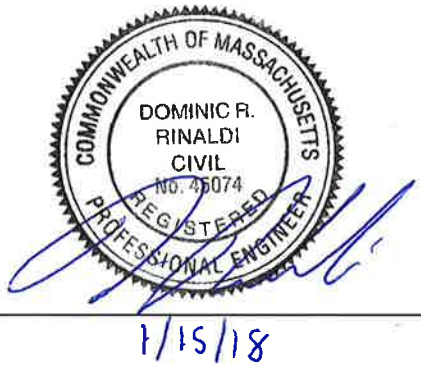
STORMWATER REPORT

WOODLAND COVE
3104 CRANBERRY HIGHWAY
WAREHAM, MA 02571

JANUARY 2018

Owner/Applicant:

DAKOTA PARTNERS
1264 Main Street
Waltham, MA 02451



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BSC Job Number: 83669.00

Prepared by:

BSC GROUP

803 Summer Street
Boston, MA 02127

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SECTION 1.0

PROJECT INFORMATION

1.01 PROJECT DESCRIPTION

Dakota Partners (The Applicant) is seeking to construct a new multi-family housing development in Wareham, Massachusetts, hereinafter referred to as "the Project". The total project area is approximately 8.63 acres and is located at 3104 Cranberry Highway. The project is bounded on the north by a parcel deeded to Onset Fire District, bounded on the east by residential properties, bounded on the south by Cranberry Highway (Route 6 & 28), and bounded on the west by residential properties.

The Project includes the demolition of the existing "Star Light Motel", which occupies the southwestern corner of the property, removal of one (1) utility pole and associated guy wire and overhead wire, demolition of a garage building, clearing and grubbing to the property line, construction of six (6) new four-story multi-family buildings, a community building, surface parking area, walkways, a playground, utility services, and a stormwater management system. The new buildings have an approximately 10,000 square foot footprint each, and the community building is approximately 3,500 square feet.

The Project is a development project designed to comply with the Massachusetts General Laws (M.G.L.) Chapter 40B, which allows developers to override certain aspects of municipal zoning bylaws by providing a certain percentage of affordable housing, as well as the Department of Environmental Protection's Stormwater Management Standards. There are no wetlands on the project site. The Project is located outside of the flood zones according to the most recent FEMA Flood Insurance Rate Maps included in the Appendices.

1.02 PRE-DEVELOPMENT CONDITIONS

The existing site topography generally slopes from south to north with average slopes between 4 – 6%. The current site is mostly comprised of light woods and sandy topsoil. The NRCS Web Soil Survey, has identified three primary soil classifications underlying the project site. The soil map unit classified as 259B accounts for nearly 90% of the project site which is generally a well draining soil with high infiltration rates. The remaining 10% of the soils are on previously developed land along Route 6 & 28 and are classified as urban land. Five (5) deep hole test pits and double ring infiltrometer testing were performed by BSC Group in April, 2017, and the detailed reports are included in the Appendices. The results of the soil testing confirm the NRCS soil classifications for this property as well draining sands with deep groundwater, and as such, have been modeled as Hydrologic Soil Group A.

The existing site being largely undeveloped has no existing drainage facilities and due to the nature of the existing soils, there is very little stormwater runoff to abutting properties. The majority of runoff sheet flows overland to the north and ultimately discharges to Sand Pond, approximately 1,000-feet to the north. A portion of the site discharges to the east to existing residential. A small portion of the site flows to the south and ultimately discharges into the Cranberry Highway drainage system.

1.03 POST-DEVELOPMENT CONDITIONS

The proposed stormwater management system has been designed in a manner that will exceed the provisions of the Department of Environmental Protection (DEP) Stormwater Management Policy for a new construction project. The design is also in conformance the with Town of Wareham Zoning Bylaws.

Stormwater runoff from the buildings will be collected through roof drains and routed to underground stormwater infiltration systems that will discharge to the larger site stormwater management system. Stormwater runoff from the majority of the surface parking areas will be collected via deep sump catch basins and conveyed through water quality units and/or bio-retention areas prior to being directed to an underground stormwater infiltration system. Runoff from the remaining portions of the site will be collected via deep sump, hooded catch basins and routed through water quality units. All collected stormwater runoff will ultimately be routed via a closed pipe network to a bio-retention area along the northern property line which will overflow to the north via a 140-foot long level spreader to promote low velocity sheet flow and prevent downstream erosion. Specifics of the project's compliance with the Stormwater Standards are discussed in detail in the following sections.

SECTION 2.0

DRAINAGE SUMMARY

2.01 Stormwater Standard 1 – New Stormwater Conveyances

Per Massachusetts Stormwater Management Standard #1, no new outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. No new untreated stormwater discharges are proposed. Portions of the site will continue to flow overland either offsite or to the existing drainage system in Cranberry Highway, while the majority of the site will be captured and treated prior to flowing offsite via a rip-rap level spreader that will promote low velocity sheet flow and prevent downstream erosion. Rip-rap outlet protection sizing calculations are included in Section 6.0 of this Report.

2.02 Stormwater Standard 2 – Stormwater Runoff Rates

Watershed modeling was performed using HydroCAD Stormwater Modeling Software version 10.0, a computer aided design program that combines SCS runoff methodology with standard hydraulic calculations. A model of the site's hydrology was developed for both pre and post-development conditions to assess the effects of the proposed development on the project site and surrounding areas.

The stormwater management system for the project has been designed such that the post-development conditions result in a decrease of peak runoff rates to the south, east, and the total site for the 2-year, 10-year and 100-year, 24-hour storm events, as detailed in the table below. In addition, runoff volumes discharged from the site have been reduced for all storms to all design points analyzed. The post-development peak flow to the north perimeter of the site has increased slightly over the existing during the 100-year storm event. However, these peak flow rates are very low (under 3-cfs), the volume discharged during this event is significantly reduced (0.082 acre-feet post-development versus 0.338 acre-feet pre-development), and the discharge is via a 140-foot long, rip-rap level spreader that will promote low velocity sheet flow and prevent downstream erosion. Therefore, the project is not expected to result in any increase to downstream flooding and complies with the requirements of Standard 2.

Peak Flow Discharge Rates

Node 1R – Flow Towards Route 6 and Red Brook Road

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.88	0.02	-0.86
10-Year	2.10	0.29	-1.81
100-Year	4.70	1.82	-2.88

Node 2R – Flow to East Perimeter

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.82	0.00	-0.82
10-Year	1.88	0.02	-1.86
100-Year	4.15	0.34	-3.81

Node 3R – Flow to North Perimeter

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.01	0.00	-0.01
10-Year	0.11	0.00	-0.11
100-Year	2.04	2.89	+0.85

Node – Total Site

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	1.45	0.02	-1.43
10-Year	3.44	0.30	-3.14
100-Year	8.90	4.61	-4.29

2.03 Stormwater Standard 3 – Groundwater Recharge

Groundwater recharge is provided on site via underground structural infiltration systems and bio-retention areas. Each multi-family building has an eight (8) chamber StormTech system. The majority of the surface parking areas are routed to a seventy-six (76) chamber StormTech system and three (3) infiltrating bio-retention areas. Overall, the project will result in no loss of annual recharge to groundwater as required by Standard 3. Refer to Section 6.0 of this Report for groundwater recharge information.

2.04 Stormwater Standard 4 – TSS Removal

As a new development, the Project stormwater management system will achieve a TSS removal greater than 80%. The proposed stormwater management system has been designed to provide treatment of runoff in order to reduce suspended solids prior to discharge off-site through the implementation of the following best management practices:

- Deep Sump Hooded Catch Basins
- Proprietary Hydrodynamic Separator
- Underground Stormwater Infiltration Chamber Systems (StormTech units or approved equal)
- Infiltrating Bio-Retention Areas

The water quality volume is defined as the runoff volume requiring TSS Removal for the site, and is equal to 1-inch of runoff over the total impervious area of the post-development site. The required water quality volume required for the project is calculated below based on the post-development impervious area:

$$WQV = 1\ \cancel{in}\ x\ \frac{1\ ft}{12\ \cancel{in}} x\ 4.276ac\ x\ 43{,}560ft^2 = \mathbf{15{,}522}\boldsymbol{ft^3}$$

∴ Water Quality Volume = 15,522 cubic feet

The underground infiltration systems have been sized to treat the required water quality volume and calculation are included in Section 6.0 of this Report.

A long-term pollution prevention plan complying with the requirements of Standard 4 is included in Section 4.0 of this Report.

2.05 Stormwater Standard 5 – Land Uses with Higher Potential Pollutant Loads

This standard is not applicable as the project site is not a land use with higher potential pollutant loads (LUHPPL).

2.06 Stormwater Standard 6 – Stormwater Discharges to a Critical Area

The project area is within a Zone II of a public water supply and has, therefore been designed with a water quality volume based on a 1.0-inch depth of rainfall over the site impervious area. Refer to Section 6.0 of this Report for TSS removal information.

2.07 Stormwater Standard 7 – Redevelopment Projects

This project is a new development and therefore has been designed to fully comply with the Stormwater Management Standards.

2.08 Stormwater Standard 8 – Sedimentation and Erosion Control Plan

Erosion and sedimentation controls are shown on the Project Plans. Additionally, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Section 3.0 of this Report.

2.09 Stormwater Standard 9 – Long Term Operation and Maintenance Plan

A Long-Term Operation and Maintenance Plan is included in Section 4.0 of this Report.

2.10 Stormwater Standard 10 – Illicit Discharges

There are no known illicit discharges on the project site and none are proposed.

2.11 Conclusion

The project has been designed in accordance with DEP Stormwater Management Standards and the Town of Wareham Zoning Bylaws. Through the construction of the aforementioned stormwater systems, the project will provide peak rate attenuation, TSS removal and groundwater recharge.

SECTION 3.0

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

3.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

This Section specifies requirements and suggestions for implementation of a Stormwater Pollution Prevention Plan (SWPPP) for **Woodland Cove, in Wareham, Massachusetts**. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The stormwater pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

1. Construction Trailers
2. Lay-down Areas
3. Equipment Storage Areas
4. Stockpile Areas
5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of stormwater from the construction site for the entire construction period has been filed **at least fourteen (14) days prior to construction**. It is the Contractor's responsibility to complete and file the NOI, unless otherwise determined by the project team.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

Erosion and Sedimentation Control

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- "National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (EPA Construction General Permit February 16, 2017).
- Massachusetts Stormwater Management Policy Handbook issued by the Massachusetts Department of Environmental Protection, January 2008.
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMP's presented herein should be used as a guide for erosion and sedimentation control and are not intended to be considered specifications for construction. The most important BMP is maintaining a rapid

construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the Contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMP's shall be maintained throughout the construction process.

CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner
Dakota Partners
1264 Main Street
Waltham, MA 02451

Contractor
To be determined

Environmental Consultant
BSC Group, Inc.
803 Summer Street
Boston, MA 02127

Contact: Dominic Rinaldi, P.E.
Phone: (617) 896–4386
Email: drinaldi@bscgroup.com

Qualified SWPPP Inspectors
To Be Determined

3.1 Procedural Conditions of the Construction General Permit (CGP)

The following list outlines the Stormwater Responsibilities for all construction operators working on the Project. The operators below agree through a cooperative agreement to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading and excavation construction activities must sign the appropriate certification statement required, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.

Once the SWPPP is finalized, a signed copy, plus supporting documents, must be held at the project site during construction. A copy must remain available to EPA, State and Local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the US EPA unless the agency specifically requests a copy for review. SWPPP documents requested by a permitting authority, the permitee(s) will submit it in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMP's and Stormwater controls operating correctly and maintained regularly.

Any additions to the project which will significantly change the anticipated discharges of pollutants, must be reported to the EPA. The EPA should also be notified in advance of any anticipated events of noncompliance. The permitee must also orally inform the EPA of any discharge, which may endanger health or the environment within 24 hours, with a written report following within 5 days.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three (3) years after the project is complete.

3.2 Existing Site and Soil Conditions

The total project area is approximately 8.63 acres and is located at 3104 Cranberry Highway. The project is bounded on the north by a parcel deeded to Onset Fire District, bounded on the east by residential properties, bounded on the south by Cranberry Highway (Route 6 & 28), and bounded on the west by residential properties.

The NRCS Web Soil Survey, has identified three primary soil classifications underlying the project site. The soil map unit classified as 259B accounts for nearly 90% of the project site which is generally a well-draining soil with high infiltration rates. The remaining 10% of the soils are on previously developed land along Route 6 & 28 and are classified as urban land. Test pits were performed by BSC Group in April, 2017, confirming the NRCS soil classifications for this property, and as such, have been modeled as Hydrologic Soil Group A.

3.3 Project Description and Intended Construction Sequence

The site is currently comprised of woods and sandy topsoil. The proposed activities will include the following major components:

- The construction of six (6) multi-family housing buildings and a community building,
- The construction of stormwater management systems, and
- Site grading, utility installation, and three bio-retention areas.

The proposed project will disturb a total of approximately 376,053± S.F. (8.633± acres).

Soil disturbing activities will include site demolition, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, storm drain inlets, stormwater management systems, utilities, building foundations, construction of site driveways and preparation for final landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMP's associated with project timetable and construction-phasing elements is provided in this Erosion and Sediment Control Plan.

Table 1 – Anticipated Construction Timetable

Construction Phasing Activity	Anticipated Timetable
Demolition, Grubbing and Stripping of Limits of Construction Phase	To be determined
Rough Site Grading and Site Utilities	To be determined
Utility Plan Construction	To be determined
Landscaping	To be determined

3.4 Potential Sources of Pollution

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of the SWPPP. Listed below are a description of potential sources of pollution from both sedimentation to Stormwater runoff, and pollutants from sources other than sedimentation.

Table 2 – Potential Sources of Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Construction Site Entrance and Site Vehicles	Vehicles leaving the site can track soils onto public roadways. Site Vehicles can readily transport exposed soils throughout the site and off-site areas.
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas.
Material Excavation, Relocation, and Stockpiling	Stockpiling of materials during excavation and relocation of soils can contribute to erosion and sedimentation. In addition, fugitive dust from stockpiled material, vehicle transport and site grading can be deposited in wetlands and waterway.
Landscaping Operations	Landscaping operations specifically associated with exposed soils can contribute to erosion and sedimentation. Hydroseeding, if not properly applied, can runoff to adjacent wetlands and waterways.

Table 3 – Potential Pollutants and Sources, other than Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Staging Areas and Construction Vehicles	Vehicle refueling, minor equipment maintenance, sanitary facilities and hazardous waste storage
Materials Storage Area	General building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
Construction Activities	Construction, paving, curb/gutter installation, concrete pouring/mortar/stucco

3.5 Erosion and Sedimentation Control Best Management Practices

All construction activities will implement Best Management Practices (BMP's) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMP's. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

3.6 Timetable and Construction Phasing

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.
- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left unstabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

Demolition, Grubbing and Stripping of Limits of Construction Phase

- Install Temporary Erosion Control (TEC) devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or haybales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all pavement and building demolition debris as indicated in accordance with all applicable local, state, and federal regulations.

Driveway Area Sub-Base Construction

- Install temporary culverts and diversion ditches and additional TEC devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder coat starting from the downhill end of the site and work toward the top.

Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top coat of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.
- Remove TEC devices only after permanent vegetation and erosion control has been fully established.

3.7 Site Stabilization

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or haybale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, haybales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, haybale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4" of loam placed before seeded and mulched.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3 to 1.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Stormwater Collection System Installation

- The Stormwater drainage system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.

Completion of Paved Areas

- During the placement of sub-base and pavement, the entrance to the Stormwater drainage systems shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

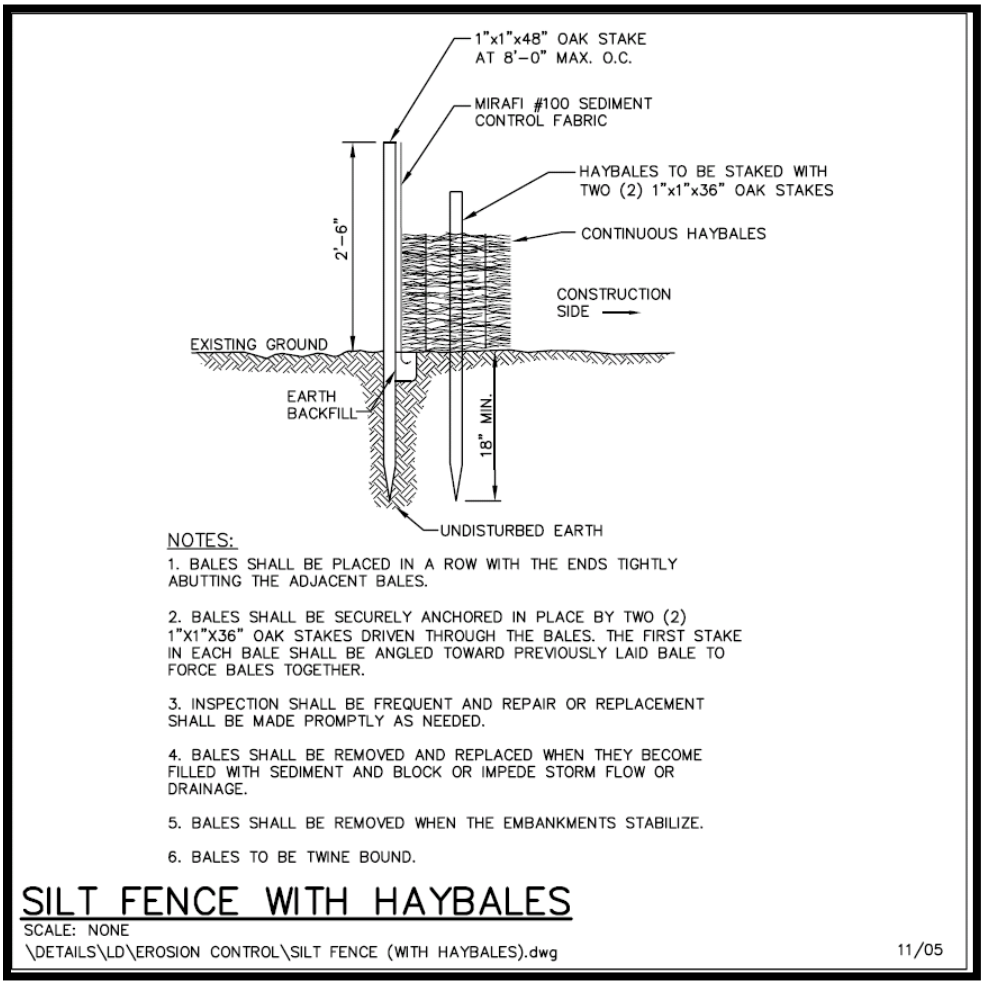
- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall be stabilized within 14 days from the last construction activity, except when construction activity will resume within 21 days (e.g., the total time period that construction activity is temporarily ceased is less than 21 days).
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

3.8 Temporary Structural Erosion Control Measures

Temporary erosion control measures serve to minimize construction-associated impacts to wetland resource and undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

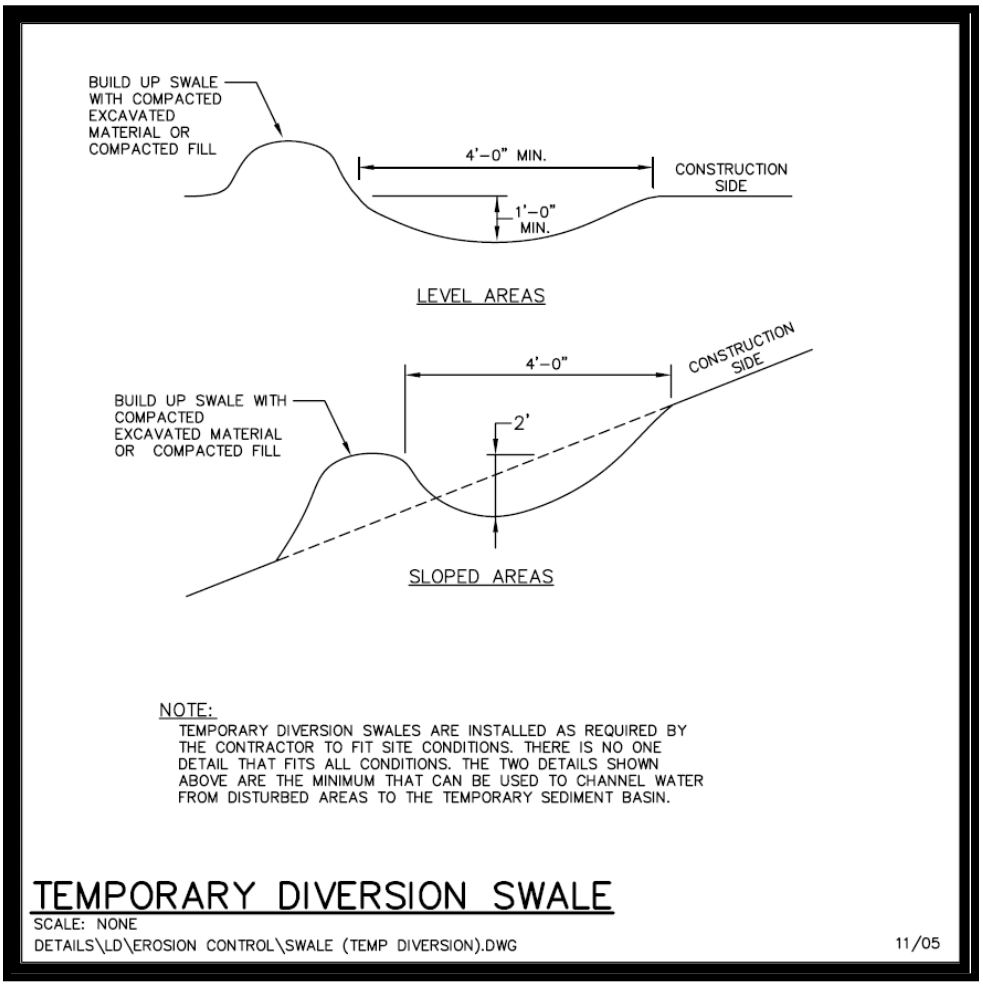
3.8.1 Silt Socks, Haybales, and Silt Fencing

The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the adjacent wetlands or undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.



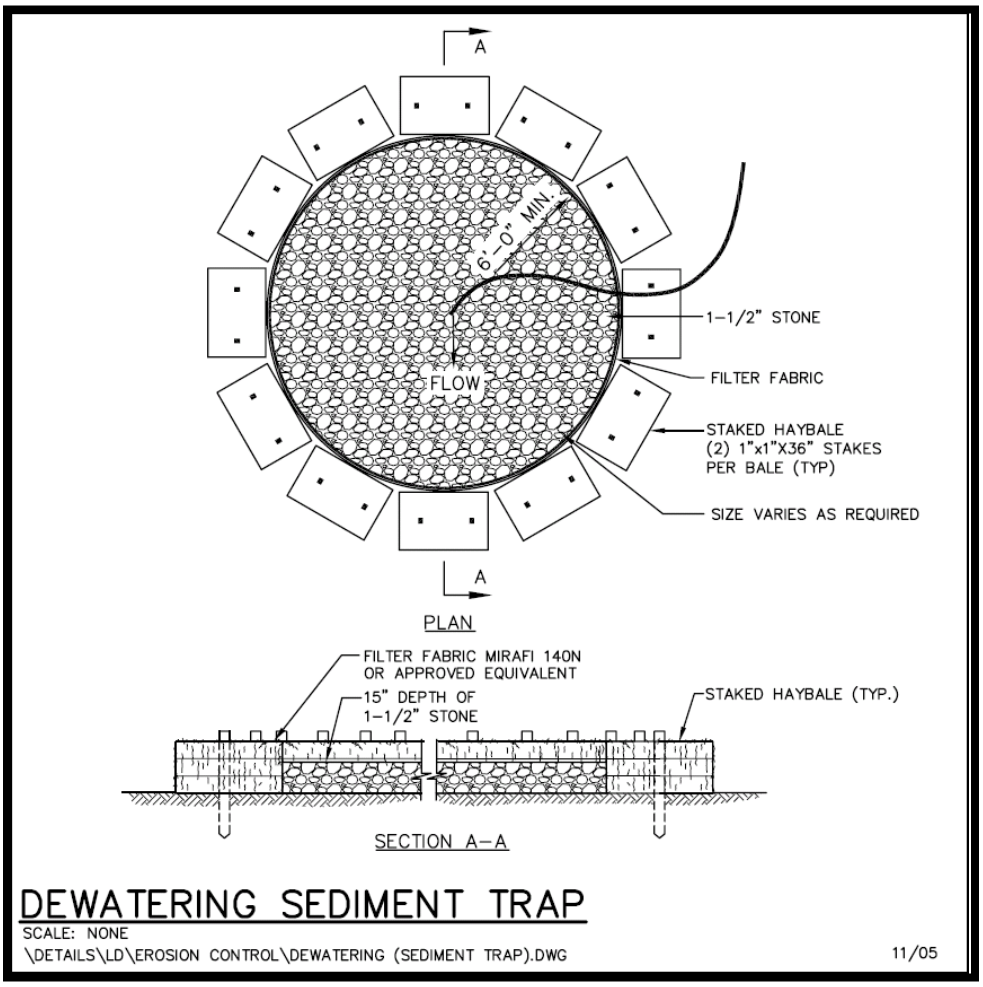
3.8.2 Temporary Stormwater Diversion Swale

A temporary diversion swale is an effective practice for temporarily diverting stormwater flows and to reduce stormwater runoff velocities during storm events. The swale channel can be installed before infrastructure construction begins at the site, or as needed throughout the construction process. The diversion swale should be routinely compacted or seeded to minimize the amount of exposed soil.



3.8.3 Dewatering Basins

Dewatering may be required during stormwater system, foundation construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.



3.8.4 Material Stockpiling Locations

Piping and trench excavate associated with the subsurface utility work will be contained with a single row of silt socks and/or haybales.

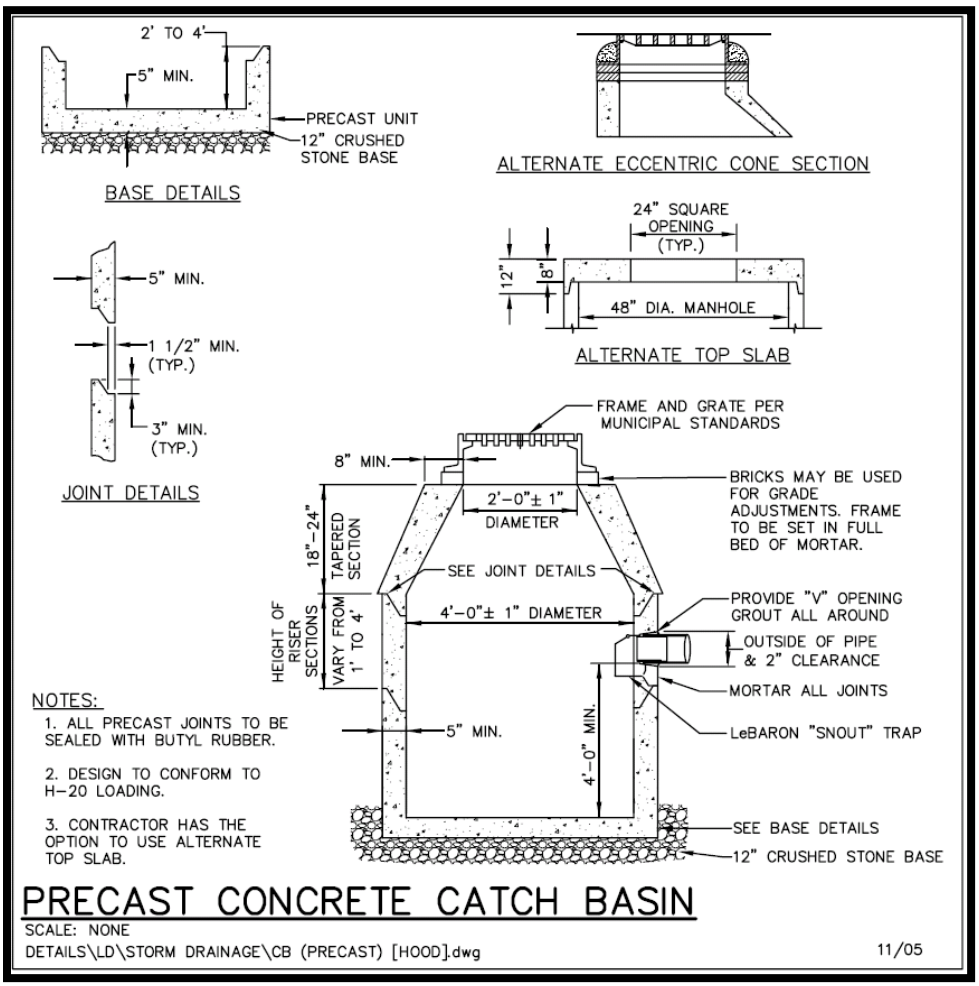
3.9 Permanent Structural Erosion Control Measures

Permanent erosion control measures serve to minimize post-construction impacts to wetland resource areas and undisturbed areas. Please refer to the following sections for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

3.9.1 Catch Basins with Deep Sumps and Hooded Traps

Driveways will be bermed (or curbed) and provided with catch basins to collect runoff. The entire drainage system for each respective project phase will be installed during the initial phases of construction. The collection system will be installed from the downstream end up, and in a manner which will not allow runoff from disturbed areas to enter the pipes.

The catch basins will be inspected and cleaned as necessary (sediment depth of 12") at least two times per year. The optimum time for cleaning is during the period just after the snowmelt of late winter and prior to the onset of heavy spring precipitation. All sediments and hydrocarbons will be properly handled and disposed of in accordance with local state and federal guidelines and regulations.



3.10 Good Housekeeping Best Management Practices

3.10.1 Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with

a properly secured tarp before the hauler exits the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly so as to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Two temporary sanitary facilities (portable toilets) will be provided at the site in the combined staging area. The toilets will be away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

3.10.2 Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well-organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

3.10.3 Designated Washout Areas

Designated temporary, below-ground concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

3.10.4 Equipment/Vehicle Maintenance and Fueling Areas

Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging

and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

3.10.5 Equipment/Vehicle Wash down Area

All equipment and vehicle washing will be performed off-site.

3.10.6 Spill Prevention Plan

A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction. Should there be an accidental release of petroleum product into a resource area, the appropriate agencies will be immediately notified.

3.10.7 Inspections

Maintenance of existing and proposed BMP's to address stormwater management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of stormwater or non-stormwater discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.

Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days and within 24-hours after a storm event of greater than one-quarter inch, in accordance with the CGP. The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

3.10.8 Amendment Requirements

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.
- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.

- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.
- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

3.11 SWPPP Inspection and Maintenance Report

The following form is an example to be used for SWPPP Inspection Reporting.

Stormwater Construction Site Inspection and Maintenance Report

TO BE COMPLETED AT LEAST EVERY 7 DAYS AND WITHIN 24 HOURS OF A STORM EVENT OF AT LEAST 0.25 INCHES. AFTER SITE STABILIZATION, TO BE COMPLETED AT LEAST ONCE PER MONTH FOR THREE YEARS OR UNTIL A NOTICE OF TERMINATION IS FILED (IF APPLICABLE).

General Information			
Project Name	Woodland Cove		
NPDES Tracking No. (if applicable)		**Location**	3104 Cranberry Highway Wareham, MA
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	**BMP Installed?**	**BMP Maintenance Required?**	**Corrective Action Needed and Notes Action required by whom and when**
1	Catch Basin Protection	❑Yes ❑No	❑Yes ❑No	
2	Haybale & Silt Fencing	❑Yes ❑No	❑Yes ❑No	
3	Straw Wattles	❑Yes ❑No	❑Yes ❑No	
4	Construction Entrance	❑Yes ❑No	❑Yes ❑No	
5	Sediment Basins	❑Yes ❑No	❑Yes ❑No	
6	Dewatering Pit	❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	Vehicle Maintenance not allowed on site
10	Are materials that are potential stormwater	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
	contaminants stored inside or under cover?			
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____
(Qualified Person Performing the Inspection)

Signature:_____ **Date:** _____

Print name and title: _____
(Contractor/Operator)

Signature:_____ **Date:**_____

SECTION 4.0

LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

4.0 LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

As required by Standard #4 of the Stormwater Management Policy, this Long-Term Pollution Prevention Plan has been developed for source control and pollution prevention at the site after construction.

MAINTENANCE RESPONSIBILITY

Ensuring that the provisions of the Long-Term Pollution Prevention Plan are followed will be the responsibility of The Applicant, Dakota Partners.

GOOD HOUSEKEEPING PRACTICES

The site to be kept clean of trash and debris at all times. Trash, junk, etc. is not to be left outside.

VEHICLE WASHING CONTROLS

The following BMP's, or equivalent measures, methods or practices are required if you are engaged in vehicle washing and/or steam cleaning:

> It is allowable to rinse down the body or a vehicle, including the bed of a truck, with just water without doing any wash water control BMP's.
>
> If you wash (with mild detergents) on an area that infiltrates water, such as gravel, grass, or loose soil, it is acceptable to let the wash water infiltrate as long as you only wash the body of vehicles.
>
> However, if you wash on a paved area and use detergents or other cleansers, or if you wash/rinse the engine compartment or the underside of vehicles, you must take the vehicles to a commercial vehicle wash.

REQUIREMENTS FOR ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BMPS

All stormwater BMPs are to be inspected and maintain as follows;

Haybales, Silt Fence, and other temporary measures

The temporary erosion control measures will be installed up gradient of any wetland resource area where any disturbance or alteration might otherwise allow for erosion or sedimentation. They will be regularly inspected to ensure that they are functioning adequately. Additional supplies of these temporary measures will be stockpiled on site for any immediate needs or routine replacement.

Deep Sump Hooded Catch Basins

Regular maintenance is essential. Catch basins remain effective at removing pollutants only if they are cleaned out frequently. Inspect or clean basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of the deposits in the catch basin sump is greater than or equal to one half the depth form the bottom of the invert of the lowest pipe in the basin.

Water Quality Treatment Units

The water quality treatment structures require periodic inspection and cleaning to maintain operation and function. Owners should have these units inspected on a semi-annual basis and after periods of intense precipitation. Inspections can be done by using a clear Plexiglas tube ("sludge judge") to extract a water column sample. When sediment accumulation reaches 15% of storage capacity, cleaning of the unit is required.

These water quality structures must and will be checked and cleaned immediately after petroleum spills; contact appropriate regulatory agencies.

Maintenance of these units should be done by a vacuum truck that will remove the water, sediment, debris, floating hydrocarbons and other materials in unit. Proper cleaning and disposal of the removed materials and liquid must be followed.

Underground Infiltration System

Maintenance is required for the proper operation of the underground infiltration system. Infiltration systems are prone to failure due to clogging if the upstream water quality units are not maintained. The use of pretreatment BMPs will minimize failure and maintenance requirements.

After construction, the infiltration system shall be inspected after every major storm for the first few months to ensure proper stabilization and function. Water levels in the access ports shall be recorded over several days to check the drainage of the systems. It is recommended that a log book be maintained showing the depth of water in the detention/infiltration systems at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the detention/infiltration have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

Preventive maintenance on the infiltration system shall be performed at least twice a year, and sediment shall be removed from any and all pretreatment and collection structures. Sediment shall be removed when deposits approach within six inches of the invert heights of connecting pipes between unit rows, or in sumped inlet structures. Ponded water inside the systems (as visible from the access ports) that remains after several days most likely indicates that the bottom of the systems are clogged and will require cleaning or replacement.

The system is designed with a defined top portal area at the "down-flow" end of the chamber that can be cut out to accept up to a 10-inch diameter riser pipe. The 10-inch riser can be used as an observation well and as access for a vacuum truck tube for use in removing sediment. The "down flow" ends of the units have end walls that are closed on the bottom. The closed bottom functions like a coffer dam, with most of the sediment depositing prior to flowing into the next chamber, facilitating its removal through the riser pipe, which is positioned directly above this area.

Bio-Retention Area

Bio-retention areas require routine maintenance to ensure that the system functions well as a stormwater BMP and maintains an aesthetic element. A landscaping contractor working elsewhere on the site can complete maintenance tasks in many cases.

Systems require careful attention while plants are being established and seasonal landscaping thereafter. Proper selection of plant species and support during establishment of vegetation should minimize—if not eliminate—the need for fertilizers and pesticides.

Bio-retention areas should be inspected on a semi-annual basis and after major storm events. The system should be inspected monthly for erosion. Eroded areas shall be repaired by reseeding or mulching as necessary. Vegetated areas should be properly maintained and mowed to a height of 2-inches. Accumulated litter and debris should be periodically removed to ensure that the storage areas will function properly. Outlet structures should be inspected periodically and after every storm to ensure that the outlet is functioning properly. Paved surfaces directed to the bio-retention area should be cleaned periodically to remove litter, debris, and vehicle-generated residues and other non-point source pollutants to provide increased pollution control.

Vegetation should be inspected twice per year, at the beginning and end of the growing season. Dead and diseased vegetation should be removed and replaced. Weeds and invasive species should be removed and woody vegetation should be pruned as necessary.

Pre-treatment devices, inflow locations, and overflows should be inspected annually to ensure proper functioning. Any sediment build-up should be removed.

Pipe Outlet Protection

The outlet protection should be checked at least annually and after every major storm. If the rip-rap has been displaced, undermined or damaged, it should be repaired immediately. The channel immediately below the outlet should be

checked to see that erosion is not occurring. The downstream channel should be kept clear of obstructions such as fallen trees, debris, and sediment that could change flow patterns and/or tailwater depths on the pipes. Repairs must be carried out immediately to avoid additional damage to the outlet protection apron.

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS AND OTHER LANDSCAPE AREAS

Suggested Maintenance Operations

A. Trees and Shrubs

Disease and Pest Management - Prevention of disease or infestation is the first step of Pest Management. A plant that is in overall good health is far less susceptible to disease. Good general landscape maintenance can reduce problems from disease.

Inspections of plant materials for signs of disease or infestation are to be performed monthly by the Landscape Maintenance Contractor's Certified Arborist. This is a critical step for early diagnosis. Trees and Shrubs that have been diagnosed to have a plant disease or an infestation of insect pests are to be treated promptly with an appropriate material by a licensed applicator.

Fertilization - Trees and shrubs live outside their natural environment and should be given proper care to maintain health and vigor. Fertilizing trees and shrubs provides the plants with nutrients needed to resist insect attack, to resist drought and to grow thicker foliage. Fertilizing of new and old trees may be done in one of three ways, in either the early spring or the late fall.

- Systemic Injection of new and existing trees on trees 2 inches or greater in diameter. You must be licensed to apply this method.
- Soil Injection – a liquid fertilizer with a product such as Arbor Green or Rapid Grow injected into the soil under the drip zone of a tree or shrub. Material must be used according to manufacturers' specifications to be effective. Outside contracting is recommended.
- Punch Bar Method – a dry fertilizer such as 10-10-10, may be used by punched holes in the drip zone of the tree 12-18" deep, two feet apart around the circumference, to the edge of the drip line. Three pounds of fertilizer should be used per diameter inch for trees with trunks six inches or more in diameter.
- Fertilizer of shrubs – use a fertilizer such as 10-10-10, broadcast over the planting area according to the manufacturers' rate and water in.
- All fertilization must be noted on daily maintenance log.

Watering - Trees and Shrubs will need supplemental watering to remain in vigorous health. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Trees and shrubs should be watered in such a manner as to totally saturate the soil in the root zone area. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

Plant Replacement - Unhealthy plants that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the daily maintenance log. The area shall be treated to prevent further infestation. The plant shall then be replaced with a healthy specimen of the same species and size. This work shall have a pre-established budget allowance for the year.

A spring inspection of all plant materials shall be performed to identify those plant materials that are not in vigorously healthy condition. Unhealthy plant materials shall be evaluated. If the problem is determined to be minor the plant material shall be given appropriate restorative care in accordance with this maintenance guideline until it is restored to a vigorously healthy condition. Unhealthy plant materials that do not respond to restorative care or are determined to be beyond saving shall be replaced with a healthy specimen of the same species and size. In the case of the necessity of replacing extremely large plant materials the Landscape Architect shall determine the size of the replacement plant.

Pruning - Proper pruning is the selective removal of branches without changing the plant's natural appearance, or habit of growth. All tree pruning is to be performed by a licensed Arborist. All branches that are dead, broken, scared or crossing should be removed. All cuts should be made at the collar and not cut flush with the base.

Pruning on the site shall be done for the following purposes;

- To maintain or reduce the size of a tree or shrub
- To remove dead, diseased or damaged branches
- To rejuvenate old shrubs and encourage new growth
- To stimulate future flower and fruit development
- To maximize the visibility of twig color
- To prevent damage and reduce hazards to people and properties

All shrubs are recommended to be pruned on an annual basis to prevent the shrub from becoming overgrown and eliminate the need for drastic pruning. There are several types of pruning for deciduous shrubs. Hand snips should be used to maintain a more natural look or hand shears can be used for a more formal appearance.

Winter Protection - All trees and shrubs are to be watered, fertilized, and mulched before the first frost. All stakes should be checked and ties adjusted. Damaged branches should be pruned.

Broadleaf and Coniferous Evergreen plant materials are to be sprayed with an anti-desiccant product to prevent winter burn. The application shall be repeated during a suitable mid-winter thaw.

Shrubs located in areas likely to be piled with snow during snow removal (but not designated as Snow Storage Areas) shall be marked by six-foot high poles with bright green banner flags. Stockpiles of snow are not to be located in these areas due to potential damage to the plant materials from both the weight of the snow and the snow melting chemicals.

At the fall landscape maintenance conference parameters will be discussed between the Landscape Maintenance Contractor and the snow removal contractor to assure minimal damage and loss of landscape amenities during the winter season.

Seasonal Clean Up - A thorough spring cleanup is to be performed. This includes the removal and replacement of dead or unhealthy plant materials and the cleanup of plant debris and any general debris that has accumulated over the winter season. Mulch is to be lightly raked to clean debris from the surface without removing any mulch. Twigs and debris are to be removed from the planting beds throughout the growing season.

Mulching - Planting beds shall be mulched with a treated shredded hardwood mulch free from dirt, debris, and insects. A sample of this mulch shall be given to the Owner for approval prior to installation.

Maintain a 2-3" maximum depth and keep free of weeds either by hand weeding or by the use of a pre-emergent weed control such as Treflan or Serfian. Seasonal re-mulching shall occur as necessary in the spring and the fall to maintain this minimum depth. When new mulch is added to the planting bed it shall be spread to create a total depth of no more than three inches. Edges should be maintained in a cleanly edged fashion.

Mulch shall not be placed directly against the trunk of any tree or shrub.

B. Groundcover and Perennials

Disease and Pest Management – Pesticides and herbicides should be applied only as problems occur, with the proper chemical applied only by a trained professional or in the case of pesticide, a Certified Pesticide Applicator. Plants should be monitored weekly and treated accordingly.

Fertilizer – The health of the plants can be maintained or improved, and their growth encouraged by an application of complete fertilizer. Apply a fertilizer such as 4-12-4 as growth becomes apparent and before mulching. Apply to all groundcover and perennial planting areas by hand and avoid letting the fertilizer come in contact with the foliage, or use a liquid fertilizer and apply by soaking the soil. Apply according to the manufacturers' specifications.

Fertilization shall stop at the end of July.

Water – Groundcovers and Perennials will need supplemental watering in order to become established, healthy plants. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Until established, groundcovers and perennials should be watered in such a manner as to totally saturate the soil in the root zone area, to a depth of 6 inches. Once established, perennials shall continue to be watered as necessary to maintain them in a vigorous healthy condition. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Landscape Maintenance Contractor.

Replacement – Any unhealthy plant/s that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the landscape maintenance log. The area shall be treated to prevent further infestation. The plant/s shall then be replaced with healthy specimen/s of the same species and size. Old Forge shall have a pre-established budget allowance for this type of replacement, each year.

Plant material that is damaged as a result of other landscape maintenance activities, such as mowing, shall be replaced with healthy specimens of the same species and size, at no additional cost to the owner.

Deadheading – Perennials shall be checked on a weekly basis and dead-headed once flowers have faded or as necessary based on plant type and duration of flower. Spent flowers can be pinched off with the thumb and forefinger. Continue to remove all faded flowers until Fall. All associated debris shall be removed from site daily.

Staking – Upright-growing perennials need support especially when in flower. Use of bamboo stakes, galvanized wire hoops or mesh may be necessary for their support. Supports should be put in place before they have become too difficult to handle. The supports should not be taller than the mature height of the perennial plant.

Division of Perennials – Two or three-year-old perennials are easily divided in the spring if more plants are needed. To divide, cut out the entire section of plant to be divided, including roots. The larger divisions (those with three or more shoots), can be set out immediately in their permanent location, where they can be expected to bloom the same season. Smaller divisions are best planted in an out-of-the-way planting bed until the following autumn or spring, when they can be moved to their permanent location.

Weeding – All planting beds should be kept weed-free. Weed either by hand or with a pre-emergent herbicide such as Treflen used according to manufacturers' specifications. Manual weeding is to be used in combination with the use of spot applications of herbicides. Both live and dead weeds are to be pulled and removed from the site.

All herbicide applications shall be documented in the Landscape Maintenance Log. The actual product label or the manufacturer's product specification sheet for the specific product shall also be included in the Log.

Only personnel with appropriate applicator licenses shall supervise and/or perform the application of pesticide products requiring a license.

Winterizing – Perennial gardens should be cleaned-up when growth ceases in the fall. Remove foliage of plants that normally die down to the ground. Divide and replant over-grown clumps.

C. Lawn Areas - Turf Systems

Mowing – Proper mowing is an integral part of any good turf maintenance program. Without it, the finest in fertilization, watering and other vital maintenance practices would be completely ineffective. Proper mowing will help control dicot weeds; help the turf survive during periods of extreme heat, and gain strength and vigor to resist disease and other infestations.

Mowing height – The proper mowing height will vary somewhat according to the type of grass. The most common type of seed & sod lawns contain a mixture of bluegrass, fine fescue and perennial rye, which should be mowed at 2-3 inches.

Mowing frequency – The basic rule of thumb for mowing frequency is to never remove more than 1/3 of the grass blade in one mowing. Example: if you want to mow your turf at 2 inches, you should cut it when it reaches 3 inches. Removing more than ½ of the grass plant at a time can put the plant into shock, thus making it more susceptible to stress disease and weed infestation.

Mowing frequency will vary with the growing season and should be set by the plant height and not a set date. It will often be necessary to mow twice a week during periods of surge growth to help maintain plant health and color. Mowing should be cut back during periods of stress.

Grass clippings should be removed whenever they are thick enough to layer the turf. The return of clippings to the soil actually adds nutrients and helps retain moisture. Heavily clumped grass clippings are a sign of infrequent mowing, calling for an adjustment in the mowing schedule.

When mowing any area, try to alternate mowing patterns. This tends to keep grass blades more erect and assures an even cut. A dull mower will cause color loss due to tearing of the turf plant, and since mowing will ultimately determine the appearance of any turf area there is an absolute necessity for a clean sharp cut.

Weed & Pest Control and Fertilizing- In order to maintain turf grass health, vigor color, and nutrients, fertilizer must be added to the soil. Recommendations for fertilization of lawn areas are as follows; fertilize at the rate of one (1) pound of nitrogen per thousand square feet, per year is optimum. Fertilizer should be a balanced slow release, sulfur coated type fertilizer.

Weed Control - All turf areas will require some weed control, for both weed grasses and dicot weeds. Weeds should be treated at the appropriate time and with a material labeled for the target weed. Please refer to the fertilizer weed and pest schedule for timing.

Pest Control - All turf areas will require some pest control. Pests should be treated at the appropriate time with a material labeled for the target pest. Please refer to the fertilizer, weed and pest schedule for timing.

Lime - A common cause for an unhealthy lawn is acidic soil. When the pH is below the neutral range (between 6-7) vital plant nutrients become fixed in the soil and cannot be absorbed by the grass plant. Lime corrects an acid soil condition, supplies calcium for plant growth and improves air and water circulation. Limestone applied at the rate of 50 lbs. per thousand square feet will adjust the soil pH one point over a period of 6-9 months.

D. Fertilizer, Weed & Pest Control Schedule – Turf Systems

Spring - (April)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control
Late Spring - (June)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control Insect Control (if needed)
*Summer - (August)	Fertilize one (1) pound of nitrogen per 1,000 square feet Broadleaf weed control (if needed) Insect Control (if needed)

Fall - (September) Fertilize one (1) pound of nitrogen per 1,000 square feet

*Omit if area is not to be irrigated

Lawn Maintenance Task Schedule

MARCH (Weather permitting)
- Clean up winter debris, sand, leaves, trash etc.
- Re-edge mulch beds, maintain at 2-3" maximum.
- Fertilize plants
- Aerate and thatch turf (conditions permitting)

APRIL
- Reseed or sod all areas needing attention.
- Fertilize and weed control
- Lime
- Start mowing when grass reaches 2-1/2", mow to 2"

MAY
- Mow turf to 2-2-1/2"
- Weed as necessary.
- Check for disease and pest problems in both turf and plants.

JUNE
- Mow turf to 2-1/2" – 3"
- Fertilize and weed control.
- Weed
- Check for disease and pest problems in both turf and plants, treat as necessary.

PROVISIONS FOR SOLID WASTE MANAGEMENT (SITE TRASH)

Trash will be placed in on-site dumpsters and the Owner will make provisions for its regular and timely removal.

SNOW DISPOSAL AND PLOWING PLANS

The purpose of the snow and snowmelt management plan is to provide guidelines regarding snow disposal site selection, site preparation and maintenance that are acceptable to the Department of Environmental Protection. For the areas that require snow removal, snow storage onsite will largely be accomplished by using pervious areas along the shoulder of the roadway and development as windrowed by plows.

- Avoid dumping of snow into any water body, including rivers, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater basins. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.
- In significant storm events, the melting or off-site trucking of snow may be implemented. These activities shall be conducted in accordance with all local, state and federal regulations.

WINTER ROAD SALT AND/OR SAND USE AND STORAGE RESTRICTIONS

The applicant will be responsible for sanding and salting the site. No storage on site.

STREET SWEEPING SCHEDULES

There are three types of sweepers: Mechanical, Regenerative Air, and Vacuum Filter.

1) Mechanical: Mechanical sweepers use brooms or rotary brushes to scour the pavement.
2) Regenerative Air: These sweepers blow air onto the road or parking lot surface, causing fines to rise where they are vacuumed.
3) Vacuum filter: These sweepers remove fines along roads. Two general types of vacuum filter sweepers are available - wet and dry. The dry type uses a broom in combination with the vacuum. The wet type uses water for dust suppression

Regardless of the type chosen, the efficiency of street sweeping is increased when sweepers are operated in tandem.

This project has not included street sweeping as part of the TSS removal calculations. However, it is recommended that street sweeping of the parking areas occur four times a year, including once after the spring snow melt.

Reuse and Disposal of Street Sweepings

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Mass DEP's Bureau of Waste Prevention has issued a written policy regarding the reuse and disposal of street sweepings. These sweepings are regulated as a solid waste, and can be used in three ways:

- In one of the ways already approved by Mass DEP (e.g., daily cover in a landfill, additive to compost, fill in a public way)
- If approved under a Beneficial Use Determination
- Disposed in a landfill

TRAINING OF STAFF OR PERSONNEL INVOLVED WITH IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Long-Term Pollution Prevention Plan is to be implemented by property owner of the site. Trained and, if required, licensed Professionals are to be hired by the owner as applicable to implement the Long-Term Pollution Prevention Plan.

LIST OF EMERGENCY CONTACTS FOR IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The applicant will be required to implement the Long-Term Pollution Prevention Plan and will create and maintain a list of emergency contacts.

POST CONSTRUCTION PHASE INSPECTION SCHEDULE AND EVALUATION CHECKLIST

Inspection Date	Inspector	BMP Inspected	Inspection Frequency Requirements	Comments	Recommendation	Follow-up Inspection Required (yes/no)
		Catch Basin	Four times a year			
		Water Quality Units	Four times a year			
		Infiltration System	Twice a year			
		Bio-Retention Area	Twice a year			
		Pipe Outlet Protection	Once a year			

1. Refer to the Massachusetts Stormwater Handbook Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspections and maintenance of specific BMP's

2. Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

3. Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

4. Other Notes: (Include deviations from Conservation Commission Approvals, Planning Board Approvals and Approved Plans)

SECTION 5.0

HYDROLOGY CALCULATIONS

5.01 EXISTING WATERSHED PLAN

WOODLAND COVE

3104 CRANBERRY HIGHWAY
IN
WAREHAM
MASSACHUSETTS

EXISTING WATERSHED PLAN

AUGUST, 2017

REVISIONS:

NO.	DATE	DESC.

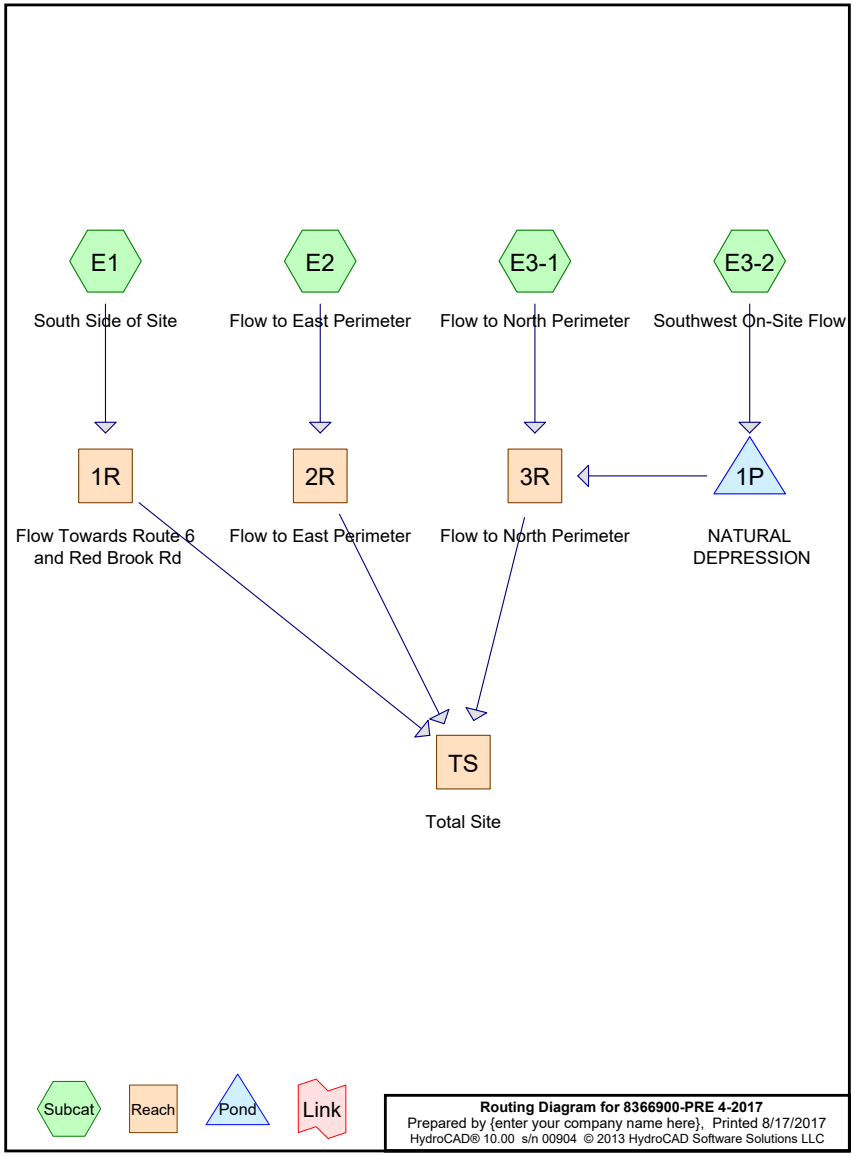
PREPARED FOR:
DAKOTA PARTNERS
1264 MAIN STREET
WALTHAM, MA 02451

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: NTS

FILE: 2017-08-10 PROP WS
DWG.:
JOB. NO: 8-3669.00
SHEET 1 OF 1

5.02 EXISTING HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.844	49	50-75% Grass cover, Fair, HSG A (E1)
2.738	68	<50% Grass cover, Poor, HSG A (E2, E3-1, E3-2)
0.040	96	Gravel surface, HSG A (E1)
0.375	98	Paved parking, HSG A (E1)
0.028	98	Roofs, HSG A (E3-2)
4.608	30	Woods, Good, HSG A (E1, E2, E3-1, E3-2)
8.633	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.633	HSG A	E1, E2, E3-1, E3-2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
8.633		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.844	0.000	0.000	0.000	0.000	0.844	50-75% Grass cover, Fair	E1
2.738	0.000	0.000	0.000	0.000	2.738	<50% Grass cover, Poor	E2, E3-1, E3-2
0.040	0.000	0.000	0.000	0.000	0.040	Gravel surface	E1
0.375	0.000	0.000	0.000	0.000	0.375	Paved parking	E1
0.028	0.000	0.000	0.000	0.000	0.028	Roofs	E3-2
4.608	0.000	0.000	0.000	0.000	4.608	Woods, Good	E1, E2, E3-1, E3-2
8.633	**0.000**	**0.000**	**0.000**	**0.000**	**8.633**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E1: South Side of Site Runoff Area=1.318 ac 28.45% Impervious Runoff Depth>0.70"
Tc=6.0 min CN=64 Runoff=0.88 cfs 0.077 af

Subcatchment E2: Flow to East Perimeter Runoff Area=1.483 ac 0.00% Impervious Runoff Depth>0.75"
Flow Length=398' Tc=14.8 min CN=65 Runoff=0.82 cfs 0.092 af

Subcatchment E3-1: Flow to North Perimeter Runoff Area=5.068 ac 0.00% Impervious Runoff Depth>0.01"
Flow Length=542' Tc=12.3 min CN=39 Runoff=0.01 cfs 0.004 af

Subcatchment E3-2: Southwest On-Site Flow Runoff Area=0.764 ac 3.66% Impervious Runoff Depth>0.07"
Flow Length=155' Tc=9.8 min CN=44 Runoff=0.01 cfs 0.004 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=0.88 cfs 0.077 af
Outflow=0.88 cfs 0.077 af

Reach 2R: Flow to East Perimeter Inflow=0.82 cfs 0.092 af
Outflow=0.82 cfs 0.092 af

Reach 3R: Flow to North Perimeter Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Reach TS: Total Site Inflow=1.45 cfs 0.173 af
Outflow=1.45 cfs 0.173 af

Pond 1P: NATURAL DEPRESSION Peak Elev=71.00' Storage=0 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Total Runoff Area = 8.633 ac Runoff Volume = 0.178 af Average Runoff Depth = 0.25"
95.33% Pervious = 8.230 ac 4.67% Impervious = 0.403 ac

Summary for Subcatchment E1: South Side of Site

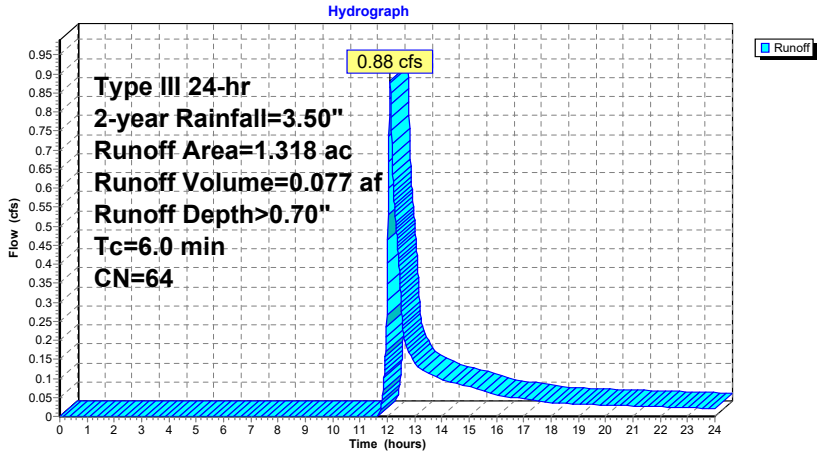
Runoff = 0.88 cfs @ 12.11 hrs, Volume= 0.077 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.059	30	Woods, Good, HSG A
0.844	49	50-75% Grass cover, Fair, HSG A
0.375	98	Paved parking, HSG A
0.040	96	Gravel surface, HSG A
1.318	64	Weighted Average
0.943		71.55% Pervious Area
0.375		28.45% Impervious Area

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

Subcatchment E1: South Side of Site



Summary for Subcatchment E2: Flow to East Perimeter

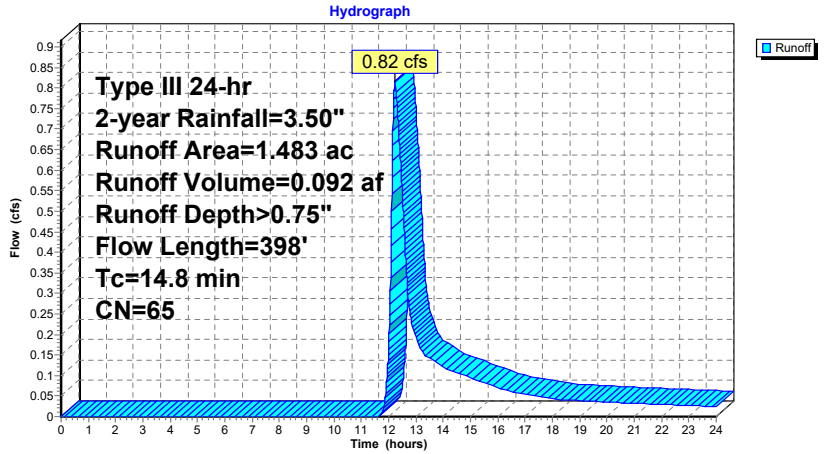
Runoff = 0.82 cfs @ 12.24 hrs, Volume= 0.092 af, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.109	30	Woods, Good, HSG A
1.374	68	<50% Grass cover, Poor, HSG A
1.483	65	Weighted Average
1.483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
3.0	348	0.0140	1.90		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
14.8	398	Total			

Subcatchment E2: Flow to East Perimeter



Summary for Subcatchment E3-1: Flow to North Perimeter

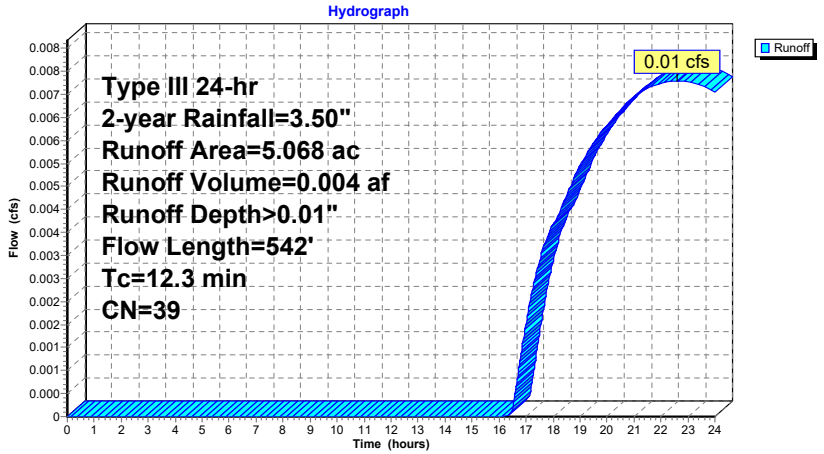
Runoff = 0.01 cfs @ 22.59 hrs, Volume= 0.004 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
3.932	30	Woods, Good, HSG A
1.136	68	<50% Grass cover, Poor, HSG A
5.068	39	Weighted Average
5.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.9	492	0.0300	2.79		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
12.3	542	Total			

Subcatchment E3-1: Flow to North Perimeter



Summary for Subcatchment E3-2: Southwest On-Site Flow

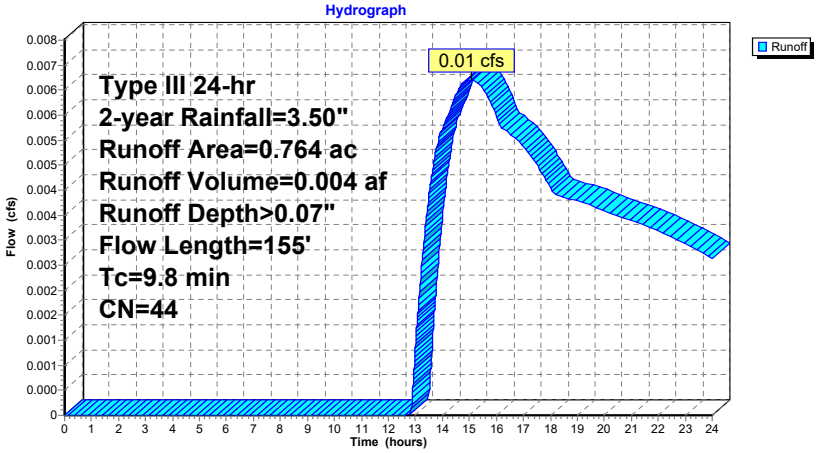
Runoff = 0.01 cfs @ 15.06 hrs, Volume= 0.004 af, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.508	30	Woods, Good, HSG A
0.228	68	<50% Grass cover, Poor, HSG A
0.028	98	Roofs, HSG A
0.764	44	Weighted Average
0.736		96.34% Pervious Area
0.028		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.4	105	0.0630	4.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.8	155	Total			

Subcatchment E3-2: Southwest On-Site Flow

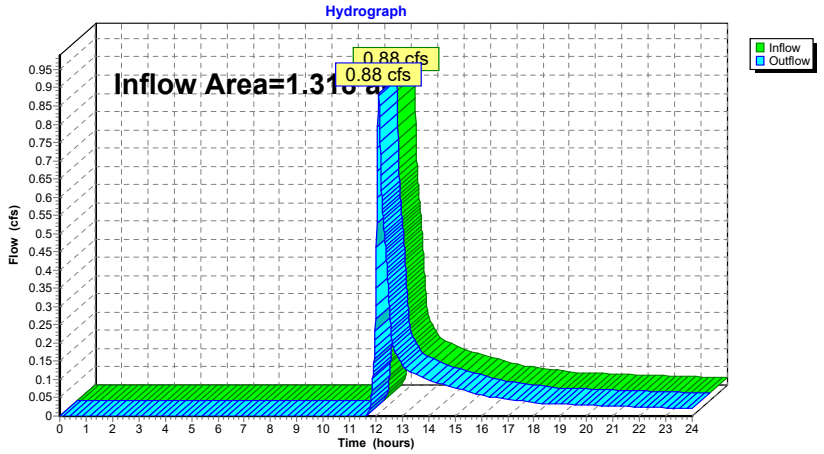


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.318 ac, 28.45% Impervious, Inflow Depth > 0.70" for 2-year event
Inflow = 0.88 cfs @ 12.11 hrs, Volume= 0.077 af
Outflow = 0.88 cfs @ 12.11 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

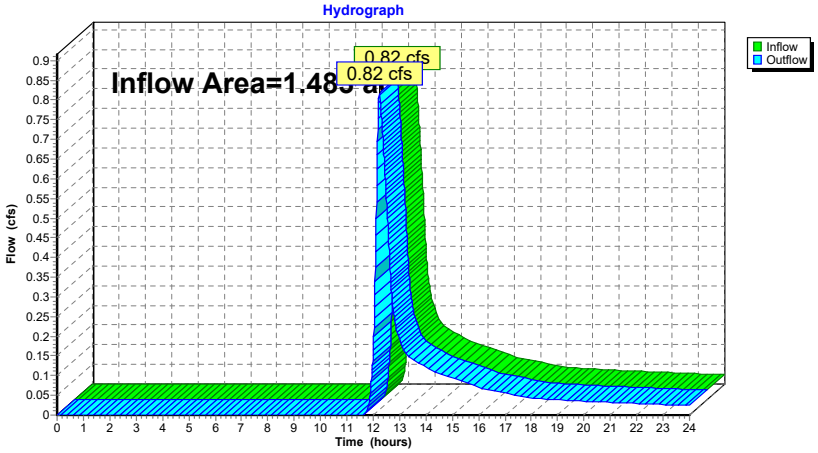


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth > 0.75" for 2-year event
Inflow = 0.82 cfs @ 12.24 hrs, Volume= 0.092 af
Outflow = 0.82 cfs @ 12.24 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

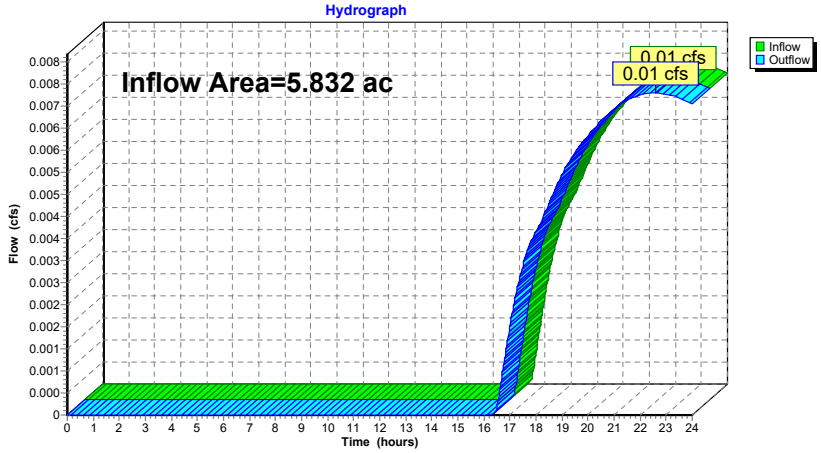


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 5.832 ac, 0.48% Impervious, Inflow Depth > 0.01" for 2-year event
Inflow = 0.01 cfs @ 22.59 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 22.59 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

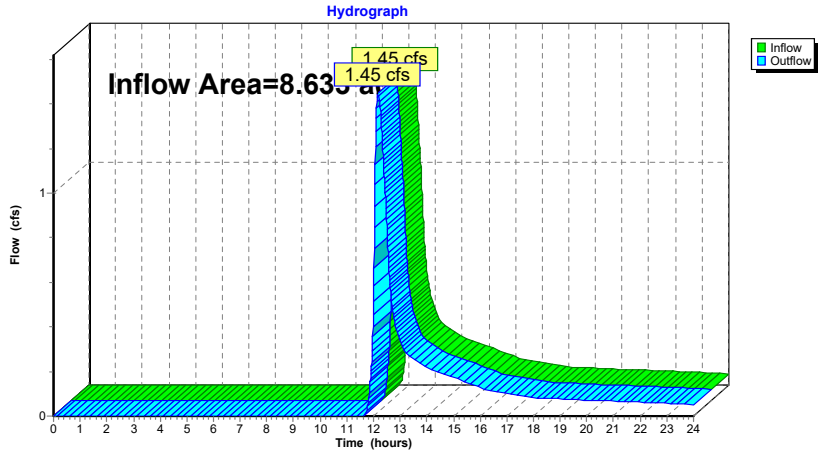


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 4.67% Impervious, Inflow Depth > 0.24" for 2-year event
Inflow = 1.45 cfs @ 12.15 hrs, Volume= 0.173 af
Outflow = 1.45 cfs @ 12.15 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: NATURAL DEPRESSION

Inflow Area = 0.764 ac, 3.66% Impervious, Inflow Depth > 0.07" for 2-year event
Inflow = 0.01 cfs @ 15.06 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 15.06 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 15.06 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.00' @ 0.00 hrs Surf.Area= 823 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	71.00'	2,662 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

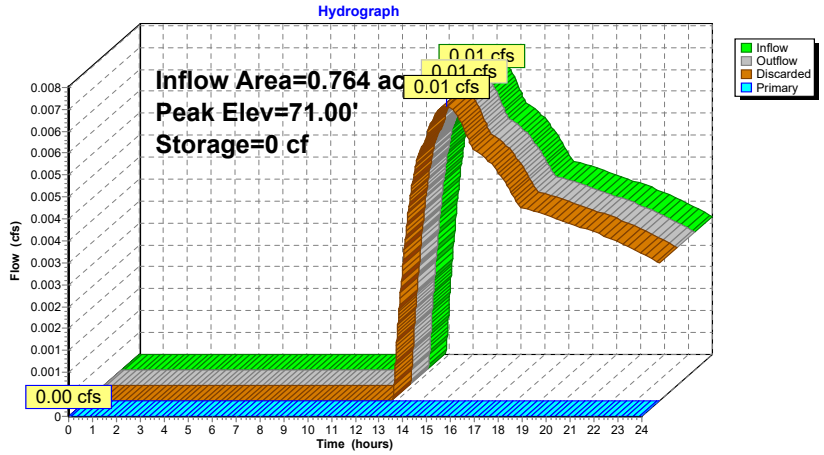
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.00	823	109.0	0	0	823
72.00	5,113	316.0	2,662	2,662	7,827

Device	Routing	Invert	Outlet Devices
#1	Discarded	71.00'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	71.90'	**33.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 15.06 hrs HW=71.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.30 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=71.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: NATURAL DEPRESSION



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E1: South Side of Site Runoff Area=1.318 ac 28.45% Impervious Runoff Depth>1.45"
Tc=6.0 min CN=64 Runoff=2.10 cfs 0.159 af

Subcatchment E2: Flow to East Perimeter Runoff Area=1.483 ac 0.00% Impervious Runoff Depth>1.52"
Flow Length=398' Tc=14.8 min CN=65 Runoff=1.88 cfs 0.187 af

Subcatchment E3-1: Flow to North Perimeter Runoff Area=5.068 ac 0.00% Impervious Runoff Depth>0.16"
Flow Length=542' Tc=12.3 min CN=39 Runoff=0.11 cfs 0.068 af

Subcatchment E3-2: Southwest On-Site Flow Runoff Area=0.764 ac 3.66% Impervious Runoff Depth>0.34"
Flow Length=155' Tc=9.8 min CN=44 Runoff=0.10 cfs 0.021 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=2.10 cfs 0.159 af
Outflow=2.10 cfs 0.159 af

Reach 2R: Flow to East Perimeter Inflow=1.88 cfs 0.187 af
Outflow=1.88 cfs 0.187 af

Reach 3R: Flow to North Perimeter Inflow=0.11 cfs 0.068 af
Outflow=0.11 cfs 0.068 af

Reach TS: Total Site Inflow=3.44 cfs 0.414 af
Outflow=3.44 cfs 0.414 af

Pond 1P: NATURAL DEPRESSION Peak Elev=71.00' Storage=0 cf Inflow=0.10 cfs 0.021 af
Discarded=0.10 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.021 af

Total Runoff Area = 8.633 ac Runoff Volume = 0.436 af Average Runoff Depth = 0.61"
95.33% Pervious = 8.230 ac 4.67% Impervious = 0.403 ac

Summary for Subcatchment E1: South Side of Site

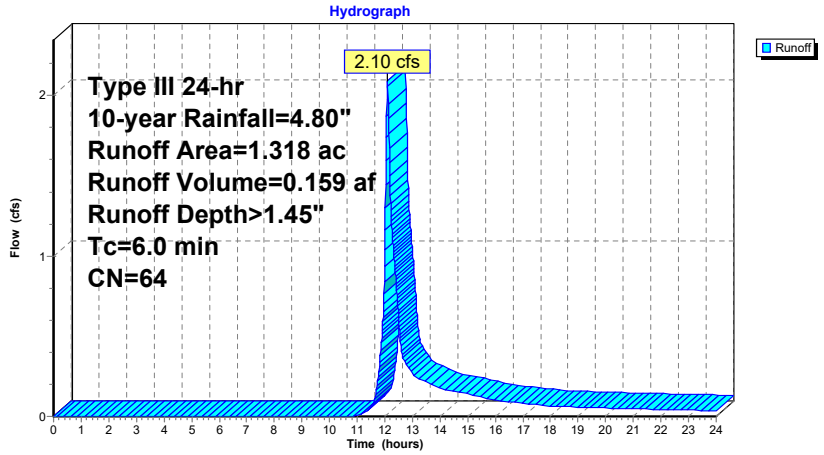
Runoff = 2.10 cfs @ 12.10 hrs, Volume= 0.159 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.059	30	Woods, Good, HSG A
0.844	49	50-75% Grass cover, Fair, HSG A
0.375	98	Paved parking, HSG A
0.040	96	Gravel surface, HSG A
1.318	64	Weighted Average
0.943		71.55% Pervious Area
0.375		28.45% Impervious Area

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

Subcatchment E1: South Side of Site



Summary for Subcatchment E2: Flow to East Perimeter

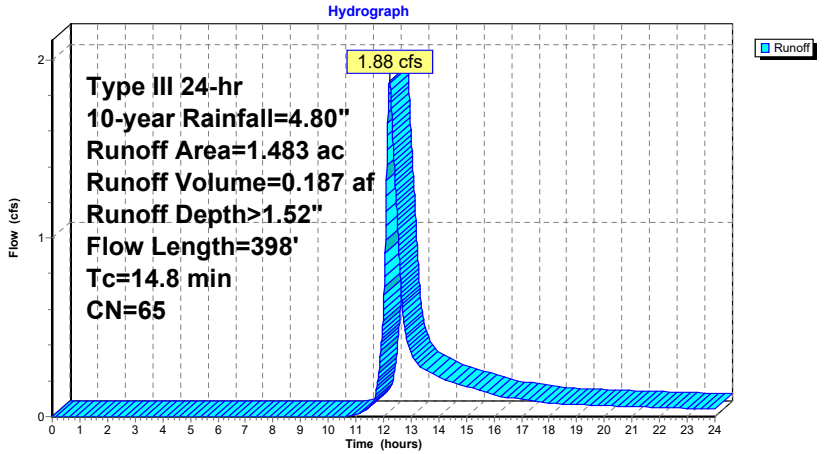
Runoff = 1.88 cfs @ 12.22 hrs, Volume= 0.187 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.109	30	Woods, Good, HSG A
1.374	68	<50% Grass cover, Poor, HSG A
1.483	65	Weighted Average
1.483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
3.0	348	0.0140	1.90		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
14.8	398	Total			

Subcatchment E2: Flow to East Perimeter



Summary for Subcatchment E3-1: Flow to North Perimeter

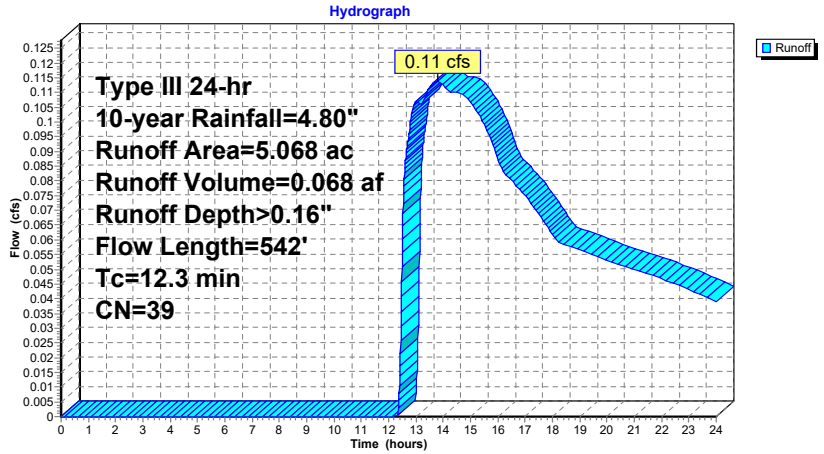
Runoff = 0.11 cfs @ 13.79 hrs, Volume= 0.068 af, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
3.932	30	Woods, Good, HSG A
1.136	68	<50% Grass cover, Poor, HSG A
5.068	39	Weighted Average
5.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.9	492	0.0300	2.79		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
12.3	542	Total			

Subcatchment E3-1: Flow to North Perimeter



Summary for Subcatchment E3-2: Southwest On-Site Flow

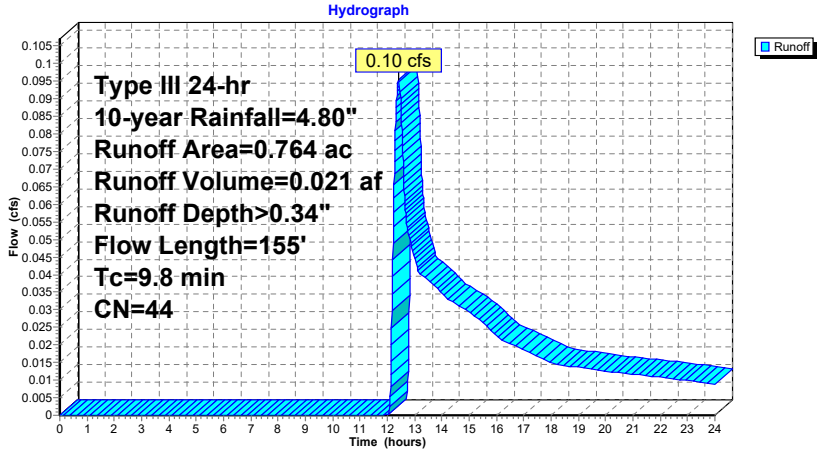
Runoff = 0.10 cfs @ 12.42 hrs, Volume= 0.021 af, Depth> 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.508	30	Woods, Good, HSG A
0.228	68	<50% Grass cover, Poor, HSG A
0.028	98	Roofs, HSG A
0.764	44	Weighted Average
0.736		96.34% Pervious Area
0.028		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.4	105	0.0630	4.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.8	155	Total			

Subcatchment E3-2: Southwest On-Site Flow

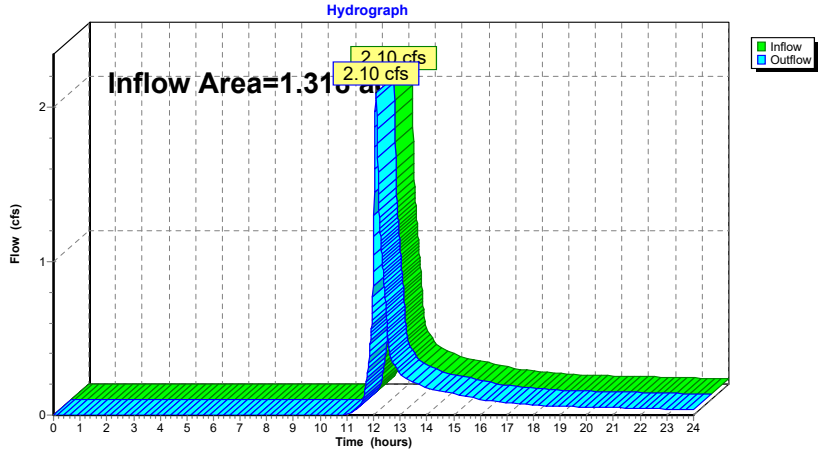


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.318 ac, 28.45% Impervious, Inflow Depth > 1.45" for 10-year event
Inflow = 2.10 cfs @ 12.10 hrs, Volume= 0.159 af
Outflow = 2.10 cfs @ 12.10 hrs, Volume= 0.159 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

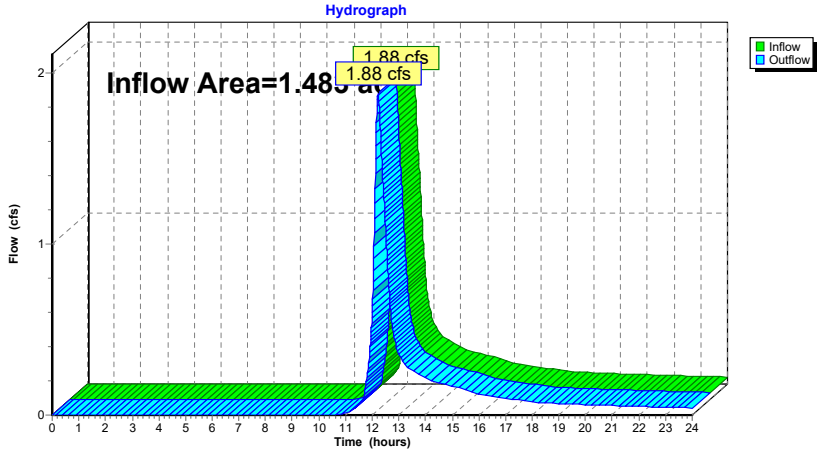


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth > 1.52" for 10-year event
Inflow = 1.88 cfs @ 12.22 hrs, Volume= 0.187 af
Outflow = 1.88 cfs @ 12.22 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

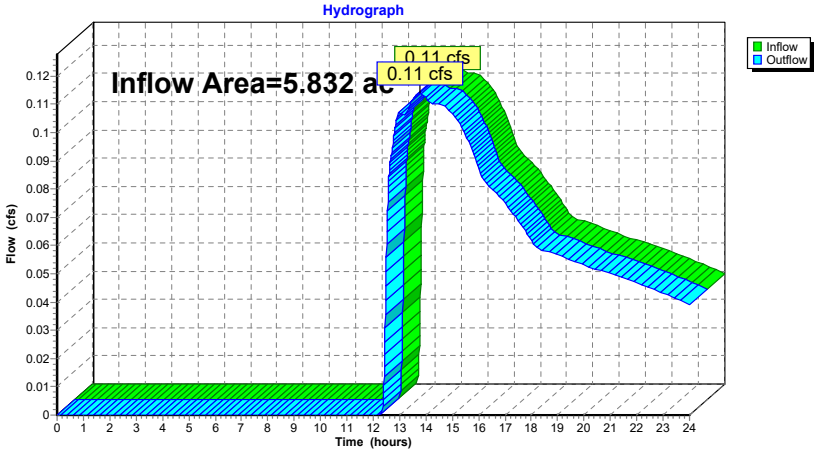


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 5.832 ac, 0.48% Impervious, Inflow Depth > 0.14" for 10-year event
Inflow = 0.11 cfs @ 13.79 hrs, Volume= 0.068 af
Outflow = 0.11 cfs @ 13.79 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

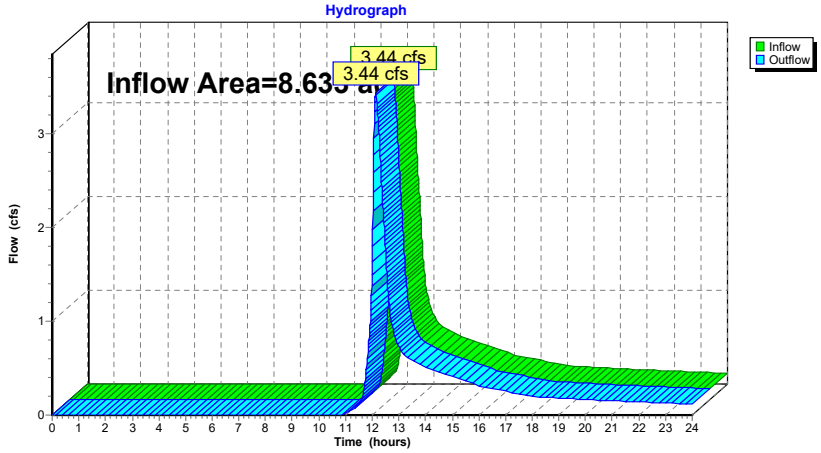


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 4.67% Impervious, Inflow Depth > 0.58" for 10-year event
Inflow = 3.44 cfs @ 12.13 hrs, Volume= 0.414 af
Outflow = 3.44 cfs @ 12.13 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: NATURAL DEPRESSION

Inflow Area = 0.764 ac, 3.66% Impervious, Inflow Depth > 0.34" for 10-year event
Inflow = 0.10 cfs @ 12.42 hrs, Volume= 0.021 af
Outflow = 0.10 cfs @ 12.42 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.10 cfs @ 12.42 hrs, Volume= 0.021 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.00' @ 0.00 hrs Surf.Area= 823 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	71.00'	2,662 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

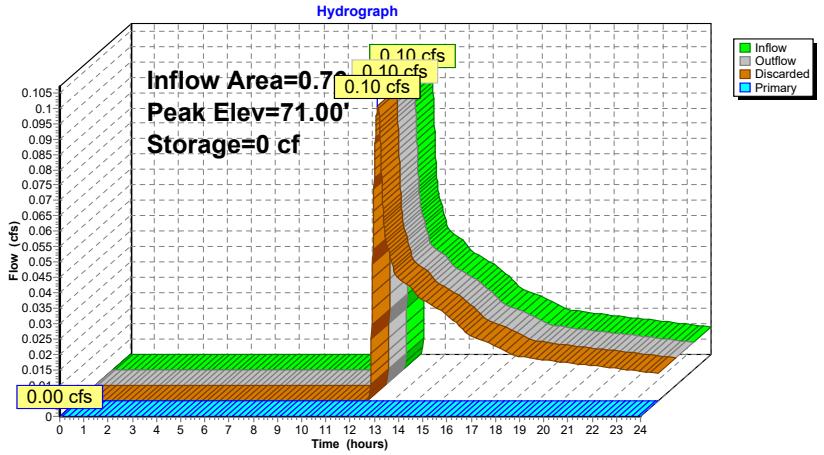
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.00	823	109.0	0	0	823
72.00	5,113	316.0	2,662	2,662	7,827

Device	Routing	Invert	Outlet Devices
#1	Discarded	71.00'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	71.90'	**33.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 12.42 hrs HW=71.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.30 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=71.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: NATURAL DEPRESSION



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E1: South Side of Site Runoff Area=1.318 ac 28.45% Impervious Runoff Depth>3.07"
Tc=6.0 min CN=64 Runoff=4.70 cfs 0.338 af

Subcatchment E2: Flow to East Perimeter Runoff Area=1.483 ac 0.00% Impervious Runoff Depth>3.17"
Flow Length=398' Tc=14.8 min CN=65 Runoff=4.15 cfs 0.392 af

Subcatchment E3-1: Flow to North Perimeter Runoff Area=5.068 ac 0.00% Impervious Runoff Depth>0.80"
Flow Length=542' Tc=12.3 min CN=39 Runoff=2.04 cfs 0.338 af

Subcatchment E3-2: Southwest On-Site Flow Runoff Area=0.764 ac 3.66% Impervious Runoff Depth>1.20"
Flow Length=155' Tc=9.8 min CN=44 Runoff=0.68 cfs 0.076 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=4.70 cfs 0.338 af
Outflow=4.70 cfs 0.338 af

Reach 2R: Flow to East Perimeter Inflow=4.15 cfs 0.392 af
Outflow=4.15 cfs 0.392 af

Reach 3R: Flow to North Perimeter Inflow=2.04 cfs 0.338 af
Outflow=2.04 cfs 0.338 af

Reach TS: Total Site Inflow=8.90 cfs 1.067 af
Outflow=8.90 cfs 1.067 af

Pond 1P: NATURAL DEPRESSION Peak Elev=71.17' Storage=182 cf Inflow=0.68 cfs 0.076 af
Discarded=0.48 cfs 0.076 af Primary=0.00 cfs 0.000 af Outflow=0.48 cfs 0.076 af

Total Runoff Area = 8.633 ac Runoff Volume = 1.143 af Average Runoff Depth = 1.59"
95.33% Pervious = 8.230 ac 4.67% Impervious = 0.403 ac

Summary for Subcatchment E1: South Side of Site

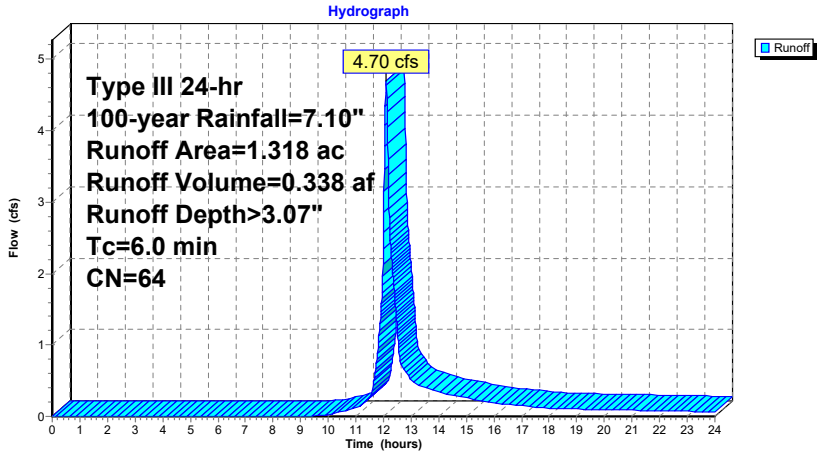
Runoff = 4.70 cfs @ 12.09 hrs, Volume= 0.338 af, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.059	30	Woods, Good, HSG A
0.844	49	50-75% Grass cover, Fair, HSG A
0.375	98	Paved parking, HSG A
0.040	96	Gravel surface, HSG A
1.318	64	Weighted Average
0.943		71.55% Pervious Area
0.375		28.45% Impervious Area

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

Subcatchment E1: South Side of Site



Summary for Subcatchment E2: Flow to East Perimeter

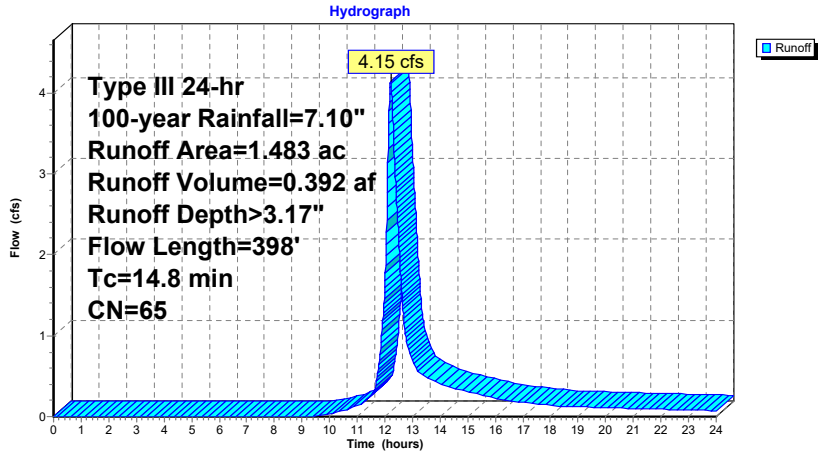
Runoff = 4.15 cfs @ 12.21 hrs, Volume= 0.392 af, Depth> 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.109	30	Woods, Good, HSG A
1.374	68	<50% Grass cover, Poor, HSG A
1.483	65	Weighted Average
1.483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
3.0	348	0.0140	1.90		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
14.8	398	Total			

Subcatchment E2: Flow to East Perimeter



Summary for Subcatchment E3-1: Flow to North Perimeter

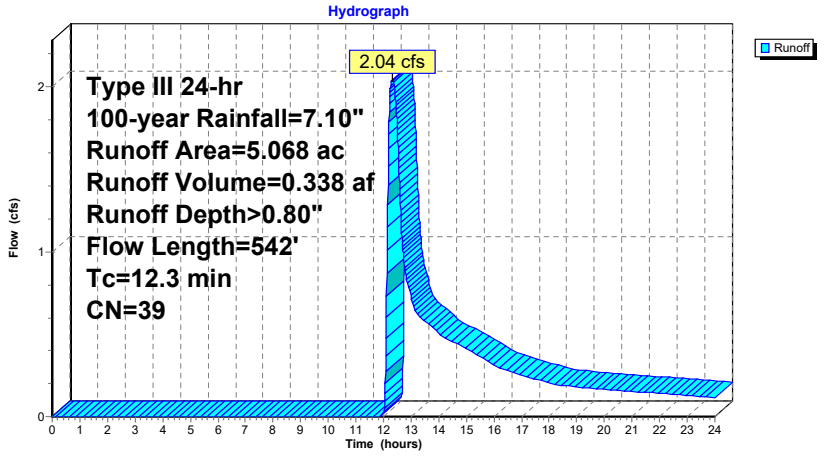
Runoff = 2.04 cfs @ 12.32 hrs, Volume= 0.338 af, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
3.932	30	Woods, Good, HSG A
1.136	68	<50% Grass cover, Poor, HSG A
5.068	39	Weighted Average
5.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.9	492	0.0300	2.79		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
12.3	542	Total			

Subcatchment E3-1: Flow to North Perimeter



Summary for Subcatchment E3-2: Southwest On-Site Flow

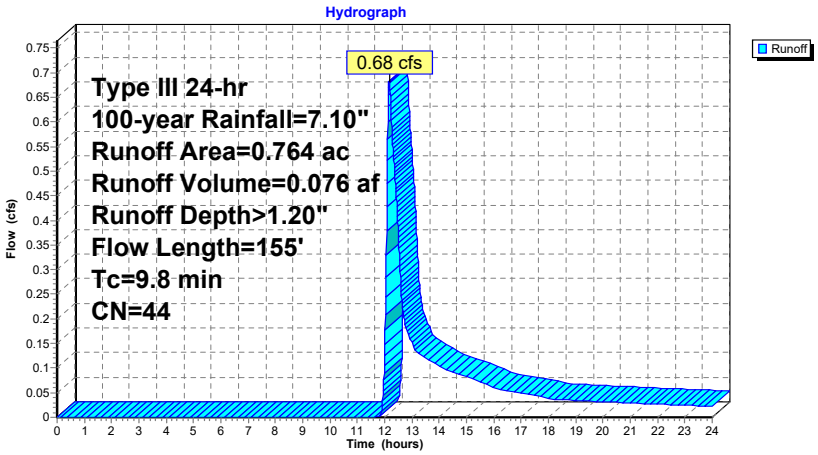
Runoff = 0.68 cfs @ 12.17 hrs, Volume= 0.076 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.508	30	Woods, Good, HSG A
0.228	68	<50% Grass cover, Poor, HSG A
0.028	98	Roofs, HSG A
0.764	44	Weighted Average
0.736		96.34% Pervious Area
0.028		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0350	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.4	105	0.0630	4.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.8	155	Total			

Subcatchment E3-2: Southwest On-Site Flow

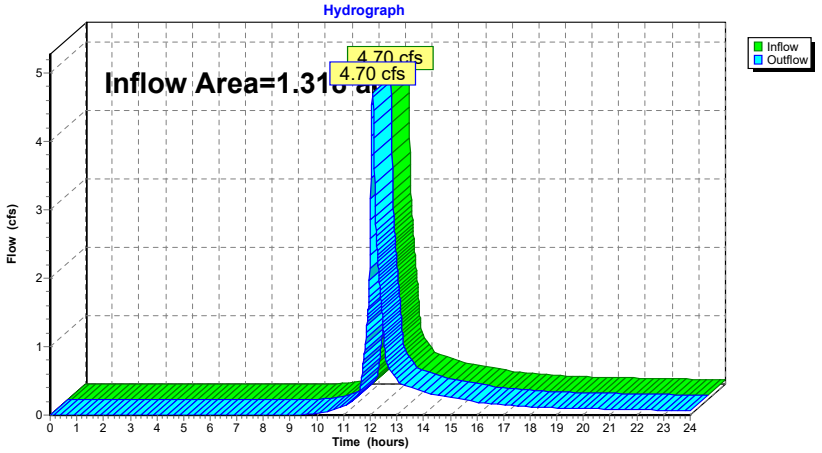


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.318 ac, 28.45% Impervious, Inflow Depth > 3.07" for 100-year event
Inflow = 4.70 cfs @ 12.09 hrs, Volume= 0.338 af
Outflow = 4.70 cfs @ 12.09 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

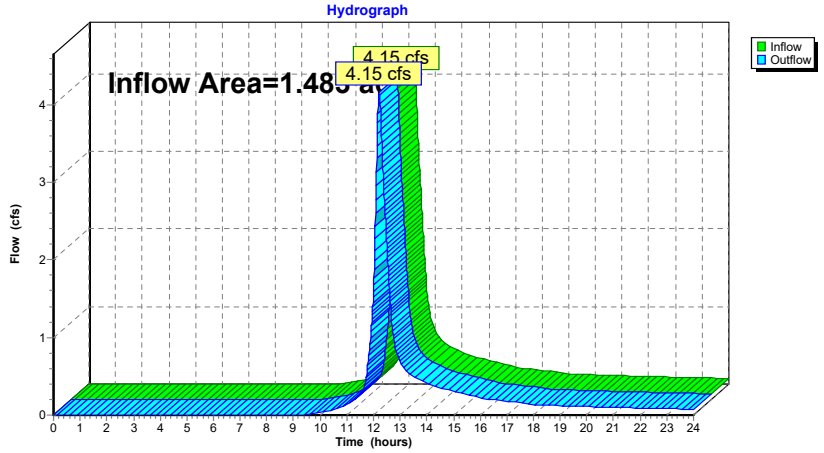


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth > 3.17" for 100-year event
Inflow = 4.15 cfs @ 12.21 hrs, Volume= 0.392 af
Outflow = 4.15 cfs @ 12.21 hrs, Volume= 0.392 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

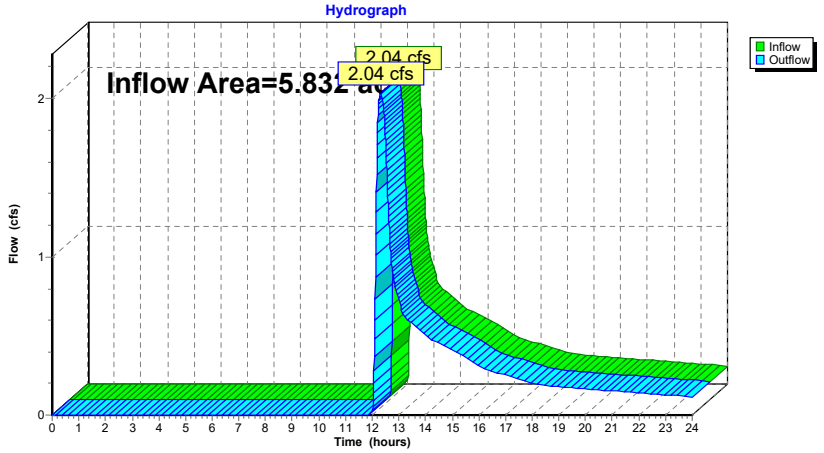


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 5.832 ac, 0.48% Impervious, Inflow Depth > 0.70" for 100-year event
Inflow = 2.04 cfs @ 12.32 hrs, Volume= 0.338 af
Outflow = 2.04 cfs @ 12.32 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

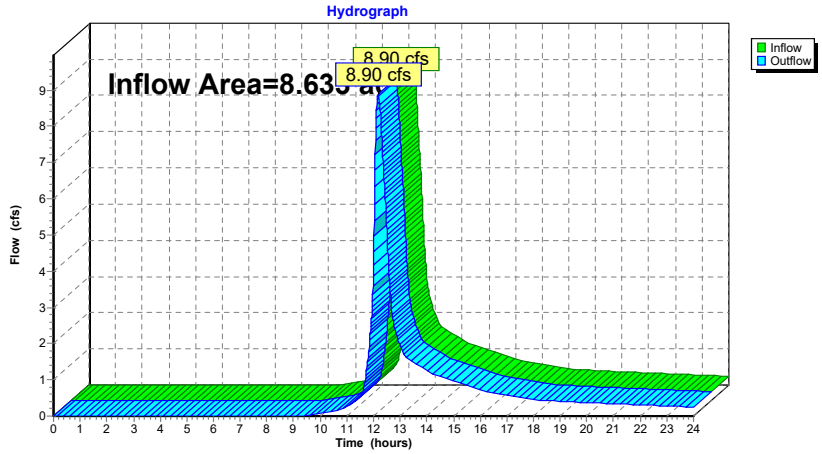


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 4.67% Impervious, Inflow Depth > 1.48" for 100-year event
Inflow = 8.90 cfs @ 12.17 hrs, Volume= 1.067 af
Outflow = 8.90 cfs @ 12.17 hrs, Volume= 1.067 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: NATURAL DEPRESSION

Inflow Area = 0.764 ac, 3.66% Impervious, Inflow Depth > 1.20" for 100-year event
Inflow = 0.68 cfs @ 12.17 hrs, Volume= 0.076 af
Outflow = 0.48 cfs @ 12.39 hrs, Volume= 0.076 af, Atten= 29%, Lag= 13.2 min
Discarded = 0.48 cfs @ 12.39 hrs, Volume= 0.076 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.17' @ 12.39 hrs Surf.Area= 1,303 sf Storage= 182 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.5 min (905.1 - 903.6)

Volume	Invert	Avail.Storage	Storage Description
#1	71.00'	2,662 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

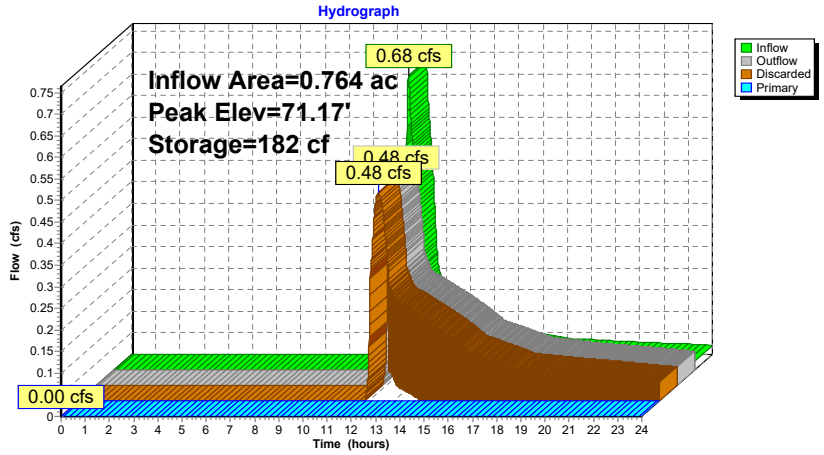
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.00	823	109.0	0	0	823
72.00	5,113	316.0	2,662	2,662	7,827

Device	Routing	Invert	Outlet Devices
#1	Discarded	71.00'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	71.90'	**33.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

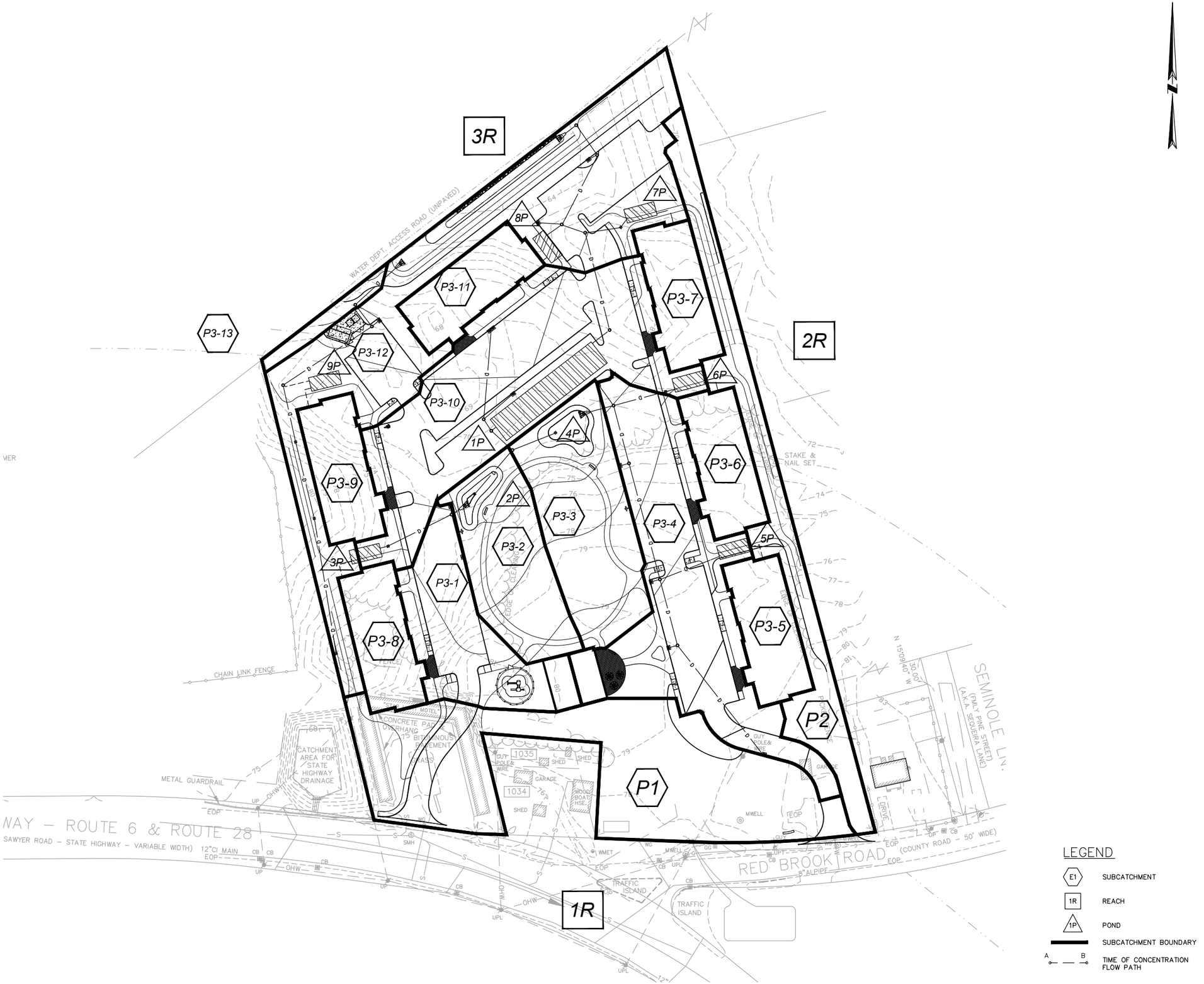
Discarded OutFlow Max=0.48 cfs @ 12.39 hrs HW=71.17' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=71.00' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: NATURAL DEPRESSION



5.03 PROPOSED WATERSHED PLAN



LEGEND

E1	SUBCATCHMENT
1R	REACH
1P	POND
	SUBCATCHMENT BOUNDARY
A — B	TIME OF CONCENTRATION FLOW PATH

WOODLAND COVE

3104 CRANBERRY HIGHWAY
IN
WAREHAM
MASSACHUSETTS

PROPOSED WATERSHED PLAN

AUGUST, 2017

REVISIONS:

NO.	DATE	DESC.

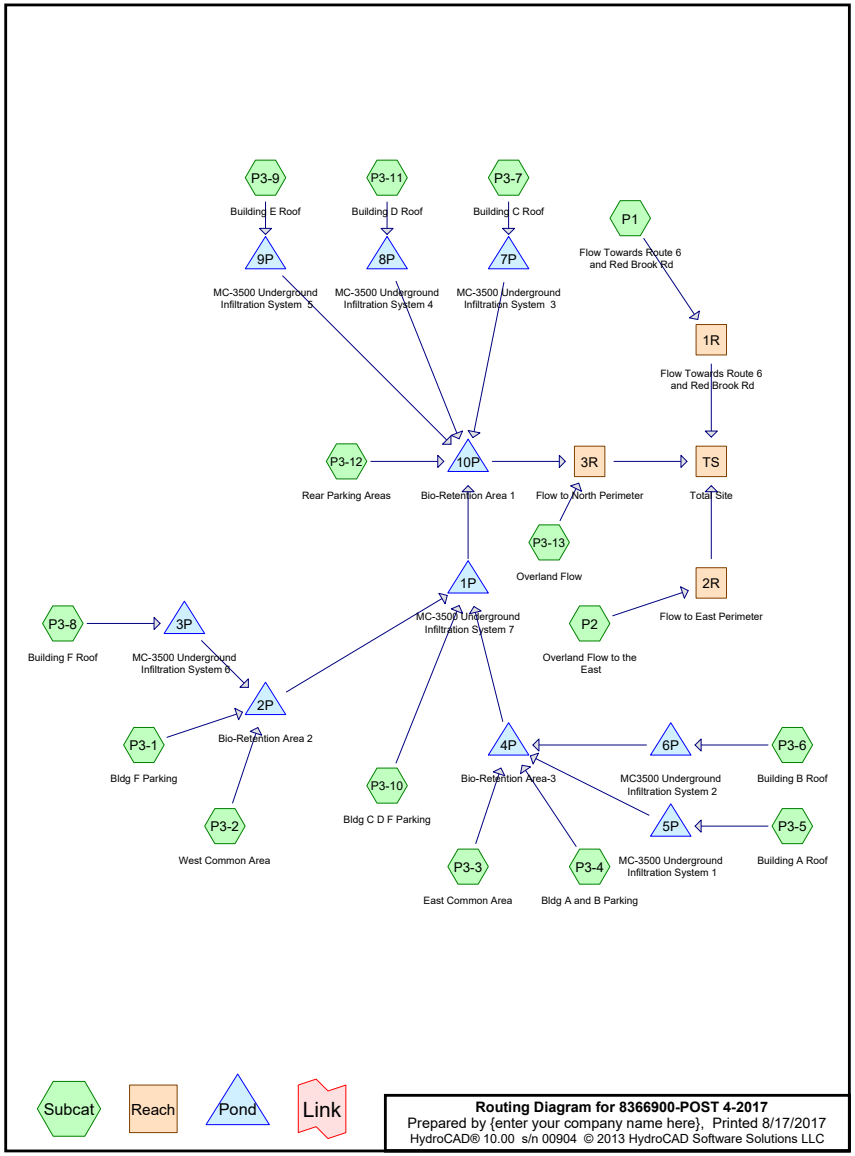
PREPARED FOR:
DAKOTA PARTNERS
1264 MAIN STREET
WALTHAM, MA 02451

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: NTS

FILE: 2017-08-10 PROP WS
DWG.:
JOB. NO: 8-3669.00
SHEET 1 OF 1

5.04 PROPOSED HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.360	39	>75% Grass cover, Good, HSG A (P1, P2, P3-1, P3-10, P3-12, P3-13, P3-2, P3-3, P3-4)
0.103	98	Paved (P3-2, P3-3)
2.719	98	Paved parking, HSG A (P1, P3-1, P3-10, P3-12, P3-4)
1.422	98	Roofs, HSG A (P3-11, P3-5, P3-6, P3-7, P3-8, P3-9)
0.029	98	Unconnected pavement, HSG A (P2)
8.633	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.530	HSG A	P1, P2, P3-1, P3-10, P3-11, P3-12, P3-13, P3-2, P3-3, P3-4, P3-5, P3-6, P3-7, P3-8, P3-9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.103	Other	P3-2, P3-3
8.633		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
4.360	0.000	0.000	0.000	0.000	4.360	>75% Grass cover, Good	P1, P2, P3-1, P3-10, P3-12, P3-13, P3-2, P3-3, P3-4
0.000	0.000	0.000	0.000	0.103	0.103	Paved	P3-2, P3-3
2.719	0.000	0.000	0.000	0.000	2.719	Paved parking	P1, P3-1, P3-10, P3-12, P3-4
1.422	0.000	0.000	0.000	0.000	1.422	Roofs	P3-11, P3-5, P3-6, P3-7, P3-8, P3-9
0.029	0.000	0.000	0.000	0.000	0.029	Unconnected pavement	P2
8.530	**0.000**	**0.000**	**0.000**	**0.103**	**8.633**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	66.00	65.79	21.0	0.0100	0.013	12.0	0.0	0.0
2	2P	66.15	65.53	62.0	0.0100	0.013	12.0	0.0	0.0
3	3P	70.20	70.10	10.0	0.0100	0.013	12.0	0.0	0.0
4	4P	67.02	66.53	49.0	0.0100	0.013	12.0	0.0	0.0
5	5P	74.00	73.90	10.0	0.0100	0.013	6.0	0.0	0.0
6	6P	72.50	72.40	10.0	0.0100	0.013	6.0	0.0	0.0
7	7P	68.05	67.95	10.0	0.0100	0.013	6.0	0.0	0.0
8	8P	67.55	67.45	10.0	0.0100	0.013	6.0	0.0	0.0
9	9P	69.05	68.95	10.0	0.0100	0.013	6.0	0.0	0.0

Time span=0.00-26.00 hrs, dt=0.01 hrs, 2601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Flow Towards Route 6 Runoff Area=1.301 ac 12.76% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=47 Runoff=0.02 cfs 0.013 af

Subcatchment P2: Overland Flow to the East Runoff Area=0.591 ac 4.91% Impervious Runoff Depth=0.02"
Tc=6.0 min UI Adjusted CN=40 Runoff=0.00 cfs 0.001 af

Subcatchment P3-1: Bldg F Parking Runoff Area=0.485 ac 74.02% Impervious Runoff Depth=1.86"
Tc=6.0 min CN=83 Runoff=1.06 cfs 0.075 af

Subcatchment P3-10: Bldg C D F Parking Runoff Area=1.187 ac 78.35% Impervious Runoff Depth=2.02"
Tc=6.0 min CN=85 Runoff=2.81 cfs 0.199 af

Subcatchment P3-11: Building D Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Subcatchment P3-12: Rear Parking Areas Runoff Area=1.460 ac 31.44% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=58 Runoff=0.45 cfs 0.055 af

Subcatchment P3-13: Overland Flow Runoff Area=0.068 ac 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment P3-2: West Common Area Runoff Area=0.459 ac 10.46% Impervious Runoff Depth=0.08"
Tc=6.0 min CN=45 Runoff=0.01 cfs 0.003 af

Subcatchment P3-3: East Common Area Runoff Area=0.602 ac 9.14% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=44 Runoff=0.01 cfs 0.003 af

Subcatchment P3-4: Bldg A and B Parking Runoff Area=1.058 ac 76.09% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=84 Runoff=2.40 cfs 0.171 af

Subcatchment P3-5: Building A Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Subcatchment P3-6: Building B Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Subcatchment P3-7: Building C Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Subcatchment P3-8: Building F Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Subcatchment P3-9: Building E Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.065 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=0.02 cfs 0.013 af
Outflow=0.02 cfs 0.013 af

Reach 2R: Flow to East Perimeter Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 3R: Flow to North Perimeter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach TS: Total Site Inflow=0.02 cfs 0.014 af
Outflow=0.02 cfs 0.014 af

Pond 1P: MC-3500 Underground Infiltration Peak Elev=65.99' Storage=1,577 cf Inflow=3.74 cfs 0.244 af
Discarded=1.68 cfs 0.244 af Primary=0.00 cfs 0.000 af Outflow=1.68 cfs 0.244 af

Pond 2P: Bio-Retention Area 2 Peak Elev=70.70' Storage=179 cf Inflow=1.06 cfs 0.078 af
Discarded=0.11 cfs 0.050 af Primary=0.94 cfs 0.028 af Outflow=1.05 cfs 0.078 af

Pond 3P: MC-3500 Underground Infiltration Peak Elev=68.10' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 4P: Bio-Retention Area-3 Peak Elev=70.67' Storage=1,379 cf Inflow=2.40 cfs 0.174 af
Discarded=0.55 cfs 0.158 af Primary=0.70 cfs 0.016 af Outflow=1.26 cfs 0.174 af

Pond 5P: MC-3500 Underground Infiltration Peak Elev=71.90' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 6P: MC3500 Underground Infiltration Peak Elev=70.40' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 7P: MC-3500 Underground Infiltration Peak Elev=65.95' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 8P: MC-3500 Underground Infiltration Peak Elev=65.45' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 9P: MC-3500 Underground Infiltration Peak Elev=66.95' Storage=458 cf Inflow=0.81 cfs 0.065 af
Discarded=0.25 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.065 af

Pond 10P: Bio-Retention Area 1 Peak Elev=62.60' Storage=79 cf Inflow=0.45 cfs 0.055 af
Discarded=0.32 cfs 0.055 af Primary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.055 af

Total Runoff Area = 8.633 ac Runoff Volume = 0.908 af Average Runoff Depth = 1.26"
50.50% Pervious = 4.360 ac 49.50% Impervious = 4.273 ac

Summary for Subcatchment P1: Flow Towards Route 6 and Red Brook Rd

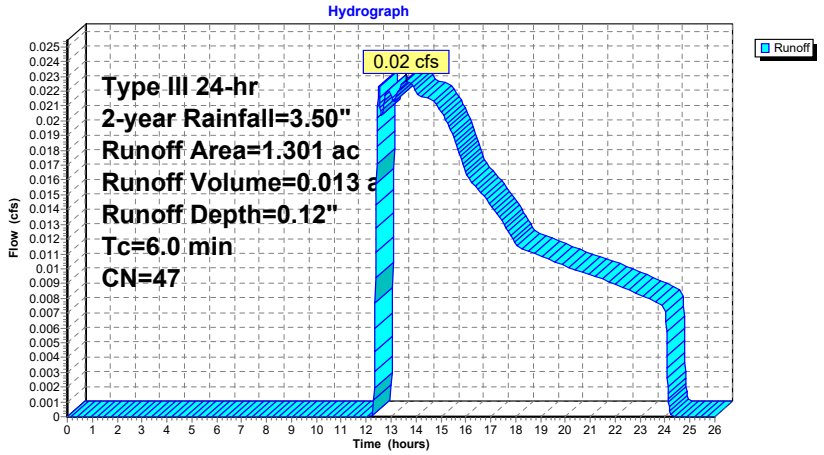
Runoff = 0.02 cfs @ 13.62 hrs, Volume= 0.013 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.166	98	Paved parking, HSG A
1.135	39	>75% Grass cover, Good, HSG A
1.301	47	Weighted Average
1.135		87.24% Pervious Area
0.166		12.76% Impervious Area

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

Subcatchment P1: Flow Towards Route 6 and Red Brook Rd



Summary for Subcatchment P2: Overland Flow to the East

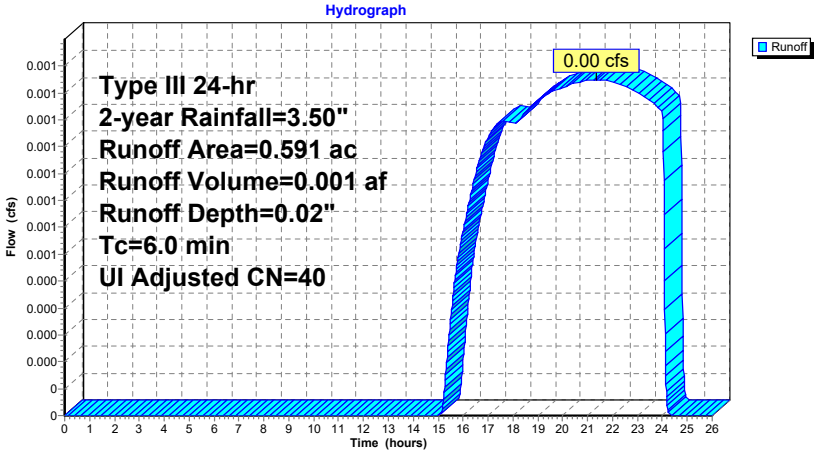
Runoff = 0.00 cfs @ 21.34 hrs, Volume= 0.001 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Adj	Description
0.029	98		Unconnected pavement, HSG A
0.562	39		>75% Grass cover, Good, HSG A
0.591	42	40	Weighted Average, UI Adjusted
0.562			95.09% Pervious Area
0.029			4.91% Impervious Area
0.029			100.00% Unconnected

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

Subcatchment P2: Overland Flow to the East



Summary for Subcatchment P3-1: Bldg F Parking

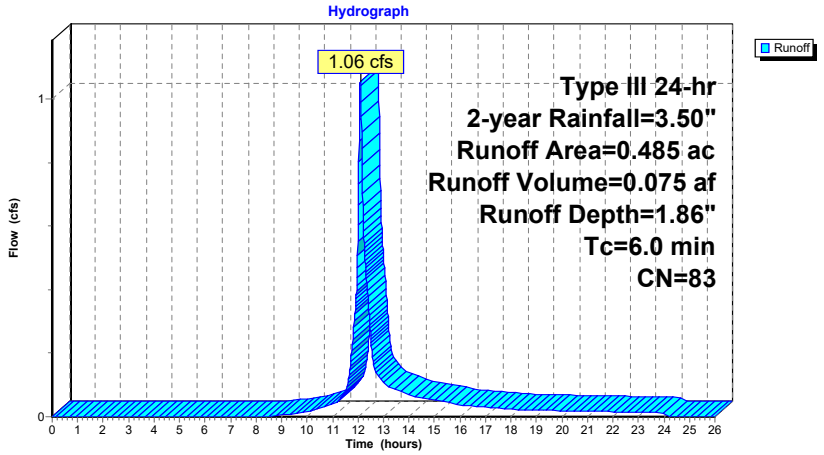
Runoff = 1.06 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.359	98	Paved parking, HSG A
0.126	39	>75% Grass cover, Good, HSG A
0.485	83	Weighted Average
0.126		25.98% Pervious Area
0.359		74.02% Impervious Area

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

Subcatchment P3-1: Bldg F Parking



Summary for Subcatchment P3-10: Bldg C D F Parking

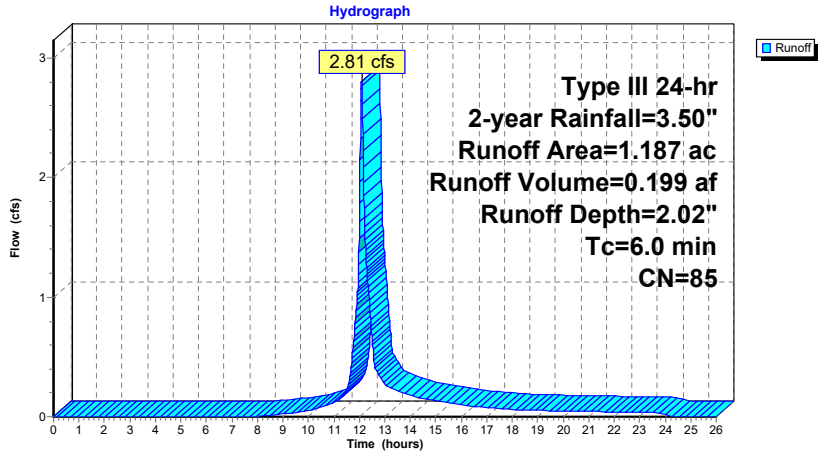
Runoff = 2.81 cfs @ 12.09 hrs, Volume= 0.199 af, Depth= 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG A
0.257	39	>75% Grass cover, Good, HSG A
1.187	85	Weighted Average
0.257		21.65% Pervious Area
0.930		78.35% Impervious Area

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

Subcatchment P3-10: Bldg C D F Parking



Summary for Subcatchment P3-11: Building D Roof

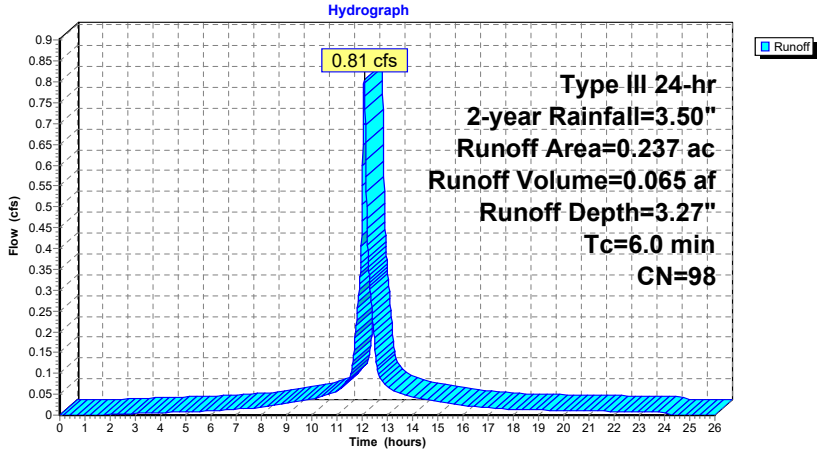
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-11: Building D Roof



Summary for Subcatchment P3-12: Rear Parking Areas

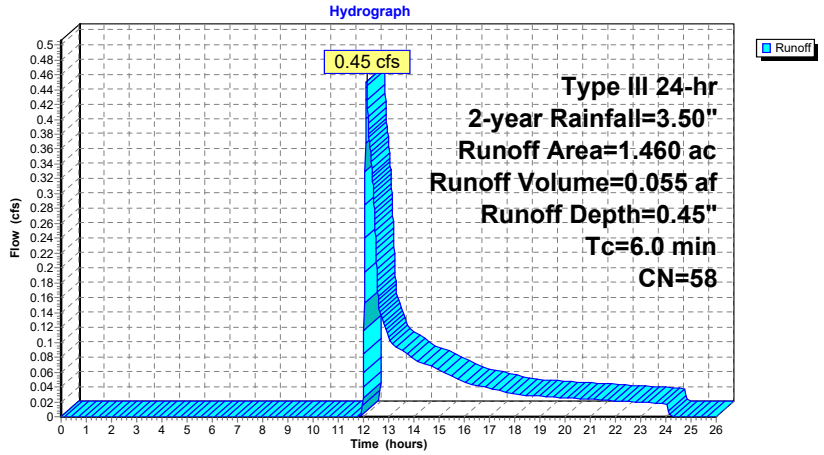
Runoff = 0.45 cfs @ 12.13 hrs, Volume= 0.055 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.459	98	Paved parking, HSG A
1.001	39	>75% Grass cover, Good, HSG A
1.460	58	Weighted Average
1.001		68.56% Pervious Area
0.459		31.44% Impervious Area

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

Subcatchment P3-12: Rear Parking Areas



Summary for Subcatchment P3-13: Overland Flow

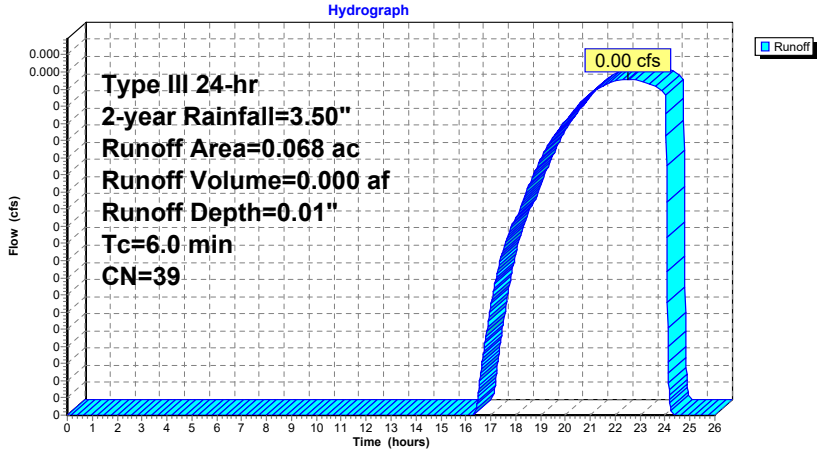
Runoff = 0.00 cfs @ 22.50 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.068	39	>75% Grass cover, Good, HSG A
0.068		100.00% Pervious Area

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

Subcatchment P3-13: Overland Flow



Summary for Subcatchment P3-2: West Common Area

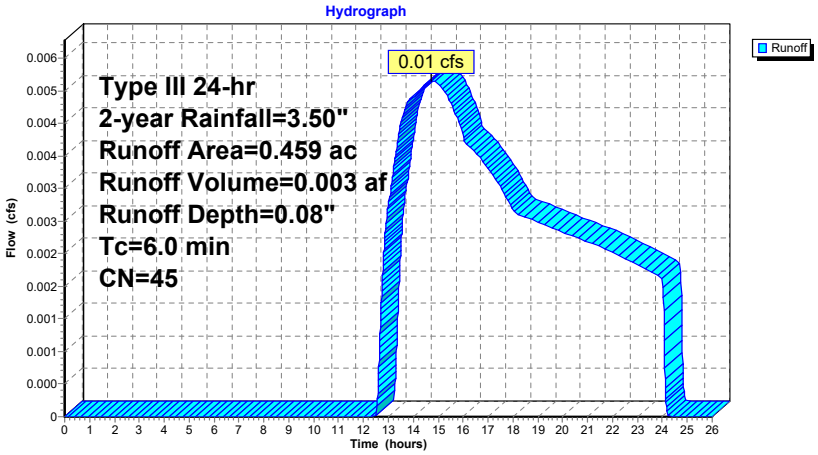
Runoff = 0.01 cfs @ 14.74 hrs, Volume= 0.003 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

	Area (ac)	CN	Description
*	0.048	98	Paved
	0.411	39	>75% Grass cover, Good, HSG A
	0.459	45	Weighted Average
	0.411		89.54% Pervious Area
	0.048		10.46% Impervious Area

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

Subcatchment P3-2: West Common Area



Summary for Subcatchment P3-3: East Common Area

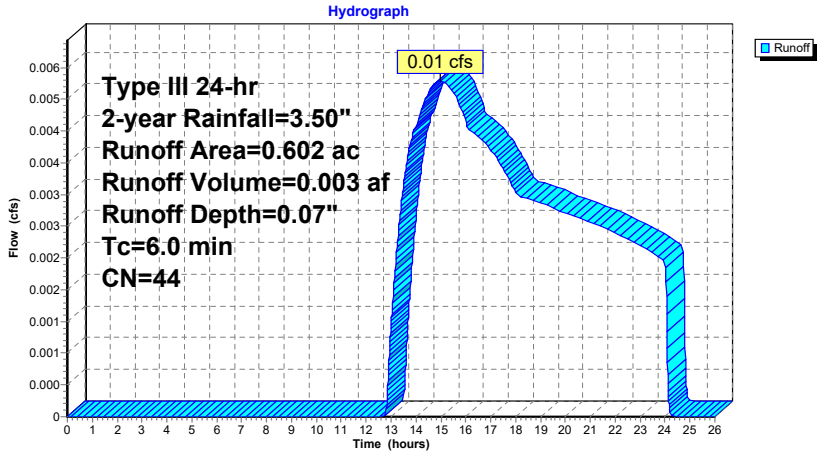
Runoff = 0.01 cfs @ 14.98 hrs, Volume= 0.003 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

	Area (ac)	CN	Description
*	0.055	98	Paved
	0.547	39	>75% Grass cover, Good, HSG A
	0.602	44	Weighted Average
	0.547		90.86% Pervious Area
	0.055		9.14% Impervious Area

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

Subcatchment P3-3: East Common Area



Summary for Subcatchment P3-4: Bldg A and B Parking

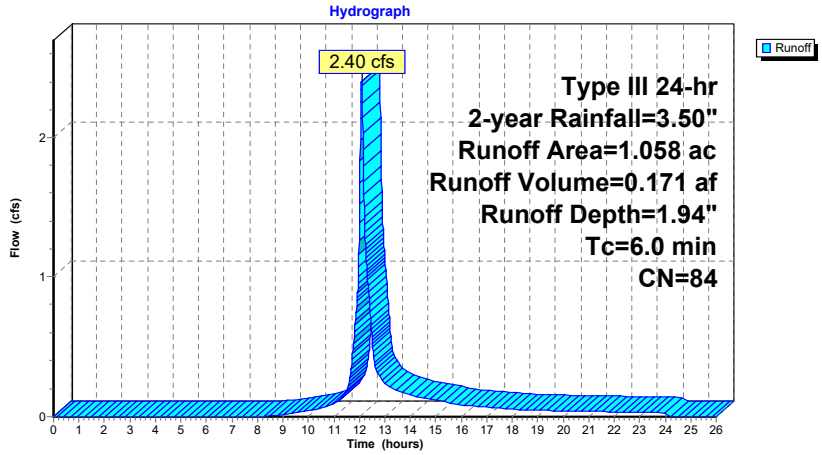
Runoff = 2.40 cfs @ 12.09 hrs, Volume= 0.171 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.805	98	Paved parking, HSG A
0.253	39	>75% Grass cover, Good, HSG A
1.058	84	Weighted Average
0.253		23.91% Pervious Area
0.805		76.09% Impervious Area

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

Subcatchment P3-4: Bldg A and B Parking



Summary for Subcatchment P3-5: Building A Roof

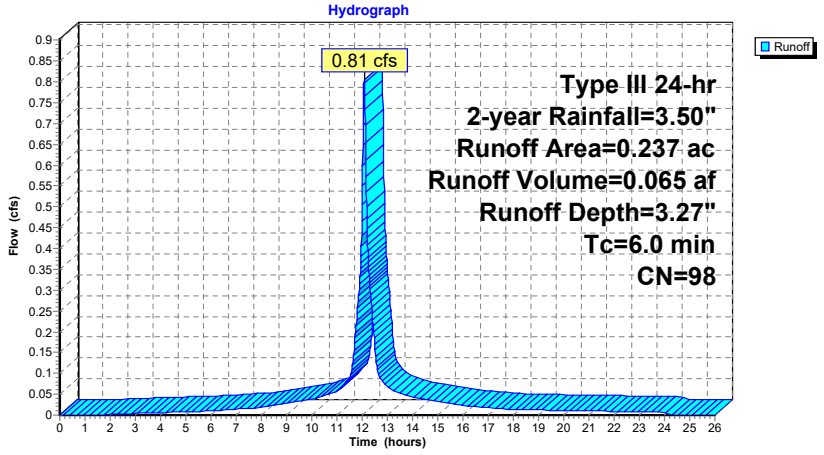
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-5: Building A Roof



Summary for Subcatchment P3-6: Building B Roof

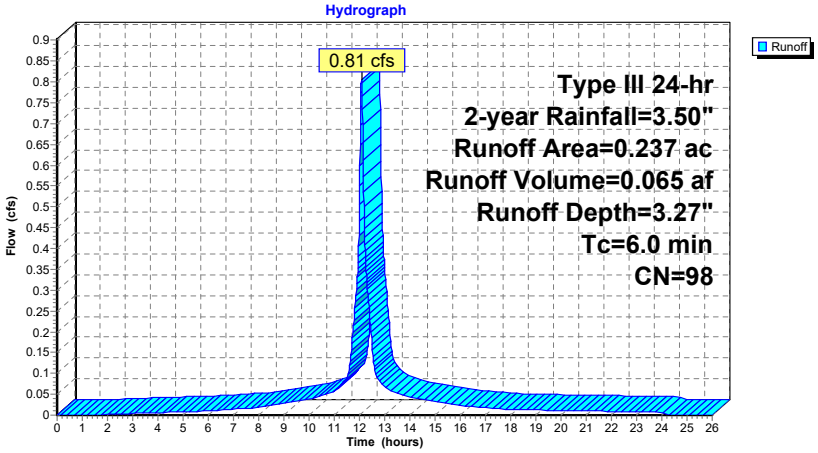
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-6: Building B Roof



Summary for Subcatchment P3-7: Building C Roof

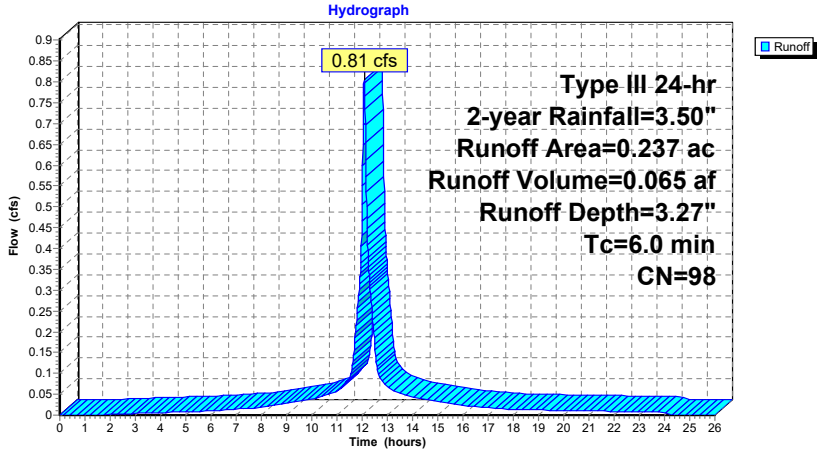
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-7: Building C Roof



Summary for Subcatchment P3-8: Building F Roof

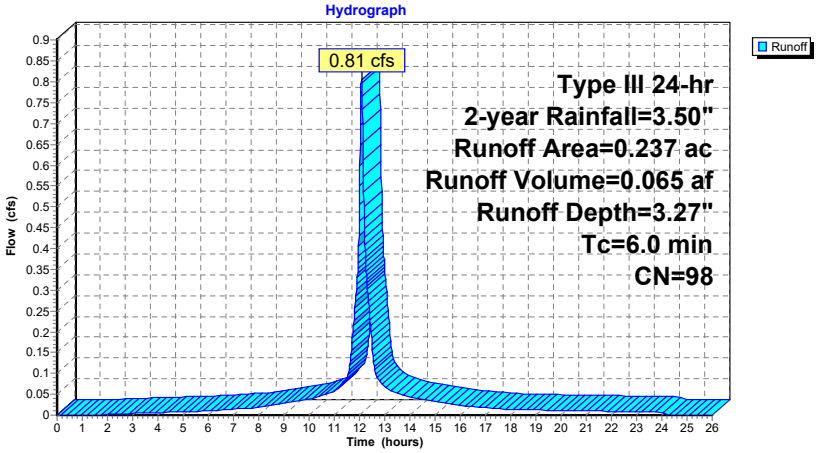
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-8: Building F Roof



Summary for Subcatchment P3-9: Building E Roof

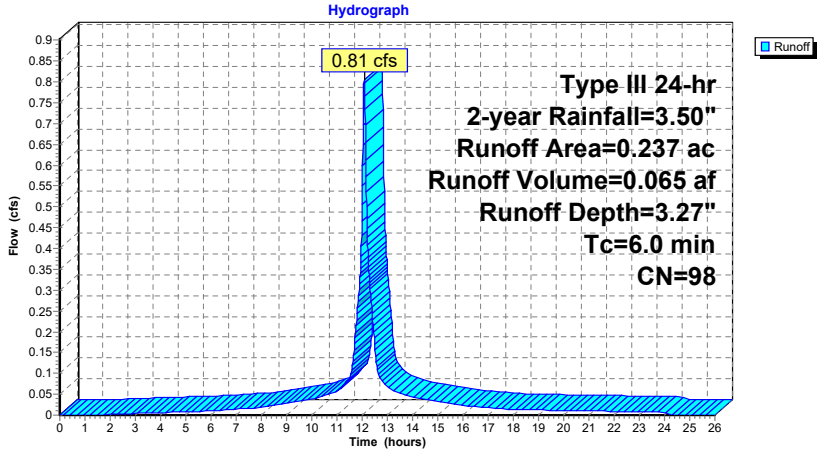
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.50"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-9: Building E Roof

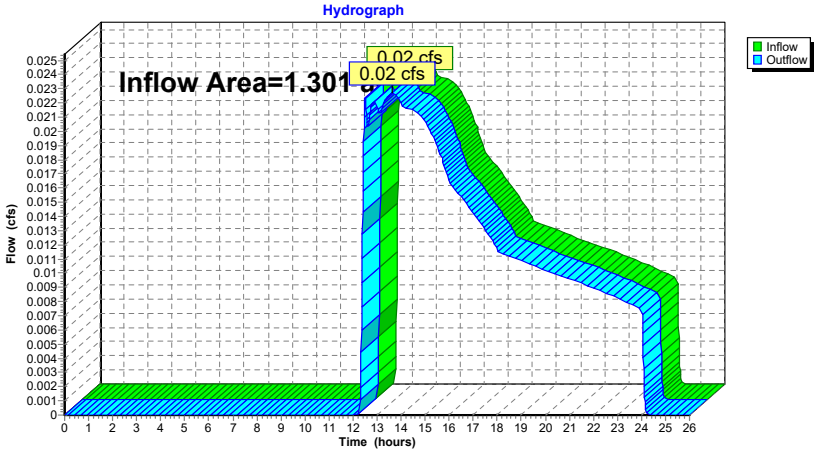


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.301 ac, 12.76% Impervious, Inflow Depth = 0.12" for 2-year event
Inflow = 0.02 cfs @ 13.62 hrs, Volume= 0.013 af
Outflow = 0.02 cfs @ 13.62 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

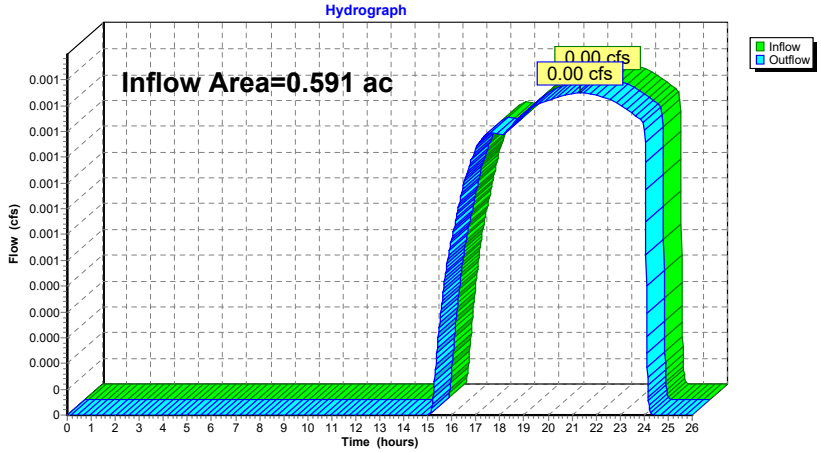


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 0.591 ac, 4.91% Impervious, Inflow Depth = 0.02" for 2-year event
Inflow = 0.00 cfs @ 21.34 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 21.34 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

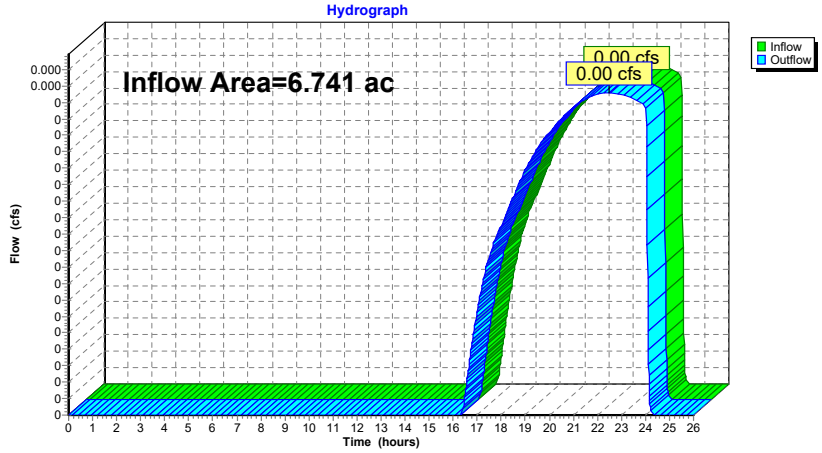


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 6.741 ac, 60.50% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 22.50 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 22.50 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

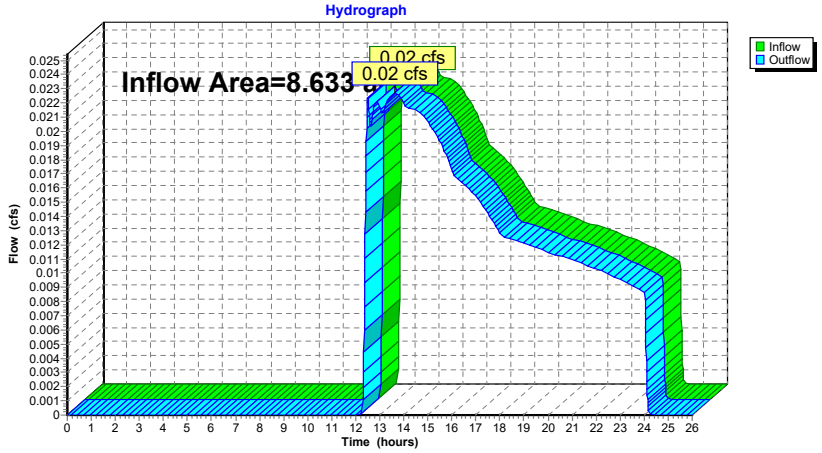


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 49.50% Impervious, Inflow Depth = 0.02" for 2-year event
Inflow = 0.02 cfs @ 13.62 hrs, Volume= 0.014 af
Outflow = 0.02 cfs @ 13.62 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: MC-3500 Underground Infiltration System 7

Inflow Area = 4.502 ac, 64.59% Impervious, Inflow Depth = 0.65" for 2-year event
Inflow = 3.74 cfs @ 12.09 hrs, Volume= 0.244 af
Outflow = 1.68 cfs @ 12.39 hrs, Volume= 0.244 af, Atten= 55%, Lag= 18.1 min
Discarded = 1.68 cfs @ 12.39 hrs, Volume= 0.244 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 65.99' @ 12.39 hrs Surf.Area= 4,248 sf Storage= 1,577 cf
Flood Elev= 70.66' Surf.Area= 4,248 sf Storage= 14,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.8 min (811.3 - 806.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.16'	5,953 cf	**29.92'W x 142.00'L x 5.50'H Field A** 23,364 cf Overall - 8,481 cf Embedded = 14,883 cf x 40.0% Voids
#2A	65.91'	8,481 cf	**ADS_StormTech MC-3500 c +Cap** x 76 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		14,434 cf	Total Available Storage

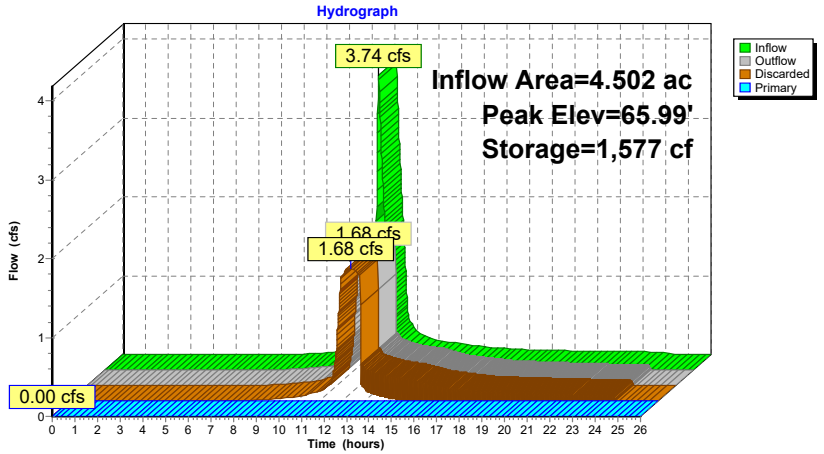
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.16'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	66.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.79' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.34'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.68 cfs @ 12.39 hrs HW=65.99' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.68 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.16' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: MC-3500 Underground Infiltration System 7



Summary for Pond 2P: Bio-Retention Area 2

Inflow Area = 1.181 ac, 54.53% Impervious, Inflow Depth = 0.80" for 2-year event
Inflow = 1.06 cfs @ 12.09 hrs, Volume= 0.078 af
Outflow = 1.05 cfs @ 12.10 hrs, Volume= 0.078 af, Atten= 1%, Lag= 0.7 min
Discarded = 0.11 cfs @ 12.10 hrs, Volume= 0.050 af
Primary = 0.94 cfs @ 12.10 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.70' @ 12.10 hrs Surf.Area= 290 sf Storage= 179 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.6 min (848.7 - 838.1)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,418 cf	**Ponding Area (Irregular)**Listed below (Recalc)

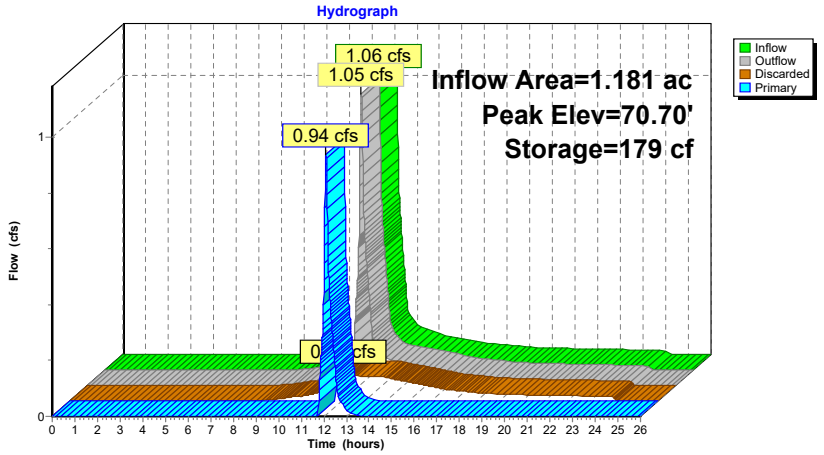
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	44	32.0	0	0	44
72.00	799	152.0	859	859	1,816
74.00	1,830	190.0	2,559	3,418	2,905

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	66.15'	**12.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.15' / 65.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.11 cfs @ 12.10 hrs HW=70.70' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.94 cfs @ 12.10 hrs HW=70.70' TW=65.50' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.94 cfs of 6.94 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.94 cfs @ 1.47 fps)

Pond 2P: Bio-Retention Area 2



Summary for Pond 3P: MC-3500 Underground Infiltration System 6

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 68.10' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 72.15' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	66.65'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	67.40'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

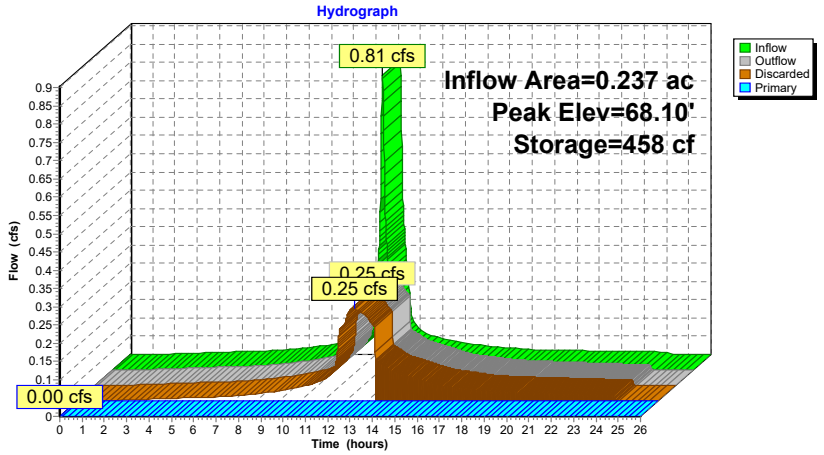
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.65'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	70.20'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 70.20' / 70.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=68.10' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.65' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 3P: MC-3500 Underground Infiltration System 6



Summary for Pond 4P: Bio-Retention Area-3

Inflow Area = 2.134 ac, 62.51% Impervious, Inflow Depth = 0.98" for 2-year event
Inflow = 2.40 cfs @ 12.09 hrs, Volume= 0.174 af
Outflow = 1.26 cfs @ 12.23 hrs, Volume= 0.174 af, Atten= 48%, Lag= 8.7 min
Discarded = 0.55 cfs @ 12.23 hrs, Volume= 0.158 af
Primary = 0.70 cfs @ 12.23 hrs, Volume= 0.016 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.67' @ 12.23 hrs Surf.Area= 1,488 sf Storage= 1,379 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.0 min (843.4 - 830.3)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,934 cf	**Ponding Area (Irregular)**Listed below (Recalc)

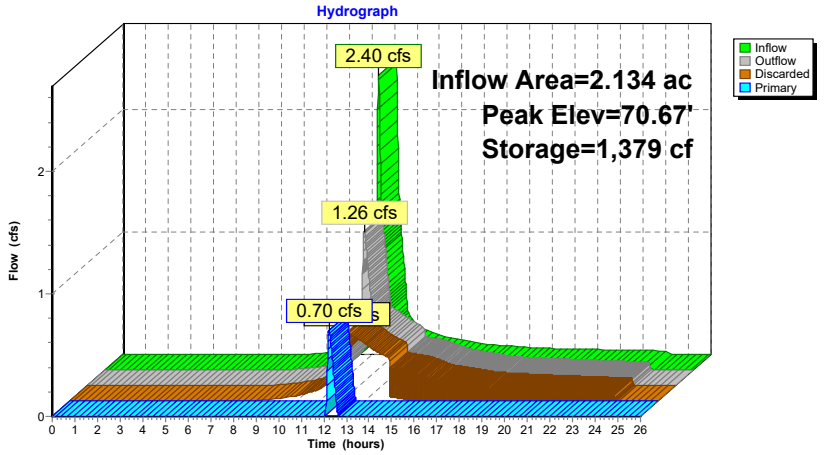
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	930	123.0	0	0	930
70.00	1,120	132.0	512	512	1,123
72.00	2,380	199.0	3,422	3,934	2,919

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	67.02'	**12.0" Round Culvert** L= 49.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.02' / 66.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.55 cfs @ 12.23 hrs HW=70.67' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.55 cfs)

Primary OutFlow Max=0.70 cfs @ 12.23 hrs HW=70.67' TW=65.92' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.70 cfs of 6.40 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.70 cfs @ 1.34 fps)

Pond 4P: Bio-Retention Area-3



Summary for Pond 5P: MC-3500 Underground Infiltration System 1

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 71.90' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 75.95' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	70.45'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	71.20'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

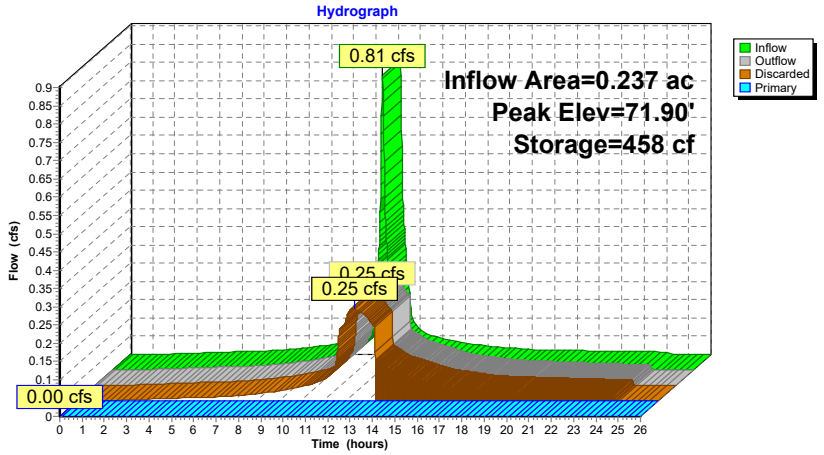
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	70.45'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	74.00'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 74.00' / 73.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=71.90' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=70.45' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 5P: MC-3500 Underground Infiltration System 1



Summary for Pond 6P: MC3500 Underground Infiltration System 2

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.40' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 74.45' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	68.95'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	69.70'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

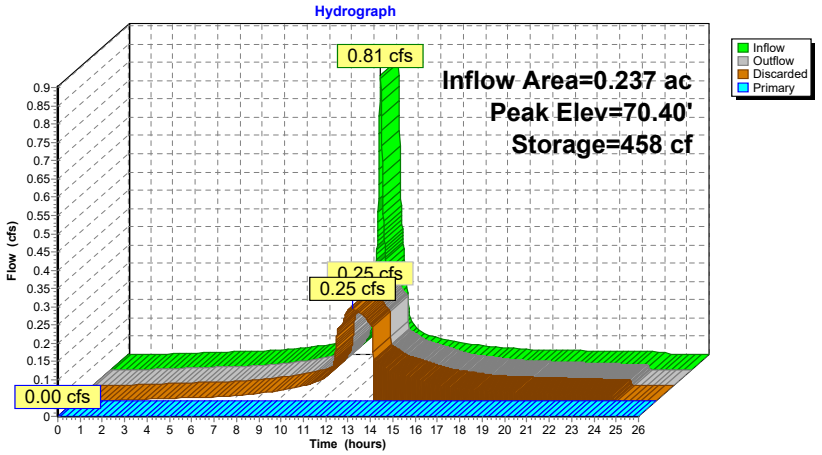
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.95'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	72.50'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 72.50' / 72.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=70.40' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=68.95' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 6P: MC3500 Underground Infiltration System 2



Summary for Pond 7P: MC-3500 Underground Infiltration System 3

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 65.95' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 70.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	65.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

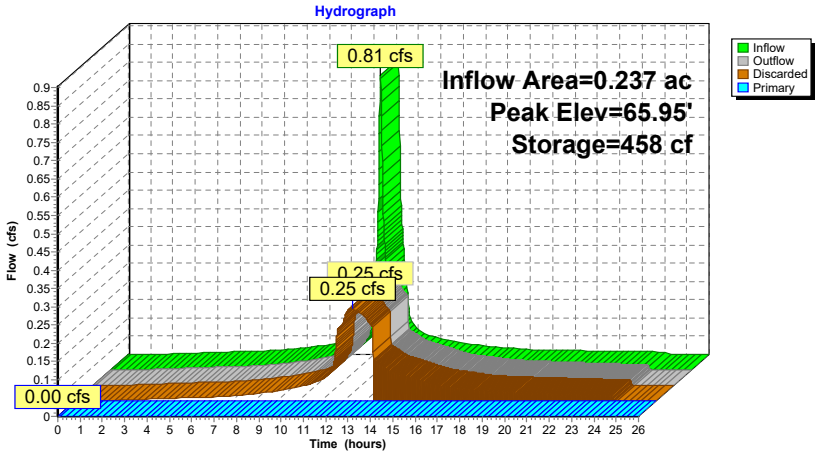
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	68.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.05' / 67.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=65.95' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.50' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 7P: MC-3500 Underground Infiltration System 3



Summary for Pond 8P: MC-3500 Underground Infiltration System 4

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 65.45' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 69.50' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	64.75'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

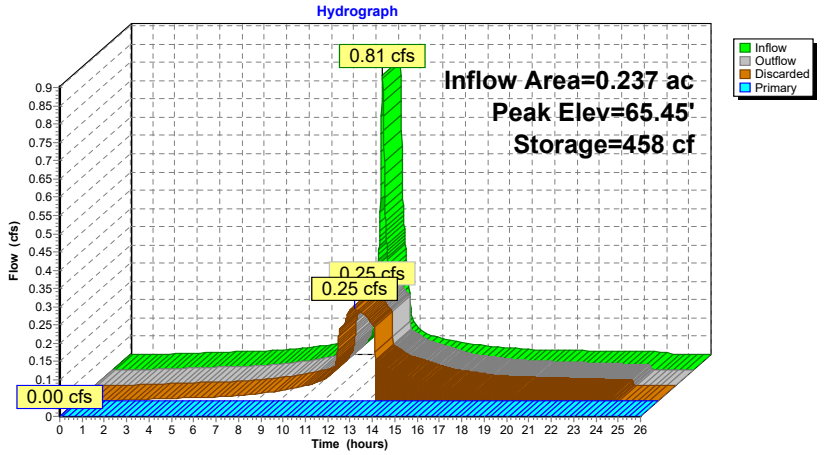
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	67.55'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.55' / 67.45' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=65.45' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.00' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 8P: MC-3500 Underground Infiltration System 4



Summary for Pond 9P: MC-3500 Underground Infiltration System 5

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 3.27" for 2-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.065 af
Outflow = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 69%, Lag= 18.0 min
Discarded = 0.25 cfs @ 12.38 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 66.95' @ 12.38 hrs Surf.Area= 537 sf Storage= 458 cf
Flood Elev= 71.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.2 min (762.8 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	66.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

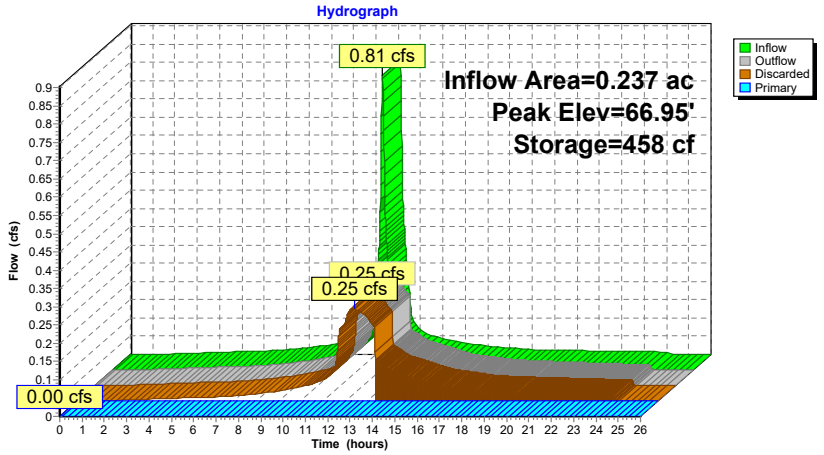
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	69.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 69.05' / 68.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.25 cfs @ 12.38 hrs HW=66.95' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.50' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 9P: MC-3500 Underground Infiltration System 5



Summary for Pond 10P: Bio-Retention Area 1

Inflow Area = 6.673 ac, 61.11% Impervious, Inflow Depth = 0.10" for 2-year event
Inflow = 0.45 cfs @ 12.13 hrs, Volume= 0.055 af
Outflow = 0.32 cfs @ 12.36 hrs, Volume= 0.055 af, Atten= 29%, Lag= 14.2 min
Discarded = 0.32 cfs @ 12.36 hrs, Volume= 0.055 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 62.60' @ 12.36 hrs Surf.Area= 854 sf Storage= 79 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.9 min (920.3 - 919.4)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	2,493 cf	**Ponding Area (Irregular)** Listed below (Recalc)

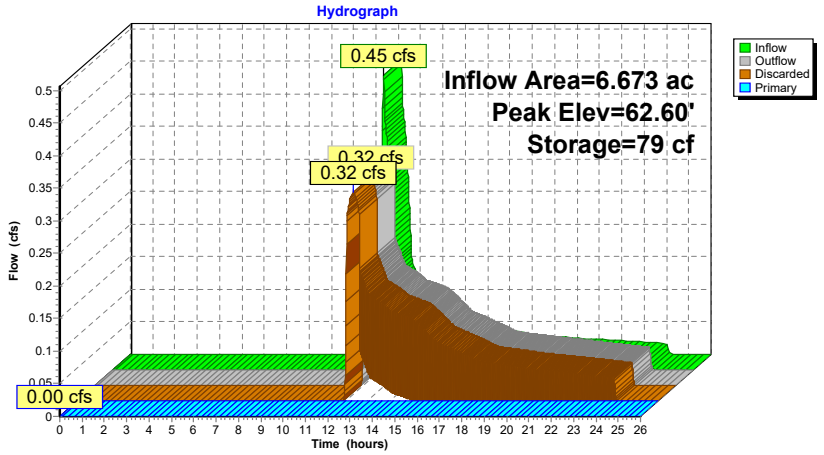
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	766	329.0	0	0	766
63.00	1,267	338.0	503	503	1,272
63.75	2,400	353.0	1,353	1,856	2,137
64.00	2,700	425.0	637	2,493	6,595

Device	Routing	Invert	Outlet Devices
#1	Discarded	62.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	63.75'	**140.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.32 cfs @ 12.36 hrs HW=62.60' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.50' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Bio-Retention Area 1



Time span=0.00-26.00 hrs, dt=0.01 hrs, 2601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Flow Towards Route 6 Runoff Area=1.301 ac 12.76% Impervious Runoff Depth=0.47"
Tc=6.0 min CN=47 Runoff=0.29 cfs 0.051 af

Subcatchment P2: Overland Flow to the East Runoff Area=0.591 ac 4.91% Impervious Runoff Depth=0.19"
Tc=6.0 min UI Adjusted CN=40 Runoff=0.02 cfs 0.009 af

Subcatchment P3-1: Bldg F Parking Runoff Area=0.485 ac 74.02% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=83 Runoff=1.70 cfs 0.121 af

Subcatchment P3-10: Bldg C D F Parking Runoff Area=1.187 ac 78.35% Impervious Runoff Depth=3.18"
Tc=6.0 min CN=85 Runoff=4.39 cfs 0.315 af

Subcatchment P3-11: Building D Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Subcatchment P3-12: Rear Parking Areas Runoff Area=1.460 ac 31.44% Impervious Runoff Depth=1.06"
Tc=6.0 min CN=58 Runoff=1.53 cfs 0.129 af

Subcatchment P3-13: Overland Flow Runoff Area=0.068 ac 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment P3-2: West Common Area Runoff Area=0.459 ac 10.46% Impervious Runoff Depth=0.38"
Tc=6.0 min CN=45 Runoff=0.07 cfs 0.015 af

Subcatchment P3-3: East Common Area Runoff Area=0.602 ac 9.14% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=44 Runoff=0.08 cfs 0.017 af

Subcatchment P3-4: Bldg A and B Parking Runoff Area=1.058 ac 76.09% Impervious Runoff Depth=3.09"
Tc=6.0 min CN=84 Runoff=3.81 cfs 0.272 af

Subcatchment P3-5: Building A Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Subcatchment P3-6: Building B Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Subcatchment P3-7: Building C Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Subcatchment P3-8: Building F Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Subcatchment P3-9: Building E Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.090 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=0.29 cfs 0.051 af
Outflow=0.29 cfs 0.051 af

Reach 2R: Flow to East Perimeter Inflow=0.02 cfs 0.009 af
Outflow=0.02 cfs 0.009 af

Reach 3R: Flow to North Perimeter Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach TS: Total Site Inflow=0.30 cfs 0.061 af
Outflow=0.30 cfs 0.061 af

Pond 1P: MC-3500 Underground Infiltration Peak Elev=67.16' Storage=5,727 cf Inflow=8.10 cfs 0.441 af
Discarded=1.83 cfs 0.441 af Primary=0.00 cfs 0.000 af Outflow=1.83 cfs 0.441 af

Pond 2P: Bio-Retention Area 2 Peak Elev=70.79' Storage=205 cf Inflow=1.71 cfs 0.136 af
Discarded=0.12 cfs 0.072 af Primary=1.58 cfs 0.063 af Outflow=1.70 cfs 0.136 af

Pond 3P: MC-3500 Underground Infiltration Peak Elev=68.96' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 4P: Bio-Retention Area-3 Peak Elev=70.91' Storage=1,750 cf Inflow=3.82 cfs 0.289 af
Discarded=0.60 cfs 0.226 af Primary=2.41 cfs 0.063 af Outflow=3.01 cfs 0.289 af

Pond 5P: MC-3500 Underground Infiltration Peak Elev=72.76' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 6P: MC3500 Underground Infiltration Peak Elev=71.26' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 7P: MC-3500 Underground Infiltration Peak Elev=66.81' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 8P: MC-3500 Underground Infiltration Peak Elev=66.31' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 9P: MC-3500 Underground Infiltration Peak Elev=67.81' Storage=810 cf Inflow=1.11 cfs 0.090 af
Discarded=0.28 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.090 af

Pond 10P: Bio-Retention Area 1 Peak Elev=63.27' Storage=888 cf Inflow=1.53 cfs 0.129 af
Discarded=0.58 cfs 0.129 af Primary=0.00 cfs 0.000 af Outflow=0.58 cfs 0.129 af

Total Runoff Area = 8.633 ac Runoff Volume = 1.471 af Average Runoff Depth = 2.04"
50.50% Pervious = 4.360 ac 49.50% Impervious = 4.273 ac

Summary for Subcatchment P1: Flow Towards Route 6 and Red Brook Rd

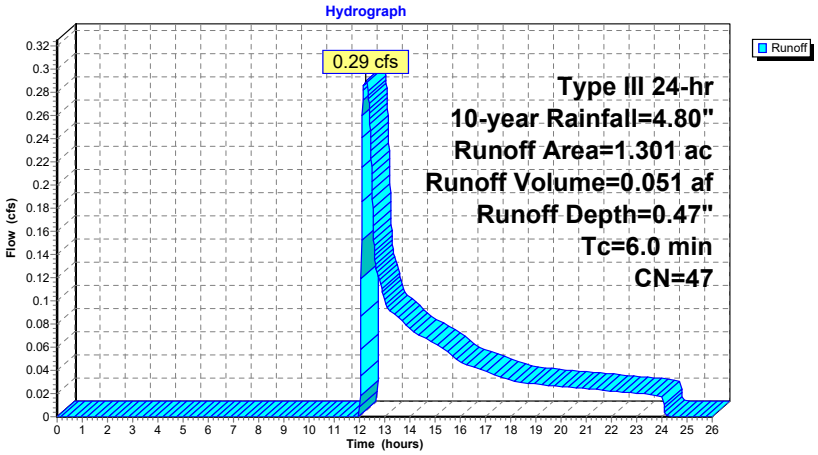
Runoff = 0.29 cfs @ 12.27 hrs, Volume= 0.051 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.166	98	Paved parking, HSG A
1.135	39	>75% Grass cover, Good, HSG A
1.301	47	Weighted Average
1.135		87.24% Pervious Area
0.166		12.76% Impervious Area

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

Subcatchment P1: Flow Towards Route 6 and Red Brook Rd



Summary for Subcatchment P2: Overland Flow to the East

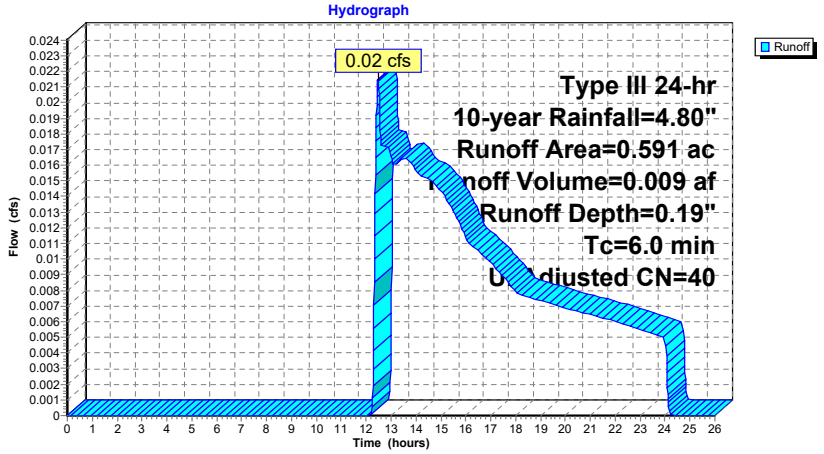
Runoff = 0.02 cfs @ 12.47 hrs, Volume= 0.009 af, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Adj	Description
0.029	98		Unconnected pavement, HSG A
0.562	39		>75% Grass cover, Good, HSG A
0.591	42	40	Weighted Average, UI Adjusted
0.562			95.09% Pervious Area
0.029			4.91% Impervious Area
0.029			100.00% Unconnected

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

Subcatchment P2: Overland Flow to the East



Summary for Subcatchment P3-1: Bldg F Parking

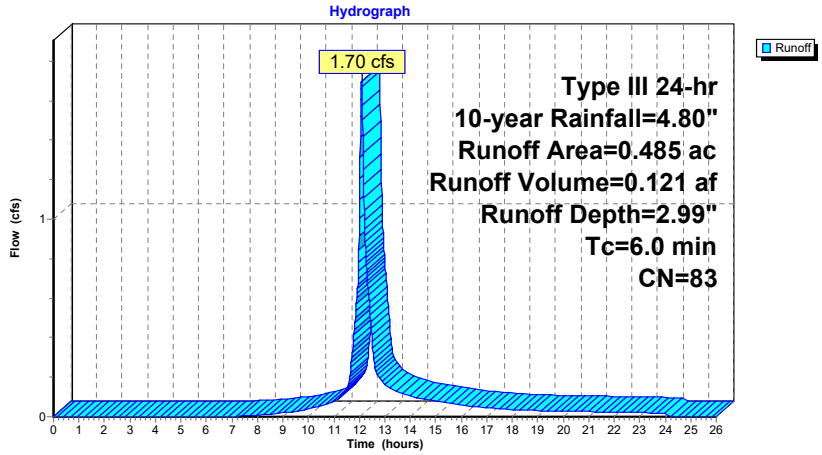
Runoff = 1.70 cfs @ 12.09 hrs, Volume= 0.121 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.359	98	Paved parking, HSG A
0.126	39	>75% Grass cover, Good, HSG A
0.485	83	Weighted Average
0.126		25.98% Pervious Area
0.359		74.02% Impervious Area

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

Subcatchment P3-1: Bldg F Parking



Summary for Subcatchment P3-10: Bldg C D F Parking

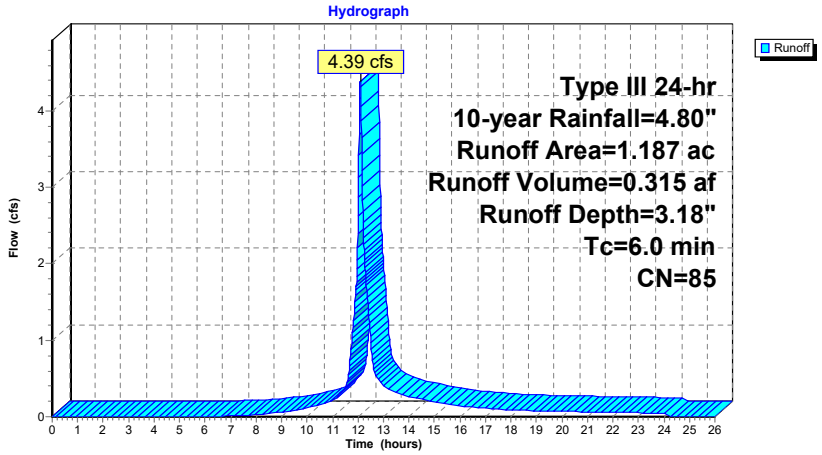
Runoff = 4.39 cfs @ 12.09 hrs, Volume= 0.315 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG A
0.257	39	>75% Grass cover, Good, HSG A
1.187	85	Weighted Average
0.257		21.65% Pervious Area
0.930		78.35% Impervious Area

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

Subcatchment P3-10: Bldg C D F Parking



Summary for Subcatchment P3-11: Building D Roof

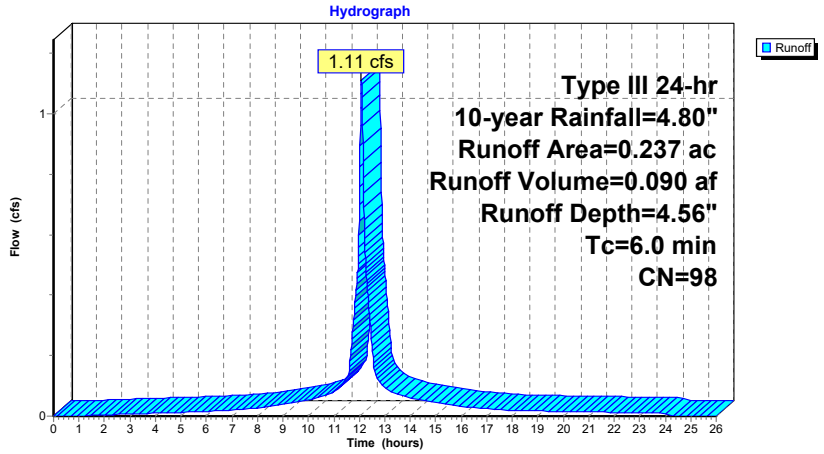
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-11: Building D Roof



Summary for Subcatchment P3-12: Rear Parking Areas

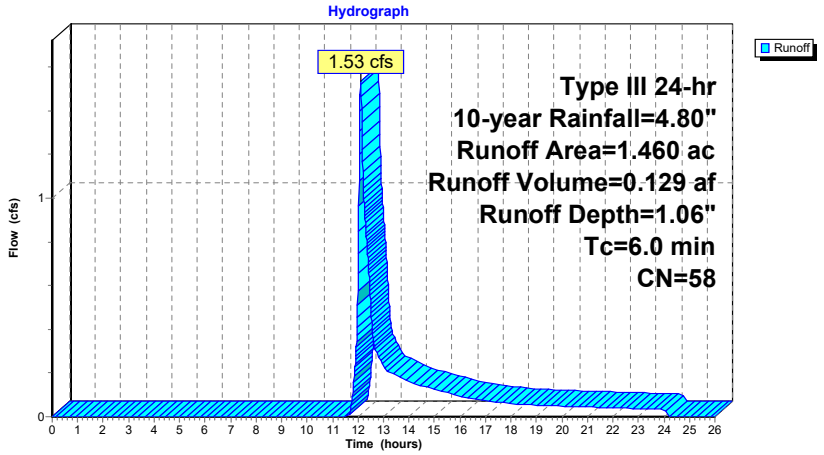
Runoff = 1.53 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.459	98	Paved parking, HSG A
1.001	39	>75% Grass cover, Good, HSG A
1.460	58	Weighted Average
1.001		68.56% Pervious Area
0.459		31.44% Impervious Area

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

Subcatchment P3-12: Rear Parking Areas



Summary for Subcatchment P3-13: Overland Flow

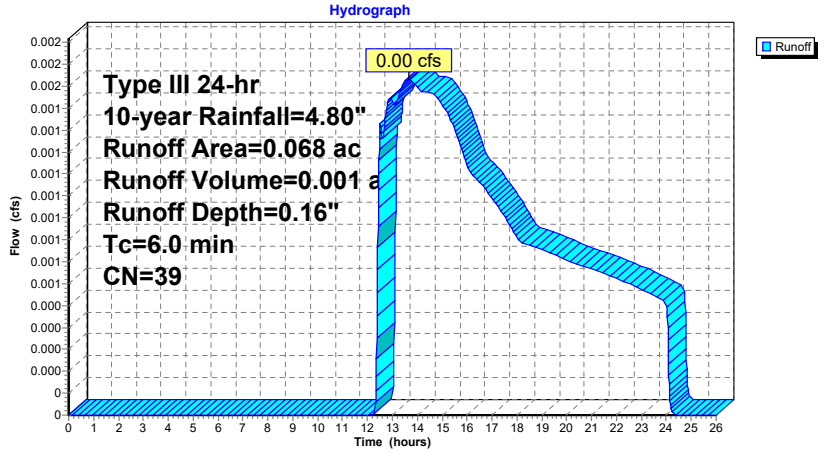
Runoff = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.068	39	>75% Grass cover, Good, HSG A
0.068		100.00% Pervious Area

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

Subcatchment P3-13: Overland Flow



Summary for Subcatchment P3-2: West Common Area

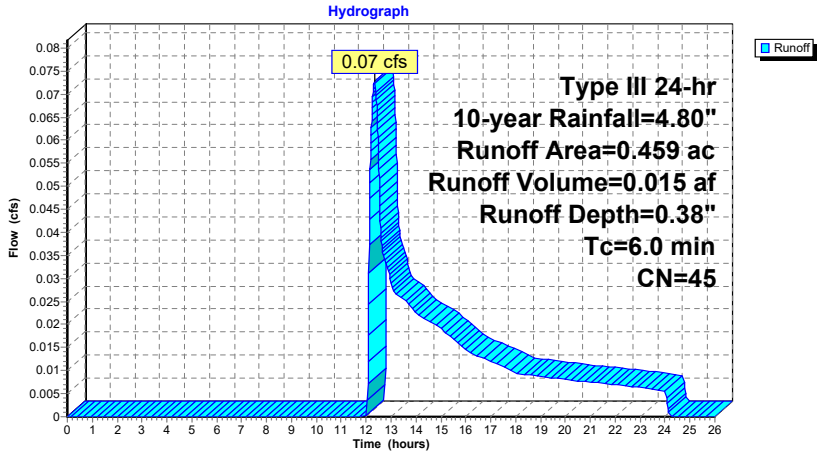
Runoff = 0.07 cfs @ 12.33 hrs, Volume= 0.015 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.048	98	Paved
	0.411	39	>75% Grass cover, Good, HSG A
	0.459	45	Weighted Average
	0.411		89.54% Pervious Area
	0.048		10.46% Impervious Area

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

Subcatchment P3-2: West Common Area



Summary for Subcatchment P3-3: East Common Area

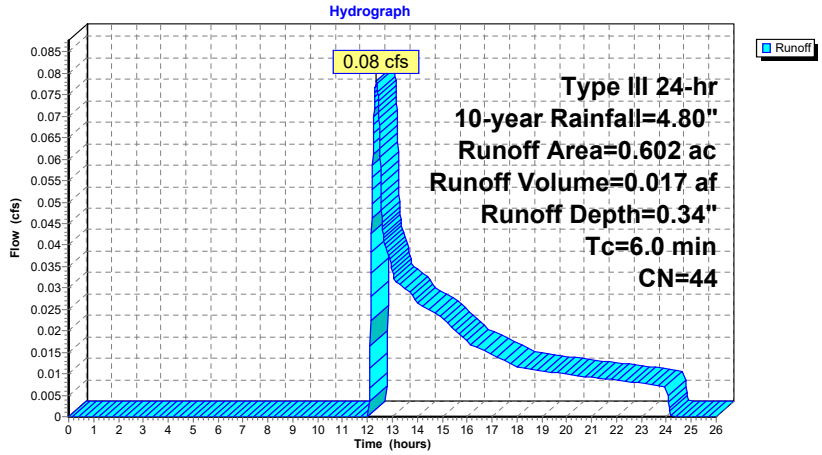
Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.017 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.055	98	Paved
	0.547	39	>75% Grass cover, Good, HSG A
	0.602	44	Weighted Average
	0.547		90.86% Pervious Area
	0.055		9.14% Impervious Area

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

Subcatchment P3-3: East Common Area



Summary for Subcatchment P3-4: Bldg A and B Parking

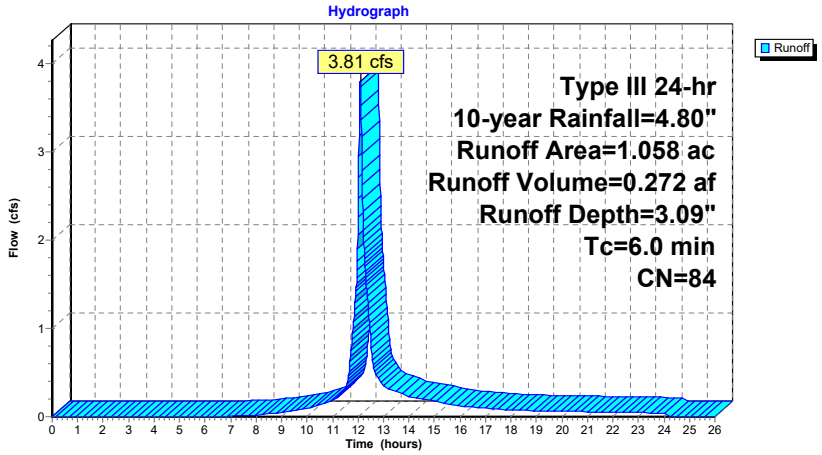
Runoff = 3.81 cfs @ 12.09 hrs, Volume= 0.272 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.805	98	Paved parking, HSG A
0.253	39	>75% Grass cover, Good, HSG A
1.058	84	Weighted Average
0.253		23.91% Pervious Area
0.805		76.09% Impervious Area

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

Subcatchment P3-4: Bldg A and B Parking



Summary for Subcatchment P3-5: Building A Roof

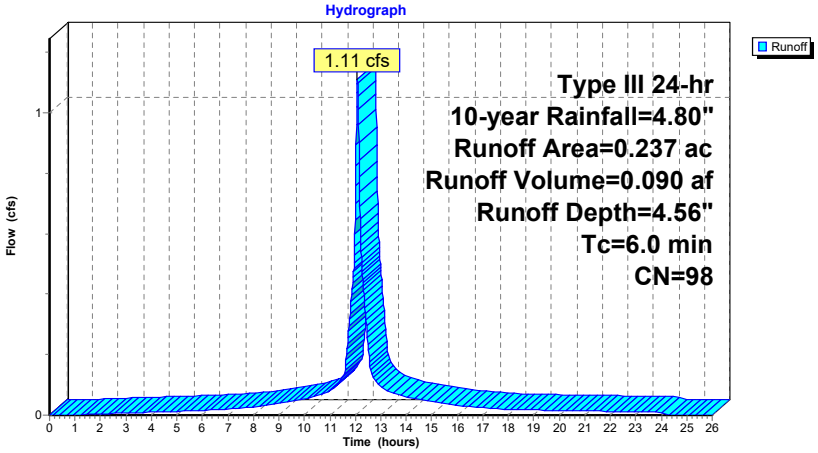
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-5: Building A Roof



Summary for Subcatchment P3-6: Building B Roof

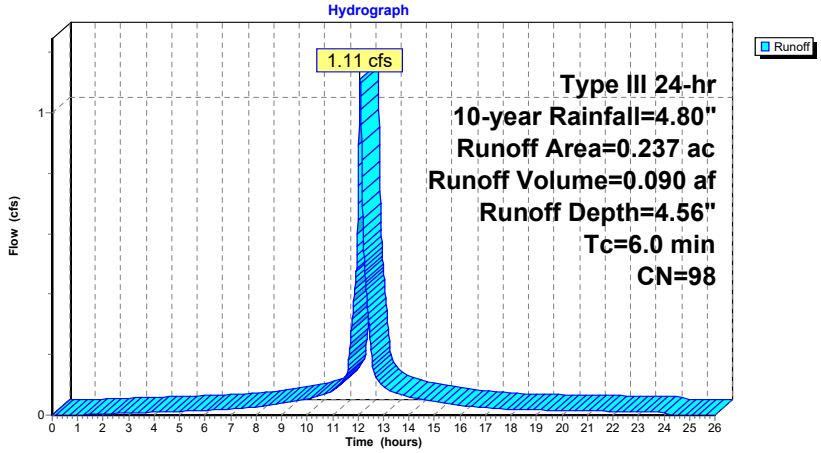
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-6: Building B Roof



Summary for Subcatchment P3-7: Building C Roof

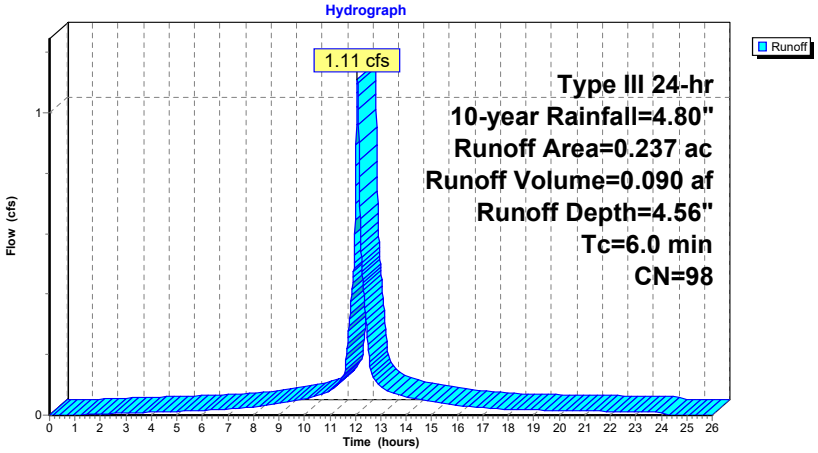
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-7: Building C Roof



Summary for Subcatchment P3-8: Building F Roof

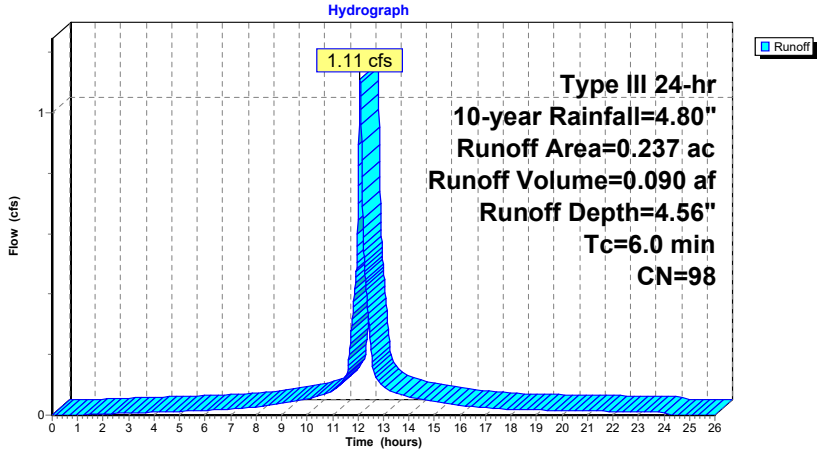
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-8: Building F Roof



Summary for Subcatchment P3-9: Building E Roof

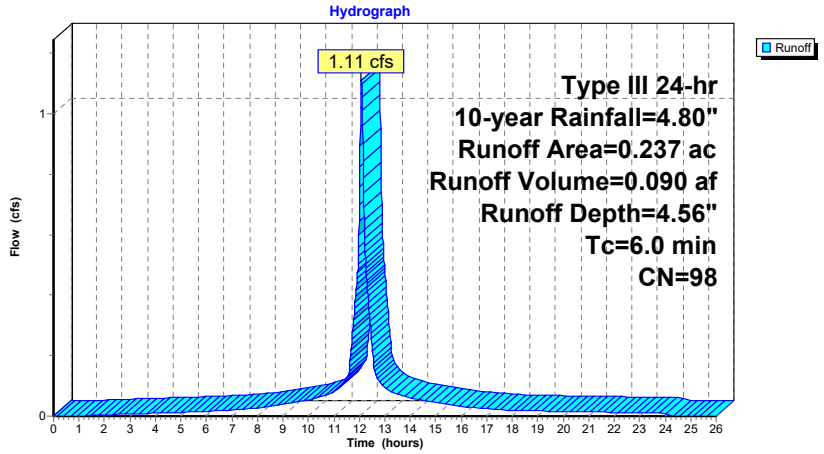
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-9: Building E Roof

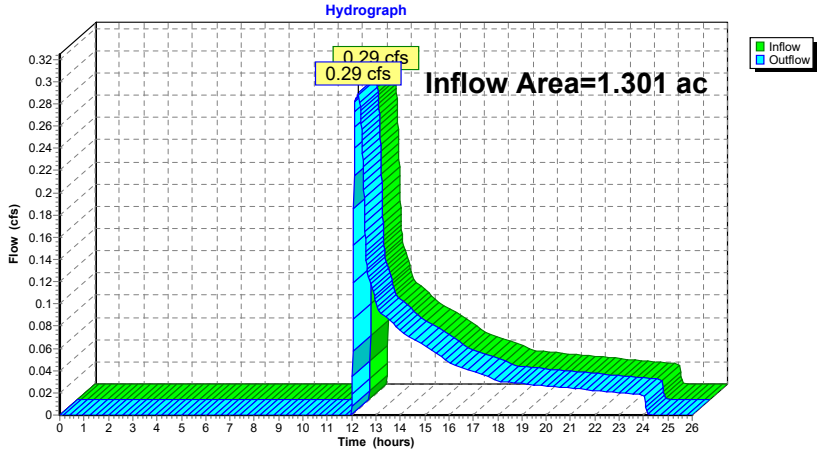


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.301 ac, 12.76% Impervious, Inflow Depth = 0.47" for 10-year event
Inflow = 0.29 cfs @ 12.27 hrs, Volume= 0.051 af
Outflow = 0.29 cfs @ 12.27 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

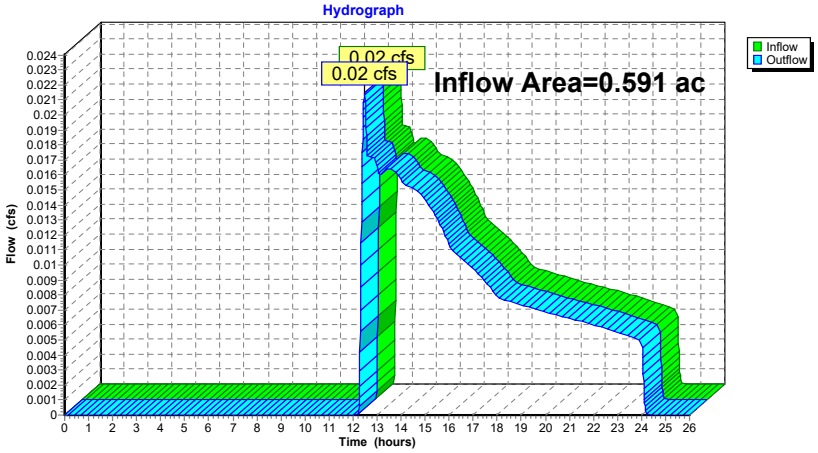


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 0.591 ac, 4.91% Impervious, Inflow Depth = 0.19" for 10-year event
Inflow = 0.02 cfs @ 12.47 hrs, Volume= 0.009 af
Outflow = 0.02 cfs @ 12.47 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

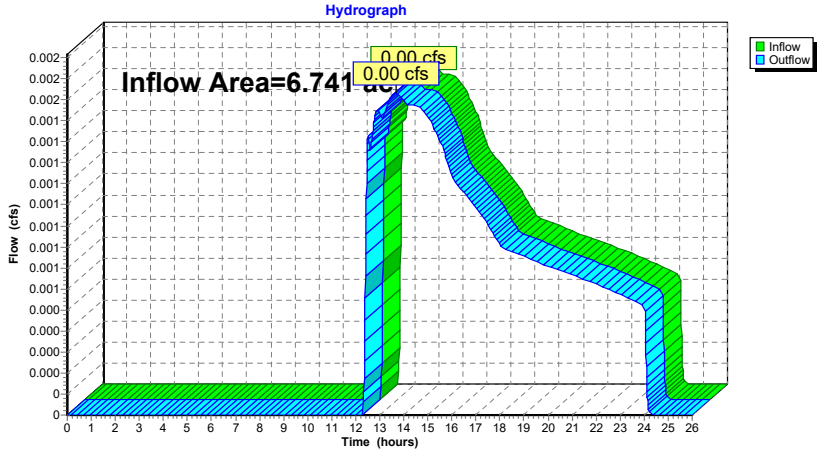


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 6.741 ac, 60.50% Impervious, Inflow Depth = 0.00" for 10-year event
Inflow = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

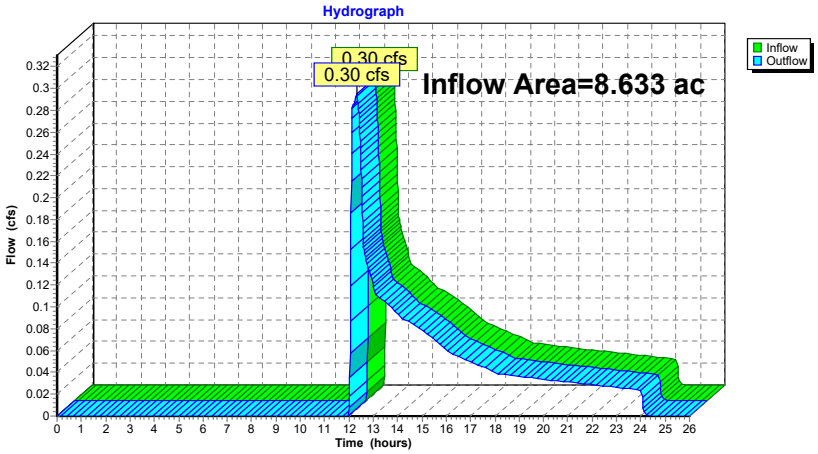


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 49.50% Impervious, Inflow Depth = 0.09" for 10-year event
Inflow = 0.30 cfs @ 12.32 hrs, Volume= 0.061 af
Outflow = 0.30 cfs @ 12.32 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: MC-3500 Underground Infiltration System 7

Inflow Area = 4.502 ac, 64.59% Impervious, Inflow Depth = 1.18" for 10-year event
Inflow = 8.10 cfs @ 12.11 hrs, Volume= 0.441 af
Outflow = 1.83 cfs @ 12.52 hrs, Volume= 0.441 af, Atten= 77%, Lag= 24.5 min
Discarded = 1.83 cfs @ 12.52 hrs, Volume= 0.441 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 67.16' @ 12.52 hrs Surf.Area= 4,248 sf Storage= 5,727 cf
Flood Elev= 70.66' Surf.Area= 4,248 sf Storage= 14,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 19.5 min (808.7 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.16'	5,953 cf	**29.92'W x 142.00'L x 5.50'H Field A** 23,364 cf Overall - 8,481 cf Embedded = 14,883 cf x 40.0% Voids
#2A	65.91'	8,481 cf	**ADS_StormTech MC-3500 c +Cap** x 76 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		14,434 cf	Total Available Storage

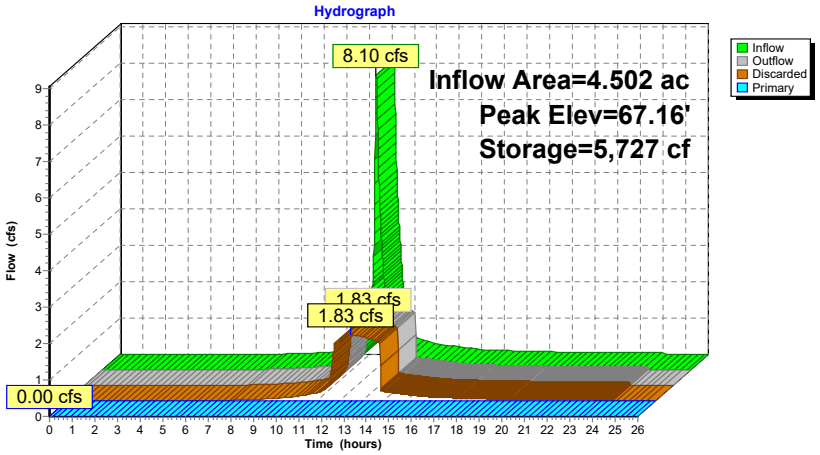
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.16'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	66.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.79' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.34'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.83 cfs @ 12.52 hrs HW=67.16' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 1.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.16' TW=62.50' (Dynamic Tailwater)
↑└**2=Culvert** (Controls 0.00 cfs)
↑└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: MC-3500 Underground Infiltration System 7



Summary for Pond 2P: Bio-Retention Area 2

Inflow Area = 1.181 ac, 54.53% Impervious, Inflow Depth = 1.38" for 10-year event
Inflow = 1.71 cfs @ 12.09 hrs, Volume= 0.136 af
Outflow = 1.70 cfs @ 12.10 hrs, Volume= 0.136 af, Atten= 1%, Lag= 0.6 min
Discarded = 0.12 cfs @ 12.10 hrs, Volume= 0.072 af
Primary = 1.58 cfs @ 12.10 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.79' @ 12.10 hrs Surf.Area= 316 sf Storage= 205 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.4 min (840.5 - 830.1)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,418 cf	**Ponding Area (Irregular)**Listed below (Recalc)

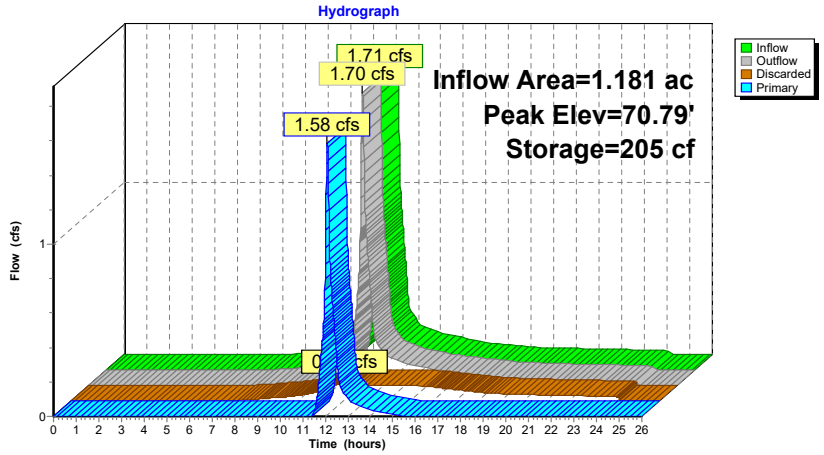
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	44	32.0	0	0	44
72.00	799	152.0	859	859	1,816
74.00	1,830	190.0	2,559	3,418	2,905

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	66.15'	**12.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.15' / 65.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.10 hrs HW=70.79' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=1.58 cfs @ 12.10 hrs HW=70.79' TW=66.08' (Dynamic Tailwater)
↑└**2=Culvert** (Passes 1.58 cfs of 7.00 cfs potential flow)
↑└**3=Orifice/Grate** (Weir Controls 1.58 cfs @ 1.75 fps)

Pond 2P: Bio-Retention Area 2



Summary for Pond 3P: MC-3500 Underground Infiltration System 6

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 68.96' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 72.15' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	66.65'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	67.40'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

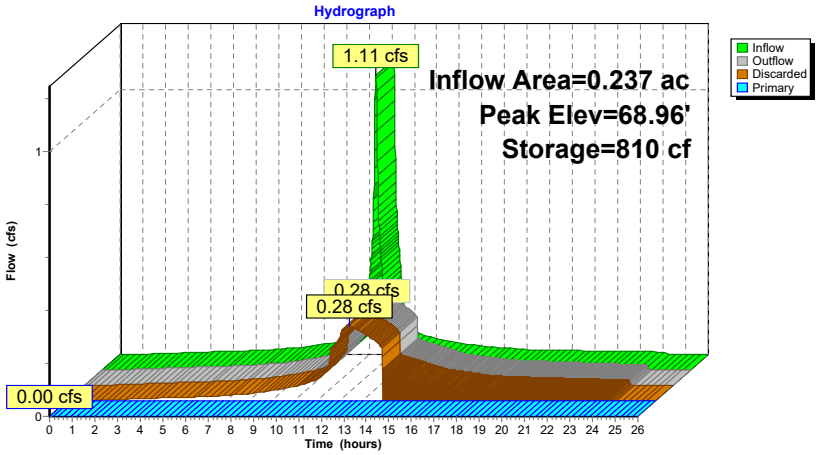
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.65'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	70.20'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 70.20' / 70.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=68.96' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.65' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 3P: MC-3500 Underground Infiltration System 6



Summary for Pond 4P: Bio-Retention Area-3

Inflow Area = 2.134 ac, 62.51% Impervious, Inflow Depth = 1.63" for 10-year event
Inflow = 3.82 cfs @ 12.09 hrs, Volume= 0.289 af
Outflow = 3.01 cfs @ 12.15 hrs, Volume= 0.289 af, Atten= 21%, Lag= 3.8 min
Discarded = 0.60 cfs @ 12.15 hrs, Volume= 0.226 af
Primary = 2.41 cfs @ 12.15 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.91' @ 12.15 hrs Surf.Area= 1,632 sf Storage= 1,750 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.3 min (833.3 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,934 cf	**Ponding Area (Irregular)**Listed below (Recalc)

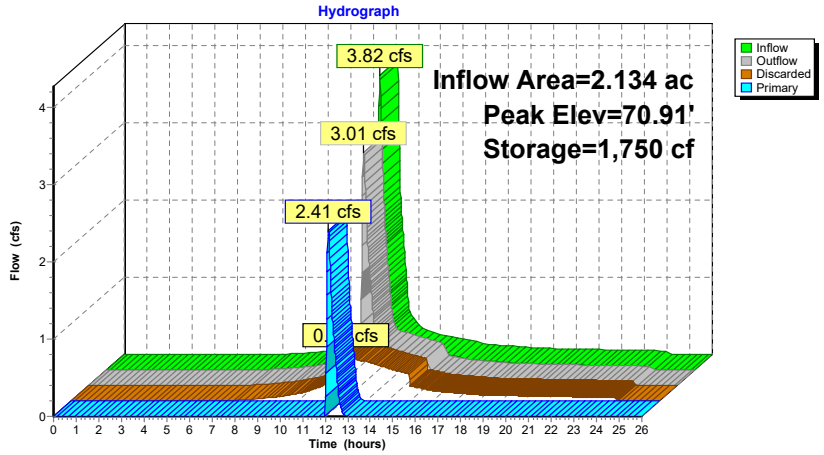
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	930	123.0	0	0	930
70.00	1,120	132.0	512	512	1,123
72.00	2,380	199.0	3,422	3,934	2,919

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	67.02'	**12.0" Round Culvert** L= 49.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.02' / 66.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.60 cfs @ 12.15 hrs HW=70.91' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.60 cfs)

Primary OutFlow Max=2.41 cfs @ 12.15 hrs HW=70.91' TW=66.39' (Dynamic Tailwater)
└**2=Culvert** (Passes 2.41 cfs of 6.64 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 2.41 cfs @ 3.06 fps)

Pond 4P: Bio-Retention Area-3



Summary for Pond 5P: MC-3500 Underground Infiltration System 1

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 72.76' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 75.95' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	70.45'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	71.20'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

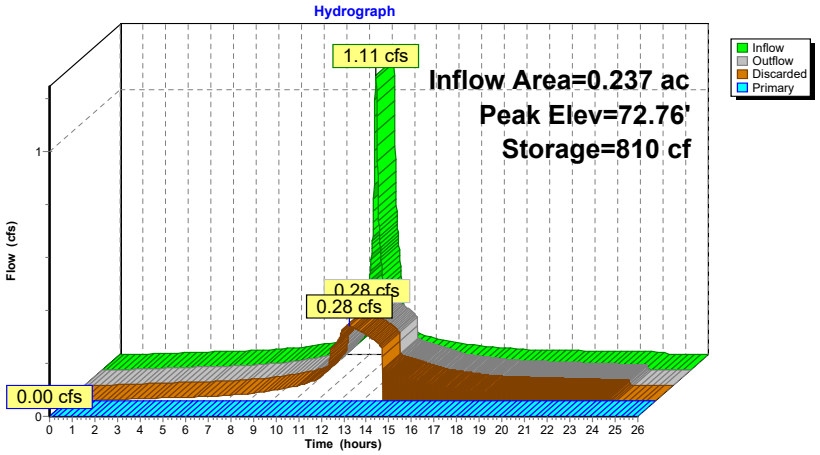
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	70.45'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	74.00'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 74.00' / 73.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=72.76' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=70.45' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 5P: MC-3500 Underground Infiltration System 1



Summary for Pond 6P: MC3500 Underground Infiltration System 2

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 71.26' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 74.45' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	68.95'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	69.70'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

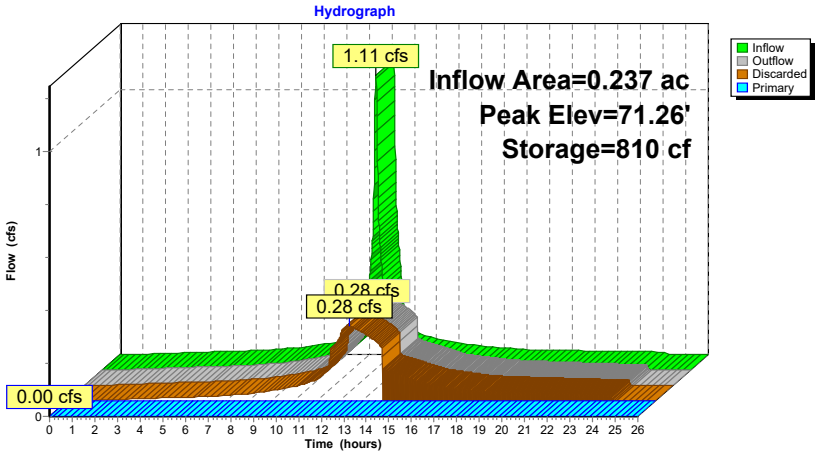
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.95'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	72.50'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 72.50' / 72.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=71.26' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=68.95' TW=69.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 6P: MC3500 Underground Infiltration System 2



Summary for Pond 7P: MC-3500 Underground Infiltration System 3

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 66.81' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 70.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	65.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

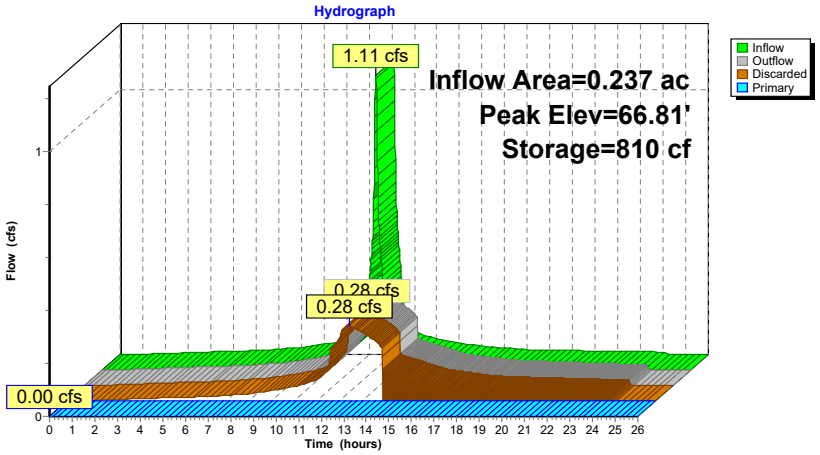
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	68.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.05' / 67.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=66.81' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.50' TW=62.50' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)

Pond 7P: MC-3500 Underground Infiltration System 3



Summary for Pond 8P: MC-3500 Underground Infiltration System 4

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 66.31' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 69.50' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	64.75'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

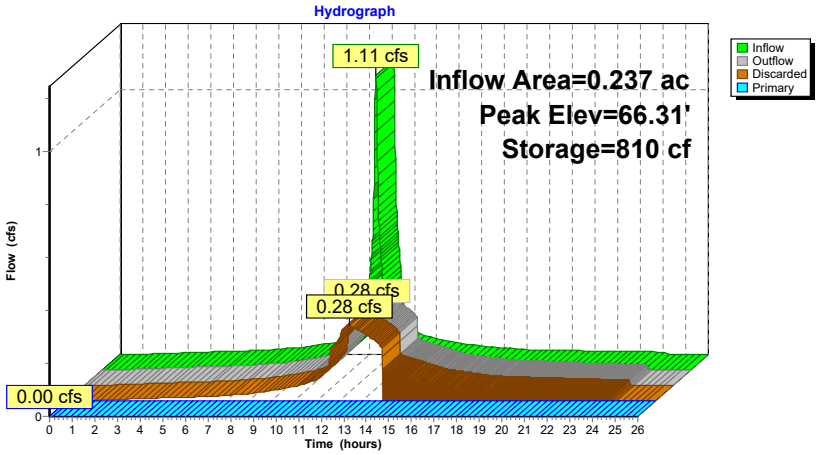
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	67.55'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.55' / 67.45' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=66.31' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.00' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 8P: MC-3500 Underground Infiltration System 4



Summary for Pond 9P: MC-3500 Underground Infiltration System 5

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af, Atten= 74%, Lag= 21.7 min
Discarded = 0.28 cfs @ 12.45 hrs, Volume= 0.090 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 67.81' @ 12.45 hrs Surf.Area= 537 sf Storage= 810 cf
Flood Elev= 71.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.5 min (763.2 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	66.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

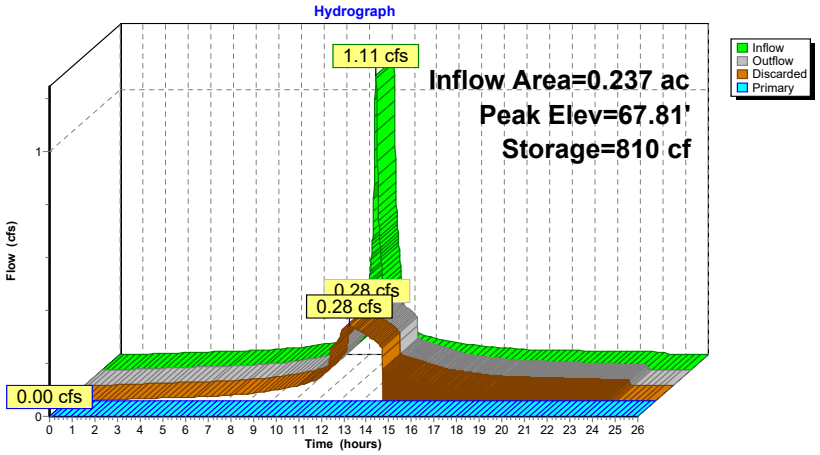
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	69.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 69.05' / 68.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.28 cfs @ 12.45 hrs HW=67.81' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.50' TW=62.50' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)

Pond 9P: MC-3500 Underground Infiltration System 5



Summary for Pond 10P: Bio-Retention Area 1

Inflow Area = 6.673 ac, 61.11% Impervious, Inflow Depth = 0.23" for 10-year event
Inflow = 1.53 cfs @ 12.10 hrs, Volume= 0.129 af
Outflow = 0.58 cfs @ 12.47 hrs, Volume= 0.129 af, Atten= 62%, Lag= 21.8 min
Discarded = 0.58 cfs @ 12.47 hrs, Volume= 0.129 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 63.27' @ 12.47 hrs Surf.Area= 1,629 sf Storage= 888 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.9 min (894.2 - 885.3)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	2,493 cf	**Ponding Area (Irregular)**Listed below (Recalc)

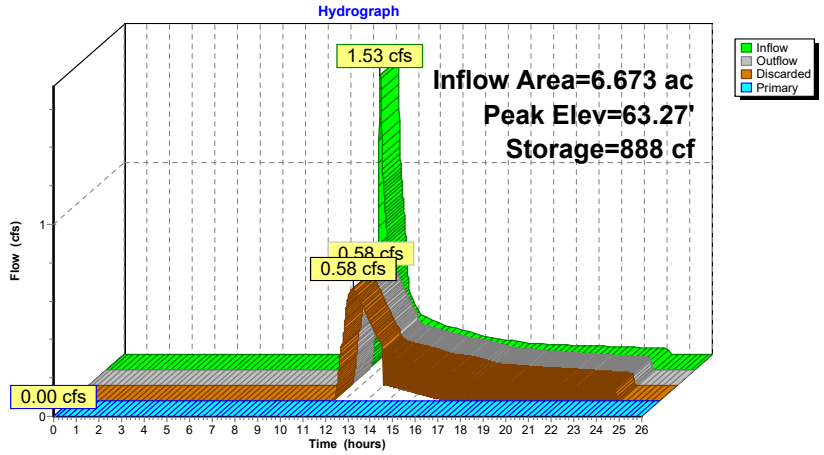
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	766	329.0	0	0	766
63.00	1,267	338.0	503	503	1,272
63.75	2,400	353.0	1,353	1,856	2,137
64.00	2,700	425.0	637	2,493	6,595

Device	Routing	Invert	Outlet Devices
#1	Discarded	62.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	63.75'	**140.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.58 cfs @ 12.47 hrs HW=63.27' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.58 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.50' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Bio-Retention Area 1



Time span=0.00-26.00 hrs, dt=0.01 hrs, 2601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Flow Towards Route 6 Runoff Area=1.301 ac 12.76% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=47 Runoff=1.82 cfs 0.158 af

Subcatchment P2: Overland Flow to the East Runoff Area=0.591 ac 4.91% Impervious Runoff Depth=0.88"
Tc=6.0 min UI Adjusted CN=40 Runoff=0.34 cfs 0.043 af

Subcatchment P3-1: Bldg F Parking Runoff Area=0.485 ac 74.02% Impervious Runoff Depth=5.12"
Tc=6.0 min CN=83 Runoff=2.85 cfs 0.207 af

Subcatchment P3-10: Bldg C D F Parking Runoff Area=1.187 ac 78.35% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=85 Runoff=7.23 cfs 0.529 af

Subcatchment P3-11: Building D Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Subcatchment P3-12: Rear Parking Areas Runoff Area=1.460 ac 31.44% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=58 Runoff=4.08 cfs 0.301 af

Subcatchment P3-13: Overland Flow Runoff Area=0.068 ac 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.005 af

Subcatchment P3-2: West Common Area Runoff Area=0.459 ac 10.46% Impervious Runoff Depth=1.28"
Tc=6.0 min CN=45 Runoff=0.53 cfs 0.049 af

Subcatchment P3-3: East Common Area Runoff Area=0.602 ac 9.14% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=44 Runoff=0.62 cfs 0.060 af

Subcatchment P3-4: Bldg A and B Parking Runoff Area=1.058 ac 76.09% Impervious Runoff Depth=5.23"
Tc=6.0 min CN=84 Runoff=6.34 cfs 0.462 af

Subcatchment P3-5: Building A Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Subcatchment P3-6: Building B Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Subcatchment P3-7: Building C Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Subcatchment P3-8: Building F Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Subcatchment P3-9: Building E Roof Runoff Area=0.237 ac 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.136 af

Reach 1R: Flow Towards Route 6 and Red Brook Rd Inflow=1.82 cfs 0.158 af
Outflow=1.82 cfs 0.158 af

Reach 2R: Flow to East Perimeter Inflow=0.34 cfs 0.043 af
Outflow=0.34 cfs 0.043 af

Reach 3R: Flow to North Perimeter Inflow=2.89 cfs 0.082 af
Outflow=2.89 cfs 0.082 af

Reach TS: Total Site Inflow=4.61 cfs 0.284 af
Outflow=4.61 cfs 0.284 af

Pond 1P: MC-3500 Underground Infiltration Peak Elev=70.66' Storage=14,433 cf Inflow=13.54 cfs 0.867 af
Discarded=2.27 cfs 0.832 af Primary=2.32 cfs 0.035 af Outflow=4.59 cfs 0.867 af

Pond 2P: Bio-Retention Area 2 Peak Elev=71.12' Storage=329 cf Inflow=3.36 cfs 0.257 af
Discarded=0.16 cfs 0.102 af Primary=2.98 cfs 0.155 af Outflow=3.14 cfs 0.257 af

Pond 3P: MC-3500 Underground Infiltration Peak Elev=70.74' Storage=1,435 cf Inflow=1.65 cfs 0.136 af
Discarded=0.35 cfs 0.135 af Primary=0.18 cfs 0.001 af Outflow=0.53 cfs 0.136 af

Pond 4P: Bio-Retention Area-3 Peak Elev=71.54' Storage=2,922 cf Inflow=6.93 cfs 0.529 af
Discarded=0.76 cfs 0.345 af Primary=3.86 cfs 0.183 af Outflow=4.62 cfs 0.529 af

Pond 5P: MC-3500 Underground Infiltration Peak Elev=74.30' Storage=1,367 cf Inflow=1.65 cfs 0.136 af
Discarded=0.34 cfs 0.132 af Primary=0.19 cfs 0.003 af Outflow=0.53 cfs 0.136 af

Pond 6P: MC3500 Underground Infiltration Peak Elev=72.80' Storage=1,367 cf Inflow=1.65 cfs 0.136 af
Discarded=0.34 cfs 0.132 af Primary=0.19 cfs 0.003 af Outflow=0.53 cfs 0.136 af

Pond 7P: MC-3500 Underground Infiltration Peak Elev=68.35' Storage=1,367 cf Inflow=1.65 cfs 0.136 af
Discarded=0.34 cfs 0.132 af Primary=0.19 cfs 0.003 af Outflow=0.53 cfs 0.136 af

Pond 8P: MC-3500 Underground Infiltration Peak Elev=67.85' Storage=1,367 cf Inflow=1.65 cfs 0.136 af
Discarded=0.34 cfs 0.132 af Primary=0.19 cfs 0.003 af Outflow=0.53 cfs 0.136 af

Pond 9P: MC-3500 Underground Infiltration Peak Elev=69.35' Storage=1,367 cf Inflow=1.65 cfs 0.136 af
Discarded=0.34 cfs 0.132 af Primary=0.19 cfs 0.003 af Outflow=0.53 cfs 0.136 af

Pond 10P: Bio-Retention Area 1 Peak Elev=63.79' Storage=1,956 cf Inflow=4.08 cfs 0.346 af
Discarded=1.04 cfs 0.269 af Primary=2.87 cfs 0.078 af Outflow=3.91 cfs 0.347 af

Total Runoff Area = 8.633 ac Runoff Volume = 2.627 af Average Runoff Depth = 3.65"
50.50% Pervious = 4.360 ac 49.50% Impervious = 4.273 ac

Summary for Subcatchment P1: Flow Towards Route 6 and Red Brook Rd

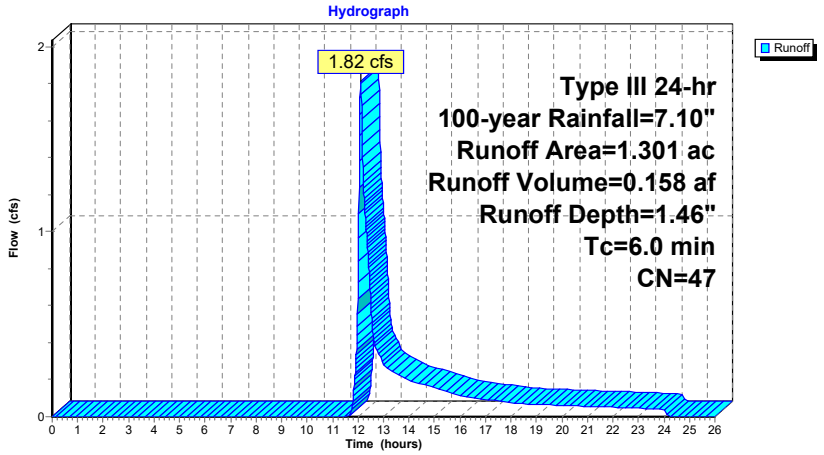
Runoff = 1.82 cfs @ 12.11 hrs, Volume= 0.158 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.166	98	Paved parking, HSG A
1.135	39	>75% Grass cover, Good, HSG A
1.301	47	Weighted Average
1.135		87.24% Pervious Area
0.166		12.76% Impervious Area

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

Subcatchment P1: Flow Towards Route 6 and Red Brook Rd



Summary for Subcatchment P2: Overland Flow to the East

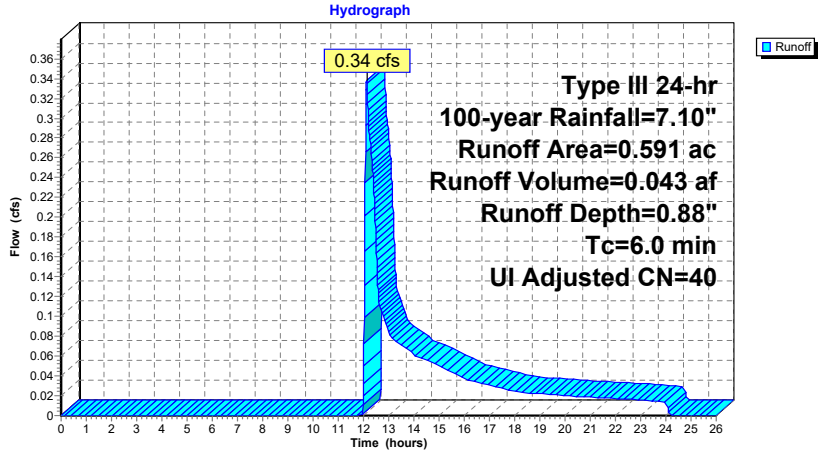
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.043 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Adj	Description
0.029	98		Unconnected pavement, HSG A
0.562	39		>75% Grass cover, Good, HSG A
0.591	42	40	Weighted Average, UI Adjusted
0.562			95.09% Pervious Area
0.029			4.91% Impervious Area
0.029			100.00% Unconnected

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

Subcatchment P2: Overland Flow to the East



Summary for Subcatchment P3-1: Bldg F Parking

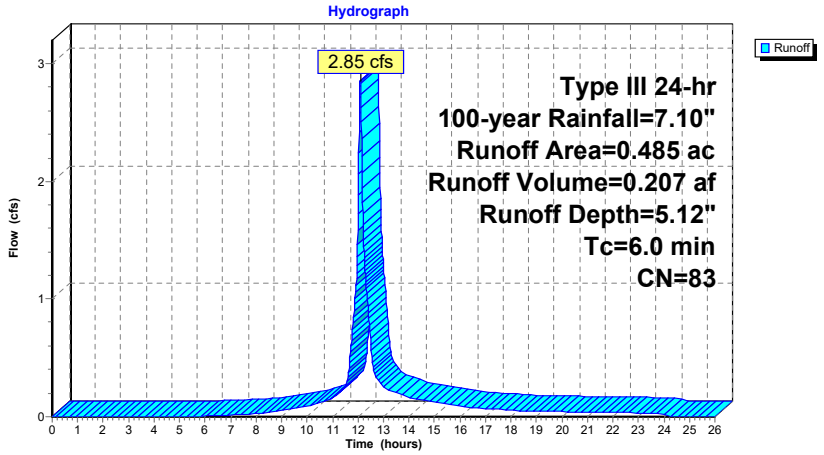
Runoff = 2.85 cfs @ 12.09 hrs, Volume= 0.207 af, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.359	98	Paved parking, HSG A
0.126	39	>75% Grass cover, Good, HSG A
0.485	83	Weighted Average
0.126		25.98% Pervious Area
0.359		74.02% Impervious Area

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

Subcatchment P3-1: Bldg F Parking



Summary for Subcatchment P3-10: Bldg C D F Parking

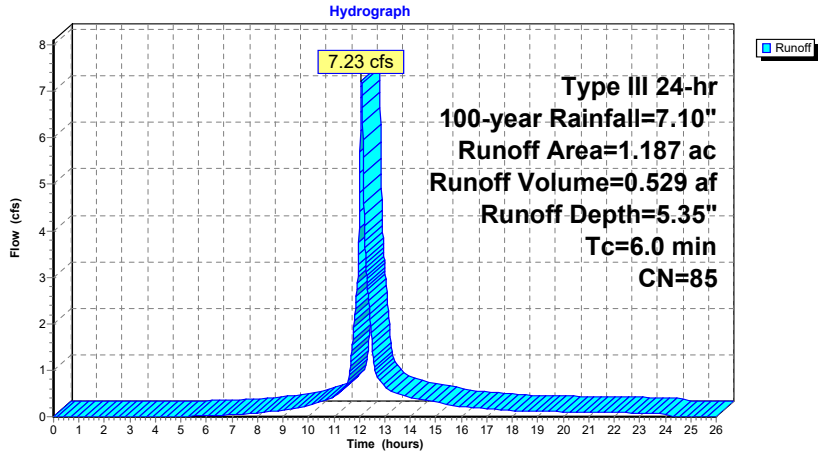
Runoff = 7.23 cfs @ 12.09 hrs, Volume= 0.529 af, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG A
0.257	39	>75% Grass cover, Good, HSG A
1.187	85	Weighted Average
0.257		21.65% Pervious Area
0.930		78.35% Impervious Area

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

Subcatchment P3-10: Bldg C D F Parking



Summary for Subcatchment P3-11: Building D Roof

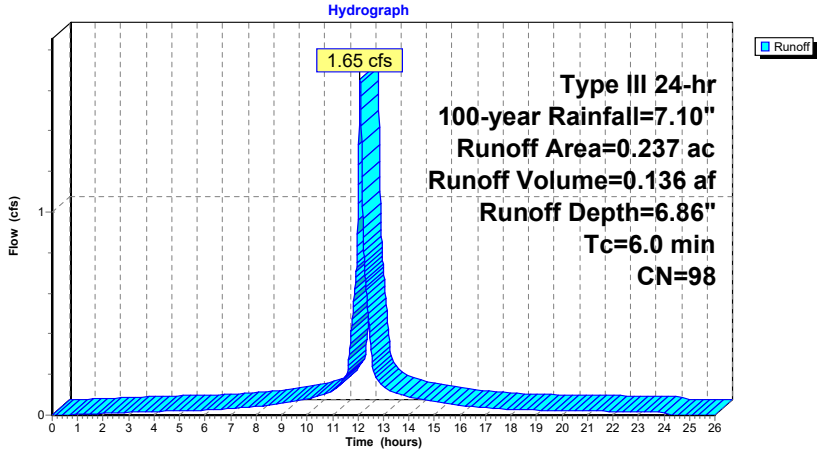
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-11: Building D Roof



Summary for Subcatchment P3-12: Rear Parking Areas

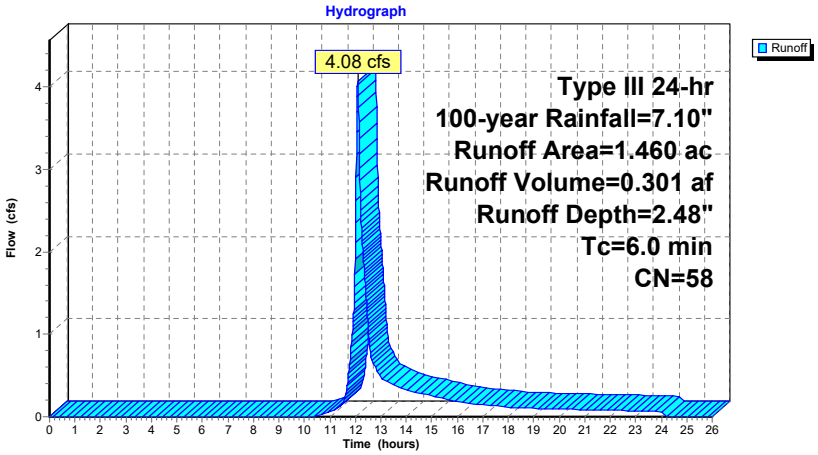
Runoff = 4.08 cfs @ 12.09 hrs, Volume= 0.301 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.459	98	Paved parking, HSG A
1.001	39	>75% Grass cover, Good, HSG A
1.460	58	Weighted Average
1.001		68.56% Pervious Area
0.459		31.44% Impervious Area

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

Subcatchment P3-12: Rear Parking Areas



Summary for Subcatchment P3-13: Overland Flow

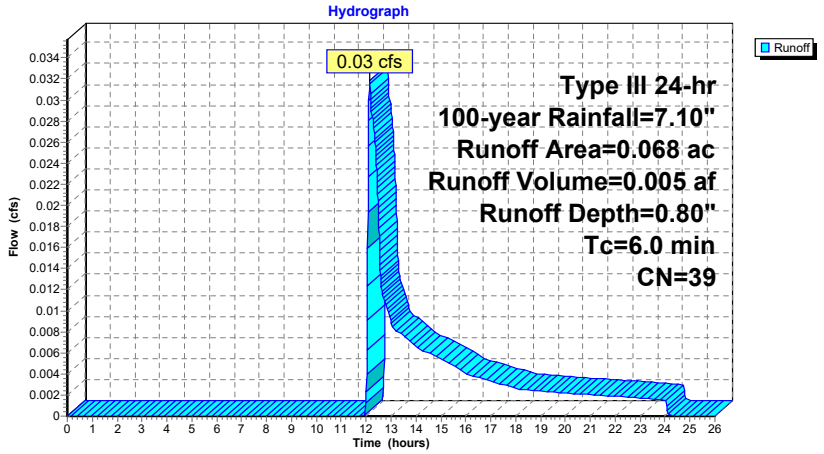
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 0.005 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.068	39	>75% Grass cover, Good, HSG A
0.068		100.00% Pervious Area

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

Subcatchment P3-13: Overland Flow



Summary for Subcatchment P3-2: West Common Area

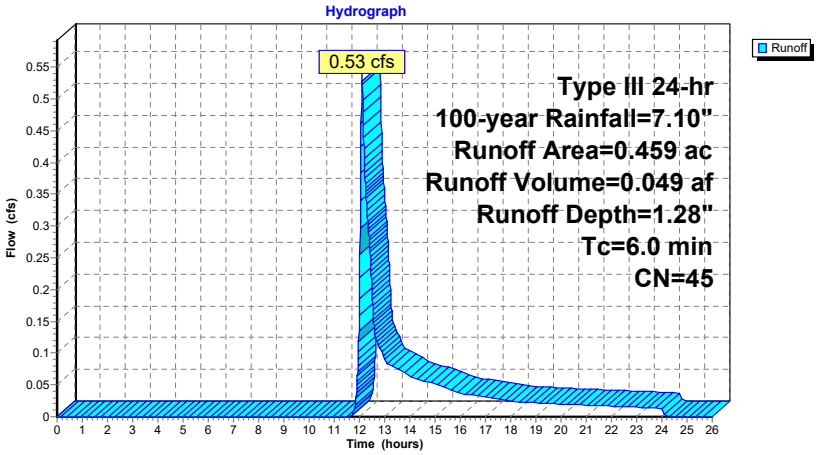
Runoff = 0.53 cfs @ 12.11 hrs, Volume= 0.049 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (ac)	CN	Description
*	0.048	98	Paved
	0.411	39	>75% Grass cover, Good, HSG A
	0.459	45	Weighted Average
	0.411		89.54% Pervious Area
	0.048		10.46% Impervious Area

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

Subcatchment P3-2: West Common Area



Summary for Subcatchment P3-3: East Common Area

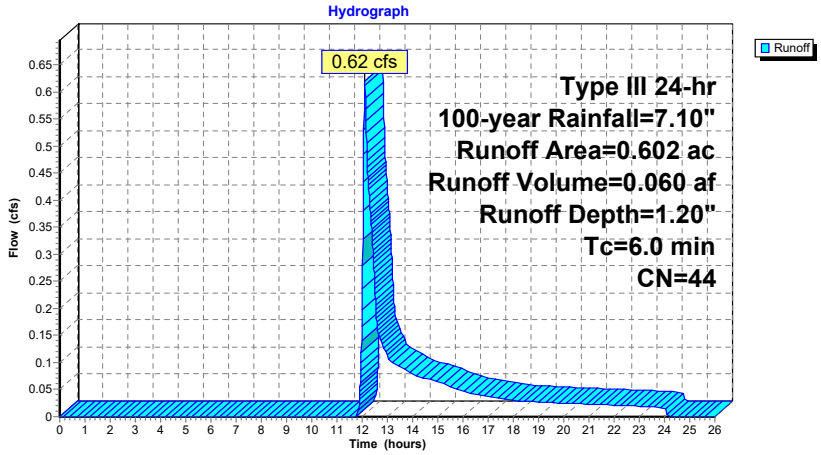
Runoff = 0.62 cfs @ 12.11 hrs, Volume= 0.060 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (ac)	CN	Description
*	0.055	98	Paved
	0.547	39	>75% Grass cover, Good, HSG A
	0.602	44	Weighted Average
	0.547		90.86% Pervious Area
	0.055		9.14% Impervious Area

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

Subcatchment P3-3: East Common Area



Summary for Subcatchment P3-4: Bldg A and B Parking

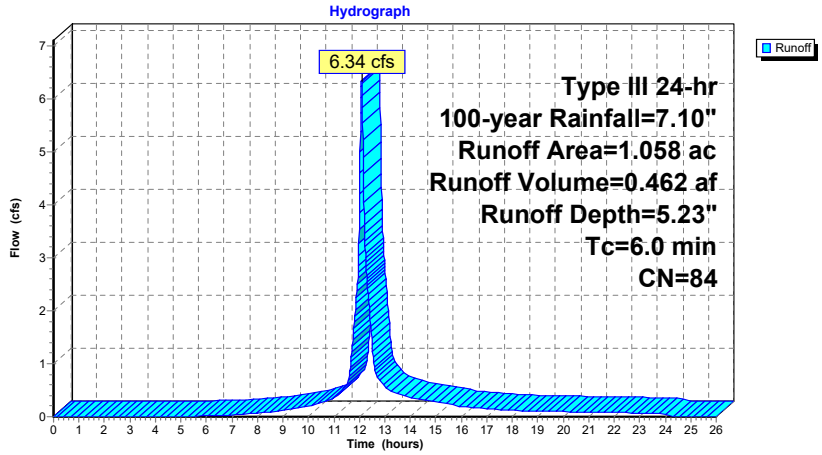
Runoff = 6.34 cfs @ 12.09 hrs, Volume= 0.462 af, Depth= 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.805	98	Paved parking, HSG A
0.253	39	>75% Grass cover, Good, HSG A
1.058	84	Weighted Average
0.253		23.91% Pervious Area
0.805		76.09% Impervious Area

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

Subcatchment P3-4: Bldg A and B Parking



Summary for Subcatchment P3-5: Building A Roof

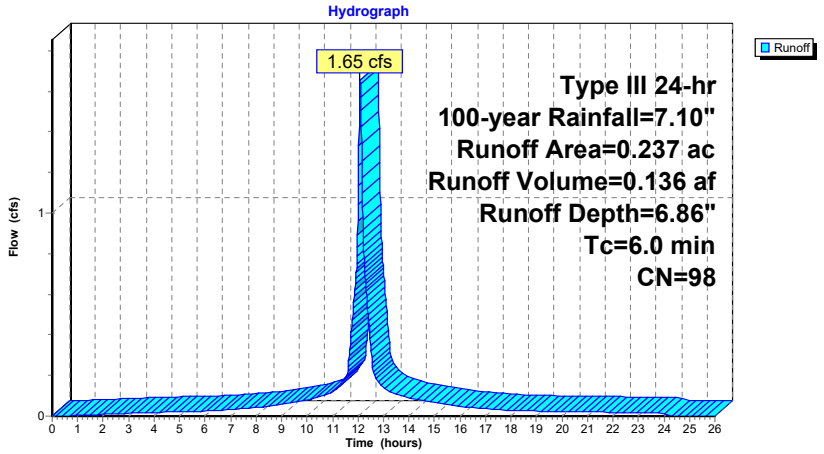
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-5: Building A Roof



Summary for Subcatchment P3-6: Building B Roof

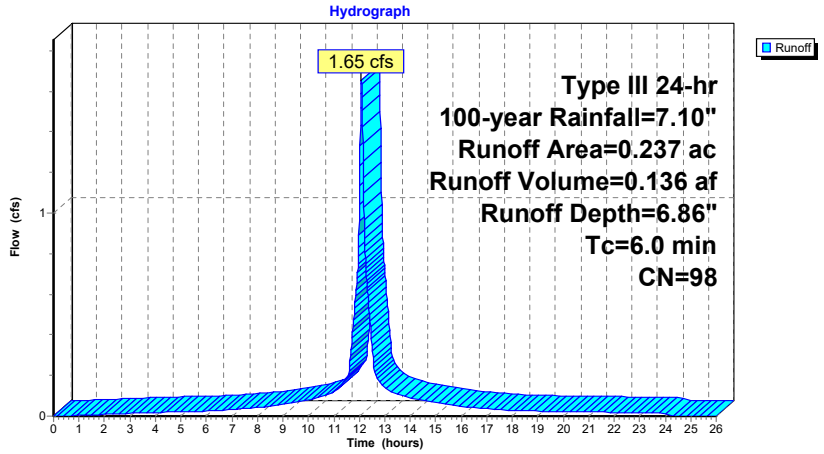
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-6: Building B Roof



Summary for Subcatchment P3-7: Building C Roof

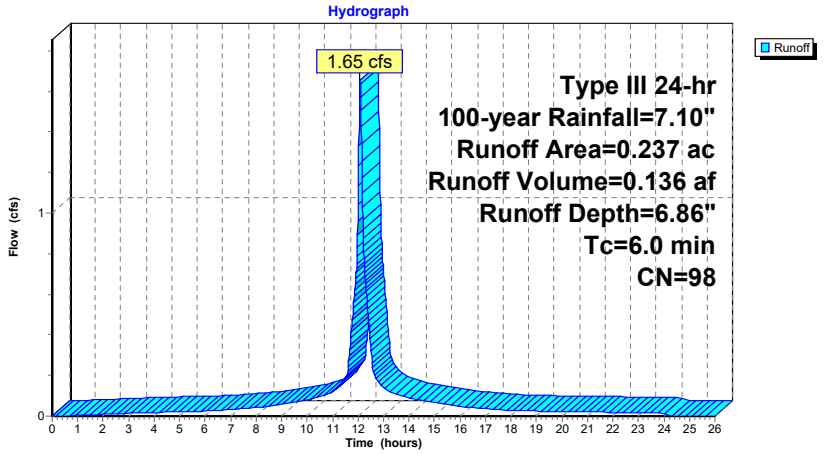
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-7: Building C Roof



Summary for Subcatchment P3-8: Building F Roof

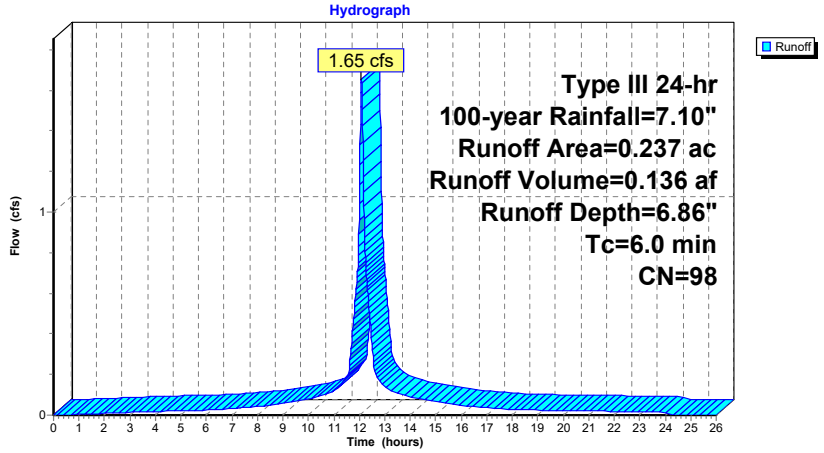
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-8: Building F Roof



Summary for Subcatchment P3-9: Building E Roof

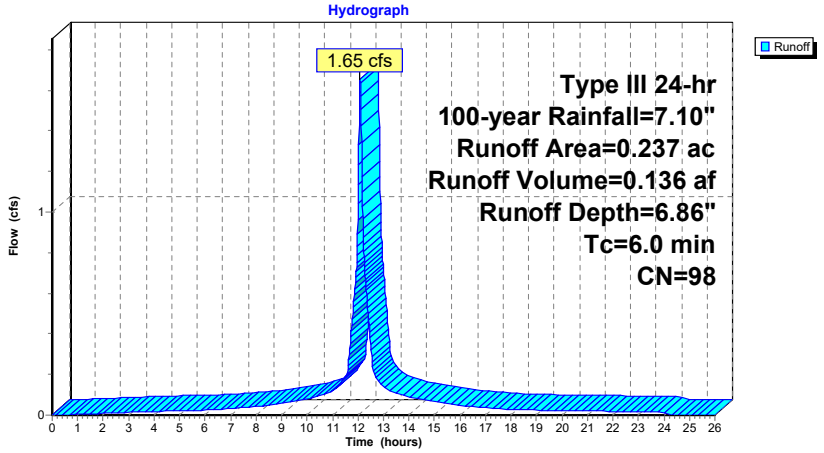
Runoff = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (ac)	CN	Description
0.237	98	Roofs, HSG A
0.237		100.00% Impervious Area

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

Subcatchment P3-9: Building E Roof

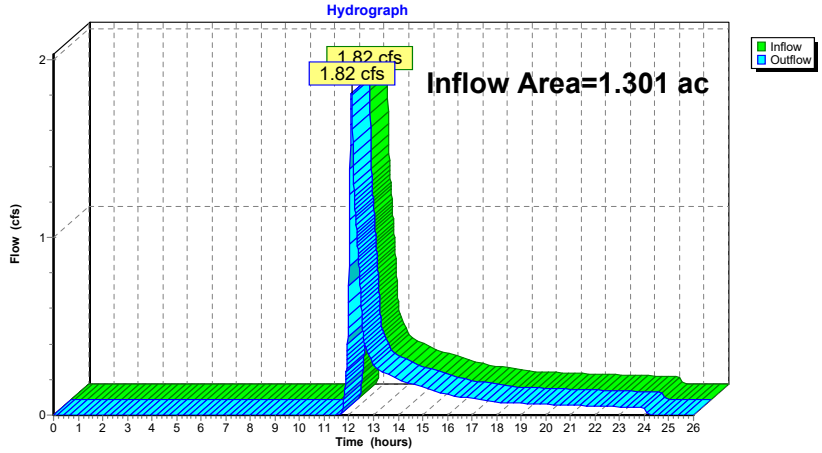


Summary for Reach 1R: Flow Towards Route 6 and Red Brook Rd

Inflow Area = 1.301 ac, 12.76% Impervious, Inflow Depth = 1.46" for 100-year event
Inflow = 1.82 cfs @ 12.11 hrs, Volume= 0.158 af
Outflow = 1.82 cfs @ 12.11 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 1R: Flow Towards Route 6 and Red Brook Rd

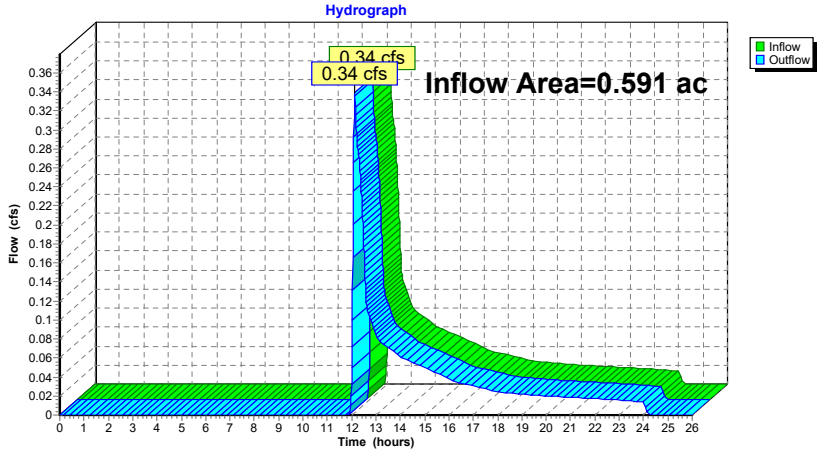


Summary for Reach 2R: Flow to East Perimeter

Inflow Area = 0.591 ac, 4.91% Impervious, Inflow Depth = 0.88" for 100-year event
Inflow = 0.34 cfs @ 12.13 hrs, Volume= 0.043 af
Outflow = 0.34 cfs @ 12.13 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 2R: Flow to East Perimeter

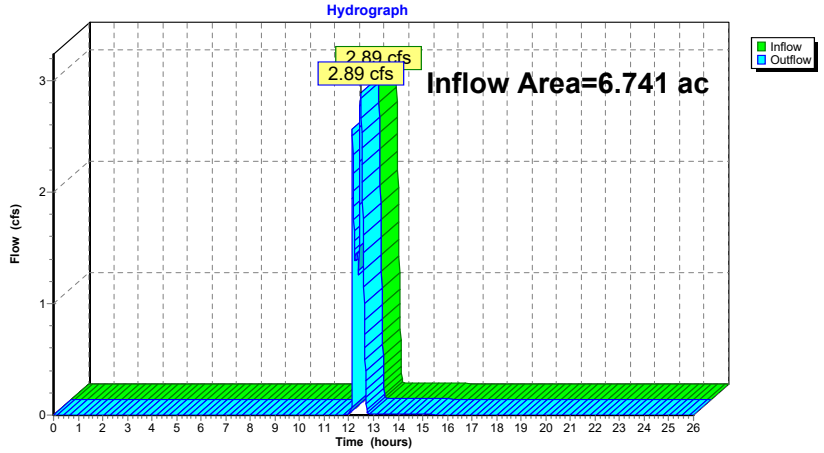


Summary for Reach 3R: Flow to North Perimeter

Inflow Area = 6.741 ac, 60.50% Impervious, Inflow Depth = 0.15" for 100-year event
Inflow = 2.89 cfs @ 12.48 hrs, Volume= 0.082 af
Outflow = 2.89 cfs @ 12.48 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach 3R: Flow to North Perimeter

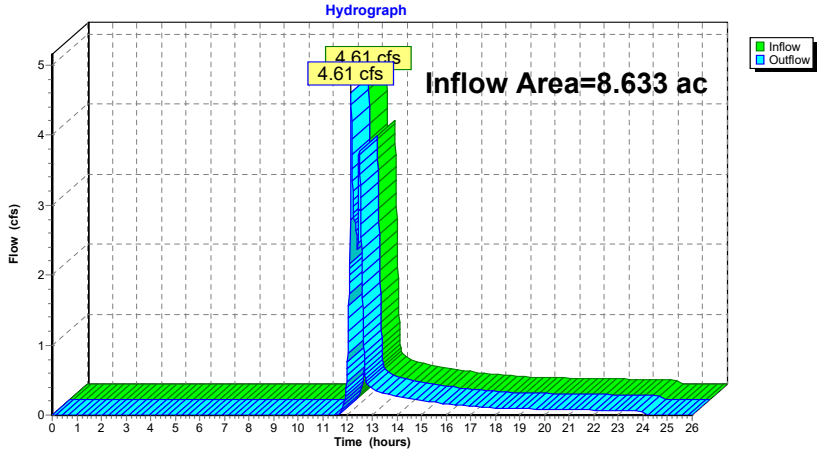


Summary for Reach TS: Total Site

Inflow Area = 8.633 ac, 49.50% Impervious, Inflow Depth = 0.39" for 100-year event
Inflow = 4.61 cfs @ 12.14 hrs, Volume= 0.284 af
Outflow = 4.61 cfs @ 12.14 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: MC-3500 Underground Infiltration System 7

Inflow Area = 4.502 ac, 64.59% Impervious, Inflow Depth = 2.31" for 100-year event
Inflow = 13.54 cfs @ 12.10 hrs, Volume= 0.867 af
Outflow = 4.59 cfs @ 12.49 hrs, Volume= 0.867 af, Atten= 66%, Lag= 23.2 min
Discarded = 2.27 cfs @ 12.49 hrs, Volume= 0.832 af
Primary = 2.32 cfs @ 12.49 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.66' @ 12.49 hrs Surf.Area= 4,248 sf Storage= 14,433 cf
Flood Elev= 70.66' Surf.Area= 4,248 sf Storage= 14,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.1 min (823.9 - 775.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.16'	5,953 cf	**29.92'W x 142.00'L x 5.50'H Field A** 23,364 cf Overall - 8,481 cf Embedded = 14,883 cf x 40.0% Voids
#2A	65.91'	8,481 cf	**ADS_StormTech MC-3500 c +Cap** x 76 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		14,434 cf	Total Available Storage

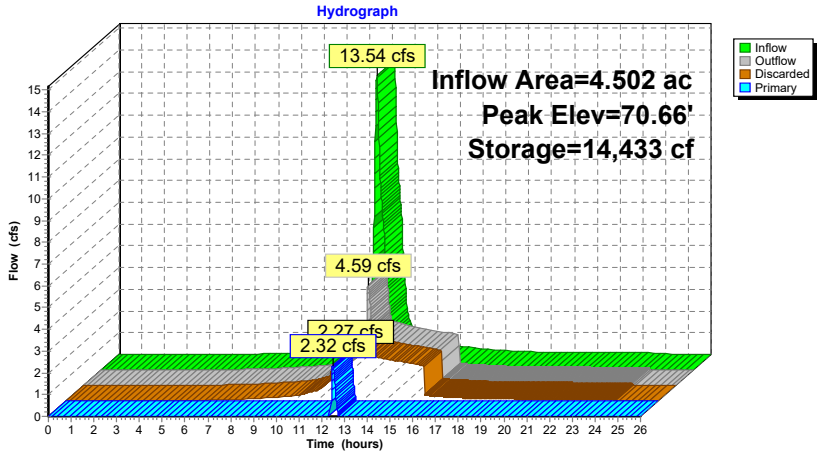
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.16'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	66.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.79' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.34'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=2.27 cfs @ 12.49 hrs HW=70.66' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 2.27 cfs)

Primary OutFlow Max=2.32 cfs @ 12.49 hrs HW=70.66' TW=63.79' (Dynamic Tailwater)
└**2=Culvert** (Passes 2.32 cfs of 7.71 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.32 cfs @ 1.85 fps)

Pond 1P: MC-3500 Underground Infiltration System 7



Summary for Pond 2P: Bio-Retention Area 2

Inflow Area = 1.181 ac, 54.53% Impervious, Inflow Depth = 2.61" for 100-year event
Inflow = 3.36 cfs @ 12.09 hrs, Volume= 0.257 af
Outflow = 3.14 cfs @ 12.12 hrs, Volume= 0.257 af, Atten= 7%, Lag= 1.9 min
Discarded = 0.16 cfs @ 12.12 hrs, Volume= 0.102 af
Primary = 2.98 cfs @ 12.12 hrs, Volume= 0.155 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 71.12' @ 12.12 hrs Surf.Area= 427 sf Storage= 329 cf

Plug-Flow detention time= 8.9 min calculated for 0.257 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (827.3 - 818.5)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,418 cf	**Ponding Area (Irregular)**Listed below (Recalc)

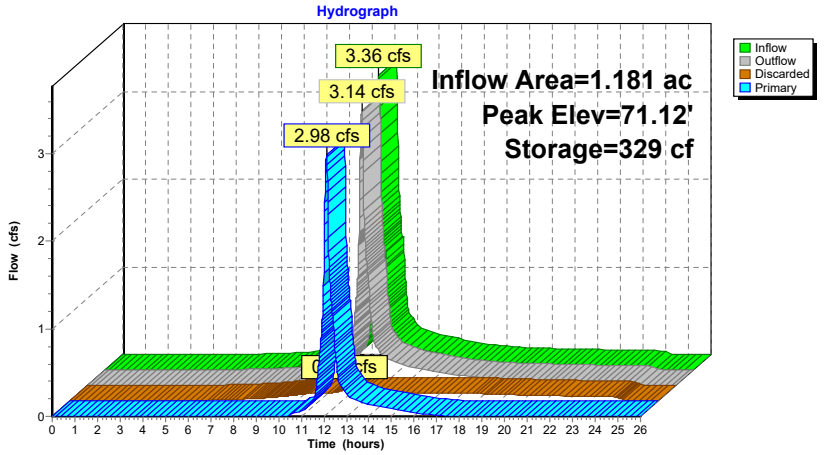
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	44	32.0	0	0	44
72.00	799	152.0	859	859	1,816
74.00	1,830	190.0	2,559	3,418	2,905

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	66.15'	**12.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.15' / 65.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.16 cfs @ 12.12 hrs HW=71.12' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=2.98 cfs @ 12.12 hrs HW=71.12' TW=67.47' (Dynamic Tailwater)
└**2=Culvert** (Passes 2.98 cfs of 6.48 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 2.98 cfs @ 3.80 fps)

Pond 2P: Bio-Retention Area 2



Summary for Pond 3P: MC-3500 Underground Infiltration System 6

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.40 hrs, Volume= 0.136 af, Atten= 68%, Lag= 19.1 min
Discarded = 0.35 cfs @ 12.40 hrs, Volume= 0.135 af
Primary = 0.18 cfs @ 12.40 hrs, Volume= 0.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.74' @ 12.40 hrs Surf.Area= 537 sf Storage= 1,435 cf
Flood Elev= 72.15' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 24.2 min (767.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	66.65'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	67.40'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

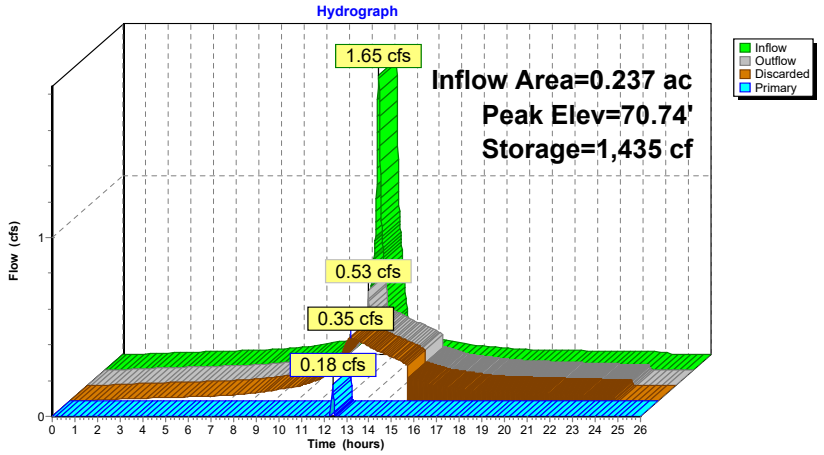
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.65'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	70.20'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 70.20' / 70.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.35 cfs @ 12.40 hrs HW=70.74' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.35 cfs)

Primary OutFlow Max=0.13 cfs @ 12.40 hrs HW=70.74' TW=70.73' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 0.13 cfs @ 0.45 fps)

Pond 3P: MC-3500 Underground Infiltration System 6



Summary for Pond 4P: Bio-Retention Area-3

Inflow Area = 2.134 ac, 62.51% Impervious, Inflow Depth = 2.97" for 100-year event
Inflow = 6.93 cfs @ 12.09 hrs, Volume= 0.529 af
Outflow = 4.62 cfs @ 12.18 hrs, Volume= 0.529 af, Atten= 33%, Lag= 5.4 min
Discarded = 0.76 cfs @ 12.18 hrs, Volume= 0.345 af
Primary = 3.86 cfs @ 12.18 hrs, Volume= 0.183 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 71.54' @ 12.18 hrs Surf.Area= 2,051 sf Storage= 2,922 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.2 min (821.7 - 808.5)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,934 cf	**Ponding Area (Irregular)**Listed below (Recalc)

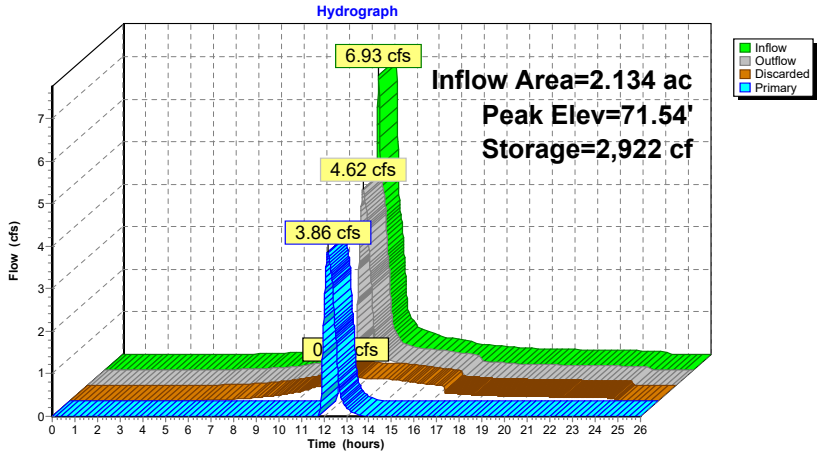
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	930	123.0	0	0	930
70.00	1,120	132.0	512	512	1,123
72.00	2,380	199.0	3,422	3,934	2,919

Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	67.02'	**12.0" Round Culvert** L= 49.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.02' / 66.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.76 cfs @ 12.18 hrs HW=71.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.76 cfs)

Primary OutFlow Max=3.86 cfs @ 12.18 hrs HW=71.54' TW=68.13' (Dynamic Tailwater)
└**2=Culvert** (Passes 3.86 cfs of 6.68 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 3.86 cfs @ 4.92 fps)

Pond 4P: Bio-Retention Area-3



Summary for Pond 5P: MC-3500 Underground Infiltration System 1

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.37 hrs, Volume= 0.136 af, Atten= 68%, Lag= 17.3 min
Discarded = 0.34 cfs @ 12.37 hrs, Volume= 0.132 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 74.30' @ 12.37 hrs Surf.Area= 537 sf Storage= 1,367 cf
Flood Elev= 75.95' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (765.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	70.45'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	71.20'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

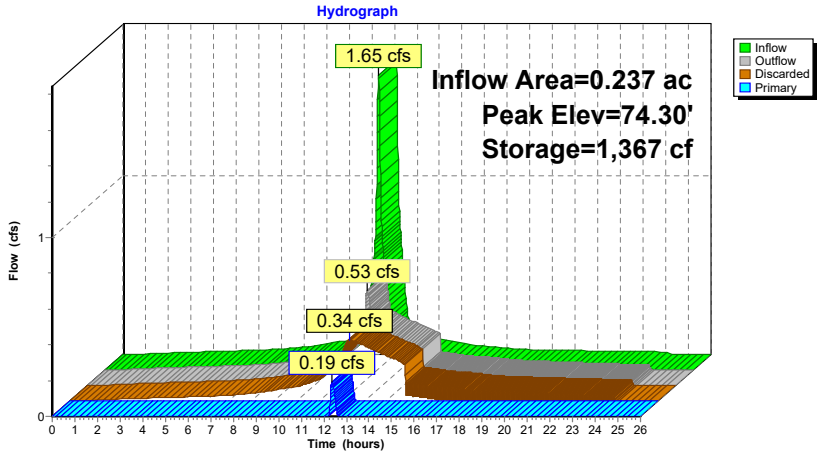
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	70.45'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	74.00'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 74.00' / 73.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.34 cfs @ 12.37 hrs HW=74.30' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=74.30' TW=71.23' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.19 cfs @ 2.19 fps)

Pond 5P: MC-3500 Underground Infiltration System 1



Summary for Pond 6P: MC3500 Underground Infiltration System 2

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.37 hrs, Volume= 0.136 af, Atten= 68%, Lag= 17.3 min
Discarded = 0.34 cfs @ 12.37 hrs, Volume= 0.132 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 72.80' @ 12.37 hrs Surf.Area= 537 sf Storage= 1,367 cf
Flood Elev= 74.45' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (765.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	68.95'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	69.70'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

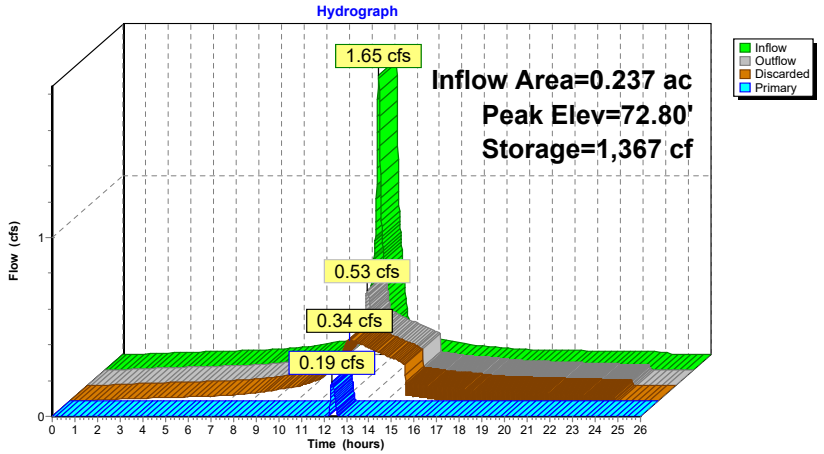
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.95'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	72.50'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 72.50' / 72.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.34 cfs @ 12.37 hrs HW=72.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=72.80' TW=71.23' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.19 cfs @ 2.19 fps)

Pond 6P: MC3500 Underground Infiltration System 2



Summary for Pond 7P: MC-3500 Underground Infiltration System 3

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.37 hrs, Volume= 0.136 af, Atten= 68%, Lag= 17.3 min
Discarded = 0.34 cfs @ 12.37 hrs, Volume= 0.132 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 68.35' @ 12.37 hrs Surf.Area= 537 sf Storage= 1,367 cf
Flood Elev= 70.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (765.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	65.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

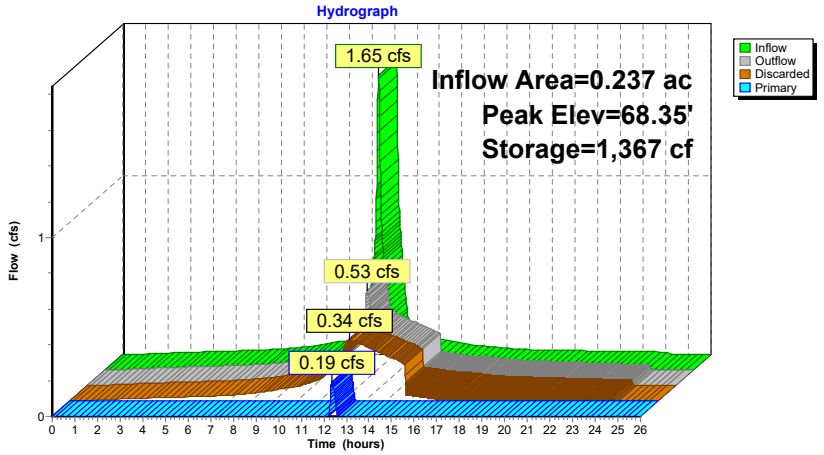
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	68.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.05' / 67.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.34 cfs @ 12.37 hrs HW=68.35' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=68.35' TW=63.78' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.19 cfs @ 2.19 fps)

Pond 7P: MC-3500 Underground Infiltration System 3



Summary for Pond 8P: MC-3500 Underground Infiltration System 4

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.37 hrs, Volume= 0.136 af, Atten= 68%, Lag= 17.3 min
Discarded = 0.34 cfs @ 12.37 hrs, Volume= 0.132 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 67.85' @ 12.37 hrs Surf.Area= 537 sf Storage= 1,367 cf
Flood Elev= 69.50' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (765.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	64.75'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

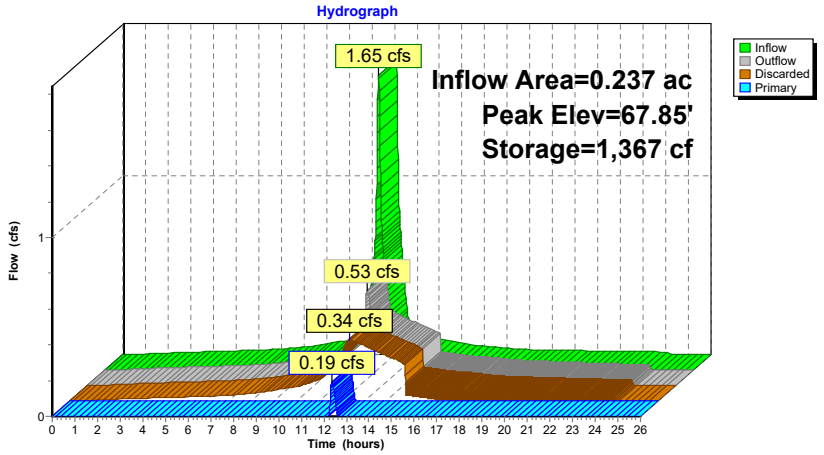
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	67.55'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.55' / 67.45' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.34 cfs @ 12.37 hrs HW=67.85' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=67.85' TW=63.78' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.19 cfs @ 2.19 fps)

Pond 8P: MC-3500 Underground Infiltration System 4



Summary for Pond 9P: MC-3500 Underground Infiltration System 5

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth = 6.86" for 100-year event
Inflow = 1.65 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 0.53 cfs @ 12.37 hrs, Volume= 0.136 af, Atten= 68%, Lag= 17.3 min
Discarded = 0.34 cfs @ 12.37 hrs, Volume= 0.132 af
Primary = 0.19 cfs @ 12.37 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 69.35' @ 12.37 hrs Surf.Area= 537 sf Storage= 1,367 cf
Flood Elev= 71.00' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (765.0 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	66.25'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

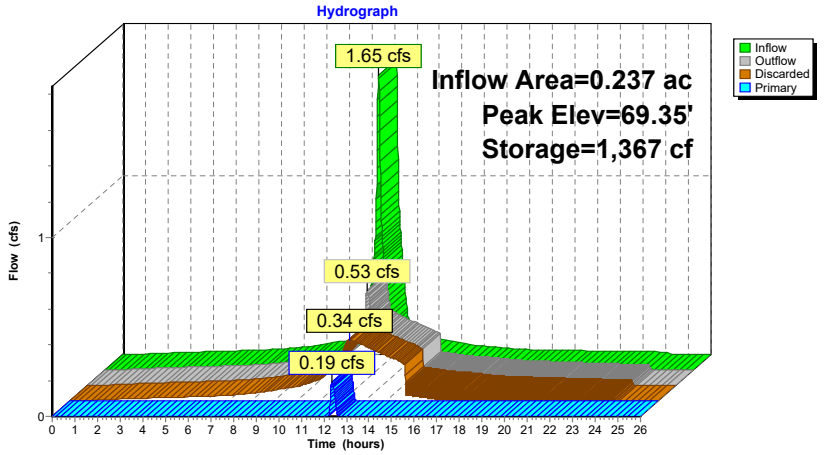
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	69.05'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 69.05' / 68.95' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.34 cfs @ 12.37 hrs HW=69.35' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.19 cfs @ 12.37 hrs HW=69.35' TW=63.78' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.19 cfs @ 2.19 fps)

Pond 9P: MC-3500 Underground Infiltration System 5



Summary for Pond 10P: Bio-Retention Area 1

Inflow Area = 6.673 ac, 61.11% Impervious, Inflow Depth = 0.62" for 100-year event
Inflow = 4.08 cfs @ 12.09 hrs, Volume= 0.346 af
Outflow = 3.91 cfs @ 12.48 hrs, Volume= 0.347 af, Atten= 4%, Lag= 23.0 min
Discarded = 1.04 cfs @ 12.48 hrs, Volume= 0.269 af
Primary = 2.87 cfs @ 12.48 hrs, Volume= 0.078 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 63.79' @ 12.48 hrs Surf.Area= 2,448 sf Storage= 1,956 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.8 min (857.4 - 843.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	2,493 cf	**Ponding Area (Irregular)**Listed below (Recalc)

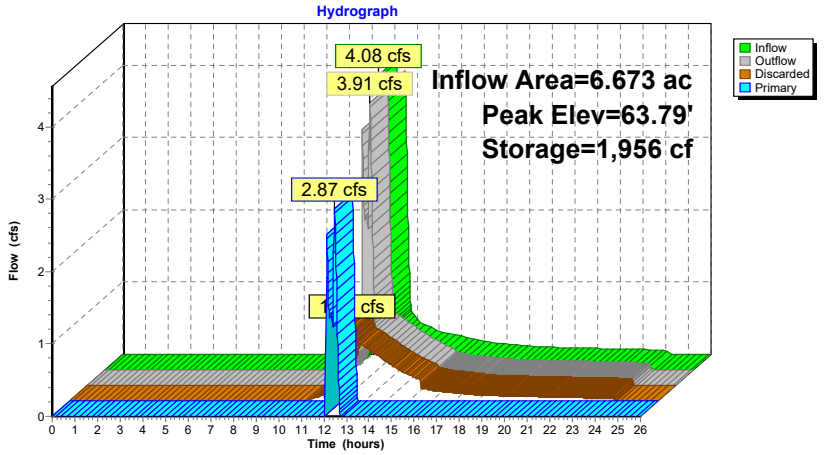
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	766	329.0	0	0	766
63.00	1,267	338.0	503	503	1,272
63.75	2,400	353.0	1,353	1,856	2,137
64.00	2,700	425.0	637	2,493	6,595

Device	Routing	Invert	Outlet Devices
#1	Discarded	62.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	63.75'	**140.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=1.04 cfs @ 12.48 hrs HW=63.79' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.04 cfs)

Primary OutFlow Max=2.86 cfs @ 12.48 hrs HW=63.79' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.86 cfs @ 0.50 fps)

Pond 10P: Bio-Retention Area 1



SECTION 6.0

ADDITIONAL DRAINAGE CALCULATIONS

6.01 TSS REMOVAL CALCULATIONS

TSS Removal Calculation Worksheet

Location: Wareham, MA

Project: Woodland Cove

BSC GROUP

Prepared By: C. Thomas

Date: 8/15/2017

Proposed Watershed Areas - P3-10

Pretreatment - Catch Basin

Total Impervious Area, Acres= 0.930

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Catch Basin	0.25	1.00	0.25	0.75
Water Quality Unit	0.77	0.75	0.58	0.17
Infiltration Basin	0.80	0.17	0.14	0.03

TSS Removal = 0.97

Proposed Watershed Areas - P3-1, P3-4 & P3-12

Pretreatment - Catch Basin

Total Impervious Area, Acres= 1.623

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Catch Basin	0.25	1.00	0.25	0.75
Bio-Retention Area	0.90	0.75	0.68	0.08

TSS Removal = 0.93

Proposed Watershed Area - P1 & P2

Pretreatment - None

Total Impervious Area, Acres= 0.198

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
		1.00		1.00

TSS Removal =

WEIGHTED AVERAGE

Total =Sum(Watershed Impervious Area * TSS Removal Rate)

Sum(Impervious Area)

Total Site TSS Removal = 0.87

*Equals remaining load from previous BMP (E)

6.02 GROUNDWATER RECHARGE VOLUME CALCULATIONS

Required Recharge Volume

Rv = F x Impervious Area

Where:

Rv = Recharge Volume

F=Target Depth Factor associated with each Hydrologic Soil Group

(F=0.60-inch for Soil Type A)

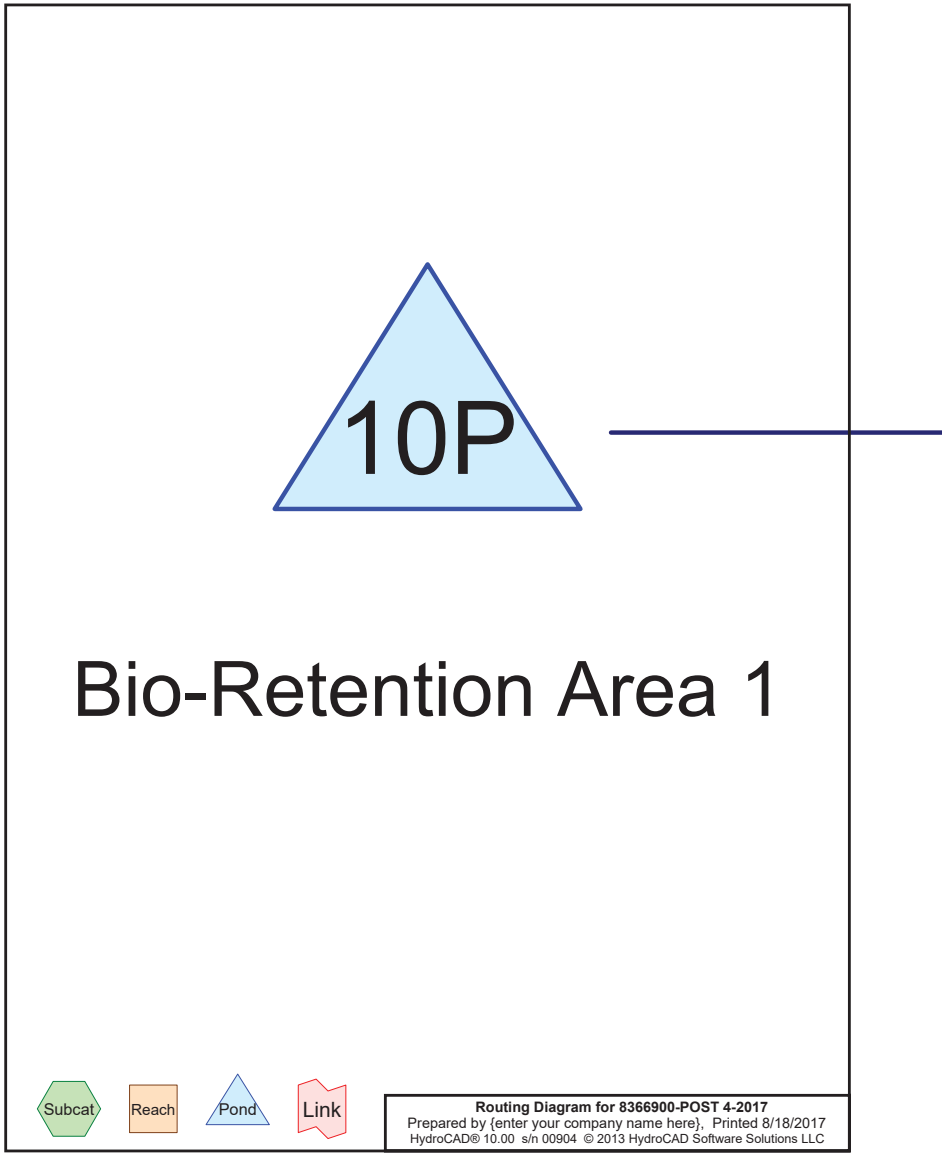
Impervious Area = Proposed Pavement and Rooftop area on-site

$$Rv = \left(\frac{0.60in}{12}\right)\left(4.276acx43{,}560sf/ac\right) =$$

Rv = 9,313 cf (required recharge volume)

Storage Provided

- Underground Infiltration Systems and Bio-Retention Areas = 24,168 cubic feet provided. Refer to the HydroCAD calculations provided for more information.



Summary for Pond 10P: Bio-Retention Area 1

Inflow Area = 6.673 ac, 61.11% Impervious, Inflow Depth = 0.36" for Recharge event
Inflow = 2.56 cfs @ 12.10 hrs, Volume= 0.199 af
Outflow = 0.79 cfs @ 12.49 hrs, Volume= 0.199 af, Atten= 69%, Lag= 23.8 min
Discarded = 0.79 cfs @ 12.49 hrs, Volume= 0.199 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 63.74' @ 12.49 hrs Surf.Area= 2,387 sf Storage= 1,837 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 16.3 min (887.0 - 870.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	2,493 cf	**Ponding Area (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	766	329.0	0	0	766
63.00	1,267	338.0	503	503	1,272
63.75	2,400	353.0	1,353	1,856	2,137
64.00	2,700	425.0	637	2,493	6,595

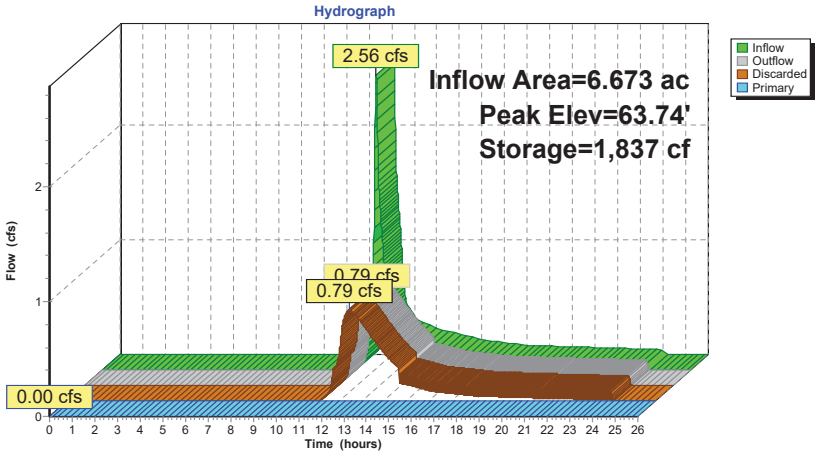
Device	Routing	Invert	Outlet Devices
#1	Discarded	62.50'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	63.75'	**140.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

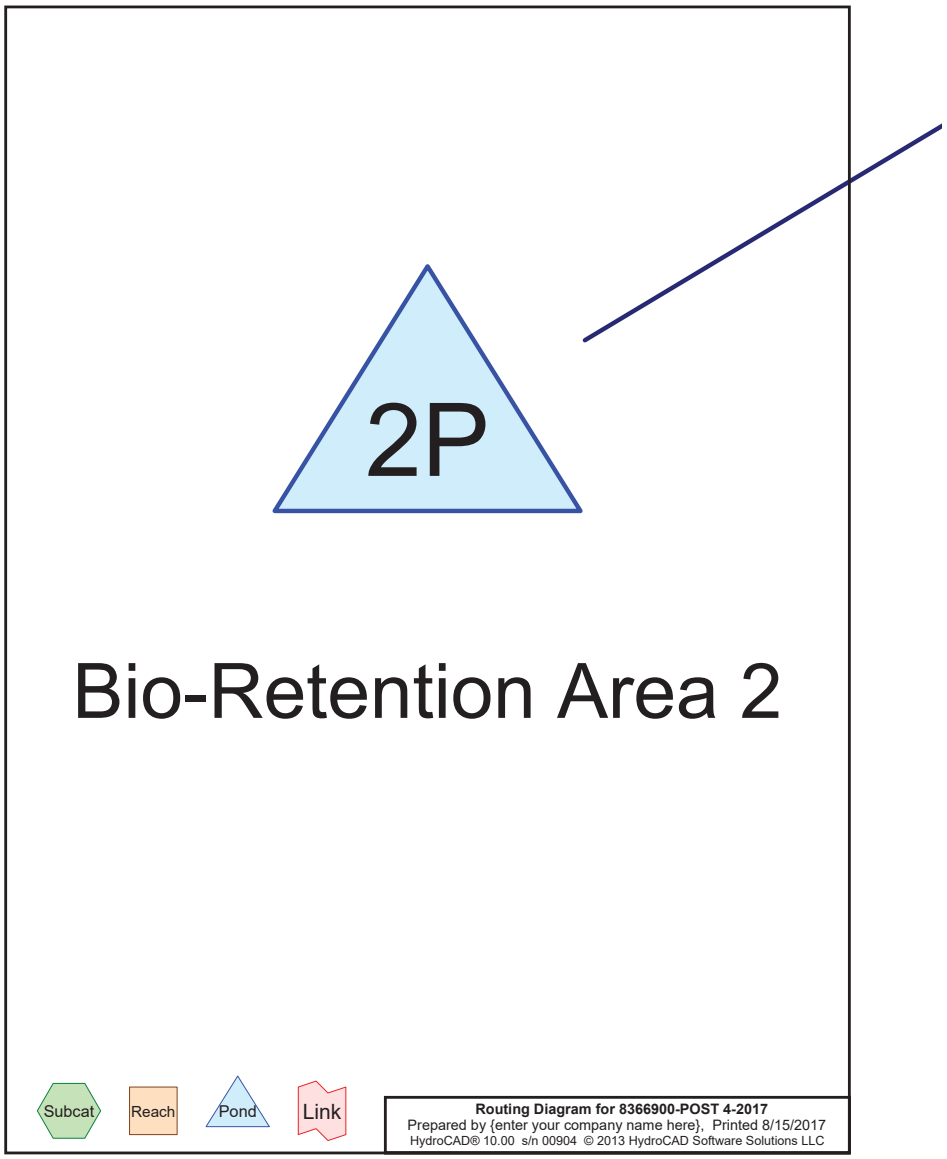
Discarded OutFlow Max=0.79 cfs @ 12.49 hrs HW=63.74' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.50' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Bio-Retention Area-1 provides approximately 1,837 cubic feet of storage below the overflow at elevation 63.74

Pond 10P: Bio-Retention Area 1





Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	66.75	66.13	62.0	0.0100	0.013	12.0	0.0	0.0

Summary for Pond 2P: Bio-Retention Area 2

Inflow Area = 1.181 ac, 54.53% Impervious, Inflow Depth > 0.16" for Recharge event
Inflow = 0.19 cfs @ 12.10 hrs, Volume= 0.015 af
Outflow = 0.08 cfs @ 12.42 hrs, Volume= 0.015 af, Atten= 58%, Lag= 18.8 min
Discarded = 0.08 cfs @ 12.42 hrs, Volume= 0.015 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 70.43' @ 12.42 hrs Surf.Area= 216 sf Storage= 111 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.0 min (886.3 - 876.3)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,418 cf	**Rain Gardens (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	44	32.0	0	0	44
72.00	799	152.0	859	859	1,816
74.00	1,830	190.0	2,559	3,418	2,905

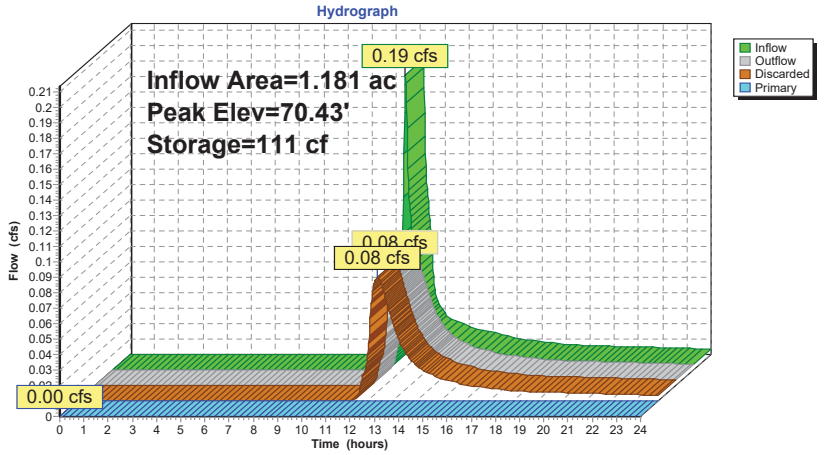
Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	66.75'	**12.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.75' / 66.13' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

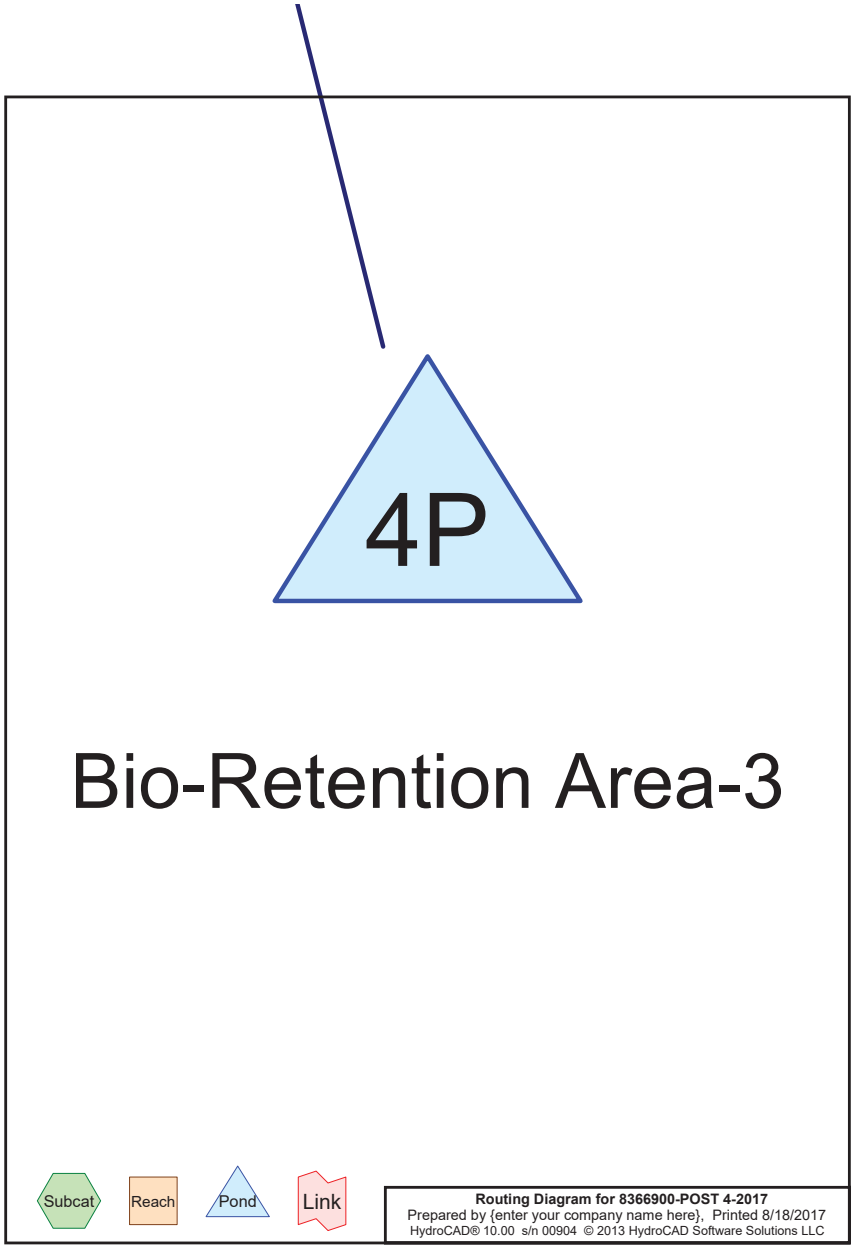
Discarded OutFlow Max=0.08 cfs @ 12.42 hrs HW=70.43' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=69.50' TW=65.16' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.00 cfs of 5.23 cfs potential flow)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Bio-Retention Area-2 provides approximately 111 cubic feet of storage below the overflow at elevation 70.43

Pond 2P: Bio-Retention Area 2





Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	4P	67.02	66.53	49.0	0.0100	0.013	12.0	0.0	0.0

Summary for Pond 4P: Bio-Retention Area-3

Inflow Area = 2.134 ac, 62.51% Impervious, Inflow Depth = 0.67" for Recharge event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 0.120 af
Outflow = 0.50 cfs @ 12.45 hrs, Volume= 0.120 af, Atten= 70%, Lag= 21.6 min
Discarded = 0.50 cfs @ 12.45 hrs, Volume= 0.120 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.44' @ 12.45 hrs Surf.Area= 1,355 sf Storage= 1,051 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.2 min (849.0 - 836.8)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	3,934 cf	**Ponding Area (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.50	930	123.0	0	0	930
70.00	1,120	132.0	512	512	1,123
72.00	2,380	199.0	3,422	3,934	2,919

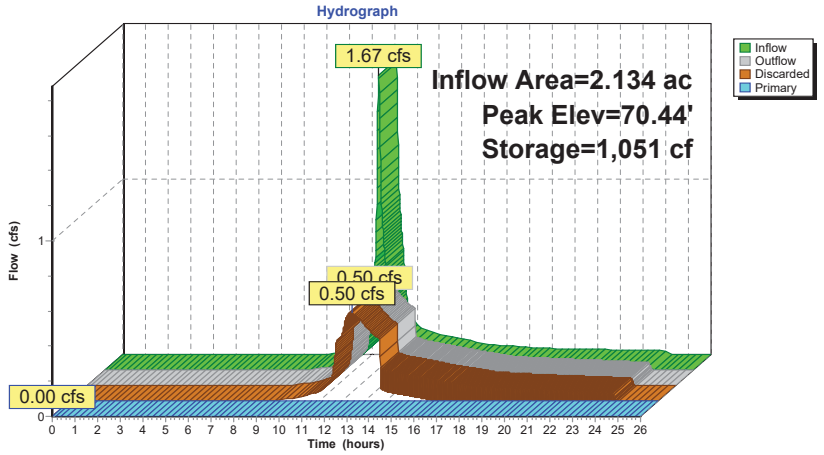
Device	Routing	Invert	Outlet Devices
#1	Discarded	69.50'	**16.000 in/hr Exfiltration over Surface area**
#2	Primary	67.02'	**12.0" Round Culvert** L= 49.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.02' / 66.53' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

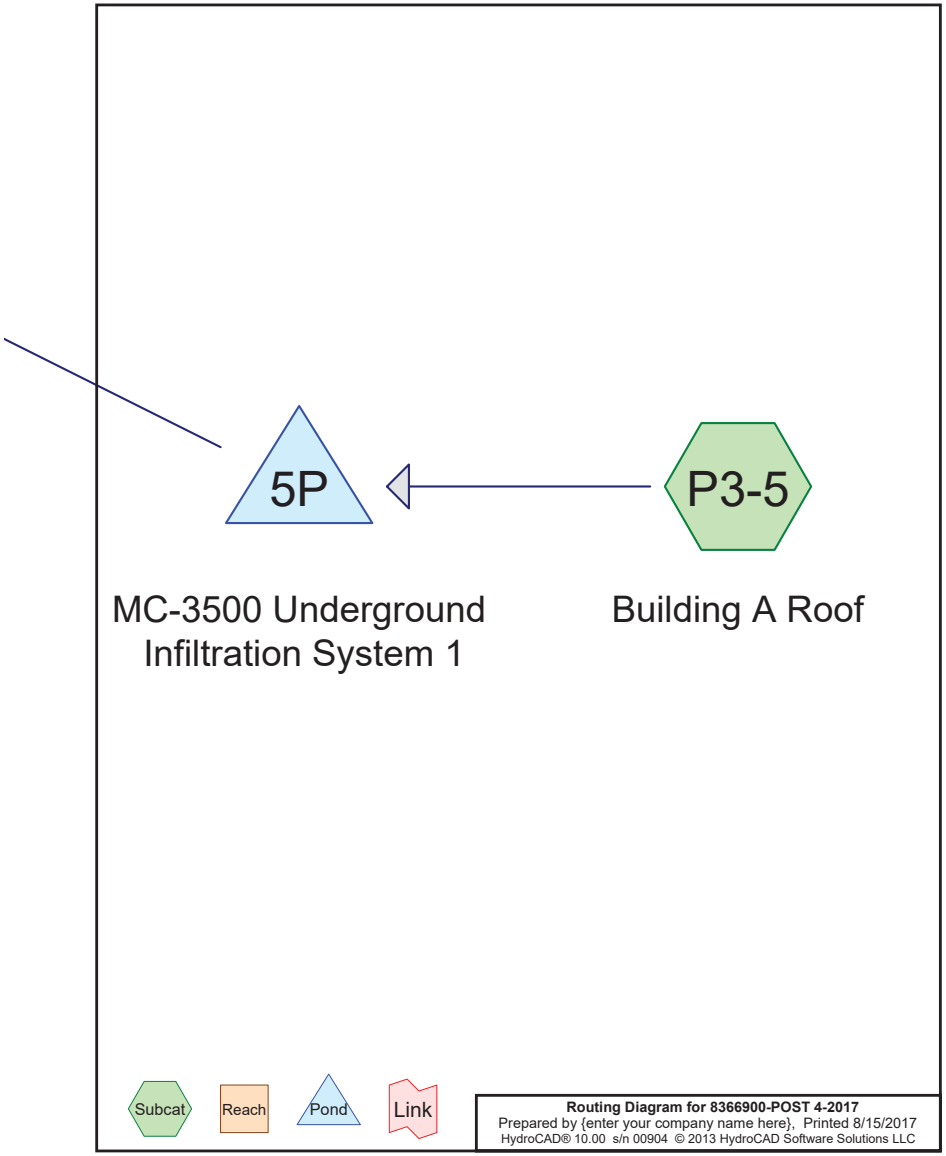
Discarded OutFlow Max=0.50 cfs @ 12.45 hrs HW=70.44' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=69.50' TW=65.16' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.00 cfs of 5.08 cfs potential flow)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Bio-Retention Area-3 provides approximately 1,051 cubic feet of storage below the overflow at elevation 70.44

Pond 4P: Bio-Retention Area-3





Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.237	98	Roof (P3-5)
0.237	**98**	**TOTAL AREA**

Summary for Subcatchment P3-5: Building A Roof

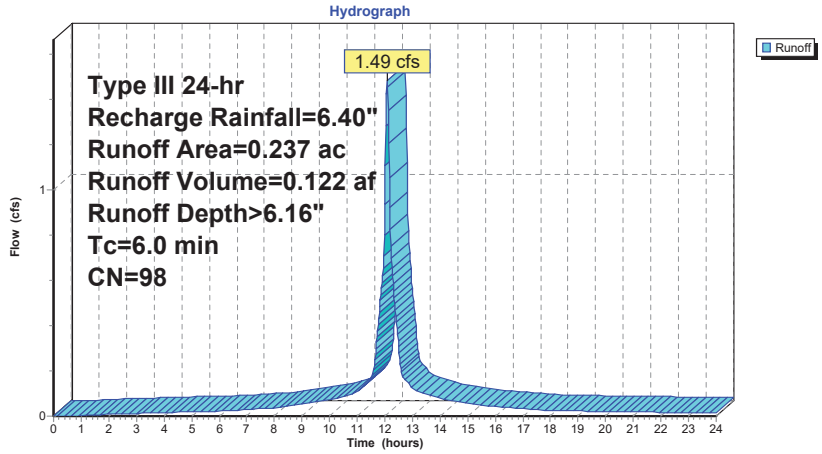
Runoff = 1.49 cfs @ 12.08 hrs, Volume= 0.122 af, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr Recharge Rainfall=6.40"

	Area (ac)	CN	Description
*	0.237	98	Roof
	0.237		100.00% Impervious Area

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

Subcatchment P3-5: Building A Roof



Summary for Pond 5P: MC-3500 Underground Infiltration System 1

Inflow Area = 0.237 ac,100.00% Impervious, Inflow Depth > 6.16" for Recharge event
Inflow = 1.49 cfs @ 12.08 hrs, Volume= 0.122 af
Outflow = 0.33 cfs @ 12.48 hrs, Volume= 0.122 af, Atten= 78%, Lag= 24.0 min
Discarded = 0.33 cfs @ 12.48 hrs, Volume= 0.122 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 73.98' @ 12.48 hrs Surf.Area= 537 sf Storage= 1,262 cf
Flood Elev= 75.95' Surf.Area= 537 sf Storage= 1,746 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 21.8 min (765.5 - 743.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	70.45'	804 cf	**15.58'W x 34.45'L x 5.50'H Field A** 2,952 cf Overall - 942 cf Embedded = 2,010 cf x 40.0% Voids
#2A	71.20'	942 cf	**ADS_StormTech MC-3500 c +Cap** x 8 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		1,746 cf	Total Available Storage

Storage Group A created with Chamber Wizard

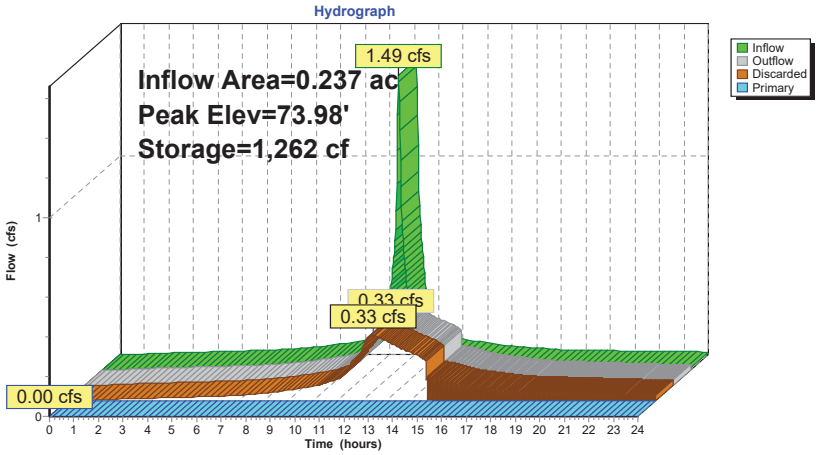
Device	Routing	Invert	Outlet Devices
#1	Discarded	70.45'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	74.00'	**6.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 74.00' / 73.90' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

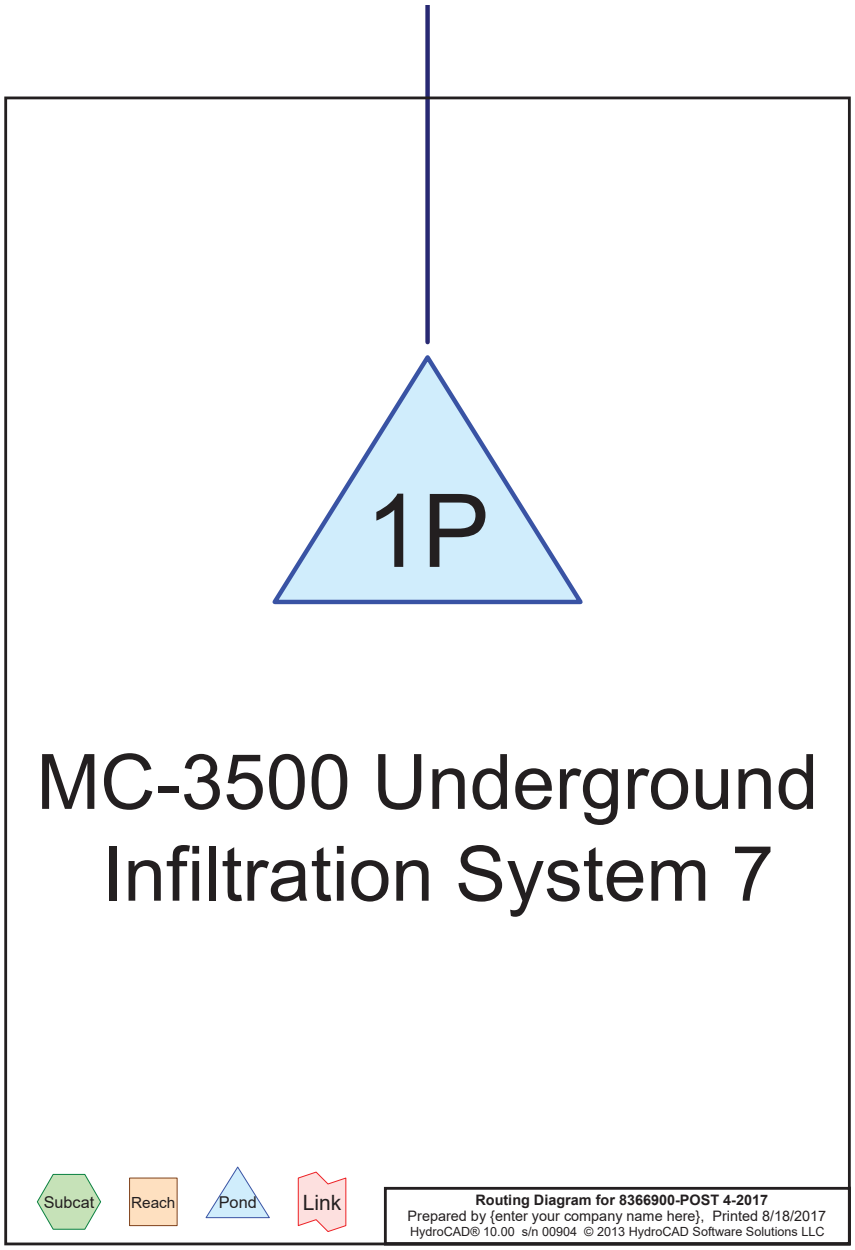
Discarded OutFlow Max=0.33 cfs @ 12.48 hrs HW=73.98' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=70.45' TW=69.50' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)

Building A, B, C, D, E and F Infiltration Systems provide approx. 1,262 cubic feet of storage below the overflow. 1,262 cf x 6 systems=7572 cf

Pond 5P: MC-3500 Underground Infiltration System 1





Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	66.00	65.79	21.0	0.0100	0.013	12.0	0.0	0.0

Summary for Pond 1P: MC-3500 Underground Infiltration System 7

Inflow Area = 4.502 ac, 64.59% Impervious, Inflow Depth = 2.09" for Recharge event
Inflow = 12.65 cfs @ 12.10 hrs, Volume= 0.784 af
Outflow = 2.21 cfs @ 12.60 hrs, Volume= 0.784 af, Atten= 83%, Lag= 29.8 min
Discarded = 2.21 cfs @ 12.60 hrs, Volume= 0.784 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 70.17' @ 12.60 hrs Surf.Area= 4,248 sf Storage= 13,597 cf
Flood Elev= 70.66' Surf.Area= 4,248 sf Storage= 14,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.0 min (825.4 - 777.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.16'	5,953 cf	**29.92'W x 142.00'L x 5.50'H Field A** 23,364 cf Overall - 8,481 cf Embedded = 14,883 cf x 40.0% Voids
#2A	65.91'	8,481 cf	**ADS_StormTech MC-3500 c +Cap** x 76 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		14,434 cf	Total Available Storage

Storage Group A created with Chamber Wizard

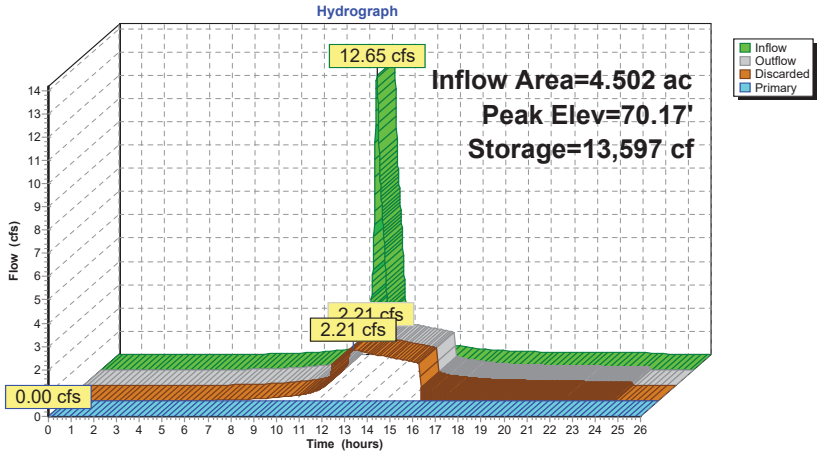
Device	Routing	Invert	Outlet Devices
#1	Discarded	65.16'	**16.000 in/hr Exfiltration over Wetted area**
#2	Primary	66.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.79' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	70.34'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=2.21 cfs @ 12.60 hrs HW=70.17' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 2.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.16' TW=62.50' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Infiltration System-7 provides approximately 13,597 cubic feet of storage below the overflow at elevation 70.17

Pond 1P: MC-3500 Underground Infiltration System 7



6.03 WATER QUALITY SIZING CALCULATIONS

Calculation Sheet

BSC GROUP

Project No.	83669.00	**Calc By**	C. Thomas
Subject	WQV Sizing	**Date**	8/15/17
Location	Wareham MA	**Checked by**	D. Rinaldi
		Date	8/15/17

Reference

Mass DEP standard method to convert Required Water Quality Volume to a discharge rate for sizing flow based on Manufactured Proprietary Treatment Practices.

$$Q_1 = (q_u)(A)(WQV)$$

where Q = peak flow rate associated w/ first 1 inch of runoff.

q_u = unit peak discharge in csm/in.

A = impervious surface drainage area (square miles)

WQV = water quality volume in water shed inches (1 inch)

WQV-1

$$Q = (774\ csm/in)(0.930\ ac)(0.0015625\ mi^2/ac)(1.0\ inch)$$

$$Q = 1.12\ cfs$$

CONTECH® ENGINEERED SOLUTIONS

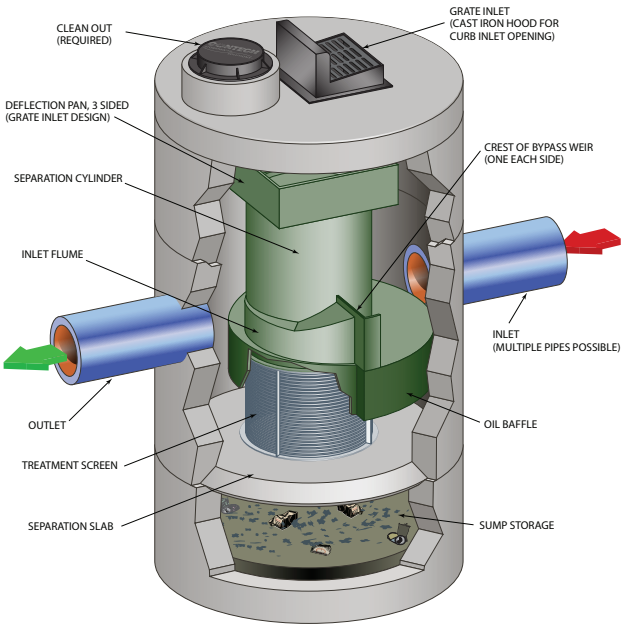
Hydrodynamic Separation Products Overview

Massachusetts

CDS® Vortechs® VortSentry® HS

Patented continuous deflection separation (CDS) technology

Using patented continuous deflective separation technology, the CDS system screens, separates and traps sediment, debris, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Available in precast or cast-in-place. Offline units can treat flows from 30 to 8500 L/s (1 to 300 cfs). Inline units can treat up to 170 L/s (7.5 cfs), and internally bypass larger flows in excess of 1420 L/s (50 cfs). The pollutant removal capability of the CDS system has been proven in the lab and field.



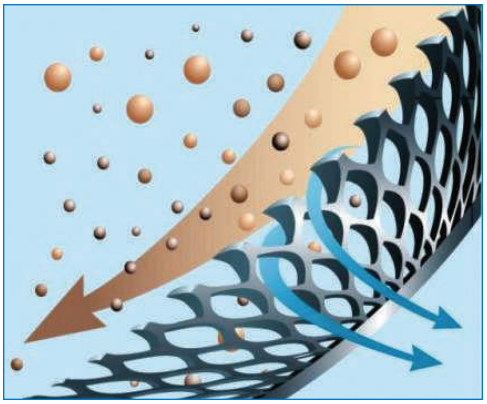
How does it work?

Stormwater enters the CDS unit's diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed. All flows up to the system's treatment design capacity enter the separation chamber.

Swirl concentration and screen deflection forces floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants will not wash out.



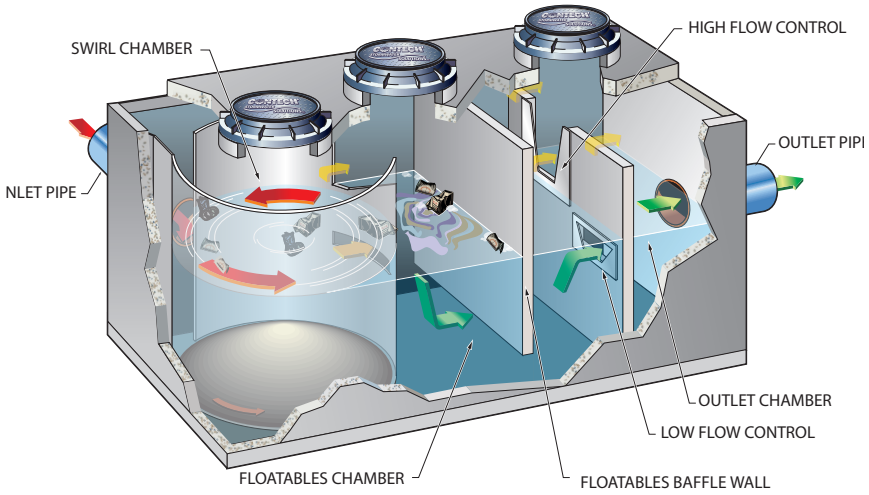
CDS

- Removes sediment, trash and free oil and grease
- Patented screening technology captures and retains 100% of floatables, including neutrally buoyant and all other material larger than the screen aperture
- Operation independent of flow
- Performance verified through lab and field testing
- Unobstructed maintenance access
- Customizable/flexible design and multiple configurations available
- Separates and confines pollutants from outlet flow
- Inline, offline, grate inlet and drop inlet configurations available
- Multiple screen aperture sizes available
- Allows for multiple inlet pipes

High performance hydrodynamic separation

The Vortechs system is a high-performance hydrodynamic separator that effectively removes finer sediment, oil and grease, and floating and sinking debris. Its swirl concentrator and flow controls work together to minimize turbulence and provide stable storage of captured pollutants. The design also allows for easy inspection and unobstructed maintenance access. With comprehensive lab and field testing, the system delivers proven results and site-specific solutions.

Precast models can treat peak design flows up to 25 cfs; cast-in-place models handle even greater flows. A typical system is sized to provide an 80% load reduction based on laboratory-verified removal efficiencies for varying particle size distributions such as 50-micron sediment particles.



How does it work?

Water enters the swirl chamber at a tangent, inducing a gentle swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floating pollutants are stopped at the baffle wall. Typically Vortechs systems are sized such that 80% or more of runoff through the system will be controlled exclusively by the low flow control. This orifice effectively reduces inflow velocity and turbulence by inducing a slight backwater appropriate to the site.

During larger storms, the water level rises above the low flow control and begins to flow through the high flow control. The layer of floating pollutants is elevated above the influent pipe, preventing re-entrainment. Swirling action increases in relation to the storm intensity, which helps prevent re-suspension. When the storm drain is flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs system will be sized large enough so that previously captured pollutants are retained in the system even during these infrequent events.

As a storm subsides, treated runoff decants out of the Vortechs system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet and outlet pipes. The low water level facilitates easier inspection and cleaning, and significantly reduces maintenance costs by reducing pump-out volume.

Vortechs

- Proven performance speeds approval process
- Treats peak flows without bypassing
- Flow controls reduce inflow velocity and increase residence time
- Unobstructed access simplifies maintenance
- Shallow system profile makes installation easier and less expensive
- Very low headloss
- Flexible design fits multiple site constraints

Vortechs®

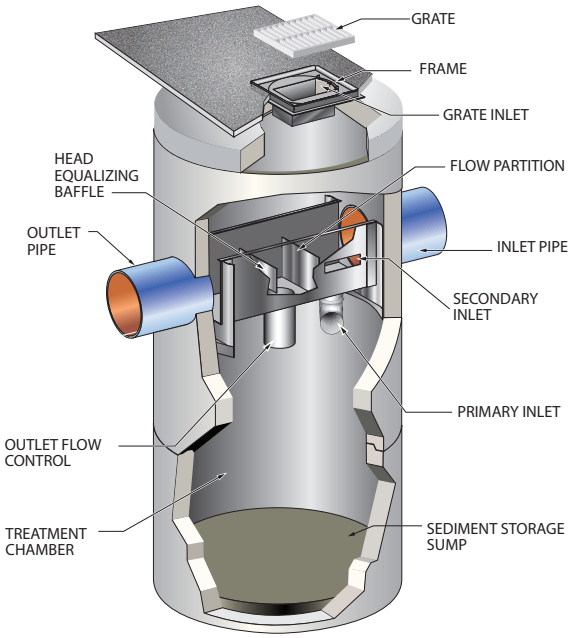
VortSentry® HS

Engineered performance and installation simplicity

The VortSentry HS system employs a helical flow pattern that enhances trapping and containment of pollutants and provides effective removal of settleable solids and floating contaminants from urban runoff.

With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The design of the VortSentry HS minimizes adverse velocities or turbulence in the treatment chamber. This helps to prevent the washout of previously captured pollutants even during peak conditions.

The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofits.



How does it work?

Flows from low intensity storms, which are most frequent, are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.

VortSentry HS

- Helical flow pattern enhances trapping and containment of pollutants
- High treatment and bypass capacities
- Compact footprint ideal for congested sites
- Lightweight design easy to install
- Available in both inline and grate inlet configurations
- Quick manufacturing turnaround time

Available Models

CDS Model	Typical Internal MH Diameter or Equivalent ID[1] (ft)	Typical Depth[2] Below Pipe Invert (ft)	Treatment Capacity[3] (cfs)	Screen Diameter/ Height (ft)	Maximum Sediment Storage Capacity (CF)
2015_4	4	4.5	1.4	2.0/1.5	50
w/ 1' added sump	4	5.5	1.4	2.0/1.5	63
w/ 2' added sump	4	6.5	1.4	2.0/1.5	75
w/ 3' added sump	4	7.5	1.4	2.0/1.5	88
2015	5	4.7	1.4	2.0/1.5	79
w/ 1' added sump	5	5.7	1.4	2.0/1.5	98
w/ 2' added sump	5	6.7	1.4	2.0/1.5	118
2020	5	5.3	2.2	2.0/2.0	90
w/ 1' added sump	5	6.3	2.2	2.0/2.0	110
w/ 2' added sump	5	7.3	2.2	2.0/2.0	129
2025	5	5.6	3.2	2.0/2.5	97
w/ 1' added sump	5	6.6	3.2	2.0/2.5	117
w/ 2' added sump	5	7.6	3.2	2.0/2.5	136
3020	6	5.4	3.9	3.0/2.0	134
w/ 1' added sump	6	6.4	3.9	3.0/2.0	163
w/ 2' added sump	6	7.4	3.9	3.0/2.0	191
3030	6	6.2	6.1	3.0/3.0	157
w/ 1' added sump	6	7.2	6.1	3.0/3.0	185
w/ 2' added sump	6	8.2	6.1	3.0/3.0	213
4030	8	7.2	7.9	4.0/3.0	329
w/ 1' added sump	8	8.2	7.9	4.0/3.0	379
w/ 2' added sump	8	9.2	7.9	4.0/3.0	429
4040	8	8.3	12.4	4.0/4.0	381
w/ 1' added sump	8	9.3	12.4	4.0/4.0	431
w/ 2' added sump	8	10.3	12.4	4.0/4.0	482

1. Structure diameter represents the typical inside dimension of the concrete structure. Offline systems will require additional concrete diversion components
2. Depth below pipe can vary to accommodate site specific design. Depth below pipe invert represents the depth from the pipe invert to the inside bottom of concrete structure.
3. Treatment Capacity is based on laboratory testing using OK-110 (average d50 particle size of approximately 100 microns) and a 2400 micron screen.

Sediment Depths Indicating Required Servicing*

CDS Model	Sediment Depth (in.)
2015_4	18"
2015	18"
2020	18"
2025	18"
3020	18"
3030	18"
4030	27"
4040	27"
Every 1' of added sump depth	Add 9"

* Based on 75% capacity of isolated sump.

Available Models

Vortechs Model	Swirl Chamber Diameter		Internal Length		Peak Treatment Flow[1]		Sediment Storage[2]	
	ft	m	ft	m	cfs	L/s	yd3	m3
1000	3	0.9	9	2.7	1.6	45.3	0.7	0.5
2000	4	1.2	10	3	2.8	79.3	1.2	0.9
3000	5	1.5	11	3.4	4.5	127.4	1.8	1.4
4000	6	1.8	12	3.7	6	169.9	2.4	1.8
5000	7	2.1	13	4	8.5	240.7	3.2	2.4
7000	8	2.4	14	4.3	11	311.5	4	3.1
9000	9	2.7	15	4.6	14	396.4	4.8	3.7
11000	10	3	16	4.9	17.5	495.5	5.6	4.3
16000	12	3.7	18	5.5	25	707.9	7.1	5.4

1. Peak Treatment Flow is maximum flow treated for each unit listed. This flow represents an infrequent storm event such as a 10 or 25 yr storm. Standard Vortechs System depth below invert is 3' for all precast models. Cast-in-place system are available to treat higher flows. Check with your local representatives for specifications.
2. Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.

VortSentry HS Model	Swirl Chamber Diameter (ft)	Typical Depth Below Invert (ft)	Treatment Capacity (cfs)[1]	Max. Inlet/Outlet Pipe Diameter (in)	Maximum Sediment Storage Capacity (CF)
VortSentry HS36*	3	5.6	0.55	18	39
w/ 1' added sump	3	6.6	0.55	18	47
w/ 2' added sump	3	7.6	0.55	18	54
w/ 3' added sump	3	8.6	0.55	18	61
w/ 4' added sump	3	9.6	0.55	18	68
w/ 5' added sump	3	10.6	0.55	18	75
VortSentry HS48**	4	6.8	1.2	24	85
w/ 1' added sump	4	7.8	1.2	24	97
w/ 2' added sump	4	8.8	1.2	24	110
w/ 3' added sump	4	9.8	1.2	24	123
w/ 4' added sump	4	10.8	1.2	24	135
VortSentry HS60***	5	8.0	2.2	30	156
w/ 1' added sump	5	9.0	2.2	30	176
w/ 2' added sump	5	10.0	2.2	30	196
w/ 3' added sump	5	11.0	2.2	30	215

*maintenance recommended when sediment reaches a height of 3'-7" below water surface elevation in sump.
**maintenance recommended when sediment reaches a height of 4'-9" below water surface elevation in sump.
***maintenance recommended when sediment reaches a height of 6.0' below water surface elevation in sump.
1. Design Flow Rate is based on 80% removal of particle size distribution with an average particle size of 240 micron. This flow also represents the maximum flow prior to which bypass occurs.

Notes:

Systems can be sized based on a water quality flow (e.g. 1 inch storm) or on a net annual basis depending on the local regulatory requirement.

When sizing based on a water quality storm, the required flow to be treated should be equal or less than the listed water quality flow for the selected system. Systems sized based on a water quality storm are generally more conservatively sized.

Additional particle size distributions are available for sizing purposes upon request.

Depth below invert is measured to the inside bottom of the system. This depth can be adjusted to meet specific storage or maintenance requirements.

Contact our support staff for the most cost effective sizing for your area.

Customer Support

Installation

Contech products are some of the easiest to install in the industry. We provide comprehensive installation drawings, details and instructions, as well as full technical support on every project.

Maintenance

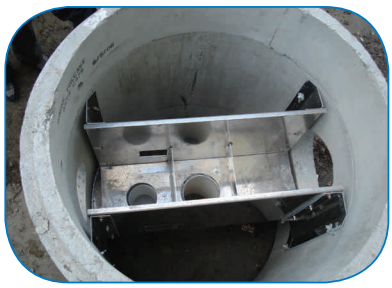
Maintenance of Contech Stormwater Solutions products is cost effective, straightforward and efficient. We offer a complete range of engineering planning, design and drawing, and construction services that can be tailored to your specific site needs.

Inspection

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on your stormwater BMP's.

CCMP's agree to:

- Inspect and maintain systems in accordance to the manufacturer's specifications
- Provide maintenance only when necessary to avoid undue costs to system owners
- Utilize only OEM replacement cartridges
- Provide quality reports to system owners
- Allow Contech to audit maintenance events to ensure quality
- Maintain the highest level of service standards



Support

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our professional engineering staff engineers.

CONTECH®
ENGINEERED SOLUTIONS

800.338.1122
www.ContechES.com

Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit ContechES.com or call 800.338.1122.

6.04 WATER QUALITY VOLUME CALCULATIONS

Water Quality Volume Calculation

$V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} \text{ square feet})$

V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: **1.0-inch** used for discharges to other areas.
A_{IMP} = Total Impervious Area (in acres) used for driveways, parking, etc.

Underground Infiltration Systems and Bio-Retention Areas

A_{IMP} = 4.276 ac

V_{WQ} = (1 inches/12 inches/foot) * (4.276 ac x 43,560 square feet/ac)

V_{WQ} = 15,522 cubic feet (required volume), provided volume = 24,168 cubic feet (refer to the HydroCAD calculations provided)

6.05 RIP-RAP OUTLET PROTECTION SIZING

OUTLET PROTECTION SIZING

BSC GROUP

Project No. 83669.00
Subject Outlet Protection Sizing Calcs
Location Wareham, MA

Calc By C. Thomas
Date 8/15/2017
Checked by D. Rinaldi
Date 1/12/2018

FES-1

Q=Design Discharge, (ft^3/s) = 2.06 cfs
D=Culvert Diameter, (ft) = 1.00 ft
TW=Tailwater Depth, (ft) = 0.4 ft, (0.4xD for unknow tailwater, or enter known tailwater)
(Tailwater depth is to be limited to between 0.4D and 1.0D)

Riprap Rock Sizing

$$D_{50} = 0.2D\left[\frac{Q}{\sqrt{gD^{2.5}}}\right]^{4/3}\left[\frac{D}{TW}\right]$$

g=32.2 fps
D_{50} = median rock size, ft

$$D_{50} = 0.28\,\frac{2.06}{5.67}\,(4/3)\,\frac{1.00}{0.40} = 0.18 \text{ ft}$$

= **2.18 inches**

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth	
1	**5**	**4D**	**$3.5D_{50}$**	**Use Class 1**
2	6	4D	$3.5D_{50}$	
3	10	5D	$3.3D_{50}$	
4	14	6D	$2.2D_{50}$	
5	20	7D	$2.0D_{50}$	
6	22	8D	$2.0D_{50}$	

Apron Dimensions
Length, L=5D = **5 ft**
Depth=$3.3D_{50}$ = **16.50 Inches**
Width=3D+(2/3)L = **6.33 ft** (at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**8**	to	**10**
85	**7**	to	**9**
50	**5**	to	**8**
15	**3**	to	**7**

FES-2

Q=Design Discharge, (ft^3/s) = 1.08 cfs
D=Culvert Diameter, (ft) = 1.00 ft
TW=Tailwater Depth, (ft) = 0.4 ft, (0.4xD for unknow tailwater, or enter known tailwater)
(Tailwater depth is to be limited to between 0.4D and 1.0D)

Riprap Rock Sizing

$$D_{50} = 0.2D\left[\frac{Q}{\sqrt{gD^{2.5}}}\right]^{4/3}\left[\frac{D}{TW}\right]$$

g=32.2 fps
D_{50} = median rock size, ft

$$D_{50} = 0.28\,\frac{1.08}{5.67}\,(4/3)\,\frac{1.00}{0.40} = 0.08 \text{ ft}$$

= **0.92 inches**

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth	
1	**5**	**4D**	**$3.5D_{50}$**	**Use Class 1**
2	6	4D	$3.5D_{50}$	
3	10	5D	$3.3D_{50}$	
4	14	6D	$2.2D_{50}$	
5	20	7D	$2.0D_{50}$	
6	22	8D	$2.0D_{50}$	

Apron Dimensions
Length, L=5D = **5 ft**
Depth=$3.3D_{50}$ = **16.50 Inches**
Width=3D+(2/3)L = **6.33 ft** (at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**8**	to	**10**
85	**7**	to	**9**
50	**5**	to	**8**
15	**3**	to	**7**

Reference Note: Sizing based in accordance with HEC #14 as required by MassHighway Design Manual

OUTLET PROTECTION SIZING

BSC GROUP

Project No. 83669.00
Subject Outlet Protection Sizing Calcs
Location Wareham, MA

Calc By C. Thomas
Date 8/15/2017
Checked by D. Rinaldi
Date 1/12/2018

FES-3

Q=Design Discharge, (ft^3/s) = 5.33 cfs
D=Culvert Diameter, (ft) = 1.25 ft
TW=Tailwater Depth, (ft) = 0.5 ft, (0.4xD for unknow tailwater, or enter known tailwater)
(Tailwater depth is to be limited to between 0.4D and 1.0D)

Riprap Rock Sizing

$$D_{50} = 0.2D\left[\frac{Q}{\sqrt{gD^{2.5}}}\right]^{4/3}\left[\frac{D}{TW}\right]$$

g=32.2 fps
D_{50} = median rock size, ft

$$D_{50} = 0.28\,\frac{5.33}{9.91}^{(4/3)}\,\frac{1.25}{0.50} = 0.31 \text{ ft}$$

= **3.67 inches**

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth	
1	**5**	**4D**	**3.5D_{50}**	**Use Class 1**
2	6	4D	3.5D_{50}	
3	10	5D	3.3D_{50}	
4	14	6D	2.2D_{50}	
5	20	7D	2.0D_{50}	
6	22	8D	2.0D_{50}	

Apron Dimensions
Length, L=5D = **6 ft**
Depth=3.3D_{50} = **16.50 Inches**
Width=3D+(2/3)L = **7.92 ft** (at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**8**	to	**10**
85	**7**	to	**9**
50	**5**	to	**8**
15	**3**	to	**7**

FES-4

Q=Design Discharge, (ft^3/s) = 2.25 cfs
D=Culvert Diameter, (ft) = 1.00 ft
TW=Tailwater Depth, (ft) = 0.4 ft, (0.4xD for unknow tailwater, or enter known tailwater)
(Tailwater depth is to be limited to between 0.4D and 1.0D)

Riprap Rock Sizing

$$D_{50} = 0.2D\left[\frac{Q}{\sqrt{gD^{2.5}}}\right]^{4/3}\left[\frac{D}{TW}\right]$$

g=32.2 fps
D_{50} = median rock size, ft

$$D_{50} = 0.28\,\frac{2.25}{5.67}^{(4/3)}\,\frac{1.00}{0.40} = 0.20 \text{ ft}$$

= **2.45 inches**

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth	
1	**5**	**4D**	**3.5D_{50}**	**Use Class 1**
2	6	4D	3.5D_{50}	
3	10	5D	3.3D_{50}	
4	14	6D	2.2D_{50}	
5	20	7D	2.0D_{50}	
6	22	8D	2.0D_{50}	

Apron Dimensions
Length, L=5D = **5 ft**
Depth=3.3D_{50} = **16.50 Inches**
Width=3D+(2/3)L = **6.33 ft** (at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**6**	to	**7**
85	**5**	to	**7**
50	**4**	to	**6**
15	**2**	to	**5**

Reference Note: Sizing based in accordance with HEC #14 as required by MassHighway Design Manual

6.06 PIPE SIZING CALCULATIONS

THE BSC GROUP
803 Summer Street
Boston, MA 02127
(617) 896-4300

Project: Woodland Cove
Location: Wareham, MA
Project #: 83669.00
Date: 8/15/2017
Calculate: C. Thomas
Check: D. Rinaldi

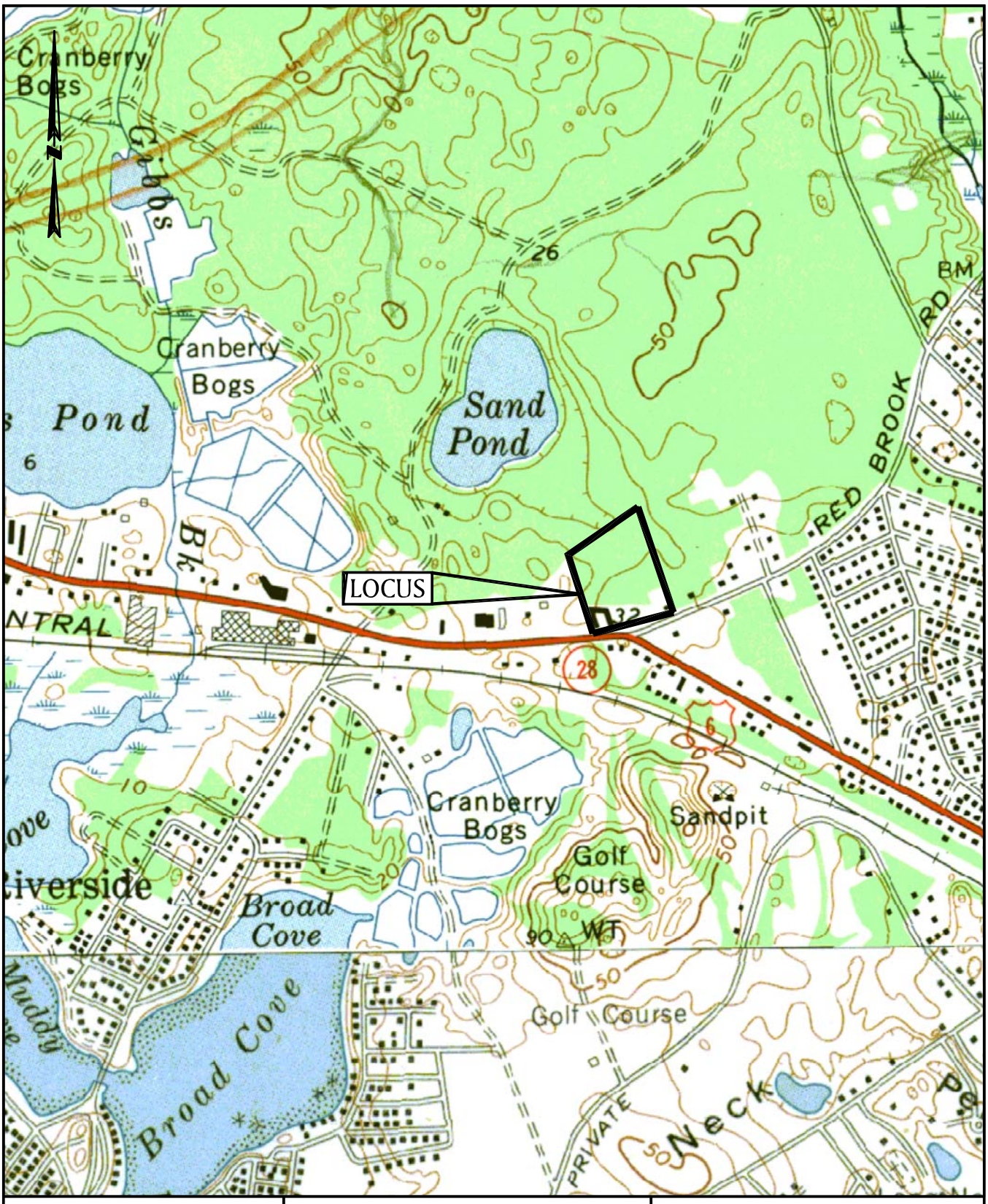
Design Parameters:
Year Storm Event: 25 Years
IDF Curve: Boston
Minimum Pipe Size: 12"
Pipe Material: HDPE
Mannings N Value: 0.013
Weighted Ca: 1.1

PIPE SIZING TABLE

FROM	TO	Tc (Min)	Tc (Pipe) T=(L/Va)/60 (min)	RAINFALL INTENSITY [I] (in./hr.)	**DESIGN** Q Actual QA = CxAxI (cfs)	**DESIGN** VEL_{ACTUAL} V_A = (Q_A/Q_F)xVAR	LENGTH (FT)	SLOPE	SIZE (IN)	N	**CAPACITY** VEL_{FULL} VF = (1.49/n) $(R^{2/3})(S^{1/2})$	**CAPACITY** Q Full $Q_F = V_F$xA (cfs)	CONCLUSION
CB-12	DMH-11	6.0	0.8	5.8	0.60	3.31	152	0.010	12	0.013	4.53	3.55	O.K.
CB-11	DMH-11	6.0	0.0	5.8	1.92	4.60	6	0.010	12	0.013	4.53	3.55	O.K.
DMH-11	DMH-10	6.0	0.2	5.8	2.52	4.91	73	0.010	12	0.013	4.53	3.55	O.K.
CLEANOUT	DMH-10	6.0	0.4	5.8	0.19	2.47	58	0.010	8	0.013	3.45	1.20	O.K.
ROOF DRAIN 1	INFIL-1	6.0	0.1	5.8	1.32	4.77	28	0.015	8	0.013	4.23	1.47	O.K.
CB-10	DMH-10	6.0	0.0	5.8	0.27	2.61	6	0.010	12	0.013	4.53	3.55	O.K.
DMH-10	DMH-9	6.0	0.4	5.8	2.98	5.07	131	0.010	12	0.013	4.53	3.55	O.K.
CB-9	DMH-9	6.0	0.0	5.8	1.58	4.36	6	0.010	12	0.013	4.53	3.55	O.K.
DMH-9	DMH-8	6.0	0.2	5.8	4.56	5.70	63	0.010	15	0.013	5.26	6.45	O.K.
CB-8	DMH-8	6.0	0.1	5.8	0.58	3.31	24	0.010	12	0.013	4.53	3.55	O.K.
CLEANOUT	DMH-8	6.0	0.4	5.8	0.19	2.47	58	0.010	8	0.013	3.45	1.20	O.K.
ROOF DRAIN-2	INFIL-2	6.0	0.1	5.8	1.32	4.77	27	0.015	8	0.013	4.23	1.47	O.K.
DMH-8	FES-3	6.0	0.1	5.8	5.33	5.87	32	0.010	15	0.013	5.26	6.45	O.K.
ROOF DRAIN-6	INFIL-6	6.0	0.1	5.8	1.32	4.77	29	0.015	8	0.013	4.23	1.47	O.K.
AD-3	DMH-7	6.0	0.8	5.8	0.12	1.71	77	0.005	8	0.013	2.44	0.85	O.K.
CB-7	DMH-7	6.0	0.2	5.8	1.72	4.49	45	0.010	12	0.013	4.53	3.55	O.K.
CB-6	DMH-7	6.0	0.0	5.8	0.41	2.94	5	0.010	12	0.013	4.53	3.55	O.K.
DMH-7	FES-4	6.0	0.0	5.8	2.25	5.55	8	0.015	12	0.013	5.55	4.35	O.K.
AD-2	DMH-6	6.0	0.2	5.8	2.17	4.74	62	0.010	12	0.013	4.53	3.55	O.K.
AD-1	DMH-6	6.0	0.2	5.8	2.86	5.02	49	0.010	12	0.013	4.53	3.55	O.K.
DMH-6	DMH-5	6.0	0.1	5.8	5.03	5.80	28	0.010	15	0.013	5.26	6.45	O.K.
CB-4	WQU-1	6.0	0.1	5.8	2.07	6.04	39	0.020	12	0.013	6.40	5.03	O.K.
CB-5	WQU-1	6.0	0.3	5.8	3.47	5.16	96	0.010	12	0.013	4.53	3.55	O.K.
WQU-1	DMH-5	6.0	0.0	5.8	5.54	5.90	12	0.010	15	0.013	5.26	6.45	O.K.
DMH-5	INF-7	6.0	0.0	5.8	10.57	7.00	5	0.010	24	0.013	7.20	22.62	O.K.
INF-3 CLEANOUT	DMH-4	6.0	0.4	5.8	0.19	2.34	51	0.010	12	0.013	4.53	3.55	O.K.
DMH-4	DMH-3	6.0	0.4	5.8	0.19	2.34	55	0.010	12	0.013	4.53	3.55	O.K.
ROOF DRAIN-3	INF-3	6.0	0.1	5.8	1.32	4.77	31	0.015	8	0.013	4.23	1.47	O.K.
ROOF DRAIN-4	INF-4	6.0	0.0	5.8	1.32	4.77	7	0.015	8	0.013	4.23	1.47	O.K.
INF-4	DMH-3	6.0	0.1	5.8	0.19	2.57	17	0.010	6	0.013	2.85	0.56	O.K.
CB-3	DMH-3	6.0	0.1	5.8	0.53	5.65	20	0.050	12	0.013	10.12	7.95	O.K.
DMH-3	DMH-2	6.0	0.4	5.8	0.91	3.76	81	0.010	12	0.013	4.53	3.55	O.K.
CB-1	DMH-2	6.0	0.0	5.8	1.15	4.03	9	0.010	12	0.013	4.53	3.55	O.K.
DMH-2	DMH-1	6.0	0.2	5.8	2.06	3.56	47	0.005	12	0.013	3.20	2.51	O.K.
DMH-1	FES-1	6.0	0.1	5.8	2.06	4.29	24	0.008	12	0.013	4.05	3.18	O.K.
AD-4 5 & 6	DMH-14	6.0	0.8	5.8	0.06	1.28	62	0.005	12	0.013	3.20	2.51	O.K.
INF-5	DMH-14	6.0	0.2	5.8	0.19	2.57	28	0.010	6	0.013	2.85	0.56	O.K.
DMH-14	DMH-13	6.0	0.9	5.8	0.25	2.03	111	0.005	12	0.013	3.20	2.51	O.K.
CB-2	DMH-13	6.0	0.1	5.8	0.83	3.64	11	0.010	12	0.013	4.53	3.55	O.K.
DMH-13	DMH-12	6.0	0.1	5.8	1.08	5.06	33	0.020	12	0.013	6.40	5.03	O.K.
DMH-12	FES-2	6.0	0.2	5.8	1.08	3.93	50	0.010	12	0.013	4.53	3.55	O.K.

APPENDIX A

USGS LOCUS MAP



PREPARED FOR:

DAKOTA PARTNERS
WALTHAM, MA
02451

USGS LOCUS MAP

WOODLAND COVE
3104 CRANBERRY HIGHWAY
WAREHAM, MA

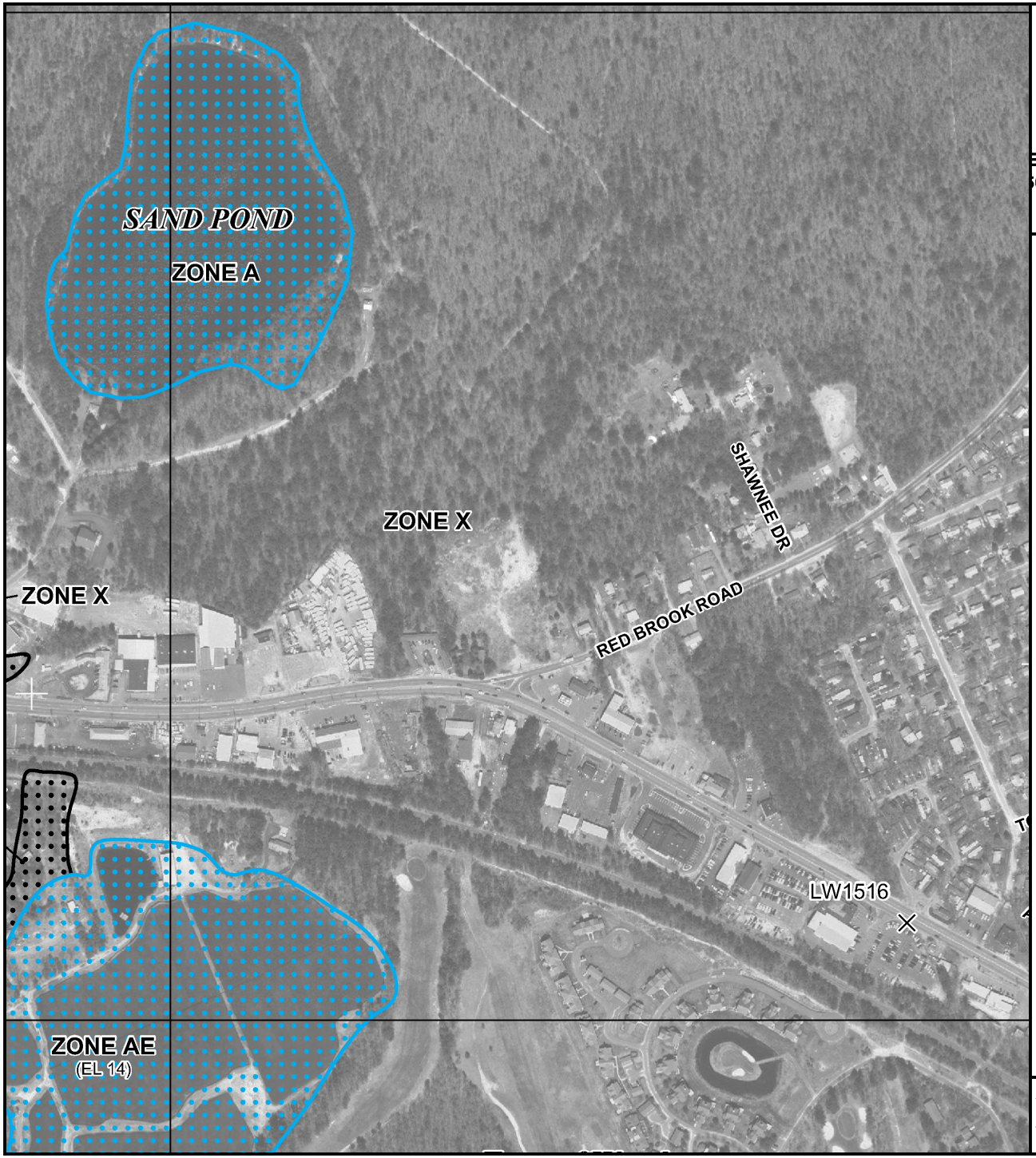
BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

Job No.: 8-3669.00 Date: 8/17/2017
Scale: 1"=1,000' Revised:
Dwg. No: Figure: 1 OF 1

File: 8366900/C/D/8366900-TITLE.DWG

APPENDIX B

FEMA MAP



MAP SCALE 1" = 500'

250 0 500 1000 FEET

50 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0494J

FIRM

FLOOD INSURANCE RATE MAP

PLYMOUTH COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 494 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PLYMOUTH, TOWN OF	250278	0494	J
WAREHAM, TOWN OF	255223	0494	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25023C0494J

EFFECTIVE DATE
JULY 17, 2012

Federal Emergency Management Agency

APPENDIX C

WEB SOIL SURVEY

Soil Map—Plymouth County, Massachusetts
(Wareham MFH)

Map Scale: 1:1,780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 9, Sep 14, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Plymouth County, Massachusetts (MA023)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
259B	Carver loamy coarse sand, 3 to 8 percent slopes	8.4	88.4%
637B	Carver - Urban land complex, 0 to 8 percent slopes	0.8	8.3%
665B	Udipsamments, 0 to 8 percent slopes	0.3	3.3%
Totals for Area of Interest		**9.5**	**100.0%**

APPENDIX D

SOIL TEST PIT LOGS AND DOUBLE RING INFILTROMETER TESTING

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Dakota Partners
Owner Name

3104 Cranberry Highway
Street Address

Map/Lot #

Wareham
City

MA
State

02532
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: UC-Davis Soil Web (Source) 259B (Soil Map Unit)

Carver Loamy Coarse Sand, 3 to 8 Percent Slopes
Soil Name

N/A
Soil Limitations

Sandy Glaciofluvial Deposits
Geologic/Parent Material

Outwash Plain
Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: (Year Published/Source) (Publication Scale) (Map Unit)

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☒ Yes ☐ No
If Yes, continue to #5.

Within the 100-year flood boundary? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 03/2017 (Month/Year) Range: ☐ Above Normal ☐ Normal ☒ Below Normal

8. Other references reviewed: USGS Groundwater Well MA-WFW 51 Wareham,MA

Average Groundwater Depth March = 6.59'. Current Depth = 8.05'

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP #1 | 4/14/2017 (Date) | 8:30 AM (Time) | Clear 55 (Weather)

1. Location

Ground Elevation at Surface of Hole: ~ 79' feet Latitude/Longitude: /

Description of Location: Open Field / Vacant Lot

2. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0% (Slope (%))

Grassed, Low Pines / Shrubs (Vegetation) | Outwash Plain (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	N/A feet	Drainage Way	N/A feet	Wetlands	N/A feet
Property Line	~210' feet	Drinking Water Well	N/A feet	Other	N/A feet

4. Parent Material: Sandy Glaciofluvial Deposits Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A (Depth Weeping from Pit) | N/A (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: >12' (Bottom of Test Pit) inches | >67' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP #1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6"	A	10 YR 3/2	N/A	N/A	N/A	SL	0%	0%	Granular	Friable	
6"-20"	B1	10 YR 5/8	N/A	N/A	N/A	LS	0%	5%	Moderate Blocky	Friable	
20"-34"	B2	10 YR 5/6	N/A	N/A	N/A	LS	5%	25%	Massive	Friable	
34"-56"	C1	10 YR 6/4	N/A	N/A	N/A	LS	5%	25%	Strong Blocky	Friable	
56"-70"	C2	10 YR 7/3	N/A	N/A	N/A	FLS	0%	0%	Strong Blocky	Firm	

Additional Notes:

Excavator dug to an additional depth of 12' (144"). No groundwater observed.

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP#2 | 4/14/2017 (Date) | 9:50 AM (Time) | Clear 55 (Weather)

1. Location

Ground Elevation at Surface of Hole: ~76' feet Latitude/Longitude: /

2. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | Slope (%)

Grassed, Low Shrubs (Vegetation) | Outwash Plain (Landform) | Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	N/A feet	Drainage Way	N/A feet	Wetlands	N/A feet
Property Line	~140' feet	Drinking Water Well	N/A feet	Other	N/A feet

4. Parent Material: Sandy Glaciofluvial Deposits Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A (Depth Weeping from Pit) | N/A (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: >13.5' (Bottom of Test Pit) >62.5' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP#2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-36"	Disturbed Soil	Mix	N/A	N/A	N/A	LS	0%	0%	Strong Blocky	Friable	
36"-40"	A	10 YR 3/3	N/A	N/A	N/A	SL	0%	0%	Granular	Friable	
40"-72"	B	10 YR 5/8	N/A	N/A	N/A	LS	2%	15%	Strong Blocky	Firm	
72"-78"	C	10 YR 6/2	N/A	N/A	N/A	FLS	0%	0%	Blocky	Friable	

Additional Notes:

Disturbed soil mix of loamy sand and organics. Excavator dug to an additional depth of 13’ 6”. No evidence of groundwater observed.

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP #3 | 4/14/2017 (Date) | 10:30 AM (Time) | Clear 65 (Weather)

1. Location

Ground Elevation at Surface of Hole: ~ 71 feet Latitude/Longitude: /

Description of Location: Open Field / Vacant Lot

2. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0% (Slope (%))

Grassed, Low Pines / Shrubs (Vegetation) | Outwash Plain (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	N/A feet	Drainage Way	N/A feet	Wetlands	N/A feet
Property Line	~230' feet	Drinking Water Well	N/A feet	Other	N/A feet

4. Parent Material: Sandy Glaciofluvial Deposits Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A (Depth Weeping from Pit) | N/A (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: >12' (Bottom of Test Pit) inches | >59' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP #3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18"	A	10 YR 2/2	N/A	N/A	N/A	SL	0%	0%	Granular	Friable	
18"-36"	B1	10 YR 5/8	N/A	N/A	N/A	LS	0%	5%	Strong Blocky	Friable	
36"-51"	B2	10 YR 5/3	N/A	N/A	N/A	LS	50%	60%	Massive	Firm in Place	
51"-78"	C	10 YR 6/6	N/A	N/A	N/A	LS	0%	0%	Block	Friable	

Additional Notes:

Excavator dug to an additional depth of 12' (144"). No groundwater observed.

Commonwealth of Massachusetts
City/Town of
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C. On-Site Review (continued)

Deep Observation Hole Number: TP#4 | 4/14/2017 (Date) | 11:30 AM (Time) | Clear 65 (Weather)

1. Location

Ground Elevation at Surface of Hole: ~64' feet Latitude/Longitude: /

2. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | Slope (%)

Vegetation: Grassed, Low Shrubs | Landform: Outwash Plain | Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	N/A feet	Drainage Way	N/A feet	Wetlands	N/A feet
Property Line	~140' feet	Drinking Water Well	N/A feet	Other	N/A feet

4. Parent Material: Sandy Glaciofluvial Deposits Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A Depth Weeping from Pit | N/A Depth Standing Water in Hole

Estimated Depth to High Groundwater: >12' (Bottom of Test Pit) inches | >52' elevation

Commonwealth of Massachusetts
City/Town of
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C. On-Site Review (continued)

Deep Observation Hole Number: TP#4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10 YR 3/3	N/A	N/A	N/A	SL	0%	0%	Granular	Friable	
36"-40"	B	10 YR 5/8	N/A	N/A	N/A	LS	0%	0%	Strong Blocky	Friable	
40"-72"	C	10 YR 5/3	N/A	N/A	N/A	LS	5%	10%	Blocky	Firm	

Additional Notes:

Excavator dug an additional depth to 12'. No groundwater observed.

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City/Town of
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C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP #5 | 4/14/2017 (Date) | 12:30 PM (Time) | Clear 65 (Weather)

1. Location

Ground Elevation at Surface of Hole: ~ 73 feet Latitude/Longitude: /

Description of Location: Open Field / Vacant Lot

2. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0% (Slope (%))

Grassed, Low Pines / Shrubs (Vegetation) | Outwash Plain (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	N/A feet	Drainage Way	N/A feet	Wetlands	N/A feet
Property Line	~120' feet	Drinking Water Well	N/A feet	Other	N/A feet

4. Parent Material: Sandy Glaciofluvial Deposits Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A (Depth Weeping from Pit) | N/A (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: >12' (Bottom of Test Pit) inches | >61' elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP #5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6"	A	10 YR 3/3	N/A	N/A	N/A	SL	0%	0%	Granular	Friable	
6"-24"	B1	10 YR 5/8	N/A	N/A	N/A	LS	0%	5%	Strong Blocky	Friable	
24"-48"	B2	10 YR 5/6	N/A	N/A	N/A	LS	10%	20%	Blocky	Friable	
48"-66"	C	10 YR 5/3	N/A	N/A	N/A	FLS	0%	0%	Blocky	Friable	

Additional Notes:

Excavator dug to an additional depth of 12’ (144”). No groundwater observed.

WOODLAND COVE

3104 CRANBERRY HIGHWAY

IN

WAREHAM
MASSACHUSETTS

TEST PIT LOCATION PLAN

AUGUST, 2017

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:
DAKOTA PARTNERS
1264 MAIN STREET
WALTHAM, MA 02451

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: NTS

FILE: 2017–08–10 PROP WS
DWG.:
JOB. NO: 8–3669.00
SHEET 1 OF 1