, Lag= 0.0 min
Primary = 3.75 cfs @ 12.09 hrs, Volume= 0.311 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 218.21' @ 12.09 hrs
Flood Elev= 218.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 212.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	218.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.62 cfs @ 12.09 hrs HW=218.20' (Free Discharge)
└─**1=Culvert** (Passes 3.62 cfs of 17.96 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 3.62 cfs @ 1.48 fps)

Pond P37: 18" HDPE



Summary for Pond P38: 18" HDPE

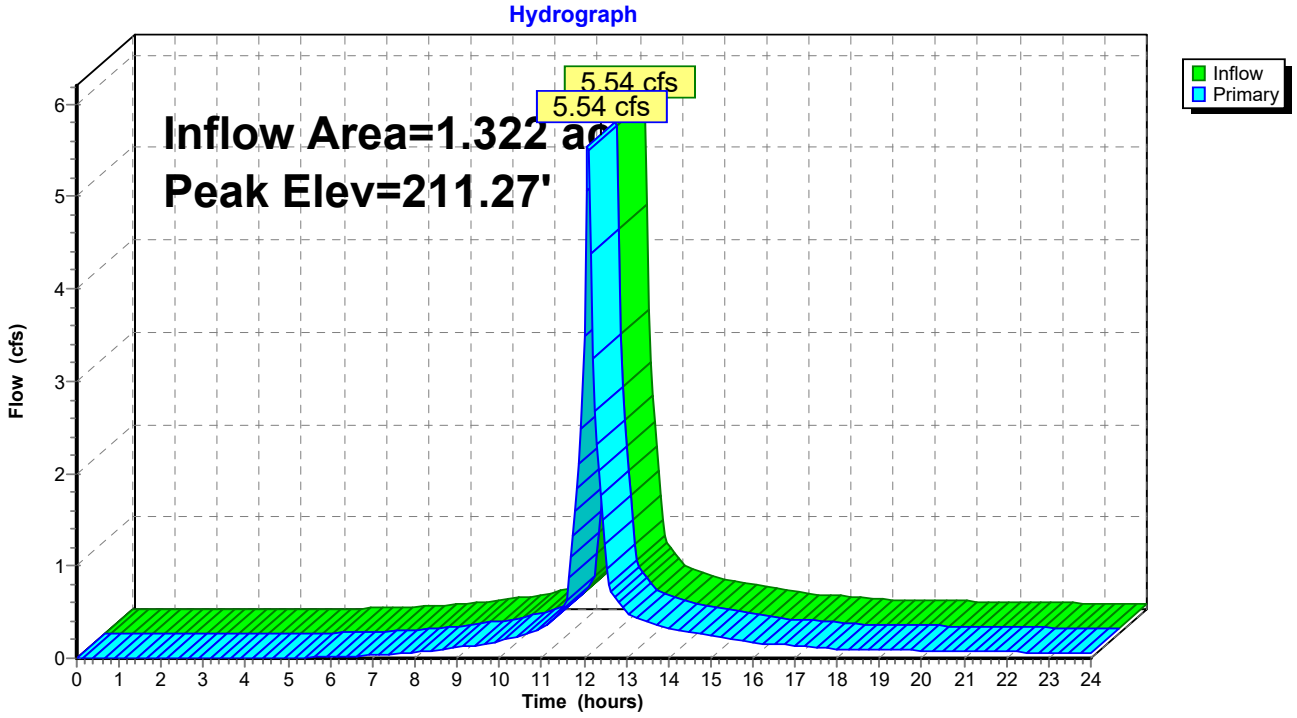
Inflow Area = 1.322 ac, 57.38% Impervious, Inflow Depth > 3.76" for 10-year 24hr event
Inflow = 5.54 cfs @ 12.09 hrs, Volume= 0.414 af
Outflow = 5.54 cfs @ 12.09 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min
Primary = 5.54 cfs @ 12.09 hrs, Volume= 0.414 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 211.27' @ 12.09 hrs
Flood Elev= 211.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	207.80'	**18.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 207.80' / 207.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	211.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.40 cfs @ 12.09 hrs HW=211.27' (Free Discharge)
└─**1=Culvert** (Passes 5.40 cfs of 13.70 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 5.40 cfs @ 1.69 fps)

Pond P38: 18" HDPE

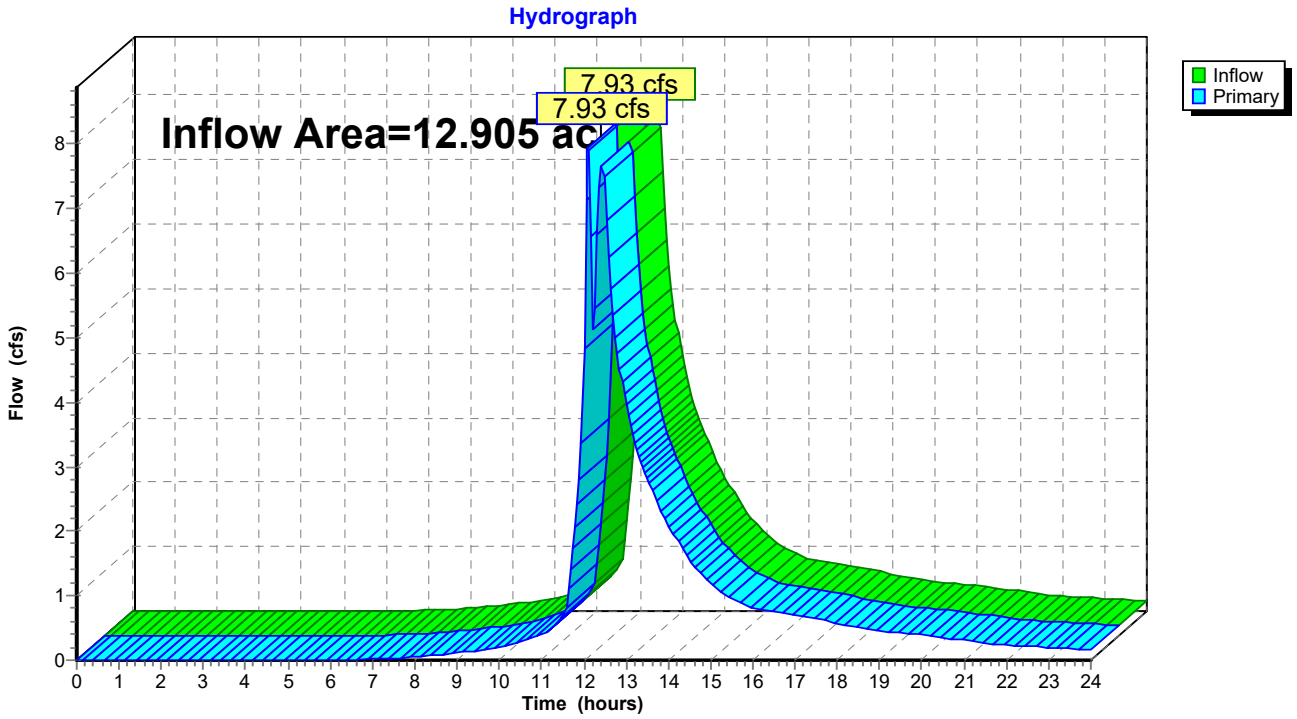


Summary for Link DP-A: Design Point A

Inflow Area = 12.905 ac, 72.18% Impervious, Inflow Depth > 1.27" for 10-year 24hr event
Inflow = 7.93 cfs @ 12.09 hrs, Volume= 1.369 af
Primary = 7.93 cfs @ 12.09 hrs, Volume= 1.369 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-A: Design Point A

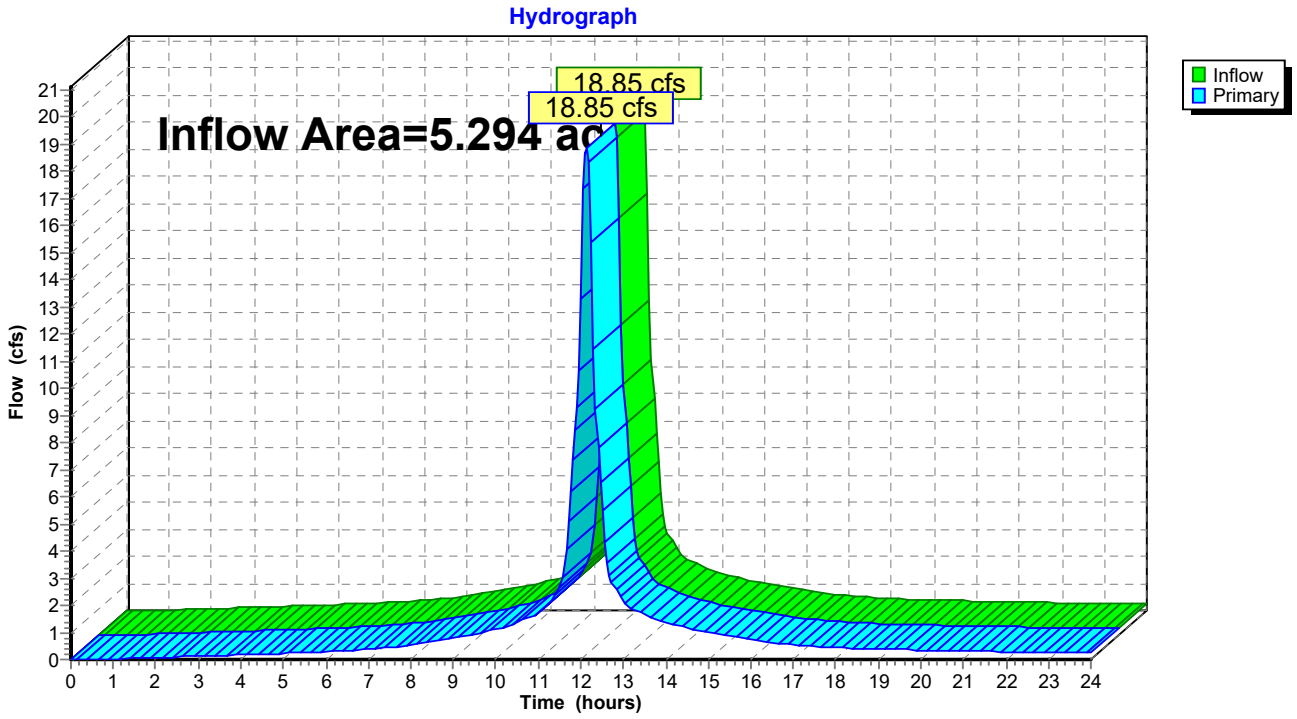


Summary for Link WQU-P5: Water Quality Unit

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 4.45" for 10-year 24hr event
Inflow = 18.85 cfs @ 12.13 hrs, Volume= 1.964 af
Primary = 18.85 cfs @ 12.13 hrs, Volume= 1.964 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P1a : Proposed Basin

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P5: Water Quality Unit

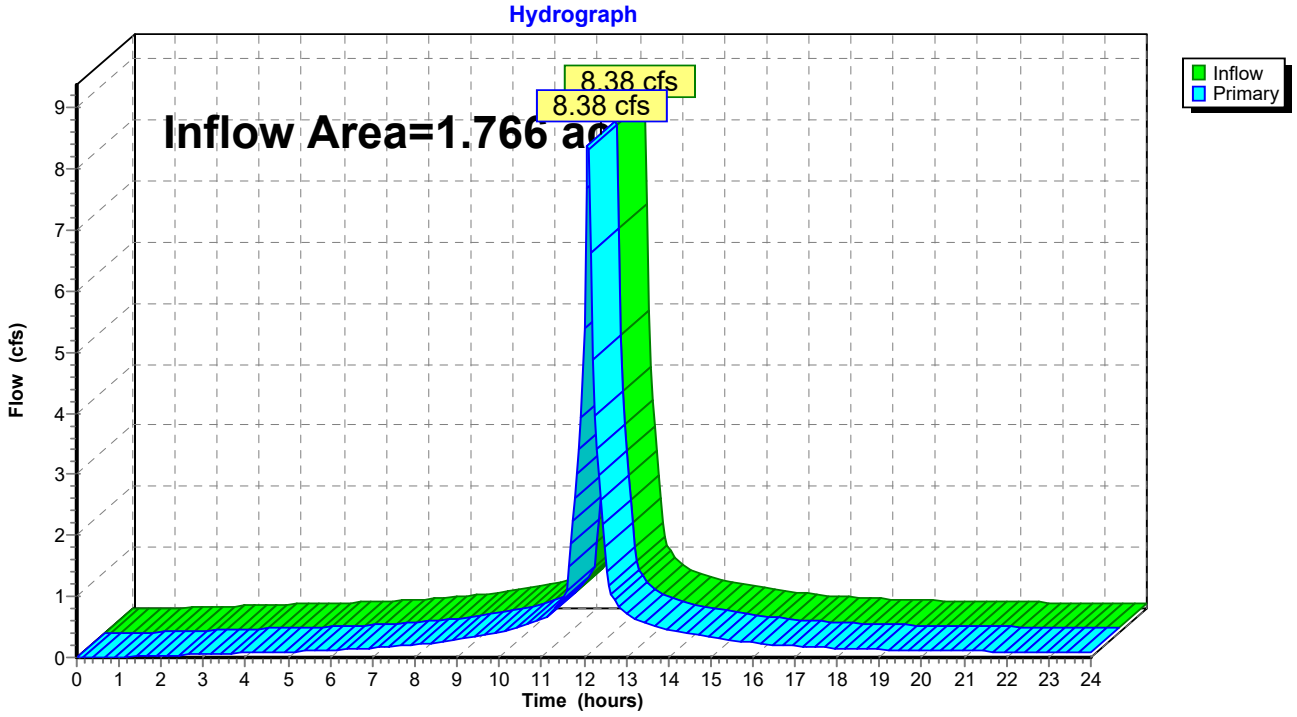


Summary for Link WQU-P6: Water Quality Unit

Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 4.73" for 10-year 24hr event
Inflow = 8.38 cfs @ 12.09 hrs, Volume= 0.696 af
Primary = 8.38 cfs @ 12.09 hrs, Volume= 0.696 af, Atten= 0%, Lag= 0.0 min
Routed to Pond CMB : Underground Storage Chambers

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P6: Water Quality Unit



Summary for Subcatchment P-A1:

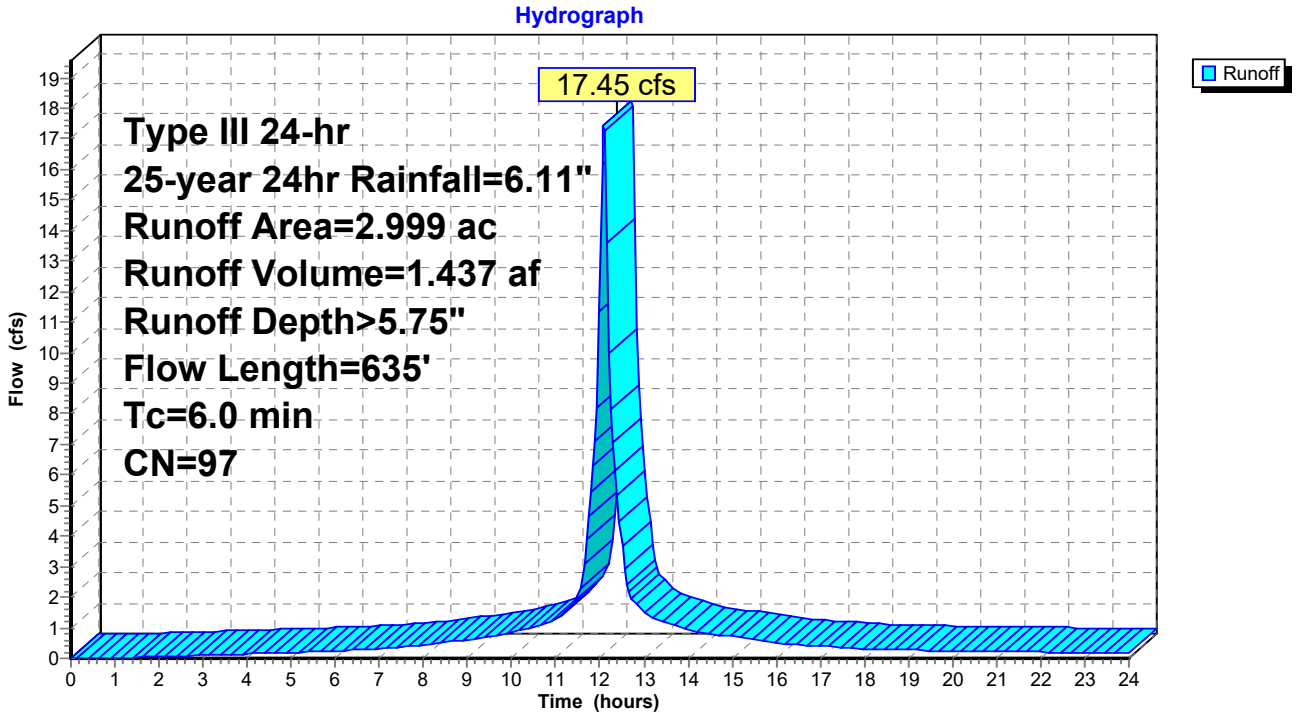
Runoff = 17.45 cfs @ 12.09 hrs, Volume= 1.437 af, Depth> 5.75"
Routed to Pond CMB : Underground Storage Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.003	98	PR Gravel Surface, Impervious, HSG C
0.007	98	PR Gravel Surface, Impervious, HSG C
0.043	98	PR Gravel Surface, Impervious, HSG C
1.360	98	EX Gravel Surface, Impervious, HSG C
0.933	98	Roofs, HSG C
0.050	98	Paved parking, HSG C
0.457	98	Paved parking, HSG C
0.069	74	>75% Grass cover, Good, HSG C
0.078	74	>75% Grass cover, Good, HSG C
2.999	97	Weighted Average
0.147		4.89% Pervious Area
2.852		95.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.19"
3.5	300	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	285	0.0060	4.60	8.14	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.7	635	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A1:



Summary for Subcatchment P-A2a:

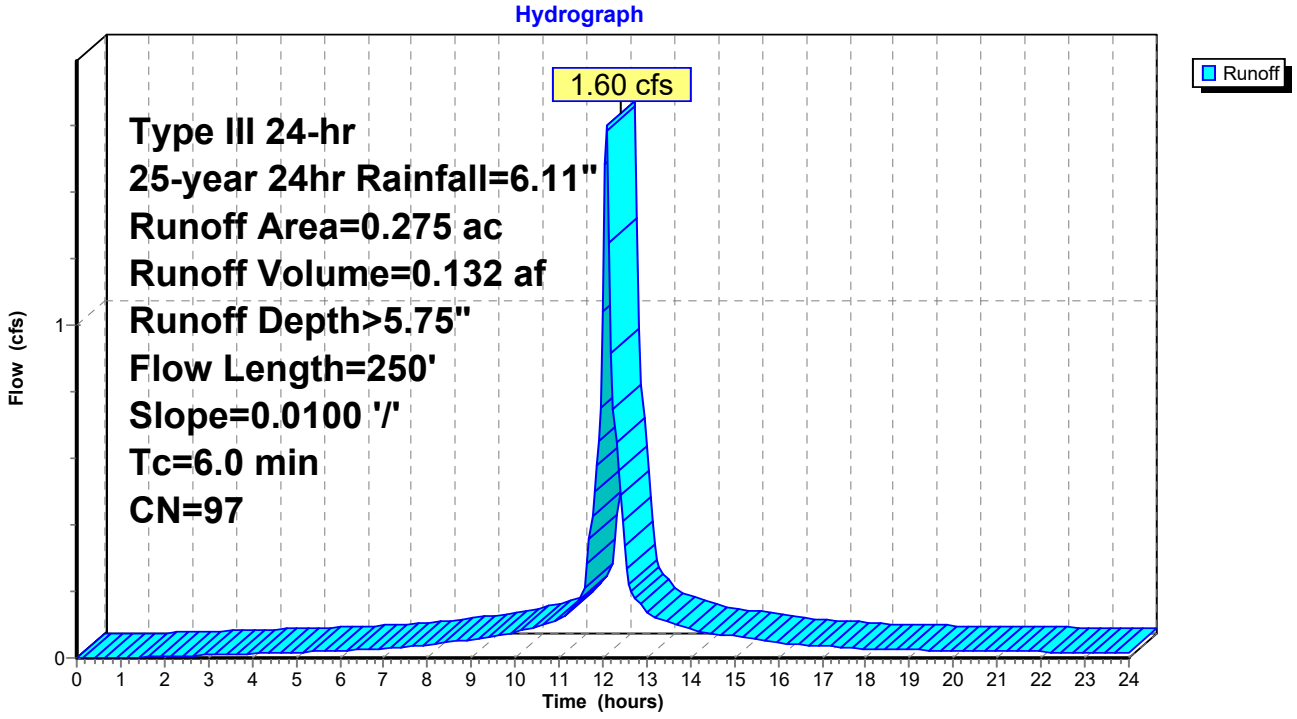
Runoff = 1.60 cfs @ 12.09 hrs, Volume= 0.132 af, Depth> 5.75"
Routed to Pond P30 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.238	98	PR Gravel Surface, Impervious, HSG C
0.016	98	EX Gravel Surface, Impervious, HSG C
0.009	96	Gravel surface, HSG C
0.275	97	Weighted Average
0.021		7.63% Pervious Area
0.254		92.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.1	200	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	250	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2a:



Summary for Subcatchment P-A2b:

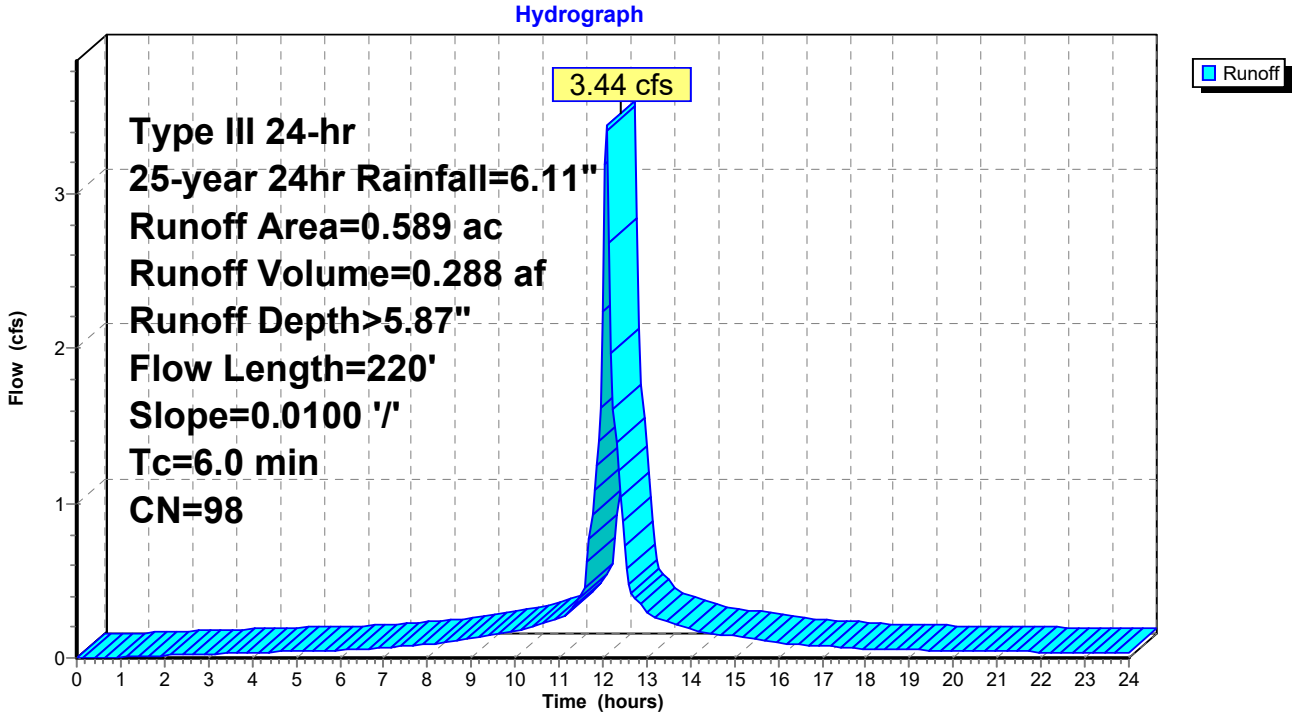
Runoff = 3.44 cfs @ 12.09 hrs, Volume= 0.288 af, Depth> 5.87"
Routed to Pond P31 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.005	74	>75% Grass cover, Good, HSG C
0.329	98	PR Gravel Surface, Impervious, HSG C
0.247	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.589	98	Weighted Average
0.012		2.08% Pervious Area
0.576		97.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.8	170	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.9	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2b:



Summary for Subcatchment P-A2c:

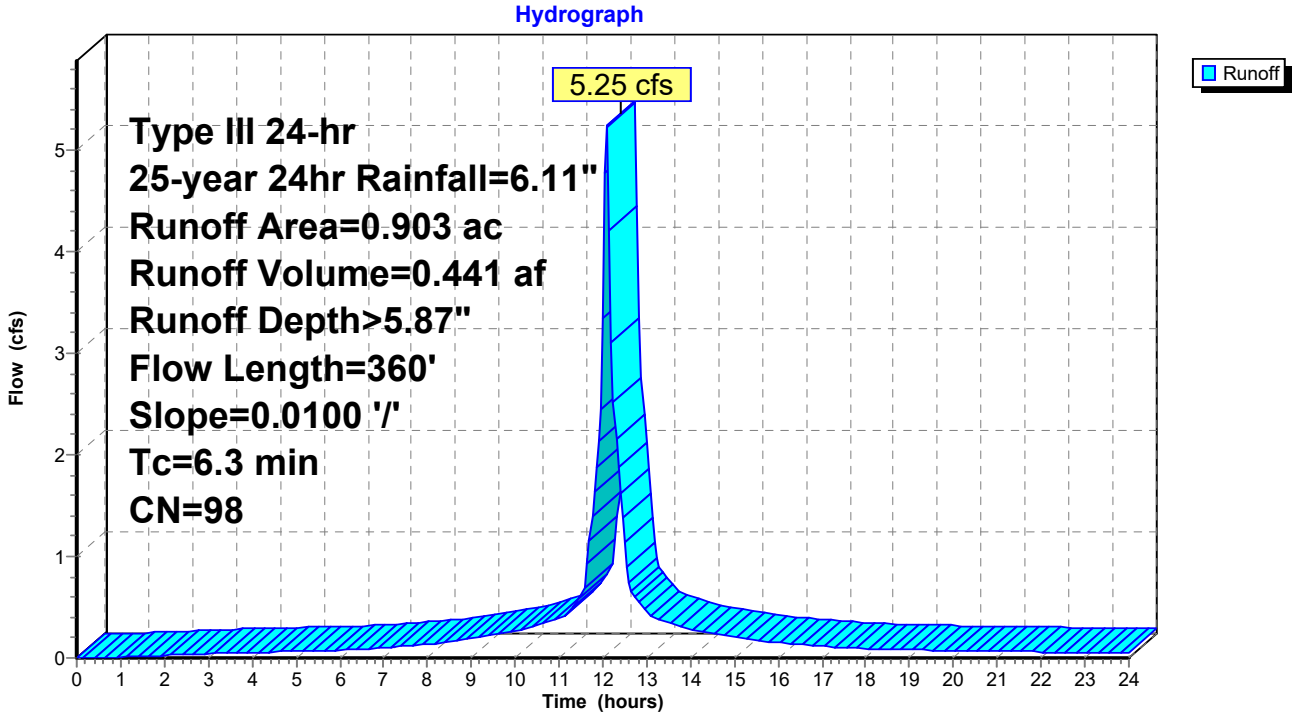
Runoff = 5.25 cfs @ 12.09 hrs, Volume= 0.441 af, Depth> 5.87"
Routed to Pond P32 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.008	74	>75% Grass cover, Good, HSG C
0.605	98	PR Gravel Surface, Impervious, HSG C
0.284	98	EX Gravel Surface, Impervious, HSG C
0.006	96	Gravel surface, HSG C
0.903	98	Weighted Average
0.014		1.55% Pervious Area
0.889		98.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A2c:



Summary for Subcatchment P-A3a:

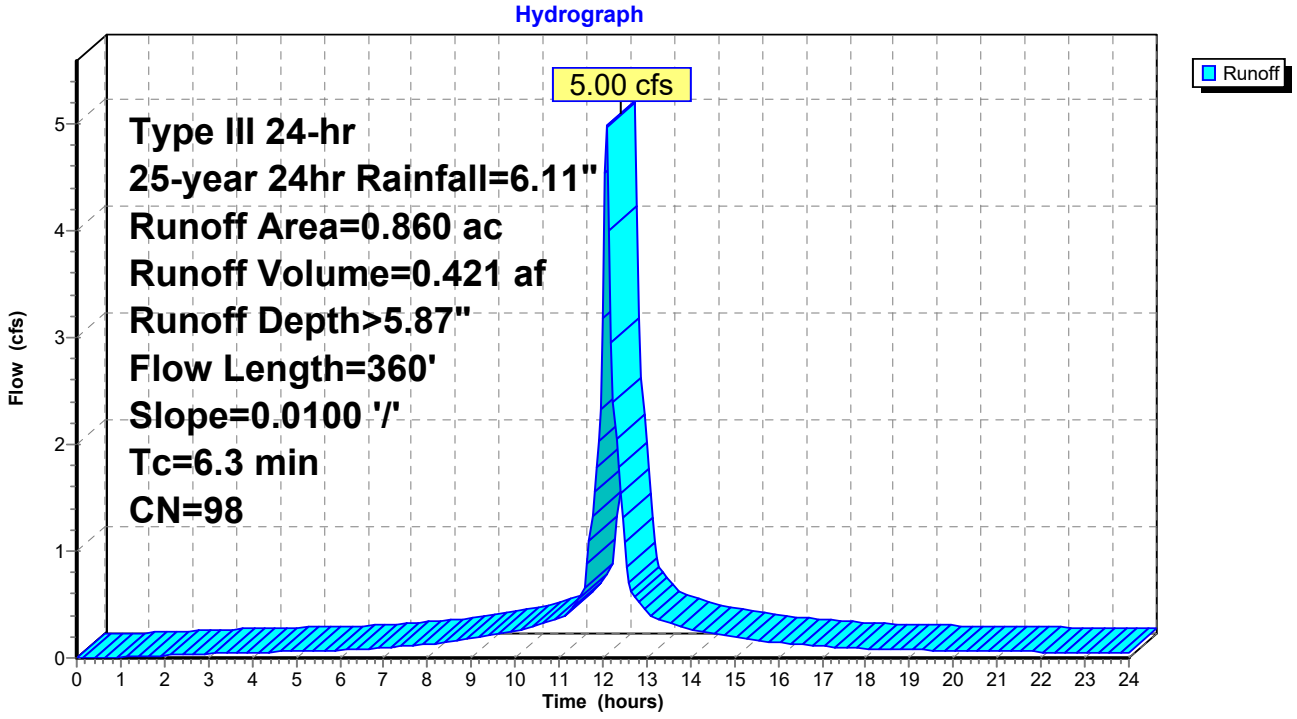
Runoff = 5.00 cfs @ 12.09 hrs, Volume= 0.421 af, Depth> 5.87"
Routed to Pond P33 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.000	74	>75% Grass cover, Good, HSG C
0.006	96	Gravel surface, HSG C
0.094	98	EX Gravel Surface, Impervious, HSG C
0.760	98	PR Gravel Surface, Impervious, HSG C
0.860	98	Weighted Average
0.006		0.72% Pervious Area
0.854		99.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A3a:



Summary for Subcatchment P-A3b:

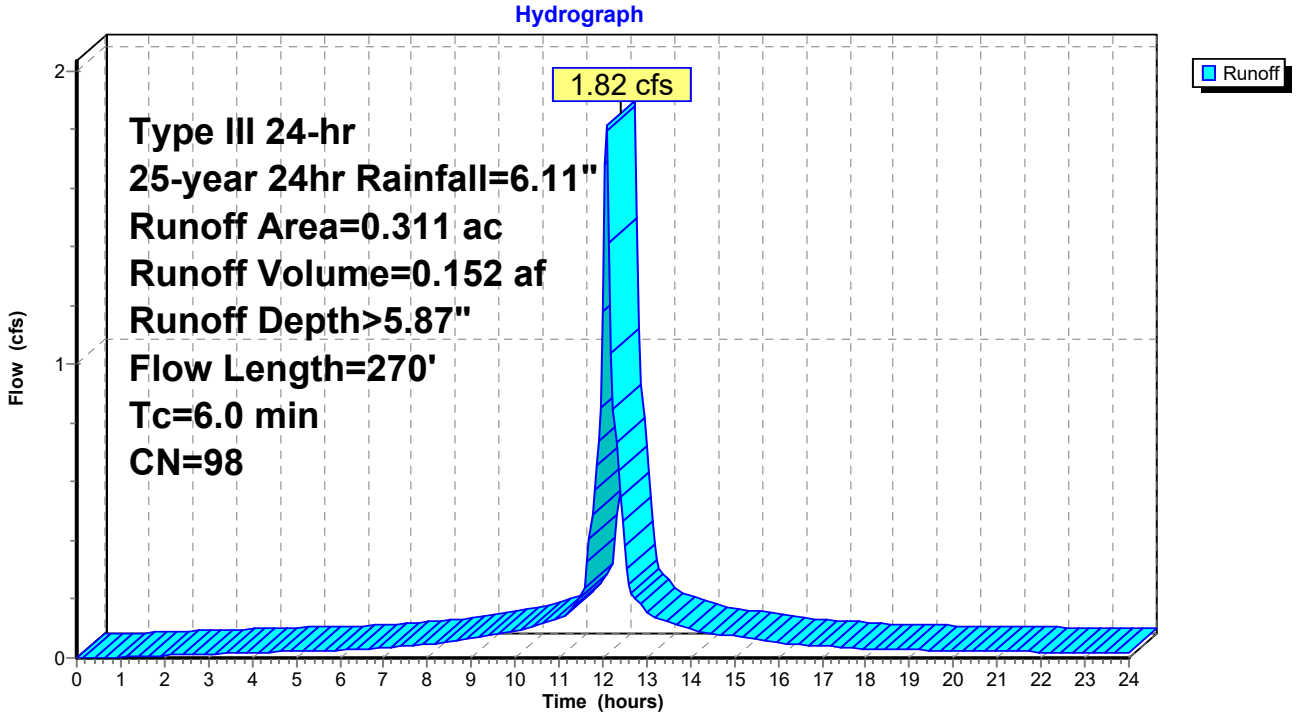
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.152 af, Depth> 5.87"
Routed to Pond P34 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.303	98	PR Gravel Surface, Impervious, HSG C
0.008	96	Gravel surface, HSG C
0.311	98	Weighted Average
0.008		2.48% Pervious Area
0.303		97.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	130	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	270	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3b:



Summary for Subcatchment P-A3c:

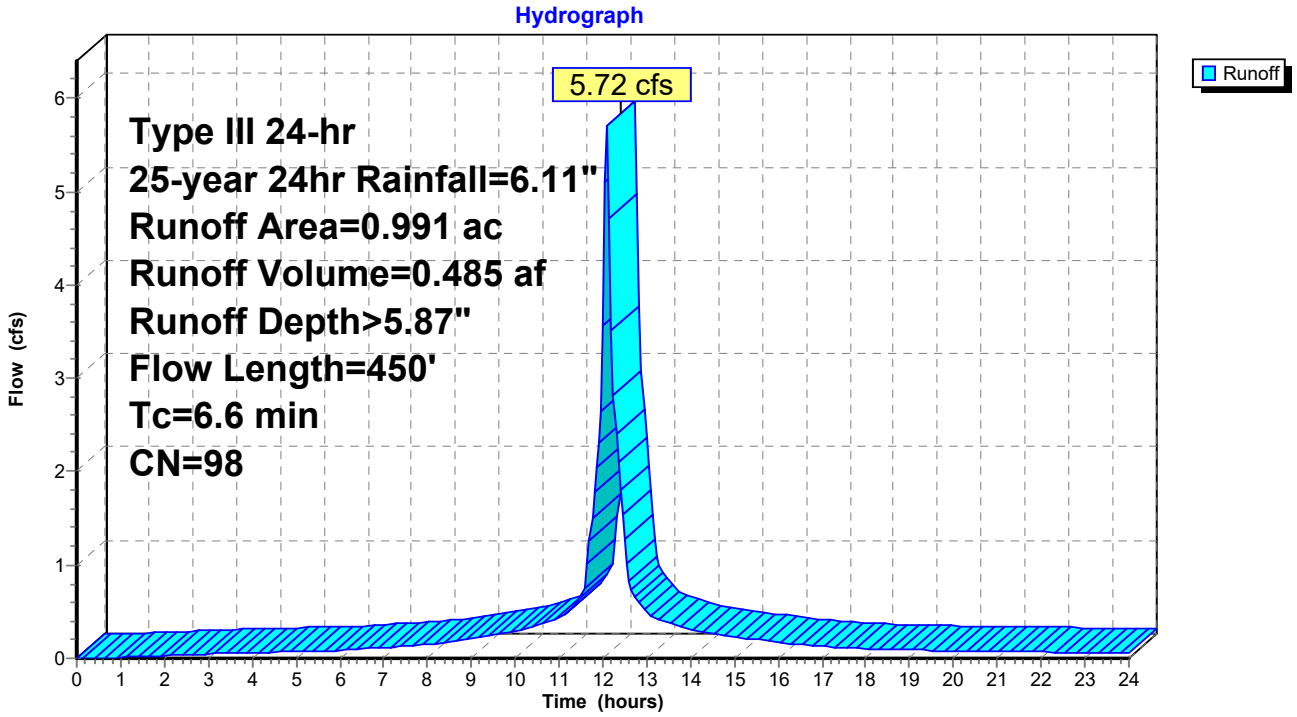
Runoff = 5.72 cfs @ 12.09 hrs, Volume= 0.485 af, Depth> 5.87"
Routed to Pond P35 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.983	98	PR Gravel Surface, Impervious, HSG C
0.001	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.991	98	Weighted Average
0.007		0.76% Pervious Area
0.983		99.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.4	230	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	100	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	70	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	450	Total			

Subcatchment P-A3c:



Summary for Subcatchment P-A3d:

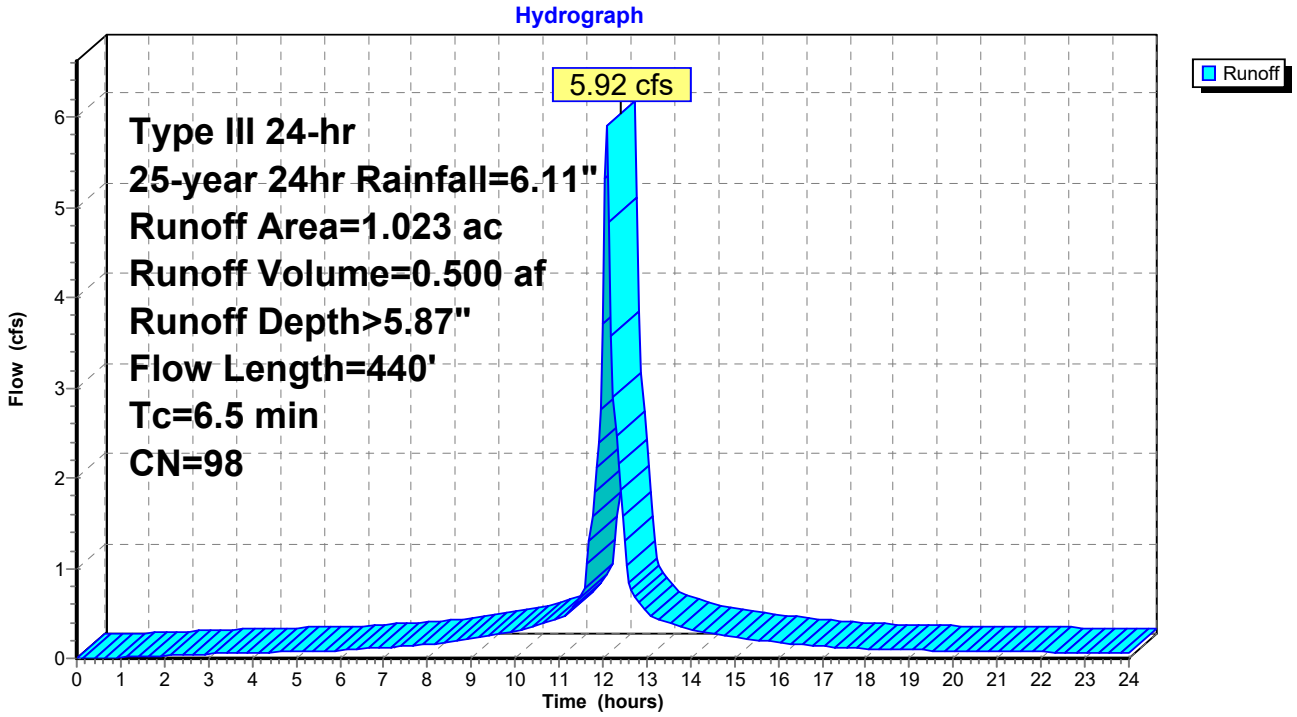
Runoff = 5.92 cfs @ 12.09 hrs, Volume= 0.500 af, Depth> 5.87"
Routed to Pond P36 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.918	98	PR Gravel Surface, Impervious, HSG C
0.018	98	EX Gravel Surface, Impervious, HSG C
0.004	96	Gravel surface, HSG C
0.004	96	Gravel surface, HSG D
0.079	98	PR Gravel Surface, Impervious, HSG D
1.023	98	Weighted Average
0.009		0.85% Pervious Area
1.015		99.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	120	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	160	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	440	Total			

Subcatchment P-A3d:



Summary for Subcatchment P-A3e:

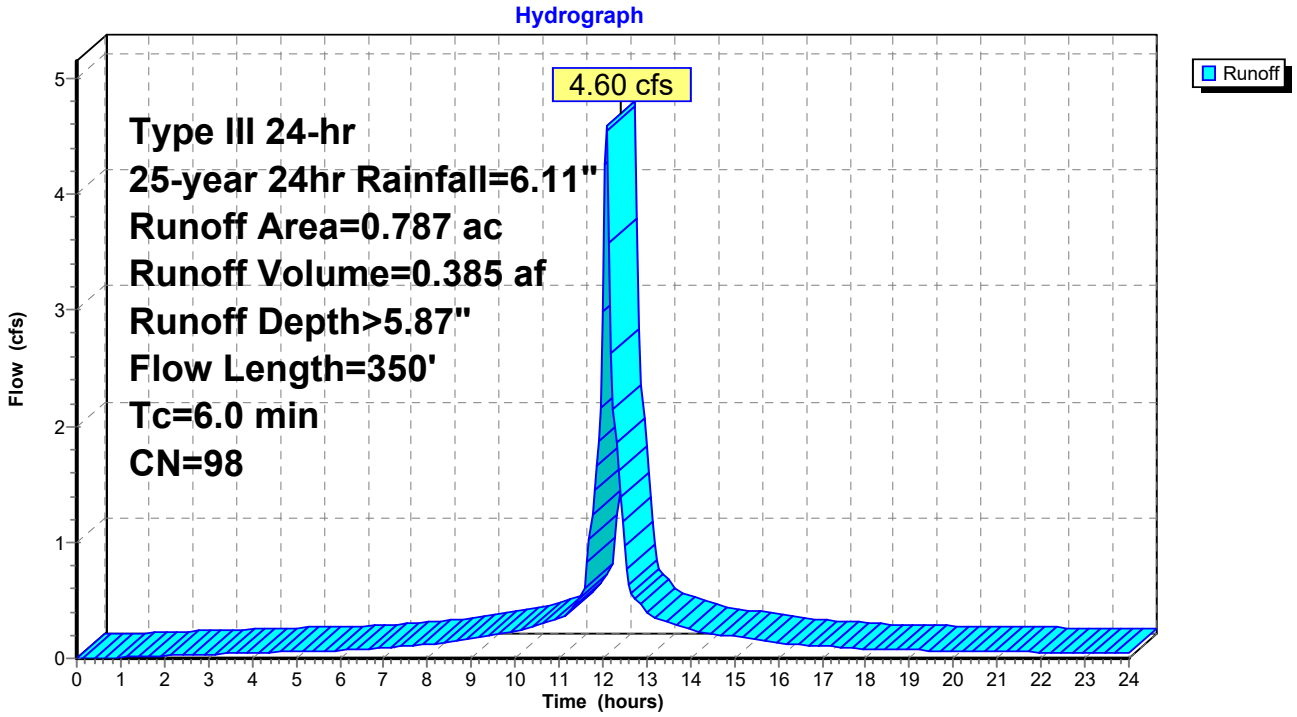
Runoff = 4.60 cfs @ 12.09 hrs, Volume= 0.385 af, Depth> 5.87"
Routed to Pond P37 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.669	98	PR Gravel Surface, Impervious, HSG C
0.031	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG D
0.068	98	PR Gravel Surface, Impervious, HSG D
0.787	98	Weighted Average
0.018		2.34% Pervious Area
0.768		97.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.7	160	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	140	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3e:



Summary for Subcatchment P-A4: Subcat P-A4

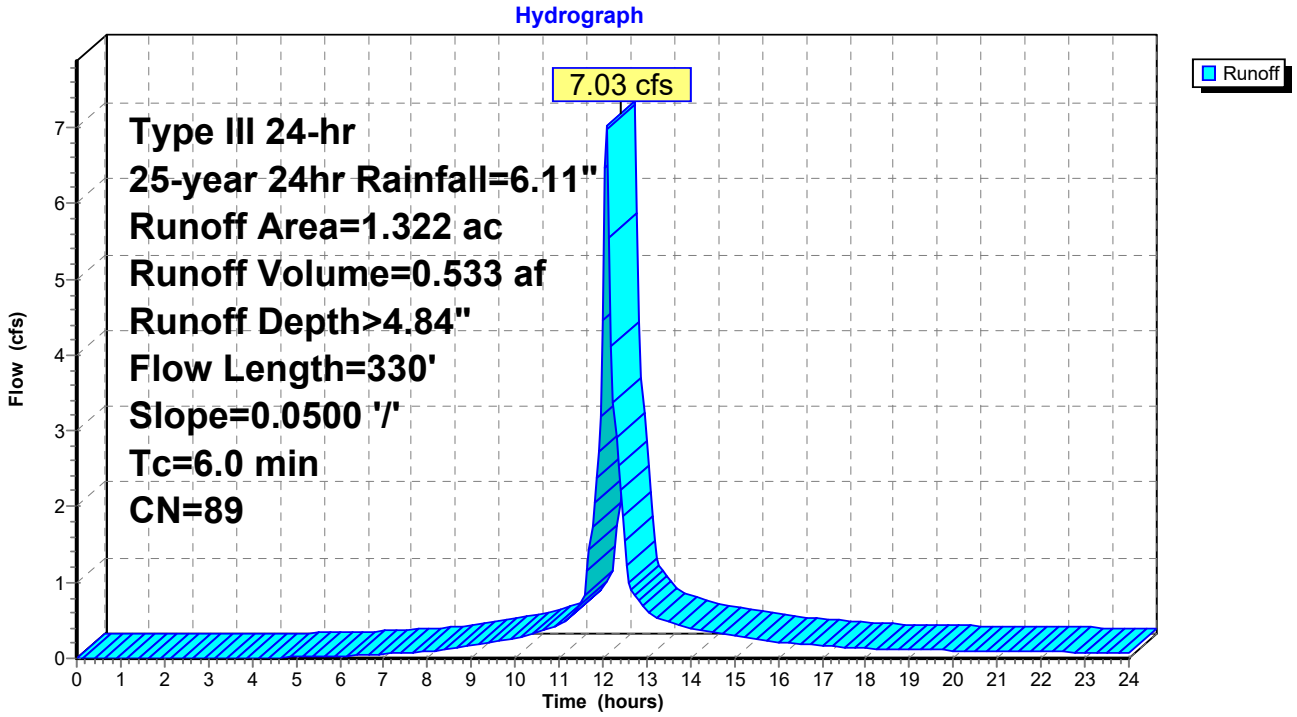
Runoff = 7.03 cfs @ 12.09 hrs, Volume= 0.533 af, Depth> 4.84"
Routed to Pond P38 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.523	98	PR Gravel Surface, Impervious, HSG C
0.123	98	EX Gravel Surface, Impervious, HSG C
0.403	74	>75% Grass cover, Good, HSG C
0.001	74	>75% Grass cover, Good, HSG C
0.084	80	>75% Grass cover, Good, HSG D
0.071	80	>75% Grass cover, Good, HSG D
0.005	96	Gravel surface, HSG D
0.112	98	PR Gravel Surface, Impervious, HSG D
1.322	89	Weighted Average
0.564		42.62% Pervious Area
0.759		57.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.0500	0.51		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.3	280	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	330	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A4: Subcat P-A4



Summary for Subcatchment P-A5:

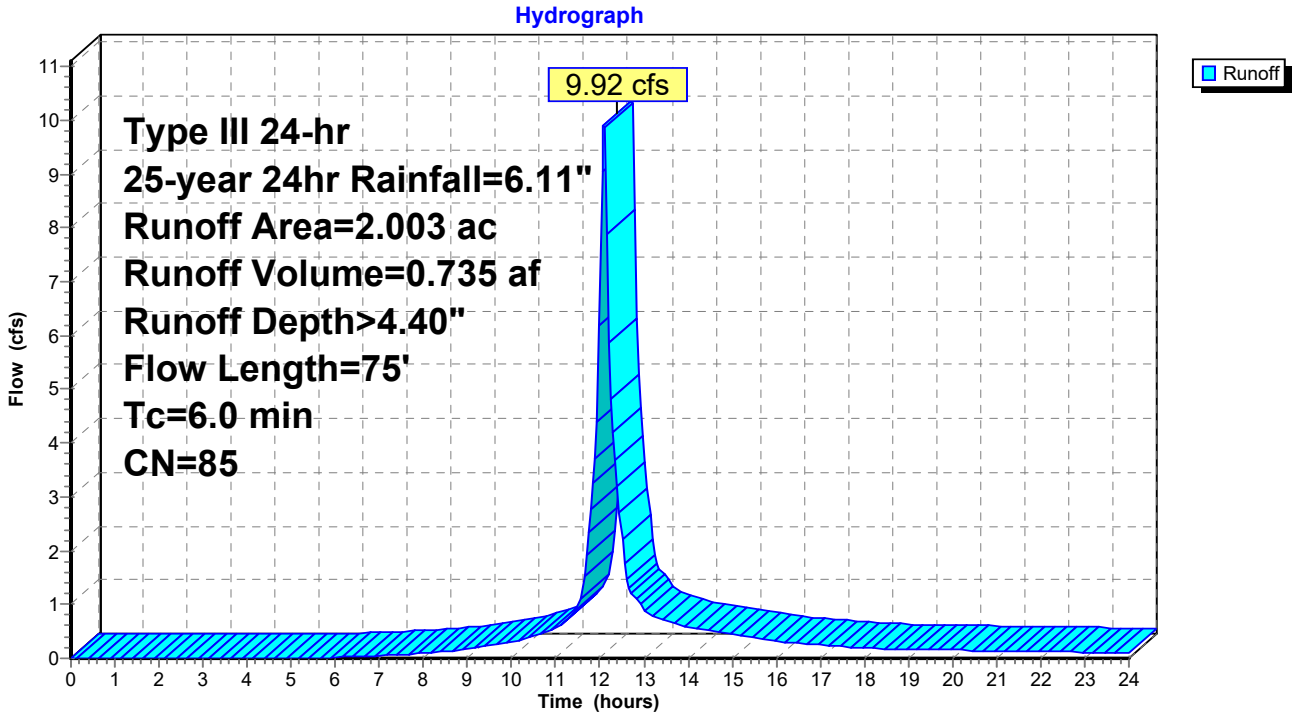
Runoff = 9.92 cfs @ 12.09 hrs, Volume= 0.735 af, Depth> 4.40"
Routed to Link DP-A : Design Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.011	98	EX Gravel Surface, Impervious, HSG C
0.211	96	Gravel surface, HSG D
0.000	96	Gravel surface, HSG D
0.763	96	Gravel surface, HSG C
0.001	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.071	77	Woods, Good, HSG D
0.002	77	Woods, Good, HSG D
0.001	77	Woods, Good, HSG D
0.009	77	Woods, Good, HSG D
0.341	70	Woods, Good, HSG C
0.018	74	>75% Grass cover, Good, HSG C
0.324	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.214	74	>75% Grass cover, Good, HSG C
0.002	80	>75% Grass cover, Good, HSG D
2.003	85	Weighted Average
1.991		99.44% Pervious Area
0.011		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	35	0.5000	0.56		**Sheet Flow,** Range n= 0.130 P2= 3.19"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A5:



Summary for Subcatchment P-A6: Subcat P-A6

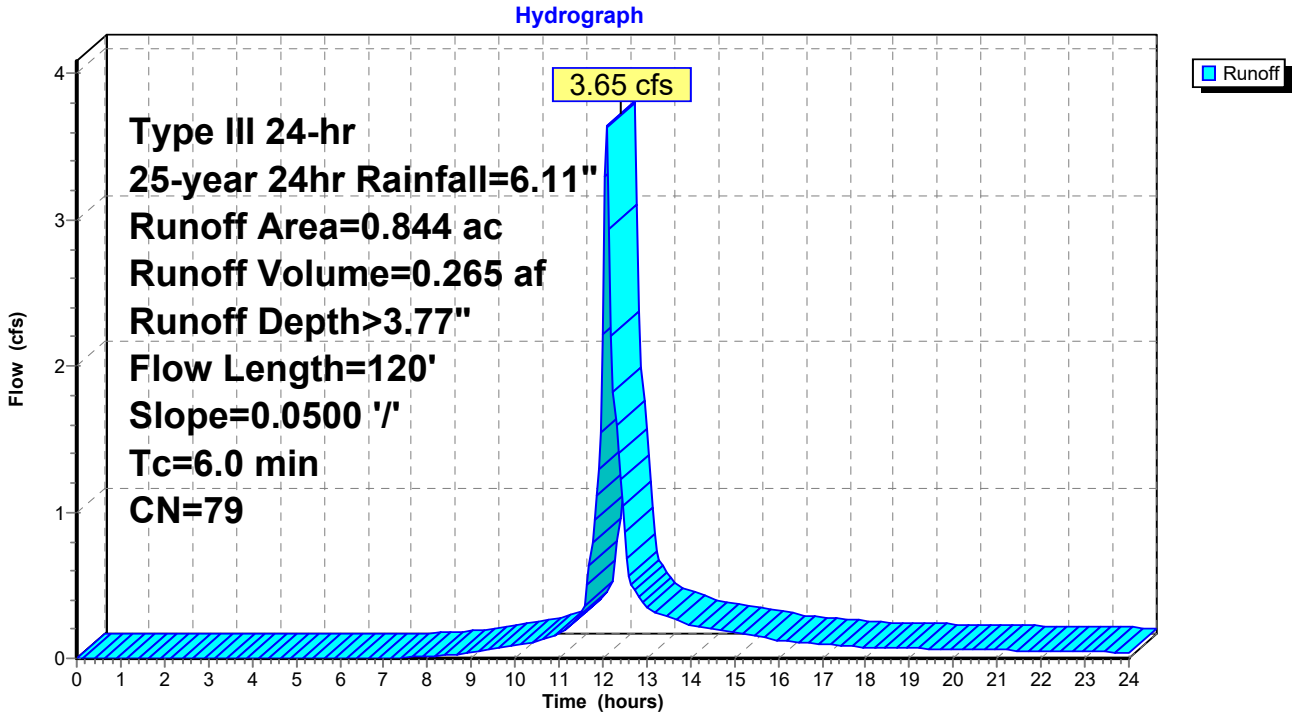
Runoff = 3.65 cfs @ 12.09 hrs, Volume= 0.265 af, Depth> 3.77"
Routed to Pond P1a : Proposed Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year 24hr Rainfall=6.11"

Area (ac)	CN	Description
0.000	98	PR Gravel Surface, Impervious, HSG C
0.050	98	EX Gravel Surface, Impervious, HSG C
0.127	74	>75% Grass cover, Good, HSG C
0.140	74	>75% Grass cover, Good, HSG C
0.425	80	>75% Grass cover, Good, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.000	98	PR Gravel Surface, Impervious, HSG D
0.844	79	Weighted Average
0.793		93.99% Pervious Area
0.051		6.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.19"
0.3	70	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	120	Total			

Subcatchment P-A6: Subcat P-A6



Summary for Pond CMB: Underground Storage Chambers

Inflow Area = 4.765 ac, 95.93% Impervious, Inflow Depth > 5.79" for 25-year 24hr event
Inflow = 27.74 cfs @ 12.09 hrs, Volume= 2.298 af
Outflow = 5.63 cfs @ 12.51 hrs, Volume= 1.778 af, Atten= 80%, Lag= 25.5 min
Discarded = 0.92 cfs @ 8.90 hrs, Volume= 1.374 af
Primary = 4.71 cfs @ 12.51 hrs, Volume= 0.404 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 223.17' @ 12.51 hrs Surf.Area= 16,464 sf Storage= 42,490 cf
Flood Elev= 224.00' Surf.Area= 16,464 sf Storage= 54,255 cf

Plug-Flow detention time= 200.0 min calculated for 1.778 af (77% of inflow)
Center-of-Mass det. time= 117.9 min (867.2 - 749.2)

Volume	Invert	Avail.Storage	Storage Description
#1B	219.75'	6,779 cf	**196.00'W x 84.00'L x 4.92'H Field A** 80,948 cf Overall - 64,000 cf Embedded = 16,948 cf x 40.0% Voids
#2B	220.50'	47,770 cf	**retain_it upright 3.5'** x 240 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 24 Rows adjusted for 417.5 cf perimeter wall
		54,549 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	219.75'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	220.40'	**24.0" Round Culvert** L= 370.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 220.40' / 210.00' S= 0.0281 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	222.75'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.92 cfs @ 8.90 hrs HW=219.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=4.67 cfs @ 12.51 hrs HW=223.16' (Free Discharge)
└**2=Culvert** (Passes 4.67 cfs of 15.86 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 4.67 cfs @ 1.88 fps)

Pond CMB: Underground Storage Chambers - Chamber Wizard Field A

Chamber Model = retain_it upright 3.5' (retain-it® upright)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
24 Rows adjusted for 417.5 cf perimeter wall

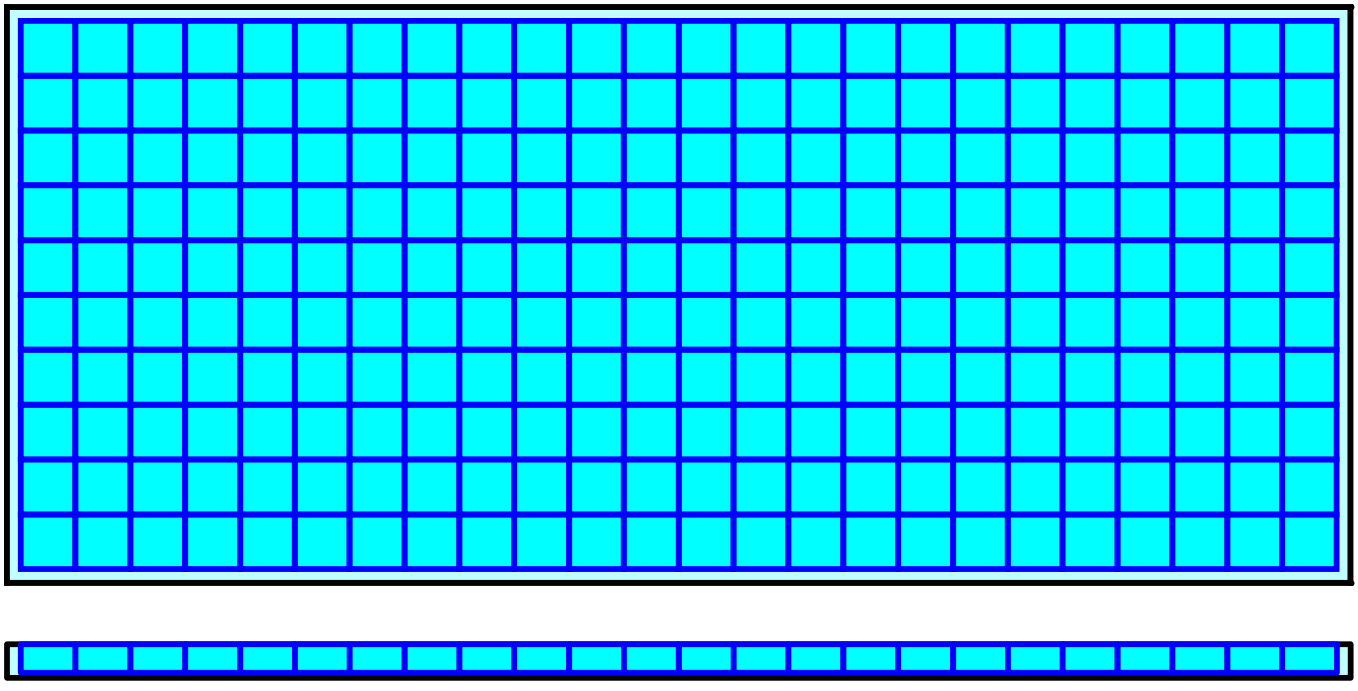
10 Chambers/Row x 8.00' Long = 80.00' Row Length +24.0" End Stone x 2 = 84.00' Base Length
24 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 196.00' Base Width
9.0" Stone Base + 50.0" Chamber Height = 4.92' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 24 x 2 = 417.5 cf Perimeter Wall
240 Chambers x 200.8 cf - 417.5 cf Perimeter wall = 47,769.8 cf Chamber Storage
240 Chambers x 266.7 cf = 64,000.0 cf Displacement

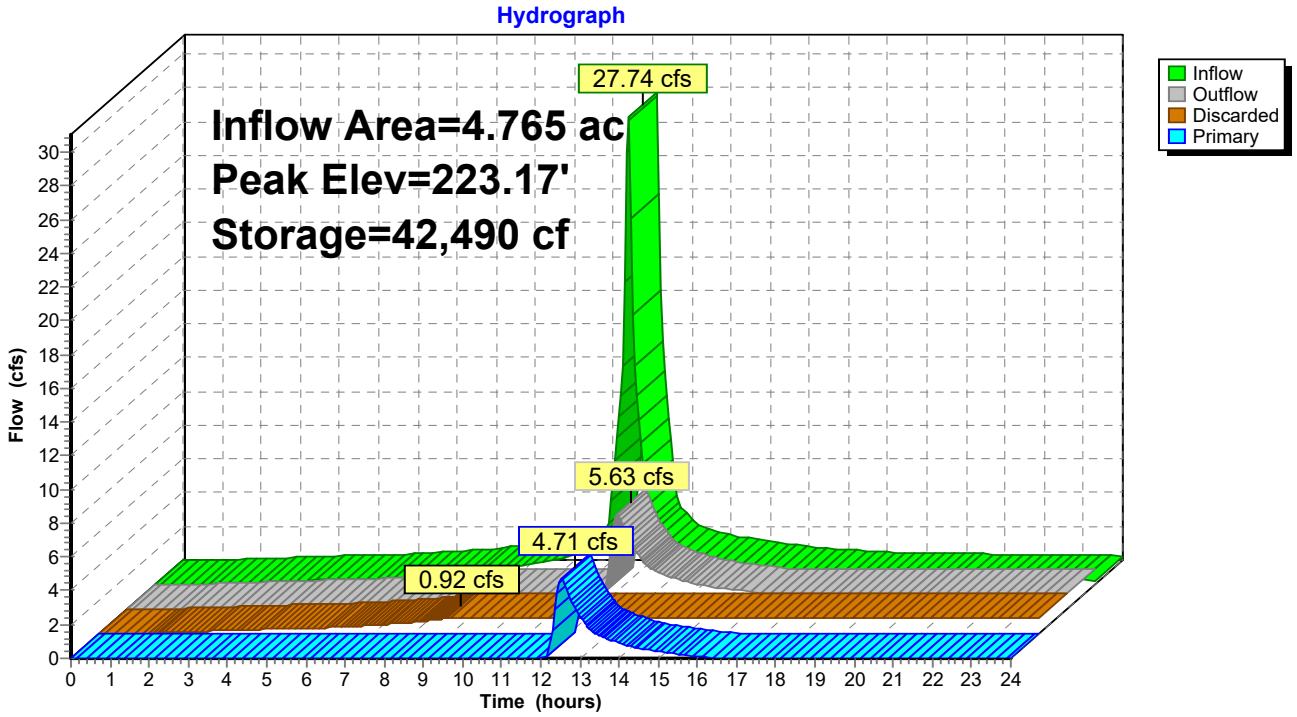
80,948.0 cf Field - 64,000.0 cf Chambers = 16,948.0 cf Stone x 40.0% Voids = 6,779.2 cf Stone Storage

Chamber Storage + Stone Storage = 54,549.0 cf = 1.252 af
Overall Storage Efficiency = 67.4%
Overall System Size = 84.00' x 196.00' x 4.92'

240 Chambers
2,998.1 cy Field
627.7 cy Stone



Pond CMB: Underground Storage Chambers



Summary for Pond D27: DMH - 24"

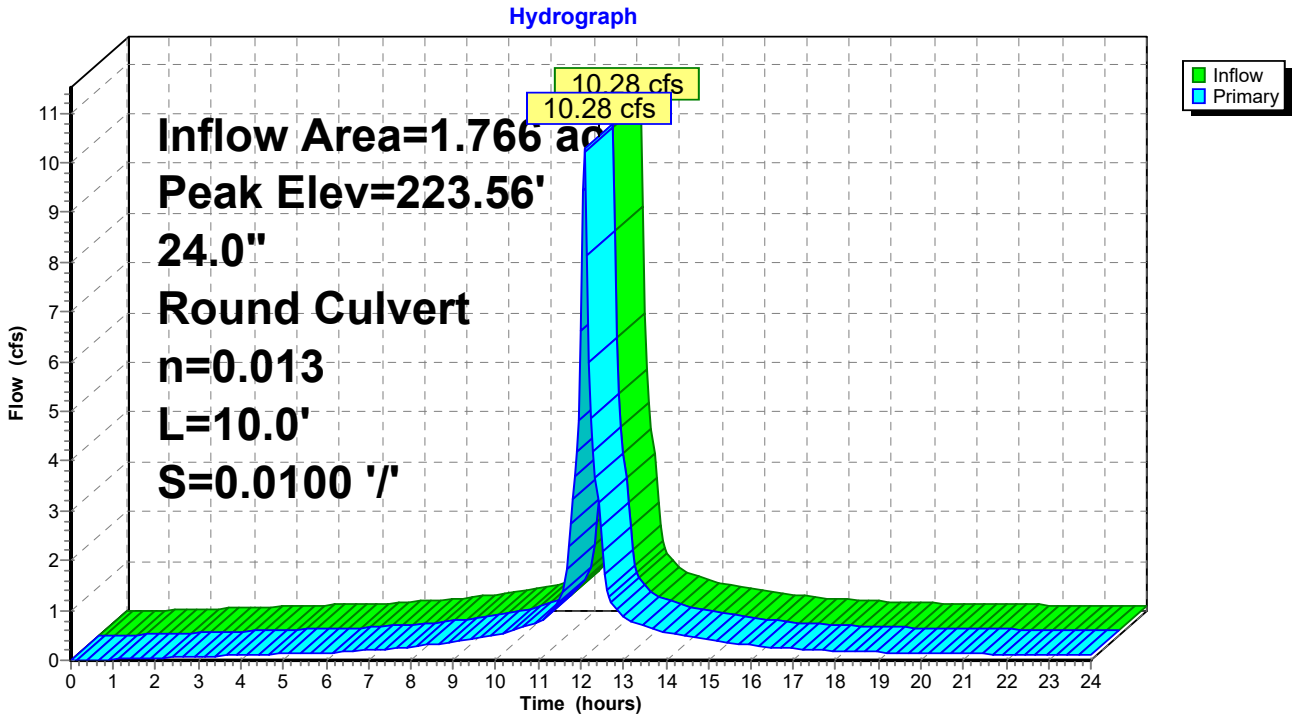
Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 5.85" for 25-year 24hr event
Inflow = 10.28 cfs @ 12.09 hrs, Volume= 0.861 af
Outflow = 10.28 cfs @ 12.09 hrs, Volume= 0.861 af, Atten= 0%, Lag= 0.0 min
Primary = 10.28 cfs @ 12.09 hrs, Volume= 0.861 af
Routed to Link WQU-P6 : Water Quality Unit

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 223.56' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	221.80'	**24.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 221.80' / 221.70' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.03 cfs @ 12.09 hrs HW=223.54' (Free Discharge)
1=Culvert (Barrel Controls 10.03 cfs @ 4.63 fps)

Pond D27: DMH - 24"



Summary for Pond D30: DMH - 24"

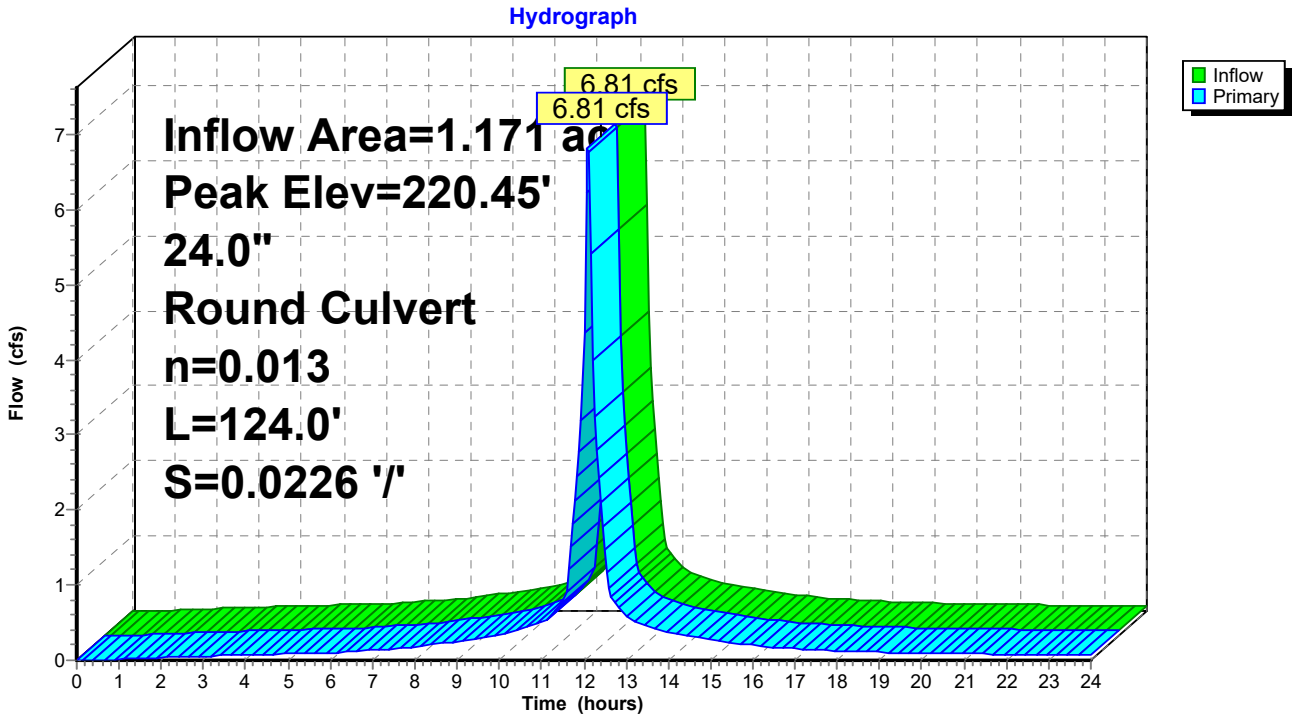
Inflow Area = 1.171 ac, 98.81% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 6.81 cfs @ 12.09 hrs, Volume= 0.572 af
Outflow = 6.81 cfs @ 12.09 hrs, Volume= 0.572 af, Atten= 0%, Lag= 0.0 min
Primary = 6.81 cfs @ 12.09 hrs, Volume= 0.572 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 220.45' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	219.30'	**24.0" Round Culvert** L= 124.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.30' / 216.50' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=6.65 cfs @ 12.09 hrs HW=220.43' (Free Discharge)
1=Culvert (Inlet Controls 6.65 cfs @ 3.62 fps)

Pond D30: DMH - 24"



Summary for Pond D31: DMH - 30"

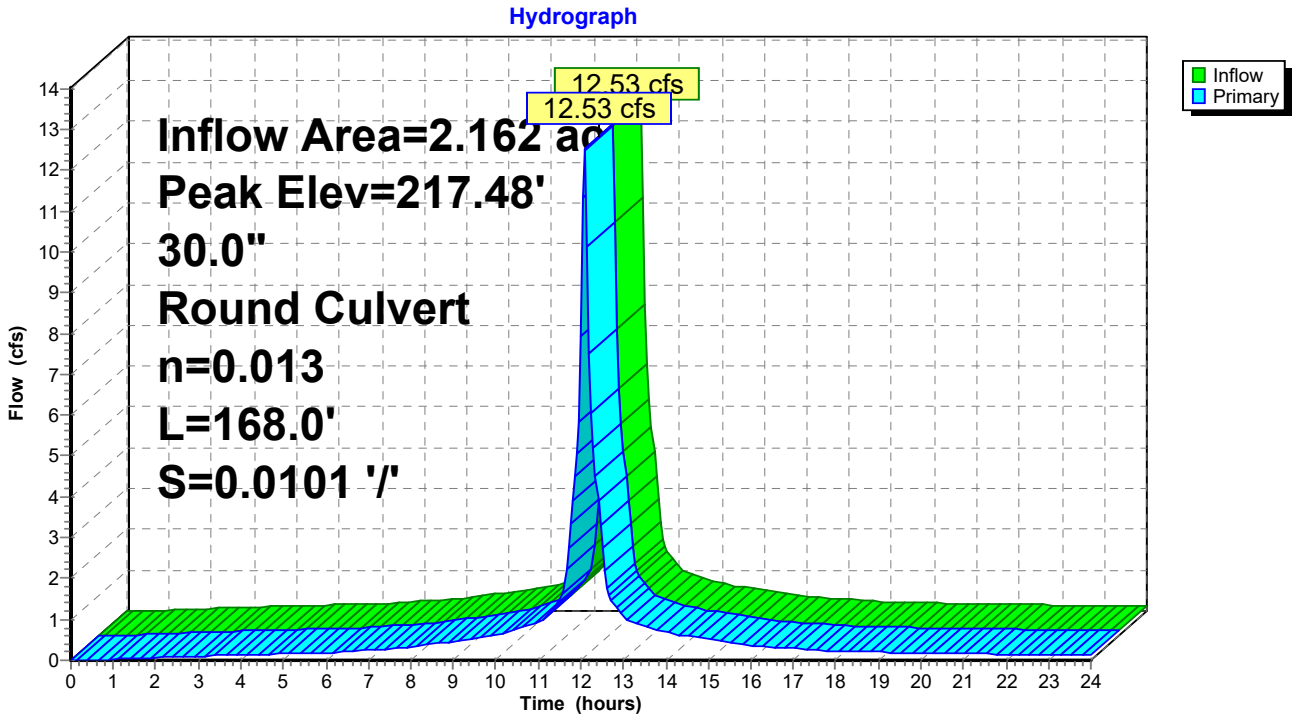
Inflow Area = 2.162 ac, 99.01% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 12.53 cfs @ 12.09 hrs, Volume= 1.057 af
Outflow = 12.53 cfs @ 12.09 hrs, Volume= 1.057 af, Atten= 0%, Lag= 0.0 min
Primary = 12.53 cfs @ 12.09 hrs, Volume= 1.057 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 217.48' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	216.00'	**30.0" Round Culvert** L= 168.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.00' / 214.30' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=12.28 cfs @ 12.09 hrs HW=217.46' (Free Discharge)
1=Culvert (Inlet Controls 12.28 cfs @ 4.12 fps)

Pond D31: DMH - 30"



Summary for Pond D32: DMH - 30"

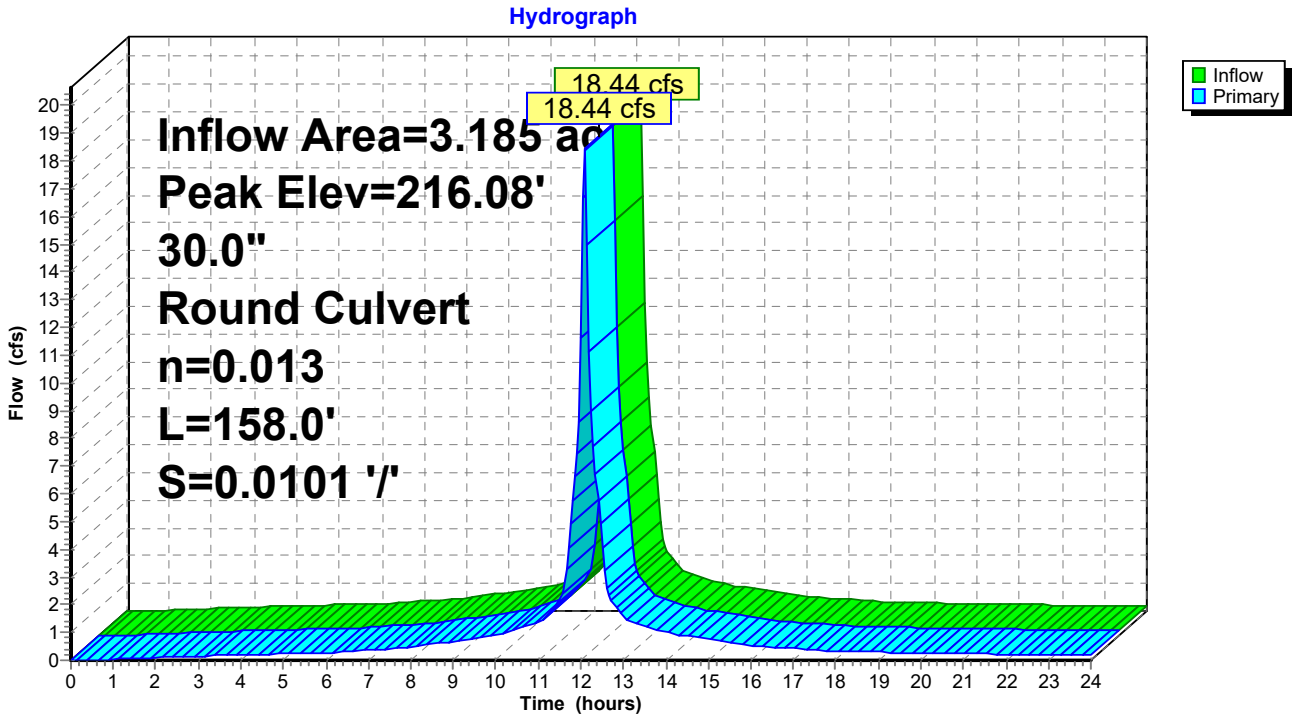
Inflow Area = 3.185 ac, 99.06% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 18.44 cfs @ 12.09 hrs, Volume= 1.557 af
Outflow = 18.44 cfs @ 12.09 hrs, Volume= 1.557 af, Atten= 0%, Lag= 0.0 min
Primary = 18.44 cfs @ 12.09 hrs, Volume= 1.557 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 216.08' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	214.20'	**30.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.20' / 212.60' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=18.09 cfs @ 12.09 hrs HW=216.05' (Free Discharge)
1=Culvert (Inlet Controls 18.09 cfs @ 4.64 fps)

Pond D32: DMH - 30"



Summary for Pond D33: DMH - 30"

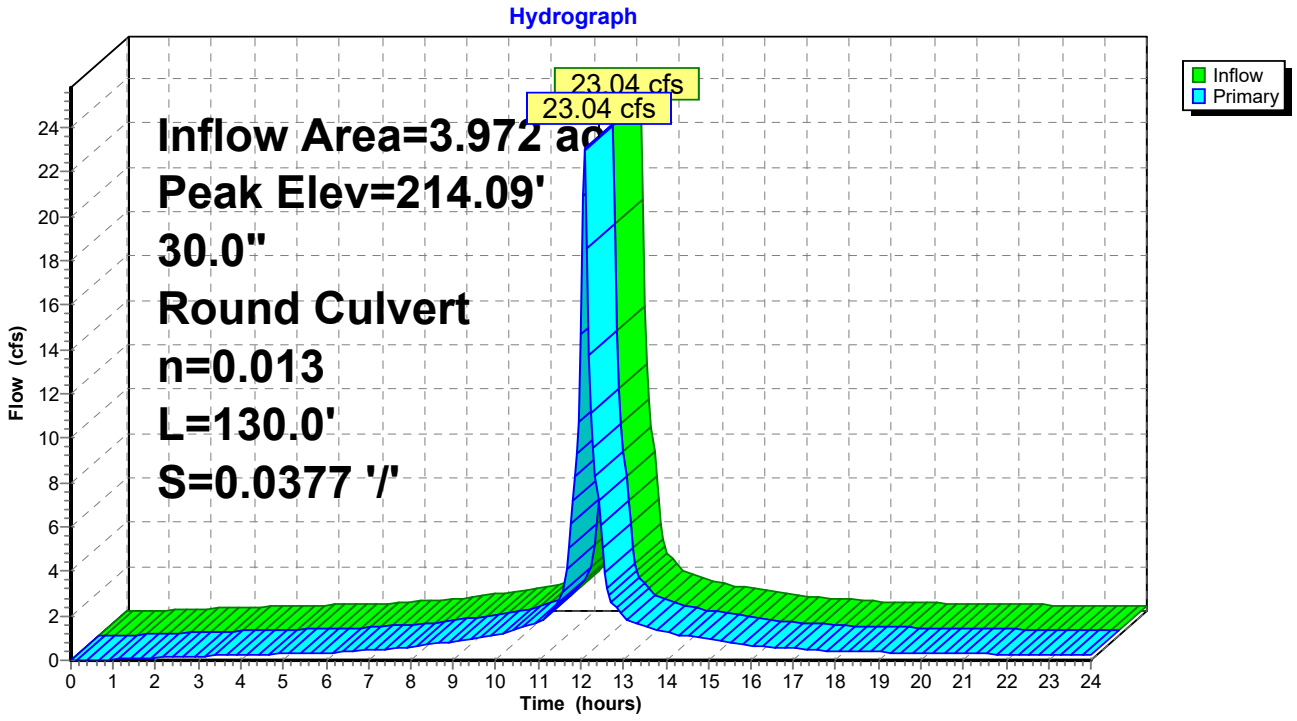
Inflow Area = 3.972 ac, 98.78% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 23.04 cfs @ 12.09 hrs, Volume= 1.942 af
Outflow = 23.04 cfs @ 12.09 hrs, Volume= 1.942 af, Atten= 0%, Lag= 0.0 min
Primary = 23.04 cfs @ 12.09 hrs, Volume= 1.942 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 214.09' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	211.90'	**30.0" Round Culvert** L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 211.90' / 207.00' S= 0.0377 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=22.57 cfs @ 12.09 hrs HW=214.06' (Free Discharge)
1=Culvert (Inlet Controls 22.57 cfs @ 5.00 fps)

Pond D33: DMH - 30"



Summary for Pond F1: Forebay

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 5.61" for 25-year 24hr event
Inflow = 30.07 cfs @ 12.09 hrs, Volume= 2.475 af
Outflow = 31.64 cfs @ 12.11 hrs, Volume= 2.475 af, Atten= 0%, Lag= 1.0 min
Primary = 19.34 cfs @ 12.11 hrs, Volume= 2.388 af
Routed to Link WQU-P5 : Water Quality Unit
Secondary = 12.30 cfs @ 12.11 hrs, Volume= 0.087 af
Routed to Pond P1a : Proposed Basin

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 207.52' @ 12.11 hrs Surf.Area= 1,492 sf Storage= 2,462 cf

Plug-Flow detention time= 0.8 min calculated for 2.470 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (754.6 - 753.9)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	3,235 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

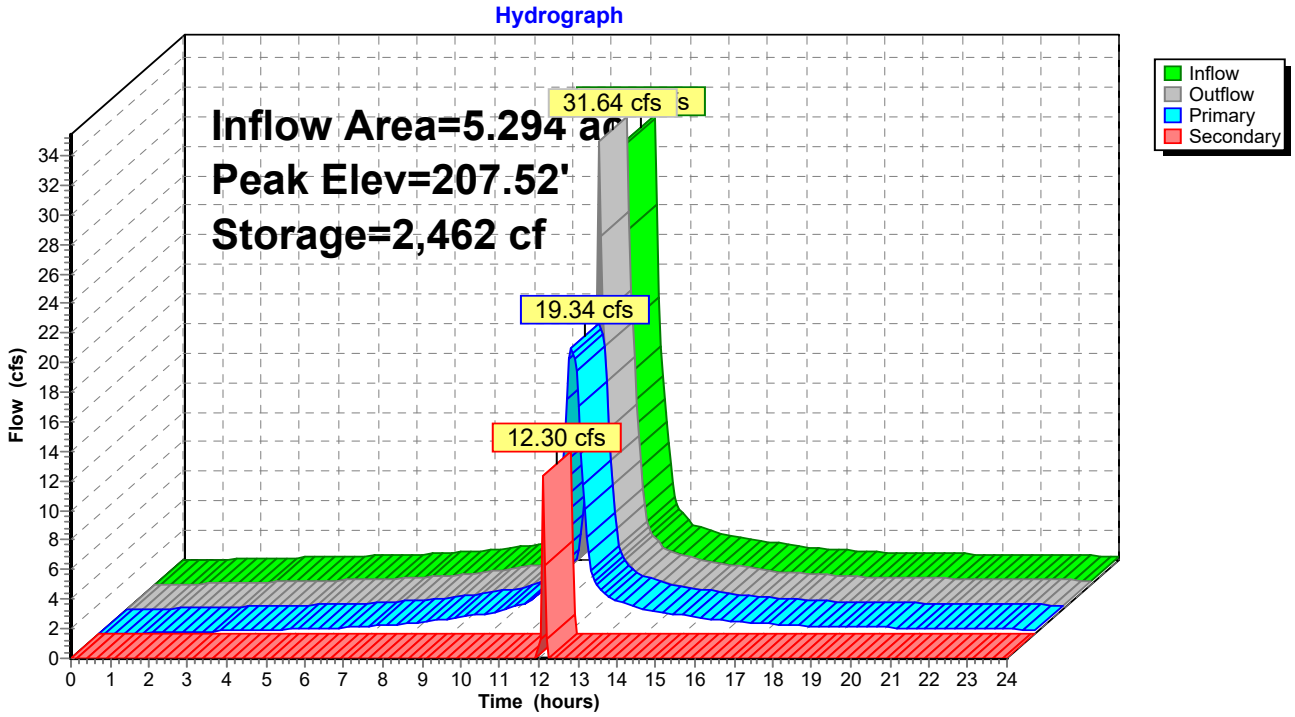
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
205.00	480	0	0
207.00	1,270	1,750	1,750
208.00	1,700	1,485	3,235

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**18.0" Round 18" Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.60' / 201.30' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	205.00'	**1.0" x 21.0" Horiz. Double Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	207.00'	**12.0' long + 2.0 '/' SideZ x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=19.26 cfs @ 12.11 hrs HW=207.47' (Free Discharge)
└**1=18" Culvert** (Inlet Controls 19.26 cfs @ 10.90 fps)
└**2=Double Grate** (Passes 19.26 cfs of 22.08 cfs potential flow)

Secondary OutFlow Max=11.11 cfs @ 12.11 hrs HW=207.48' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 11.11 cfs @ 1.79 fps)

Pond F1: Forebay



Summary for Pond P1a: Proposed Basin

Inflow Area = 6.138 ac, 77.11% Impervious, Inflow Depth > 5.36" for 25-year 24hr event
Inflow = 35.24 cfs @ 12.11 hrs, Volume= 2.740 af
Outflow = 10.14 cfs @ 12.43 hrs, Volume= 2.155 af, Atten= 71%, Lag= 19.4 min
Discarded = 0.89 cfs @ 12.43 hrs, Volume= 0.967 af
Primary = 9.25 cfs @ 12.43 hrs, Volume= 1.188 af
Routed to Link DP-A : Design Point A
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 203.97' @ 12.43 hrs Surf.Area= 15,940 sf Storage= 55,060 cf

Plug-Flow detention time= 208.9 min calculated for 2.155 af (79% of inflow)
Center-of-Mass det. time= 129.1 min (889.6 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	90,590 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	1,180	0	0
199.00	3,950	2,565	2,565
200.00	7,100	5,525	8,090
201.00	9,950	8,525	16,615
202.00	11,950	10,950	27,565
203.00	14,000	12,975	40,540
204.00	16,000	15,000	55,540
205.00	17,500	16,750	72,290
206.00	19,100	18,300	90,590

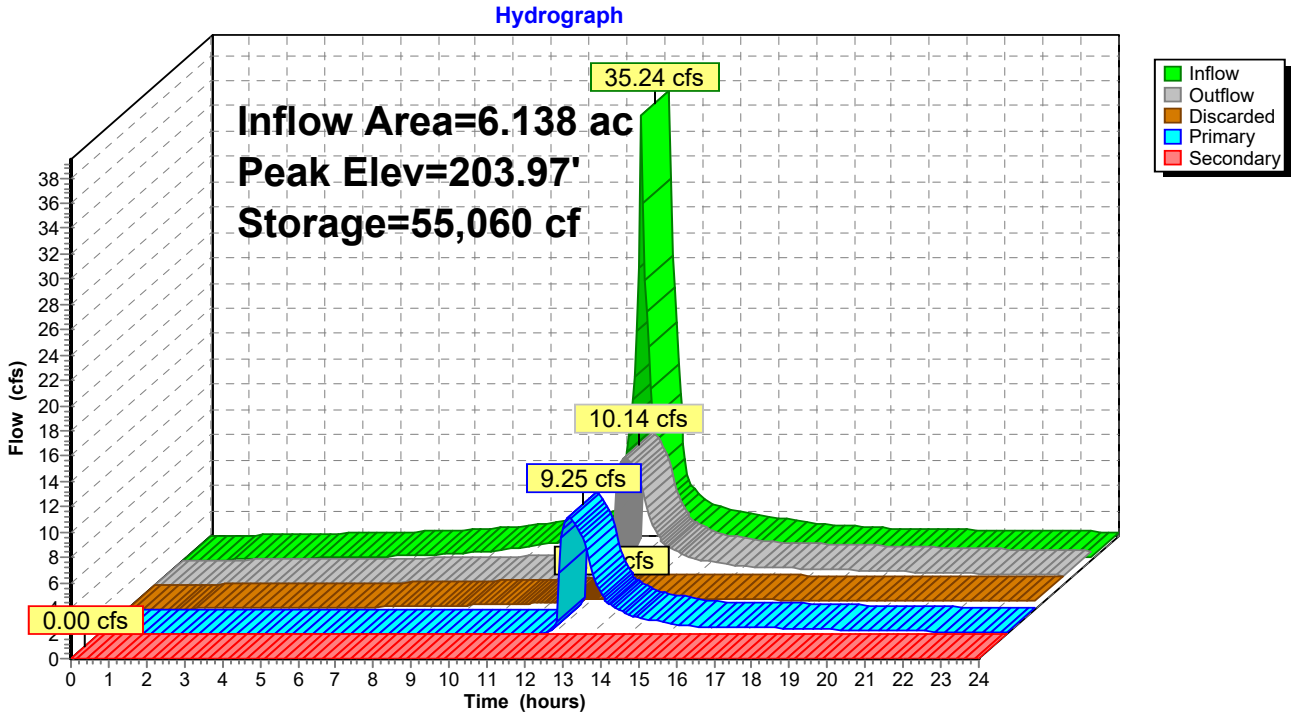
Device	Routing	Invert	Outlet Devices
#1	Secondary	205.00'	**10.0' long + 3.0 '/' SideZ x 11.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.53 2.59 2.70 2.68 2.67 2.68 2.66 2.64
#2	Primary	198.00'	**18.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 198.00' / 194.40' S= 0.0514 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	201.50'	**1.0" Vert. Orifice/Grate X 8.00 columns** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 2	203.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.89 cfs @ 12.43 hrs HW=203.97' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.89 cfs)

Primary OutFlow Max=9.24 cfs @ 12.43 hrs HW=203.97' (Free Discharge)
└**2=Culvert** (Passes 9.24 cfs of 19.44 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.87 cfs @ 6.64 fps)
  └**4=Orifice/Grate** (Orifice Controls 8.37 cfs @ 4.74 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=198.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond P1a: Proposed Basin



Summary for Pond P30: 12" HDPE

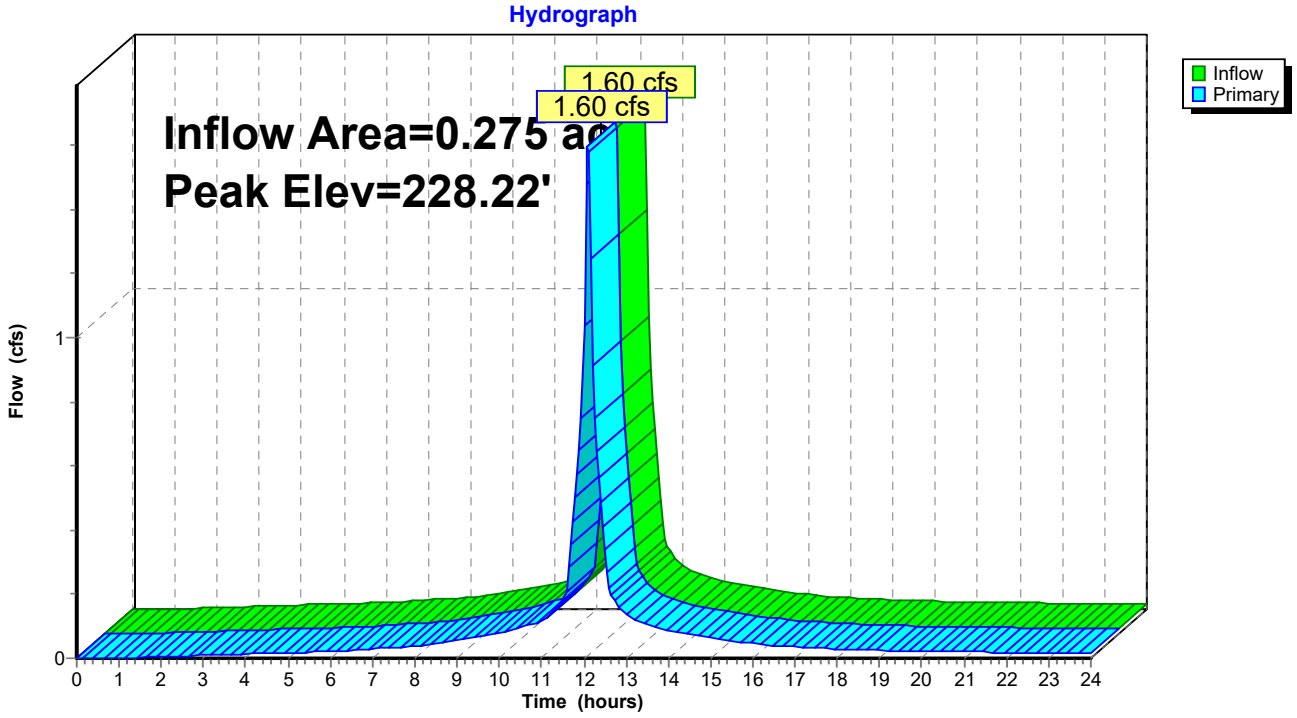
Inflow Area = 0.275 ac, 92.37% Impervious, Inflow Depth > 5.75" for 25-year 24hr event
Inflow = 1.60 cfs @ 12.09 hrs, Volume= 0.132 af
Outflow = 1.60 cfs @ 12.09 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min
Primary = 1.60 cfs @ 12.09 hrs, Volume= 0.132 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.22' @ 12.09 hrs
Flood Elev= 228.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	224.60'	**12.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 224.60' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.54 cfs @ 12.09 hrs HW=228.22' (Free Discharge)
└**1=Culvert** (Passes 1.54 cfs of 4.95 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.54 cfs @ 1.11 fps)

Pond P30: 12" HDPE



Summary for Pond P31: 12" HDPE

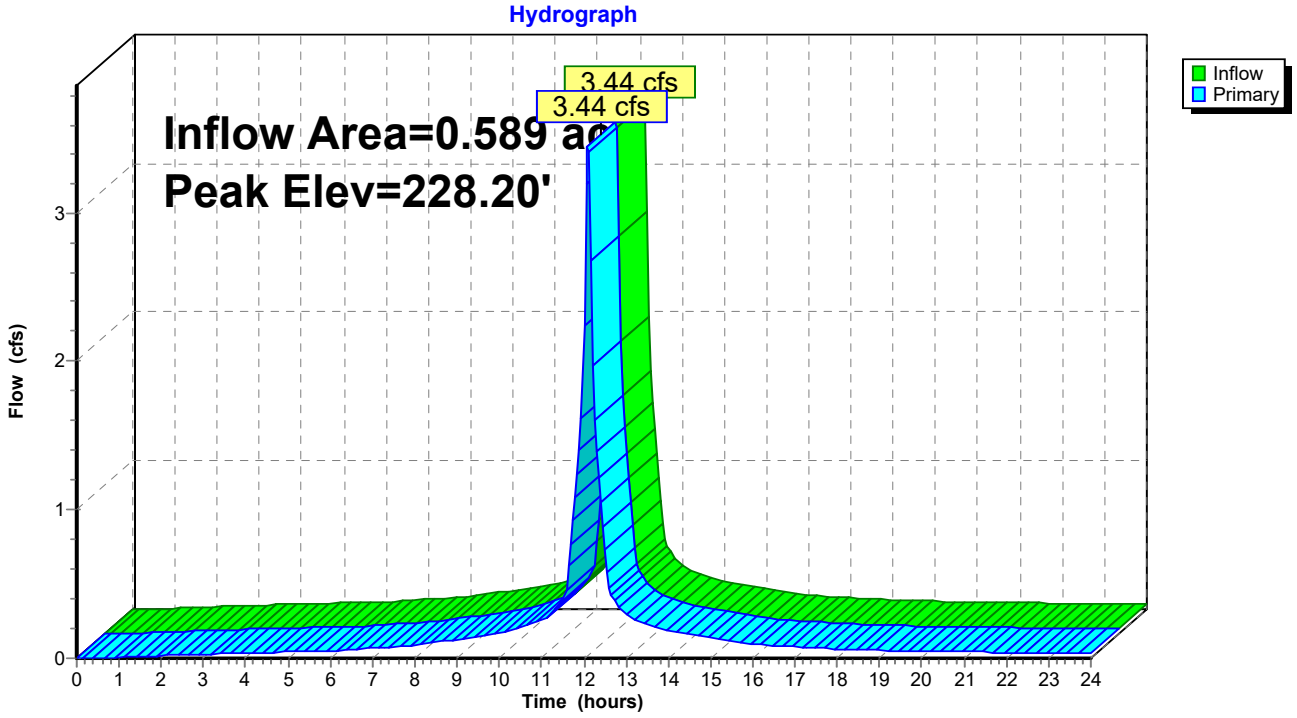
Inflow Area = 0.589 ac, 97.92% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 3.44 cfs @ 12.09 hrs, Volume= 0.288 af
Outflow = 3.44 cfs @ 12.09 hrs, Volume= 0.288 af, Atten= 0%, Lag= 0.0 min
Primary = 3.44 cfs @ 12.09 hrs, Volume= 0.288 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.20' @ 12.09 hrs
Flood Elev= 228.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.00'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.00' / 222.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.32 cfs @ 12.09 hrs HW=228.19' (Free Discharge)
└─**1=Culvert** (Passes 3.32 cfs of 8.19 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 3.32 cfs @ 1.44 fps)

Pond P31: 12" HDPE



Summary for Pond P32: 18" HDPE

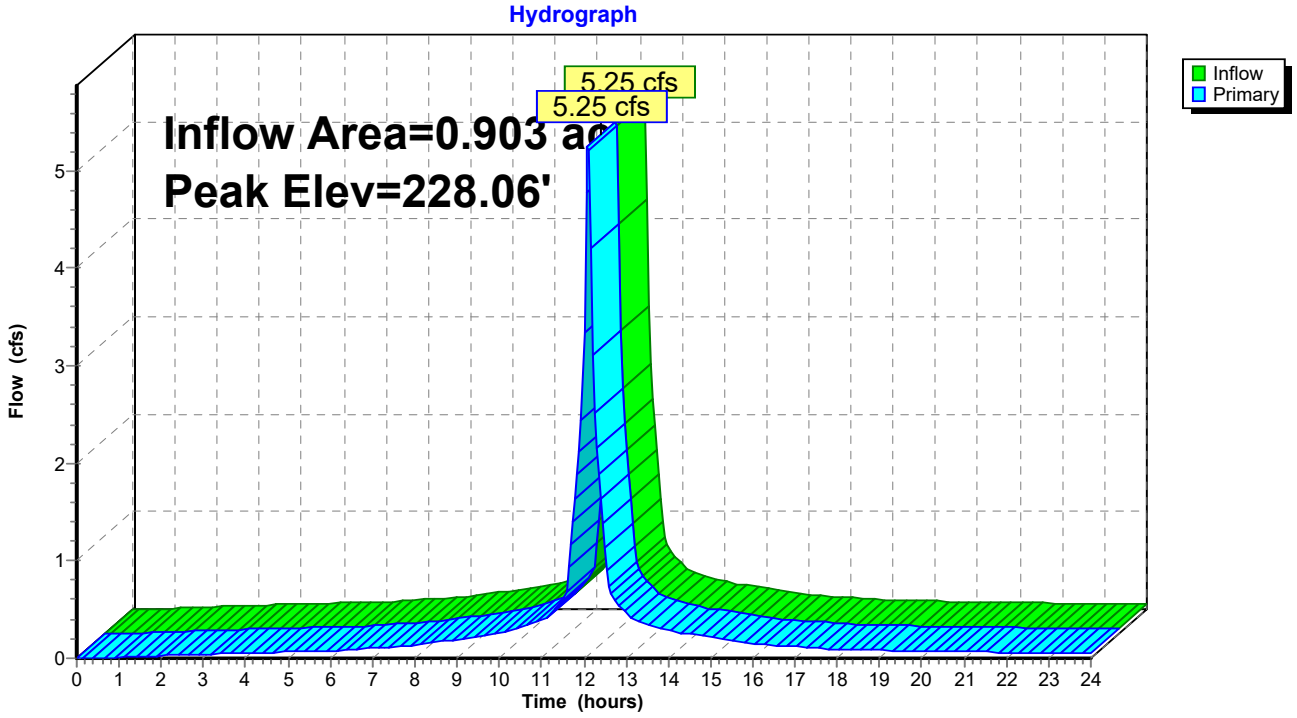
Inflow Area = 0.903 ac, 98.45% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 5.25 cfs @ 12.09 hrs, Volume= 0.441 af
Outflow = 5.25 cfs @ 12.09 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.0 min
Primary = 5.25 cfs @ 12.09 hrs, Volume= 0.441 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.06' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.80'	**18.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.80' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.12 cfs @ 12.09 hrs HW=228.06' (Free Discharge)
└**1=Culvert** (Passes 5.12 cfs of 15.07 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 5.12 cfs @ 1.66 fps)

Pond P32: 18" HDPE



Summary for Pond P33: 18" HDPE

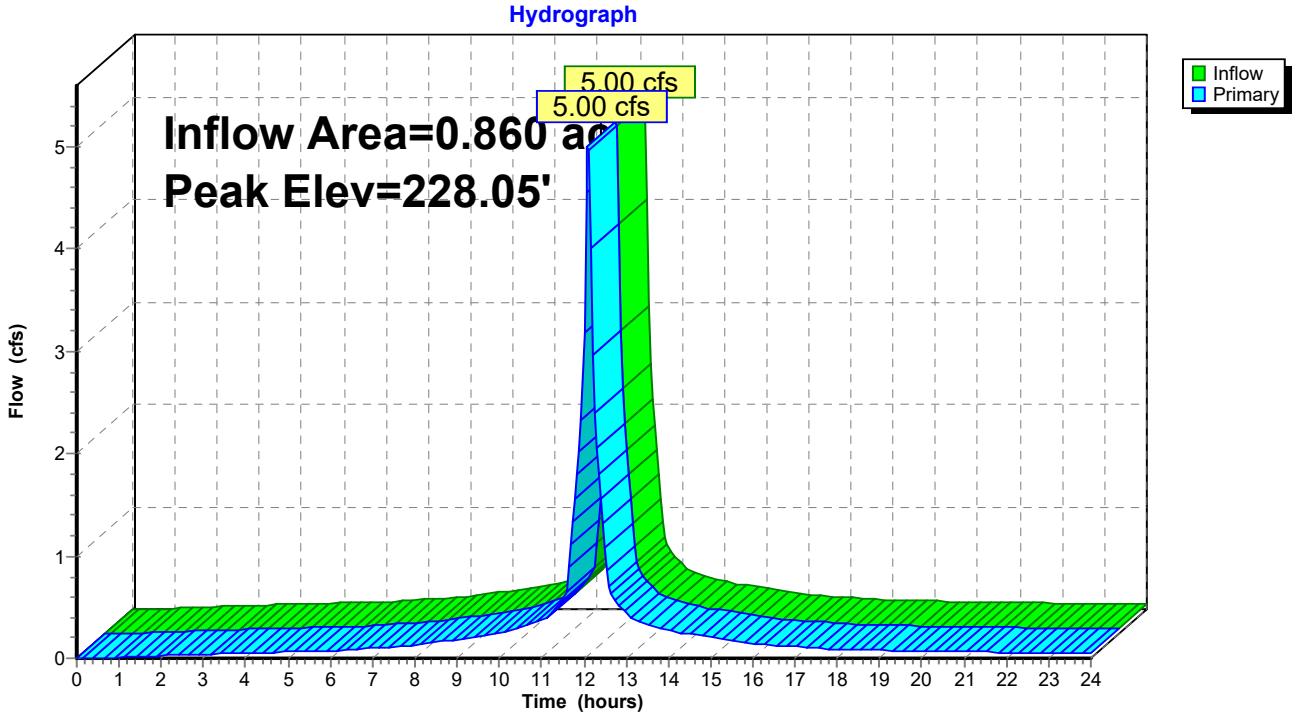
Inflow Area = 0.860 ac, 99.28% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 5.00 cfs @ 12.09 hrs, Volume= 0.421 af
Outflow = 5.00 cfs @ 12.09 hrs, Volume= 0.421 af, Atten= 0%, Lag= 0.0 min
Primary = 5.00 cfs @ 12.09 hrs, Volume= 0.421 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.05' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	222.80'	**18.0" Round Culvert** L= 198.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.80' / 219.80' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.87 cfs @ 12.09 hrs HW=228.05' (Free Discharge)
└─**1=Culvert** (Passes 4.87 cfs of 16.28 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 4.87 cfs @ 1.63 fps)

Pond P33: 18" HDPE



Summary for Pond P34: 18" HDPE

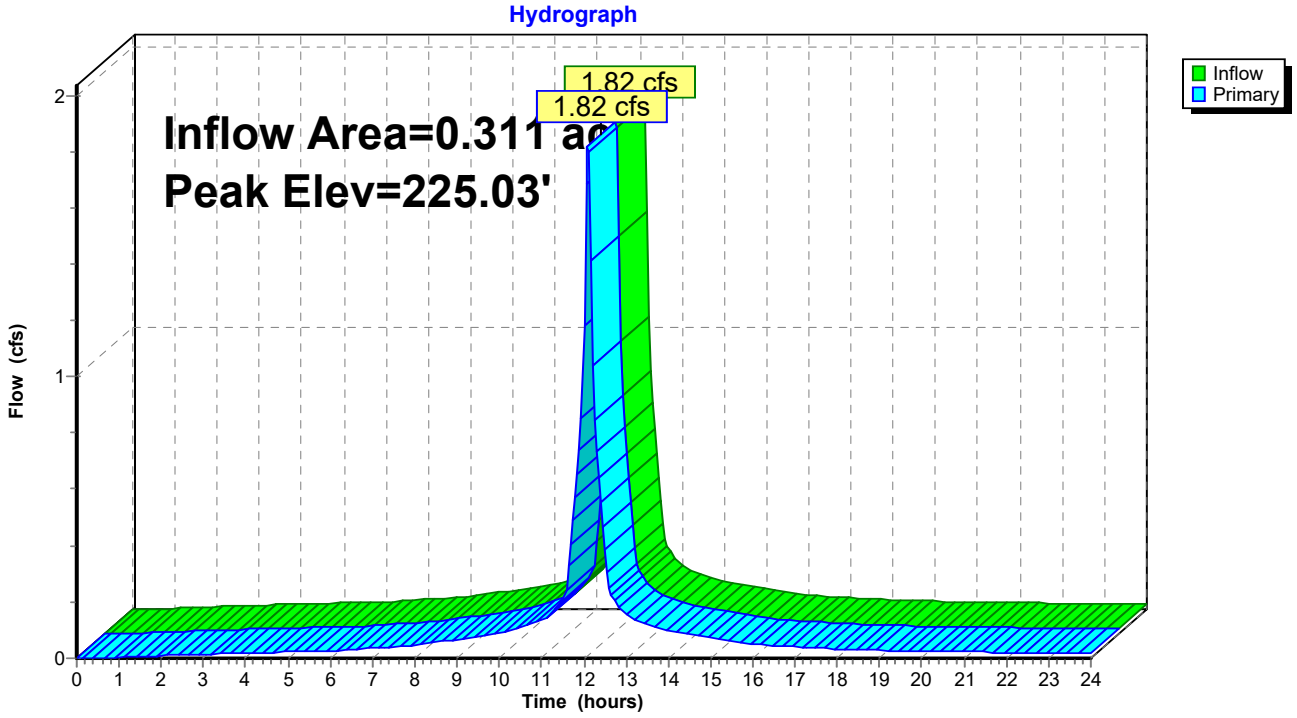
Inflow Area = 0.311 ac, 97.52% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.152 af
Outflow = 1.82 cfs @ 12.09 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.09 hrs, Volume= 0.152 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 225.03' @ 12.09 hrs
Flood Elev= 225.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.90'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.90' / 219.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	224.90'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.75 cfs @ 12.09 hrs HW=225.03' (Free Discharge)
└─**1=Culvert** (Passes 1.75 cfs of 17.80 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 1.75 cfs @ 1.16 fps)

Pond P34: 18" HDPE



Summary for Pond P35: 18" HDPE

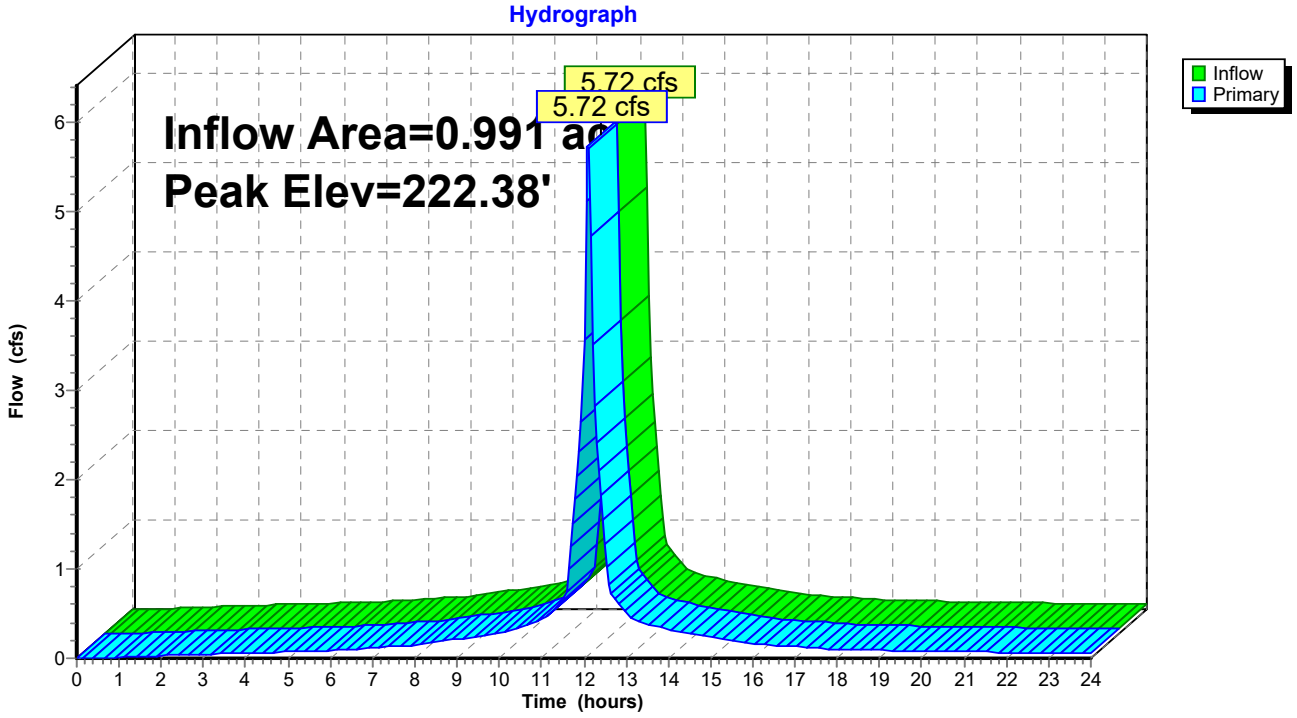
Inflow Area = 0.991 ac, 99.24% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 5.72 cfs @ 12.09 hrs, Volume= 0.485 af
Outflow = 5.72 cfs @ 12.09 hrs, Volume= 0.485 af, Atten= 0%, Lag= 0.0 min
Primary = 5.72 cfs @ 12.09 hrs, Volume= 0.485 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.38' @ 12.09 hrs
Flood Elev= 222.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 217.10' / 217.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	222.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.62 cfs @ 12.09 hrs HW=222.37' (Free Discharge)
└─**1=Culvert** (Passes 5.62 cfs of 18.10 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 5.62 cfs @ 1.71 fps)

Pond P35: 18" HDPE



Summary for Pond P36: 18" HDPE

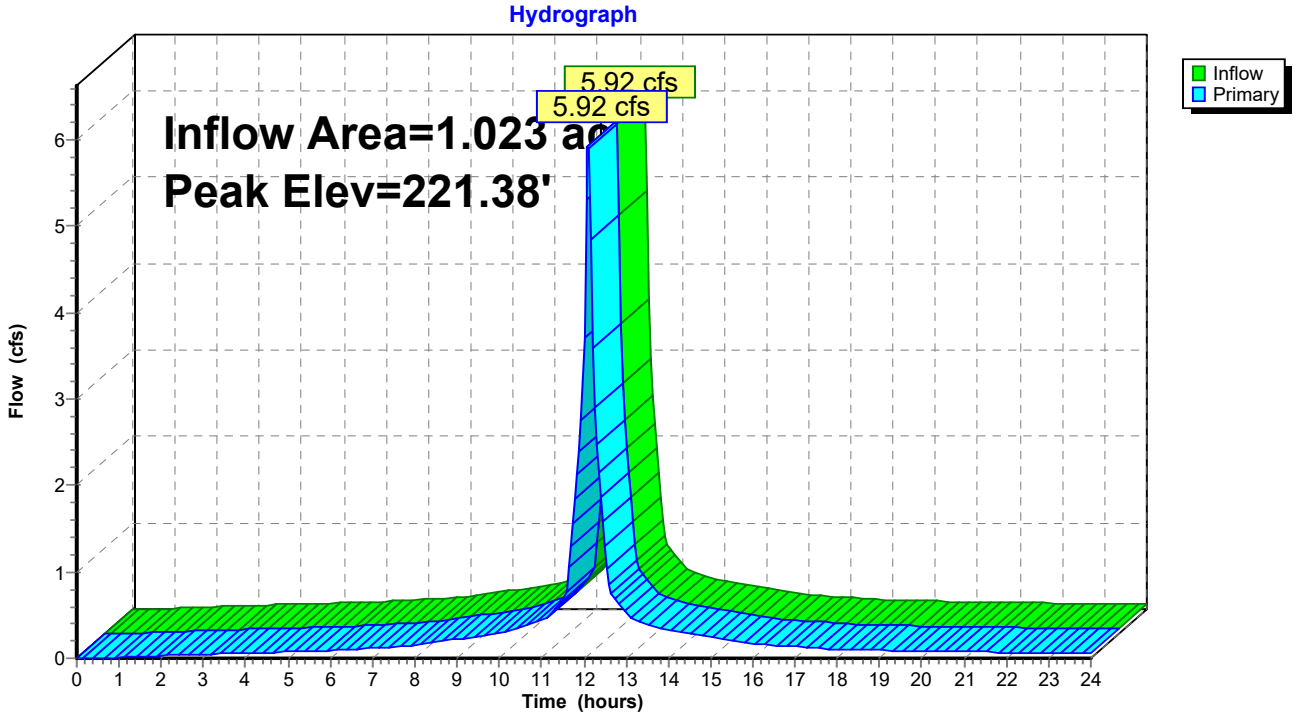
Inflow Area = 1.023 ac, 99.15% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 5.92 cfs @ 12.09 hrs, Volume= 0.500 af
Outflow = 5.92 cfs @ 12.09 hrs, Volume= 0.500 af, Atten= 0%, Lag= 0.0 min
Primary = 5.92 cfs @ 12.09 hrs, Volume= 0.500 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 221.38' @ 12.09 hrs
Flood Elev= 221.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	216.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.10' / 216.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	221.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.81 cfs @ 12.09 hrs HW=221.38' (Free Discharge)
└─**1=Culvert** (Passes 5.81 cfs of 18.11 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 5.81 cfs @ 1.73 fps)

Pond P36: 18" HDPE



Summary for Pond P37: 18" HDPE

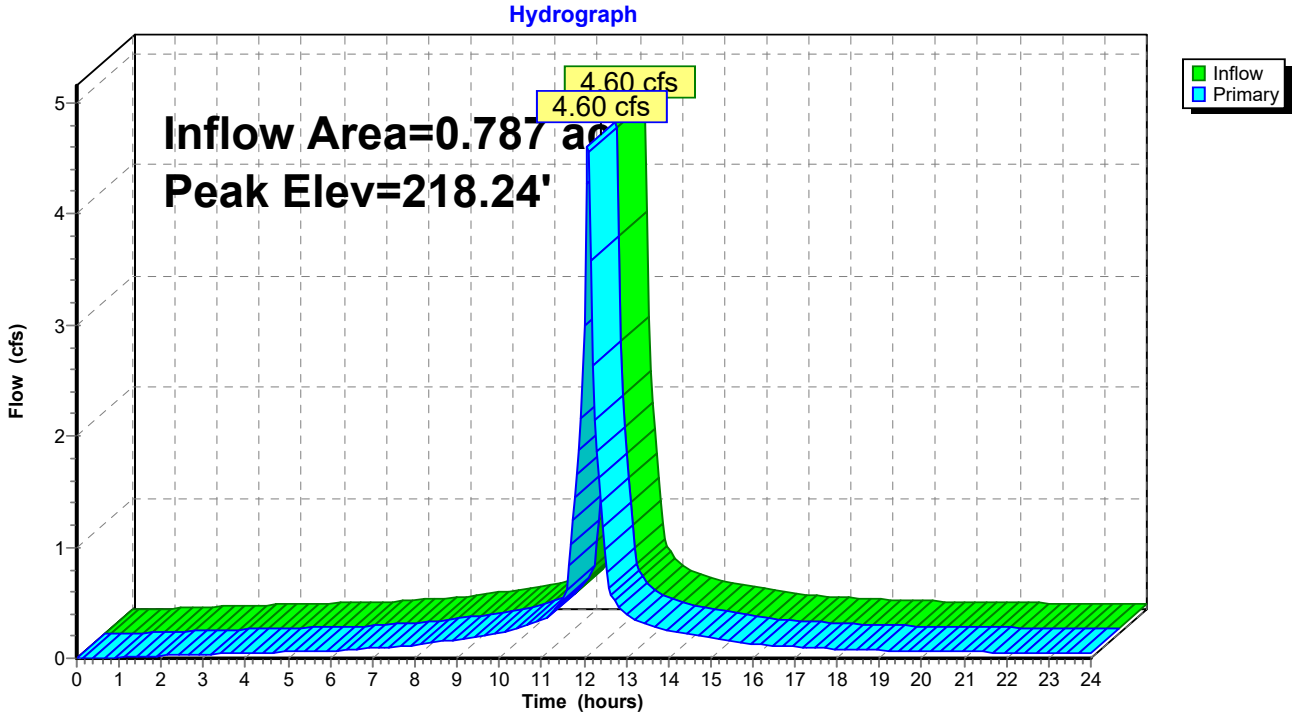
Inflow Area = 0.787 ac, 97.66% Impervious, Inflow Depth > 5.87" for 25-year 24hr event
Inflow = 4.60 cfs @ 12.09 hrs, Volume= 0.385 af
Outflow = 4.60 cfs @ 12.09 hrs, Volume= 0.385 af, Atten= 0%, Lag= 0.0 min
Primary = 4.60 cfs @ 12.09 hrs, Volume= 0.385 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 218.24' @ 12.09 hrs
Flood Elev= 218.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 212.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	218.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.46 cfs @ 12.09 hrs HW=218.23' (Free Discharge)
└**1=Culvert** (Passes 4.46 cfs of 18.02 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 4.46 cfs @ 1.58 fps)

Pond P37: 18" HDPE



Summary for Pond P38: 18" HDPE

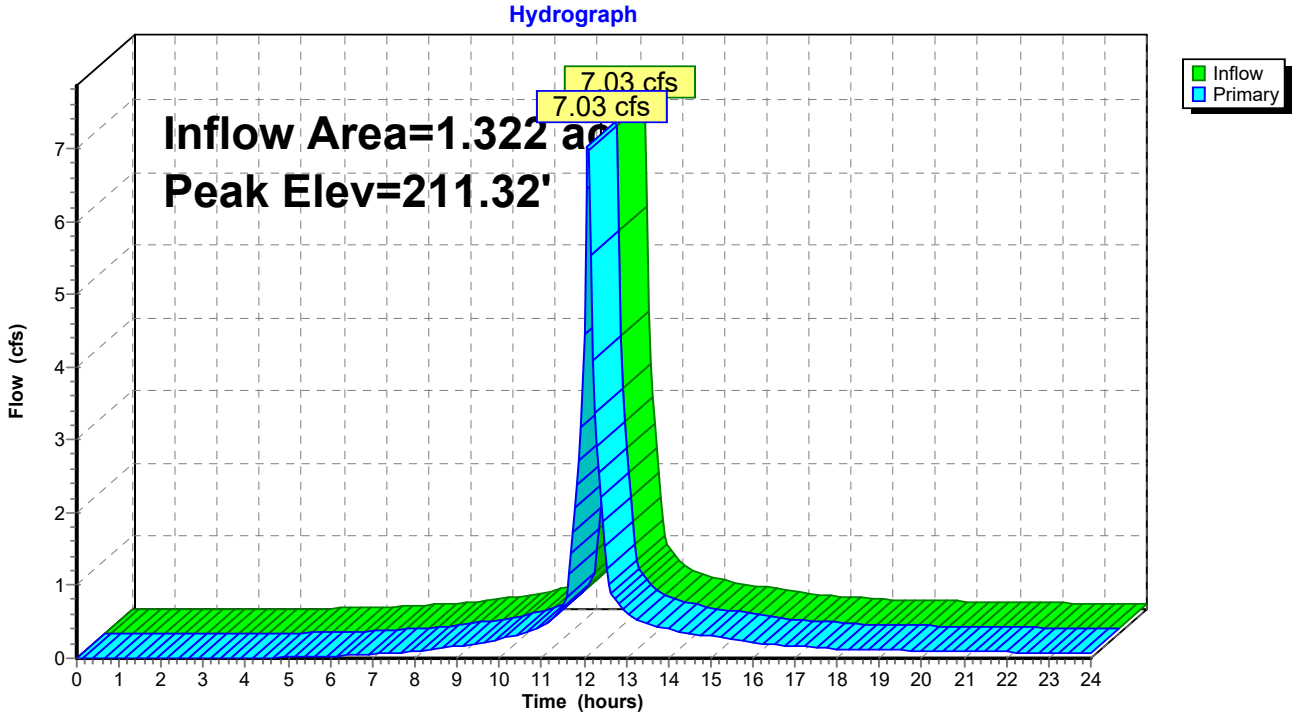
Inflow Area = 1.322 ac, 57.38% Impervious, Inflow Depth > 4.84" for 25-year 24hr event
Inflow = 7.03 cfs @ 12.09 hrs, Volume= 0.533 af
Outflow = 7.03 cfs @ 12.09 hrs, Volume= 0.533 af, Atten= 0%, Lag= 0.0 min
Primary = 7.03 cfs @ 12.09 hrs, Volume= 0.533 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 211.32' @ 12.09 hrs
Flood Elev= 211.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	207.80'	**18.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 207.80' / 207.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	211.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.85 cfs @ 12.09 hrs HW=211.31' (Free Discharge)
└**1=Culvert** (Passes 6.85 cfs of 13.82 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 6.85 cfs @ 1.83 fps)

Pond P38: 18" HDPE

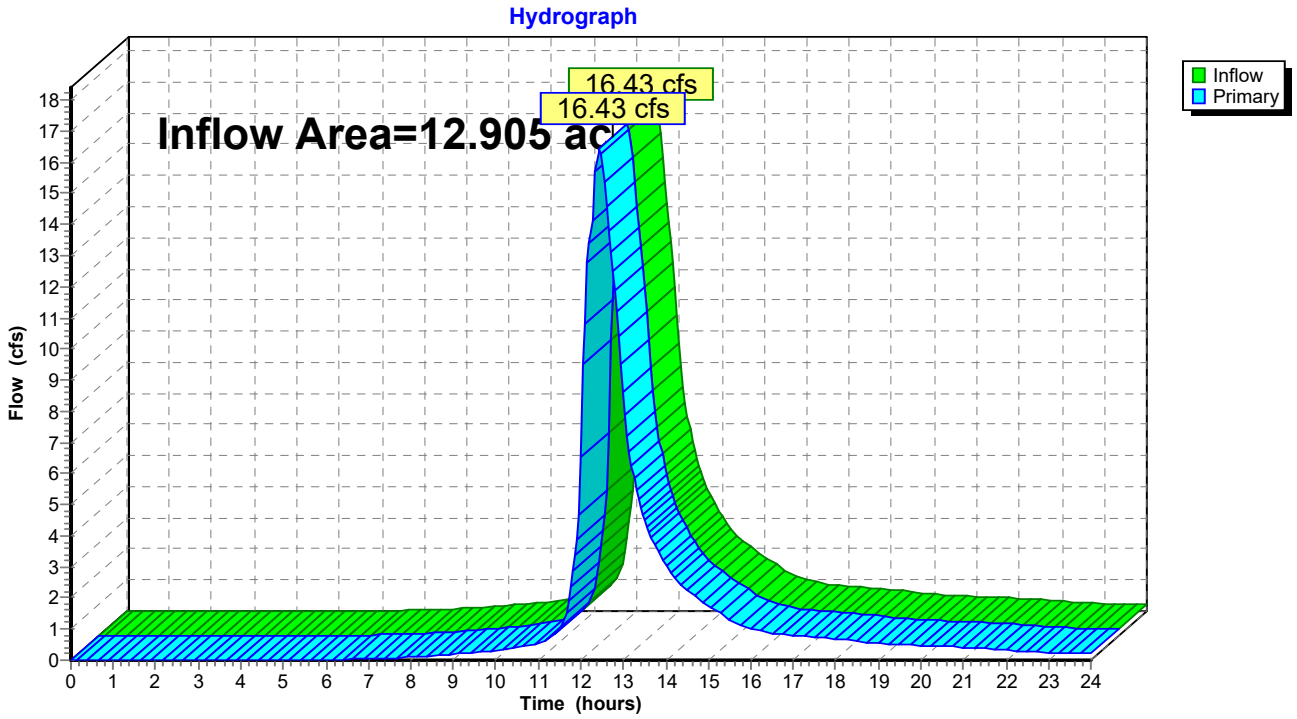


Summary for Link DP-A: Design Point A

Inflow Area = 12.905 ac, 72.18% Impervious, Inflow Depth > 2.16" for 25-year 24hr event
Inflow = 16.43 cfs @ 12.44 hrs, Volume= 2.327 af
Primary = 16.43 cfs @ 12.44 hrs, Volume= 2.327 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-A: Design Point A

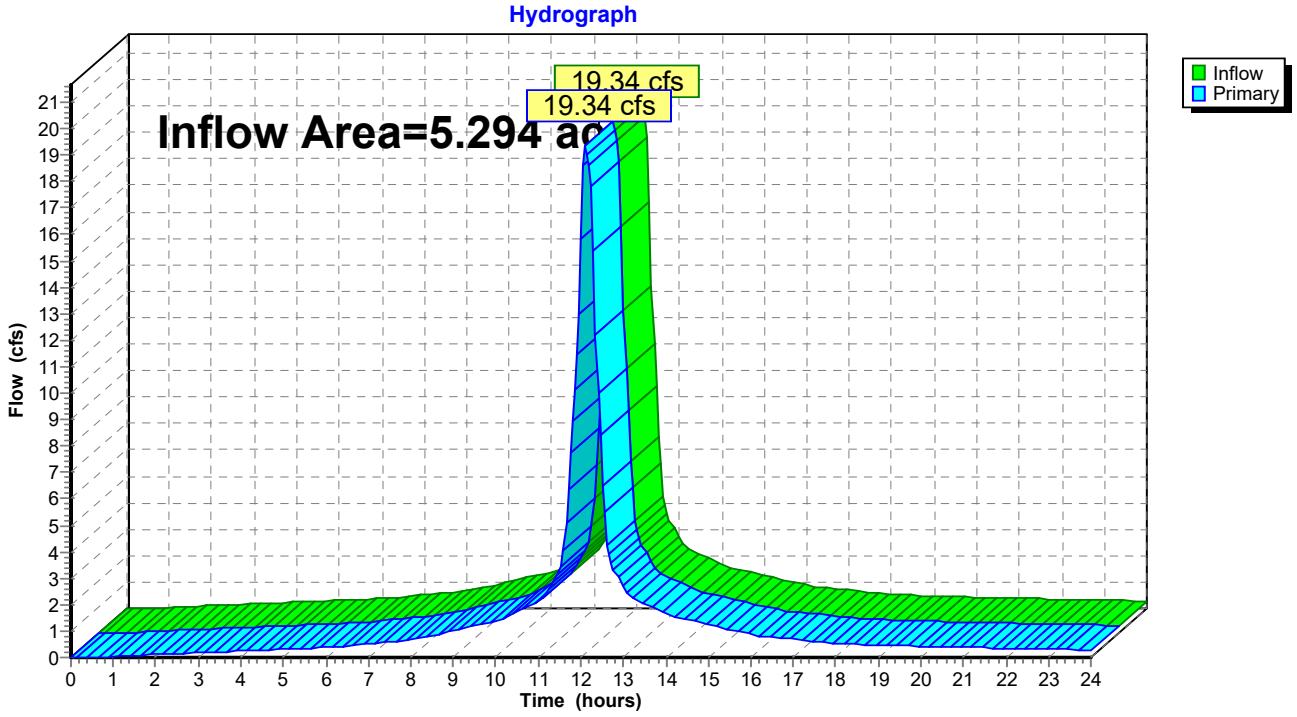


Summary for Link WQU-P5: Water Quality Unit

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 5.41" for 25-year 24hr event
Inflow = 19.34 cfs @ 12.11 hrs, Volume= 2.388 af
Primary = 19.34 cfs @ 12.11 hrs, Volume= 2.388 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P1a : Proposed Basin

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P5: Water Quality Unit

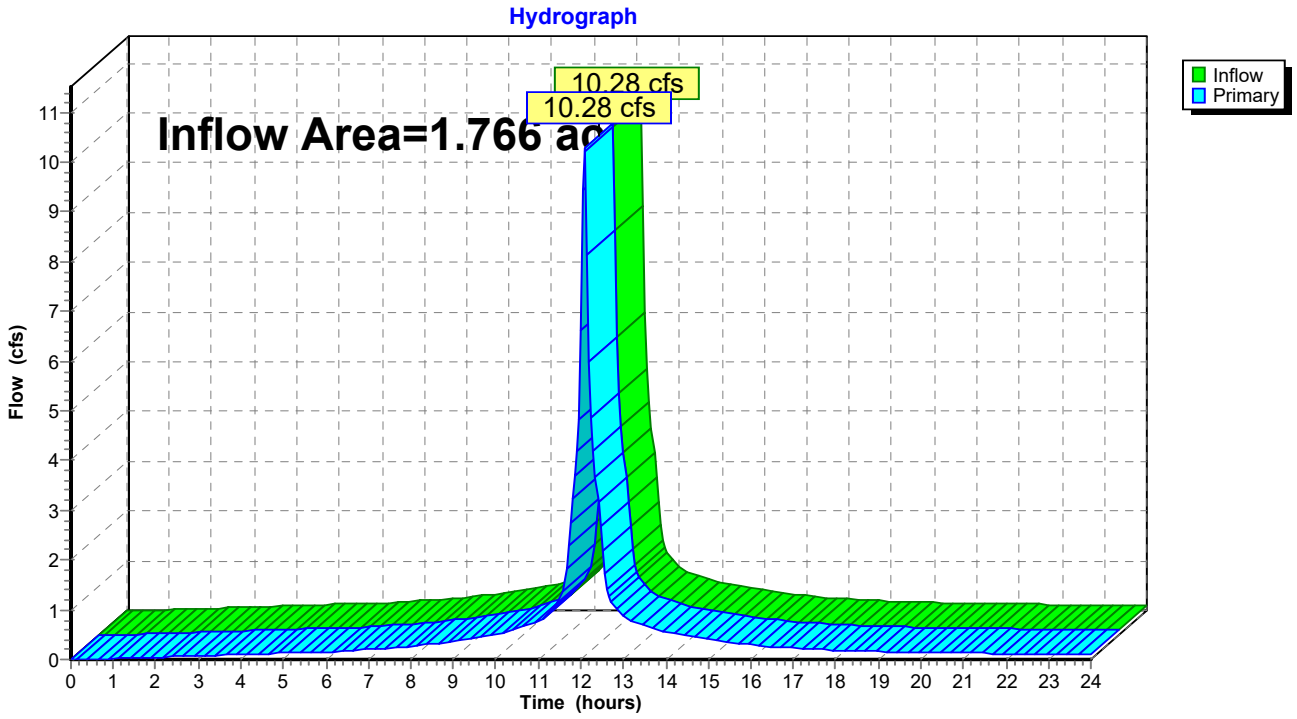


Summary for Link WQU-P6: Water Quality Unit

Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 5.85" for 25-year 24hr event
Inflow = 10.28 cfs @ 12.09 hrs, Volume= 0.861 af
Primary = 10.28 cfs @ 12.09 hrs, Volume= 0.861 af, Atten= 0%, Lag= 0.0 min
Routed to Pond CMB : Underground Storage Chambers

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P6: Water Quality Unit



Summary for Subcatchment P-A1:

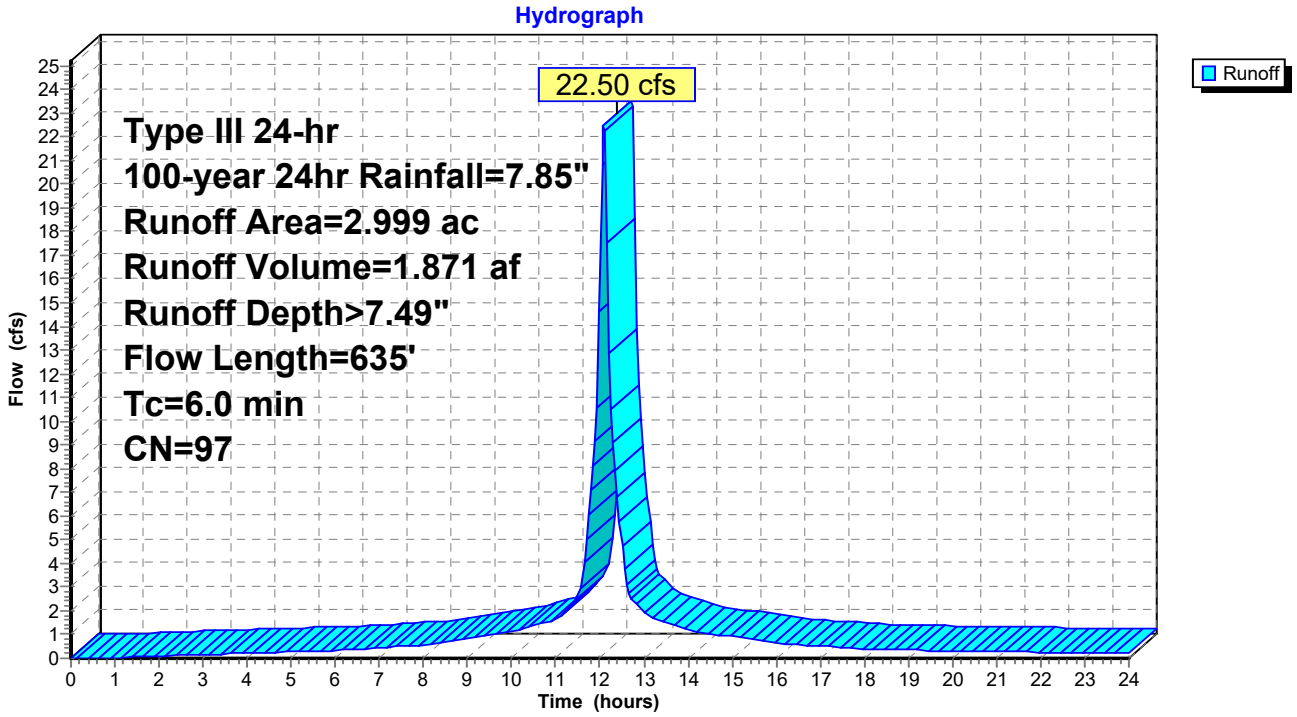
Runoff = 22.50 cfs @ 12.09 hrs, Volume= 1.871 af, Depth> 7.49"
Routed to Pond CMB : Underground Storage Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.003	98	PR Gravel Surface, Impervious, HSG C
0.007	98	PR Gravel Surface, Impervious, HSG C
0.043	98	PR Gravel Surface, Impervious, HSG C
1.360	98	EX Gravel Surface, Impervious, HSG C
0.933	98	Roofs, HSG C
0.050	98	Paved parking, HSG C
0.457	98	Paved parking, HSG C
0.069	74	>75% Grass cover, Good, HSG C
0.078	74	>75% Grass cover, Good, HSG C
2.999	97	Weighted Average
0.147		4.89% Pervious Area
2.852		95.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.19"
3.5	300	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	285	0.0060	4.60	8.14	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.7	635	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A1:



Summary for Subcatchment P-A2a:

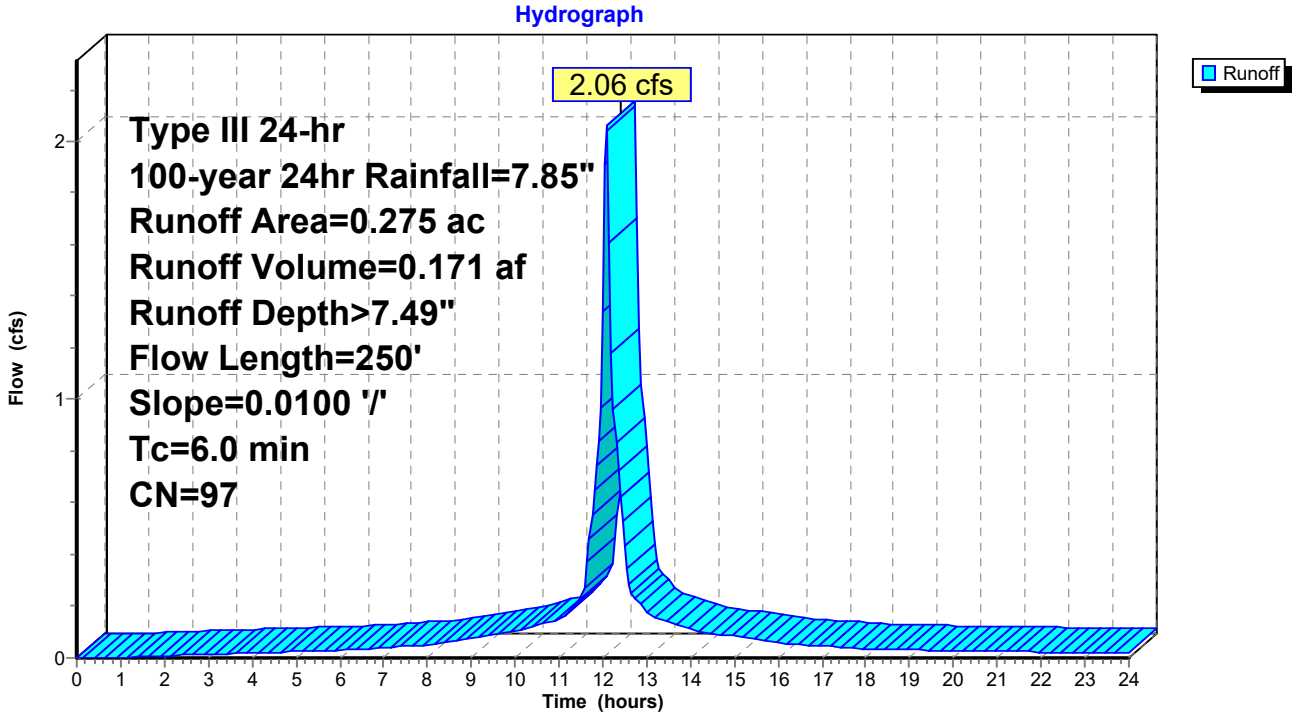
Runoff = 2.06 cfs @ 12.09 hrs, Volume= 0.171 af, Depth> 7.49"
Routed to Pond P30 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.238	98	PR Gravel Surface, Impervious, HSG C
0.016	98	EX Gravel Surface, Impervious, HSG C
0.009	96	Gravel surface, HSG C
0.275	97	Weighted Average
0.021		7.63% Pervious Area
0.254		92.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.1	200	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	250	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2a:



Summary for Subcatchment P-A2b:

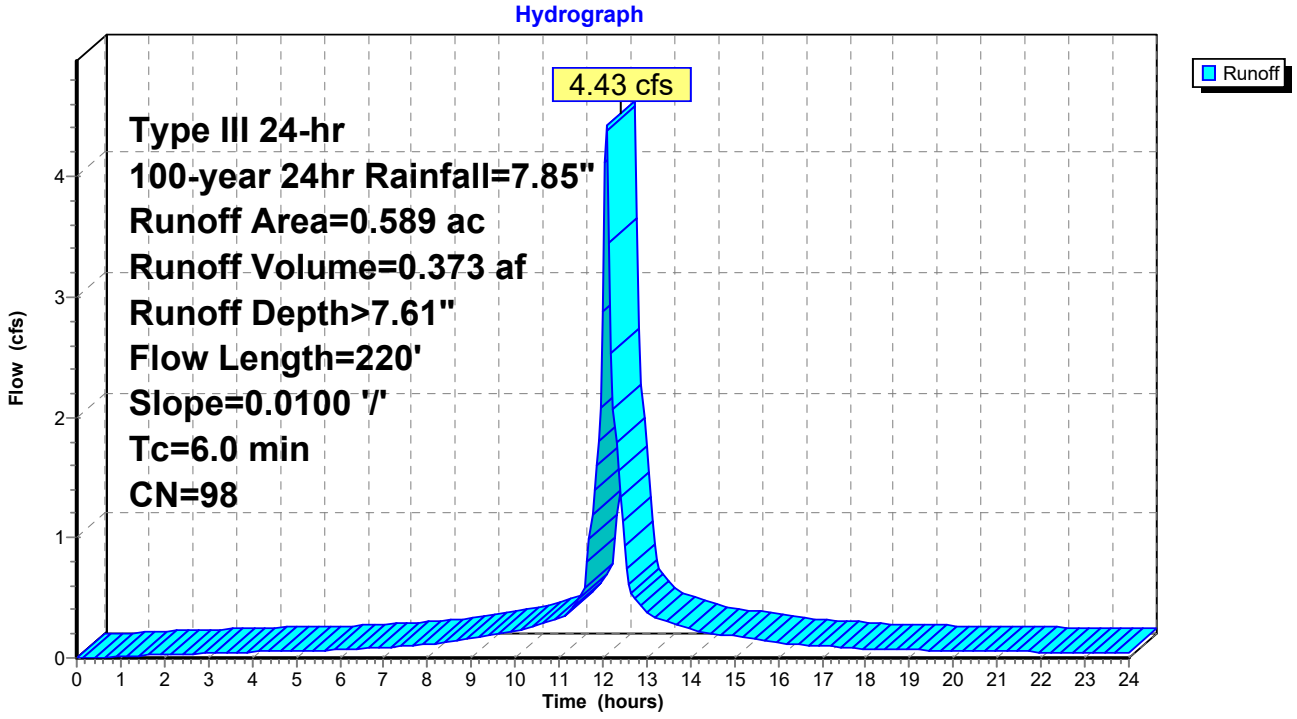
Runoff = 4.43 cfs @ 12.09 hrs, Volume= 0.373 af, Depth> 7.61"
Routed to Pond P31 : 12" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.005	74	>75% Grass cover, Good, HSG C
0.329	98	PR Gravel Surface, Impervious, HSG C
0.247	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.589	98	Weighted Average
0.012		2.08% Pervious Area
0.576		97.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.8	170	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.9	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A2b:



Summary for Subcatchment P-A2c:

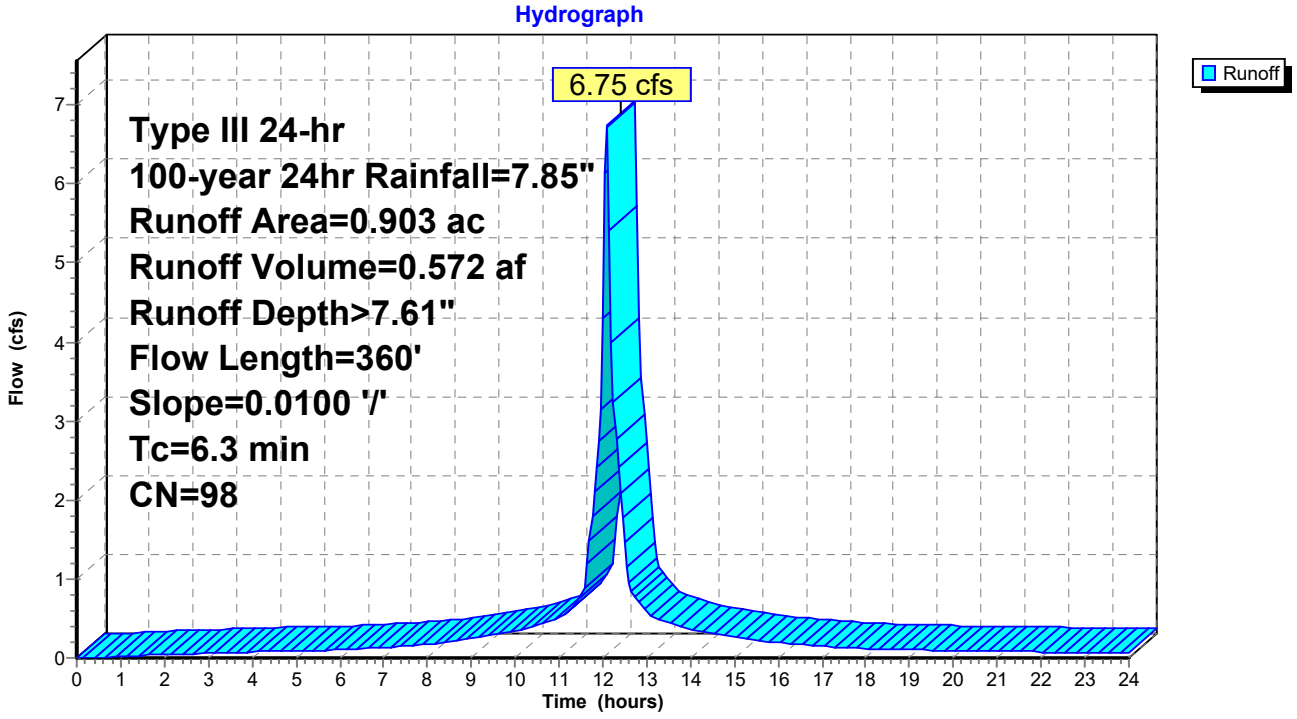
Runoff = 6.75 cfs @ 12.09 hrs, Volume= 0.572 af, Depth> 7.61"
Routed to Pond P32 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.008	74	>75% Grass cover, Good, HSG C
0.605	98	PR Gravel Surface, Impervious, HSG C
0.284	98	EX Gravel Surface, Impervious, HSG C
0.006	96	Gravel surface, HSG C
0.903	98	Weighted Average
0.014		1.55% Pervious Area
0.889		98.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A2c:



Summary for Subcatchment P-A3a:

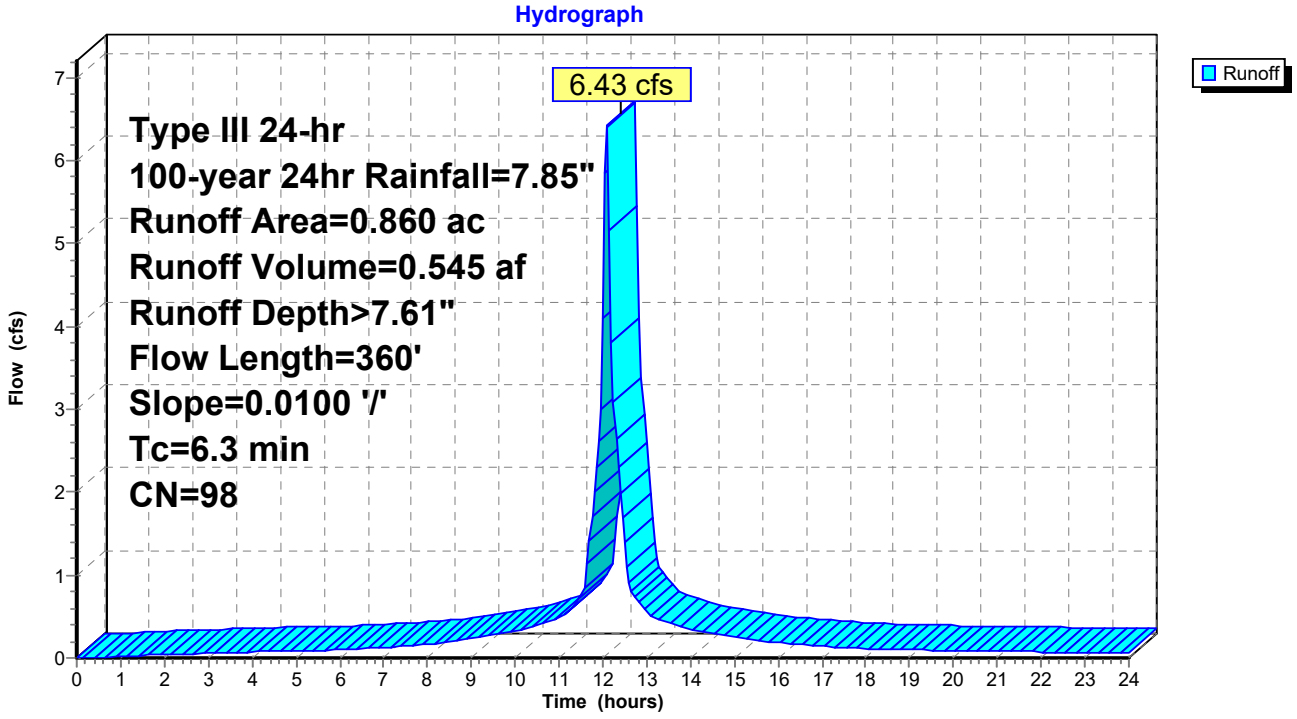
Runoff = 6.43 cfs @ 12.09 hrs, Volume= 0.545 af, Depth> 7.61"
Routed to Pond P33 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.000	74	>75% Grass cover, Good, HSG C
0.006	96	Gravel surface, HSG C
0.094	98	EX Gravel Surface, Impervious, HSG C
0.760	98	PR Gravel Surface, Impervious, HSG C
0.860	98	Weighted Average
0.006		0.72% Pervious Area
0.854		99.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
3.2	310	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.3	360	Total			

Subcatchment P-A3a:



Summary for Subcatchment P-A3b:

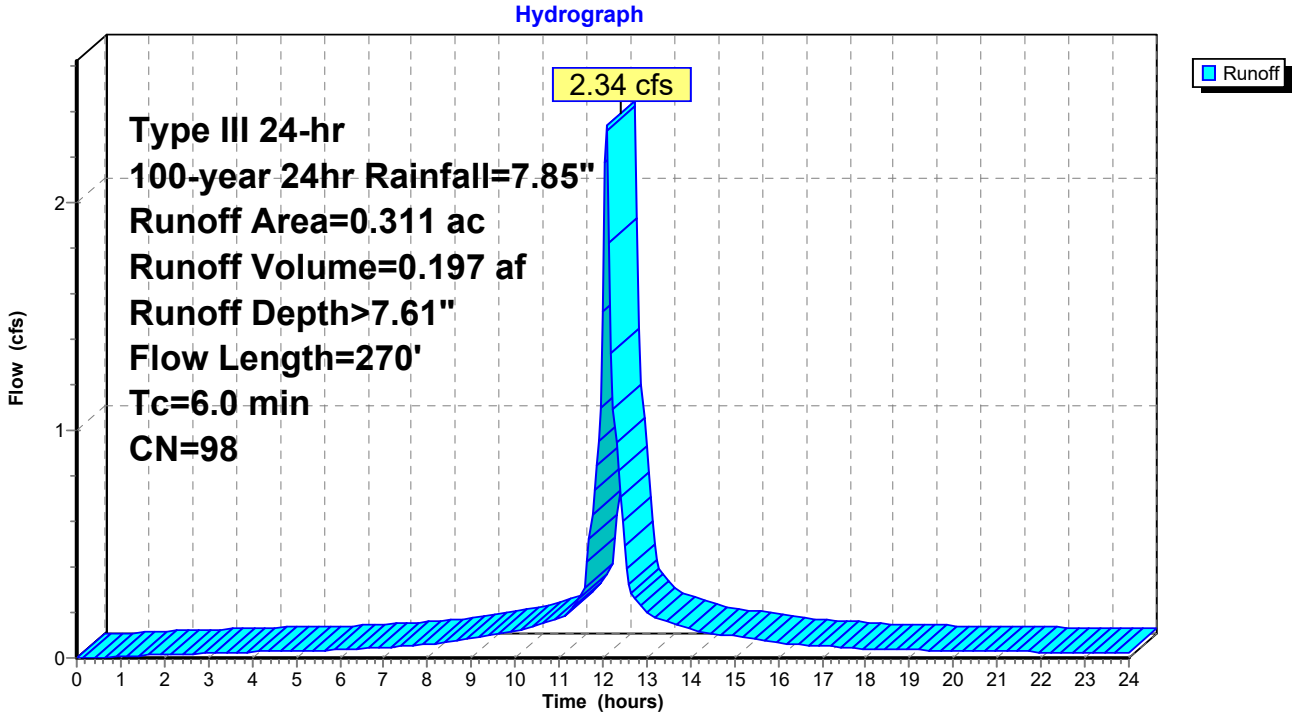
Runoff = 2.34 cfs @ 12.09 hrs, Volume= 0.197 af, Depth> 7.61"
Routed to Pond P34 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.303	98	PR Gravel Surface, Impervious, HSG C
0.008	96	Gravel surface, HSG C
0.311	98	Weighted Average
0.008		2.48% Pervious Area
0.303		97.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	130	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	270	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3b:



Summary for Subcatchment P-A3c:

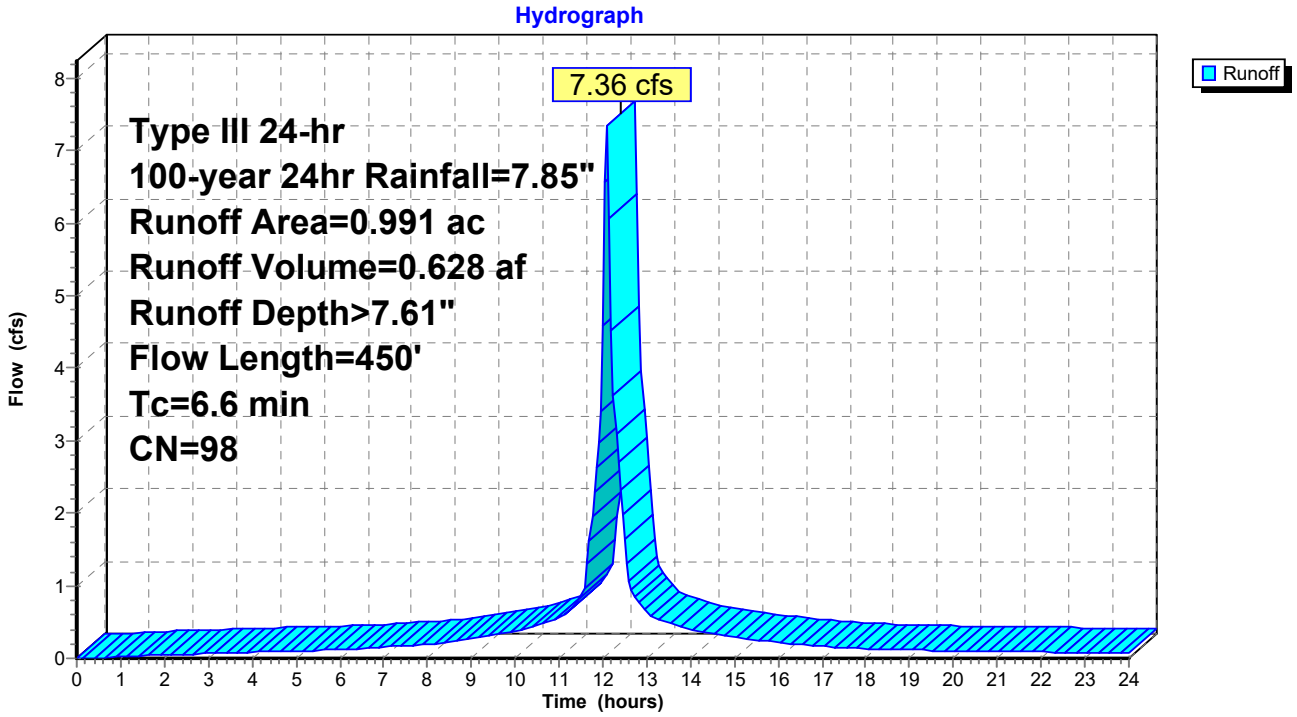
Runoff = 7.36 cfs @ 12.09 hrs, Volume= 0.628 af, Depth> 7.61"
Routed to Pond P35 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.983	98	PR Gravel Surface, Impervious, HSG C
0.001	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG C
0.991	98	Weighted Average
0.007		0.76% Pervious Area
0.983		99.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
2.4	230	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	100	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	70	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	450	Total			

Subcatchment P-A3c:



Summary for Subcatchment P-A3d:

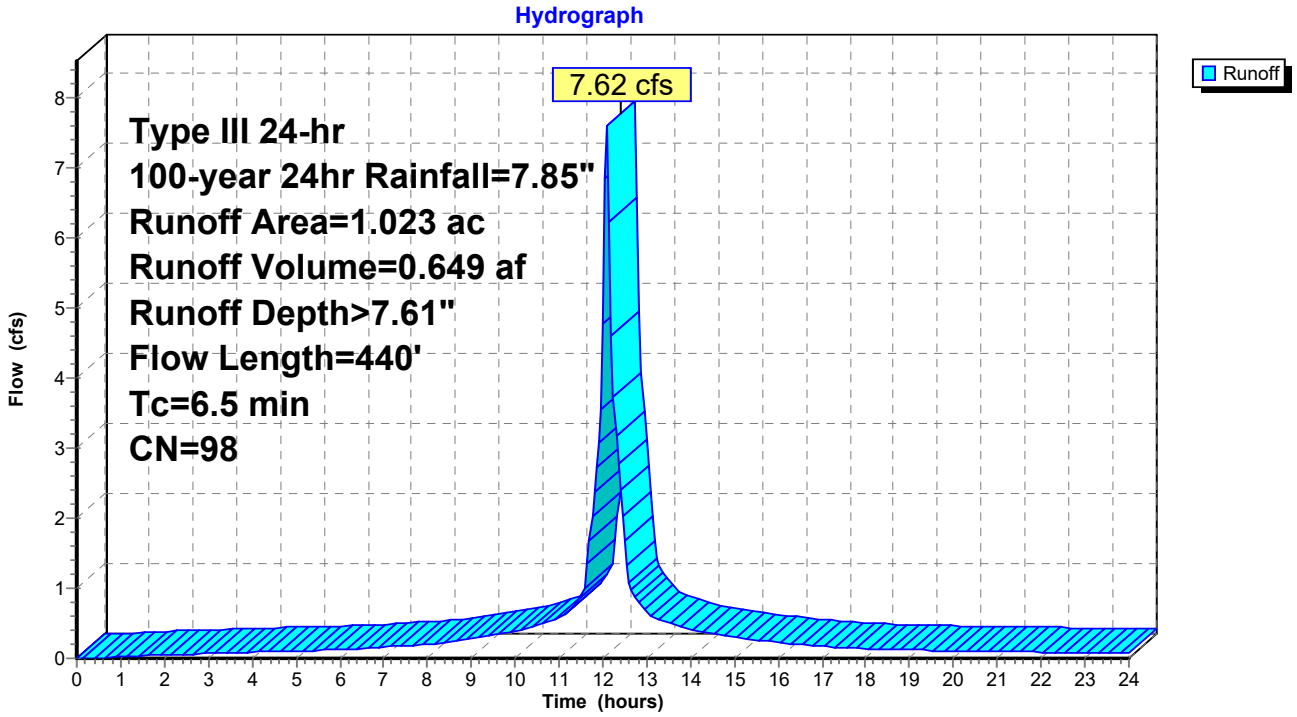
Runoff = 7.62 cfs @ 12.09 hrs, Volume= 0.649 af, Depth> 7.61"
Routed to Pond P36 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.918	98	PR Gravel Surface, Impervious, HSG C
0.018	98	EX Gravel Surface, Impervious, HSG C
0.004	96	Gravel surface, HSG C
0.004	96	Gravel surface, HSG D
0.079	98	PR Gravel Surface, Impervious, HSG D
1.023	98	Weighted Average
0.009		0.85% Pervious Area
1.015		99.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	120	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	160	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	440	Total			

Subcatchment P-A3d:



Summary for Subcatchment P-A3e:

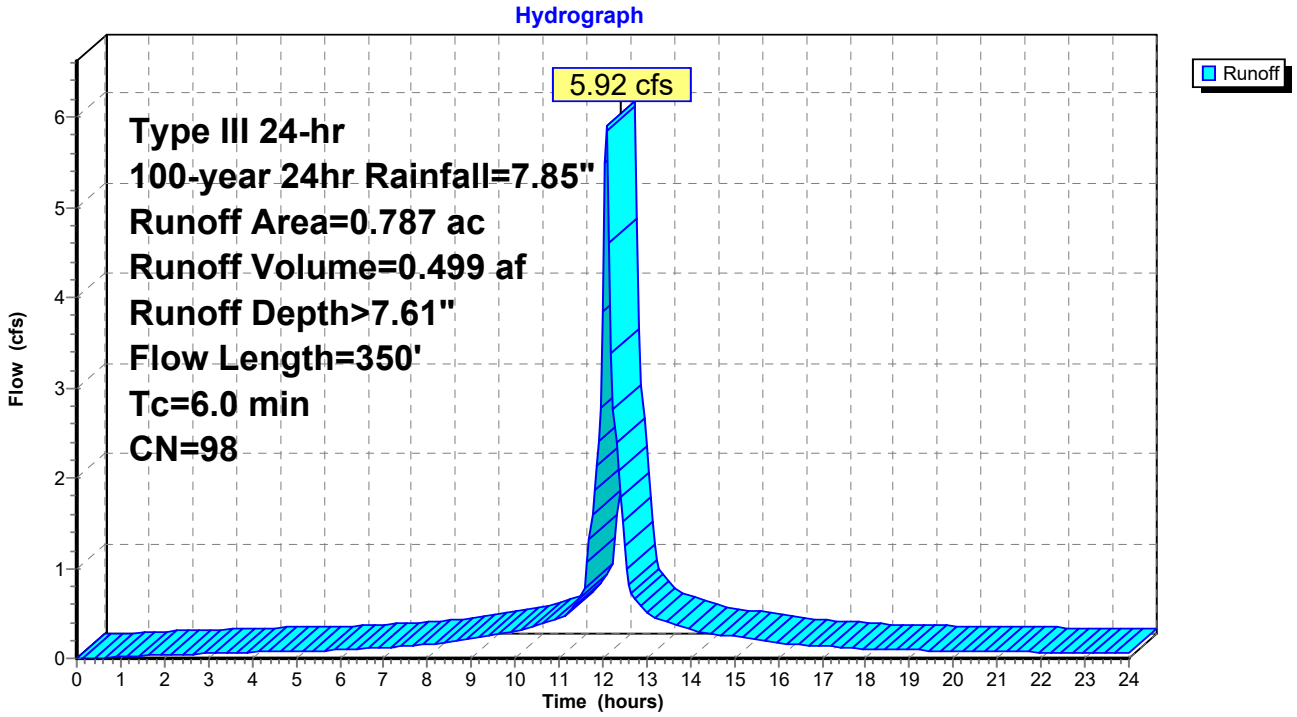
Runoff = 5.92 cfs @ 12.09 hrs, Volume= 0.499 af, Depth> 7.61"
Routed to Pond P37 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.012	74	>75% Grass cover, Good, HSG C
0.669	98	PR Gravel Surface, Impervious, HSG C
0.031	98	EX Gravel Surface, Impervious, HSG C
0.007	96	Gravel surface, HSG D
0.068	98	PR Gravel Surface, Impervious, HSG D
0.787	98	Weighted Average
0.018		2.34% Pervious Area
0.768		97.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0100	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
0.7	160	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	140	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.8	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A3e:



Summary for Subcatchment P-A4: Subcat P-A4

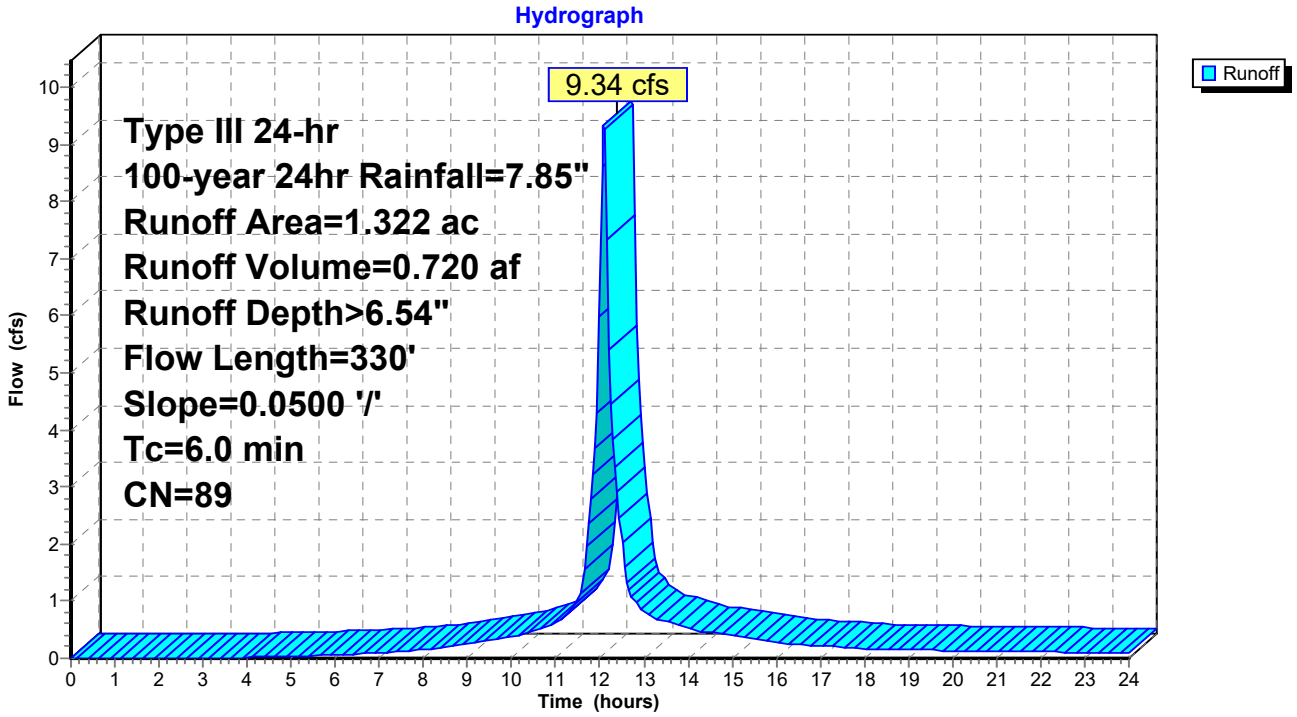
Runoff = 9.34 cfs @ 12.09 hrs, Volume= 0.720 af, Depth> 6.54"
Routed to Pond P38 : 18" HDPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.523	98	PR Gravel Surface, Impervious, HSG C
0.123	98	EX Gravel Surface, Impervious, HSG C
0.403	74	>75% Grass cover, Good, HSG C
0.001	74	>75% Grass cover, Good, HSG C
0.084	80	>75% Grass cover, Good, HSG D
0.071	80	>75% Grass cover, Good, HSG D
0.005	96	Gravel surface, HSG D
0.112	98	PR Gravel Surface, Impervious, HSG D
1.322	89	Weighted Average
0.564		42.62% Pervious Area
0.759		57.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.0500	0.51		**Sheet Flow,** Fallow n= 0.050 P2= 3.19"
1.3	280	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	330	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A4: Subcat P-A4



Summary for Subcatchment P-A5:

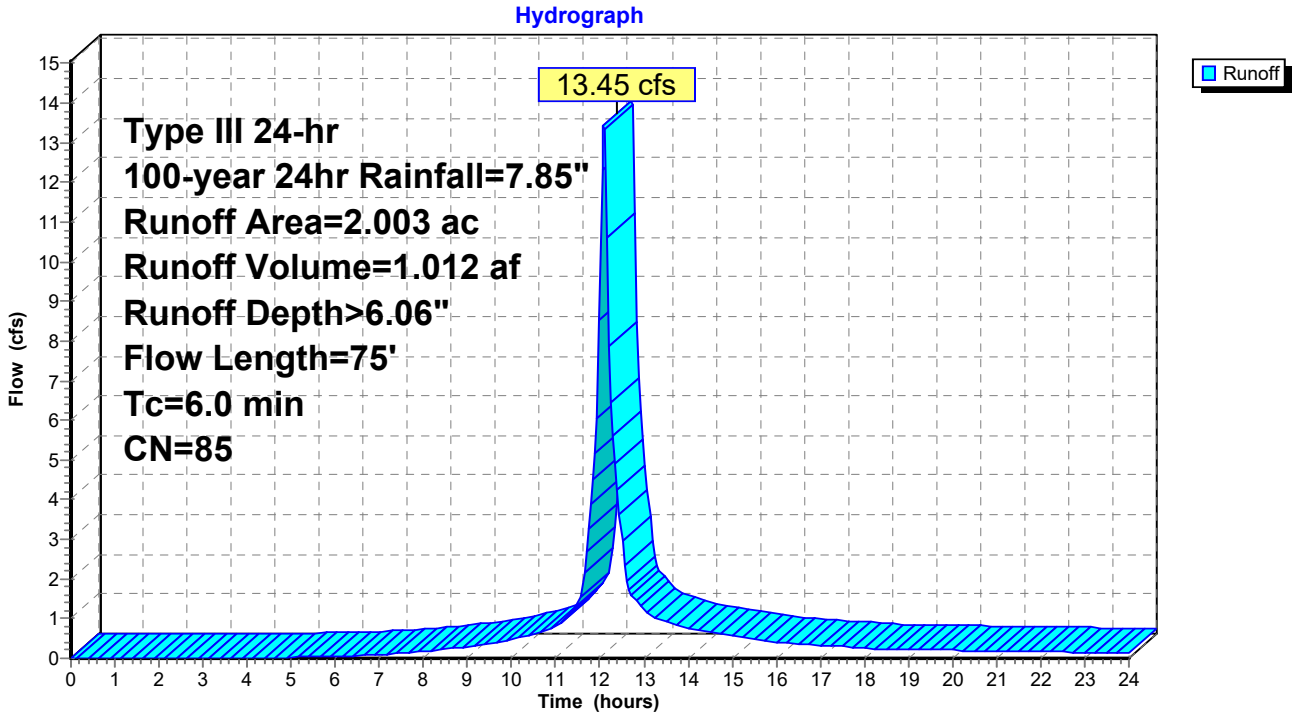
Runoff = 13.45 cfs @ 12.09 hrs, Volume= 1.012 af, Depth> 6.06"
Routed to Link DP-A : Design Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.011	98	EX Gravel Surface, Impervious, HSG C
0.211	96	Gravel surface, HSG D
0.000	96	Gravel surface, HSG D
0.763	96	Gravel surface, HSG C
0.001	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.000	77	Woods, Good, HSG D
0.071	77	Woods, Good, HSG D
0.002	77	Woods, Good, HSG D
0.001	77	Woods, Good, HSG D
0.009	77	Woods, Good, HSG D
0.341	70	Woods, Good, HSG C
0.018	74	>75% Grass cover, Good, HSG C
0.324	80	>75% Grass cover, Good, HSG D
0.002	80	>75% Grass cover, Good, HSG D
0.001	80	>75% Grass cover, Good, HSG D
0.014	80	>75% Grass cover, Good, HSG D
0.016	80	>75% Grass cover, Good, HSG D
0.214	74	>75% Grass cover, Good, HSG C
0.002	80	>75% Grass cover, Good, HSG D
2.003	85	Weighted Average
1.991		99.44% Pervious Area
0.011		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	35	0.5000	0.56		**Sheet Flow,** Range n= 0.130 P2= 3.19"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-A5:



Summary for Subcatchment P-A6: Subcat P-A6

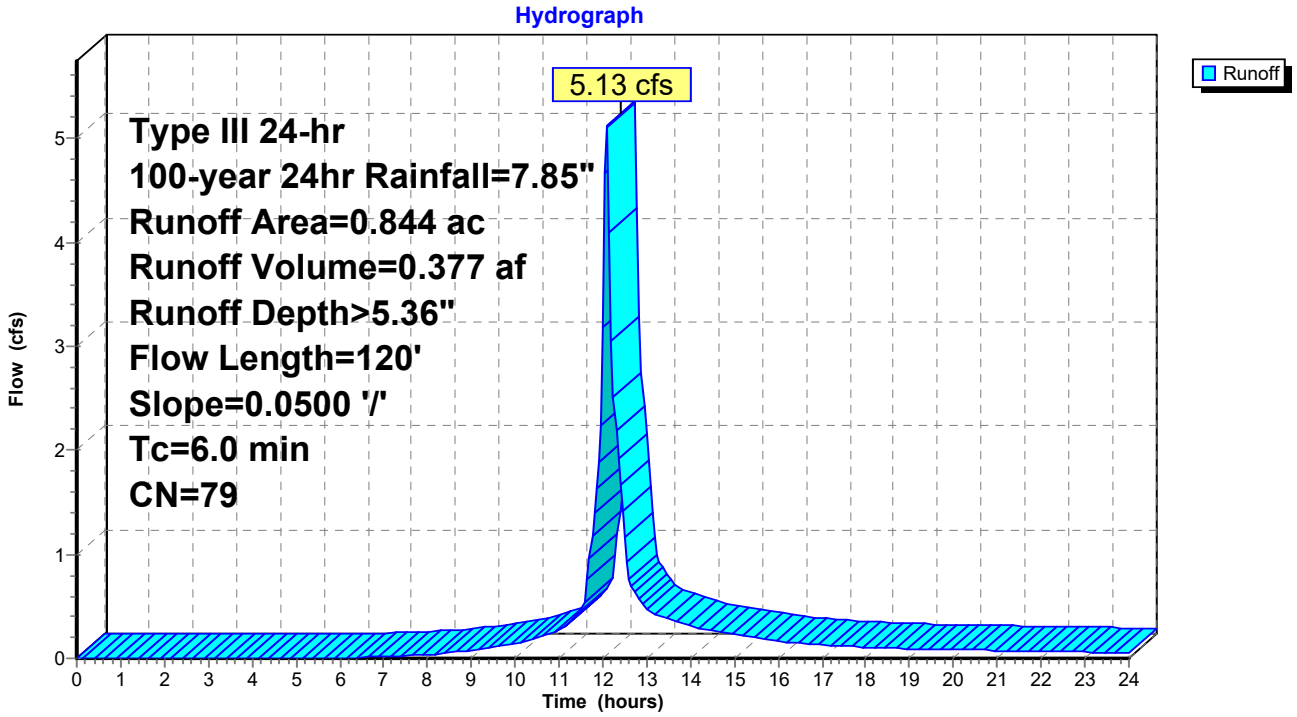
Runoff = 5.13 cfs @ 12.09 hrs, Volume= 0.377 af, Depth> 5.36"
Routed to Pond P1a : Proposed Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year 24hr Rainfall=7.85"

Area (ac)	CN	Description
0.000	98	PR Gravel Surface, Impervious, HSG C
0.050	98	EX Gravel Surface, Impervious, HSG C
0.127	74	>75% Grass cover, Good, HSG C
0.140	74	>75% Grass cover, Good, HSG C
0.425	80	>75% Grass cover, Good, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.000	98	PR Gravel Surface, Impervious, HSG D
0.844	79	Weighted Average
0.793		93.99% Pervious Area
0.051		6.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.19"
0.3	70	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	120	Total			

Subcatchment P-A6: Subcat P-A6



Summary for Pond CMB: Underground Storage Chambers

Inflow Area = 4.765 ac, 95.93% Impervious, Inflow Depth > 7.52" for 100-year 24hr event
Inflow = 35.73 cfs @ 12.09 hrs, Volume= 2.988 af
Outflow = 14.85 cfs @ 12.30 hrs, Volume= 2.389 af, Atten= 58%, Lag= 12.6 min
Discarded = 0.92 cfs @ 8.20 hrs, Volume= 1.453 af
Primary = 13.93 cfs @ 12.30 hrs, Volume= 0.935 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 223.54' @ 12.30 hrs Surf.Area= 16,464 sf Storage= 47,815 cf
Flood Elev= 224.00' Surf.Area= 16,464 sf Storage= 54,255 cf

Plug-Flow detention time= 159.5 min calculated for 2.384 af (80% of inflow)
Center-of-Mass det. time= 83.2 min (828.3 - 745.2)

Volume	Invert	Avail.Storage	Storage Description
#1B	219.75'	6,779 cf	**196.00'W x 84.00'L x 4.92'H Field A** 80,948 cf Overall - 64,000 cf Embedded = 16,948 cf x 40.0% Voids
#2B	220.50'	47,770 cf	**retain_it upright 3.5'** x 240 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 24 Rows adjusted for 417.5 cf perimeter wall
		54,549 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	219.75'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	220.40'	**24.0" Round Culvert** L= 370.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 220.40' / 210.00' S= 0.0281 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	222.75'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.92 cfs @ 8.20 hrs HW=219.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=13.92 cfs @ 12.30 hrs HW=223.54' (Free Discharge)
└**2=Culvert** (Passes 13.92 cfs of 17.48 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 13.92 cfs @ 2.93 fps)

Pond CMB: Underground Storage Chambers - Chamber Wizard Field A

Chamber Model = retain_it upright 3.5' (retain-it® upright)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
24 Rows adjusted for 417.5 cf perimeter wall

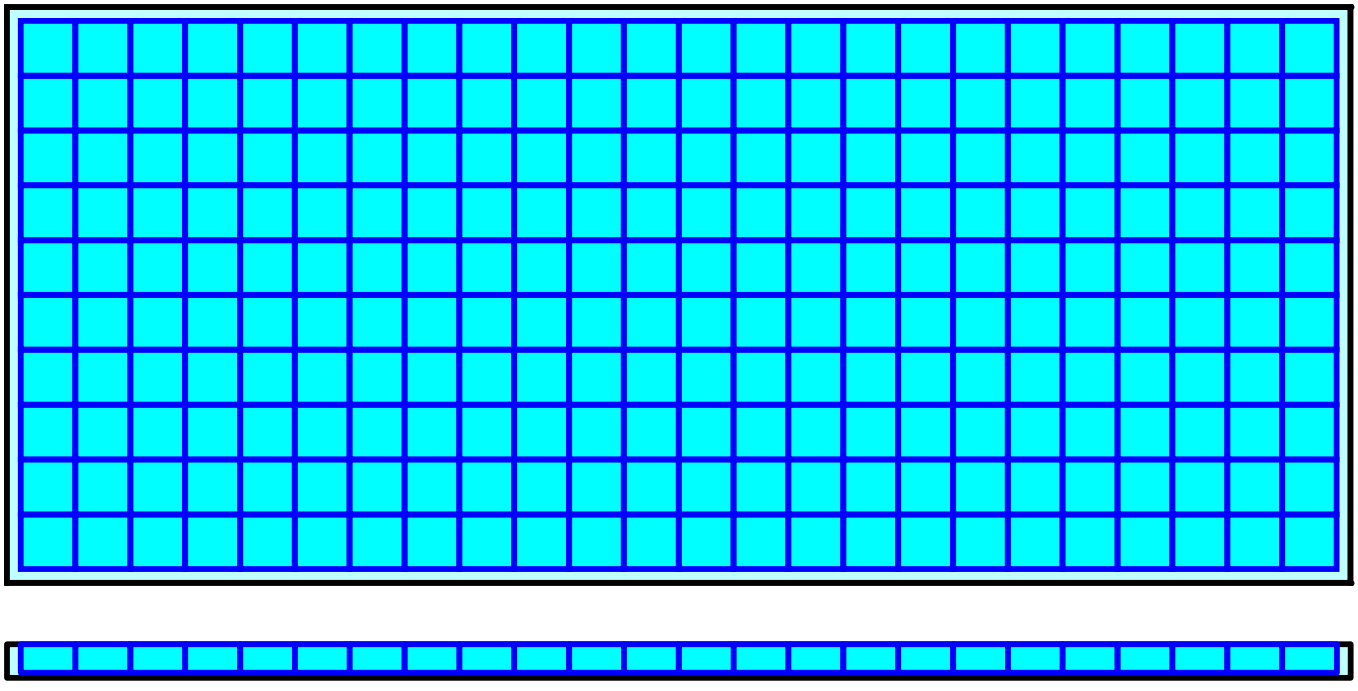
10 Chambers/Row x 8.00' Long = 80.00' Row Length +24.0" End Stone x 2 = 84.00' Base Length
24 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 196.00' Base Width
9.0" Stone Base + 50.0" Chamber Height = 4.92' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 24 x 2 = 417.5 cf Perimeter Wall
240 Chambers x 200.8 cf - 417.5 cf Perimeter wall = 47,769.8 cf Chamber Storage
240 Chambers x 266.7 cf = 64,000.0 cf Displacement

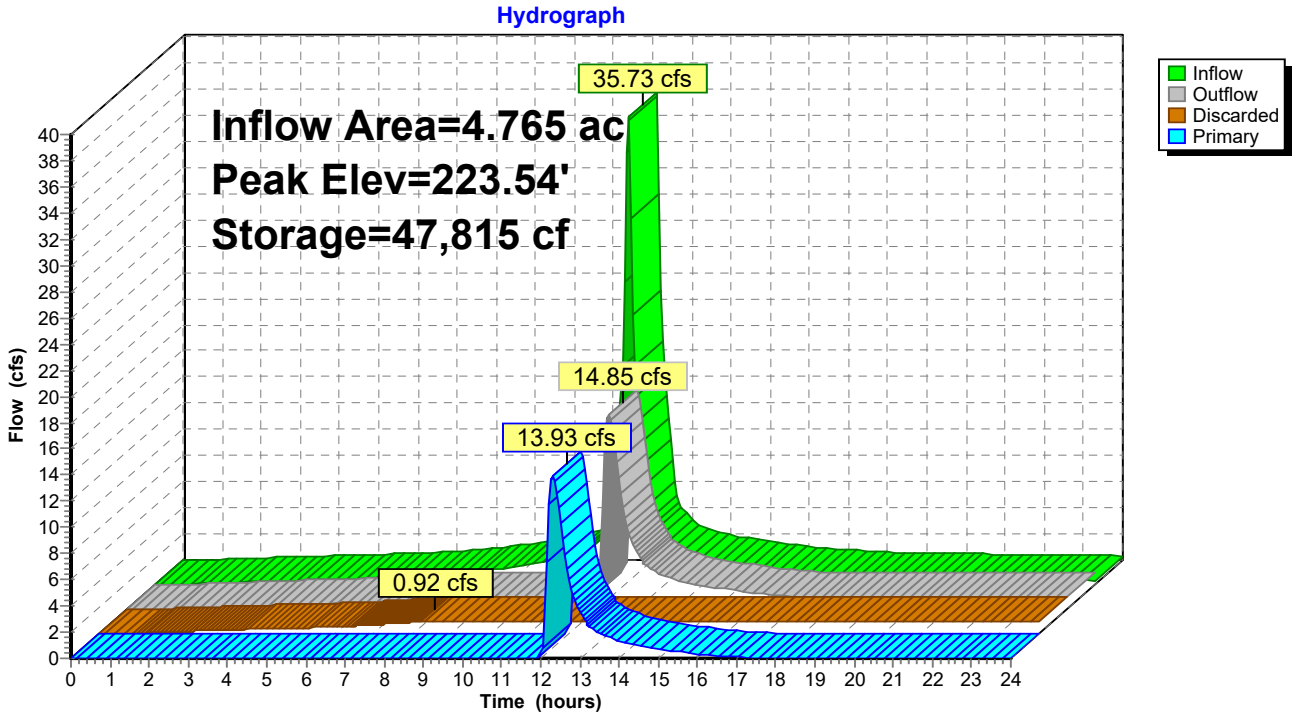
80,948.0 cf Field - 64,000.0 cf Chambers = 16,948.0 cf Stone x 40.0% Voids = 6,779.2 cf Stone Storage

Chamber Storage + Stone Storage = 54,549.0 cf = 1.252 af
Overall Storage Efficiency = 67.4%
Overall System Size = 84.00' x 196.00' x 4.92'

240 Chambers
2,998.1 cy Field
627.7 cy Stone



Pond CMB: Underground Storage Chambers



Summary for Pond D27: DMH - 24"

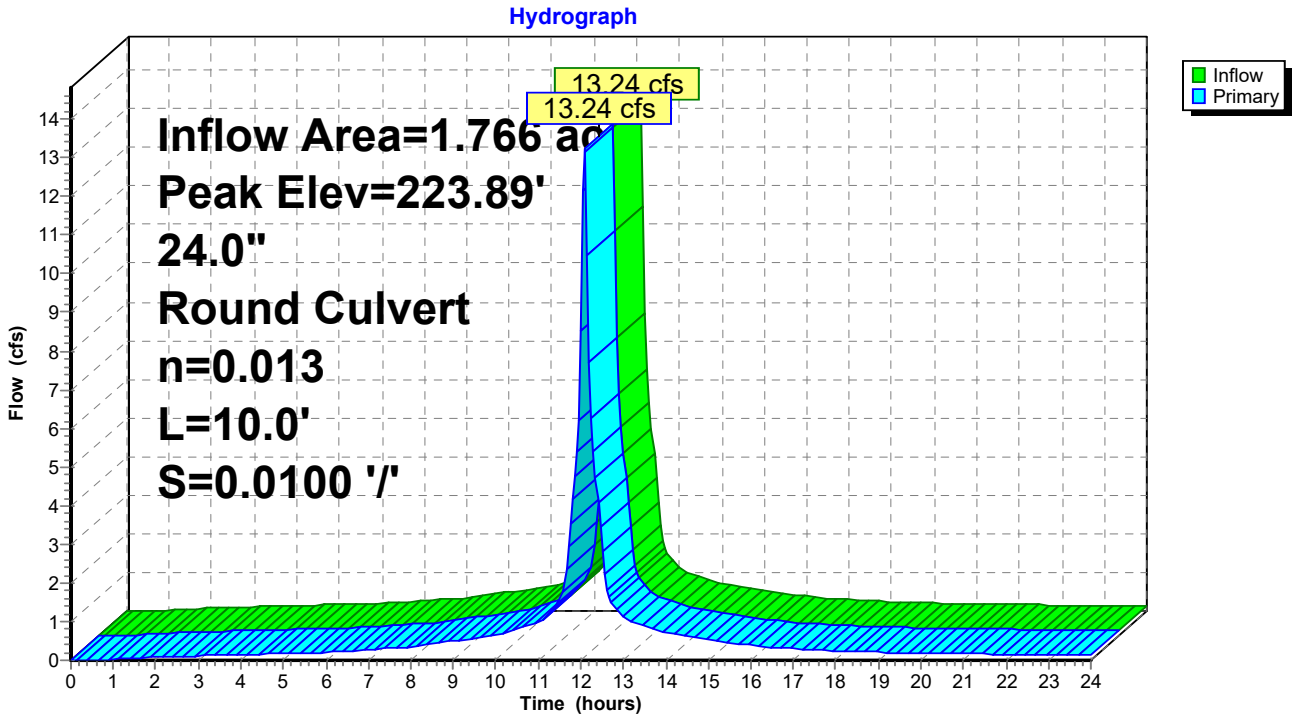
Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 7.59" for 100-year 24hr event
Inflow = 13.24 cfs @ 12.09 hrs, Volume= 1.117 af
Outflow = 13.24 cfs @ 12.09 hrs, Volume= 1.117 af, Atten= 0%, Lag= 0.0 min
Primary = 13.24 cfs @ 12.09 hrs, Volume= 1.117 af
Routed to Link WQU-P6 : Water Quality Unit

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 223.89' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	221.80'	**24.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 221.80' / 221.70' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.91 cfs @ 12.09 hrs HW=223.85' (Free Discharge)
1=Culvert (Barrel Controls 12.91 cfs @ 4.97 fps)

Pond D27: DMH - 24"



Summary for Pond D30: DMH - 24"

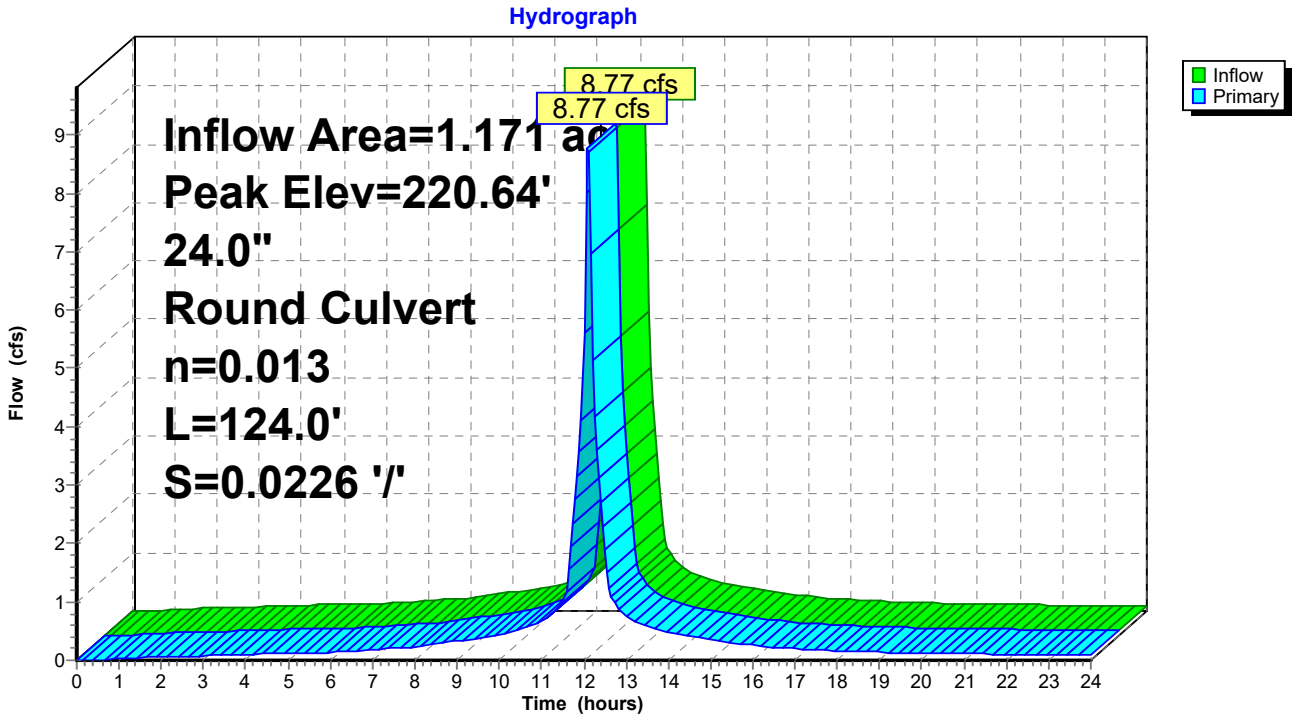
Inflow Area = 1.171 ac, 98.81% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 8.77 cfs @ 12.09 hrs, Volume= 0.742 af
Outflow = 8.77 cfs @ 12.09 hrs, Volume= 0.742 af, Atten= 0%, Lag= 0.0 min
Primary = 8.77 cfs @ 12.09 hrs, Volume= 0.742 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 220.64' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	219.30'	**24.0" Round Culvert** L= 124.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.30' / 216.50' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.56 cfs @ 12.09 hrs HW=220.62' (Free Discharge)
1=Culvert (Inlet Controls 8.56 cfs @ 3.91 fps)

Pond D30: DMH - 24"



Summary for Pond D31: DMH - 30"

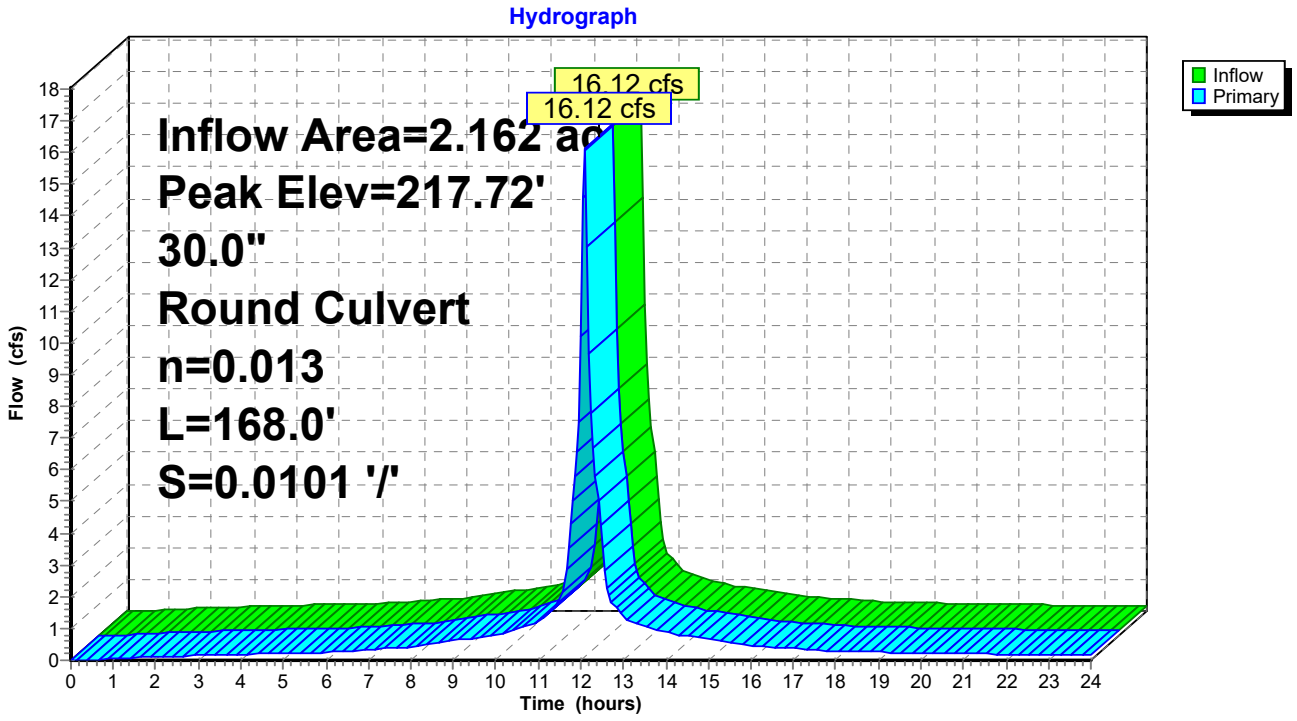
Inflow Area = 2.162 ac, 99.01% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 16.12 cfs @ 12.09 hrs, Volume= 1.370 af
Outflow = 16.12 cfs @ 12.09 hrs, Volume= 1.370 af, Atten= 0%, Lag= 0.0 min
Primary = 16.12 cfs @ 12.09 hrs, Volume= 1.370 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 217.72' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	216.00'	**30.0" Round Culvert** L= 168.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.00' / 214.30' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=15.80 cfs @ 12.09 hrs HW=217.70' (Free Discharge)
1=Culvert (Inlet Controls 15.80 cfs @ 4.44 fps)

Pond D31: DMH - 30"



Summary for Pond D32: DMH - 30"

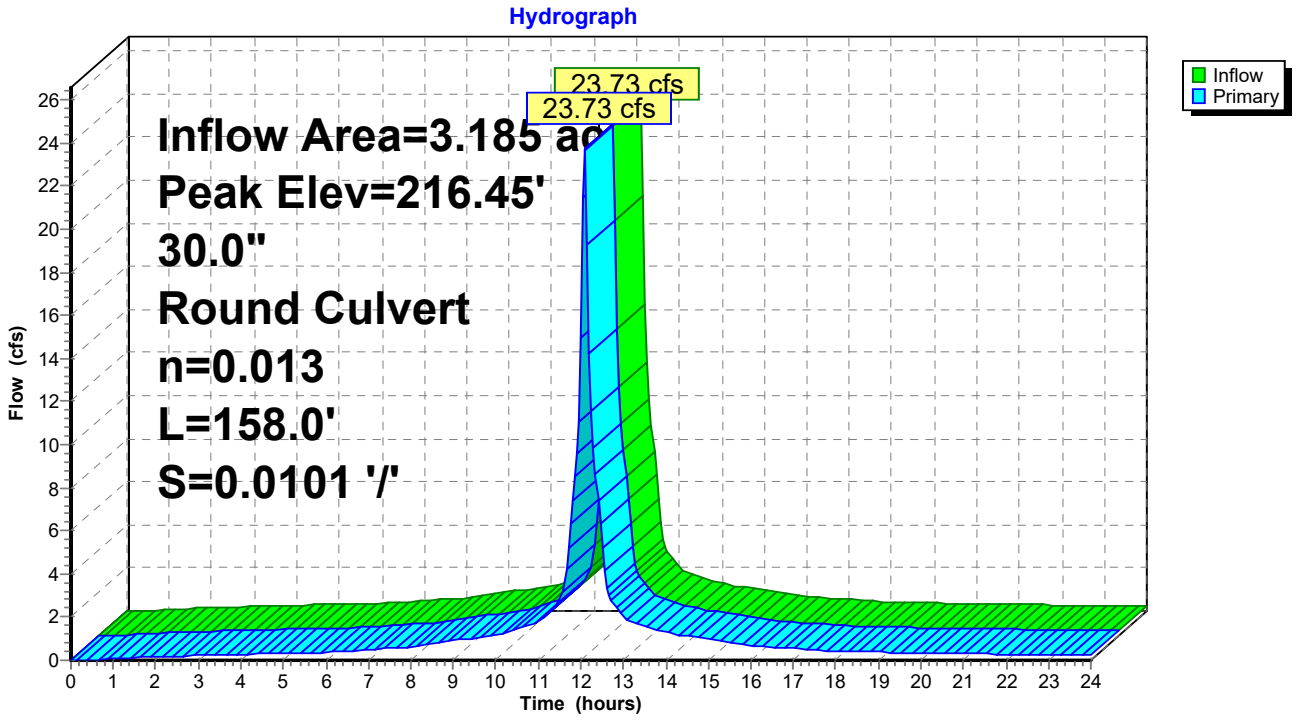
Inflow Area = 3.185 ac, 99.06% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 23.73 cfs @ 12.09 hrs, Volume= 2.019 af
Outflow = 23.73 cfs @ 12.09 hrs, Volume= 2.019 af, Atten= 0%, Lag= 0.0 min
Primary = 23.73 cfs @ 12.09 hrs, Volume= 2.019 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 216.45' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	214.20'	**30.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.20' / 212.60' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=23.30 cfs @ 12.09 hrs HW=216.41' (Free Discharge)
1=Culvert (Inlet Controls 23.30 cfs @ 5.07 fps)

Pond D32: DMH - 30"



Summary for Pond D33: DMH - 30"

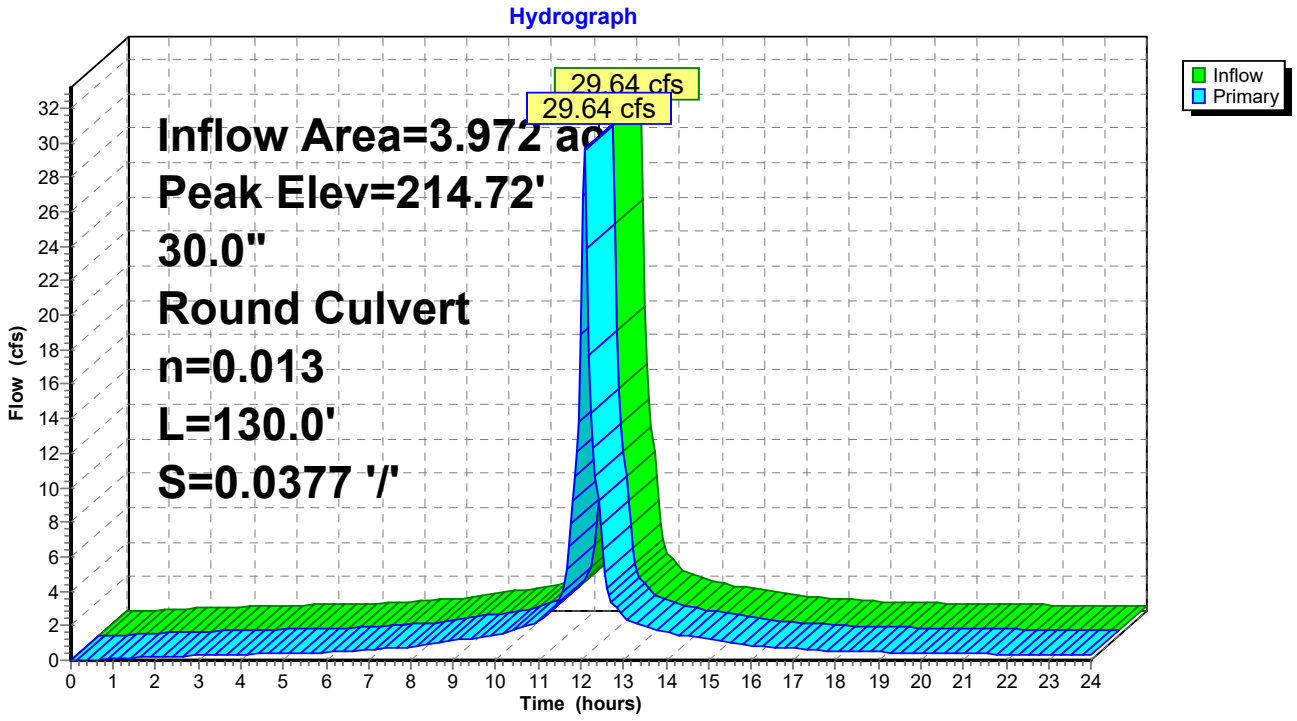
Inflow Area = 3.972 ac, 98.78% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 29.64 cfs @ 12.09 hrs, Volume= 2.517 af
Outflow = 29.64 cfs @ 12.09 hrs, Volume= 2.517 af, Atten= 0%, Lag= 0.0 min
Primary = 29.64 cfs @ 12.09 hrs, Volume= 2.517 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 214.72' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	211.90'	**30.0" Round Culvert** L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 211.90' / 207.00' S= 0.0377 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=29.04 cfs @ 12.09 hrs HW=214.66' (Free Discharge)
1=Culvert (Inlet Controls 29.04 cfs @ 5.92 fps)

Pond D33: DMH - 30"



Summary for Pond F1: Forebay

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 7.34" for 100-year 24hr event
Inflow = 38.98 cfs @ 12.09 hrs, Volume= 3.237 af
Outflow = 38.83 cfs @ 12.10 hrs, Volume= 3.237 af, Atten= 0%, Lag= 0.6 min
Primary = 19.62 cfs @ 12.10 hrs, Volume= 3.012 af
Routed to Link WQU-P5 : Water Quality Unit
Secondary = 19.20 cfs @ 12.10 hrs, Volume= 0.224 af
Routed to Pond P1a : Proposed Basin

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 207.67' @ 12.10 hrs Surf.Area= 1,557 sf Storage= 2,693 cf

Plug-Flow detention time= 0.8 min calculated for 3.237 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (750.5 - 749.7)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	3,235 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

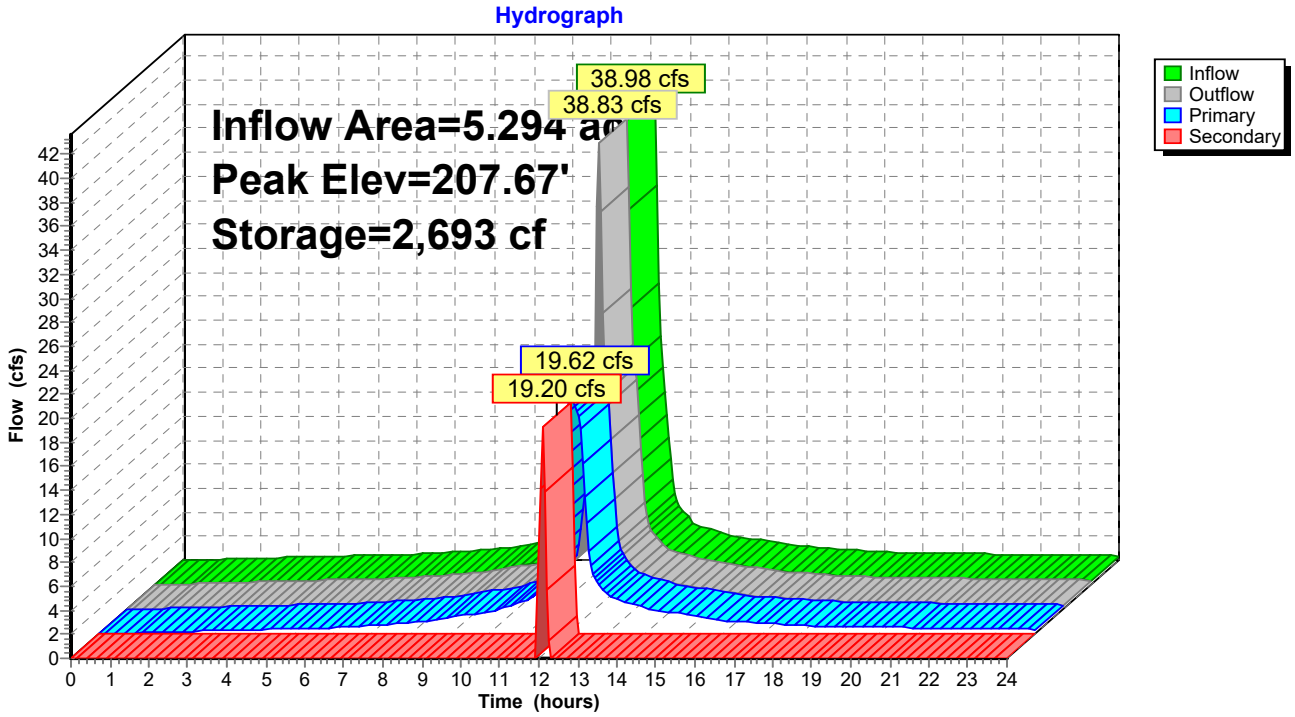
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
205.00	480	0	0
207.00	1,270	1,750	1,750
208.00	1,700	1,485	3,235

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**18.0" Round 18" Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.60' / 201.30' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	205.00'	**1.0" x 21.0" Horiz. Double Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	207.00'	**12.0' long + 2.0 '/' SideZ x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=19.62 cfs @ 12.10 hrs HW=207.67' (Free Discharge)
└**1=18" Culvert** (Inlet Controls 19.62 cfs @ 11.10 fps)
└**2=Double Grate** (Passes 19.62 cfs of 22.93 cfs potential flow)

Secondary OutFlow Max=19.13 cfs @ 12.10 hrs HW=207.67' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 19.13 cfs @ 2.16 fps)

Pond F1: Forebay



Summary for Pond P1a: Proposed Basin

Inflow Area = 6.138 ac, 77.11% Impervious, Inflow Depth > 7.07" for 100-year 24hr event
Inflow = 43.94 cfs @ 12.10 hrs, Volume= 3.614 af
Outflow = 13.57 cfs @ 12.44 hrs, Volume= 2.971 af, Atten= 69%, Lag= 20.5 min
Discarded = 0.96 cfs @ 12.44 hrs, Volume= 1.041 af
Primary = 12.61 cfs @ 12.44 hrs, Volume= 1.931 af
Routed to Link DP-A : Design Point A
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-A : Design Point A

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 204.84' @ 12.44 hrs Surf.Area= 17,266 sf Storage= 69,573 cf

Plug-Flow detention time= 179.6 min calculated for 2.965 af (82% of inflow)
Center-of-Mass det. time= 108.4 min (864.6 - 756.2)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	90,590 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	1,180	0	0
199.00	3,950	2,565	2,565
200.00	7,100	5,525	8,090
201.00	9,950	8,525	16,615
202.00	11,950	10,950	27,565
203.00	14,000	12,975	40,540
204.00	16,000	15,000	55,540
205.00	17,500	16,750	72,290
206.00	19,100	18,300	90,590

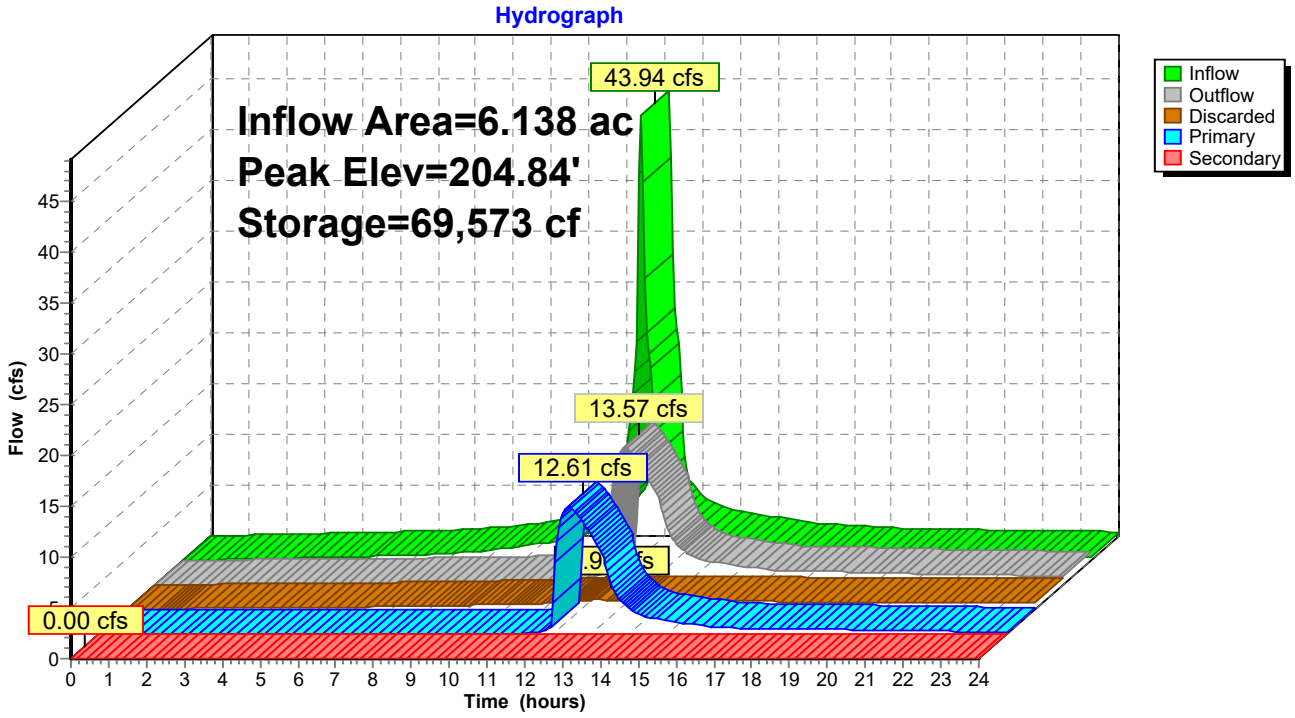
Device	Routing	Invert	Outlet Devices
#1	Secondary	205.00'	**10.0' long + 3.0 '/' SideZ x 11.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.53 2.59 2.70 2.68 2.67 2.68 2.66 2.64
#2	Primary	198.00'	**18.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 198.00' / 194.40' S= 0.0514 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	201.50'	**1.0" Vert. Orifice/Grate X 8.00 columns** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 2	203.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.96 cfs @ 12.44 hrs HW=204.84' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=12.60 cfs @ 12.44 hrs HW=204.84' (Free Discharge)
└**2=Culvert** (Passes 12.60 cfs of 21.00 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 1.05 cfs @ 8.03 fps)
  └**4=Orifice/Grate** (Orifice Controls 11.55 cfs @ 6.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=198.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond P1a: Proposed Basin



Summary for Pond P30: 12" HDPE

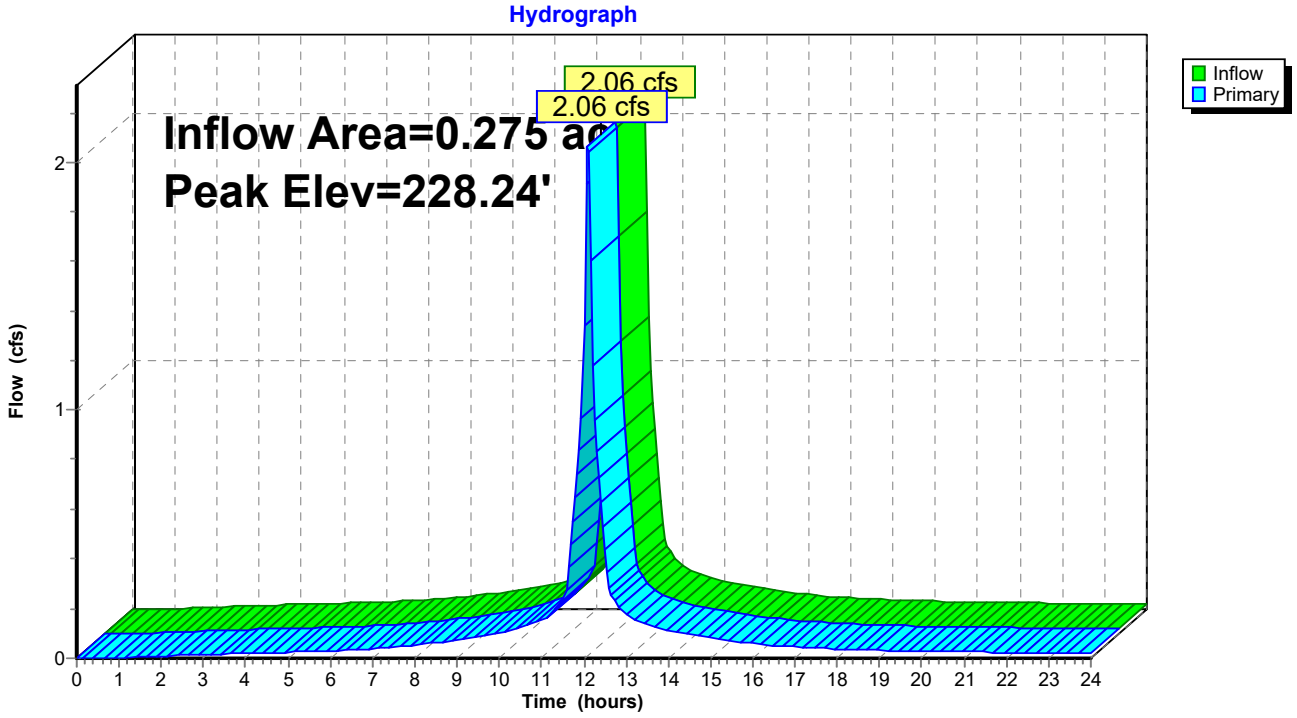
Inflow Area = 0.275 ac, 92.37% Impervious, Inflow Depth > 7.49" for 100-year 24hr event
Inflow = 2.06 cfs @ 12.09 hrs, Volume= 0.171 af
Outflow = 2.06 cfs @ 12.09 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
Primary = 2.06 cfs @ 12.09 hrs, Volume= 0.171 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.24' @ 12.09 hrs
Flood Elev= 228.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	224.60'	**12.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 224.60' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.00 cfs @ 12.09 hrs HW=228.24' (Free Discharge)
└─**1=Culvert** (Passes 2.00 cfs of 4.96 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.00 cfs @ 1.21 fps)

Pond P30: 12" HDPE



Summary for Pond P31: 12" HDPE

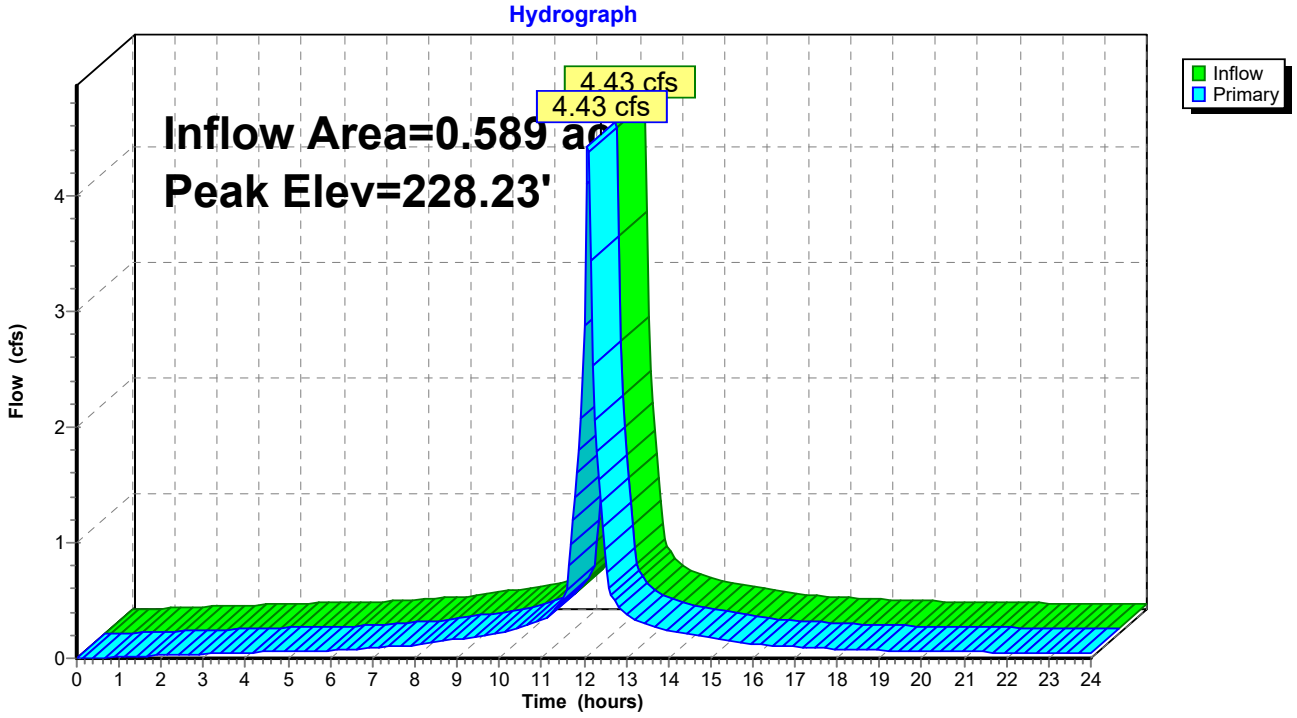
Inflow Area = 0.589 ac, 97.92% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 4.43 cfs @ 12.09 hrs, Volume= 0.373 af
Outflow = 4.43 cfs @ 12.09 hrs, Volume= 0.373 af, Atten= 0%, Lag= 0.0 min
Primary = 4.43 cfs @ 12.09 hrs, Volume= 0.373 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.23' @ 12.09 hrs
Flood Elev= 228.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.00'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.00' / 222.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	228.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.30 cfs @ 12.09 hrs HW=228.23' (Free Discharge)
└─**1=Culvert** (Passes 4.30 cfs of 8.22 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 4.30 cfs @ 1.56 fps)

Pond P31: 12" HDPE



Summary for Pond P32: 18" HDPE

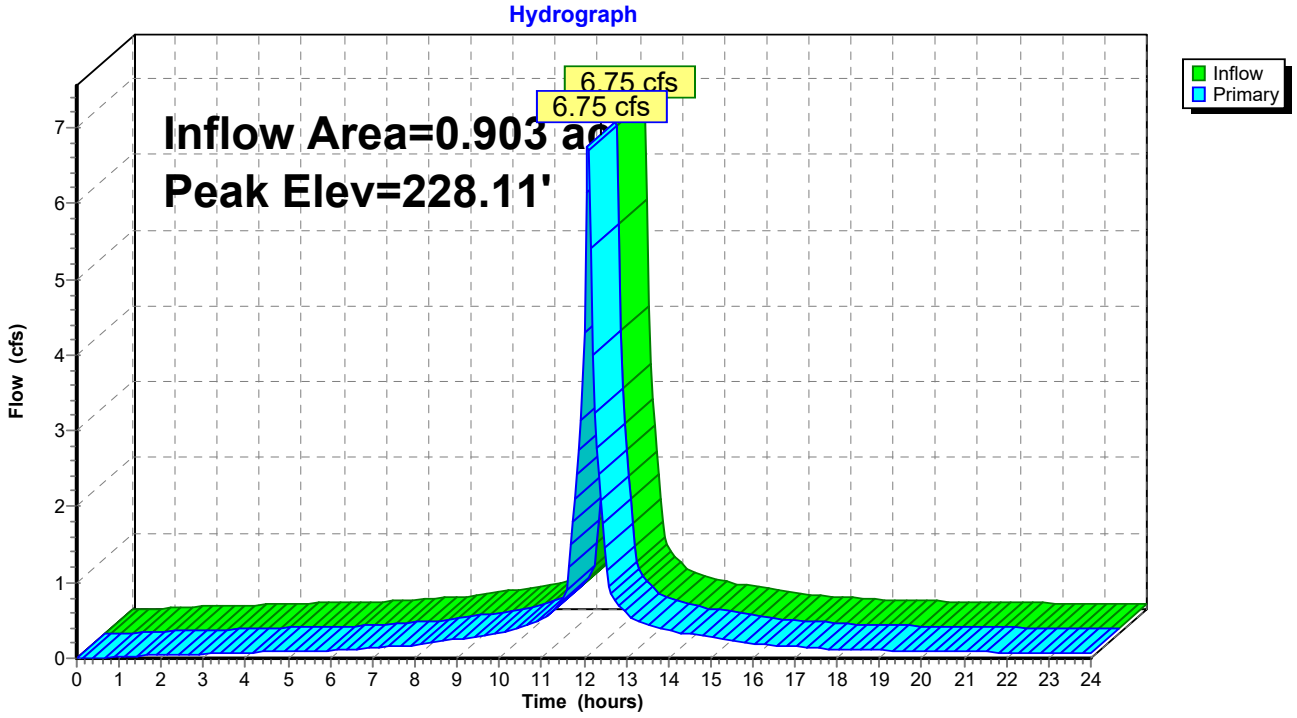
Inflow Area = 0.903 ac, 98.45% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 6.75 cfs @ 12.09 hrs, Volume= 0.572 af
Outflow = 6.75 cfs @ 12.09 hrs, Volume= 0.572 af, Atten= 0%, Lag= 0.0 min
Primary = 6.75 cfs @ 12.09 hrs, Volume= 0.572 af
Routed to Pond D27 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.11' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.80'	**18.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.80' / 222.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.59 cfs @ 12.09 hrs HW=228.10' (Free Discharge)
└─**1=Culvert** (Passes 6.59 cfs of 15.16 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 6.59 cfs @ 1.80 fps)

Pond P32: 18" HDPE



Summary for Pond P33: 18" HDPE

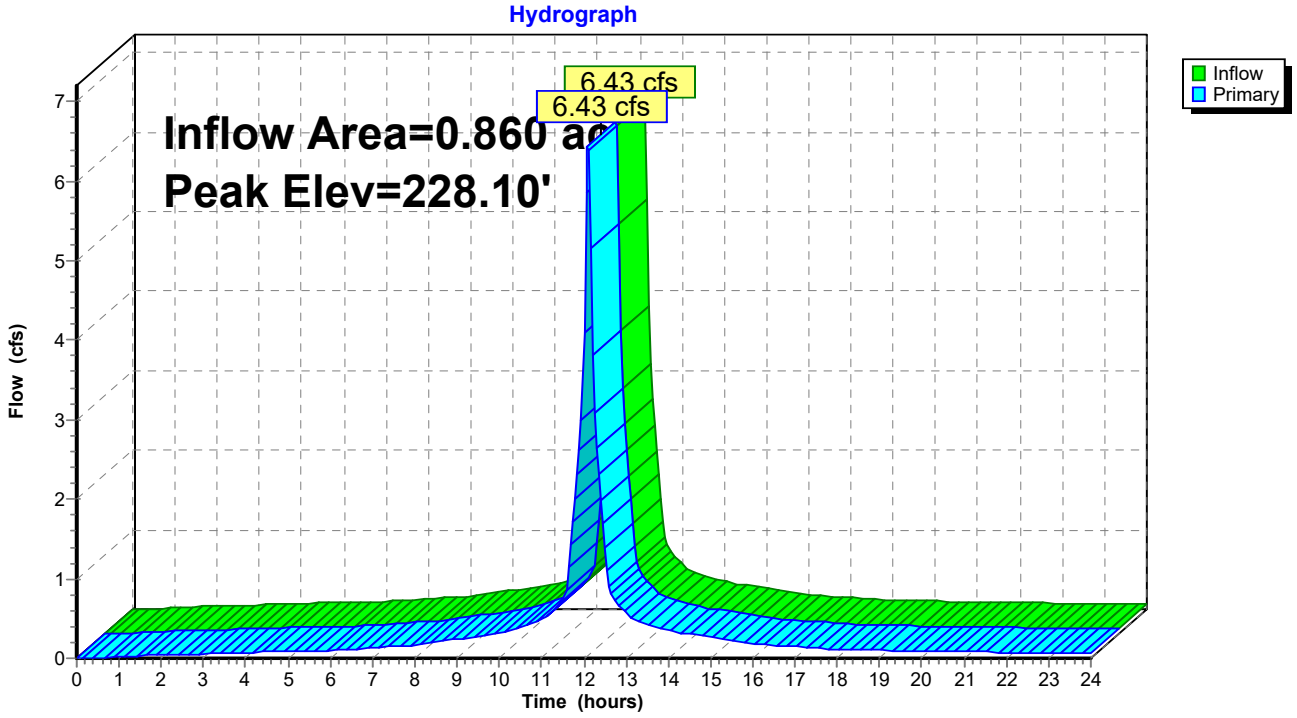
Inflow Area = 0.860 ac, 99.28% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 6.43 cfs @ 12.09 hrs, Volume= 0.545 af
Outflow = 6.43 cfs @ 12.09 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min
Primary = 6.43 cfs @ 12.09 hrs, Volume= 0.545 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 228.10' @ 12.09 hrs
Flood Elev= 228.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	222.80'	**18.0" Round Culvert** L= 198.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.80' / 219.80' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	227.80'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.27 cfs @ 12.09 hrs HW=228.09' (Free Discharge)
└**1=Culvert** (Passes 6.27 cfs of 16.33 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 6.27 cfs @ 1.77 fps)

Pond P33: 18" HDPE



Summary for Pond P34: 18" HDPE

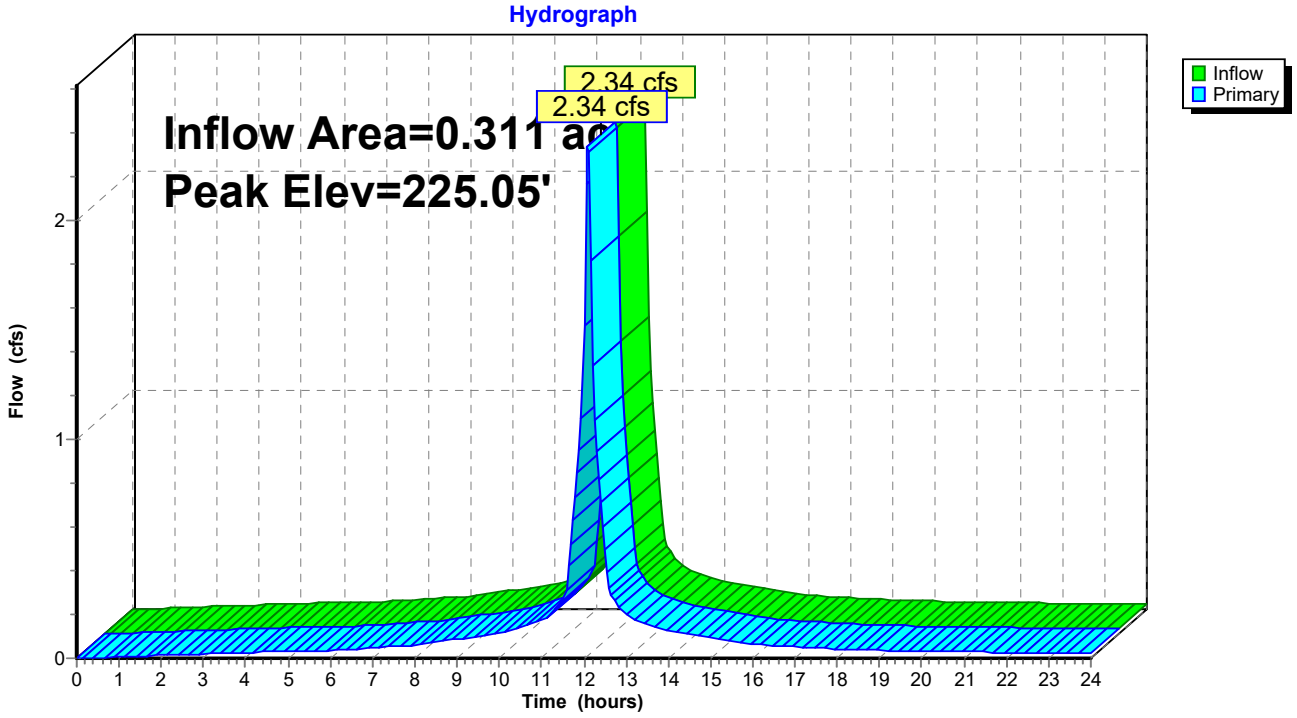
Inflow Area = 0.311 ac, 97.52% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 2.34 cfs @ 12.09 hrs, Volume= 0.197 af
Outflow = 2.34 cfs @ 12.09 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min
Primary = 2.34 cfs @ 12.09 hrs, Volume= 0.197 af
Routed to Pond D30 : DMH - 24"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 225.05' @ 12.09 hrs
Flood Elev= 225.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.90'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 219.90' / 219.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	224.90'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.25 cfs @ 12.09 hrs HW=225.05' (Free Discharge)
└─**1=Culvert** (Passes 2.25 cfs of 17.85 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.25 cfs @ 1.26 fps)

Pond P34: 18" HDPE



Summary for Pond P35: 18" HDPE

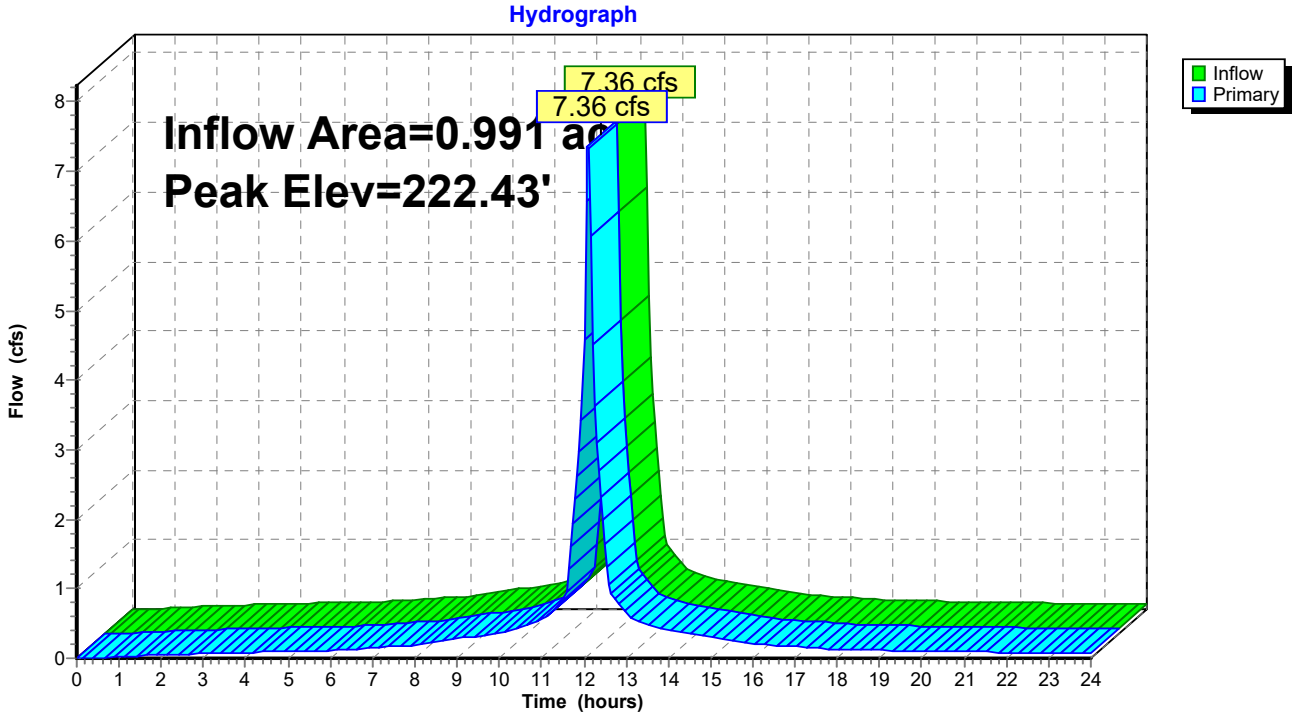
Inflow Area = 0.991 ac, 99.24% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 7.36 cfs @ 12.09 hrs, Volume= 0.628 af
Outflow = 7.36 cfs @ 12.09 hrs, Volume= 0.628 af, Atten= 0%, Lag= 0.0 min
Primary = 7.36 cfs @ 12.09 hrs, Volume= 0.628 af
Routed to Pond D31 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.43' @ 12.09 hrs
Flood Elev= 222.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 217.10' / 217.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	222.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=7.23 cfs @ 12.09 hrs HW=222.42' (Free Discharge)
└─**1=Culvert** (Passes 7.23 cfs of 18.20 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 7.23 cfs @ 1.86 fps)

Pond P35: 18" HDPE



Summary for Pond P36: 18" HDPE

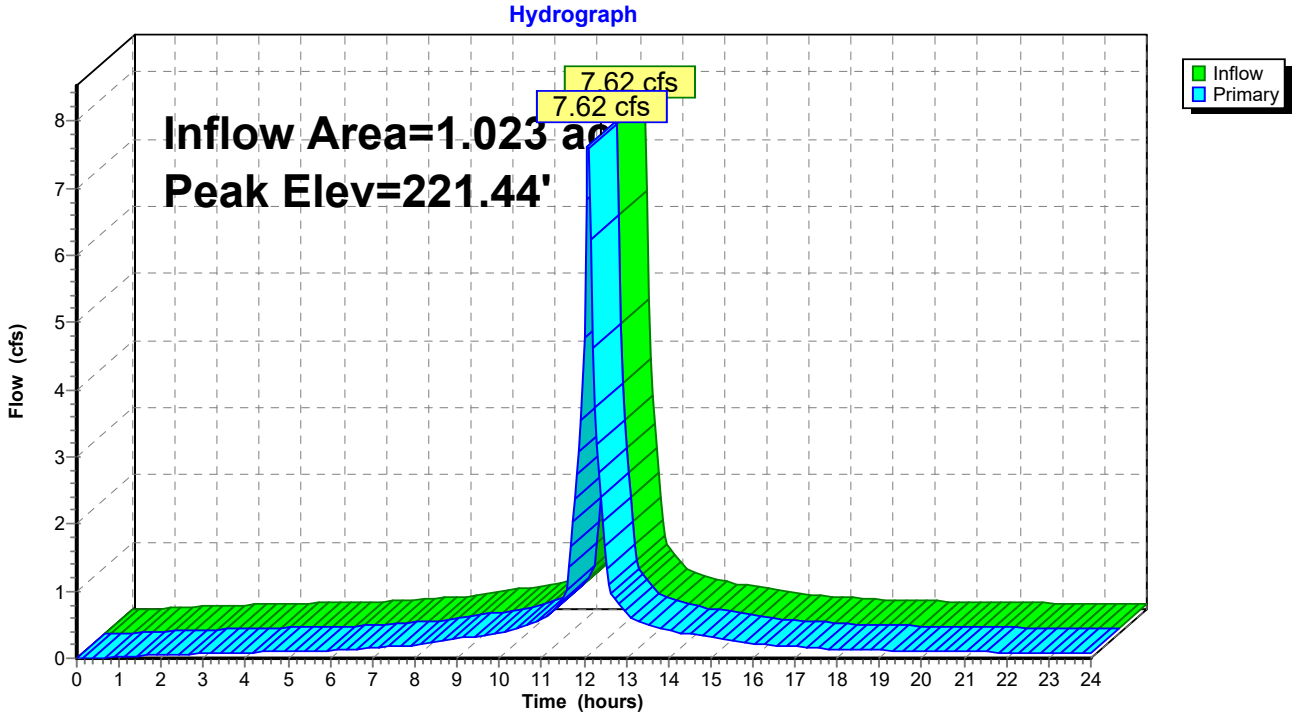
Inflow Area = 1.023 ac, 99.15% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 7.62 cfs @ 12.09 hrs, Volume= 0.649 af
Outflow = 7.62 cfs @ 12.09 hrs, Volume= 0.649 af, Atten= 0%, Lag= 0.0 min
Primary = 7.62 cfs @ 12.09 hrs, Volume= 0.649 af
Routed to Pond D32 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 221.44' @ 12.09 hrs
Flood Elev= 221.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	216.10'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 216.10' / 216.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	221.10'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=7.48 cfs @ 12.09 hrs HW=221.43' (Free Discharge)
└─**1=Culvert** (Passes 7.48 cfs of 18.21 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 7.48 cfs @ 1.88 fps)

Pond P36: 18" HDPE



Summary for Pond P37: 18" HDPE

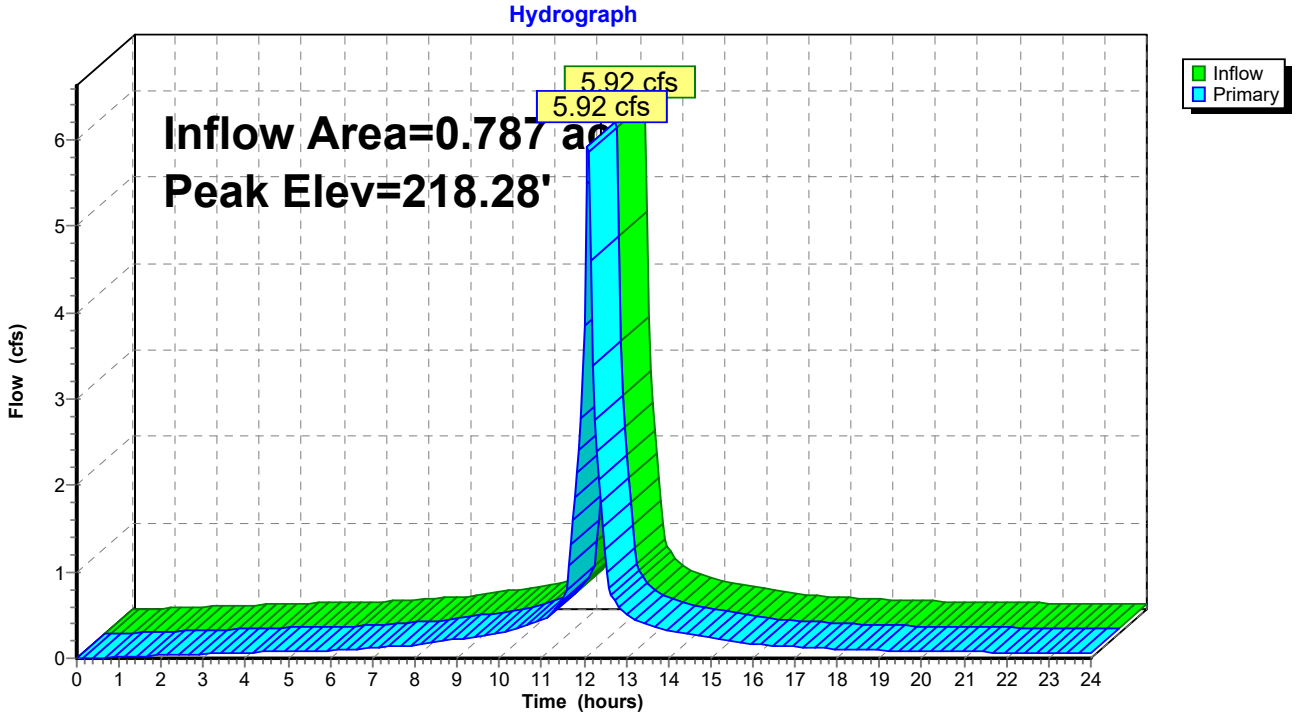
Inflow Area = 0.787 ac, 97.66% Impervious, Inflow Depth > 7.61" for 100-year 24hr event
Inflow = 5.92 cfs @ 12.09 hrs, Volume= 0.499 af
Outflow = 5.92 cfs @ 12.09 hrs, Volume= 0.499 af, Atten= 0%, Lag= 0.0 min
Primary = 5.92 cfs @ 12.09 hrs, Volume= 0.499 af
Routed to Pond D33 : DMH - 30"

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 218.28' @ 12.09 hrs
Flood Elev= 218.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 212.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	218.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.75 cfs @ 12.09 hrs HW=218.28' (Free Discharge)
└─**1=Culvert** (Passes 5.75 cfs of 18.11 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 5.75 cfs @ 1.72 fps)

Pond P37: 18" HDPE



Summary for Pond P38: 18" HDPE

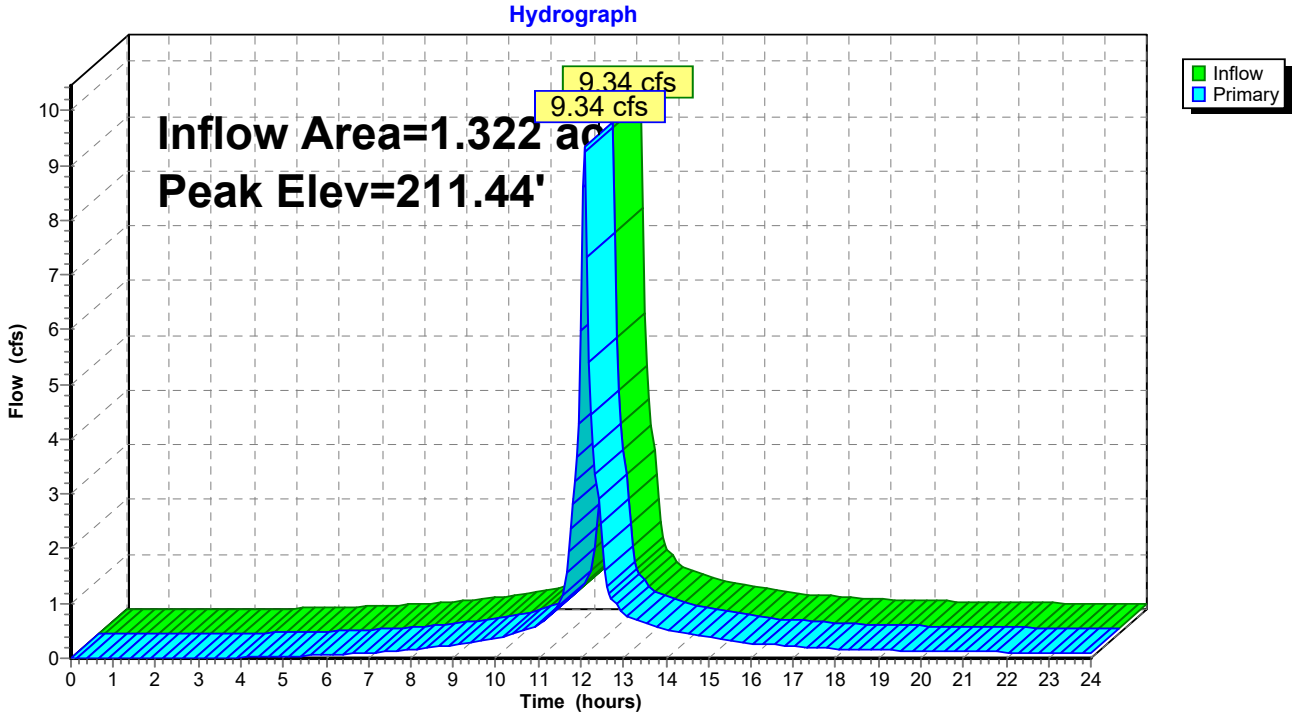
Inflow Area = 1.322 ac, 57.38% Impervious, Inflow Depth > 6.54" for 100-year 24hr event
Inflow = 9.34 cfs @ 12.09 hrs, Volume= 0.720 af
Outflow = 9.34 cfs @ 12.09 hrs, Volume= 0.720 af, Atten= 0%, Lag= 0.0 min
Primary = 9.34 cfs @ 12.09 hrs, Volume= 0.720 af
Routed to Pond F1 : Forebay

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 211.44' @ 12.09 hrs
Flood Elev= 211.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	207.80'	**18.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 207.80' / 207.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	211.00'	**1.0" x 21.0" Horiz. Orifice/Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads

Primary OutFlow Max=9.11 cfs @ 12.09 hrs HW=211.42' (Free Discharge)
└**1=Culvert** (Passes 9.11 cfs of 14.08 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 9.11 cfs @ 3.12 fps)

Pond P38: 18" HDPE

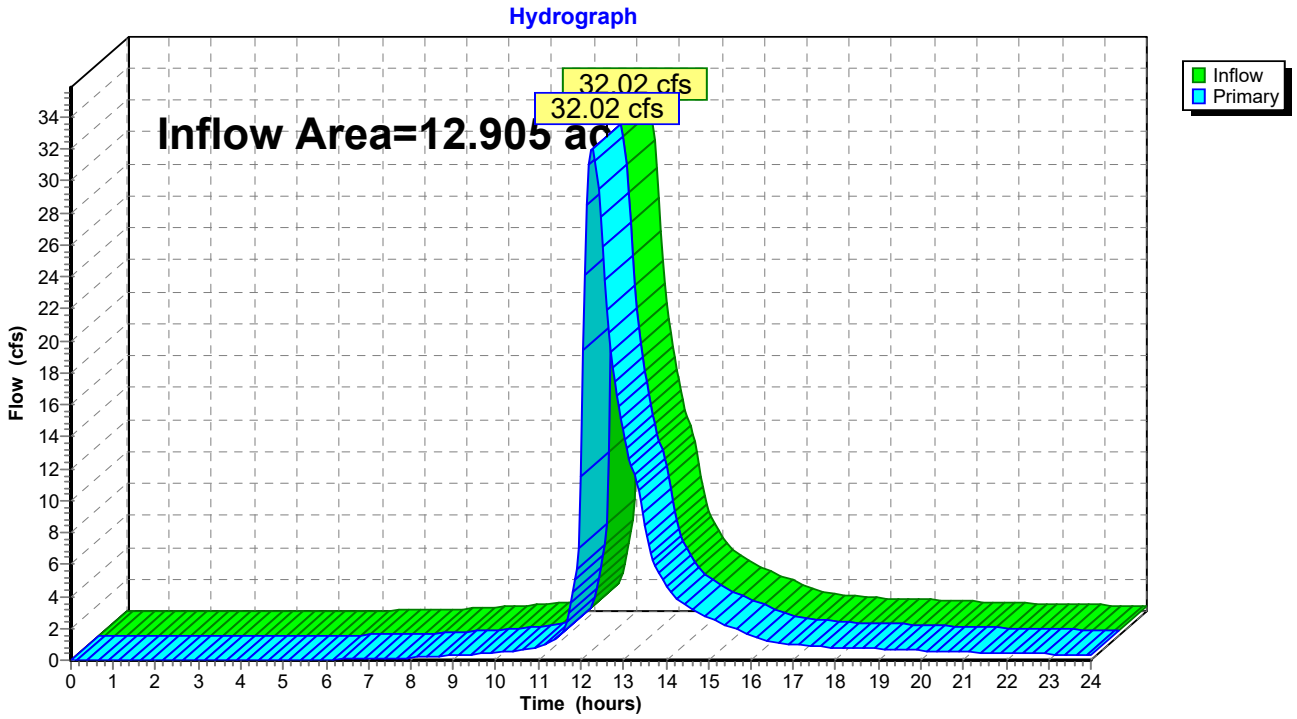


Summary for Link DP-A: Design Point A

Inflow Area = 12.905 ac, 72.18% Impervious, Inflow Depth > 3.61" for 100-year 24hr event
Inflow = 32.02 cfs @ 12.27 hrs, Volume= 3.878 af
Primary = 32.02 cfs @ 12.27 hrs, Volume= 3.878 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-A: Design Point A

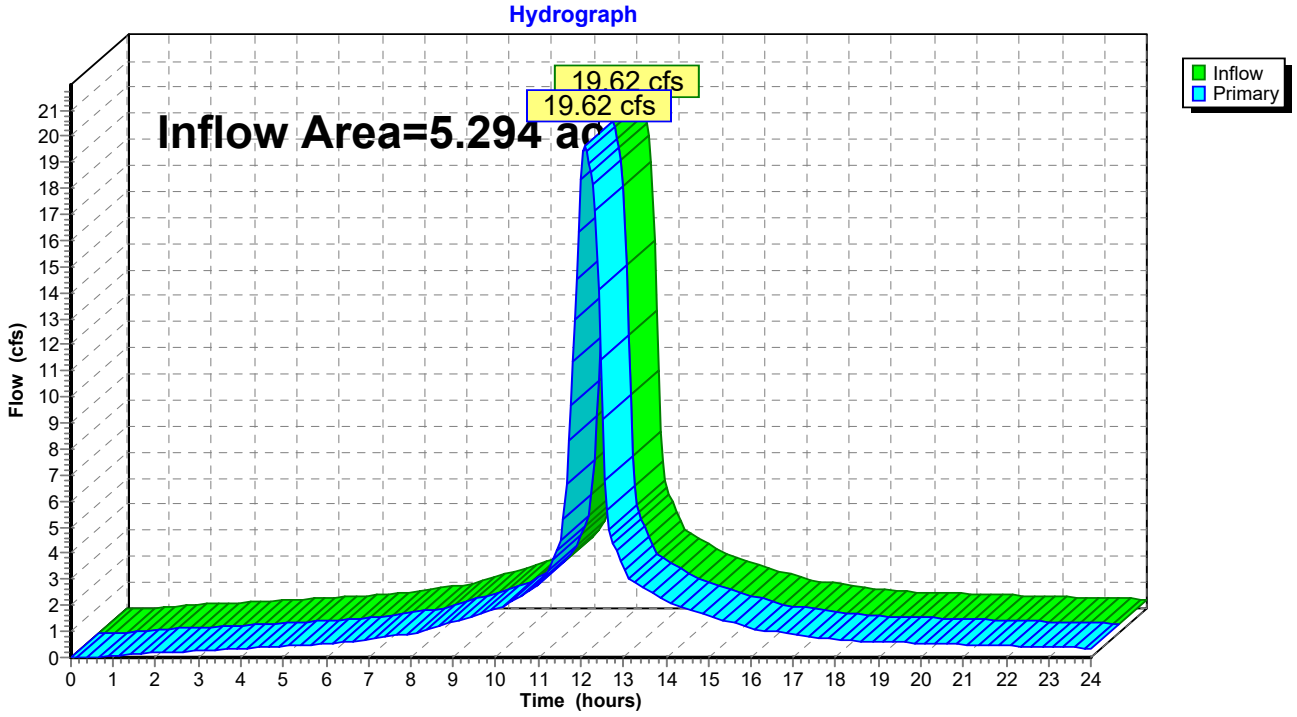


Summary for Link WQU-P5: Water Quality Unit

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 6.83" for 100-year 24hr event
Inflow = 19.62 cfs @ 12.10 hrs, Volume= 3.012 af
Primary = 19.62 cfs @ 12.10 hrs, Volume= 3.012 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P1a : Proposed Basin

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P5: Water Quality Unit

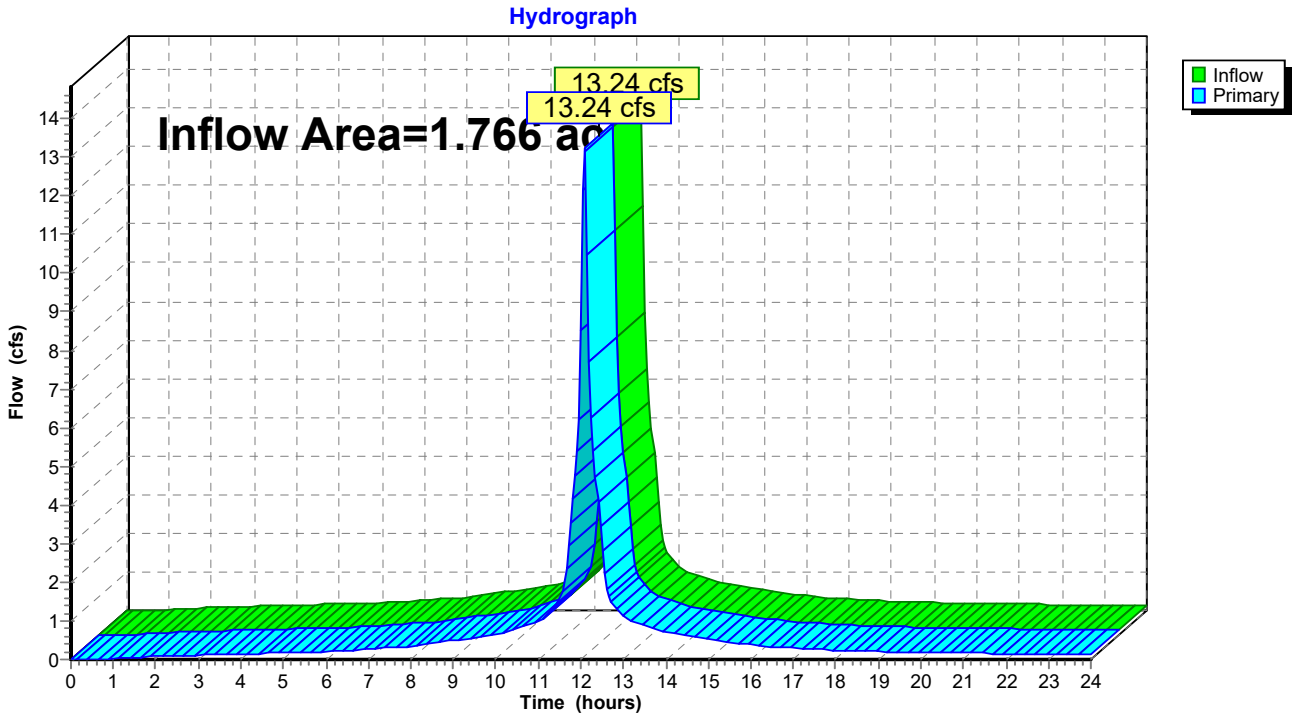


Summary for Link WQU-P6: Water Quality Unit

Inflow Area = 1.766 ac, 97.33% Impervious, Inflow Depth > 7.59" for 100-year 24hr event
Inflow = 13.24 cfs @ 12.09 hrs, Volume= 1.117 af
Primary = 13.24 cfs @ 12.09 hrs, Volume= 1.117 af, Atten= 0%, Lag= 0.0 min
Routed to Pond CMB : Underground Storage Chambers

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P6: Water Quality Unit



APPENDIX F

SUPPORTING CALCULATIONS

F1 - Atlas Rainfall Data
F2 - Water Quality Calculations (Rev. 4/21/2026)
F3 - Groundwater Recharge Calculations (Rev. 4/21/2026)
F4 - TSS Removal Calculation Worksheets
F5 - Culvert Outlet RipRap Apron Sizing Calculations
F6 - Contech Water Quality Unit Sizing Test Results
F7 - Illicit Discharge Statement

APPENDIX F2

(REV. 4/21/2026)

Water Quality Calculations

Water Quality Volume Flow Rate Calculations

Project Name: Site Development Permitting
Project Location: 14 Sterling Road, Billerica, MA
Project Number: 347-159

Date: April 2026
Calculated By: KFH
Checked By: DSK

Structure Name: WQU-P5
Description: Contech Cascade CS-6
Subcatchment: P-A3a through P-A3e, PA-4

Total Drainage Area:	5.294	ac
% Impervious:	88.44%	
Total Impervious Area:	4.682	ac

**Refer to HydroCAD Report*

Runoff Depth to be Treated: 1.0 inches

Required Water Quality Volume:	**16,996**	**cf**
	0.390	ac ft

FLOW RATE CONVERSION*

$Q = (qu)(A)(WQV)$

Where:

Q = flow rate associated with the depth of runoff, in cfs
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area, in square miles
WQV = water quality volume in watershed inches

Given:

1-acre =	0.0015625	mi^2
6 minute =	0.01	hours
qu (**1**-inch) =	**774**	csm/in

Calculation:

qu=	**774**	
A=	4.68	ac
WQV=	1.0	in

Required Water Quality Flow Rate:	**5.66**	**cfs****

Proposed sediment forebay attenuates equivalent water quality flow rate for 0.404 ac-ft of flow to **5.23 cfs, refer to attached HydroCAD output.

Contech WQU Device CS-6 will provide a min. of 80% TSS Removal Efficiency below 5.6 cfs (See Attached Documentation)

(Based on Manufacturer's sizing. See attached documentation.)

* Flow rate conversion based on the Massachusetts Department of Environmental Protection Wetlands Program - Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices

Water Quality Volume Flow Rate Calculations

Project Name: Site Development Permitting
Project Location: 14 Sterling Road, Billerica, MA
Project Number: 347-159

Date: April 2026
Calculated By: KFH
Checked By: DSK

Structure Name: WQU-P6
Subcatchment: P-A2a through P-A2c

Description: Contech Cascade CS-5

Total Drainage Area: 1.766 ac

% Impervious: 97.33%
Total Impervious Area: 1.719 ac
**Refer to HydroCAD Report*

Runoff Depth to be Treated: 1.0 inches

Required Water Quality Volume:	**6,239**	**cf**
	0.143	ac ft

FLOW RATE CONVERSION

Q = (qu)(A)(WQV)

Where:

Q = flow rate associated with the depth of runoff, in cfs
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area, in square miles
WQV = water quality volume in watershed inches

Given:

1-acre = 0.0015625 mi^2
6 minute = 0.01 hours
qu (**1**-inch) = **774** csm/in

Calculation:

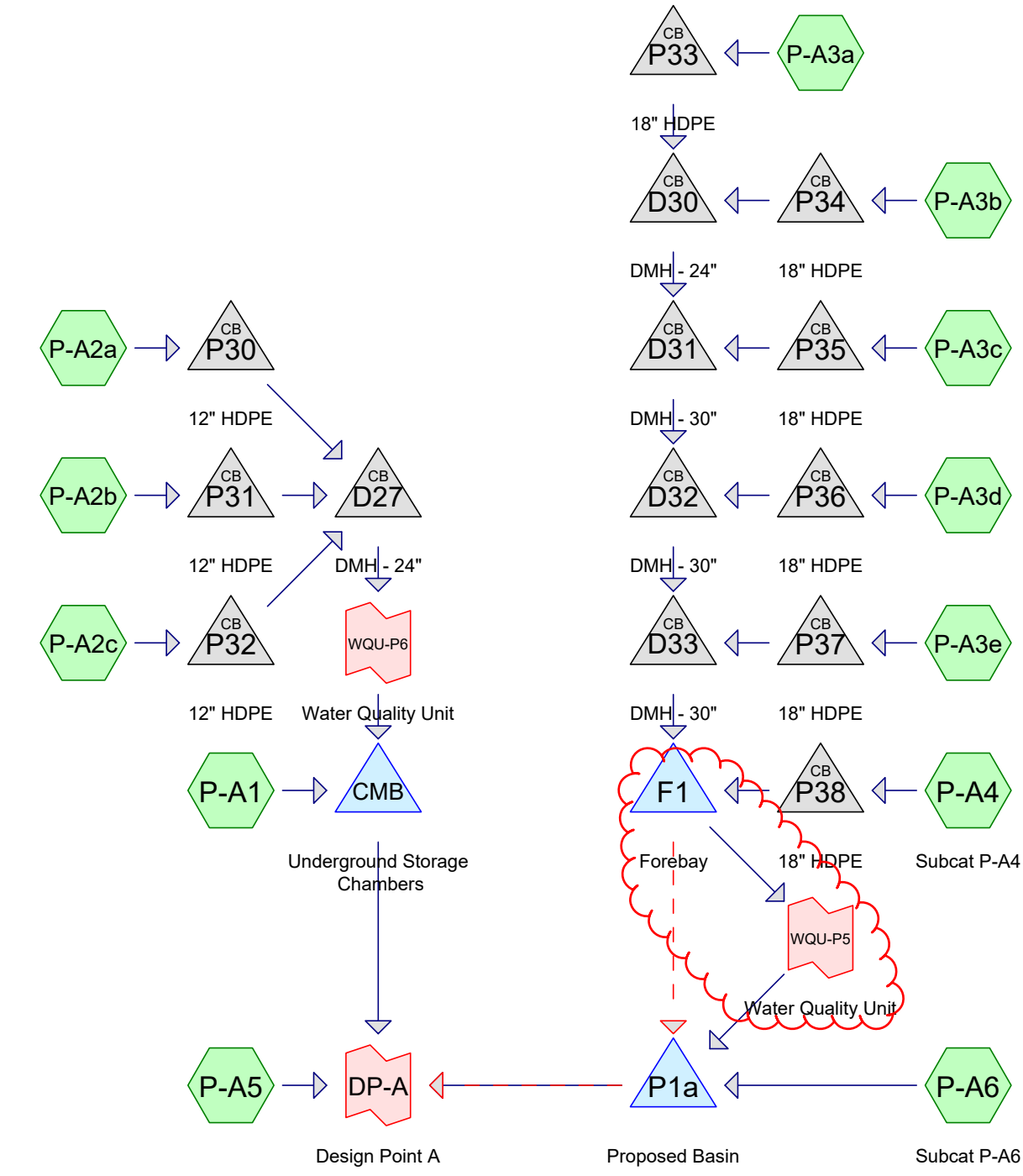
qu= **774**
A= 1.72 ac
WQV= 1.0 in

Required Water Quality Flow Rate:	**2.08**	**cfs**

Contech WQU Device CS-5 will provide a min. of 80% TSS Removal Efficiency below 3.5 cfs (See Attached Documentation)

(Based on Manufacturer's sizing. See attached documentation.)

* Flow rate conversion based on the Massachusetts Department of Environmental Protection Wetlands Program - Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices



Routing Diagram for 347159-3-Post-Dev Stormwater Analysis_R1
Prepared by CEC Inc, Printed 4/17/2026

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1" WQ Volume	Type III 24-hr		Default	24.00	1	1.28	2

Refer to Post-Development HydroCAD Model Output located in Appendix E for a complete report which includes the proposed conditions areas, soil listing, subcatchments, etc.

Summary for Pond F1: Forebay

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 0.91" for 1" WQ Volume event
Inflow = 5.22 cfs @ 12.09 hrs, Volume= 0.404 af
Outflow = 5.23 cfs @ 12.10 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.3 min
Primary = 5.23 cfs @ 12.10 hrs, Volume= 0.404 af
Routed to Link WQU-P5 : Water Quality Unit
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond P1a : Proposed Basin

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 205.26' @ 12.10 hrs Surf.Area= 583 sf Storage= 139 cf

Plug-Flow detention time= 0.8 min calculated for 0.403 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (790.0 - 789.3)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	3,235 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

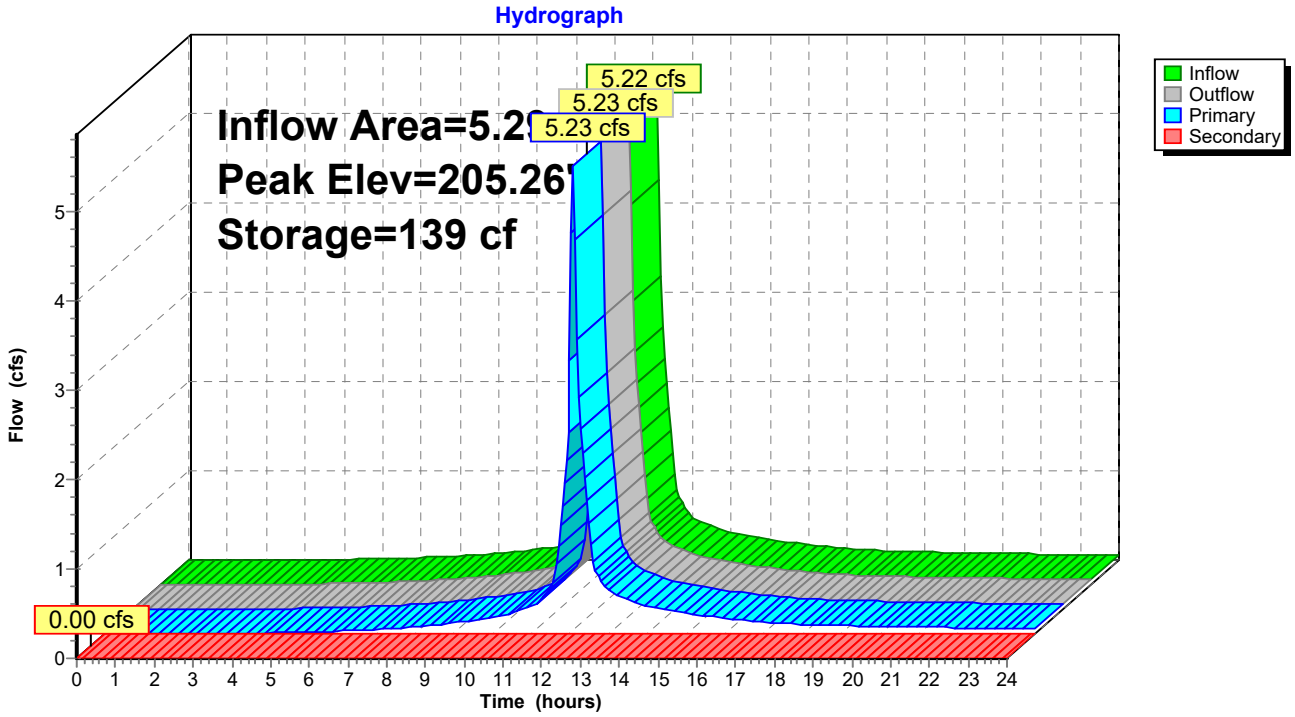
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
205.00	480	0	0
207.00	1,270	1,750	1,750
208.00	1,700	1,485	3,235

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**18.0" Round 18" Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.60' / 201.30' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	205.00'	**1.0" x 21.0" Horiz. Double Grate X 10.00 columns** X 2 rows C= 0.600 in 24.0" x 48.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	207.00'	**12.0' long + 2.0 '/' SideZ x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.21 cfs @ 12.10 hrs HW=205.26' (Free Discharge)
└**1=18" Culvert** (Passes 5.21 cfs of 14.52 cfs potential flow)
└**2=Double Grate** (Weir Controls 5.21 cfs @ 1.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=205.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond F1: Forebay

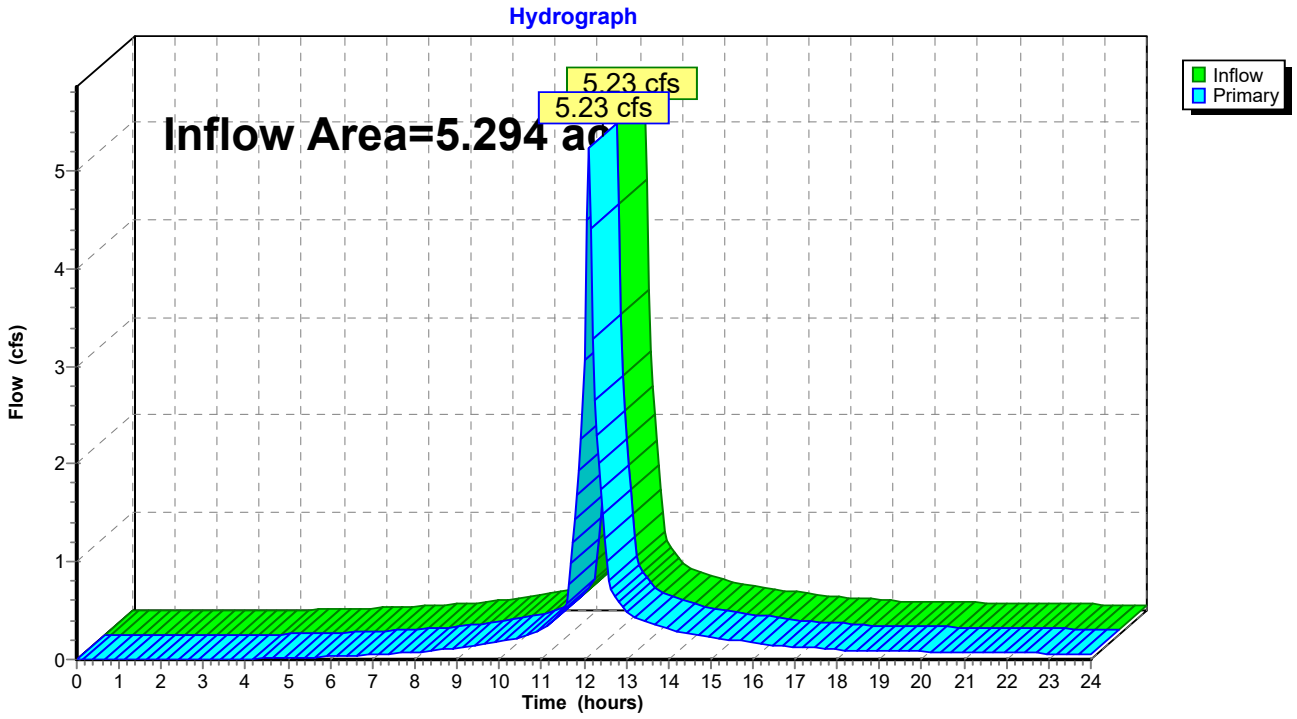


Summary for Link WQU-P5: Water Quality Unit

Inflow Area = 5.294 ac, 88.44% Impervious, Inflow Depth > 0.91" for 1" WQ Volume event
Inflow = 5.23 cfs @ 12.10 hrs, Volume= 0.404 af
Primary = 5.23 cfs @ 12.10 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P1a : Proposed Basin

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link WQU-P5: Water Quality Unit



APPENDIX F3
(REV. 4/21/2026)
Groundwater Recharge Calculations

Groundwater Recharge Calculations

Project Name: W.L. French Site Development Permitting
Project Location: 14 Sterling Road, Billerica, MA
Project Number: 347-159

Date: April 2026
Calculated By: KFH
Checked By: DSK

OVERALL SITE RECHARGE

Existing Conditions Impervious Area

Hydraulic Soil Group	Area (sq ft)	Area (acres)	Recharge Depth (in)	Volume (cu ft)
A	0	0.00	0.60	0
B	0	0.00	0.35	0
C	160,100	3.68	0.25	3,336
D	0	0.00	0.10	0
TOTAL	**160,100**	**3.68**		**3,336**

Proposed Conditions Impervious Area

Hydraulic Soil Group	Area (sq ft)	Area (acres)	Recharge Depth (in)	Volume (cu ft)
A	0	0.00	0.60	0
B	0	0.00	0.35	0
C	429,800	9.87	0.25	8,955
D	21,200	0.49	0.10	177
TOTAL	**451,000**	**10.35**		**9,132**

Net Required Recharge Volume: 5,796 cu ft

Capture Area Adjustment

* Impervious Area to Recharge Facility: 4.57 ac
Total Site Impervious Area: 10.35 ac
** Impervious Ratio: 2.27

* (includes portions of the existing pavement and the maintenance facility roof area)

** (Total Site Impervious / Impervious Area to Recharge Facility)

Adjusted Required Recharge Volume: 13,129 cu ft

Groundwater Recharge Calculations

Project Name: W.L. French Site Development Permitting
Project Location: 14 Sterling Road, Billerica, MA
Project Number: 347-159

Date: April 2026
Calculated By: KFH
Checked By: DSK

Stormwater BMP: Underground Chambers (node CMB) Description: Retain-It 3.5' Chambers

Provided Recharge Volume

Bottom of Stone:	219.75	ft	
Overflow Outlet Elevation:	222.75	ft	
*** Volume Provided:	36,642	cu ft	*** (See attached HydroCAD output)

Total Provided Recharge Volume: 36,642 cu ft

72-hour Drawdown Calculation

Provided Recharge Volume:	36,642	cu ft	
Saturated Hydraulic Conductivity:	2.41	in / hr	(Rawls Rate for Loamy Sand was used)
Bottom Area:	16,464	sq ft	
Drawdown Time:	**11.1**	**hours**	

Stage-Area-Storage for Pond CMB: Underground Storage Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
219.75	**16,464**	0
219.80	16,464	329
219.85	16,464	659
219.90	16,464	988
219.95	16,464	1,317
220.00	16,464	1,646
220.05	16,464	1,976
220.10	16,464	2,305
220.15	16,464	2,634
220.20	16,464	2,964
220.25	16,464	3,293
220.30	16,464	3,622
220.35	16,464	3,951
220.40	16,464	4,281
220.45	16,464	4,610
220.50	16,464	4,939
220.55	16,464	5,644
220.60	16,464	6,348
220.65	16,464	7,053
220.70	16,464	7,757
220.75	16,464	8,462
220.80	16,464	9,166
220.85	16,464	9,871
220.90	16,464	10,575
220.95	16,464	11,280
221.00	16,464	11,984
221.05	16,464	12,689
221.10	16,464	13,393
221.15	16,464	14,098
221.20	16,464	14,802
221.25	16,464	15,507
221.30	16,464	16,211
221.35	16,464	16,916
221.40	16,464	17,620
221.45	16,464	18,325
221.50	16,464	19,029
221.55	16,464	19,734
221.60	16,464	20,438
221.65	16,464	21,143
221.70	16,464	21,847
221.75	16,464	22,552
221.80	16,464	23,256
221.85	16,464	23,961
221.90	16,464	24,665
221.95	16,464	25,370
222.00	16,464	26,074
222.05	16,464	26,779
222.10	16,464	27,483
222.15	16,464	28,188
222.20	16,464	28,892
222.25	16,464	29,597
222.30	16,464	30,301

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
222.35	16,464	31,006
222.40	16,464	31,710
222.45	16,464	32,415
222.50	16,464	33,119
222.55	16,464	33,824
222.60	16,464	34,528
222.65	16,464	35,233
222.70	16,464	35,937
222.75	16,464	36,642
222.80	16,464	37,346
222.85	16,464	38,051
222.90	16,464	38,755
222.95	16,464	39,460
22		
22		
22		
22		
223.25	16,464	43,687
223.30	16,464	44,392
223.35	16,464	45,096
223.40	16,464	45,801
223.45	16,464	46,505
223.50	16,464	47,210
223.55	16,464	47,914
223.60	16,464	48,619
223.65	16,464	49,323
223.70	16,464	50,028
223.75	16,464	50,732
223.80	16,464	51,437
223.85	16,464	52,141
223.90	16,464	52,846
223.95	16,464	53,550
224.00	16,464	54,255
224.05	16,464	54,277
224.10	16,464	54,299
224.15	16,464	54,321
224.20	16,464	54,343
224.25	16,464	54,365
224.30	16,464	54,387
224.35	16,464	54,409
224.40	16,464	54,431
224.45	16,464	54,453
224.50	16,464	54,475
224.55	16,464	54,497
224.60	16,464	54,520
224.65	16,464	**54,542**

Storage provided in the Subsurface Pre-Cast Concrete Infiltration Chamber System, below the outlet elevation