GPI

Engineering | Design | Planning | Construction Management

**Engineers Report**
*September 9th, 2021*

# STORMWATER POLLUTION PREVENTION PLAN

## For

# PROPOSED ALLTOWN FRESH RETAIL MARKET

1401 Saratoga Road (U.S. Route 9)
Town of Moreau,
Saratoga County
New York

**Owner/Developer:** **Drake Petroleum Company, Inc.**
**800 South Street, Suite 500**
**Waltham, Massachusetts**

*WARNING: The alteration of this material in any way, unless under the direction of a comparable professional, i.e. a Professional Engineer, is a violation of the New York State Education Law and/or Regulations and is a Class 'A' misdemeanor.*

# PREPARER OF THE SWPPP

"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(s) 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 false statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Name: Joshua D. O'Connor, P.E.

Title: Project Engineer

License No.: 090970

Date: September 9th, 2021

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# 1.0 EXECUTIVE SUMMARY

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared for construction activities associated with the Proposed Alltown Fresh Retail Market Project hereafter called "the project". The "project site" is located at 1401 Saratoga Road (U.S. Route 9) in the Town of Moreau, Saratoga County, New York. This SWPPP includes elements necessary to comply with the national baseline general permit for construction activities enacted by the U.S. Environmental Protection Agency (EPA) under the National Pollutant Discharge Elimination System (NPDES) program and all local governing agency requirements. Implementation of this SWPPP must be initiated at the start of construction.

This SWPPP has been developed in accordance with the "New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity" General Permit Number GP-0-20-001, effective January 29, 2020 through January 28, 2025.

This SWPPP, the document titled "Stormwater Management Report For Proposed Alltown Fresh Retail Market", and the accompanying plans entitled "Proposed Alltown Fresh Retail Market" have been submitted as a set to identify and detail storm water management, pollution prevention, and erosion and sediment control measures required for the project during and following construction. All engineering drawings, as well as the Stormwater Management Report, are considered integral to the SWPPP and thus this SWPPP is only considered complete with their inclusion.

This report considers the impacts associated with the intended development with the purpose of:

- Maintaining existing drainage patterns as much as possible while continuing the conveyance of upland watershed runoff;
- Controlling increases in the rate of stormwater runoff resulting from the proposed redevelopment, so as not to adversely alter downstream conditions; and,
- Mitigating potential stormwater quality impacts and preventing soil erosion and sedimentation resulting from stormwater runoff generated both during and after construction.

## 1.1 Project Description

The project proposes the new construction of a 4,800 sf convenience retail market and a redevelopment of the site's fuel station facilities. 44 off-street parking spaces (inclusive of semi-truck parking stalls), internal driveways, fueling islands with canopies, and an outdoor seating area for customers are also planned. Additionally, the project site will reuse the existing ¾" water service, abandon the existing septic fields, provide new underground electric services, as well as a new stormwater collection and treatment systems. The existing

vegetation will be maintained to the maximum extent possible and will be supplemented to buffer views into the site from an adjacent residential property behind the site. The proposed improvements will result in disturbance of approximately 2.9 acres with the construction of 1.98 acres of impervious surface.

The project site is currently served by existing onsite septic facilities. Records found for the initial development of the fuel station that exist onsite indicate that the septic field is located in the front of the property and may have been paved over. The proposed work will be initiated upon completion of a sanitary sewer extension project that is currently underway in the Town. Once the sanitary sewer extension has been installed to the front of the site and is rendered "service ready", a new sanitary sewer connection will be made. The project documents show an anticipated location of the sanitary sewer extension for the proposed service connection.

The proposed project is located at 1401 U.S. Route 9 in the Town of Moreau, bound by the roads State Route 9 (Saratoga Road), Lamplighter Boulevard (hereinafter referred to as the "subject site"). The project encompasses approximately 3.16 acres of land and includes Tax Map Parcel Number 63.03-1-15.2. The site currently includes a retail store and gas station but a majority of the site is currently paved surfaces or compacted gravel parking areas. A location map of the site has been provided in Section 3.0 of this report.

This project is located within the Town of Moreau regulated, traditional land use control Municipal Separate Stormwater Sewer System (MS4). Submission of this SWPPP to the MS4 for review and acceptance is required.

Project construction activities will consist primarily of the proposed buildings, site grading, paving, landscaping, installation of new electric and site lighting, installation of a sanitary sewer connection and the installation of a stormwater drainage and management systems. Construction phase pollutant sources anticipated at the site are disturbed (exposed) soil, vehicle fuels and lubricants, chemicals associated with building demolition, and building demolition materials. Without adequate control, there is the potential for each type of pollutant to be transported by stormwater.

## 1.2 Stormwater Pollution Controls

The proposed measures outlined herein have been designed to provide water quality controls by treating and runoff prior to its discharge on site. These measures have been designed and evaluated in accordance with the following standards and guidelines:

- New York State Stormwater Management Design Manual (January 2015).
- New York State Standards and Specifications for Erosion and Sediment Control (November 2016).

The project proposes the use of two separate underground infiltration chambers to filter and detain the water quality volume produced from the proposed development of the new health facility and pharmacy buildings.

Pre- and post-development surface runoff rates have been evaluated for the 1-, 10-, and 100-year 24-hour storm events. Comparison of pre- and post-development watershed conditions demonstrates that there is no runoff from the project site, therefore the project will not have an impact on the adjacent or downstream properties.

The proposed stormwater collection systems consisting of pipes, open drainage ways and on-site stormwater management facilities will adequately collect, treat, and convey the stormwater.

Stormwater quality will be enhanced through the implementation of the proposed stormwater management facilities, erosion and sediment control measures and maintenance practices outlined herein. The entire Water Quality Volume will be treated through the use of runoff reduction techniques and standard techniques.

## 1.3 Conclusion

This SWPPP has been prepared in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control and NYS Stormwater Management Design Manual. The pre- and post-development drainage analysis showed there is no discharge from the project site to Waters of the United States or to a municipal separate storm sewer system that discharges to Waters of the United States, therefore a New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity General Permit Number GP-0-20-001 is not required. However, as a best practice, a SWPPP has been prepared in conformance with GP-0-20-001 for the project to adequately implement erosion and sediment control measures during construction.

It is our opinion that the proposed development will not adversely impact adjacent or downstream properties if the stormwater management facilities are properly constructed and maintained in accordance with the requirements outlined herein.

# 2.0 SWPPP IMPLEMENTATION RESPONSIBILITIES

A summary of the responsibilities and obligations of all parties involved with compliance with the NYSDEC SPDES General Permit, GP-0-20-001 conditions are outlined in the subsequent sections. For a complete listing of the definitions, responsibilities, and obligations, refer to the SPDES General Permit GP-0-20-001.

## 2.1 Definitions

1. General SPDES Permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 authorizing a category of discharges.
2. Owner or Operator - means the person, persons, or legal entity which owns or leases the property on which the construction activity is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications. There may be occasions during the course of a project in which there are multiple Operators, all of which will need to file and maintain the appropriate SWPPP documents and plans, including without limitation, the Notice of Intent (NOI) and Notice of Termination (NOT).
3. Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that an individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

4. Qualified Professional – means a person that is knowledgeable in the principals and practices of Stormwater management and treatment, such as a licensed Professional

Engineer or Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction Stormwater management practice component must have an understanding of the principals of hydrology, water quality management practice design, water quality control design, and, in many cases, the principals of hydraulics in order to prepare a SWPPP that conforms to the Department's technical standard. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

5. Trained Contractor – means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principals from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

## 2.2 Owners or Operator's and Contractor's Responsibilities

1. Retain the services of a "Qualified Professional", as defined under Section 2.1, to provide the services outlined in Section 2.3 "Operator's Engineer's Responsibilities".
2. Schedule a pre-construction meeting which shall include the Contractor and their sub-contractors to discuss responsibilities as they relate to the implementation of this SWPPP.
3. Require the Contractor to fully implement the SWPPP prepared for the site by the Operator's Professional to ensure that the provisions of the SWPPP are implemented from the commencement of construction activity until all areas of disturbance have achieved final stabilization and the Notice of Termination (NOT) has been submitted.
4. Maintain a copy of the SWPPP, Spill Prevention, Countermeasures, and Cleanup ("SPCC") Plan, inspection records, and other required records on the job site so that they may be made available to the regulatory agencies.
5. Take the proper steps to ensure that the long-term operation and maintenance of the post-construction stormwater management practices will be performed.
6. Require the implementation of the post-construction inspections and maintenance procedures outlined in the Operation and Maintenance Guide, found in Appendix D.

## 2.3 Operator's Qualified Professional Responsibilities

1. Prepare the SWPPP using good engineering practices, best management practices, and in compliance with all federal, state, and local regulatory requirements.
2. If requested, assist the Owner or Operator with submitting the SWPPP to the appropriate regulated MS4 for review and acceptance.
3. Assist as requested, the Owner or Operator and Contractor in providing copies of the SWPPP to the Town of Moreau once all signatures and attachments are complete.

4. Participate at pre-construction meeting with the Operator, Contractor, and their sub-contractors to discuss responsibilities as they relate to the implementation of this SWPPP.
5. Enter Contractor's information in Section 2.5 "SWPPP Participants" once a Contractor is selected by the Owner or Operator.

## 2.4 Contractor's Responsibilities

1. Maintain SWPPP and SWMR on-site and available in a dry enclosure.
2. Sign the SWPPP Contractor's Certification Form contained within Appendix A and forward to the Operator's construction phase Qualified Professional for inclusion in the Site Log Book.
3. Identify at least one Trained Individual that will be responsible for implementation of this SWPPP. Ensure that at least one Trained Individual is on site on a daily basis when soil disturbance activities are being performed.
4. Provide the names and addresses of all subcontractors working on the project site. Require all subcontractors who will be involved with the major construction activities that will result in soil disturbance to identify at least one Trained Individual that will be on site on a daily basis when soil disturbance activities are being performed; and to sign a copy of the Contractor's Certification Form and forward to the Operator's construction phase Qualified Professional for inclusion into the Site Log Book. This information must be retained as part of the Site Log Book.
5. Prepare a Spill Prevention and Response Plan in accordance with requirements outlined in Section 5.4. This plan shall be provided to the Operator's construction phase Qualified Professional for inclusion in the Site Log Book.
6. Participate in pre-construction meeting which shall include the Operator, Operator's construction phase Engineer, and all sub-contractors to discuss responsibilities as they relate to the implementation of this SWPPP.
7. If Contractor plans on utilizing adjacent properties for material, waste, borrow, or equipment storage areas, or if Contractor plans to engage in industrial activity other than construction (such as operating asphalt and/or concrete plants) at the site, Contractor shall submit appropriate documentation to the Owner and Operator's design Qualified Professional so that the SWPPP can be modified accordingly.
8. Implement site stabilization, erosion and sediment control measures, and other requirements of the SWPPP.
9. Conduct daily inspections of erosion and sediment control measures installed at the site to ensure that they remain in effective operating condition at all times. Prepare, and retain written documentation of inspections as well as of all repairs/maintenance activities performed. This information must be retained as part of the site log book.
10. Maintain a record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated. A log for keeping such records is provided in

Appendix C.

11. Provide monthly training sessions for all entities and subcontractors involved with installing, applying, performing, maintaining and inspecting measures outlined within this SWPPP.
12. Begin implementing corrective actions within one day of receipt of notification by the Town of Moreau that deficiencies exist with the erosion and sedimentation control measures employed at the site. Corrective actions shall be completed within a reasonable time frame.
13. Maintain the site log book with all required documentation identified in the previous sections.

## SWPPP Participants

1. Design Engineer:

Joshua D. O'Connor, P.E.
Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
Phone: 518-453-9431

2. Construction Qualified[1] Professional:

Name and Title: _____

Company Name: _____

Mailing Address: _____

_____

Phone: _____

Fax: _____

3. Operator:

Thomas Danieluk, Senior Project Manager
Drake Petroleum Company, Inc.
800 South Street, Suite 500
P.O. Box 9161
Waltham, MA 02454-9161

4. Contractor[2]:

Name and Title: _____

Company Name: _____

Mailing Address: _____

_____

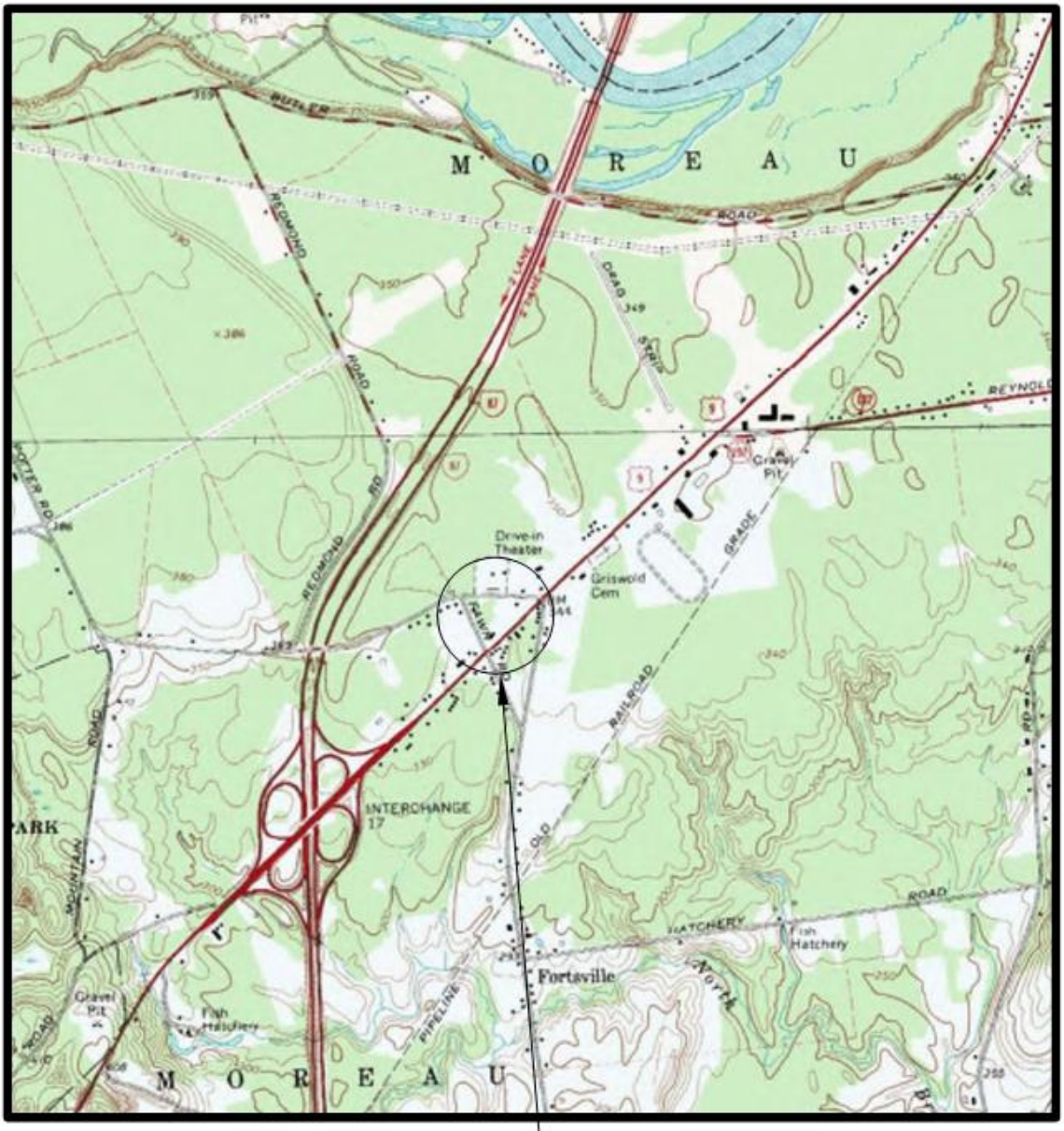
Phone: _____

Fax: _____

[1] Construction Phase Engineer information to be entered once selected and if different from design engineer.
[2] Contractor's information to be entered once the Contractor has been selected.

# 3.0 SITE CHARACTERISTICS

The site is located at 1401 U.S. Route 9, in the Town of Moreau, Saratoga County, New York which lies between an existing restaurant building to the southwest, Lamplighter Boulevard to the northeast, and a residential development to the northwest. A site location map has been included in this section for clarification. Additional in-depth site characteristics can be found in the Stormwater Management Report associated with the Proposed Alltown Fresh Retail Market project.



# 4.0 CONSTRUCTION SEQUENCE

This project's disturbance area encompasses less than five acres of land and disturbance of additional off-site properties to facilitate construction is not anticipated, therefore written approval from NYSDEC allowing the disturbance of more than five acres of land at any one time is not required. If the Contractor's construction sequence requires the disturbance of more than five acres at any one-time, written approval must be obtained from NYSDEC prior to disturbing more than five acres at once.

The "Erosion and Sediment Control Plan" in the accompanying drawings identify the major construction activities that are the subject of this SWPPP. The order (or sequence) in which the major activities are expected to begin is presented on the accompanying drawings, though each activity will not necessarily be completed before the next begins. In addition, these activities could occur in a different order if necessary, to maintain adequate erosion and sediment control. If this is the case, the contractor shall notify the Owner and Operator's Quality Professional overseeing the implementation of the SWPPP.

The Contractor will be responsible for implementing the erosion and sediment control measures identified on the plans. The Contractor may designate these tasks to certain subcontractors as seen fit, but the ultimate responsibility for implementing these controls and ensuring their proper function remains with the Contractor.

Refer to the accompanying plans for details and specifications regarding the construction sequencing schedule.

# 5.0 CONSTRUCTION-PHASE POLLUTION CONTROL

The SWPPP and accompanying plans identify the temporary and permanent erosion and sediment control measures that have been incorporated into the design of this project. These measures will be implemented during construction, to minimize soil erosion and control sediment transport off-site, and after construction, to control the quality and quantity of stormwater runoff from the developed site.

Erosion control measures, designed to minimize soil loss, and sediment control measures, intended to retain eroded soil and prevent it from reaching water bodies or adjoining properties, have been developed in accordance with the following documents:

- NYSDEC SPDES General Permit for Stormwater Discharges From Construction Activity, Permit No. GP-0-20-001 (effective January 29, 2020 through January 28, 2025)
- New York State Standards and Specifications for Erosion and Sediment Control, NYSDEC (November 2016)

The SWPPP and accompanying plans outline the construction sequence for implementing the erosion and sediment control measures. The SWPPP and accompanying plans include limitations on the duration of soil exposure, criteria and specifications for placement and installation of the erosion and sediment control measures, a maintenance schedule, and specifications for the implementation of erosion and sediment control practices and procedures.

Temporary and permanent erosion and sediment control measures that shall be applied during construction generally include:

1. Minimizing soil erosion and sedimentation by stabilization of disturbed areas and by removing sediment from construction-site discharges.
2. Preservation of existing vegetation as much as possible. Following the completion of construction activities in any portion of the site permanent vegetation shall be established on all exposed soils.
3. Site preparation activities shall be planned to minimize the area and duration of soil disruption.
4. Permanent traffic corridors shall be established, and "routes of convenience" shall be avoided.

## 5.1 Temporary Erosion and Sediment Control Measures

The temporary erosion and sediment control measures described in the following sections are included as part of the construction documents.

### *5.1.1 Stabilized Construction Access*

Prior to construction, stabilized construction access will be installed, as shown on the detail

plan, to reduce the tracking of sediment onto public roadways.

Construction traffic must enter and exit the site at the stabilized construction access. The intent is to trap dust and mud that would otherwise be carried off-site by construction traffic.

The access shall be maintained in a condition, which will control tracking of sediment onto public rights-of-way or streets. When necessary, the placement of additional aggregate atop the filter fabric will be done to assure the minimum thickness is maintained. All sediments and soils spilled, dropped, or washed onto the public rights-of-way must be removed immediately. Periodic inspection and needed maintenance shall be provided after each substantial rainfall event.

### *5.1.2 Dust Control*

Water trucks shall be used as needed during construction to reduce dust generated on the site. Dust control must be provided by the general Contractor to a degree that is acceptable to the Owner, and in compliance with the applicable local and state dust control requirements.

### *5.1.3 Temporary Soil Stockpile*

Materials, such as topsoil, will be temporarily stockpiled (if necessary) on the site during the construction process. Stockpiles shall be located in an area away from storm drainage, water bodies and/or courses, and will be properly protected from erosion by a surrounding silt fence barrier.

### *5.1.4 Sediment Control Barrier*

Prior to the initiation of and during construction activities, a sediment control barrier (i.e.: silt fence, compost filter sock, etc.) will be established along the down slope perimeter of areas to be disturbed as a result of the construction which lie up gradient of watercourses or adjacent properties. These barriers may extend into non-impact areas to provide adequate protection of adjacent lands.

Clearing and grubbing will be performed only as necessary for the installation of the sediment control barriers. To facilitate effectiveness of the barriers, daily inspections and inspections immediately after significant storm events will be performed by site personnel. Maintenance of the barrier will be performed as needed.

### *5.1.5 Temporary Seeding*

Areas undergoing clearing or grading and any areas disturbed by construction activities where work is delayed, suspended, or incomplete and will not be re-disturbed for 21 days or more shall be stabilized with temporary vegetative cover within 14 days after construction activity in that portion of the site has ceased.

### *5.1.6 Sediment Barrier Inlet Protection*

Typical Sediment Control Barriers will be placed around both existing catch basins and proposed catch basins once they have been installed, to keep sediment from entering the catch basins and storm sewer system. During construction, sediment barriers shall be replaced as necessary to ensure proper function of the structure.

### *5.1.7 Erosion Control Blanket*

Erosion control blankets shall be installed on all slopes exceeding 3:1. Erosion control blankets provide temporary erosion protection, rapid vegetative establishment, and long-term erosion resistance to shear stresses associated with high runoff flow velocities associated with steep slopes.

## 5.2 Permanent Erosion and Sediment Control Measures

The permanent erosion and sediment control measures described in the following sections are included as part of the construction documents.

### *5.2.1 Soil Restoration*

Soil Restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Healthy soil is vital to a sustainable environment and landscape.

The contractor shall implement soil restoration practices in accordance with Table 5.3 of the NYSDEC Stormwater Management Design Manual, included as Table 3 below.

**Table 1: Soil Restoration Requirements**

| Type of Soil Disturbance | Soil Restoration Requirement | | Comments/Examples |
|---|---|---|---|
| No soil disturbance | Restoration not permitted | | Preservation of Natural Features |
| Minimal soil disturbance | Restoration not required | | Clearing and grubbing |
| Areas where topsoil is stripped only- no change in grade | HSG A&B | HSG C&D | Protect area from any ongoing construction activities |
| | Apply 6 inches of topsoil | Aerate* and apply 6 inches of topsoil | |
| Areas of cut or fill | HSG A&B | HSG C&D | |
| | Aerate* and apply 6 inches of topsoil | Apply full Soil Restoration** | |
| Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls) | Apply full Soil Restoration** (de-compaction and compost enhancement) | | |
| Areas where Runoff Reduction and/or infiltration practice are applied | Restoration not required, but may be applied to enhance the reduction specified for appropriate practices | | Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area |
| Redevelopment projects | Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area | | |

*Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spike making indentations in the soil, or prongs which function like a mini-subsoiler.

**Per "Deep Ripping and De-compaction, DEC 2008"

### *5.2.2 Establishment of Permanent Vegetation*

Disturbed areas that will be vegetated must be seeded in accordance with the contract documents. The type of seed, mulch, and maintenance measures as described in the contract documents shall also be followed.

All areas at final grade must be seeded and mulched within 14 days after completion of the major construction activity. All seeded areas should be protected with mulch.

Final site stabilization is achieved when all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of 80 percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

## 5.3 Other Pollutant Controls

Control of sediments has been described previously. Other aspects of this SWPPP are listed below:

### *5.3.1 Solid and Liquid Waste Disposal*

No solid or liquid waste materials, including building materials, shall be discharged from the site with stormwater. All solid waste, including disposable materials incidental to any construction activities, must be collected and placed in containers. The containers shall be emptied periodically by a licensed trash disposal service and hauled away from the site.

Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed of so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil. In this regard, potentially polluting substances should be handled in a manner consistent with the impact they represent.

### *5.3.2 Sanitary Facilities*

Temporary sanitary facilities will be provided by the Contractor throughout the construction phase. They must be utilized by all construction personnel and will be serviced by a licensed commercial Contractor. These facilities must comply with state and local sanitary or septic system regulations.

### *5.3.3 Water Source*

Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the Health Department. Water used for construction that does not originate from an approved public supply must not discharge from the site; such water can be retained in ponds until it infiltrates and/or evaporates.

## 5.4 Construction Housekeeping Practices

During the construction phase, the general Contractor will implement the following measures:

### *5.4.1 Material Stockpiles*

Material resulting from the clearing and grubbing operation will be stockpiled up slope from adequate sedimentation controls.

### *5.4.2 Equipment Cleaning and Maintenance*

The general Contractor will designate areas for equipment cleaning, maintenance, and repair. The general Contractor and subcontractors will utilize those areas. The areas will be protected by a temporary perimeter berm.

### *5.4.3 Detergents*

The use of detergents for large-scale washing is prohibited (i.e., vehicles, buildings, pavement surfaces, etc.)

### *5.4.4 Spill Prevention and Response*

A Spill Prevention and Response Plan shall be developed for the site by the Contractor. The plan shall detail the steps needed to be followed in the event of an accidental spill and shall identify contact names and phone numbers of people and agencies that must be notified.

The plan shall include Material Safety Data Sheets (MSDS) for all materials to be stored on-site. All workers on-site will be required to be trained on safe handling and spill prevention procedures for all materials used during construction. Regular tailgate safety meetings shall be held and all workers that are expected on the site during the week shall be required to attend.

### *5.4.5 Concrete Wash Areas*

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site, but only in specifically designated diked and impervious washout areas which have been prepared to prevent contact between the concrete wash and storm water. Waste generated from concrete wash water shall not be allowed to flow into drainage ways, inlets, receiving waters or highway right of ways, or any location other than the designated Concrete Wash Areas. Proper signage designating the "Concrete Wash Areas" shall be placed near the facility. Concrete Wash Areas shall be located at minimum 100 linear feet from drainage ways, inlets and surface waters.

The hardened residue from the Concrete Wash Areas will be disposed of in the same manner as other non-hazardous construction waste materials. Maintenance of the wash area is to include removal of hardened concrete. Facility shall have sufficient volume to contain all the concrete waste resulting from washout and a minimum freeboard of 12 inches. Facility shall not be filled beyond 95% capacity and shall be cleaned out once 75% full unless a new facility is constructed. The Contractor will be responsible for seeing that these procedures are followed.

Saw-cut Portland Cement Concrete (PCC) slurry shall not be allowed to enter storm drains or

watercourses. Saw-cut residue should not be left on the surface of pavement or be allowed to flow over and off pavement.

The Project may require the use of multiple concrete wash areas. All concrete wash areas will be located in an area where the likelihood of the area contributing to storm water discharges is negligible. If required, additional BMPs must be implemented to prevent concrete wastes from contributing to stormwater discharges.

#### *5.4.6 Material Storage*

Construction materials shall be stored in a dedicated staging area. The staging area shall be located in an area that minimizes the impacts of the construction materials effecting stormwater quality.

Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed of at an approved solid waste or chemical disposal facility.

## 5.5 Winter Shutdown Plan

The contractor shall implement the following procedures in order to stabilize the site against erosion during a period of winter shutdown. In areas where vegetation has not been established when the winter shutdown is to be implemented, the contractor shall implement one or more of the following devices.

- Jute/Coconut fiber blankets
- Geotextile
- Hay/straw or mulch
- Alternate method to be approved by the Design and Municipal Engineer

The project site needs to be fully stabilized by November 15$^{th}$ or winter stabilization requirements must be implemented.

Inspections shall proceed as outlined in the inspection section of this document. Inspections shall also be conducted after significant snowmelt has been documented. If damage has been documented during the inspection, the contractor shall provide repairs prior to the next scheduled inspection.

## 5.6 Winter Stabilization Requirements

Any construction activities with ongoing land disturbance and exposure, or project sites that have not been fully stabilized for winter shutdown, require additional erosion and sediment control measures during the winter season. Per New York State Standards and Specifications

for Erosion and Sediment Control, the "winter season" is defined as the period from November 15th to the following April 1st. During this time, the standard inspection schedule shall continue as outlined in the inspection section of this document. The winter stabilization measures described in the following sections are included as part of the construction documents.

### *5.6.1 Snow Management*

The contractor shall designate areas with adequate storage capacity for snow and control of melt water that does not affect ongoing construction activities. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams or debris from plowing operations that restrict the flow of runoff shall be removed.

### *5.6.2 Construction Access*

The stabilized construction access shall be maintained and kept free from debris and snow. All construction access points shall be enlarged and stabilized to provide for snow management and stockpiling. The intent is to maintain the existing travel width and not restrict construction access. Stone paths shall be used to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. The stone paths shall be a minimum 10' wide or wider to accommodate equipment.

### *5.6.3 Sediment Barrier/Silt Fence*

Sediment barriers must be installed at all appropriate perimeter and sensitive locations before the ground freezes. A minimum 25-foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes (min. 5' exposed) that are visible above the snow pack. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, spaced 5 feet apart, installed on the contour. Sediment barrier must be installed at least 15' from the toe of the soil stockpile to prevent soil migration.

### *5.6.4 Soil Stabilization*

In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three days. Mulch used for stabilization shall be applied at double the standard rate. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper. Soil stockpiles must be protected by the use of vegetation establishment, anchored straw mulch, rolled stabilization matting, or other durable covering. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil shall be stabilized at the end of the workday unless work will resume within 24 hours in the same area and no precipitation is forecasted or the work is in an area that collects and retains runoff.

# 6.0 POST-CONSTRUCTION STORMWATER CONTROL

Stormwater runoff from the proposed construction will be collected and conveyed to the control system(s) described, through a closed storm sewer network. The control system(s) onsite utilize two separate hydrodynamic separators that act as pretreatment for the underground infiltration system (DEC Stormwater Design Manual: I-4). In accordance with the design recommendations for a site with potential "Hot Spot" discharge, redundant pretreatment has been provided through the application of a Snout outlet hoods in each catch basin as well as utilizing the "isolator row" component of the Stormtech Chamber system. A more in-depth breakdown of each type of component used in the design can be found in Section 3 of the Stormwater Management Report.

# 7.0 INSPECTION AND MAINTENANCE RESPONSIBILITIES

## 7.1 Inspection and Maintenance Requirements

### *7.1.1 MS4 Inspection*

the Town of Moreau's MS4 coordinator and associated staff shall have the ability to enter the project site and conduct their own compliance inspections.

### *7.1.2 Temporary Suspension of Construction Activities*

The Owner/Operator shall notify the MS4 Coordinator when soil disturbance activities have been temporarily suspended (e.g. Winter shutdown) and temporary stabilization measures have been applied to all disturbed areas.

### *7.1.3 Post-Construction Inspections and Maintenance*

Inspections and maintenance shall be performed in accordance with Appendix D, when all disturbed areas are stabilized and all stormwater management systems are in place and operable.

## 7.2 Reporting Requirements

### *7.2.1 Site Log Book*

The Owner and Operator's construction phase Qualified Professional, on behalf of the Owner and operator, shall retain a copy of the SWPPP at the construction-site from the date of initiation of construction activities to the date of final stabilization.

During construction, the Contractor shall maintain a record of all actions described in the SWPPP at the site in the Site Log Book. The Site Log Book shall be maintained on-site and made available to the permitting authority.

### *7.2.2 Post Construction Records and Archiving*

Following construction, the Owner and Operator shall retain copies of the SWPPP, and the complete construction Site Log Book.

Record shall be maintained of all post construction inspections and maintenance work performed in accordance with the requirements outlined in Appendix D.

# APPENDIX A:

Contractor's Certification Form (Sample Form)

# Stormwater Pollution Prevention Plan
# Contractor or Subcontractor Certification Statement

Alltown Fresh Retail Market
1401 Route 9
Town of Moreau, Saratoga County, New York

Each Contractor and Subcontractor that will be responsible for installing, constructing, repairing, inspecting and/or maintaining the erosion and sediment control practices and post-construction stormwater management control practices included in the SWPPP is required to complete and sign this Certification Statement before commencing any construction activity at the site. The completed Certification Statement(s) shall be maintained at the construction site.

**Contracting Firm Information**

Name: _____

Address: _____

_____

Telephone & Fax: _____

**Contractor's Responsibilities Regarding SWPPP Implementation**

_____

_____

**Trained Individual(s) Responsible for SWPPP Implementation**[1] (Provide name, title, and date of last training)

_____

_____

**Contractor or Subcontractor Certification**[2]

I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name: _____

Title/Position: _____

Signature: _____ Date: _____

[1] A Trained Individual means an employee from a contracting (construction) firm that has received four (4) hours of training, which has been endorsed by the NYSDEC, from a Soil and Water Conservation District, CPESC, Inc. or other NYSDEC endorsed entity, in proper erosion and sediment control principles no later than two (2) years from the date GP-0-15-002 was issued. After receiving initial training, the Trained Individual shall receive four (4) hours of training every three (3) years. This individual will be responsible for implementation of the SWPPP.

[2] Signatory Requirements:

a. For a corporation, this form shall be signed by (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principle business function, or any other person who performs similar policy or decision-making functions for the corporation; or (ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship, this form shall be signed by a general partner or the proprietor, respectively.

c. For a municipality, State, Federal, or other public agency, this form shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrators of EPA).

# APPENDIX B:

Inspection Report (Sample Form)

# Stormwater Pollution Prevention Plan
# Inspection Report

Alltown Fresh Retail Market
1401 Route 9
Town of Moreau, Saratoga County, New York

A Qualified Inspector[1] shall prepare an inspection report subsequent to each and every inspection, as required in Part IV.C of the SPDES General Permit GP-0-20-001. All sections of this report are to be completed.

## 1. Inspection Information

Inspection number: _____

Date and Time of Inspection: _____

Weather Conditions: _____

Soil Conditions (e.g. dry, wet, saturated): _____

## 2. Qualified Inspector Information

Printed Name: _____

Title / Position: _____

Signature: _____ Date: _____

## 3. On the included site plan, provide a sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection. Provide additional descriptions below if necessary.

_____

_____

_____

_____

[1] A Qualified Inspector means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), licensed Landscape Architect, or other Department endorsed individual(s). It also means someone working under the direct supervision of the licensed Professional Engineer or licensed Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that an individual performing a site inspection has received four (4) hours of training, endorsed by the Department, from a Soil and Water Conservation District, CPESC, Inc. or other Department endorsed entity in proper erosion and sediment control principles no later than two (2) years from the date GP-0-10-002 was issued. After receiving the initial training, an individual working under the direct supervision of the licensed Professional Engineer or licensed Landscape Architect shall receive four (4) hours of training every three (3) years. Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

4. **In the following table, provide a description of the condition of the runoff at all points of discharge from the construction site, including conveyance systems (pipes, culverts, ditches, etc.) and overland flow. Identify any discharges of sediment from the construction site. Use additional sheets if necessary.**

| Description of Discharge Point | Condition of Runoff | Sediment Discharge Noted |
|---|---|---|
| | | yes / no<br>Estimated Quantity: |
| | | yes / no<br>Estimated Quantity: |
| | | yes / no<br>Estimated Quantity: |
| | | yes / no<br>Estimated Quantity: |

5. **For all discharge points where sediment discharge has been noted in the above table, provide detailed corrective actions that are required. Use additional sheets if necessary.**

**6. In the following table, provide checkmarks in the appropriate columns to indicate the condition of all erosion and sediment control practices at the site.**

| Erosion & Sediment Control Practice | Not Applicable | Functioning as designed | Needs repair/maintenance | Not installed properly |
|---|---|---|---|---|
| Stabilized construction entrance | | | | |
| Temporary parking areas | | | | |
| Construction vehicle wash areas | | | | |
| Silt fence | | | | |
| Temporary swales and berms | | | | |
| Stone check dams | | | | |
| Slope protection measures | | | | |
| Dewatering operations | | | | |
| Sediment traps | | | | |
| Inlet protection measures | | | | |
| Soil stockpiles | | | | |
| Dust control measures | | | | |
| Other: | | | | |
| Other: | | | | |

**7. For all erosion and sediment control practices identified in the above table as "needs repair or maintenance" or "not installed properly", provide detailed corrective actions that are required. Use additional sheets if necessary.**

8. **In the following table, indicate the current phase of construction of all post-construction stormwater management practices and identify all construction that is not in conformance with the SWPPP and technical standards.**

| SWM Practice | Current Phase of Construction | Items not in conformance with the SWPPP |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

9. **For all post-construction stormwater management practices which are identified in the above table as including "items not in conformance with the SWPPP", provide detailed corrective action(s) that are required to correct the deficiencies. Use additional sheets if necessary.**

# APPENDIX C:

Record of Stabilization and Construction Activity Dates (Sample Form)

# Site Stabilization & Construction Activities Dates

Alltown Fresh Retail Market
1401 Route 9
Town of Moreau, Saratoga County, New York

Note: This form shall be completed by the Contractor and shall remain as part of the Stormwater Pollution Prevention Plan that is to remain at the project site for the duration of construction.

A record of dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be maintained until final site stabilization is achieved and the Notice of Termination is filed.

## MAJOR GRADING ACTIVITIES:

Page ___of___

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

Description of Activity: _____
Contractor:_____
Location:_____
Start Date: _____ Finish Date: _____

# APPENDIX D:

Historical, Cultural, and Environmental Resources

NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation, and Historic Preservation

**KATHY HOCHUL**
Governor

**ERIK KULLESEID**
Commissioner

August 25, 2021

Adam Johnson
Project Engineer
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

Re: SEQRA
Proposed Alltown Fresh Retail Market
1401 Route 9, Moreau, NY 12831
21PR05705

Dear Adam Johnson:

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the project in accordance with the New York State Historic Preservation Act of 1980 (Section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the OPRHP and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6 NYCRR Part 617).

Based upon this review, it is the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

R. Daniel Mackay

Deputy Commissioner for Historic Preservation
Division for Historic Preservation

# APPENDIX E:

Stormwater Management Report

GPI

Engineering | Design | Planning | Construction Management

**Engineers Report**
*September 9th, 2021*

# STORMWATER MANAGEMENT REPORT

## For

# PROPOSED ALLTOWN FRESH RETAIL MARKET

1401 Saratoga Road (U.S. Route 9)
Town of Moreau,
Saratoga County
New York

**Owner/Developer:** **Drake Petroleum Company, Inc.**
**800 South Street, Suite 500**
**Waltham, Massachusetts**

*WARNING: The alteration of this material in any way, unless under the direction of a comparable professional, i.e. a Professional Engineer, is a violation of the New York State Education Law and/or Regulations and is a Class 'A' misdemeanor.*

# PREPARER OF THE REPORT

"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(s) 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 false statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Name: Joshua D. O'Connor, P.E.

Title: Project Engineer

License No.: 909070

Date: September 9th, 2021

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# 1.0 PROJECT INFORMATION

This Stormwater Management Report (SWMR) has been prepared for construction activities associated with the Proposed Alltown Fresh Retail Market hereafter called "the project".

This SWMR has been developed in accordance with the "New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity" General Permit Number GP-0-20-001, effective January 29, 2020 through January 28, 2025.

This report considers the impacts associated with the intended development with the purpose of:

- Maintaining existing drainage patterns as much as possible while continuing the conveyance of upland watershed runoff;
- Controlling increases in the rate of stormwater runoff resulting from the proposed redevelopment, so as not to adversely alter downstream conditions; and,
- Mitigating potential stormwater quality impacts and preventing soil erosion and sedimentation resulting from stormwater runoff generated both during and after construction.

## 1.1 Project Location

The "project site" is located at 1401 Saratoga Road (U.S. Route 9) in the Town of Moreau, Saratoga County, New York. The project site is located between Lamplighter Boulevard and Reynolds Road. A location map of the site has been provided in Appendix A, as Figure 1.

## 1.2 Project Description

The project proposes the new construction of a ±4,800 sf retail market and a redevelopment of the site's fuel station facilities. 44 off-street parking spaces (inclusive of semi-truck parking stalls), internal driveways, fueling islands with canopies, and an outdoor seating area for customers are also planned. Additionally, the project site will reuse the existing ¾" water service, abandon the existing septic fields, provide new underground electric services, as well as a new stormwater collection and treatment systems. The existing vegetation will be maintained to the maximum extent possible and will be supplemented to buffer views into the site from an adjacent residential property behind the site. The proposed improvements will result in disturbance of approximately 2.9 acres with the construction of 1.98 acres of impervious surface.

# 2.0 SITE CHARACTERISTICS

## 2.1 Land Use and Topography

The project encompasses approximately 3.16 acres of land and includes Tax Map Parcel Number 63.3-1-28, which lies within the Town of Moreau's Commercial zoning district. The land currently has an existing convenience store with gas stations and most of the site cover is asphalt pavement or highly compacted gravel, soil and asphalt which is not porous. Surrounding adjacent properties include commercial properties along State Route 9 and a residential development to the northwest.

The roads that border the project site act as high points with the project site sitting in a depression. The existing grades generally slope from a high point elevation of 349.00 along the NW edge of the property to a low depression near the eastern corner of the property with an elevation of 346.10. Stormwater runoff generally sheet flows east and remains onsite to infiltrate into the ground.

## 2.2 Soils and Groundwater

The United States Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey for Rensselaer County was reviewed and identified surficial soil conditions for the study area. The SCS identified the presence of one series soil type, "WnA" in the disturbance area. Soil survey maps are provided in Appendix A as Figure 2.

The SCS defines the map unit "WnA – Windsor loamy sand" as very deep, excessively drained soil formed in water-sorted sand. The soils are found on glacial outwash plains, kames, and terraces. Typically, the surface layer is very dark grayish brown loamy sand 11 inches thick. The subsoil layers extend to a depth of 25 inches and are comprised of yellowish brown loamy sand and yellowish brown sand. The substratum extends to a depth of 72 inches or more and consists of light yellowish brown sand.

Greenman-Pedersen Inc. completed soil investigations in June 2021, which included percolation testing and deep test pits. The deep hole tests determined the soils within the project area are consistent with WnA soils. The percolation tests revealed an infiltration rate of <1 min per inch (>60 in/hr). An infiltration rate of 30 in/hr was used for conservative design, 50% of the tested rate. A summary of the infiltration testing can be found in the in Appendix F.

The deepest test was conducted to a depth of 7.5' and no evidence of groundwater was observed. The depth to bedrock is not currently known, as it was not encountered.

**Table 1: Soil Data**

| Map Symbol & Description | Hydrologic Soil Group | Permeability (inches/hour) | Erosion Factor K | Depth to Water Table (feet) | Depth to Bedrock (feet) |
|---|---|---|---|---|---|
| WnA – Windsor Loamy Sand | A | >60 | 0.13 | >7.5 | >7.5 |

The Soil Conservation Service defines the hydrologic soil groups as follows:

- Type A Soils: Soils having a high infiltration rate and low runoff potential when thoroughly wet. These soils consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a moderate rate of water transmission.
- Type B Soils: Soils having a moderate infiltration rate when thoroughly wet and consisting mainly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately course textures. These soils have a moderate rate of water transmission.
- Type C Soils: Soils having a low infiltration rate when thoroughly wet and consisting chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine-to-fine texture. These soils have a low rate of water transmission.
- Type D Soils: Soils having a very low infiltration rate and high runoff potential when thoroughly wet. These soils consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very low rate of water transmission.

## 2.3 Watershed Designation

The project site is not located in a restricted watershed identified in appendix C of GP-0-15-002.

## 2.4 Receiving Water Bodies

Stormwater runoff remains onsite and infiltrates in the ground.

The site does not discharge into waters classified in the Section 303(d) list of impaired waters found in appendix E of GP-0-15-002.

## 2.5 Aquifer Designation

The project site is not located over a US EPA designated Sole Source aquifer. It is located over a Primary aquifer listed in the NYSDEC Technical and Operational Guidance Series (TOGS)

2.1.3 (1980).

## 2.6 Wetlands

There are no wetlands located on-site and stormwater runoff does not discharge to a regulated wetland.

## 2.7 Flood Plains

According to the National Flood Insurance Program Flood Insurance Rate Map (FIRM) (Panel 195 of 693 for Saratoga County, New York) the project site lies within Zone X, which are areas determined to be outside the 500-year floodplain.

## 2.8 Rainfall Data

Rainfall data utilized in the modeling and analysis were obtained from the Northeast Regional Climate Center (NRCC). Rainfall data averaged from the closest rainfall stations to the project site for various 24-hour storm events is presented in Table 2:

**Table 2: Rainfall Data**

| Storm Event Return Period | 24-Hour Rainfall (inches) |
|---|---|
| 90% | 1.2 |
| 1-year | 2.23 |
| 10-year | 3.71 |
| 100-year | 6.22 |

These values were used to evaluate the stormwater runoff characteristics and hydraulic analysis of the closed drainage systems and stormwater management practices.

# 3.0 Post-Construction Stormwater Control

The goals of this Stormwater Management Plan are to minimize the impact to the quality of runoff exiting the site. The NYS Stormwater Management Design Manual provides both water quality and water quantity objectives to be met by projects disturbing more than 1 acre. These objectives will be met by applying stormwater control practices to limit peak runoff rates and improve the quality of runoff leaving the developed site.

The proposed storm water management system has been designed to meet the New York State Stormwater Design Manual (NYSSDM) August 2015 edition. This version of the NYSSDM requires runoff reduction volume as well as encouraging green infrastructure techniques. Planners and designers must address a six step approach to site planning and SMP selection. The following is the six step process and applicable design considerations for this project.

1. Site Planning to preserve natural features and reduce impervious cover.

- The site has been designed to minimize the impervious cover to the maximum extent practical. Parking was determined based upon the minimum number typically required. The site was laid out to protect as many existing trees as practical. The GI Planning Worksheet has been completed and can be found in Appendix D.

2. Calculation of the Water Quality Volume (WQv) for the site

- The water quality volume for the site has been calculated and can be found in Appendix D of this report.

3. Incorporation of green infrastructure techniques and standard SMP's with Runoff Reduction Volume (RRv) Capacity.

- According to the NYSSDM, Green Infrastructure techniques are required for all new impervious areas. The project design explored many different options for handling the stormwater onsite. The project proposes to use two underground infiltration practices (100% RRv capacity).

4. Calculation of the minimum (RRv) for the site

- The minimum runoff reduction volume for the site has been calculated for the new impervious area and can be found in Appendix D of this report.

5. Apply Standard Stormwater Management Practices to address remaining Water Quality Volume

- This project proposes to handle 100% of the WQv using standard stormwater

management practices with runoff reduction capability.

6. Apply volume and peak rate controls practices if still needed to meet requirements

- The infiltration practices proposed will collect and store the 100-year rainfall event so no runoff will be leaving the site.

## 3.1 Stormwater Control Practices

Stormwater runoff from the proposed construction will be collected and conveyed to the control system(s) described herein through a combined open and closed storm sewer network.

The stormwater quantity and quality control systems described in the following sections have been incorporated into the stormwater management plan for this project. Design and sizing of the stormwater management practices can be found in Appendix E.

### *3.1.1 Underground Infiltration System (I-4)*

The underground infiltration system is an effective means of capturing and temporarily storing the WQv below grade, before allowing it to infiltrate into the ground. This project will use an underground infiltration chamber system. Hydrodynamic separators are proposed for 100% pretreatment of the WQv before entering the chamber systems. The hydrodynamic separator manufacturer design can be found in Appendix E.

The underground infiltration systems (I-4) were designed according to the criteria set forth in Section 6.3 "Stormwater Infiltration" of the NYS Stormwater Management Design Manual. The underground infiltration systems were sized using the manufacturers design software, which can be found in Appendix E.

## 3.2 Stormwater Quality Analysis

Stormwater runoff from impervious surfaces is recognized as a significant contributor of pollution that can adversely affect the quality of receiving water bodies. Therefore, treatment of stormwater runoff is important since most runoff related water quality contaminants are transported from land, particularly the impervious surfaces, during the initial stages of storm events.

### *3.2.1 NYSDEC Requirements*

The NYS Stormwater Management Design Manual requires that water quality treatment be provided for the initial flush of runoff from every storm. The NYSDEC refers to the amount of runoff to be treated as the "Water Quality Volume" (WQv). Section 4.2 of the Manual defines the Water Quality Volume as follows:

$$WQv = \frac{[(P)(R_V)(A)]}{12}$$

Where: P = 90% Rainfall Event Number
Rv = 0.05 + 0.009 (I), minimum Rv = 0.2
I = Impervious Cover (Percent)
A = Contributing Area in Acres

This definition ensures that, all other things being equal, the Water Quality Volume will increase along with the impervious cover percentage.

### *3.2.2 Methodology*

The Water Quality Volume equation has been applied to the drainage areas tributary for the disturbance of the site. The practices have been sized to accommodate the Water Quality Volume, as per the performance criteria presented in Chapter 6 of the NYS Stormwater Management Design Manual. The project used standard stormwater management practices with runoff reduction volume capacity to fully handle the WQv with runoff reduction techniques.

Design computations for the Water Quality Volume (WQv) required and the Minimum Runoff Reduction Volume (RRv) required are presented in Appendix D.

### *3.2.3 Performance Summary*

For each stormwater quality practice, Table 4 summarizes the Water Quality Volume requirements, WQv provided and runoff reduction volume provided by each practice. According to Table 3.5 in Chapter 3 of the Stormwater Management Design Manual, infiltration practices can claim 100% of the storage volume for runoff reduction or the WQv, whichever is less. The infiltration chambers system was sized to store 100% of the WQv required.

The WQv calculated for the entire disturbance area was determined to be 1,812-CF. The sum of the total runoff reduction volume provided is 1,812-CF. Therefore, this project meets the WQv requirements through the use of standard practices with runoff reduction capacity and green infrastructure techniques. The minimum RRv was calculated to be 546-CF and 1,812-CF is provided so the project meets the minimum RRv requirement. Therefore, the project should not have a significant adverse impact on the quality of the receiving waters.

**Table 3: Summary of WQ Practices**

| SWM Practice Number | SWM Practice Type | NYSDEC Design Variant | Tributary Drainage Area (acres) | Tributary Impervious Area (acres) | WQv Required (CF) | Provided RRv (CF) | Provided WQv (CF) |
|---|---|---|---|---|---|---|---|
| 1 | Infiltration | I-4 | 4.0 | 0.24* | 1,812 | 1,812 | 18,954 |

* The Imperious Area was calculated using the Stormwater Management Design Manual Chapter 9 Redevelopment criteria.

## 3.3 Stormwater Quantity Analysis

This report presents the pre-development and post-development features and conditions associated with the rate of surface water runoff within the study area. For both cases, the drainage patterns, drainage structures, soil types, and ground cover types are considered in this study.

### *3.3.1 NYSDEC Requirements*

The NYS Stormwater Management Design Manual requires that projects meet three separate stormwater quantity criteria:

1. The Channel Protection (CPv) requirement is designed to protect stream channels from erosion. This is accomplished by providing 24 hours of extended detention for the 1-year, 24-hour storm event. The Design Manual defines the CPv detention time as the center of mass detention time through each stormwater management practice.
2. The Overbank Flood Control (Qp) requirement is designed to prevent an increase in the frequency and magnitude of flow events that exceed the bank-full capacity of a channel, and therefore must spill over into the floodplain. This is accomplished by providing detention storage to ensure that, at each design point, the post-development 10-year 24-hour peak discharge rate does not exceed the corresponding pre-development rate.
3. The Extreme Flood Control (Qf) requirement is designed to prevent the increased risk of flood damage from large storm events, to maintain the boundaries of the pre-development 100-year floodplain, and to protect the physical integrity of stormwater management practices. This is accomplished by providing detention storage to ensure that, at each design point, the post-development 100-year 24-hour peak discharge rate does not exceed the corresponding pre-development rate.

When redevelopment criteria is used to design the project, NYSDEC waives the requirements for the Channel Protection, Overbank Flood Control and Extreme Flood Control if the overall

runoff volume leaving the site is equal to or less than existing conditions.

### *3.3.2 Methodology*

In order to demonstrate that detention storage requirements are being met, the NYS Stormwater Management Design Manual requires that a hydrologic and hydraulic analysis of the pre- and post-development conditions be performed using the Natural Resources Conservation Service Technical Release 20 (TR-20) and Technical Release 55 (TR-55) methodologies. HydroCAD, developed by HydroCAD Software Solutions LLC of Tamworth, New Hampshire, is a Computer-Aided-Design (CAD) program for analyzing the hydrologic and hydraulic characteristics of a given watershed and associated stormwater management facilities. HydroCAD uses the TR-20 algorithms and TR-55 methods to create and route runoff hydrographs.

HydroCAD has the capability of computing hydrographs (which represent discharge rates characteristic of specified watershed conditions, precipitation, and geologic factors) combining hydrographs and routing flows though pipes, streams and ponds. HydroCAD can also calculate the center of mass detention time for various hydraulic features. Documentation for HydroCAD can be found on their website: http://www.hydrocad.net/.

For this analysis, the watershed and drainage system was broken down into a network consisting of three types of components as described below:

A. Subcatchment: A relatively homogeneous area of land, which produces a volume and rate of runoff unique to that area.
B. Reach: Uniform streams, channels, or pipes that convey stormwater from one point to another.
C. Pond: Natural or man-made impoundment, which temporarily stores stormwater runoff and empties in a manner determined by its geometry and the hydraulic structure located at its outlets.

Subcatchments, reaches, and ponds are represented by hexagons, squares, and triangles respectively, on the watershed routing diagrams provided with the computations included in Appendix B and Appendix C.

The analysis of hydrologic and hydraulic conditions and proposed stormwater management facilities, servicing the study area, was performed by dividing the tributary watershed into relatively homogeneous subcatchments. The separation of the watershed into subcatchments was dictated by watershed conditions, methods of collection, conveyance, and points of discharge. Watershed characteristics for each subcatchment were then assessed from United States Geological Service (USGS) 7.5-minute topographic maps, aerial photographs, a topographical survey, soil surveys, site investigations, and land use maps.

Proposed stormwater management facilities were designed and evaluated in accordance with the NYS Stormwater Management Design Manual and local regulatory requirements. The hydrologic and hydraulic analysis considered the SCS, Type II 24-hour storm events identified in Table 5.

**Table 4: Design Events**

| Facility | 24-hour Storm Event |
|---|---|
| Stormwater Management Systems | 1-year |
| | 10-year |
| | 100-year |
| Flood Conditions | 100-year |

### *3.3.3 Pre-development Watershed Conditions*

The pre-development project site contains an existing convenience store and gas stations and the majority of the site cover is asphalt pavement. The roads that border the project site act as high points with the project site sitting in a depression where no runoff is leaving the site. Analysis of pre-development conditions considered existing drainage patterns, soil types, ground cover, and topography.

The contributing pre-development watershed area was split into one subcatchment, labeled EX-1. The Pre-Development Watershed Delineation Map has been provided in Appendix A as Figure 3a. A summary of each subcatchment is as follows:

Subcatchment EX-1 watershed consists of the entire project site that includes the existing convenience store and fueling canopies. This area is primarily covered with asphalt pavement and nonporous, highly compacted gravel and ashphalt. Runoff generally sheet flows from the northwest edge of the property to a shallow depression on the eastern corner of the property and infiltrated into multiple dry wells on site.

The results of the computer modeling used to analyze the overall watersheds under pre-development conditions are presented in Appendix B. A summary of the pre-development watershed runoff rates for each subcatchment is presented in Table 6.

### *3.3.4 Post-development Watershed Conditions*

The analysis of post-development conditions considered existing drainage patterns, soil types, ground cover to remain, planned site development, site grading and, stormwater management facilities proposed as part of site improvements. The contributing post-

development watershed was also split into five (5) total subcatchments to analyze the proposed storm sewer system. Existing drainage patterns are mostly unchanged and the post-development project retains all stormwater onsite for infiltration as exists in the pre-developed condition. Overall, the post-development project meets the required WQv criteria through the use of an underground infiltration chamber system. The Post-Development Watershed Delineation Map has been provided in Appendix A as Figure 4. A summary of each subcatchment is as follows:

Subcatchment Sub-1 includes the southern portion of the site between the proposed building and the proposed western driveway entrance from Route 9. Runoff will generally sheet flow to the south and west to a closed drainage system that will discharge into the underground infiltration system. Runoff will pass through hydrodynamic separator DD-1, which will provide 100% pretreatment of the WQv before it enters the underground chamber system and infiltrates into the ground. The minimum time of concentration of 6 min was used to design for the worst-case, peak runoff potential of the site and size an internal overflow for the hydrodynamic separator for storm events greater than the WQv.

Subcatchment Sub-2 includes the western portion of the site between the proposed building and the northwest property line. Runoff will generally sheet flow to the south and west to a closed drainage system that will discharge into the underground infiltration system. Runoff will pass through hydrodynamic separator DD-2, which will provide 100% pretreatment of the WQv before it enters the underground chamber system and infiltrates into the ground. The minimum time of concentration of 6 min was used to design for the worst-case, peak runoff potential of the site and size an internal overflow for the hydrodynamic separator for storm events greater than the WQv.

Subcatchment Sub-3 includes the northern portion of the site between the proposed building and the northwest property line. Runoff will generally sheet flow to the north and east to a closed drainage system that will discharge into the underground infiltration system. Runoff will pass through hydrodynamic separator DD-2, which will provide 100% pretreatment of the WQv before it enters the underground chamber system and infiltrates into the ground. The minimum time of concentration of 6 min was used to design for the worst-case, peak runoff potential of the site and size an internal overflow for the hydrodynamic separator for storm events greater than the WQv.

Subcatchment Sub-4 includes the eastern portion of the site between the proposed building and the proposed eastern driveway entrance from Route 9. Runoff will generally sheet flow to the north and east to a closed drainage system that will discharge into the underground infiltration system. Runoff will pass through hydrodynamic separator DD-1, which will provide 100% pretreatment of the WQv before it enters the underground chamber system and infiltrates into the ground. The minimum time of concentration of 6 min was used to design

for the worst-case, peak runoff potential of the site and size an internal overflow for the hydrodynamic separator for storm events greater than the WQv.

The results of the computer modeling used to analyze the overall watershed under post-development conditions are presented in Appendix C. A summary of the post-development watershed runoff rates at each design point is presented in Table 6.

### *3.3.5 Performance Summary*

A comparison of the pre- and post-development watershed conditions was performed for all subcatchments and storm events evaluated herein. This comparison demonstrates that the peak rate of runoff will not be increased and pre-development rates will be maintained. Therefore, the project will not have a significant adverse impact on the adjacent or downstream properties or receiving water courses.

The results of the computer modeling used to analyze the pre-development and post-development watersheds are presented in Appendix B and Appendix C, respectively. Table 6 summarizes the results of this analysis.

**Table 5: Summary of Pre- and Post-Development Peak Discharge Rates**

| Pre- vs. Post-Development Discharge Rate (cfs) | | | | | | |
|---|---|---|---|---|---|---|
| **Subcatchments (SC)** | **1-year 24-hour storm event** | | **10-year 24-hour storm event** | | **100-year 24-hour storm event** | |
| | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals: | 0 | 0 | 0 | 0 | 0 | 0 |

# 4.0 CONCLUSIONS

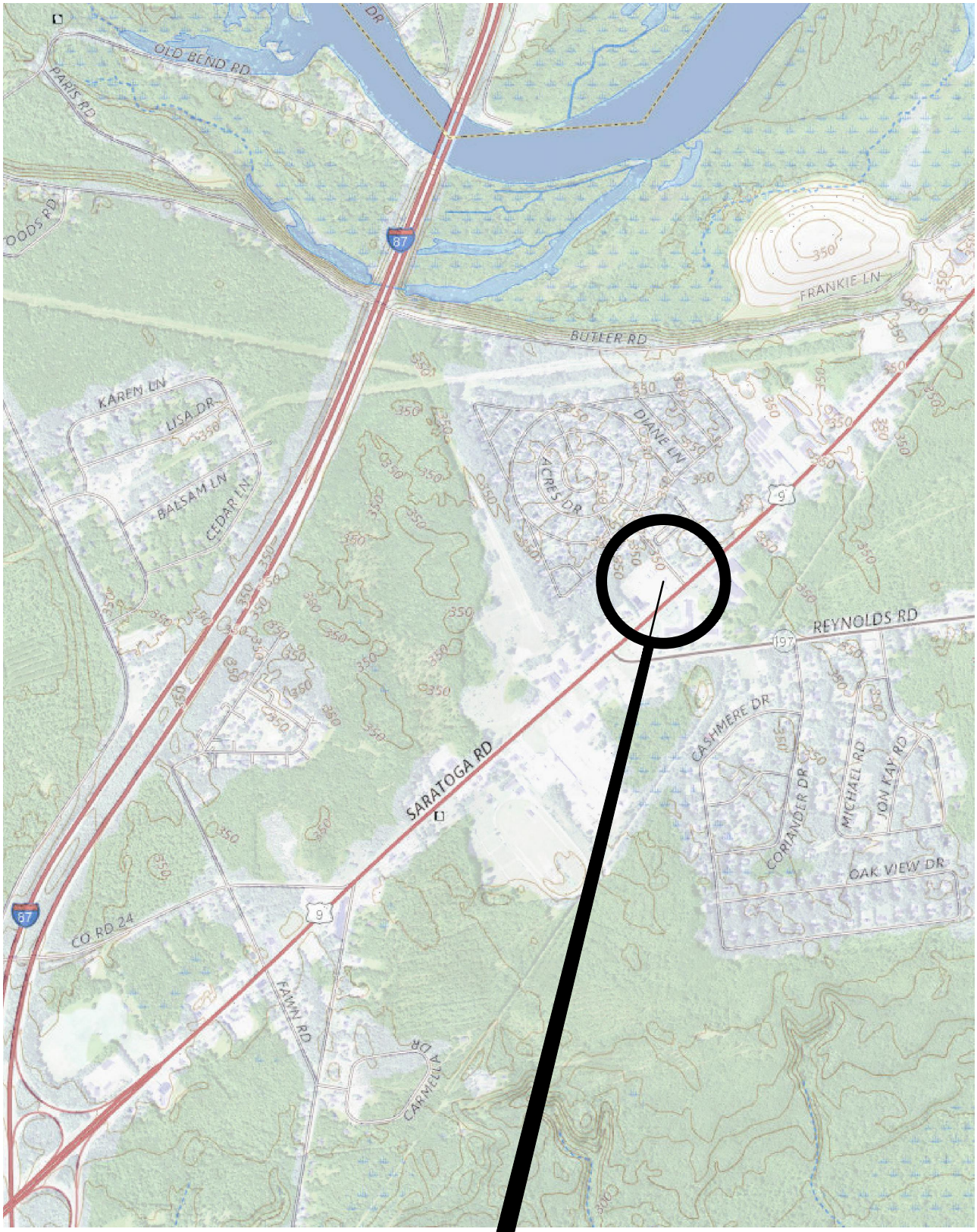
To meet stormwater discharge requirements of the Town of Moreau and DEC, a pre- and post-development drainage analysis was performed for the proposed development project. Pre- and post-development surface runoff rates have been evaluated for the 1-, 10-, and 100-year 24-hour storm events. The pre-development drainage analysis revealed that no stormwater runoff leaves the site but instead infiltrates into the ground onsite. In the post-development condition, drainage patterns will stay the same and runoff will remain onsite to infiltrate. However, since the project disturbs more than an acre, stormwater quality treatment is required. Since the proposed infiltration system will store the 100-year storm event, and

stormwater discharge by infiltration is proposed, treatment volume requirements from the proposed impervious area will be exceeded.

The pre- and post-development drainage analysis showed there is no discharge from the project site to Waters of the United States or to a municipal separate storm sewer system that discharges to Waters of the United States, therefore a New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity" General Permit Number GP-0-20-001 is not required. It is our opinion that the proposed development will not adversely impact adjacent or downstream properties if the stormwater management facilities are properly constructed and maintained in accordance with the requirements outlined herein.

# APPENDIX A:

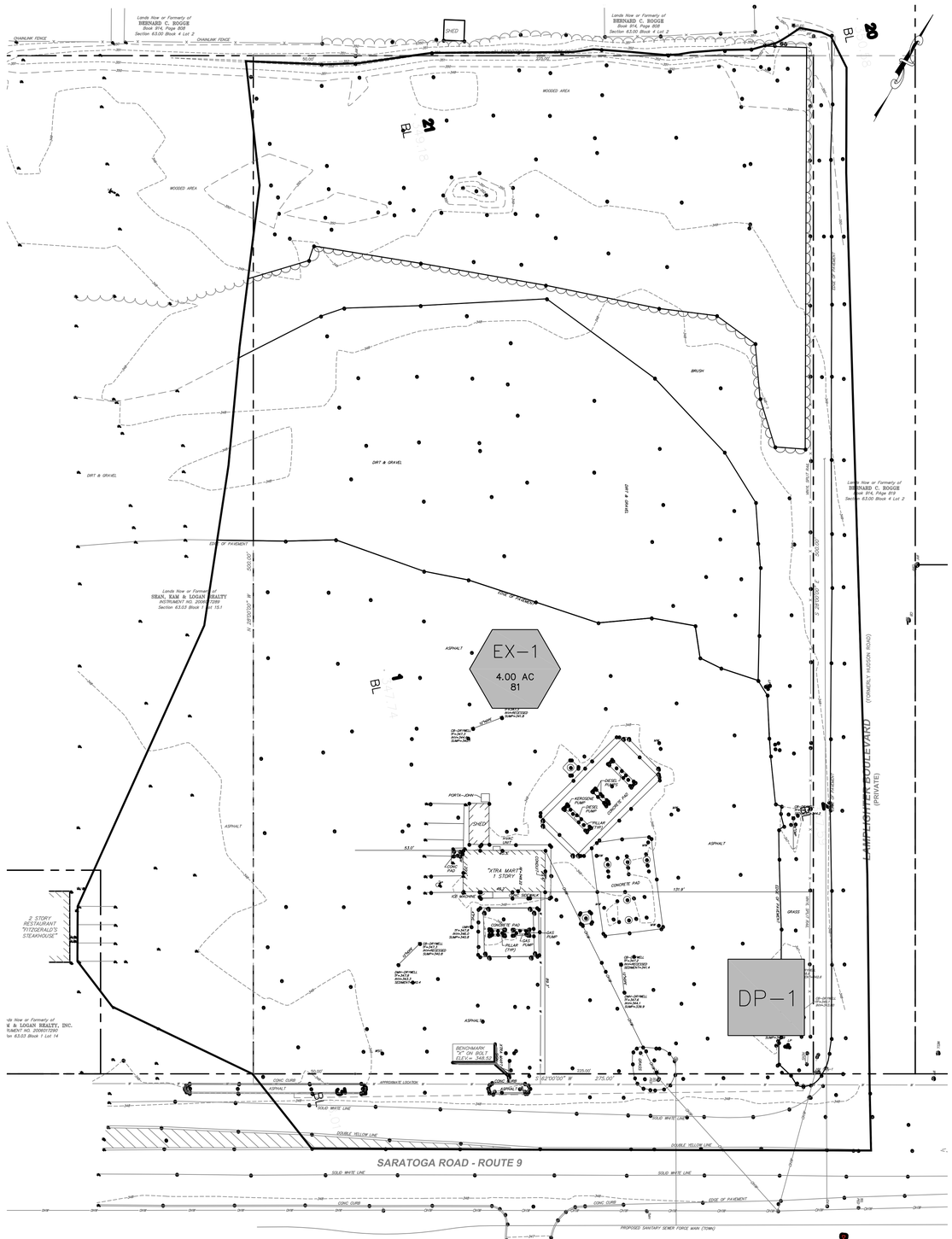
Figures




**PROJECT LOCATION**

| | |
|---|---|
| **GPI**<br>GREENMAN-PEDERSEN, INC.<br>CONSULTING ENGINEERS<br>80 WOLF ROAD, SUITE 300<br>ALBANY, NY 12205 | **PROPOSED ALLTOWN FRESH RETAIL MARKET**<br>**1401 SARATOGA ROAD (U.S. ROUTE 9)**<br>**TOWN OF MOREAU, SARATOGA COUNTY, NY**<br>**LOCATION MAP** |

| JOB NO. | SCALE: | DATE: | FIGURE NO. |
|---|---|---|---|
| ALB2021057.00 | NO SCALE | 09/01/2021 | 1 |




**STORMWATER LEGEND:**

- FLOW PATH
- WATERSHED BOUNDARY
- # / # / # – SUBCATCHMENT – TOTAL DRAINAGE AREA [ACRES] – WEIGHTED RUNOFF CURVE NUMBER
- # – POND
- # – REACH

0 30 60 100

SCALE: 1" = 30'

Dig Safely. New York Call 811 before you dig


GPI Engineering Design Planning Construction Management
518.453.9431 GPINET.COM
Greenman-Pedersen, Inc.
80 Wolf Road, Suite 300
Albany, NY 12205


PREPARED FOR

GLOBAL MONTELLO GROUP
800 SOUTH STREET
SUITE 500
WALTHAM, MA

# PROPOSED ALLTOWN FRESH RETAIL MARKET
## 1401 U.S. ROUTE 9 MOREAU, NEW YORK

PROGRESS PRINT NOT FOR CONSTRUCTION 03 SEPT. 21

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| REVISIONS | | |
|---|---|---|
| NO. | REVISION | DATE |

90% DESIGN DOCUMENTS
SEPTEMBER 7, 2021

| DRAWN/DESIGN BY | CHECKED BY |
|---|---|
| ABJ | JDO |

PRE-DEV WATERSHEDS PLAN (24x36)

GPI PROJECT/CONTRACT NO.: ALB-2021057.00

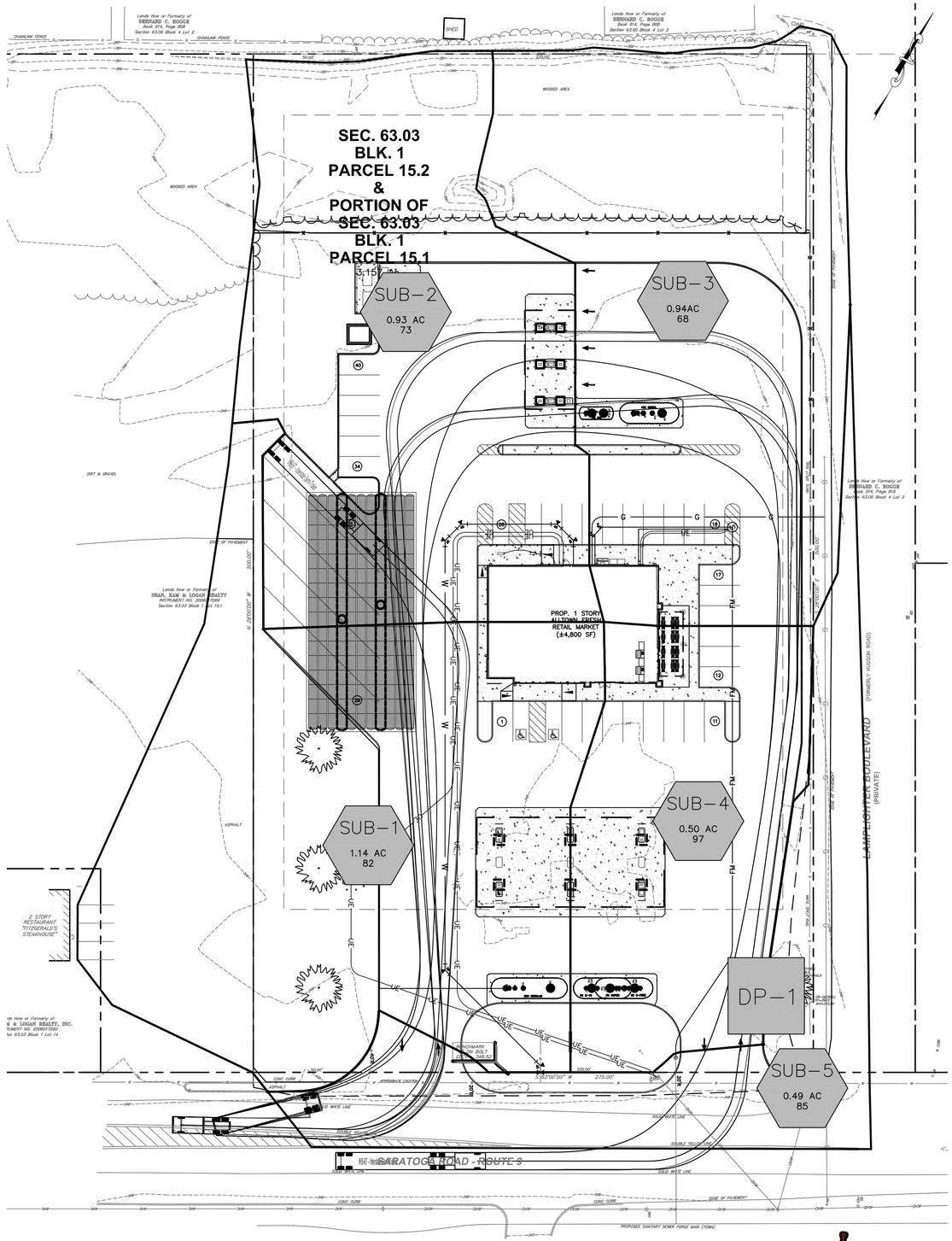
FIG. 3

SHEET X OF 13

Sep 02,2021
E:\2021\2021057.00 Moreau Global Station Rte 9\CADD\Stormwater Maps\Moreau Global Predevelopment Map.dwg
36x24 PLOT SHEET

## STORMWATER LEGEND:

- FLOW PATH
- WATERSHED BOUNDARY
- # / # / # — SUBCATCHMENT; TOTAL DRAINAGE AREA [ACRES]; WEIGHTED RUNOFF CURVE NUMBER
- # — POND
- # — REACH





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GLOBAL MONTELLO GROUP
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SUITE 500
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# PROPOSED ALLTOWN FRESH RETAIL MARKET
## 1401 U.S. ROUTE 9
## MOREAU, NEW YORK

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| REVISIONS | | |
|---|---|---|
| NO. | REVISION | DATE |

90% DESIGN DOCUMENTS
SEPTEMBER 3, 2021

| DRAWN/DESIGN BY | CHECKED BY |
|---|---|
| ABJ | JDO |

POST-DEV
WATERSHEDS
PLAN
(24x36)

GPI PROJECT/CONTRACT NO.:
ALB-2021057.00

FIG. 4

SHEET X OF 13

Dig Safely. New York Call 811 before you dig



Sep 02,2021
E:\2021\2021057.00 Moreau Global Station Rte 9\CADD\Stormwater Maps\Moreau Global Postdevelopment Map.dwg
36x24 PLOT SHEET

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Saratoga County, New York


April 8, 2021

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

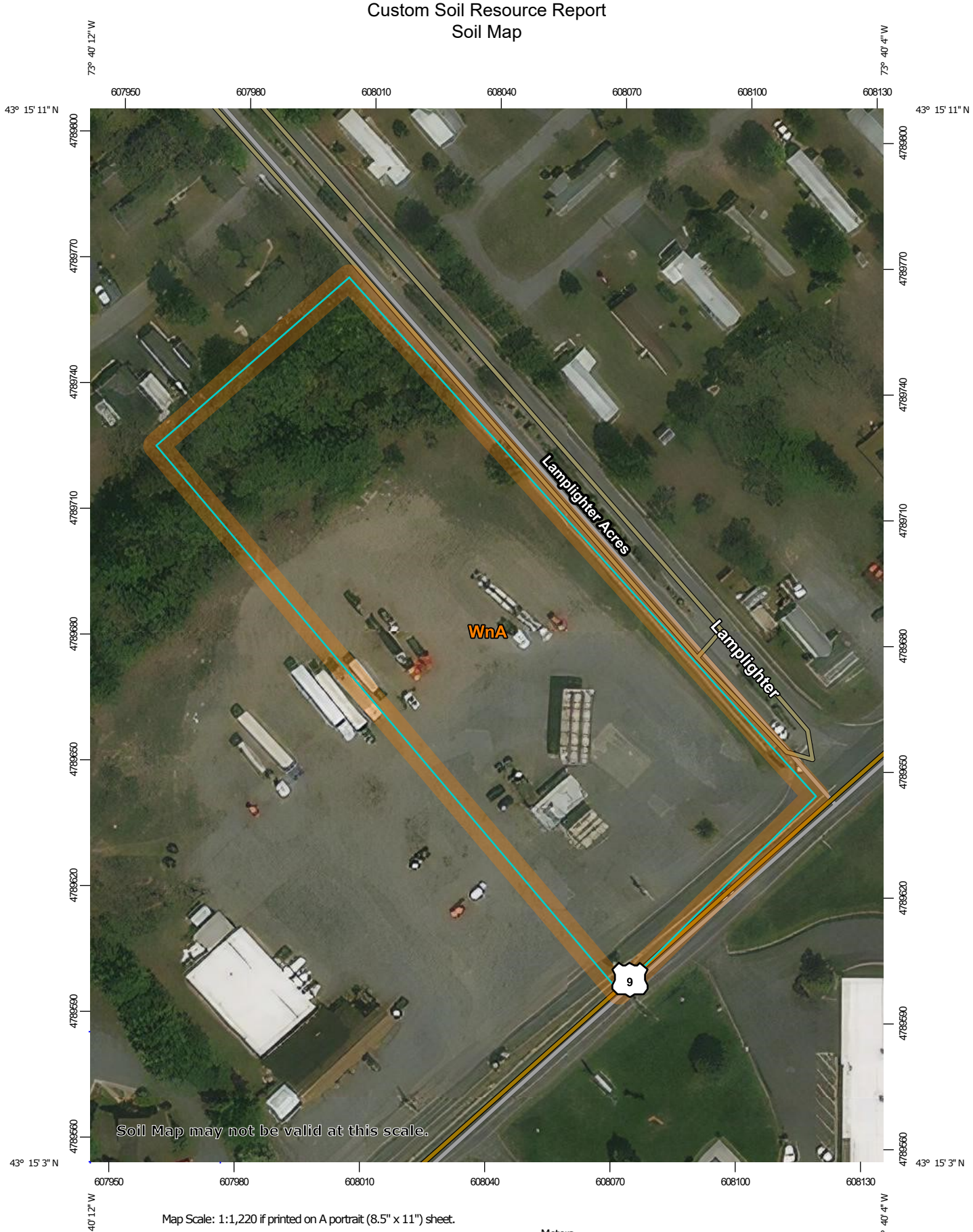
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:1,220 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:24,000.

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: Saratoga County, New York
Survey Area Data: Version 20, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 10, 2015—Mar 29, 2017

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

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| WnA | Windsor loamy sand, 0 to 3 percent slopes | 2.7 | 100.0% |
| **Totals for Area of Interest** | | **2.7** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# Saratoga County, New York

## WnA—Windsor loamy sand, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 2svkg
*Elevation:* 0 to 990 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Windsor, loamy sand, and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Windsor, Loamy Sand

#### Setting

*Landform:* Deltas, outwash terraces, outwash plains, dunes
*Landform position (three-dimensional):* Riser, tread
*Down-slope shape:* Linear, convex
*Across-slope shape:* Linear, convex
*Parent material:* Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

#### Typical profile

*O - 0 to 1 inches:* moderately decomposed plant material
*A - 1 to 3 inches:* loamy sand
*Bw - 3 to 25 inches:* loamy sand
*C - 25 to 65 inches:* sand

#### Properties and qualities

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Excessively drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water capacity:* Low (about 3.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2s
*Hydrologic Soil Group:* A
*Ecological site:* F144AY022MA - Dry Outwash
*Hydric soil rating:* No

### Minor Components

#### Deerfield, loamy sand

*Percent of map unit:* 10 percent
*Landform:* Outwash plains, terraces, deltas
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread, talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

#### Hinckley, loamy sand

*Percent of map unit:* 5 percent
*Landform:* Outwash plains, eskers, kames, deltas
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Nose slope, side slope, crest, head slope, rise
*Down-slope shape:* Convex
*Across-slope shape:* Linear, convex
*Hydric soil rating:* No

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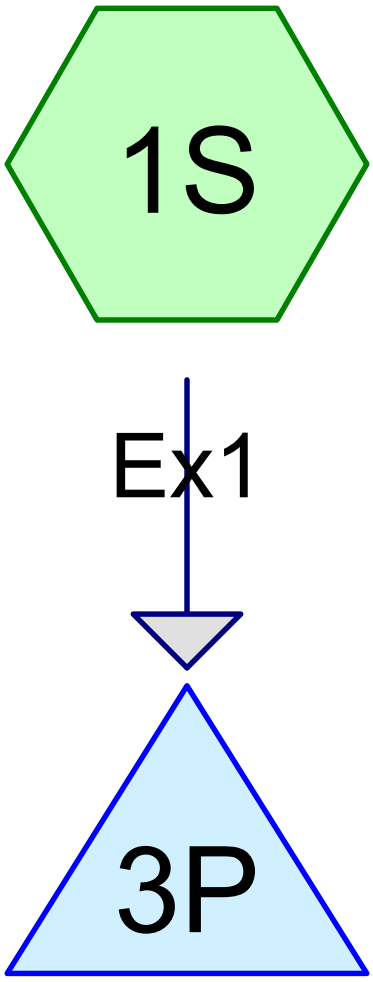
# APPENDIX B:

Pre-Development HydroCAD Report




# Ex Drywells

Subcat Reach Pond Link

**Routing Diagram for Predevelopment Watershed**
Prepared by Greenman-Pedersen, Inc., Printed 9/3/2021

## Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 1-yr | Type II 24-hr | | Default | 24.00 | 1 | 2.23 | 2 |
| 2 | 10-yr | Type II 24-hr | | Default | 24.00 | 1 | 3.71 | 2 |
| 3 | 100-yr | Type II 24-hr | | Default | 24.00 | 1 | 6.22 | 2 |

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

**Subcatchment1S: Ex1** Runoff Area=174,535 sf 52.26% Impervious Runoff Depth>0.75"
Tc=6.0 min CN=81 Runoff=5.23 cfs 0.252 af

**Pond 3P: Ex Drywells** Peak Elev=347.76' Storage=10,960 cf Inflow=5.23 cfs 0.252 af
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 4.007 ac Runoff Volume = 0.252 af Average Runoff Depth = 0.75"**
**47.74% Pervious = 1.913 ac 52.26% Impervious = 2.094 ac**

## Summary for Subcatchment 1S: Ex1

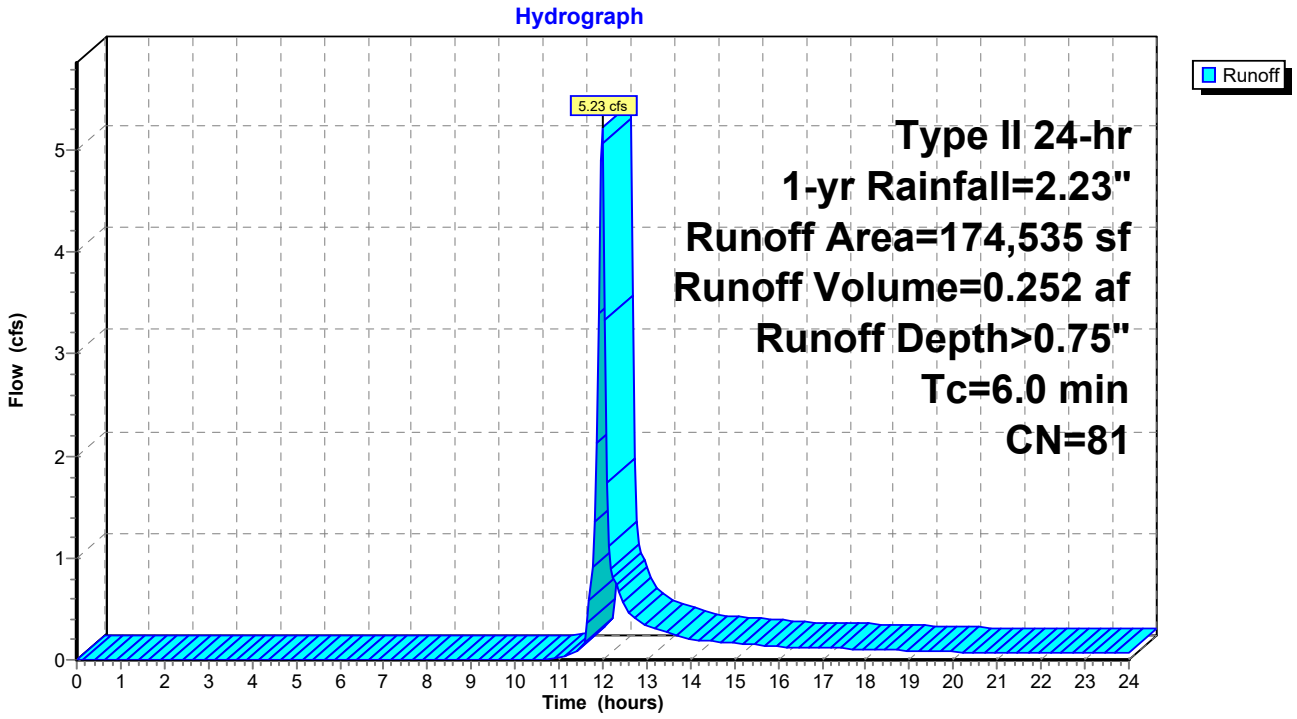
Runoff = 5.23 cfs @ 11.98 hrs, Volume= 0.252 af, Depth> 0.75"
Routed to Pond 3P : Ex Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 91,217 | 98 | Paved parking, HSG A |
| 31,602 | 96 | Gravel surface, HSG A |
| 19,421 | 49 | 50-75% Grass cover, Fair, HSG A |
| 32,295 | 36 | Woods, Fair, HSG A |
| 174,535 | 81 | Weighted Average |
| 83,318 | | 47.74% Pervious Area |
| 91,217 | | 52.26% Impervious Area |

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

### Subcatchment 1S: Ex1



## Summary for Pond 3P: Ex Drywells

Inflow Area = 4.007 ac, 52.26% Impervious, Inflow Depth > 0.75" for 1-yr event
Inflow = 5.23 cfs @ 11.98 hrs, Volume= 0.252 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 347.76' @ 24.00 hrs Surf.Area= 22,775 sf Storage= 10,960 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

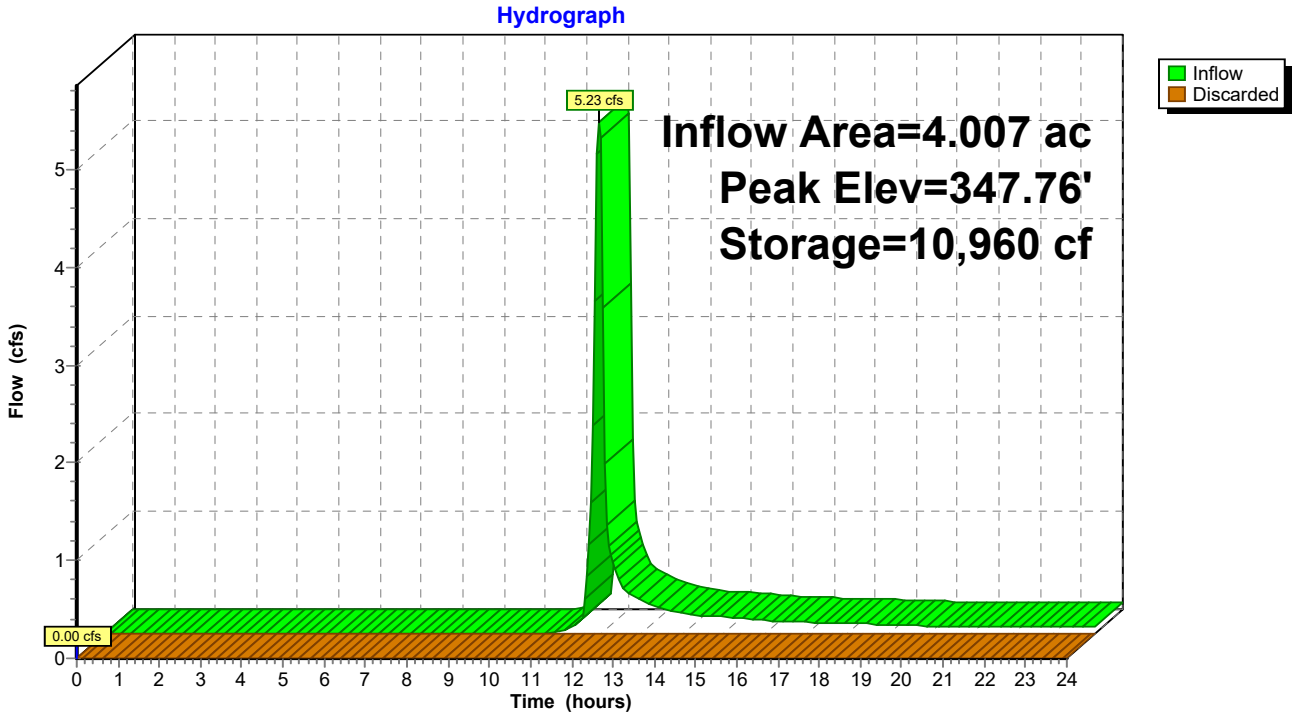
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.80' | 140,425 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.80 | 1,000 | 0 | 0 |
| 347.30 | 1,000 | 5,500 | 5,500 |
| 347.50 | 12,000 | 1,300 | 6,800 |
| 347.75 | 20,000 | 4,000 | 10,800 |
| 348.00 | 113,000 | 16,625 | 27,425 |
| 349.00 | 113,000 | 113,000 | 140,425 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 341.80' | **20.000 in/hr Exfiltration over Surface area from 341.80' - 342.00'** Excluded Surface area = 1,000 sf |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=341.80' (Free Discharge)
**1=Exfiltration** ( Controls 0.00 cfs)

## Pond 3P: Ex Drywells



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

**Subcatchment1S: Ex1** Runoff Area=174,535 sf 52.26% Impervious Runoff Depth>1.88"
Tc=6.0 min CN=81 Runoff=12.96 cfs 0.627 af

**Pond 3P: Ex Drywells** Peak Elev=348.00' Storage=27,300 cf Inflow=12.96 cfs 0.627 af
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 4.007 ac Runoff Volume = 0.627 af Average Runoff Depth = 1.88"**
**47.74% Pervious = 1.913 ac 52.26% Impervious = 2.094 ac**

## Summary for Subcatchment 1S: Ex1

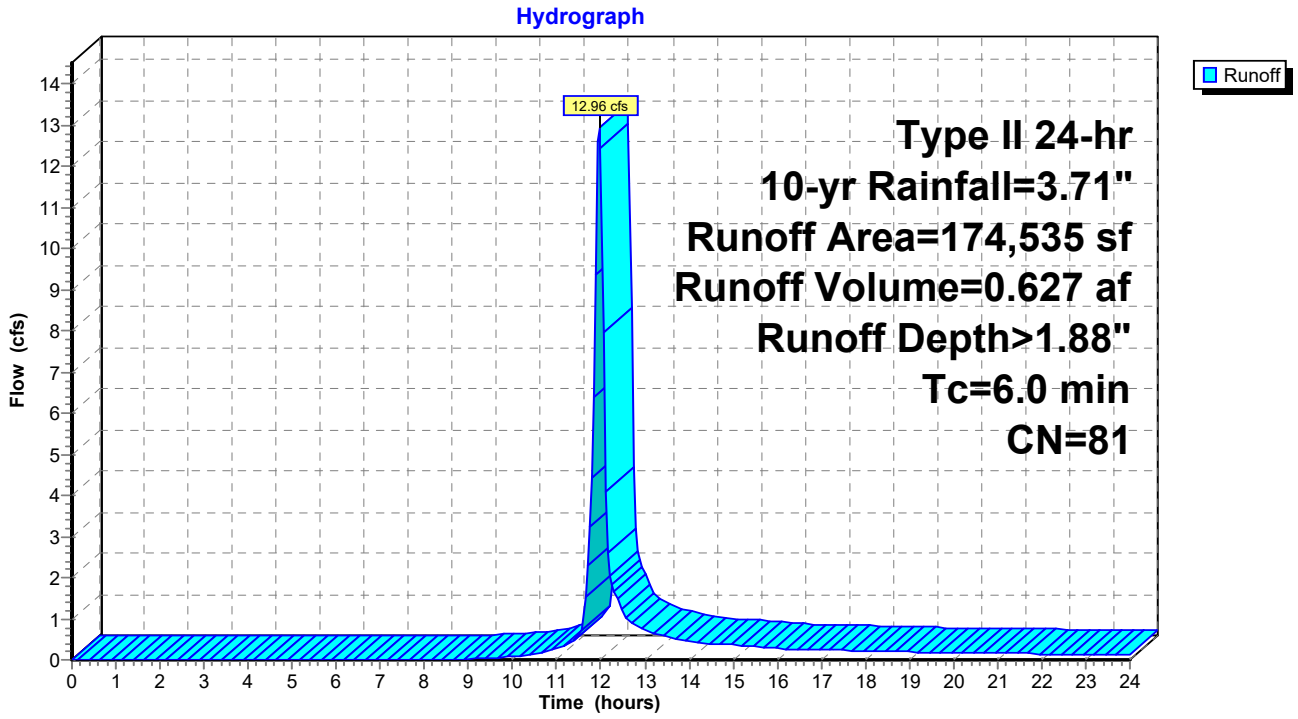
Runoff = 12.96 cfs @ 11.97 hrs, Volume= 0.627 af, Depth> 1.88"
Routed to Pond 3P : Ex Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 91,217 | 98 | Paved parking, HSG A |
| 31,602 | 96 | Gravel surface, HSG A |
| 19,421 | 49 | 50-75% Grass cover, Fair, HSG A |
| 32,295 | 36 | Woods, Fair, HSG A |
| 174,535 | 81 | Weighted Average |
| 83,318 | | 47.74% Pervious Area |
| 91,217 | | 52.26% Impervious Area |

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

### Subcatchment 1S: Ex1



## Summary for Pond 3P: Ex Drywells

Inflow Area = 4.007 ac, 52.26% Impervious, Inflow Depth > 1.88" for 10-yr event
Inflow = 12.96 cfs @ 11.97 hrs, Volume= 0.627 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 348.00' @ 24.00 hrs Surf.Area= 112,587 sf Storage= 27,300 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

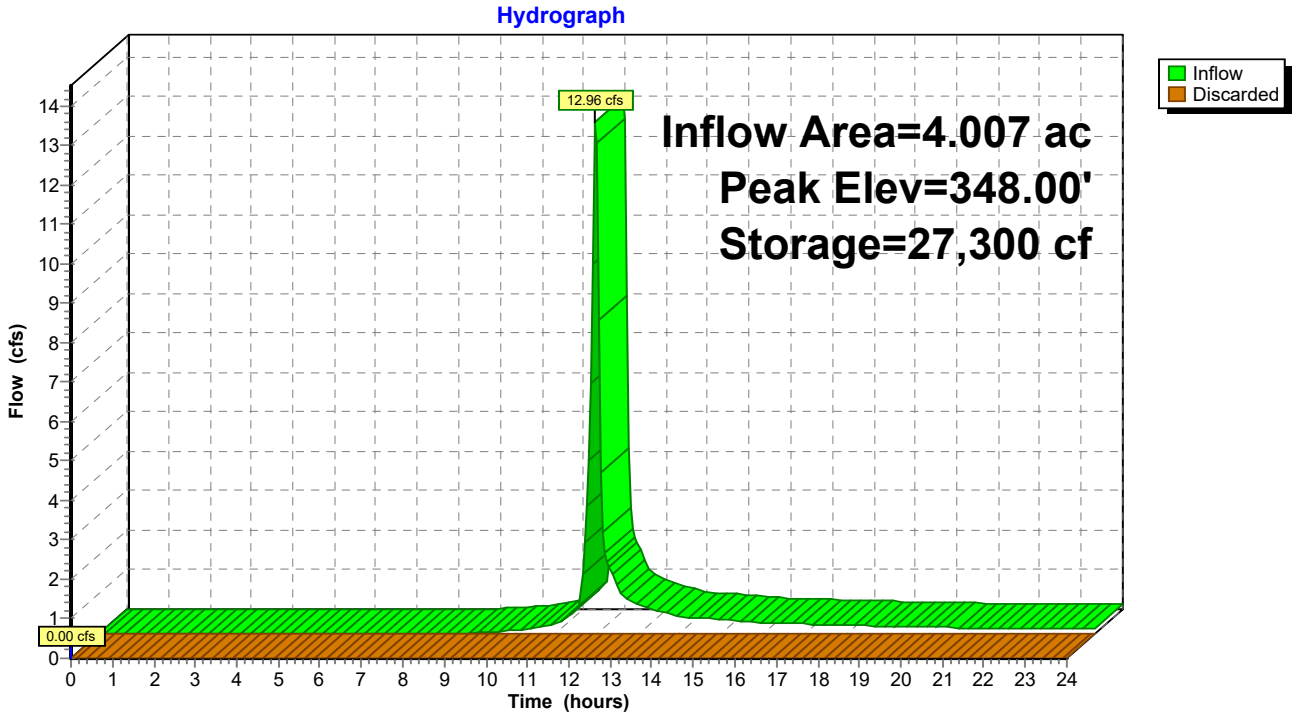
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.80' | 140,425 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.80 | 1,000 | 0 | 0 |
| 347.30 | 1,000 | 5,500 | 5,500 |
| 347.50 | 12,000 | 1,300 | 6,800 |
| 347.75 | 20,000 | 4,000 | 10,800 |
| 348.00 | 113,000 | 16,625 | 27,425 |
| 349.00 | 113,000 | 113,000 | 140,425 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 341.80' | **20.000 in/hr Exfiltration over Surface area from 341.80' - 342.00'** Excluded Surface area = 1,000 sf |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=341.80' (Free Discharge)
**1=Exfiltration** ( Controls 0.00 cfs)

## Pond 3P: Ex Drywells



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

**Subcatchment1S: Ex1** Runoff Area=174,535 sf 52.26% Impervious Runoff Depth>4.08"
Tc=6.0 min CN=81 Runoff=27.47 cfs 1.362 af

**Pond 3P: Ex Drywells** Peak Elev=348.28' Storage=59,326 cf Inflow=27.47 cfs 1.362 af
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 4.007 ac Runoff Volume = 1.362 af Average Runoff Depth = 4.08"**
**47.74% Pervious = 1.913 ac 52.26% Impervious = 2.094 ac**

## Summary for Subcatchment 1S: Ex1

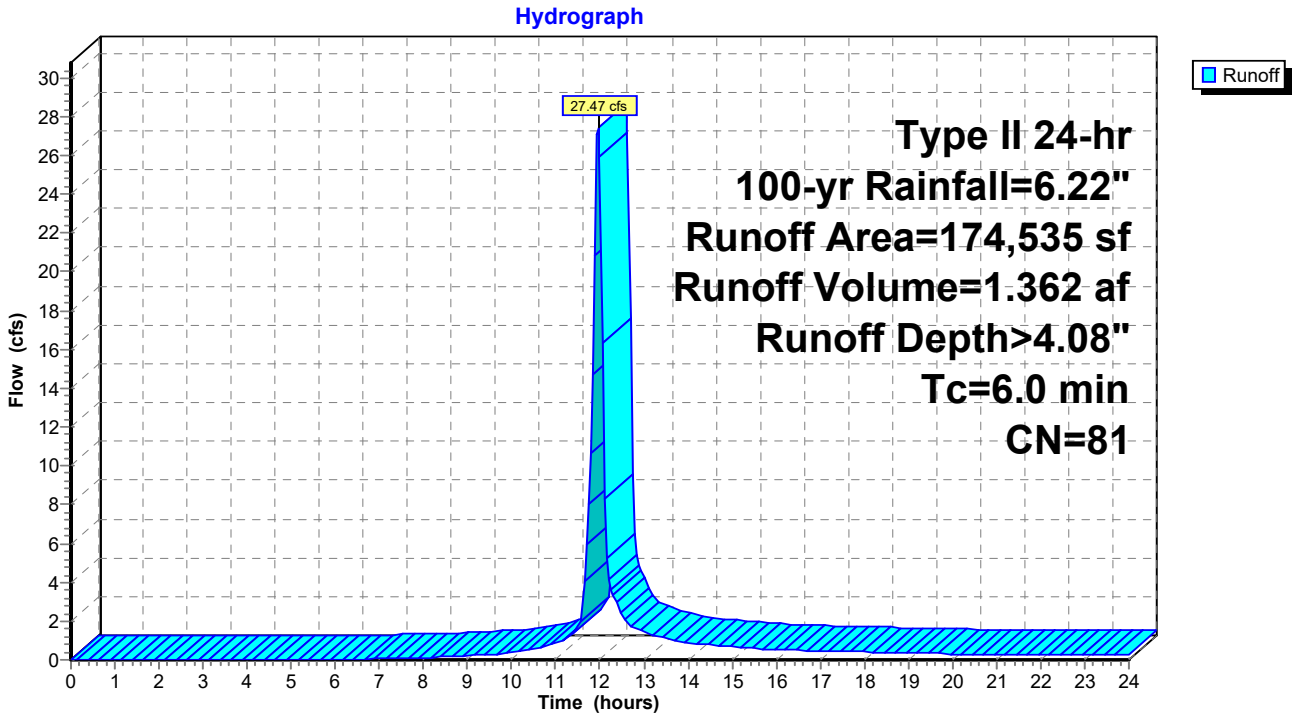
Runoff = 27.47 cfs @ 11.97 hrs, Volume= 1.362 af, Depth> 4.08"
Routed to Pond 3P : Ex Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 91,217 | 98 | Paved parking, HSG A |
| 31,602 | 96 | Gravel surface, HSG A |
| 19,421 | 49 | 50-75% Grass cover, Fair, HSG A |
| 32,295 | 36 | Woods, Fair, HSG A |
| 174,535 | 81 | Weighted Average |
| 83,318 | | 47.74% Pervious Area |
| 91,217 | | 52.26% Impervious Area |

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

## Subcatchment 1S: Ex1



## Summary for Pond 3P: Ex Drywells

Inflow Area = 4.007 ac, 52.26% Impervious, Inflow Depth > 4.08" for 100-yr event
Inflow = 27.47 cfs @ 11.97 hrs, Volume= 1.362 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 348.28' @ 24.00 hrs Surf.Area= 113,000 sf Storage= 59,326 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

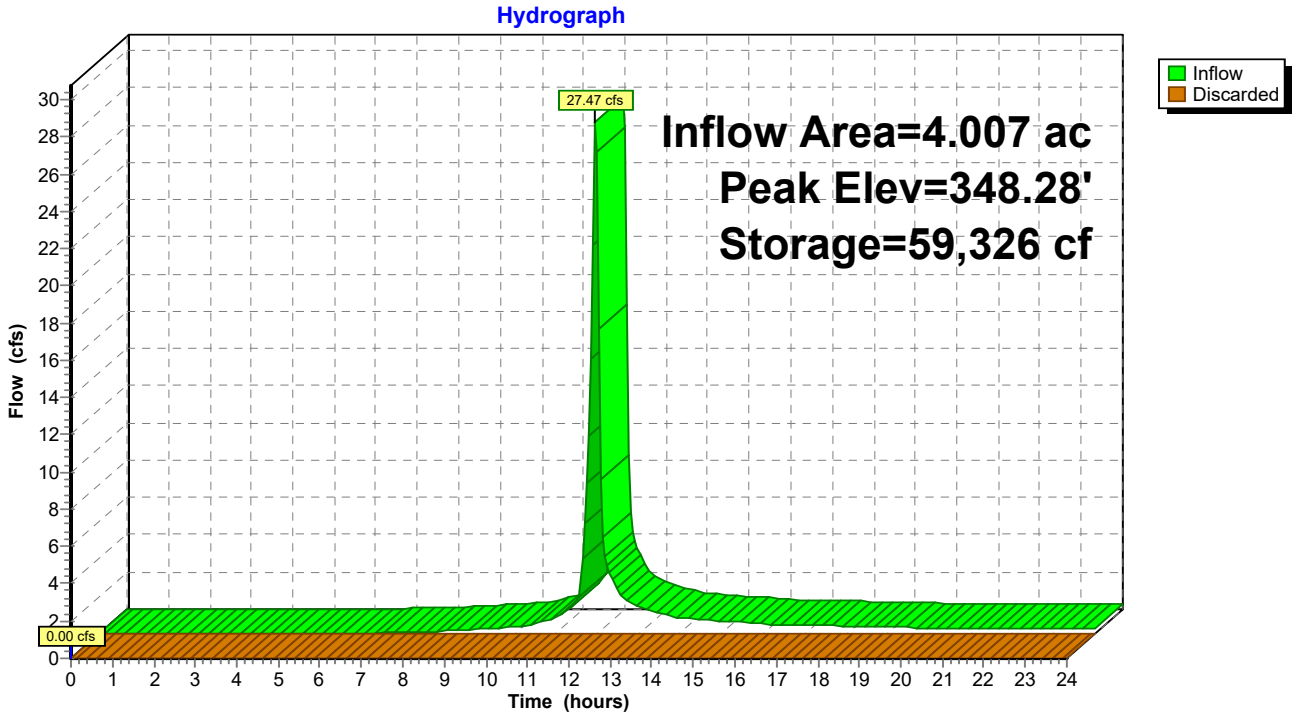
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.80' | 140,425 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.80 | 1,000 | 0 | 0 |
| 347.30 | 1,000 | 5,500 | 5,500 |
| 347.50 | 12,000 | 1,300 | 6,800 |
| 347.75 | 20,000 | 4,000 | 10,800 |
| 348.00 | 113,000 | 16,625 | 27,425 |
| 349.00 | 113,000 | 113,000 | 140,425 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 341.80' | **20.000 in/hr Exfiltration over Surface area from 341.80' - 342.00'** Excluded Surface area = 1,000 sf |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=341.80' (Free Discharge)
**1=Exfiltration** ( Controls 0.00 cfs)

## Pond 3P: Ex Drywells



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7 Node Listing
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11 Node Listing
12 Subcat 1S: Ex1
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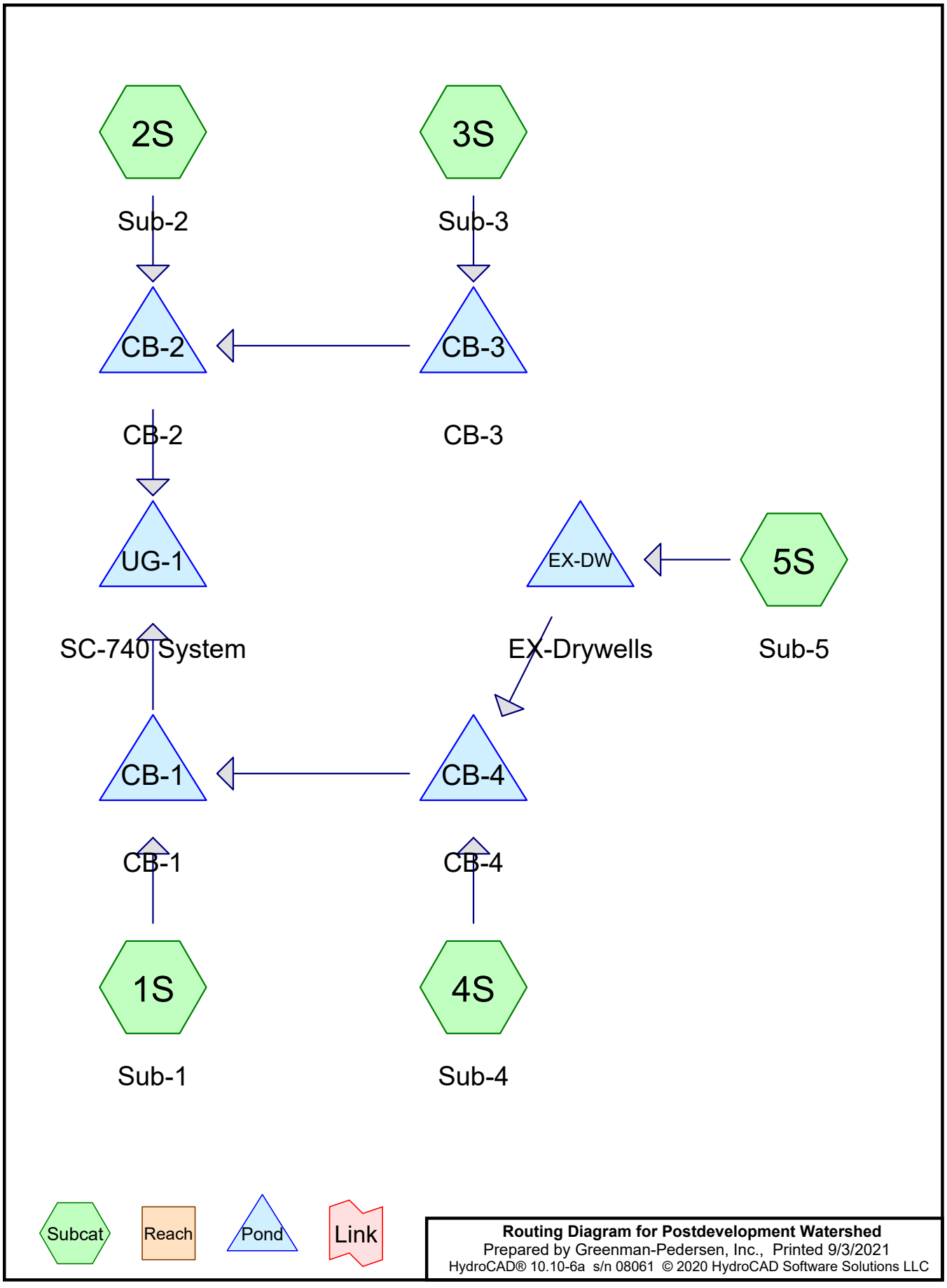
# APPENDIX C:

Post-Development HydroCAD Report




**Routing Diagram for Postdevelopment Watershed**
Prepared by Greenman-Pedersen, Inc., Printed 9/3/2021

## Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 1-yr | Type II 24-hr | | Default | 24.00 | 1 | 2.23 | 2 |
| 2 | 10-yr | Type II 24-hr | | Default | 24.00 | 1 | 3.71 | 2 |
| 3 | 100-yr | Type II 24-hr | | Default | 24.00 | 1 | 6.22 | 2 |

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 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

**Subcatchment1S: Sub-1** Runoff Area=49,730 sf 73.58% Impervious Runoff Depth>0.80"
Tc=6.0 min CN=82 Runoff=1.59 cfs 0.076 af

**Subcatchment2S: Sub-2** Runoff Area=40,658 sf 58.05% Impervious Runoff Depth>0.43"
Tc=6.0 min CN=73 Runoff=0.63 cfs 0.033 af

**Subcatchment3S: Sub-3** Runoff Area=40,869 sf 50.38% Impervious Runoff Depth>0.28"
Tc=6.0 min CN=68 Runoff=0.34 cfs 0.022 af

**Subcatchment4S: Sub-4** Runoff Area=21,872 sf 98.22% Impervious Runoff Depth>1.90"
Tc=6.0 min CN=97 Runoff=1.48 cfs 0.079 af

**Subcatchment5S: Sub-5** Runoff Area=21,406 sf 77.95% Impervious Runoff Depth>0.97"
Tc=6.0 min CN=85 Runoff=0.83 cfs 0.040 af

**Pond CB-1: CB-1** Peak Elev=342.03' Storage=36 cf Inflow=3.05 cfs 0.156 af
18.0" Round Culvert n=0.013 L=10.0' S=-0.1420 '/' Outflow=3.04 cfs 0.155 af

**Pond CB-2: CB-2** Peak Elev=339.64' Storage=7 cf Inflow=0.96 cfs 0.055 af
18.0" Round Culvert n=0.013 L=10.0' S=0.0190 '/' Outflow=0.96 cfs 0.055 af

**Pond CB-3: CB-3** Peak Elev=341.84' Storage=6 cf Inflow=0.34 cfs 0.022 af
18.0" Round Culvert n=0.013 L=225.0' S=0.0010 '/' Outflow=0.34 cfs 0.022 af

**Pond CB-4: CB-4** Peak Elev=342.64' Storage=13 cf Inflow=1.48 cfs 0.079 af
18.0" Round Culvert n=0.013 L=202.1' S=0.0010 '/' Outflow=1.48 cfs 0.079 af

**Pond EX-DW: EX-Drywells** Peak Elev=347.02' Storage=508 cf Inflow=0.83 cfs 0.040 af
Discarded=0.31 cfs 0.040 af Primary=0.00 cfs 0.000 af Outflow=0.31 cfs 0.040 af

**Pond UG-1: SC-740 System** Peak Elev=338.50' Storage=1 cf Inflow=4.00 cfs 0.210 af
Outflow=4.00 cfs 0.210 af

**Total Runoff Area = 4.007 ac Runoff Volume = 0.250 af Average Runoff Depth = 0.75"**
**31.85% Pervious = 1.276 ac 68.15% Impervious = 2.731 ac**

## Summary for Subcatchment 1S: Sub-1

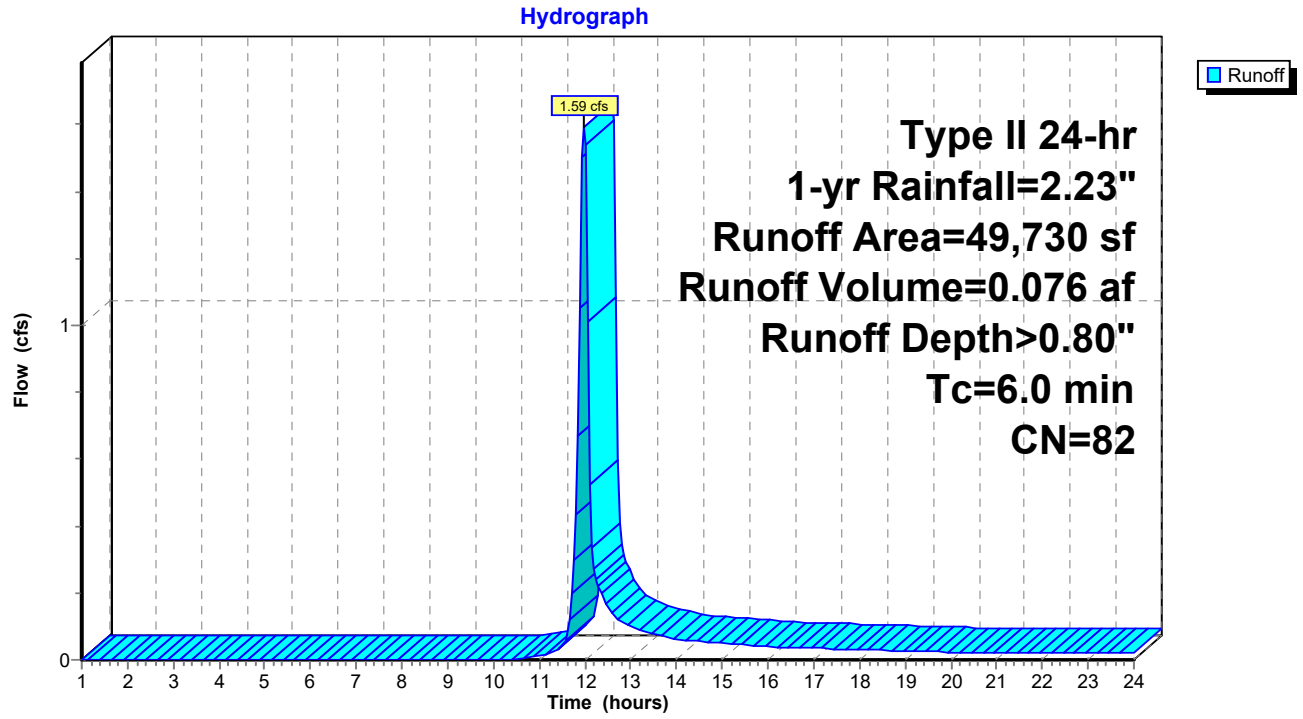
Runoff = 1.59 cfs @ 11.98 hrs, Volume= 0.076 af, Depth> 0.80"
Routed to Pond CB-1 : CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 36,592 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 13,138 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 49,730 | 82 | Weighted Average |
| 13,138 | | 26.42% Pervious Area |
| 36,592 | | 73.58% Impervious Area |

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

## Subcatchment 1S: Sub-1



## Summary for Subcatchment 2S: Sub-2

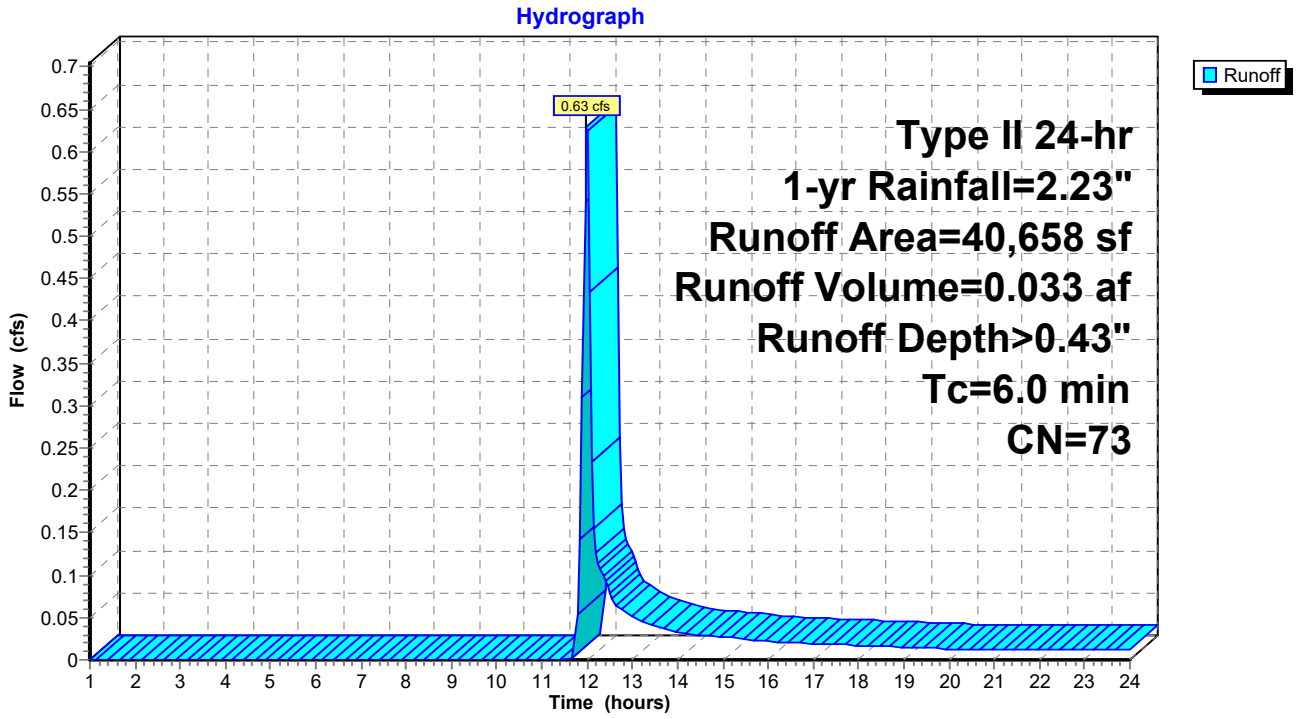
Runoff = 0.63 cfs @ 11.99 hrs, Volume= 0.033 af, Depth> 0.43"
Routed to Pond CB-2 : CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 23,602 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 7,138 | 39 | >75% Grass cover, Good, HSG A |
| 9,918 | 36 | Woods, Fair, HSG A |
| 40,658 | 73 | Weighted Average |
| 17,056 | | 41.95% Pervious Area |
| 23,602 | | 58.05% Impervious Area |

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

## Subcatchment 2S: Sub-2



## Summary for Subcatchment 3S: Sub-3

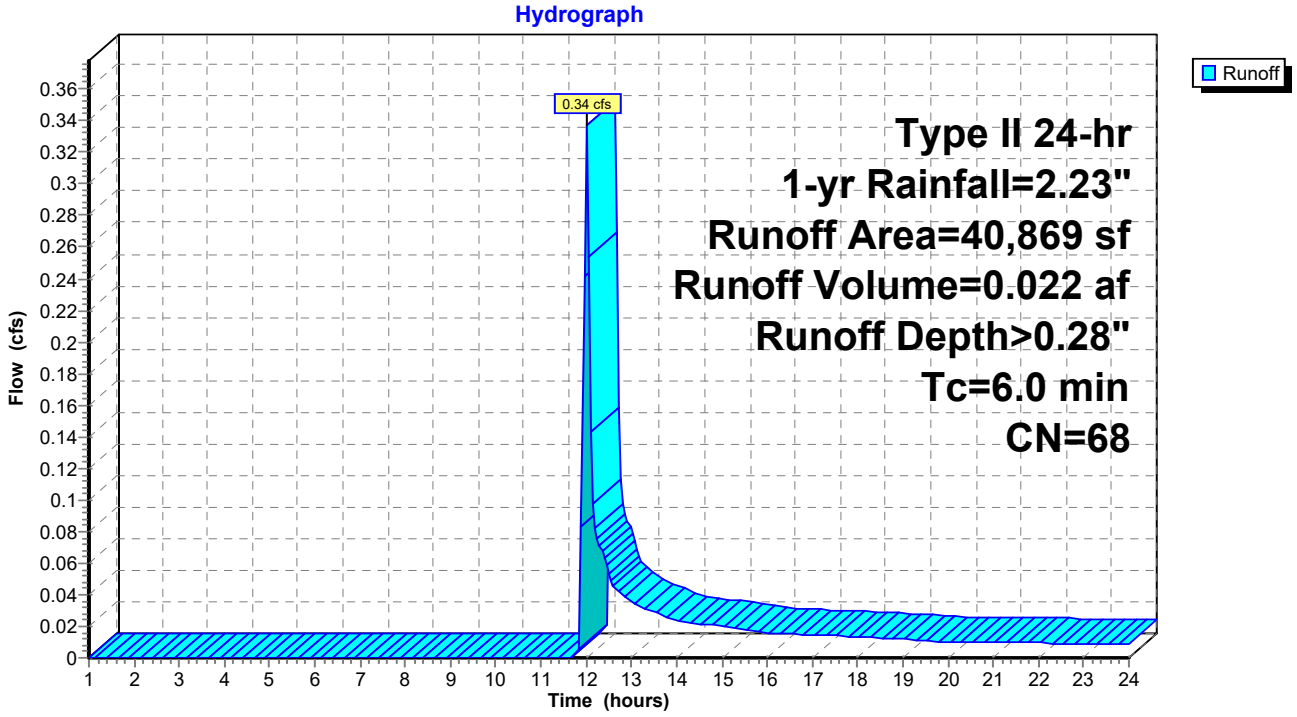
Runoff = 0.34 cfs @ 12.00 hrs, Volume= 0.022 af, Depth> 0.28"
Routed to Pond CB-3 : CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 20,590 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 6,219 | 39 | >75% Grass cover, Good, HSG A |
| 14,060 | 36 | Woods, Fair, HSG A |
| 40,869 | 68 | Weighted Average |
| 20,279 | | 49.62% Pervious Area |
| 20,590 | | 50.38% Impervious Area |

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

## Subcatchment 3S: Sub-3



## Summary for Subcatchment 4S: Sub-4

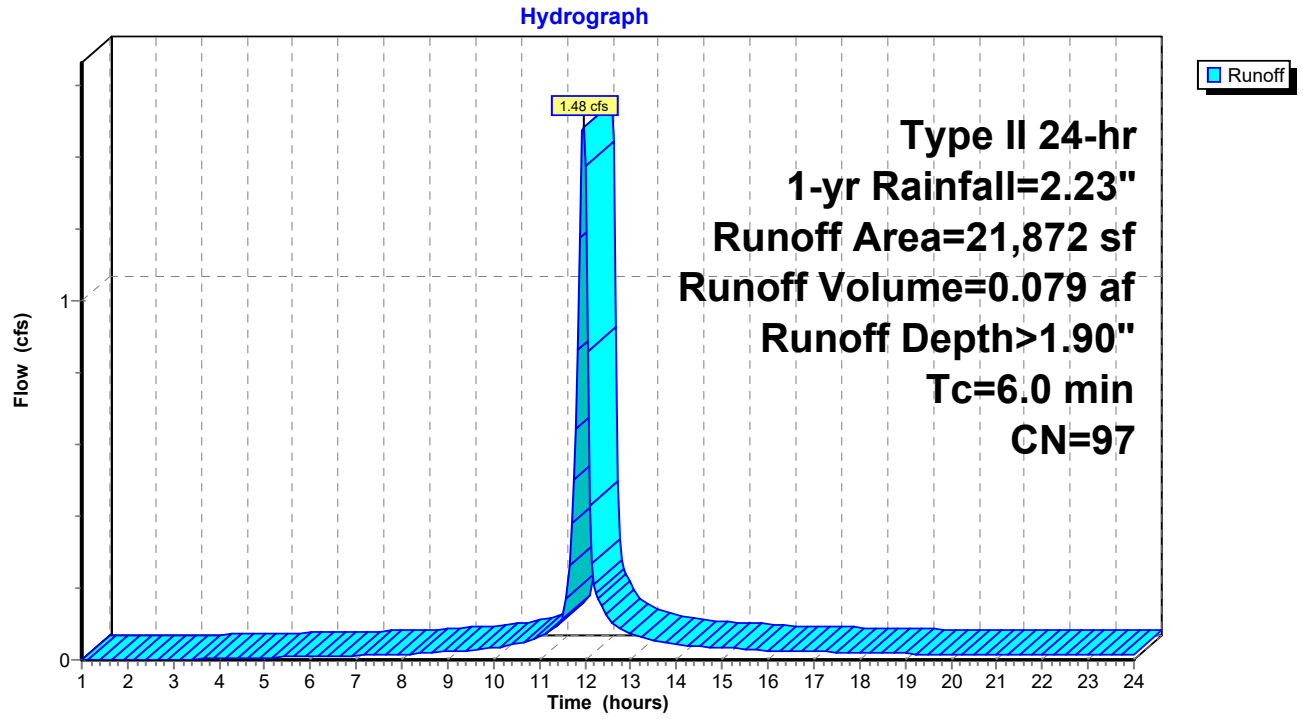
Runoff = 1.48 cfs @ 11.96 hrs, Volume= 0.079 af, Depth> 1.90"
Routed to Pond CB-4 : CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 21,482 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 390 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,872 | 97 | Weighted Average |
| 390 | | 1.78% Pervious Area |
| 21,482 | | 98.22% Impervious Area |

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

## Subcatchment 4S: Sub-4



## Summary for Subcatchment 5S: Sub-5

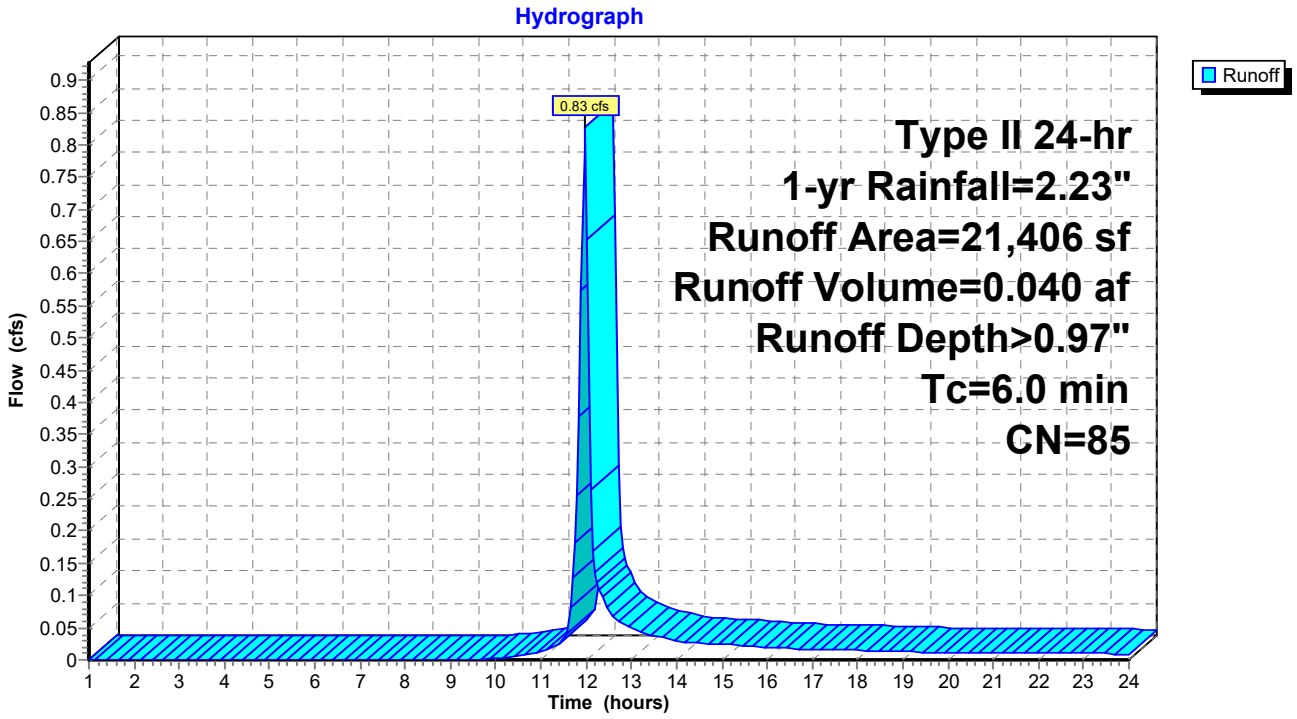
Runoff = 0.83 cfs @ 11.98 hrs, Volume= 0.040 af, Depth> 0.97"
Routed to Pond EX-DW : EX-Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.23"

| Area (sf) | CN | Description |
|---|---|---|
| 16,685 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 4,721 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,406 | 85 | Weighted Average |
| 4,721 | | 22.05% Pervious Area |
| 16,685 | | 77.95% Impervious Area |

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

## Subcatchment 5S: Sub-5



## Summary for Pond CB-1: CB-1

Inflow Area = 2.135 ac, 80.38% Impervious, Inflow Depth > 0.88" for 1-yr event
Inflow = 3.05 cfs @ 11.97 hrs, Volume= 0.156 af
Outflow = 3.04 cfs @ 11.97 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.1 min
Primary = 3.04 cfs @ 11.97 hrs, Volume= 0.155 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 342.03' @ 11.97 hrs Surf.Area= 16 sf Storage= 36 cf

Plug-Flow detention time= 4.2 min calculated for 0.155 af (100% of inflow)
Center-of-Mass det. time= 2.1 min ( 813.1 - 811.0 )

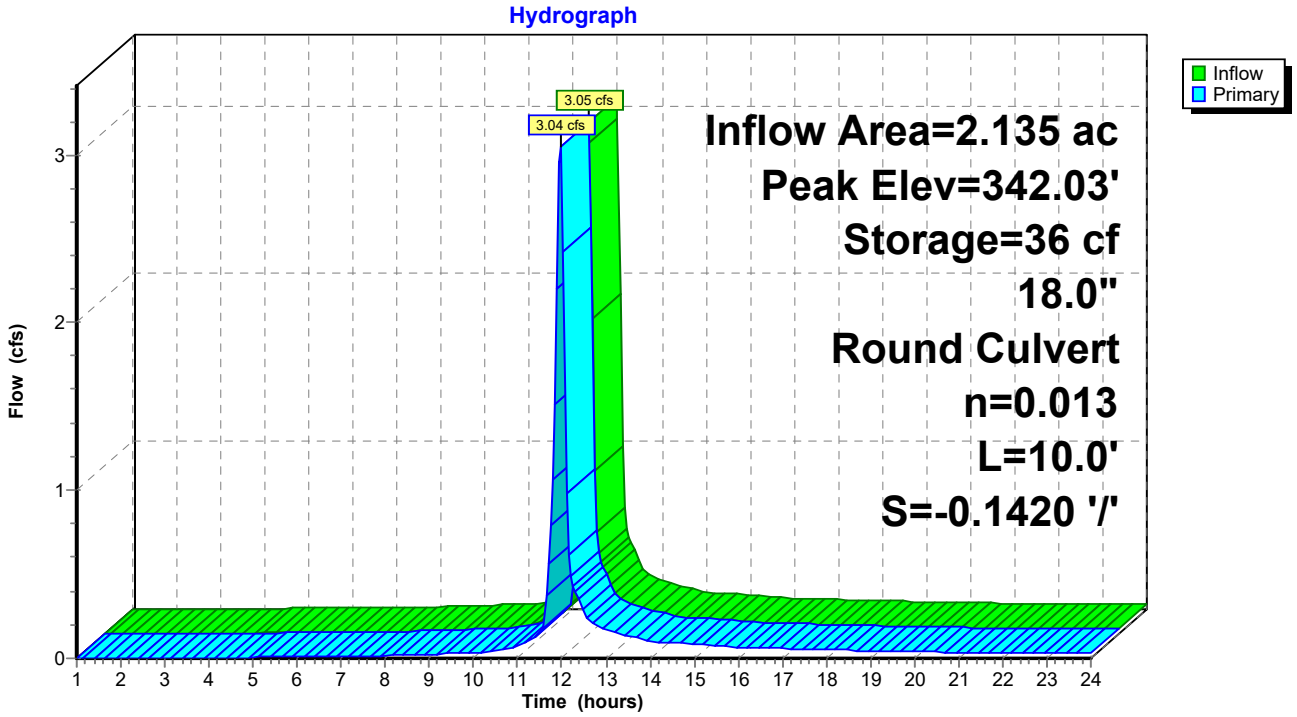
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.79' | 2,812 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.79 | 16 | 0 | 0 |
| 346.59 | 16 | 109 | 109 |
| 347.00 | 1,420 | 294 | 403 |
| 347.50 | 8,215 | 2,409 | 2,812 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.21' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.79' / 341.21' S= -0.1420 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=2.95 cfs @ 11.97 hrs HW=342.01' TW=338.50' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.95 cfs @ 3.05 fps)

## Pond CB-1: CB-1


Hydrograph
Inflow
Primary
3.05 cfs
3.04 cfs
Inflow Area=2.135 ac
Peak Elev=342.03'
Storage=36 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=-0.1420 '/'
Flow (cfs)
Time (hours)
0
1
2
3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond CB-2: CB-2

Inflow Area = 1.872 ac, 54.21% Impervious, Inflow Depth > 0.35" for 1-yr event
Inflow = 0.96 cfs @ 12.00 hrs, Volume= 0.055 af
Outflow = 0.96 cfs @ 12.00 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.1 min
Primary = 0.96 cfs @ 12.00 hrs, Volume= 0.055 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 339.64' @ 12.00 hrs Surf.Area= 16 sf Storage= 7 cf

Plug-Flow detention time= 0.4 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 0.2 min ( 902.5 - 902.3 )

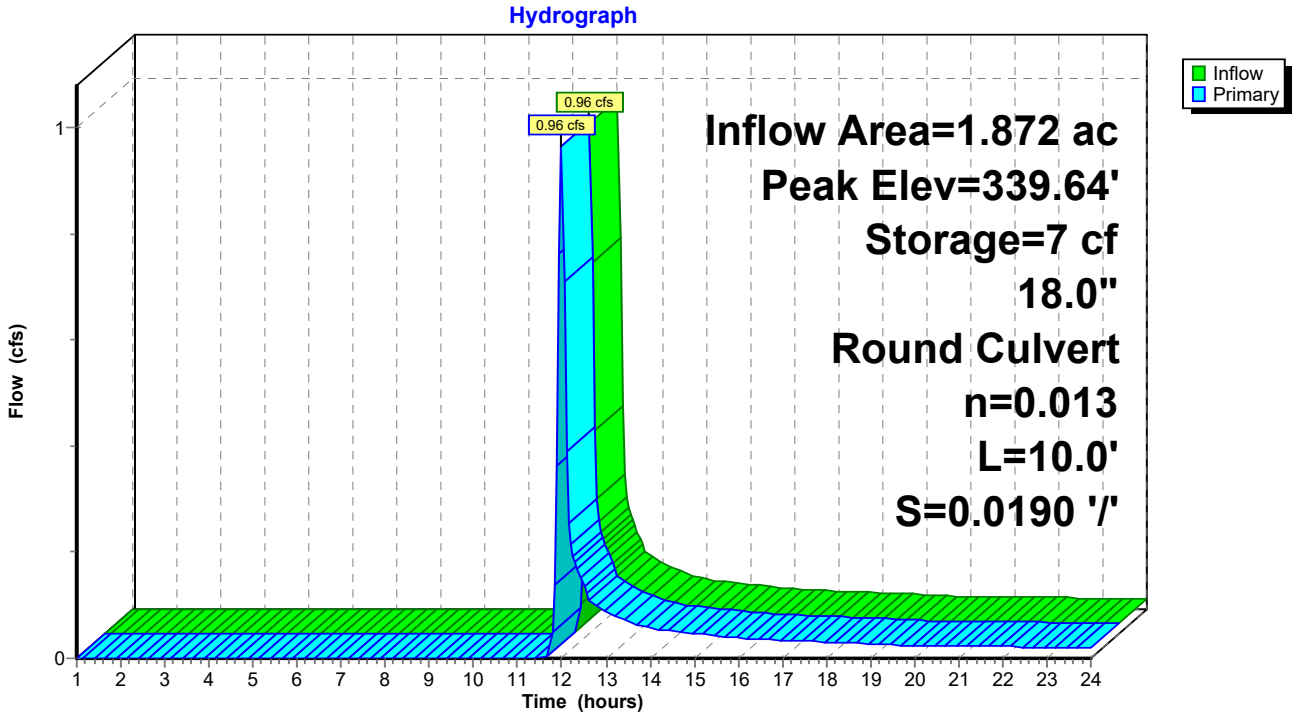
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.19' | 6,502 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.19 | 16 | 0 | 0 |
| 346.22 | 16 | 112 | 112 |
| 346.50 | 661 | 95 | 207 |
| 347.00 | 5,260 | 1,480 | 1,688 |
| 347.50 | 13,998 | 4,815 | 6,502 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 339.19' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.19' / 339.00' S= 0.0190 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=0.95 cfs @ 12.00 hrs HW=339.64' TW=338.50' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.95 cfs @ 3.19 fps)

## Pond CB-2: CB-2


Hydrograph
Inflow
Primary
0.96 cfs
0.96 cfs
Inflow Area=1.872 ac
Peak Elev=339.64'
Storage=7 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=0.0190 '/'
Flow (cfs)
0
1
Time (hours)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond CB-3: CB-3

Inflow Area = 0.938 ac, 50.38% Impervious, Inflow Depth > 0.28" for 1-yr event
Inflow = 0.34 cfs @ 12.00 hrs, Volume= 0.022 af
Outflow = 0.34 cfs @ 12.00 hrs, Volume= 0.022 af, Atten= 1%, Lag= 0.2 min
Primary = 0.34 cfs @ 12.00 hrs, Volume= 0.022 af
Routed to Pond CB-2 : CB-2

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 341.84' @ 12.00 hrs Surf.Area= 16 sf Storage= 6 cf

Plug-Flow detention time= 1.3 min calculated for 0.022 af (100% of inflow)
Center-of-Mass det. time= 0.6 min ( 920.6 - 920.0 )

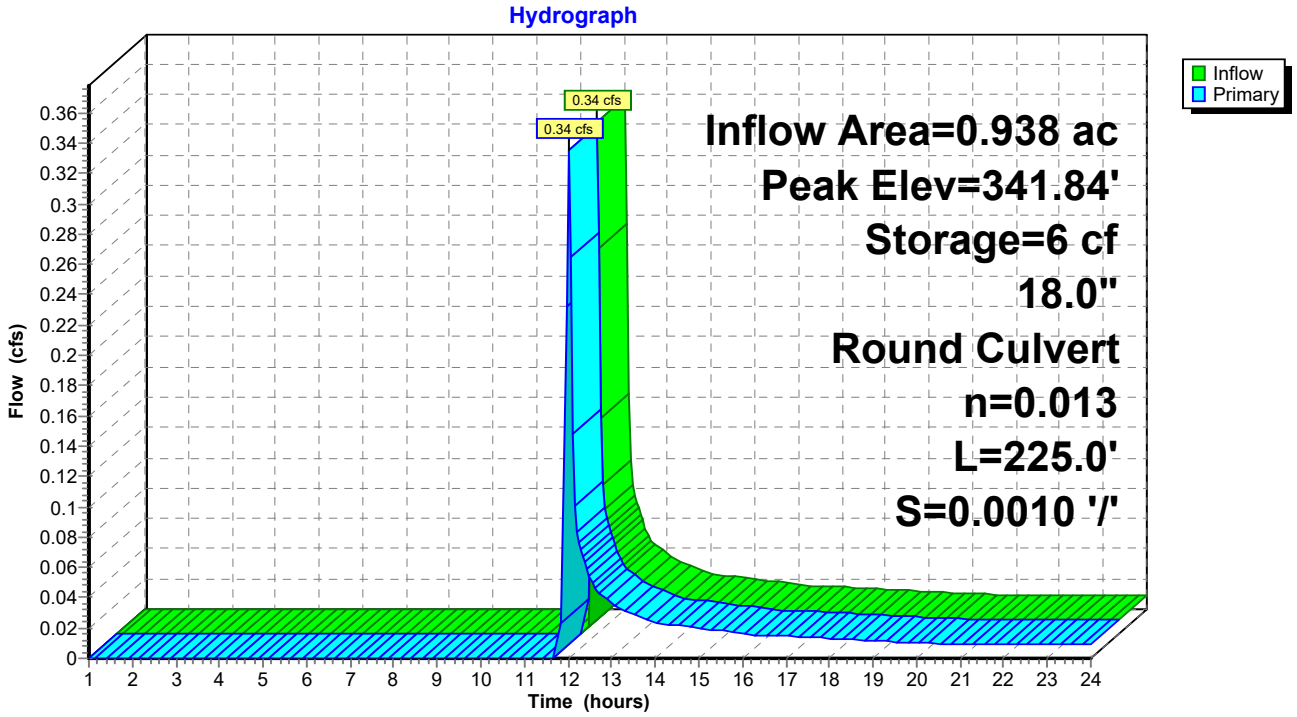
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.44' | 884 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.44 | 16 | 0 | 0 |
| 346.44 | 16 | 80 | 80 |
| 346.50 | 39 | 2 | 82 |
| 347.00 | 3,172 | 803 | 884 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.44' | **18.0" Round Culvert** L= 225.0' Ke= 0.500<br>Inlet / Outlet Invert= 341.44' / 341.21' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=0.33 cfs @ 12.00 hrs HW=341.84' TW=339.64' (Dynamic Tailwater)
**1=Culvert** (Barrel Controls 0.33 cfs @ 1.31 fps)

## Pond CB-3: CB-3


Hydrograph
Inflow
Primary
0.34 cfs
0.34 cfs
Inflow Area=0.938 ac
Peak Elev=341.84'
Storage=6 cf
18.0"
Round Culvert
n=0.013
L=225.0'
S=0.0010 '/'
Flow (cfs)
Time (hours)

## Summary for Pond CB-4: CB-4

Inflow Area = 0.994 ac, 88.19% Impervious, Inflow Depth > 0.96" for 1-yr event
Inflow = 1.48 cfs @ 11.96 hrs, Volume= 0.079 af
Outflow = 1.48 cfs @ 11.96 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.1 min
Primary = 1.48 cfs @ 11.96 hrs, Volume= 0.079 af
Routed to Pond CB-1 : CB-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 342.64' @ 11.97 hrs Surf.Area= 16 sf Storage= 13 cf

Plug-Flow detention time= 0.7 min calculated for 0.079 af (100% of inflow)
Center-of-Mass det. time= 0.5 min ( 772.3 - 771.8 )

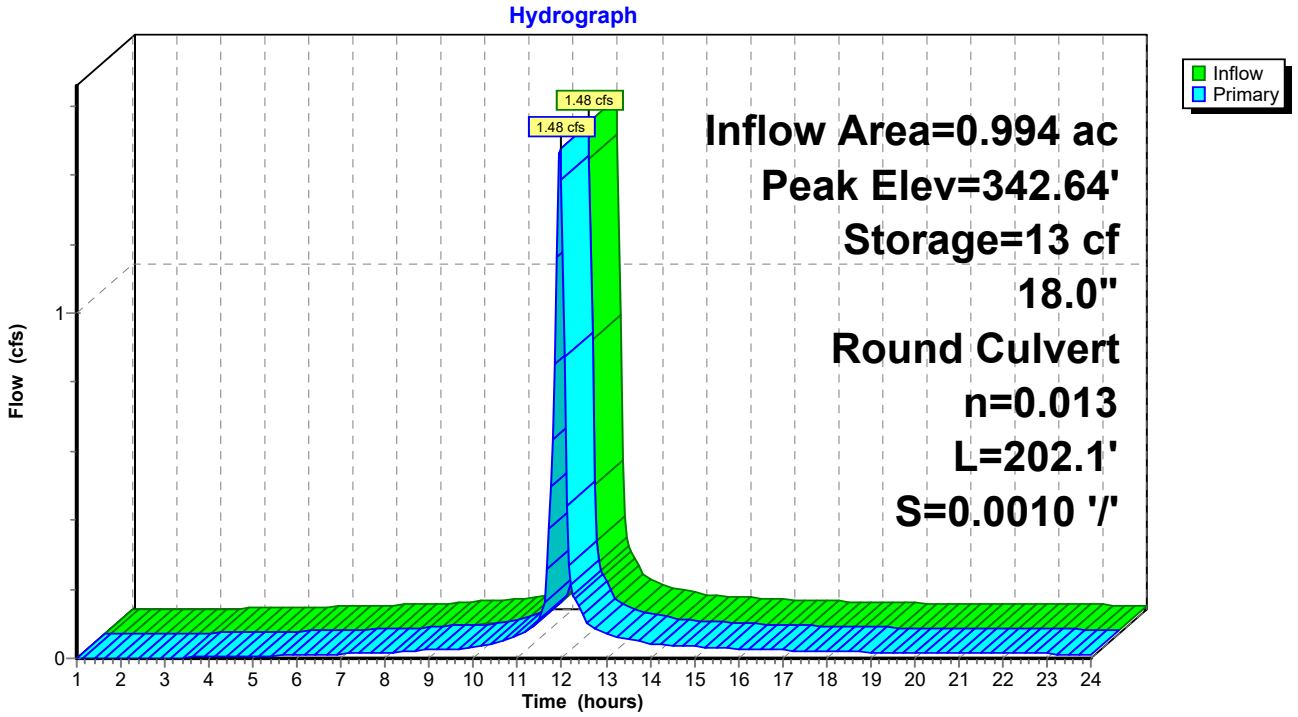
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.81' | 1,372 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.81 | 16 | 0 | 0 |
| 346.81 | 16 | 80 | 80 |
| 347.00 | 1,441 | 138 | 218 |
| 347.50 | 3,172 | 1,153 | 1,372 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.81' | **18.0" Round Culvert** L= 202.1' Ke= 0.500<br>Inlet / Outlet Invert= 341.81' / 341.61' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=1.44 cfs @ 11.96 hrs HW=342.63' TW=342.02' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.44 cfs @ 2.10 fps)

## Pond CB-4: CB-4


Hydrograph
Inflow
Primary
1.48 cfs
1.48 cfs
Inflow Area=0.994 ac
Peak Elev=342.64'
Storage=13 cf
18.0"
Round Culvert
n=0.013
L=202.1'
S=0.0010 '/'
Flow (cfs)
0
1
Time (hours)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond EX-DW: EX-Drywells

Inflow Area = 0.491 ac, 77.95% Impervious, Inflow Depth > 0.97" for 1-yr event
Inflow = 0.83 cfs @ 11.98 hrs, Volume= 0.040 af
Outflow = 0.31 cfs @ 12.10 hrs, Volume= 0.040 af, Atten= 62%, Lag= 7.5 min
Discarded = 0.31 cfs @ 12.10 hrs, Volume= 0.040 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond CB-4 : CB-4

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 347.02' @ 12.11 hrs Surf.Area= 468 sf Storage= 508 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 28.6 min ( 868.0 - 839.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 343.00' | 4,211 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

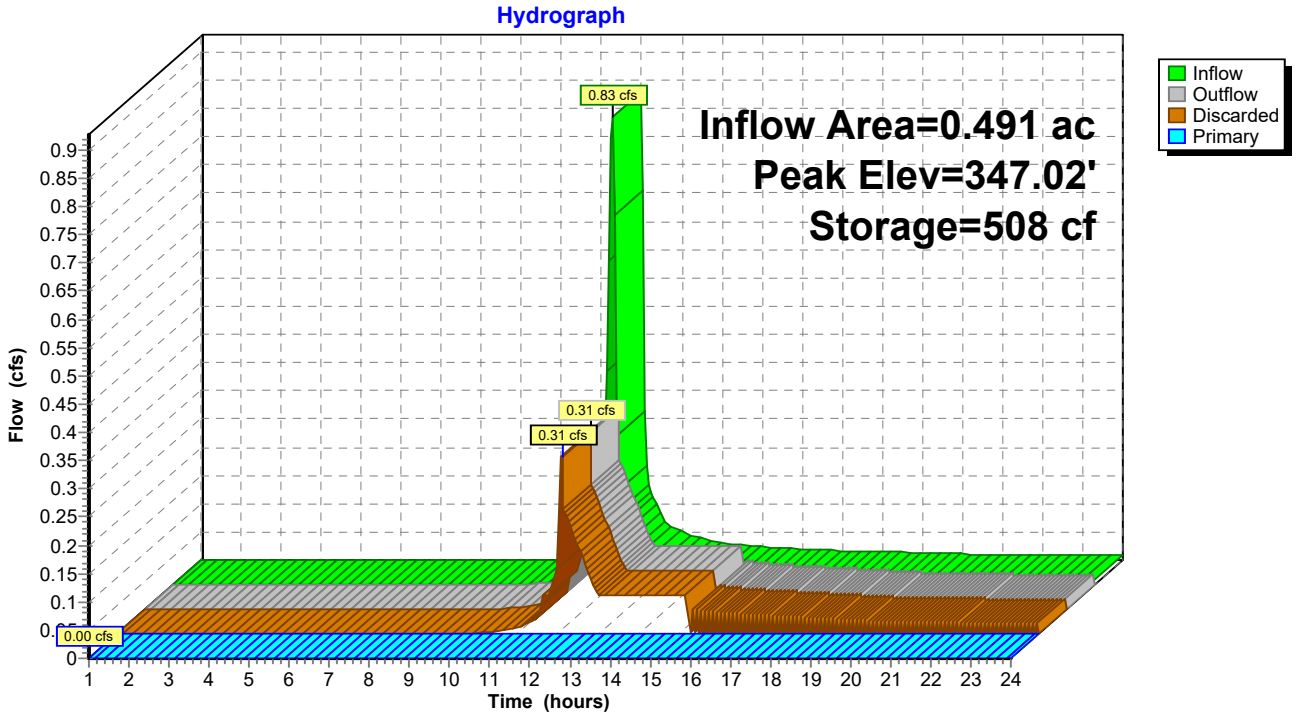
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 343.00 | 100 | 0 | 0 |
| 346.10 | 100 | 310 | 310 |
| 347.00 | 320 | 189 | 499 |
| 348.00 | 7,104 | 3,712 | 4,211 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 347.21' | **10.0' long x 15.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Discarded | 343.00' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.31 cfs @ 12.10 hrs HW=347.02' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.31 cfs)

**Primary OutFlow** Max=0.00 cfs @ 1.00 hrs HW=343.00' TW=341.81' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond EX-DW: EX-Drywells



## Summary for Pond UG-1: SC-740 System

Inflow Area = 4.007 ac, 68.15% Impervious, Inflow Depth > 0.63" for 1-yr event
Inflow = 4.00 cfs @ 11.98 hrs, Volume= 0.210 af
Outflow = 4.00 cfs @ 11.98 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Discarded = 4.00 cfs @ 11.98 hrs, Volume= 0.210 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 338.50' @ 12.00 hrs Surf.Area= 6,318 sf Storage= 1 cf
Flood Elev= 346.00' Surf.Area= 6,350 sf Storage= 13,824 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 |
|---|---|---|---|
| #1A | 338.50' | 5,610 cf | **53.75'W x 117.54'L x 3.50'H Field A**<br>22,112 cf Overall - 8,085 cf Embedded = 14,026 cf x 40.0% Voids |
| #2A | 339.00' | 8,085 cf | **ADS_StormTech SC-740 +Cap** x 176 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>176 Chambers in 11 Rows |
| #3 | 342.00' | 128 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |
| | | 13,824 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 342.00 | 32 | 0 | 0 |
| 344.00 | 32 | 64 | 64 |
| 346.00 | 32 | 64 | 128 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 338.50' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=4.39 cfs @ 11.98 hrs HW=338.50' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 4.39 cfs)

## Pond UG-1: SC-740 System - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

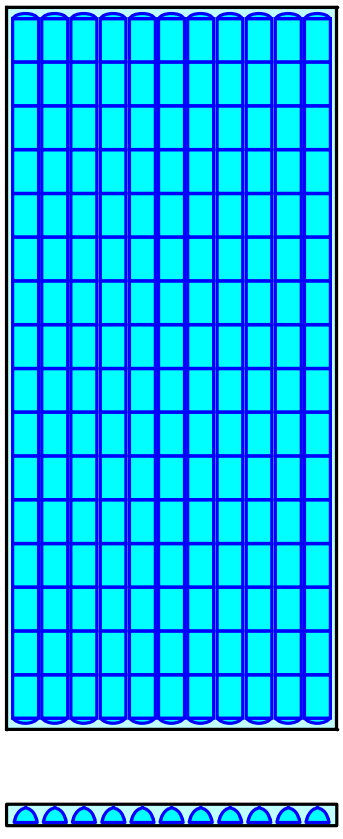
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
11 Rows x 51.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 53.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

176 Chambers x 45.9 cf = 8,085.4 cf Chamber Storage

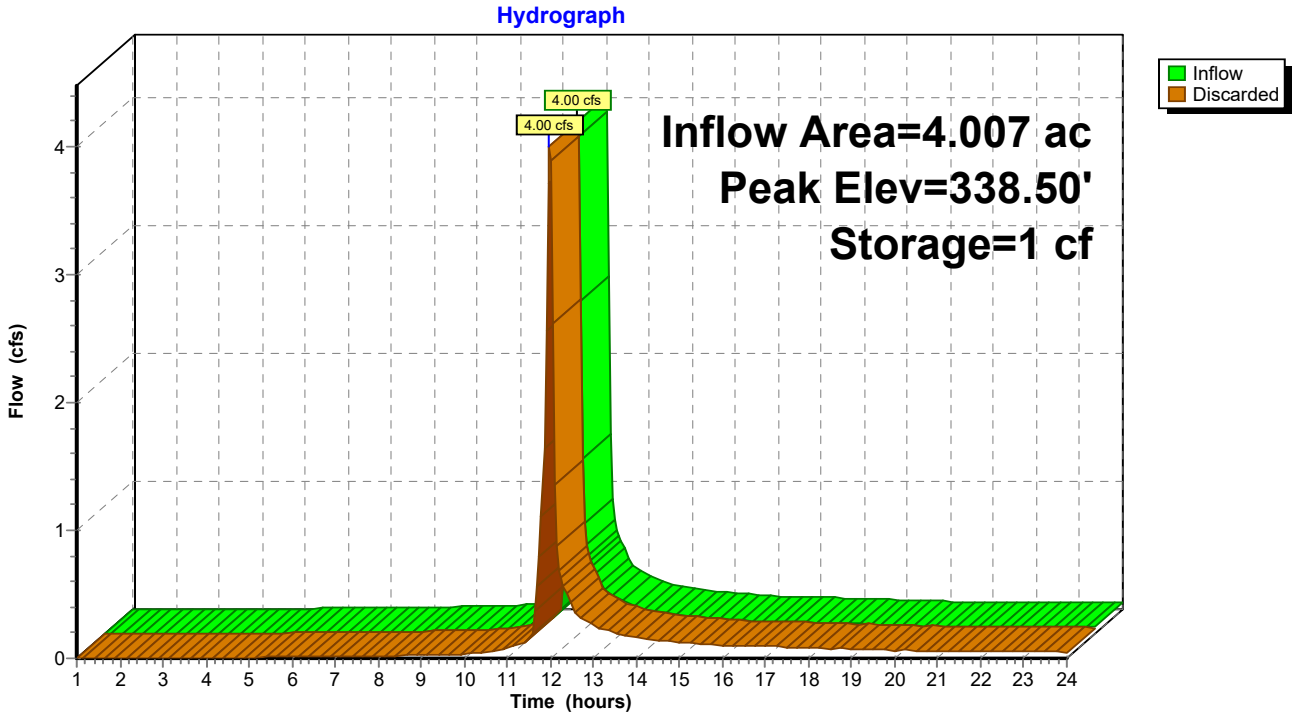
22,111.6 cf Field - 8,085.4 cf Chambers = 14,026.1 cf Stone x 40.0% Voids = 5,610.5 cf Stone Storage

Chamber Storage + Stone Storage = 13,695.9 cf = 0.314 af
Overall Storage Efficiency = 61.9%
Overall System Size = 117.54' x 53.75' x 3.50'

176 Chambers
818.9 cy Field
519.5 cy Stone



## Pond UG-1: SC-740 System



Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 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

**Subcatchment1S: Sub-1** Runoff Area=49,730 sf 73.58% Impervious Runoff Depth>1.96"
Tc=6.0 min CN=82 Runoff=3.84 cfs 0.186 af

**Subcatchment2S: Sub-2** Runoff Area=40,658 sf 58.05% Impervious Runoff Depth>1.32"
Tc=6.0 min CN=73 Runoff=2.14 cfs 0.103 af

**Subcatchment3S: Sub-3** Runoff Area=40,869 sf 50.38% Impervious Runoff Depth>1.02"
Tc=6.0 min CN=68 Runoff=1.63 cfs 0.080 af

**Subcatchment4S: Sub-4** Runoff Area=21,872 sf 98.22% Impervious Runoff Depth>3.36"
Tc=6.0 min CN=97 Runoff=2.54 cfs 0.141 af

**Subcatchment5S: Sub-5** Runoff Area=21,406 sf 77.95% Impervious Runoff Depth>2.20"
Tc=6.0 min CN=85 Runoff=1.84 cfs 0.090 af

**Pond CB-1: CB-1** Peak Elev=342.52' Storage=44 cf Inflow=6.40 cfs 0.327 af
18.0" Round Culvert n=0.013 L=10.0' S=-0.1420 '/' Outflow=6.39 cfs 0.327 af

**Pond CB-2: CB-2** Peak Elev=340.22' Storage=16 cf Inflow=3.77 cfs 0.183 af
18.0" Round Culvert n=0.013 L=10.0' S=0.0190 '/' Outflow=3.77 cfs 0.183 af

**Pond CB-3: CB-3** Peak Elev=342.32' Storage=14 cf Inflow=1.63 cfs 0.080 af
18.0" Round Culvert n=0.013 L=225.0' S=0.0010 '/' Outflow=1.63 cfs 0.080 af

**Pond CB-4: CB-4** Peak Elev=342.95' Storage=18 cf Inflow=2.56 cfs 0.142 af
18.0" Round Culvert n=0.013 L=202.1' S=0.0010 '/' Outflow=2.56 cfs 0.141 af

**Pond EX-DW: EX-Drywells** Peak Elev=347.24' Storage=776 cf Inflow=1.84 cfs 0.090 af
Discarded=1.36 cfs 0.089 af Primary=0.13 cfs 0.001 af Outflow=1.49 cfs 0.090 af

**Pond UG-1: SC-740 System** Peak Elev=339.29' Storage=2,808 cf Inflow=10.23 cfs 0.510 af
Outflow=4.39 cfs 0.513 af

**Total Runoff Area = 4.007 ac Runoff Volume = 0.599 af Average Runoff Depth = 1.80"**
**31.85% Pervious = 1.276 ac 68.15% Impervious = 2.731 ac**

## Summary for Subcatchment 1S: Sub-1

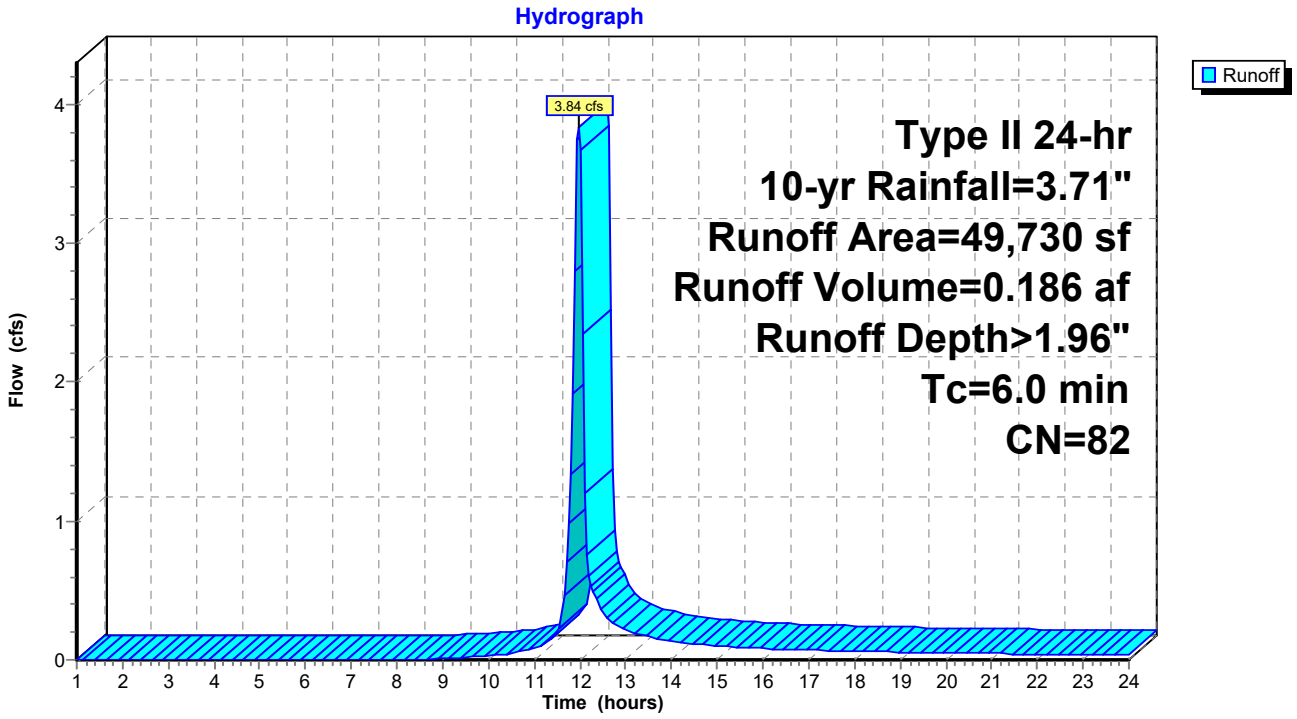
Runoff = 3.84 cfs @ 11.97 hrs, Volume= 0.186 af, Depth> 1.96"
Routed to Pond CB-1 : CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 36,592 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 13,138 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 49,730 | 82 | Weighted Average |
| 13,138 | | 26.42% Pervious Area |
| 36,592 | | 73.58% Impervious Area |

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

## Subcatchment 1S: Sub-1



## Summary for Subcatchment 2S: Sub-2

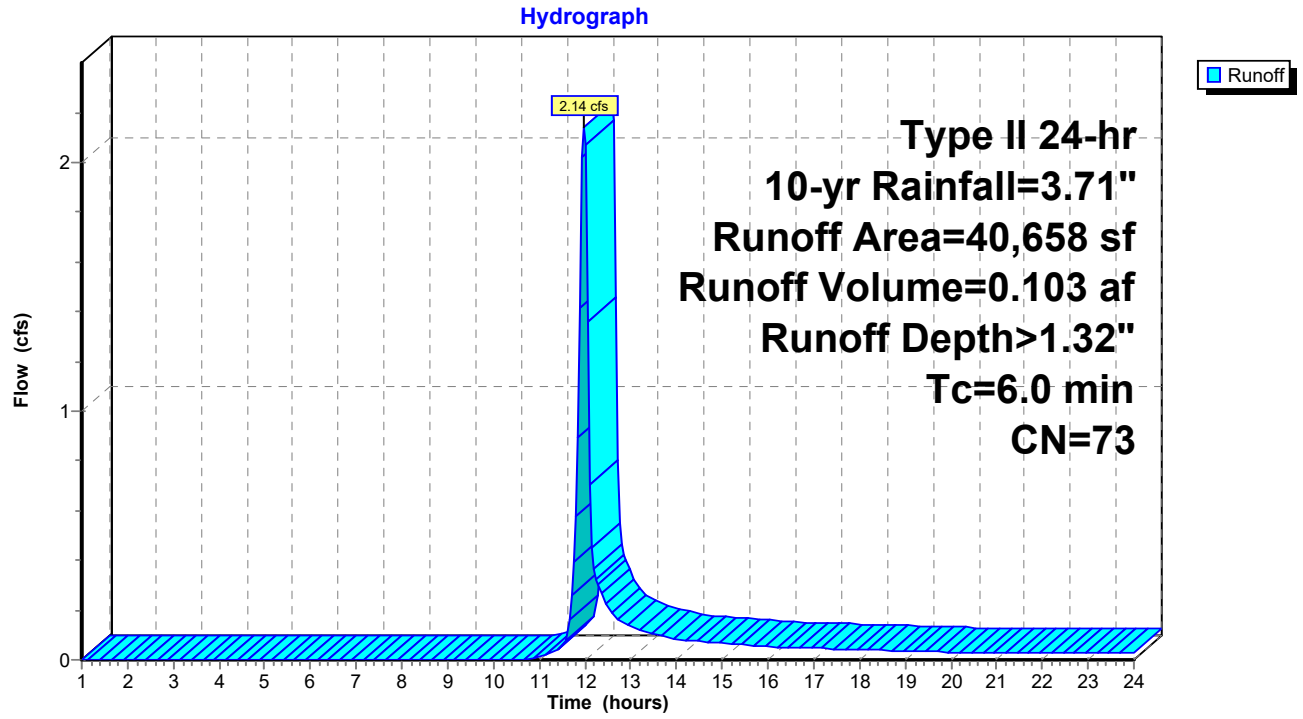
Runoff = 2.14 cfs @ 11.98 hrs, Volume= 0.103 af, Depth> 1.32"
Routed to Pond CB-2 : CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 23,602 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 7,138 | 39 | >75% Grass cover, Good, HSG A |
| 9,918 | 36 | Woods, Fair, HSG A |
| 40,658 | 73 | Weighted Average |
| 17,056 | | 41.95% Pervious Area |
| 23,602 | | 58.05% Impervious Area |

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

## Subcatchment 2S: Sub-2



## Summary for Subcatchment 3S: Sub-3

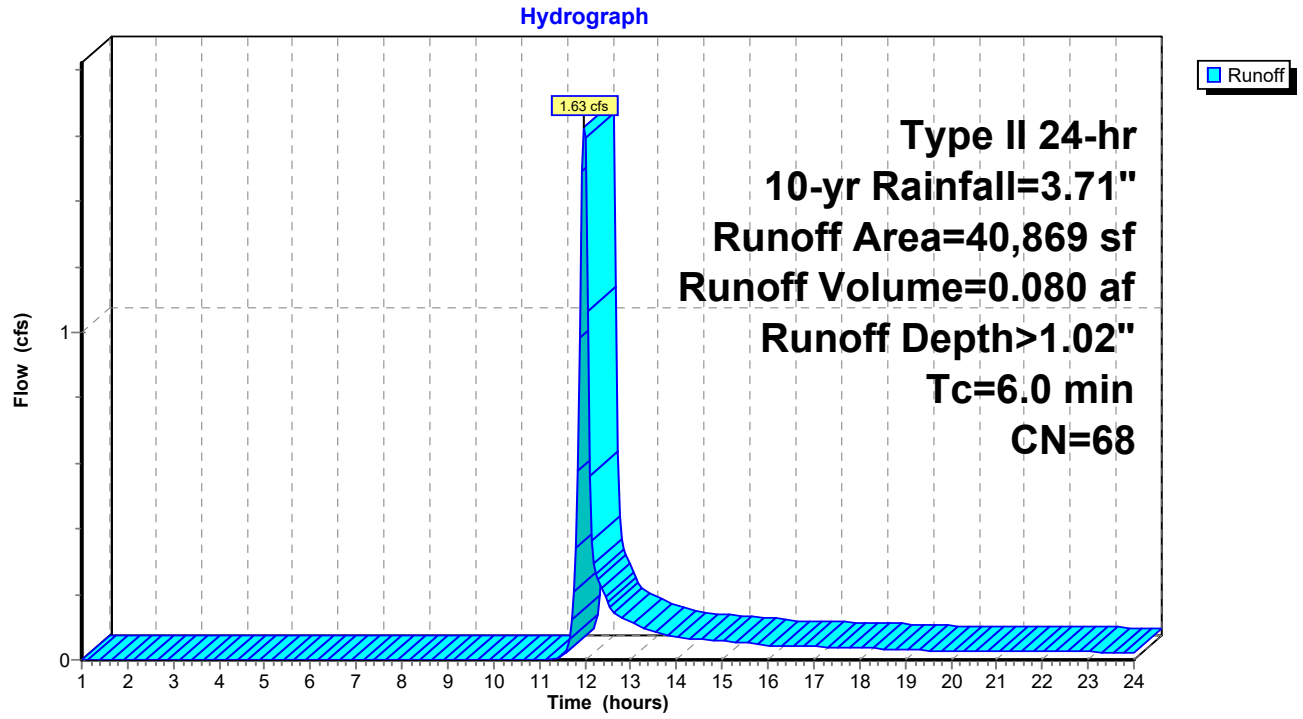
Runoff = 1.63 cfs @ 11.98 hrs, Volume= 0.080 af, Depth> 1.02"
Routed to Pond CB-3 : CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 20,590 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 6,219 | 39 | >75% Grass cover, Good, HSG A |
| 14,060 | 36 | Woods, Fair, HSG A |
| 40,869 | 68 | Weighted Average |
| 20,279 | | 49.62% Pervious Area |
| 20,590 | | 50.38% Impervious Area |

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

## Subcatchment 3S: Sub-3



## Summary for Subcatchment 4S: Sub-4

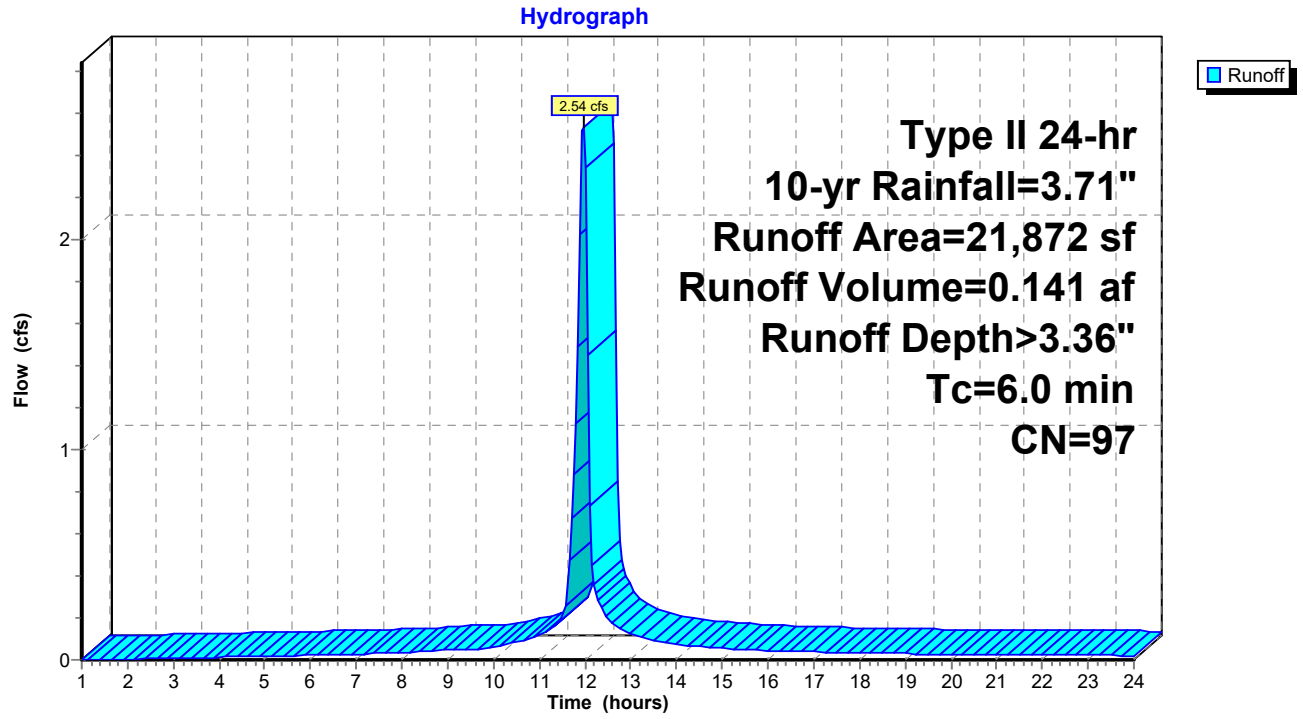
Runoff = 2.54 cfs @ 11.96 hrs, Volume= 0.141 af, Depth> 3.36"
Routed to Pond CB-4 : CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 21,482 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 390 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,872 | 97 | Weighted Average |
| 390 | | 1.78% Pervious Area |
| 21,482 | | 98.22% Impervious Area |

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

## Subcatchment 4S: Sub-4



## Summary for Subcatchment 5S: Sub-5

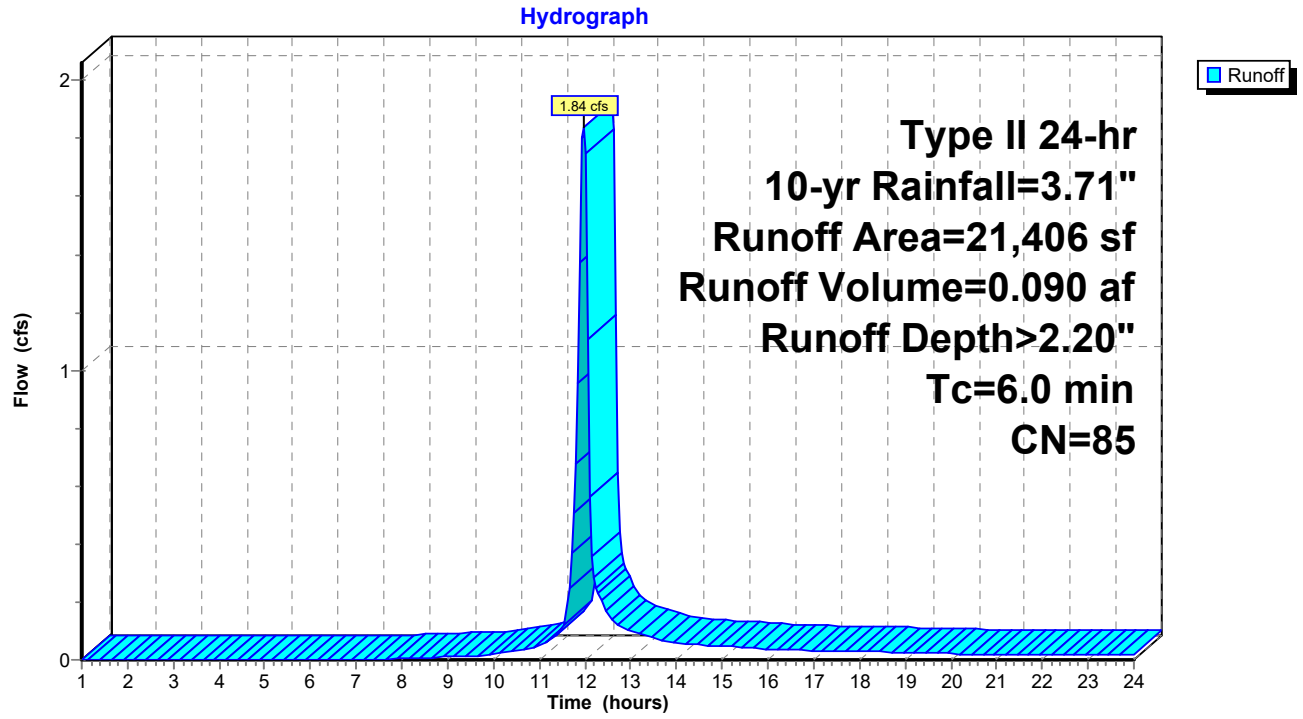
Runoff = 1.84 cfs @ 11.97 hrs, Volume= 0.090 af, Depth> 2.20"
Routed to Pond EX-DW : EX-Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.71"

| Area (sf) | CN | Description |
|---|---|---|
| 16,685 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 4,721 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,406 | 85 | Weighted Average |
| 4,721 | | 22.05% Pervious Area |
| 16,685 | | 77.95% Impervious Area |

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

## Subcatchment 5S: Sub-5



## Summary for Pond CB-1: CB-1

Inflow Area = 2.135 ac, 80.38% Impervious, Inflow Depth > 1.84" for 10-yr event
Inflow = 6.40 cfs @ 11.97 hrs, Volume= 0.327 af
Outflow = 6.39 cfs @ 11.97 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.1 min
Primary = 6.39 cfs @ 11.97 hrs, Volume= 0.327 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 342.52' @ 11.97 hrs Surf.Area= 16 sf Storage= 44 cf

Plug-Flow detention time= 2.2 min calculated for 0.327 af (100% of inflow)
Center-of-Mass det. time= 1.1 min ( 797.5 - 796.4 )

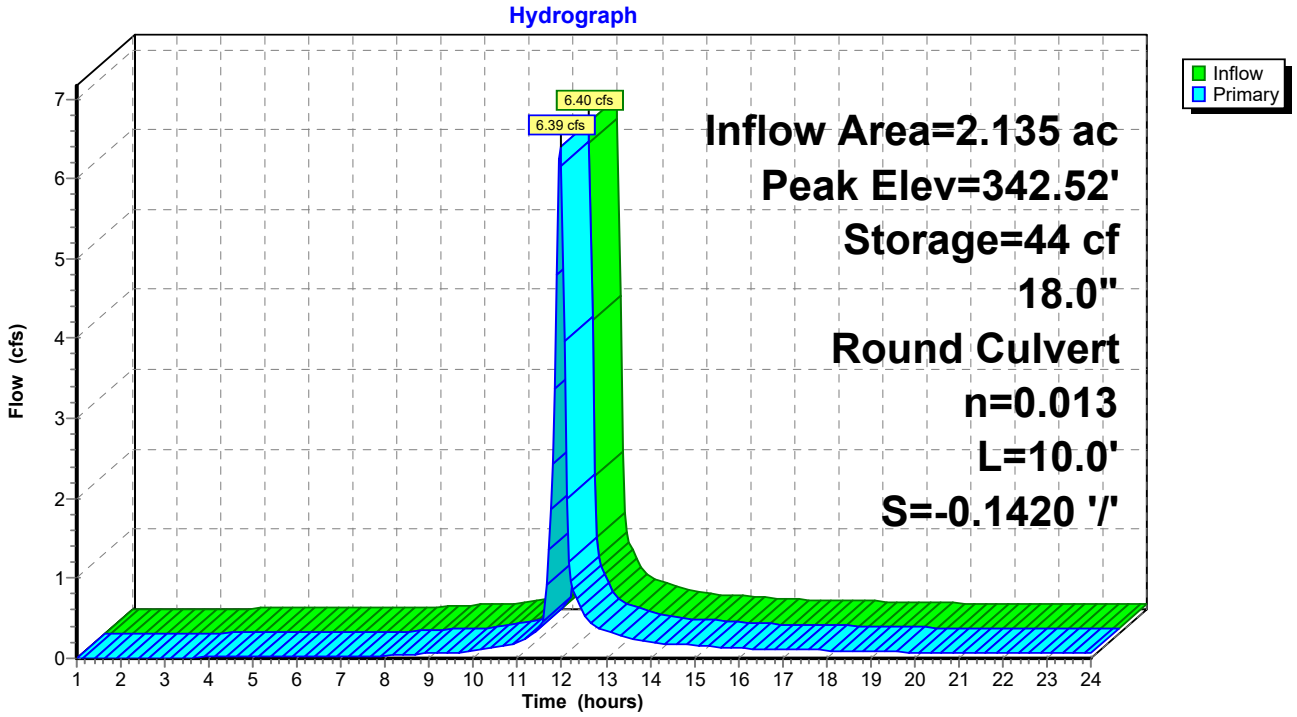
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.79' | 2,812 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.79 | 16 | 0 | 0 |
| 346.59 | 16 | 109 | 109 |
| 347.00 | 1,420 | 294 | 403 |
| 347.50 | 8,215 | 2,409 | 2,812 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.21' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.79' / 341.21' S= -0.1420 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=6.20 cfs @ 11.97 hrs HW=342.49' TW=339.02' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.20 cfs @ 3.86 fps)

## Pond CB-1: CB-1


Hydrograph
Inflow
Primary
6.40 cfs
6.39 cfs
Inflow Area=2.135 ac
Peak Elev=342.52'
Storage=44 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=-0.1420 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

## Summary for Pond CB-2: CB-2

Inflow Area = 1.872 ac, 54.21% Impervious, Inflow Depth > 1.17" for 10-yr event
Inflow = 3.77 cfs @ 11.98 hrs, Volume= 0.183 af
Outflow = 3.77 cfs @ 11.98 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.1 min
Primary = 3.77 cfs @ 11.98 hrs, Volume= 0.183 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 340.22' @ 11.98 hrs Surf.Area= 16 sf Storage= 16 cf

Plug-Flow detention time= 0.2 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 0.1 min ( 859.1 - 858.9 )

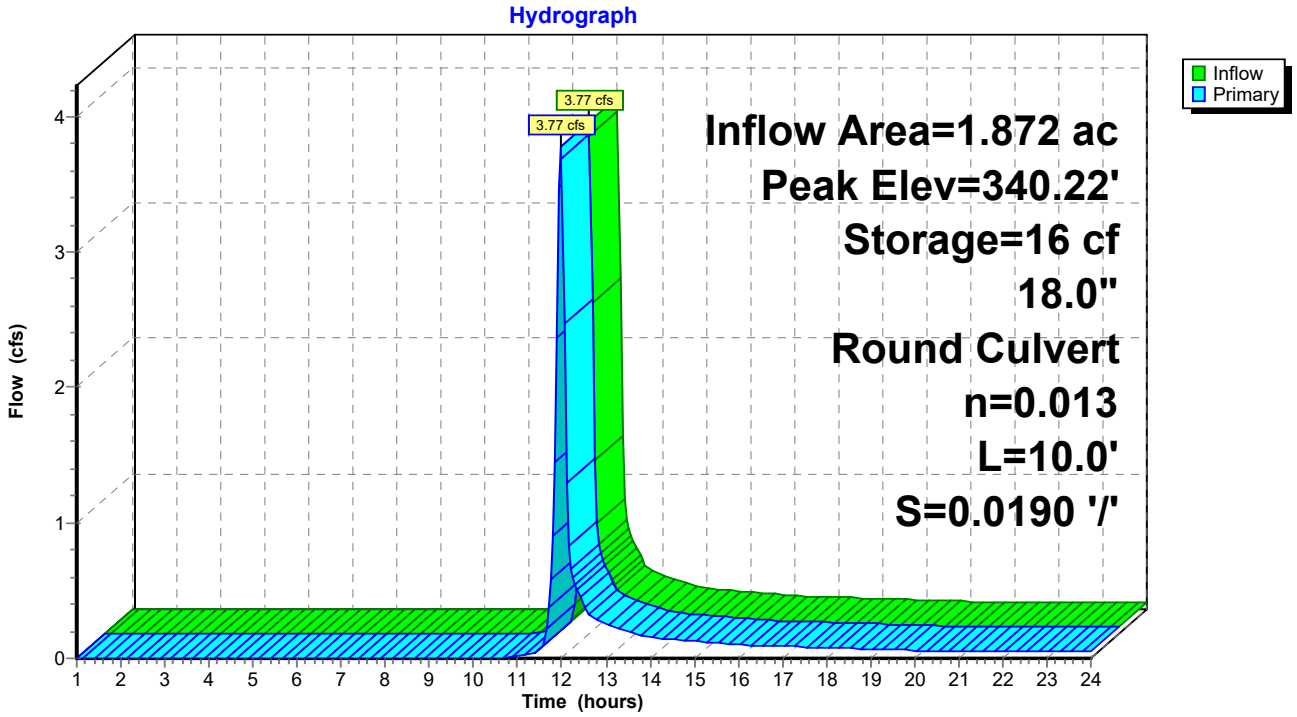
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.19' | 6,502 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.19 | 16 | 0 | 0 |
| 346.22 | 16 | 112 | 112 |
| 346.50 | 661 | 95 | 207 |
| 347.00 | 5,260 | 1,480 | 1,688 |
| 347.50 | 13,998 | 4,815 | 6,502 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 339.19' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.19' / 339.00' S= 0.0190 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=3.61 cfs @ 11.98 hrs HW=340.19' TW=339.06' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.61 cfs @ 4.10 fps)

## Pond CB-2: CB-2


Hydrograph
Inflow
Primary
3.77 cfs
3.77 cfs
Inflow Area=1.872 ac
Peak Elev=340.22'
Storage=16 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=0.0190 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond CB-3: CB-3

Inflow Area = 0.938 ac, 50.38% Impervious, Inflow Depth > 1.02" for 10-yr event
Inflow = 1.63 cfs @ 11.98 hrs, Volume= 0.080 af
Outflow = 1.63 cfs @ 11.98 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.1 min
Primary = 1.63 cfs @ 11.98 hrs, Volume= 0.080 af
Routed to Pond CB-2 : CB-2

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 342.32' @ 11.98 hrs Surf.Area= 16 sf Storage= 14 cf

Plug-Flow detention time= 0.6 min calculated for 0.080 af (100% of inflow)
Center-of-Mass det. time= 0.3 min ( 867.9 - 867.6 )

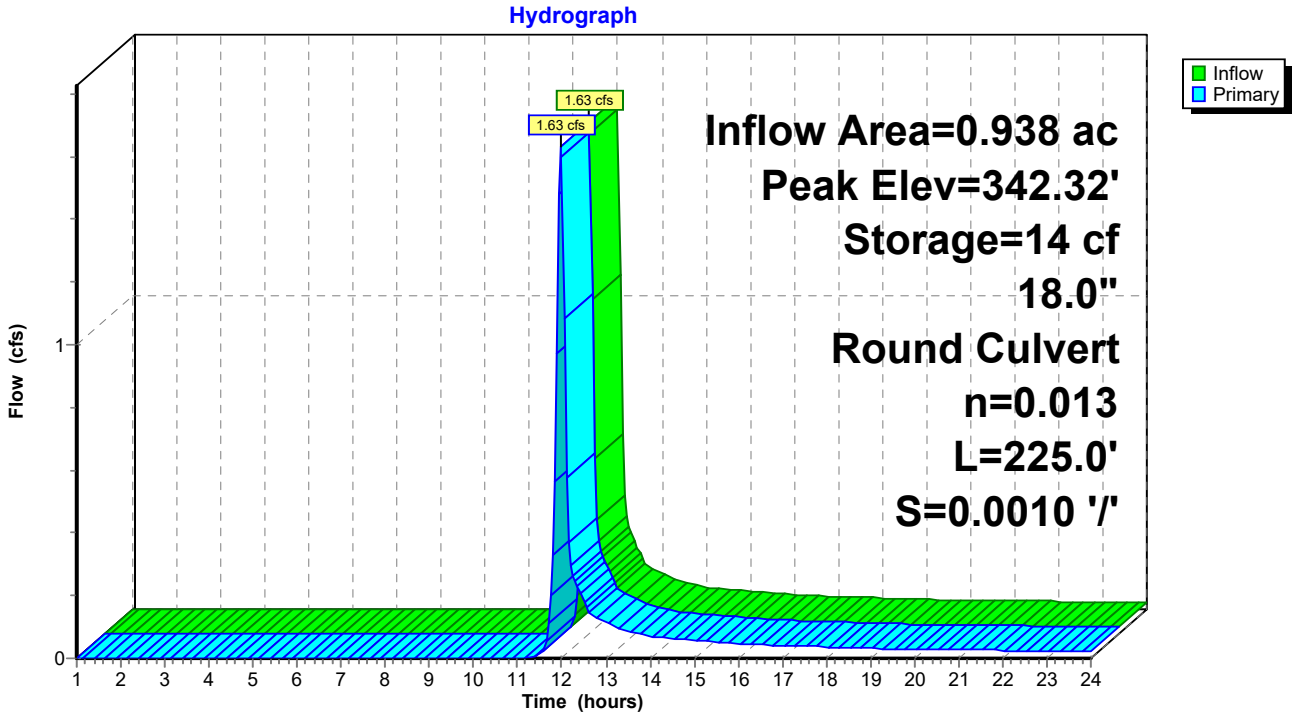
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.44' | 884 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.44 | 16 | 0 | 0 |
| 346.44 | 16 | 80 | 80 |
| 346.50 | 39 | 2 | 82 |
| 347.00 | 3,172 | 803 | 884 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.44' | **18.0" Round Culvert** L= 225.0' Ke= 0.500<br>Inlet / Outlet Invert= 341.44' / 341.21' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=1.56 cfs @ 11.98 hrs HW=342.30' TW=340.19' (Dynamic Tailwater)
**1=Culvert** (Barrel Controls 1.56 cfs @ 2.15 fps)

## Pond CB-3: CB-3


Hydrograph
Inflow
Primary
1.63 cfs
1.63 cfs
Inflow Area=0.938 ac
Peak Elev=342.32'
Storage=14 cf
18.0"
Round Culvert
n=0.013
L=225.0'
S=0.0010 '/'
Flow (cfs)
0
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

## Summary for Pond CB-4: CB-4

Inflow Area = 0.994 ac, 88.19% Impervious, Inflow Depth > 1.71" for 10-yr event
Inflow = 2.56 cfs @ 11.97 hrs, Volume= 0.142 af
Outflow = 2.56 cfs @ 11.97 hrs, Volume= 0.141 af, Atten= 0%, Lag= 0.1 min
Primary = 2.56 cfs @ 11.97 hrs, Volume= 0.141 af
Routed to Pond CB-1 : CB-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 342.95' @ 11.98 hrs Surf.Area= 16 sf Storage= 18 cf

Plug-Flow detention time= 0.6 min calculated for 0.141 af (100% of inflow)
Center-of-Mass det. time= 0.4 min ( 758.2 - 757.8 )

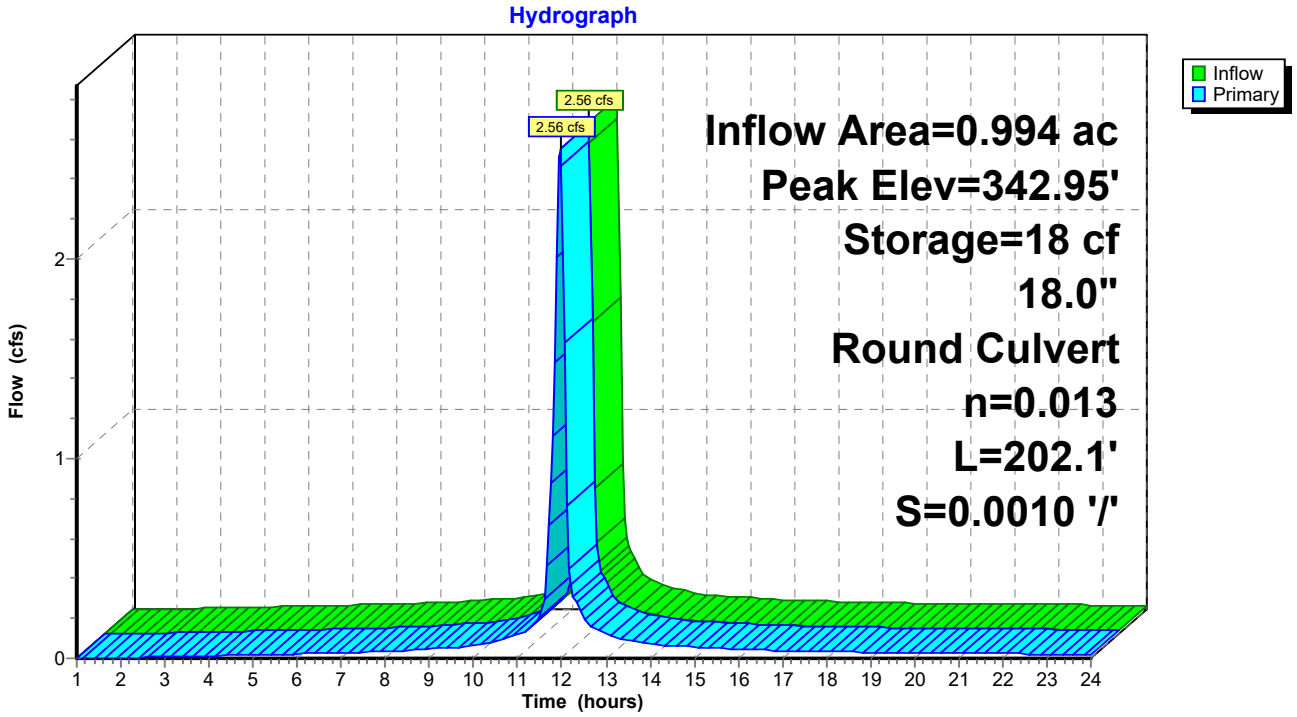
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.81' | 1,372 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.81 | 16 | 0 | 0 |
| 346.81 | 16 | 80 | 80 |
| 347.00 | 1,441 | 138 | 218 |
| 347.50 | 3,172 | 1,153 | 1,372 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.81' | **18.0" Round Culvert** L= 202.1' Ke= 0.500<br>Inlet / Outlet Invert= 341.81' / 341.61' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=2.42 cfs @ 11.97 hrs HW=342.93' TW=342.49' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.42 cfs @ 2.39 fps)

## Pond CB-4: CB-4


Hydrograph
Inflow
Primary
2.56 cfs
2.56 cfs
Inflow Area=0.994 ac
Peak Elev=342.95'
Storage=18 cf
18.0"
Round Culvert
n=0.013
L=202.1'
S=0.0010 '/'
Flow (cfs)
0
1
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

## Summary for Pond EX-DW: EX-Drywells

Inflow Area = 0.491 ac, 77.95% Impervious, Inflow Depth > 2.20" for 10-yr event
Inflow = 1.84 cfs @ 11.97 hrs, Volume= 0.090 af
Outflow = 1.49 cfs @ 12.02 hrs, Volume= 0.090 af, Atten= 19%, Lag= 3.2 min
Discarded = 1.36 cfs @ 12.02 hrs, Volume= 0.089 af
Primary = 0.13 cfs @ 12.02 hrs, Volume= 0.001 af
Routed to Pond CB-4 : CB-4

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 347.24' @ 12.02 hrs Surf.Area= 1,964 sf Storage= 776 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.9 min ( 839.7 - 815.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 343.00' | 4,211 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

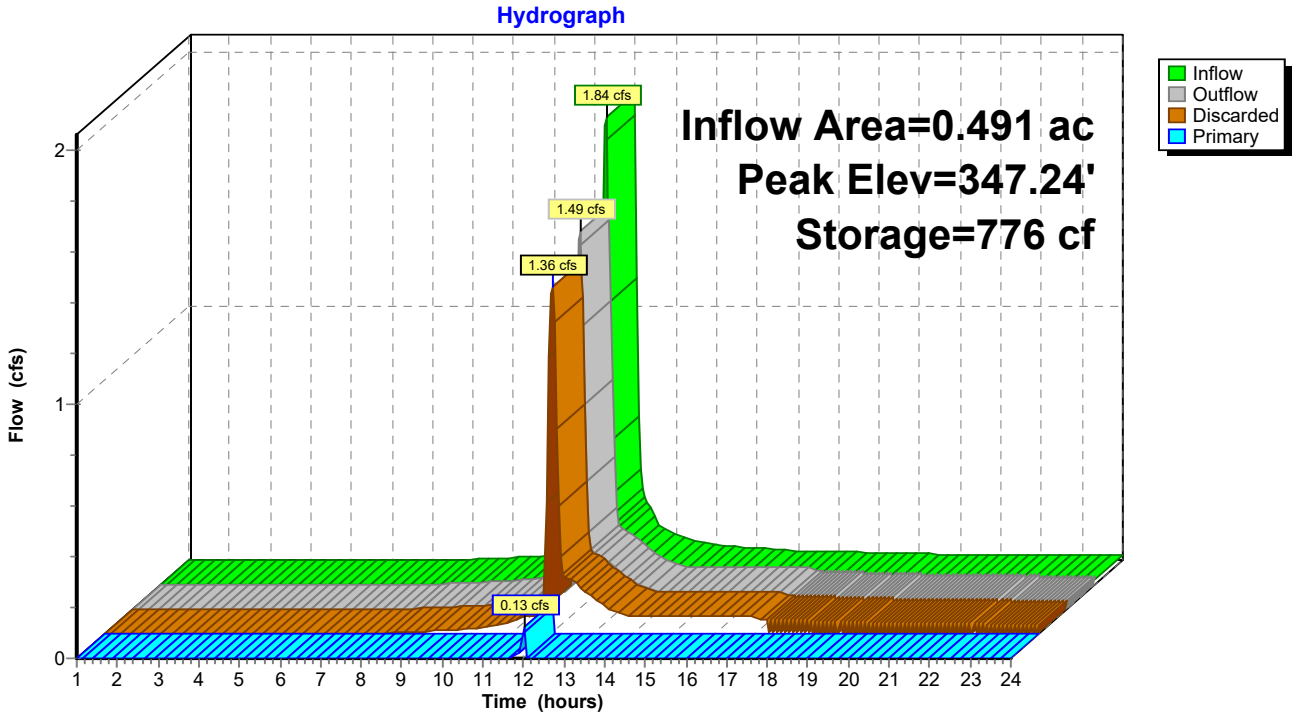
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 343.00 | 100 | 0 | 0 |
| 346.10 | 100 | 310 | 310 |
| 347.00 | 320 | 189 | 499 |
| 348.00 | 7,104 | 3,712 | 4,211 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 347.21' | **10.0' long x 15.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Discarded | 343.00' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=1.33 cfs @ 12.02 hrs HW=347.24' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.33 cfs)

**Primary OutFlow** Max=0.11 cfs @ 12.02 hrs HW=347.24' TW=342.87' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.43 fps)

## Pond EX-DW: EX-Drywells



## Summary for Pond UG-1: SC-740 System

Inflow Area = 4.007 ac, 68.15% Impervious, Inflow Depth > 1.53" for 10-yr event
Inflow = 10.23 cfs @ 11.98 hrs, Volume= 0.510 af
Outflow = 4.39 cfs @ 11.90 hrs, Volume= 0.513 af, Atten= 57%, Lag= 0.0 min
Discarded = 4.39 cfs @ 11.90 hrs, Volume= 0.513 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 339.29' @ 12.09 hrs Surf.Area= 6,318 sf Storage= 2,808 cf
Flood Elev= 346.00' Surf.Area= 6,350 sf Storage= 13,824 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.4 min ( 822.0 - 819.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 338.50' | 5,610 cf | **53.75'W x 117.54'L x 3.50'H Field A**<br>22,112 cf Overall - 8,085 cf Embedded = 14,026 cf x 40.0% Voids |
| #2A | 339.00' | 8,085 cf | **ADS_StormTech SC-740 +Cap** x 176 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>176 Chambers in 11 Rows |
| #3 | 342.00' | 128 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |
| | | 13,824 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 342.00 | 32 | 0 | 0 |
| 344.00 | 32 | 64 | 64 |
| 346.00 | 32 | 64 | 128 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 338.50' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=4.39 cfs @ 11.90 hrs HW=338.63' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 4.39 cfs)

## Pond UG-1: SC-740 System - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

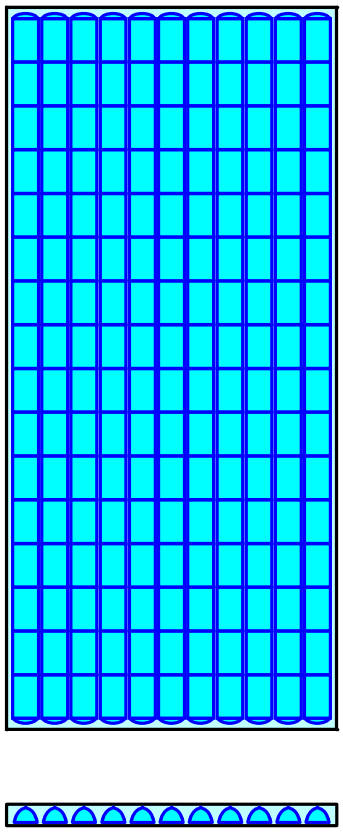
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
11 Rows x 51.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 53.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

176 Chambers x 45.9 cf = 8,085.4 cf Chamber Storage

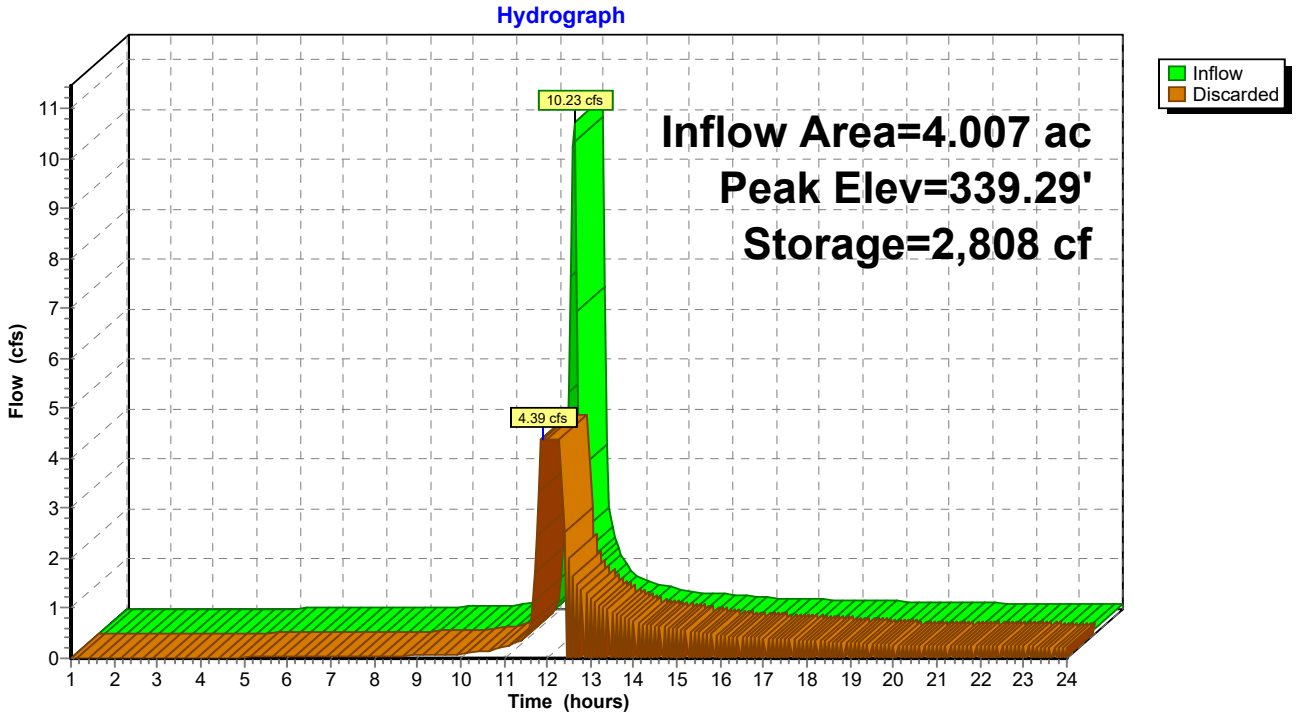
22,111.6 cf Field - 8,085.4 cf Chambers = 14,026.1 cf Stone x 40.0% Voids = 5,610.5 cf Stone Storage

Chamber Storage + Stone Storage = 13,695.9 cf = 0.314 af
Overall Storage Efficiency = 61.9%
Overall System Size = 117.54' x 53.75' x 3.50'

176 Chambers
818.9 cy Field
519.5 cy Stone



## Pond UG-1: SC-740 System



Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 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

**Subcatchment1S: Sub-1** Runoff Area=49,730 sf 73.58% Impervious Runoff Depth>4.19"
Tc=6.0 min CN=82 Runoff=7.99 cfs 0.398 af

**Subcatchment2S: Sub-2** Runoff Area=40,658 sf 58.05% Impervious Runoff Depth>3.27"
Tc=6.0 min CN=73 Runoff=5.25 cfs 0.254 af

**Subcatchment3S: Sub-3** Runoff Area=40,869 sf 50.38% Impervious Runoff Depth>2.79"
Tc=6.0 min CN=68 Runoff=4.52 cfs 0.218 af

**Subcatchment4S: Sub-4** Runoff Area=21,872 sf 98.22% Impervious Runoff Depth>5.86"
Tc=6.0 min CN=97 Runoff=4.31 cfs 0.245 af

**Subcatchment5S: Sub-5** Runoff Area=21,406 sf 77.95% Impervious Runoff Depth>4.51"
Tc=6.0 min CN=85 Runoff=3.65 cfs 0.185 af

**Pond CB-1: CB-1** Peak Elev=344.46' Storage=75 cf Inflow=13.52 cfs 0.663 af
18.0" Round Culvert n=0.013 L=10.0' S=-0.1420 '/' Outflow=13.50 cfs 0.663 af

**Pond CB-2: CB-2** Peak Elev=341.96' Storage=44 cf Inflow=9.75 cfs 0.472 af
18.0" Round Culvert n=0.013 L=10.0' S=0.0190 '/' Outflow=9.87 cfs 0.472 af

**Pond CB-3: CB-3** Peak Elev=343.06' Storage=26 cf Inflow=4.52 cfs 0.218 af
18.0" Round Culvert n=0.013 L=225.0' S=0.0010 '/' Outflow=4.56 cfs 0.218 af

**Pond CB-4: CB-4** Peak Elev=345.13' Storage=53 cf Inflow=5.71 cfs 0.265 af
18.0" Round Culvert n=0.013 L=202.1' S=0.0010 '/' Outflow=5.59 cfs 0.265 af

**Pond EX-DW: EX-Drywells** Peak Elev=347.36' Storage=1,044 cf Inflow=3.65 cfs 0.185 af
Discarded=1.90 cfs 0.165 af Primary=1.50 cfs 0.020 af Outflow=3.40 cfs 0.185 af

**Pond UG-1: SC-740 System** Peak Elev=341.92' Storage=13,503 cf Inflow=23.23 cfs 1.135 af
Outflow=4.39 cfs 1.139 af

**Total Runoff Area = 4.007 ac Runoff Volume = 1.300 af Average Runoff Depth = 3.89"**
**31.85% Pervious = 1.276 ac 68.15% Impervious = 2.731 ac**

## Summary for Subcatchment 1S: Sub-1

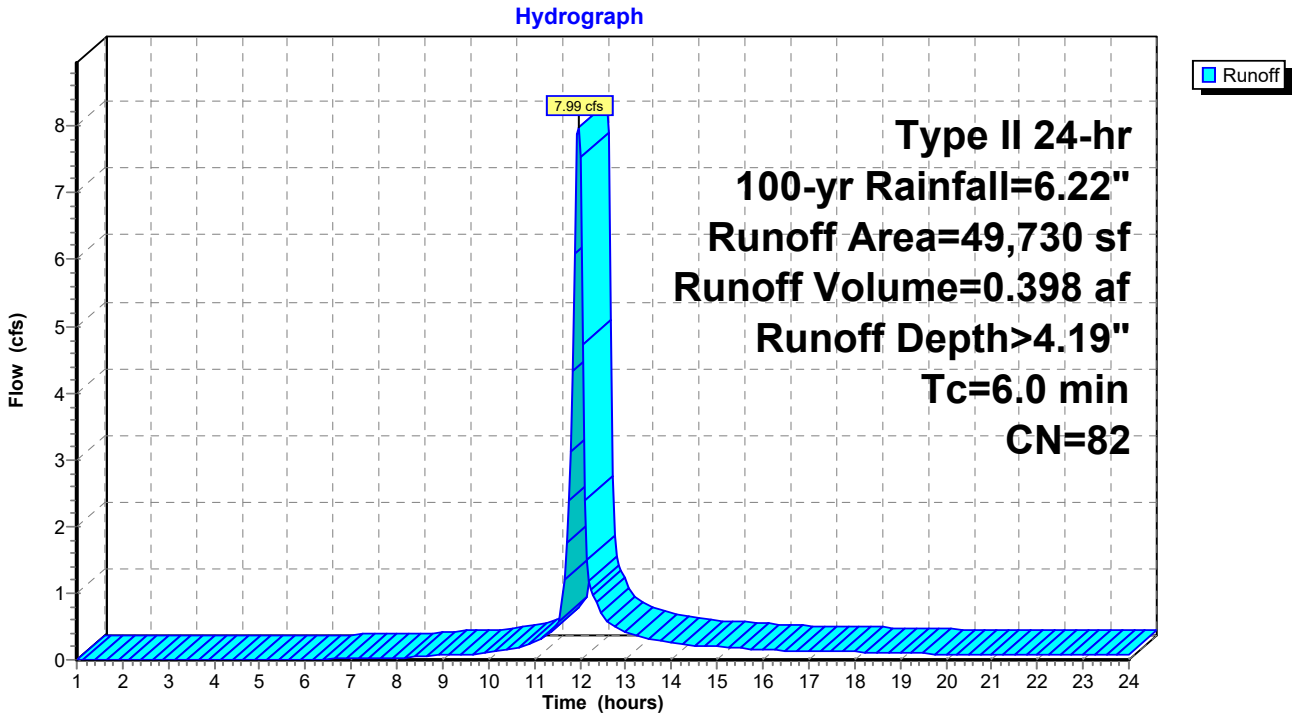
Runoff = 7.99 cfs @ 11.97 hrs, Volume= 0.398 af, Depth> 4.19"
Routed to Pond CB-1 : CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 36,592 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 13,138 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 49,730 | 82 | Weighted Average |
| 13,138 | | 26.42% Pervious Area |
| 36,592 | | 73.58% Impervious Area |

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

## Subcatchment 1S: Sub-1



## Summary for Subcatchment 2S: Sub-2

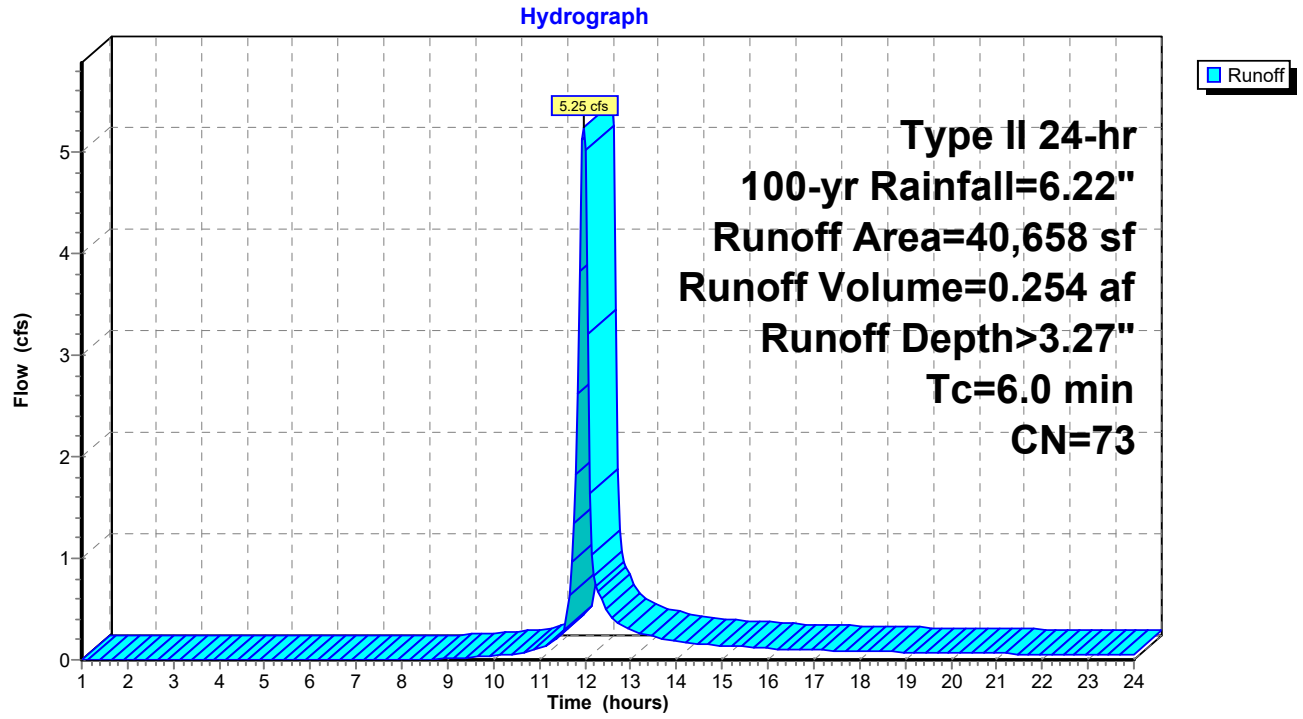
Runoff = 5.25 cfs @ 11.97 hrs, Volume= 0.254 af, Depth> 3.27"
Routed to Pond CB-2 : CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 23,602 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 7,138 | 39 | >75% Grass cover, Good, HSG A |
| 9,918 | 36 | Woods, Fair, HSG A |
| 40,658 | 73 | Weighted Average |
| 17,056 | | 41.95% Pervious Area |
| 23,602 | | 58.05% Impervious Area |

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

## Subcatchment 2S: Sub-2



## Summary for Subcatchment 3S: Sub-3

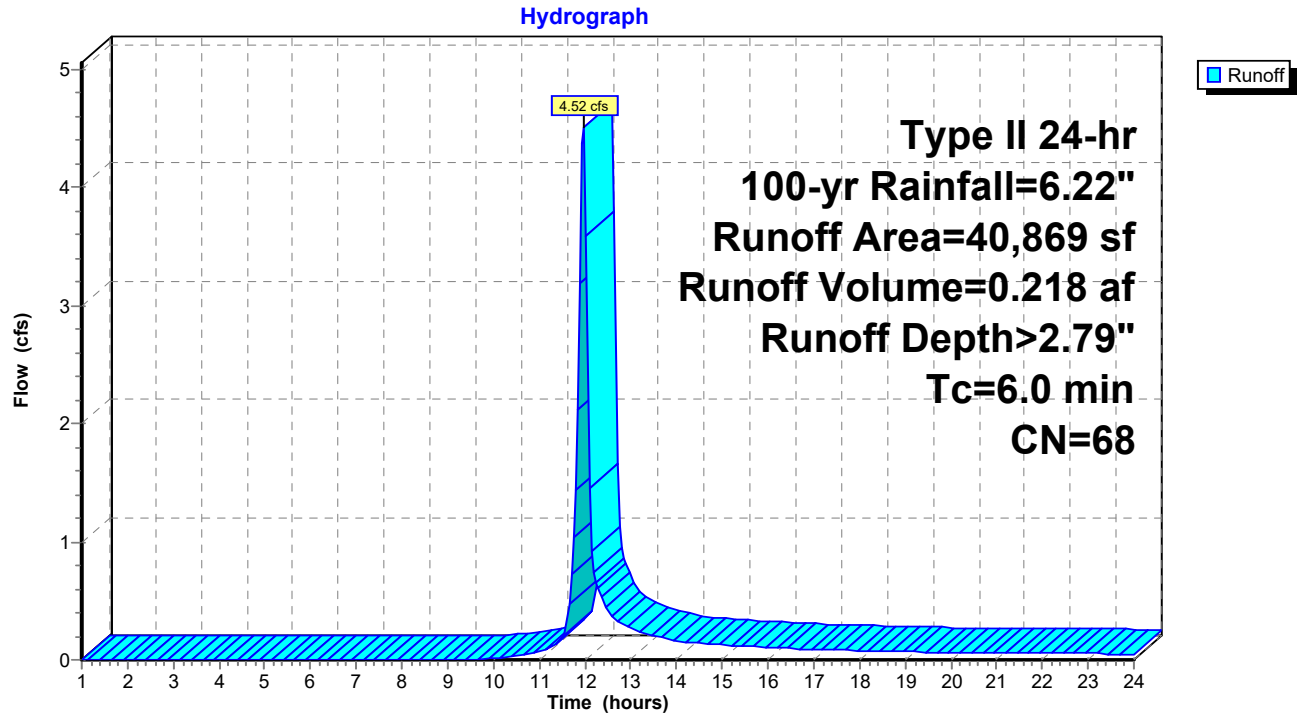
Runoff = 4.52 cfs @ 11.97 hrs, Volume= 0.218 af, Depth> 2.79"
Routed to Pond CB-3 : CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 20,590 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 6,219 | 39 | >75% Grass cover, Good, HSG A |
| 14,060 | 36 | Woods, Fair, HSG A |
| 40,869 | 68 | Weighted Average |
| 20,279 | | 49.62% Pervious Area |
| 20,590 | | 50.38% Impervious Area |

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

## Subcatchment 3S: Sub-3



## Summary for Subcatchment 4S: Sub-4

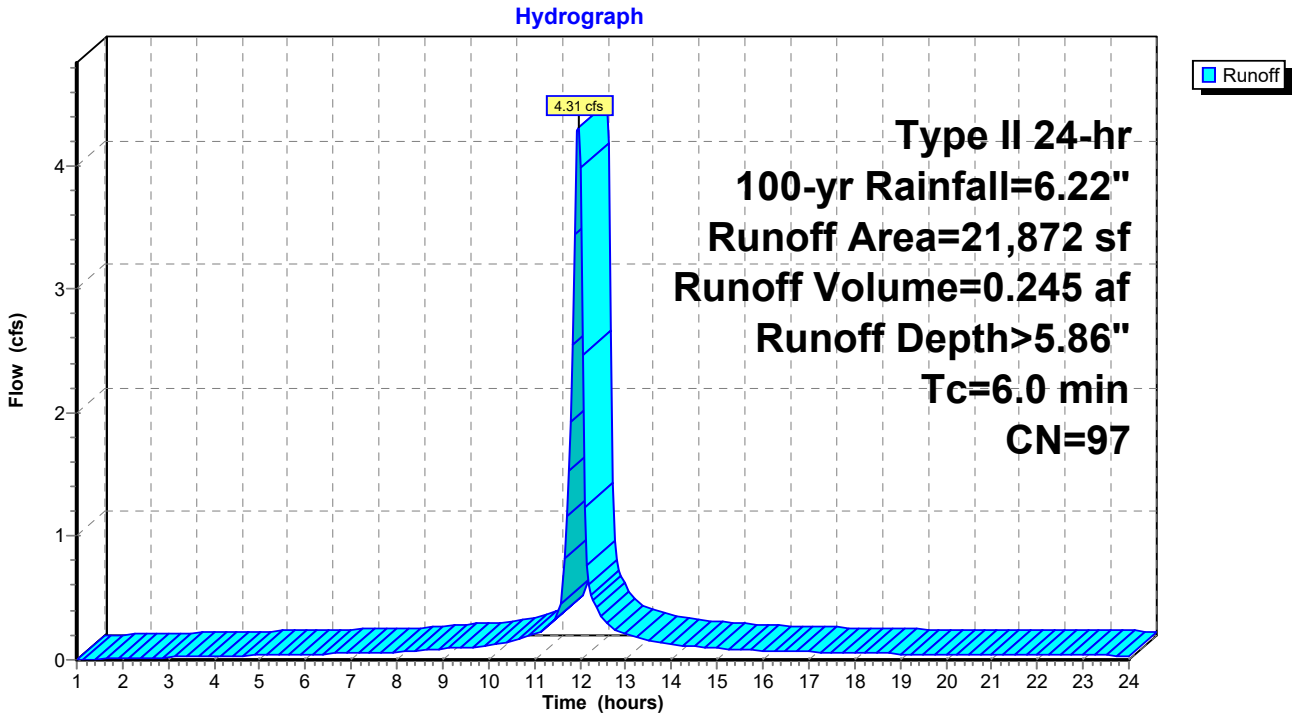
Runoff = 4.31 cfs @ 11.96 hrs, Volume= 0.245 af, Depth> 5.86"
Routed to Pond CB-4 : CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 21,482 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 390 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,872 | 97 | Weighted Average |
| 390 | | 1.78% Pervious Area |
| 21,482 | | 98.22% Impervious Area |

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

## Subcatchment 4S: Sub-4



## Summary for Subcatchment 5S: Sub-5

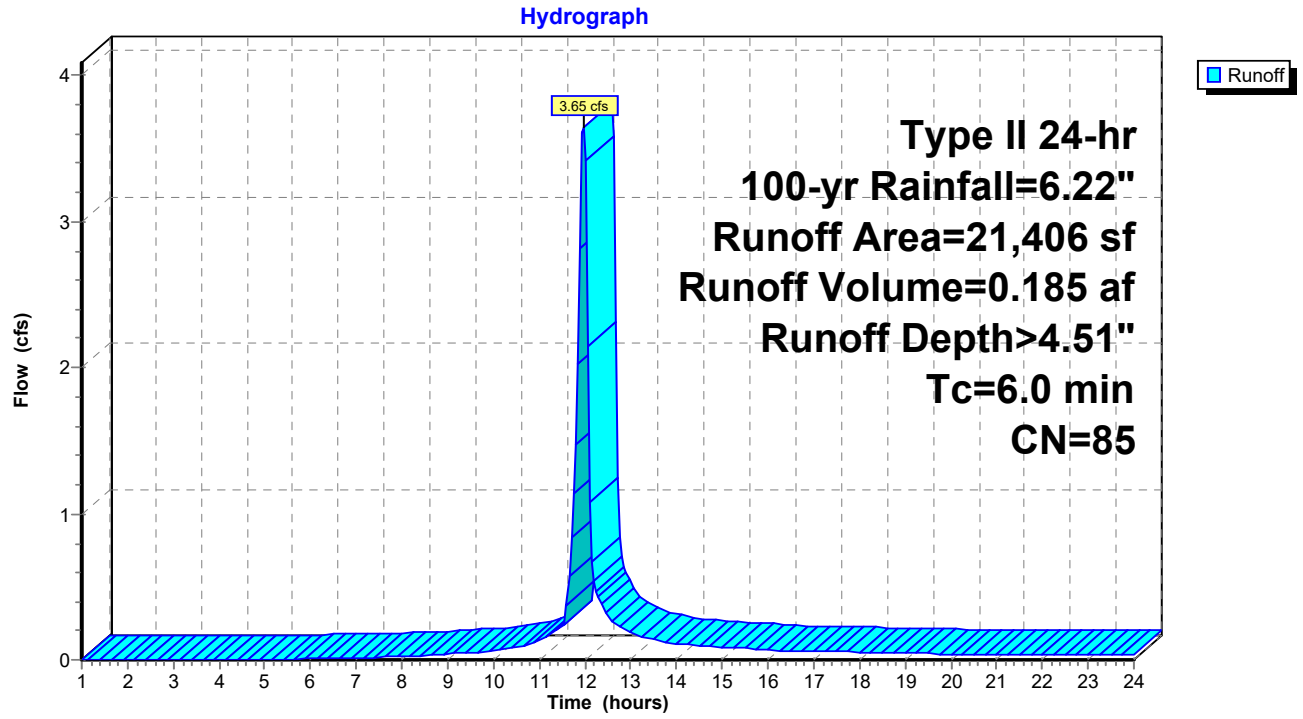
Runoff = 3.65 cfs @ 11.97 hrs, Volume= 0.185 af, Depth> 4.51"
Routed to Pond EX-DW : EX-Drywells

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=6.22"

| Area (sf) | CN | Description |
|---|---|---|
| 16,685 | 98 | Paved parking, HSG A |
| 0 | 96 | Gravel surface, HSG A |
| 4,721 | 39 | >75% Grass cover, Good, HSG A |
| 0 | 36 | Woods, Fair, HSG A |
| 21,406 | 85 | Weighted Average |
| 4,721 | | 22.05% Pervious Area |
| 16,685 | | 77.95% Impervious Area |

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

## Subcatchment 5S: Sub-5



## Summary for Pond CB-1: CB-1

Inflow Area = 2.135 ac, 80.38% Impervious, Inflow Depth > 3.73" for 100-yr event
Inflow = 13.52 cfs @ 11.97 hrs, Volume= 0.663 af
Outflow = 13.50 cfs @ 11.97 hrs, Volume= 0.663 af, Atten= 0%, Lag= 0.1 min
Primary = 13.50 cfs @ 11.97 hrs, Volume= 0.663 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 344.46' @ 11.97 hrs Surf.Area= 16 sf Storage= 75 cf

Plug-Flow detention time= 1.2 min calculated for 0.661 af (100% of inflow)
Center-of-Mass det. time= 0.6 min ( 781.0 - 780.3 )

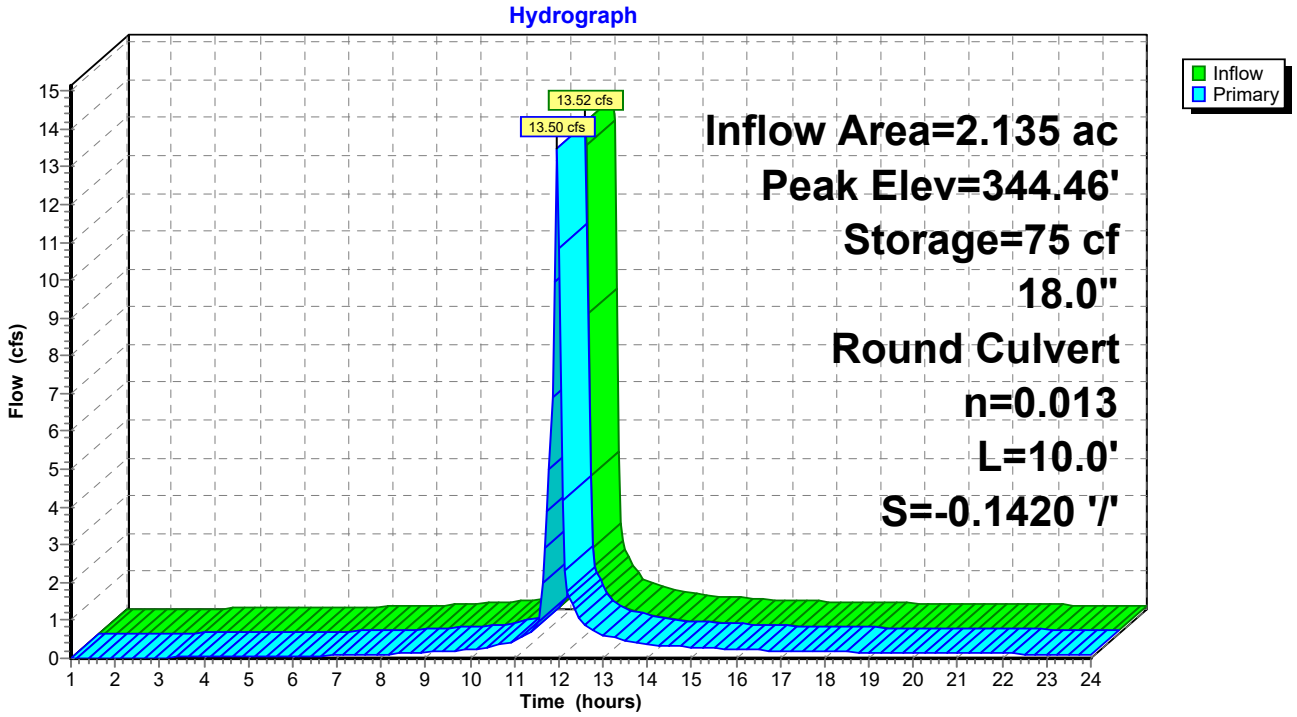
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.79' | 2,812 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.79 | 16 | 0 | 0 |
| 346.59 | 16 | 109 | 109 |
| 347.00 | 1,420 | 294 | 403 |
| 347.50 | 8,215 | 2,409 | 2,812 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.21' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.79' / 341.21' S= -0.1420 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=13.09 cfs @ 11.97 hrs HW=344.33' TW=340.29' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 13.09 cfs @ 7.41 fps)

## Pond CB-1: CB-1


Hydrograph
Inflow
Primary
13.52 cfs
13.50 cfs
Inflow Area=2.135 ac
Peak Elev=344.46'
Storage=75 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=-0.1420 '/'
Flow (cfs)
Time (hours)

## Summary for Pond CB-2: CB-2

Inflow Area = 1.872 ac, 54.21% Impervious, Inflow Depth > 3.03" for 100-yr event
Inflow = 9.75 cfs @ 11.97 hrs, Volume= 0.472 af
Outflow = 9.87 cfs @ 11.98 hrs, Volume= 0.472 af, Atten= 0%, Lag= 0.1 min
Primary = 9.87 cfs @ 11.98 hrs, Volume= 0.472 af
Routed to Pond UG-1 : SC-740 System

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 341.96' @ 12.21 hrs Surf.Area= 16 sf Storage= 44 cf

Plug-Flow detention time= 0.2 min calculated for 0.471 af (100% of inflow)
Center-of-Mass det. time= 0.2 min ( 831.2 - 831.0 )

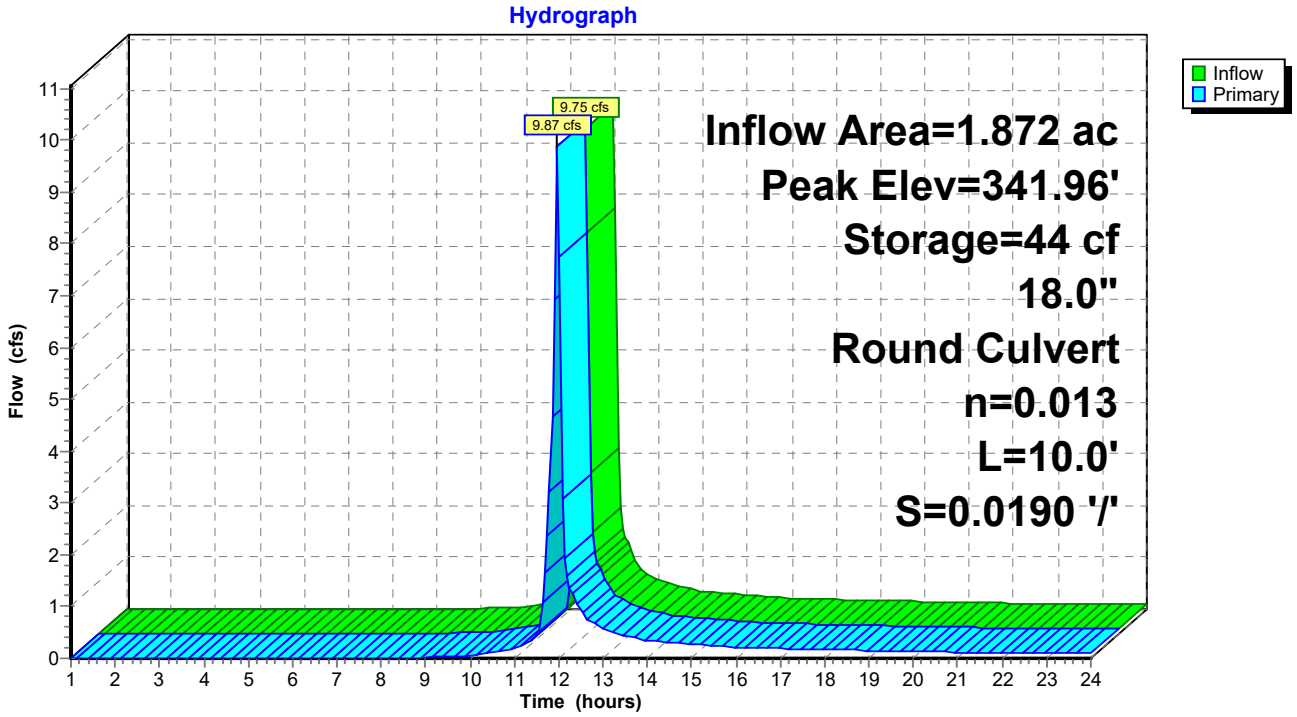
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 339.19' | 6,502 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 339.19 | 16 | 0 | 0 |
| 346.22 | 16 | 112 | 112 |
| 346.50 | 661 | 95 | 207 |
| 347.00 | 5,260 | 1,480 | 1,688 |
| 347.50 | 13,998 | 4,815 | 6,502 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 339.19' | **18.0" Round Culvert** L= 10.0' Ke= 0.500<br>Inlet / Outlet Invert= 339.19' / 339.00' S= 0.0190 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=8.14 cfs @ 11.98 hrs HW=341.24' TW=340.33' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 8.14 cfs @ 4.61 fps)

## Pond CB-2: CB-2


Hydrograph
Inflow
Primary
9.75 cfs
9.87 cfs
Inflow Area=1.872 ac
Peak Elev=341.96'
Storage=44 cf
18.0"
Round Culvert
n=0.013
L=10.0'
S=0.0190 '/'
Flow (cfs)
Time (hours)

## Summary for Pond CB-3: CB-3

Inflow Area = 0.938 ac, 50.38% Impervious, Inflow Depth > 2.79" for 100-yr event
Inflow = 4.52 cfs @ 11.97 hrs, Volume= 0.218 af
Outflow = 4.56 cfs @ 11.98 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.1 min
Primary = 4.56 cfs @ 11.98 hrs, Volume= 0.218 af
Routed to Pond CB-2 : CB-2

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 343.06' @ 11.98 hrs Surf.Area= 16 sf Storage= 26 cf

Plug-Flow detention time= 0.4 min calculated for 0.218 af (100% of inflow)
Center-of-Mass det. time= 0.2 min ( 837.3 - 837.1 )

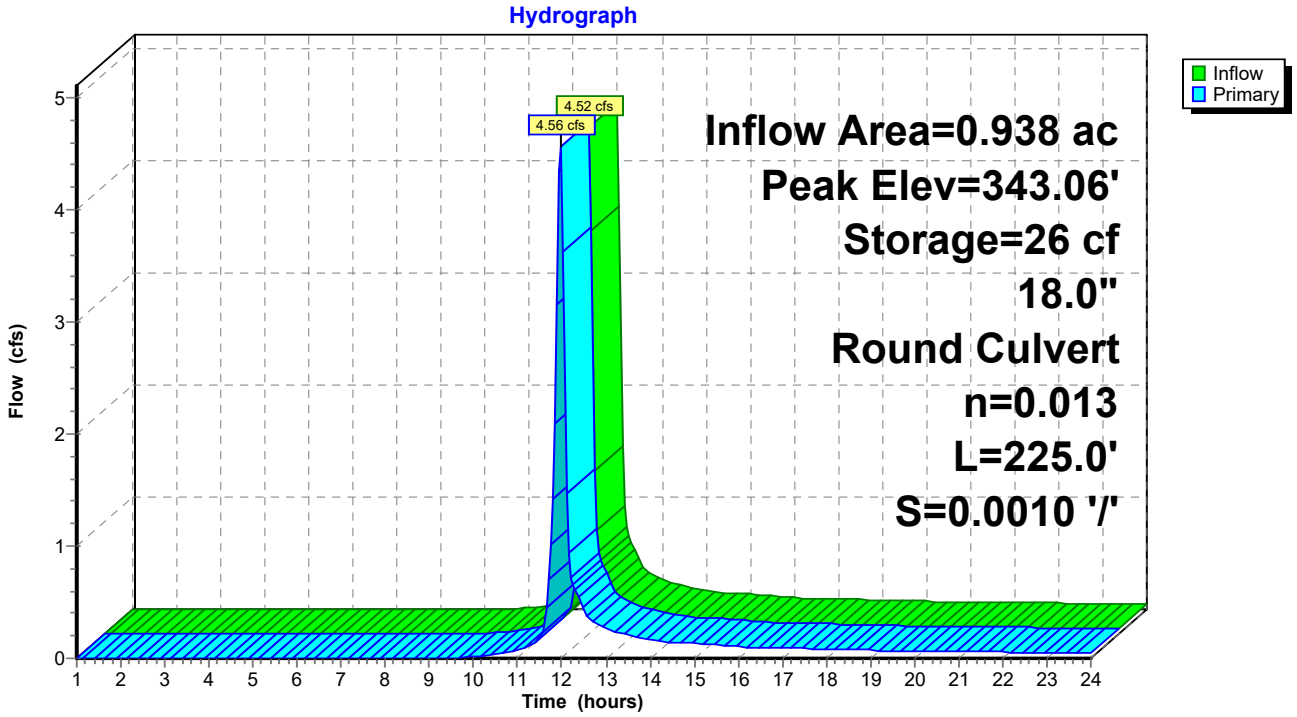
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.44' | 884 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.44 | 16 | 0 | 0 |
| 346.44 | 16 | 80 | 80 |
| 346.50 | 39 | 2 | 82 |
| 347.00 | 3,172 | 803 | 884 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.44' | **18.0" Round Culvert** L= 225.0' Ke= 0.500<br>Inlet / Outlet Invert= 341.44' / 341.21' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=4.37 cfs @ 11.98 hrs HW=343.01' TW=341.24' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 4.37 cfs @ 2.93 fps)

## Pond CB-3: CB-3


Hydrograph
Inflow
Primary
4.52 cfs
4.56 cfs
Inflow Area=0.938 ac
Peak Elev=343.06'
Storage=26 cf
18.0"
Round Culvert
n=0.013
L=225.0'
S=0.0010 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond CB-4: CB-4

Inflow Area = 0.994 ac, 88.19% Impervious, Inflow Depth > 3.20" for 100-yr event
Inflow = 5.71 cfs @ 11.98 hrs, Volume= 0.265 af
Outflow = 5.59 cfs @ 11.98 hrs, Volume= 0.265 af, Atten= 2%, Lag= 0.1 min
Primary = 5.59 cfs @ 11.98 hrs, Volume= 0.265 af
Routed to Pond CB-1 : CB-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 345.13' @ 12.01 hrs Surf.Area= 16 sf Storage= 53 cf

Plug-Flow detention time= 0.4 min calculated for 0.265 af (100% of inflow)
Center-of-Mass det. time= 0.3 min ( 745.1 - 744.9 )

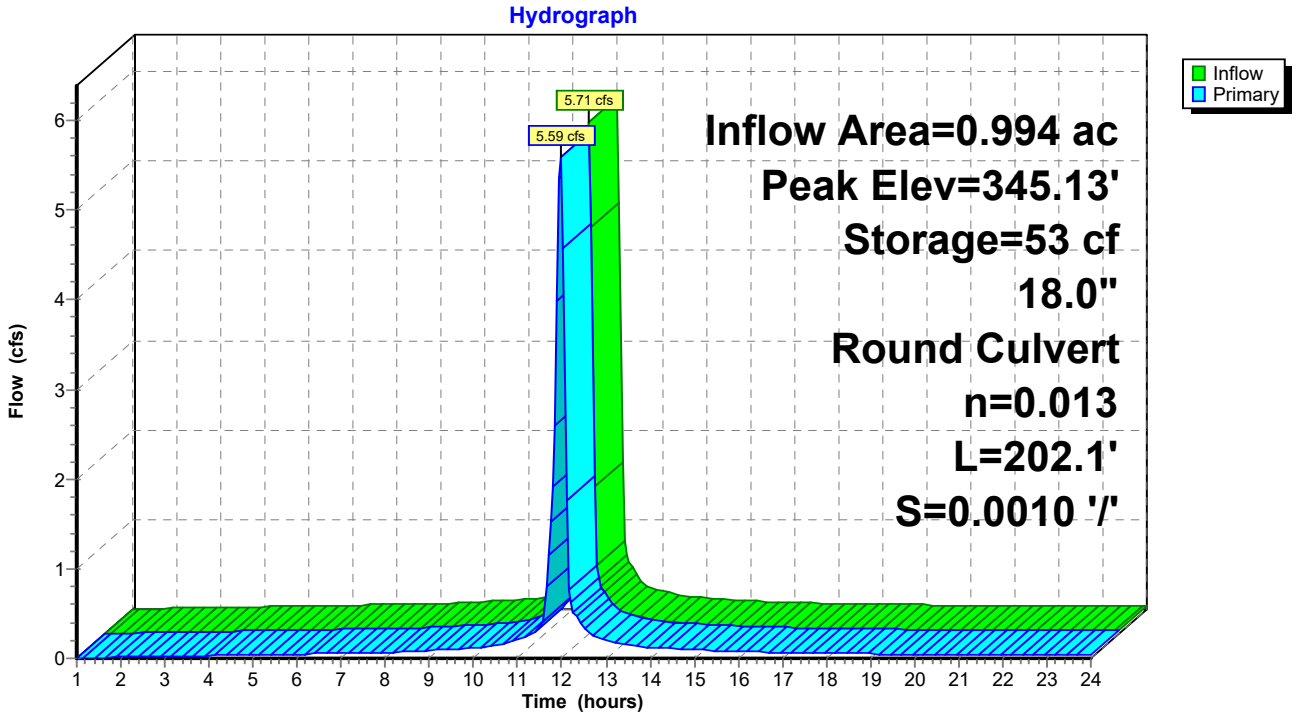
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 341.81' | 1,372 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 341.81 | 16 | 0 | 0 |
| 346.81 | 16 | 80 | 80 |
| 347.00 | 1,441 | 138 | 218 |
| 347.50 | 3,172 | 1,153 | 1,372 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 341.81' | **18.0" Round Culvert** L= 202.1' Ke= 0.500<br>Inlet / Outlet Invert= 341.81' / 341.61' S= 0.0010 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf |

**Primary OutFlow** Max=3.37 cfs @ 11.98 hrs HW=344.62' TW=344.32' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 3.37 cfs @ 1.91 fps)

## Pond CB-4: CB-4


Hydrograph
Inflow
Primary
5.71 cfs
5.59 cfs
Inflow Area=0.994 ac
Peak Elev=345.13'
Storage=53 cf
18.0"
Round Culvert
n=0.013
L=202.1'
S=0.0010 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

## Summary for Pond EX-DW: EX-Drywells

Inflow Area = 0.491 ac, 77.95% Impervious, Inflow Depth > 4.51" for 100-yr event
Inflow = 3.65 cfs @ 11.97 hrs, Volume= 0.185 af
Outflow = 3.40 cfs @ 12.00 hrs, Volume= 0.185 af, Atten= 7%, Lag= 1.9 min
Discarded = 1.90 cfs @ 12.00 hrs, Volume= 0.165 af
Primary = 1.50 cfs @ 12.00 hrs, Volume= 0.020 af
Routed to Pond CB-4 : CB-4

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 347.36' @ 12.00 hrs Surf.Area= 2,737 sf Storage= 1,044 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min ( 817.9 - 795.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 343.00' | 4,211 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

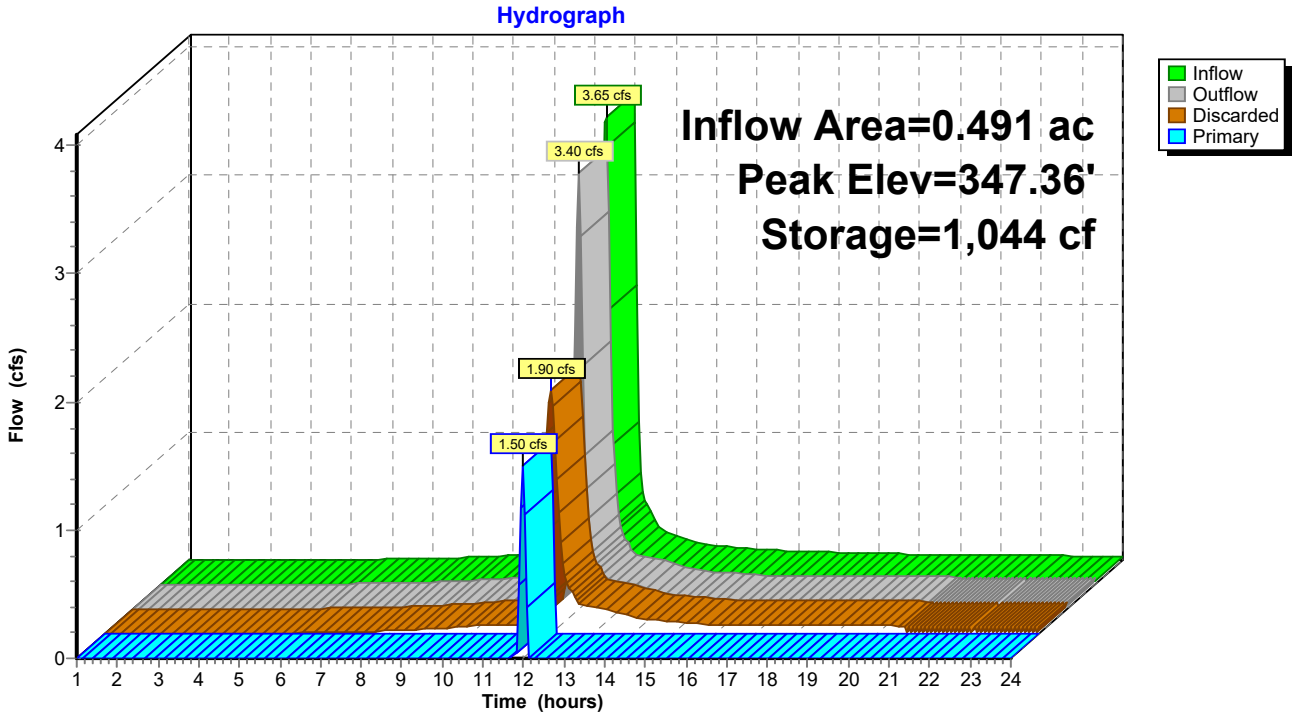
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 343.00 | 100 | 0 | 0 |
| 346.10 | 100 | 310 | 310 |
| 347.00 | 320 | 189 | 499 |
| 348.00 | 7,104 | 3,712 | 4,211 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 347.21' | **10.0' long x 15.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Discarded | 343.00' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=1.90 cfs @ 12.00 hrs HW=347.36' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.90 cfs)

**Primary OutFlow** Max=1.49 cfs @ 12.00 hrs HW=347.36' TW=345.06' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.49 cfs @ 1.02 fps)

## Pond EX-DW: EX-Drywells



## Summary for Pond UG-1: SC-740 System

Inflow Area = 4.007 ac, 68.15% Impervious, Inflow Depth > 3.40" for 100-yr event
Inflow = 23.23 cfs @ 11.97 hrs, Volume= 1.135 af
Outflow = 4.39 cfs @ 11.75 hrs, Volume= 1.139 af, Atten= 81%, Lag= 0.0 min
Discarded = 4.39 cfs @ 11.75 hrs, Volume= 1.139 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 341.92' @ 12.16 hrs Surf.Area= 6,318 sf Storage= 13,503 cf
Flood Elev= 346.00' Surf.Area= 6,350 sf Storage= 13,824 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 16.4 min ( 818.2 - 801.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 338.50' | 5,610 cf | **53.75'W x 117.54'L x 3.50'H Field A**<br>22,112 cf Overall - 8,085 cf Embedded = 14,026 cf x 40.0% Voids |
| #2A | 339.00' | 8,085 cf | **ADS_StormTech SC-740 +Cap** x 176 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>176 Chambers in 11 Rows |
| #3 | 342.00' | 128 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |
| | | 13,824 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 342.00 | 32 | 0 | 0 |
| 344.00 | 32 | 64 | 64 |
| 346.00 | 32 | 64 | 128 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 338.50' | **30.000 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=4.39 cfs @ 11.75 hrs HW=338.58' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 4.39 cfs)

## Pond UG-1: SC-740 System - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

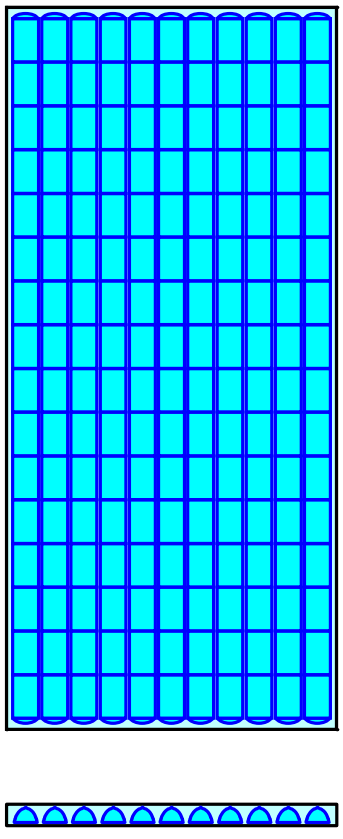
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
11 Rows x 51.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 53.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

176 Chambers x 45.9 cf = 8,085.4 cf Chamber Storage

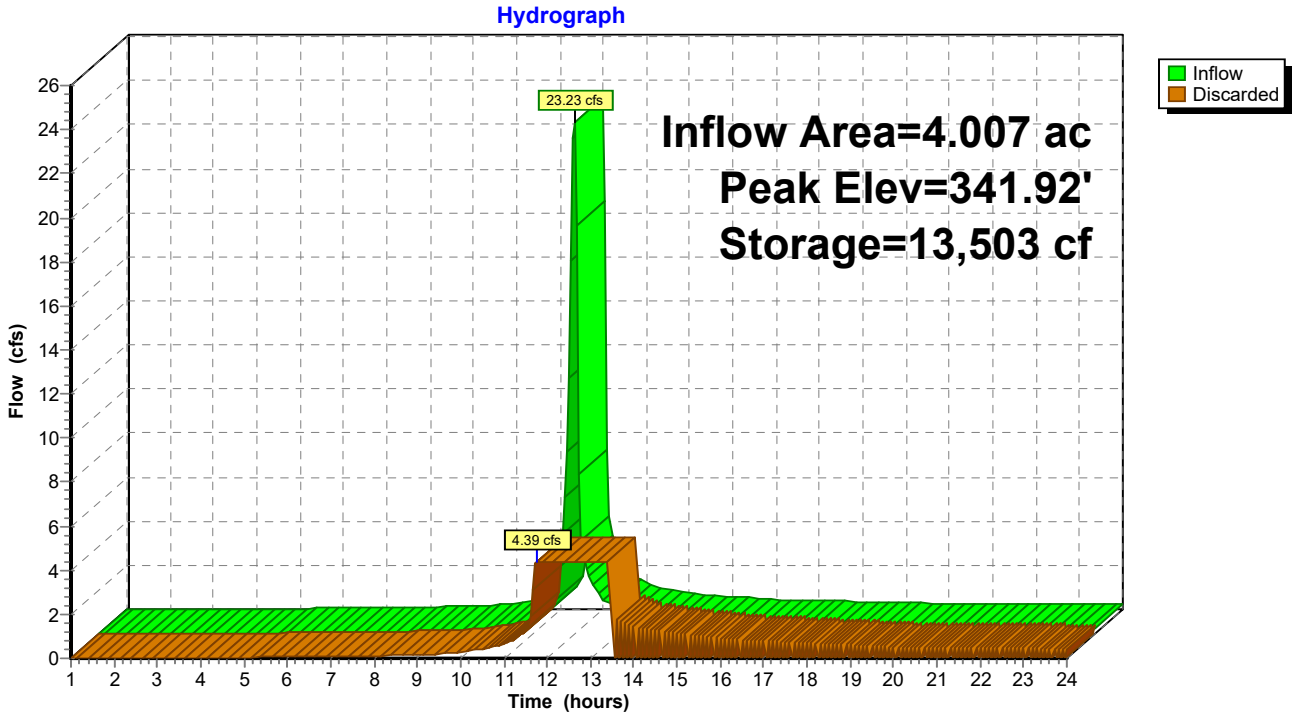
22,111.6 cf Field - 8,085.4 cf Chambers = 14,026.1 cf Stone x 40.0% Voids = 5,610.5 cf Stone Storage

Chamber Storage + Stone Storage = 13,695.9 cf = 0.314 af
Overall Storage Efficiency = 61.9%
Overall System Size = 117.54' x 53.75' x 3.50'

176 Chambers
818.9 cy Field
519.5 cy Stone



## Pond UG-1: SC-740 System



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# APPENDIX D:

WQv and NYSDEC GI Worksheets

Test #4 Depth: 54"

Times per 1" drop:
#1: 4 sec
#2: 5 sec
#3: 5 sec
#4: 5 sec

Deep Test @ #4: 7.5'
0"-10": Topsoil w/ organics and some gravel
11"-24": Yellow-Brown sand
25"-40": Brown-Gray sand
40"+: Gray sand
NO GROUNDWATER IDENTIFIED

Test #5 Depth: 50"

Times per 1" drop:
#1: 4 sec
#2: 5 sec
#3: 6 sec
#4: 6 sec
#5: 6 sec
#6: 6 sec

Test #3 Depth: 56"

Times per 1" drop:
#1: 4 sec
#2: 5 sec
#3: 7 sec
#4: 6 sec
#5: 6 sec

Test #2 Depth: 54"

Times per 1" drop:
#1: 5 sec
#2: 6 sec
#3: 7 sec
#4: 7 sec

Test not completed due to parked vehicles. Deep test relocated to #4.

Test not completed due to high volume of truck traffic and safety.

Test not completed due to parked vehicles. Deep test relocated to #7.

Deep Test @ #2: 7'
0"-12": Topsoil w/ organics and some gravel
13"-20": Yellow-Brown sand
21"-40": Brown-Gray sand
40"+: Gray sand
NO GROUNDWATER IDENTIFIED

Test #1 Depth: 48"

Times per 1" drop:
#1: 4 sec
#2: 3 sec
#3: 4 sec
#4: 4 sec

Test #6 Depth: 50"

Times per 1" drop:
#1: 5 sec
#2: 6 sec
#3: 6 sec
#4: 7 sec
#5: 7 sec

Test #7 Depth: 52"

Times per 1" drop:
#1: 3 sec
#2: 4 sec
#3: 4 sec
#4: 4 sec
#5: 5 sec

Deep Test @ #7: 7'
0"-12": Existing asphalt sections
13"-24": Compacted Brown sand
25"-40": Brown-Gray sand
40"+: Gray sand
NO GROUNDWATER IDENTIFIED

**Calculations for Determining Water Quality Volume for Wet Extended Detention Pond (Redevelopment):**

| | |
|---|---|
| Project: | Alltown Fresh - Moreau |
| Date: | 9/1/21 |
| Calc'd by: | A. LaPolt |
| Chk'd by: | J. O'Connor |

$$WQv_{req} = \frac{(P)(Rv)(A)}{12}$$

| | | | |
|---|---|---|---|
| *T*= | Proposed Total Impervious Area = | 2.35 | |
| *R*= | Existing Impervious Area = | 2.82 | |
| *N* = | WQv Impervious Area (T- R+(0.25*R) )= | 0.24 | |
| *P* = | *90% Rainfall Event* = | **1.2** | in. |
| *IC*= | *Percent Impervious Cover (N/T)* | 5.875 | |
| *Rv* = | *0.05 + 0.009(IC)* = | **0.1029** | (0.2 Min.) |
| *A* = | *Total Disturbed Area for Entire Project* = | **4.00** | ac. |

***WQv(i)* = 0.0412 ac. - ft. = 1792 CF**

Version 1.8
Last Updated: 11/09/2015

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

| Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?..... | No |
|---|---|

| Design Point: | 1 | |
|---|---|---|
| P= | 1.20 | *inch* |

*Manually enter P, Total Area and Impervious Cover.*

**Breakdown of Subcatchments**

| Catchment Number | Total Area *(Acres)* | Impervious Area *(Acres)* | Percent Impervious *%* | Rv | WQv *($ft^3$)* | Description |
|---|---|---|---|---|---|---|
| 1 | 4.00 | 0.24 | 6% | 0.10 | 1,812 | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| Subtotal (1-30) | 4.00 | 0.24 | 6% | 0.10 | **1,812** | **Subtotal 1** |
| **Total** | 4.00 | 0.24 | 6% | 0.10 | **1,812** | **Initial WQv** |

**Identify Runoff Reduction Techniques By Area**

| Technique | Total Contributing Area *(Acre)* | Contributing Impervious Area *(Acre)* | Notes |
|---|---|---|---|
| Conservation of Natural Areas | 0.00 | 0.00 | *minimum 10,000 sf* |
| Riparian Buffers | 0.00 | 0.00 | *maximum contributing length 75 feet to 150 feet* |
| Filter Strips | 0.00 | 0.00 | |
| Tree Planting | 0.00 | 0.00 | *Up to 100 sf directly connected impervious area may be subtracted per tree* |
| **Total** | **0.00** | **0.00** | |

**Recalculate WQv after application of Area Reduction Techniques**

| | Total Area *(Acres)* | Impervious Area *(Acres)* | Percent Impervious *%* | Runoff Coefficient Rv | WQv *($ft^3$)* |
|---|---|---|---|---|---|
| "<<Initial WQv" | 4.00 | 0.24 | 6% | 0.10 | 1,812 |
| Subtract Area | 0.00 | 0.00 | | | |
| WQv adjusted after Area Reductions | **4.00** | **0.24** | 6% | 0.10 | 1,812 |
| Disconnection of Rooftops | | 0.00 | | | |
| Adjusted WQv after Area Reduction and Rooftop Disconnect | 4.00 | 0.24 | 6% | 0.10 | **1,812** |
| WQv reduced by Area Reduction techniques | | | | | 0 |

# Minimum RRv

| **Enter the Soils Data for the site** | | |
|---|---|---|
| Soil Group | Acres | S |
| A | 4.00 | 55% |
| B | | 40% |
| C | | 30% |
| D | | 20% |
| Total Area | 4 | |
| **Calculate the Minimum RRv** | | |
| S = | **0.55** | |
| Impervious = | 0.24 | *acre* |
| Precipitation | 1.2 | *in* |
| Rv | 0.95 | |
| **Minimum RRv** | **546** | ***ft3*** |
| | 0.01 | af |

# NOI QUESTIONS

| # | NOI Question | Reported Value | |
|---|---|---|---|
| | | cf | af |
| 28 | Total Water Quality Volume (WQv) Required | 1812 | *0.042* |
| 30 | Total RRV Provided | 1812 | *0.042* |
| 31 | Is RRv Provided ≥WQv Required? | Yes | |
| 32 | Minimum RRv | 546 | *0.013* |
| 32a | Is RRv Provided ≥ Minimum RRv Required? | Yes | |
| | | | |
| 33a | Total WQv Treated | 0 | *0.000* |
| 34 | Sum of Volume Reduced & Treated | 1812 | *0.042* |
| 34 | Sum of Volume Reduced and Treated | 1812 | *0.042* |
| 35 | Is Sum RRv Provided and WQv Provided ≥WQv Required? | Yes | |

| Apply Peak Flow Attenuation | | | |
|---|---|---|---|
| 36 | Channel Protection | *Cpv* | |
| 37 | Overbank | *Qp* | |
| 37 | Extreme Flood Control | *Qf* | |
| | Are Quantity Control requirements met? | | |

# Infiltration Basin Worksheet

| Design Point: | 1 |
|---|---|

| Enter Site Data For Drainage Area to be Treated by Practice | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Catchment Number** | **Total Area** *(Acres)* | **Impervious Area** *(Acres)* | **Percent Impervious** *%* | **Rv** | **WQv** *($ft^3$)* | **Precipitation** *(in)* | **Description** |
| 1 | 4.00 | 0.24 | 0.06 | 0.10 | 1812.10 | 1.20 | |
| Enter Impervious Area Reduced by Disconnection of Rooftops | | 0.00 | 6% | 0.10 | 1,812 | <<WQv after adjusting for Disconnected Rooftops | |
| Enter the portion of the WQv that is not reduced for all practices routed to this practice. | | | | | 0 | *$ft^3$* | |

| Pretreatment Techniques to Prevent Clogging | | | |
|---|---|---|---|
| Infiltration Rate | 30.00 | *in/hour* | *Okay* |
| Pretreatment Sizing | 100 | *% WQv* | *25% minimum;*<br>*50% if >2 in/hr*<br>*100% if >5in/hour* |
| Pretreatment Required Volume | 1,812 | *$ft^3$* | |
| Pretreatment Provided | 2,000 | *$ft^3$* | |
| Pretreatment Techniques utilized | *Other* | | |

| Size An Infiltration Basin | | | |
|---|---|---|---|
| Design Volume | 1,812 | *$ft^3$* | WQv |
| Basal Area Required | 604 | *$ft^2$* | *Infiltration practices shall be designed to exfiltrate the entire WQv through the floor of each practice.* |
| Basal Area Provided | 6,318 | *$ft^2$* | |
| Design Depth | 3.00 | *ft* | |
| Volume Provided | 18,954 | *$ft^3$* | *Storage Volume provided in infiltration basin area (not including pretreatment.* |

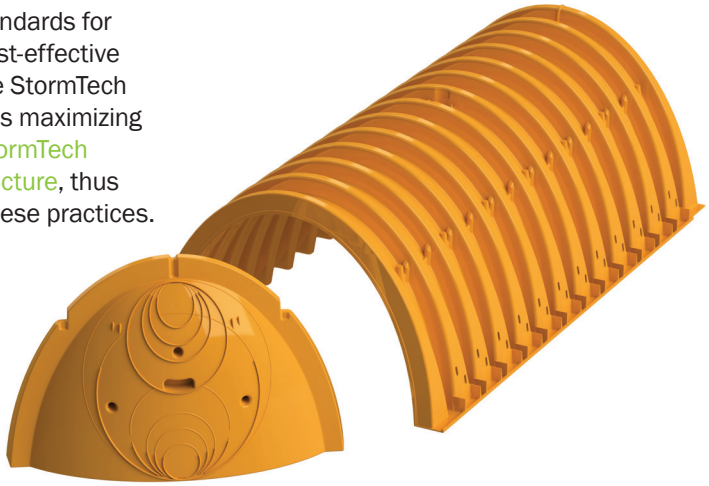
| Determine Runoff Reduction | | | |
|---|---|---|---|
| **RRv** | **1,812** | ***$ft^3$*** | ***90% of the storage provided in the basin or WQv whichever is smaller*** |
| Volume Treated | 0 | *$ft^3$* | *This is the portion of the WQv that is not reduced/infiltrated* |
| Sizing √ | OK | | *The infiltration basin must provide storage equal to or greater than the WQv of the contributing area.* |

# APPENDIX E:

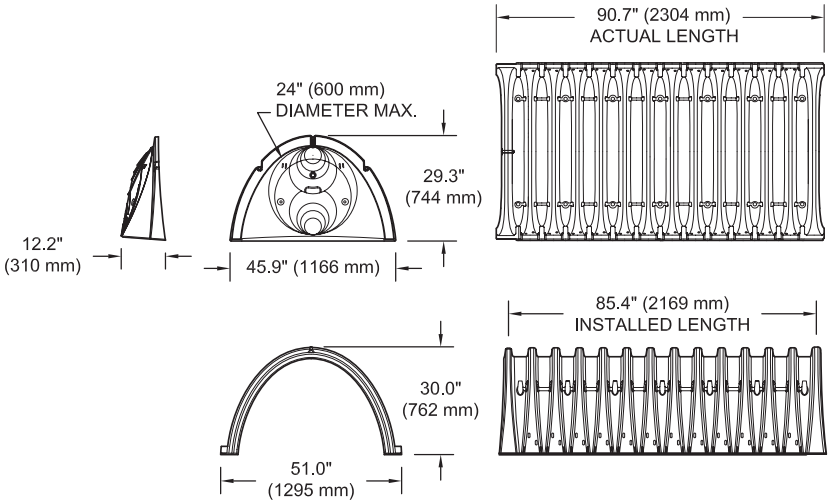
Proposed Practices Designs

# STORMTECH SC-740 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



**STORMTECH SC-740 CHAMBER**
(not to scale)




**Nominal Chamber Specifications**

**Size (L x W x H)**
85.4" x 51" x 30"
2,170 mm x 1,295 mm x 762 mm

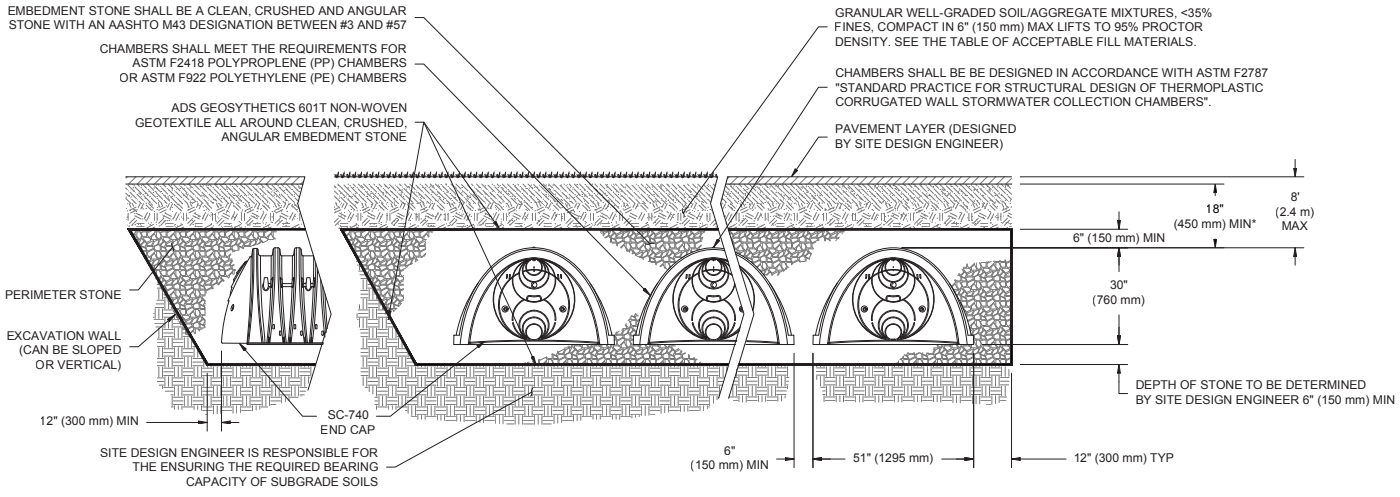
**Chamber Storage**
45.9 ft³ (1.30 m³)

**Min. Installed Storage***
74.9 ft³ (2.12 m³)

**Weight**
74.0 lbs (33.6 kg)

**Shipping**
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.




*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

# SC-740 CUMULATIVE STORAGE VOLUMES PER CHAMBER

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

| Depth of Water in System Inches (mm) | | Cumulative Chamber Storage ft³ (m³) | Total System Cumulative Storage ft³ (m³) |
|---|---|---|---|
| 42 (1067) | | 45.90 (1.300) | 74.90 (2.121) |
| 41 (1041) | | 45.90 (1.300) | 73.77 (2.089) |
| 40 (1016) | Stone | 45.90 (1.300) | 72.64 (2.057) |
| 39 (991) | Cover | 45.90 (1.300) | 71.52 (2.025) |
| 38 (965) | | 45.90 (1.300) | 70.39 (1.993) |
| 37 (940) | | 45.90 (1.300) | 69.26 (1.961) |
| 36 (914) | | 45.90 (1.300) | 68.14 (1.929) |
| 35 (889) | | 45.85 (1.298) | 66.98 (1.897) |
| 34 (864) | | 45.69 (1.294) | 65.75 (1.862) |
| 33 (838) | | 45.41 (1.286) | 64.46 (1.825) |
| 32 (813) | | 44.81 (1.269) | 62.97 (1.783) |
| 31 (787) | | 44.01 (1.246) | 61.36 (1.737) |
| 30 (762) | | 43.06 (1.219) | 59.66 (1.689) |
| 29 (737) | | 41.98 (1.189) | 57.89 (1.639) |
| 28 (711) | | 40.80 (1.155) | 56.05 (1.587) |
| 27 (686) | | 39.54 (1.120) | 54.17 (1.534) |
| 26 (660) | | 38.18 (1.081) | 52.23 (1.479) |
| 25 (635) | | 36.74 (1.040) | 50.23 (1.422) |
| 24 (610) | | 35.22 (0.977) | 48.19 (1.365) |
| 23 (584) | | 33.64 (0.953) | 46.11 (1.306) |
| 22 (559) | | 31.99 (0.906) | 44.00 (1.246) |
| 21 (533) | | 30.29 (0.858) | 1.85 (1.185) |
| 20 (508) | | 28.54 (0.808) | 39.67 (1.123) |
| 19 (483) | | 26.74 (0.757) | 37.47 (1.061) |
| 18 (457) | | 24.89 (0.705) | 35.23 (0.997) |
| 17 (432) | | 23.00 (0.651) | 32.96 (0.939) |
| 16 (406) | | 21.06 (0.596) | 30.68 (0.869) |
| 15 (381) | | 19.09 (0.541) | 28.36 (0.803) |
| 14 (356) | | 17.08 (0.484) | 26.03 (0.737) |
| 13 (330) | | 15.04 (0.426) | 23.68 (0.670) |
| 12 (305) | | 12.97 (0.367) | 21.31 (0.608) |
| 11 (279) | | 10.87 (0.309) | 18.92 (0.535) |
| 10 (254) | | 8.74 (0.247) | 16.51 (0.468) |
| 9 (229) | | 6.58 (0.186) | 14.09 (0.399) |
| 8 (203) | | 4.41 (0.125) | 11.66 (0.330) |
| 7 (178) | | 2.21 (0.063) | 9.21 (0.264) |
| 6 (152) | | 0 (0) | 6.76 (0.191) |
| 5 (127) | | 0 (0) | 5.63 (0.160) |
| 4 (102) | Stone | 0 (0) | 4.51 (0.128) |
| 3 (76) | Foundation | 0 (0) | 3.38 (0.096) |
| 2 (51) | | 0 (0) | 2.25 (0.064) |
| 1 (25) | | 0 (0) | 1.13 (0.032) |

**Note:** Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

## STORAGE VOLUME PER CHAMBER FT³ (M³)

| | Bare Chamber Storage ft³ (m³) | Chamber and Stone Foundation Depth in. (mm) | | |
|---|---|---|---|---|
| | | 6 (150) | 12 (300) | 18 (450) |
| SC-740 Chamber | 45.9 (1.3) | 74.9 (2.1) | 81.7 (2.3) | 88.4 (2.5) |

**Note:** Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

## AMOUNT OF STONE PER CHAMBER

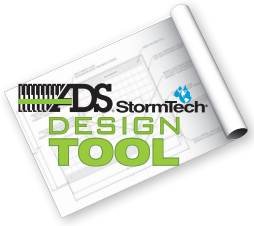
| ENGLISH TONS (yds³) | Stone Foundation Depth | | |
|---|---|---|---|
| | 6" | 12" | 16" |
| SC-740 | 3.8 (2.8) | 4.6 (3.3) | 5.5 (3.9) |
| **METRIC KILOGRAMS (m³)** | **150 mm** | **300 mm** | **450 mm** |
| SC-740 | 3,450 (2.1) | 4,170 (2.5) | 4,490 (3.0) |

**Note:** Assumes 6" (150 mm) of stone above and between chambers.

## VOLUME EXCAVATION PER CHAMBER YD³ (M³)

| | Stone Foundation Depth | | |
|---|---|---|---|
| | 6 (150) | 12 (300) | 18 (450) |
| SC-740 | 5.5 (4.2) | 6.2 (4.7) | 6.8 (5.2) |

**Note:** Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.




**Working on a project?**
**Visit us at www.stormtech.com**
**and utilize the StormTech Design Tool**

**For more information on the StormTech SC-740 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710**

*THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™*

**Advanced Drainage Systems, Inc.**
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

# Downstream Defender®

## High-Level Treatment in a Small Footprint

### Product Profile

The Downstream Defender® is an advanced vortex separator used to treat stormwater runoff in pretreatment or stand-alone applications. Its unique flow-modifying internal components distinguish the Downstream Defender® from conventional and simple swirl separators that typically bypass untreated peak flows to prevent washout of captured pollutants. Its wide treatment flow range, low headloss, small footprint and low-profile make it a compact and economical solution for capturing nonpoint source pollution.

### Components

1. Inlet to Precast Vortex Chamber
2. Cylindrical Baffle
3. Center Shaft
4. Outlet Pipe
5. Sediment Storage Sump
6. Access Lid

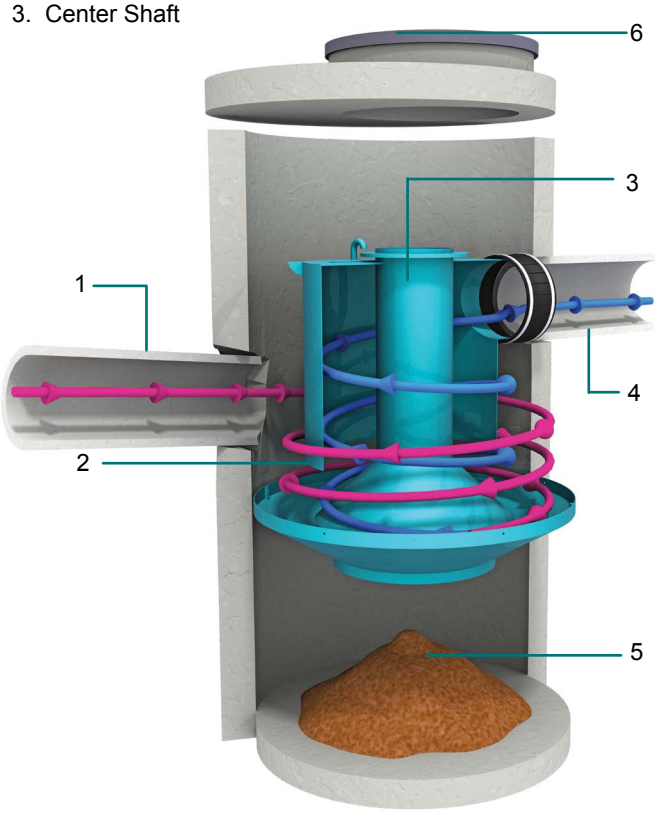



**Fig.1** The Downstream Defender® has internal components designed to maximize pollutant capture and minimize pollutant washout.

### Applications

- Removal of total suspended solids (TSS), floatable trash and petroleum products from stormwater runoff
- New construction or redevelopment of commercial and residential sites
- Pollutant hotspots such as maintenance yards, parking lots, gas stations, streets, highways, airports and transportation hubs
- Site constrained LID or green infrastructure based developments
- LEED® development projects

### Advantages

- Special internal components maximize pollutant capture and minimize footprint, headloss and washout
- Captures and retains a wide range of TSS particles
- High peak treatment flow rates
- Treats the entire storm with no washout or untreated bypass flows
- Low maintenance requirements - no dredging required, and no screens or media to block
- Variable inlet/outlet angles for ease of site layout

### How it Works

Advanced hydrodynamic vortex separation is a complex hydraulic process that augments gravity separation with low-energy rotary forces. The flow modifying internal components used in the Downstream Defender® harness the energy from vortex flow and maximize the time for separation to occur while deflecting high scour velocities (**Fig.1**).

Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (magenta arrow) and inner (blue arrow) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe. Maintenance ports at ground level provide access for easy inspection and clean-out.

# Downstream Defender®

## Drainage Profile

The Downstream Defender® is designed with a submerged tangential inlet to minimize turbulence within the device. Turbulence increases system headlosses and reduces performance by keeping pollutant particles in suspension.

The inlet elevation of the Downstream Defender® is located one inlet pipe diameter lower than the elevation of the outlet invert (**Fig.2**). This arrangement ensures that influent flows are introduced to the treatment chamber quiescently below the water surface elevation, minimizing turbulence.

The unique flow-modifying internal components also minimize hydraulic losses. There are no internal weirs or orifices; large clear openings ensure low headloss at peak flow rates with little risk of blockages that cause upstream flooding.

## Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

## Sizing & Design

The Downstream Defender® can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1)**. Selection and layout of the appropriate Downstream Defender® model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a)** and offline (**Fig.3b**) configurations are common.

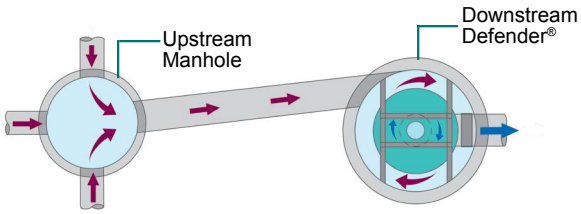



**Fig.3a** The Downstream Defender® in an online configuration.

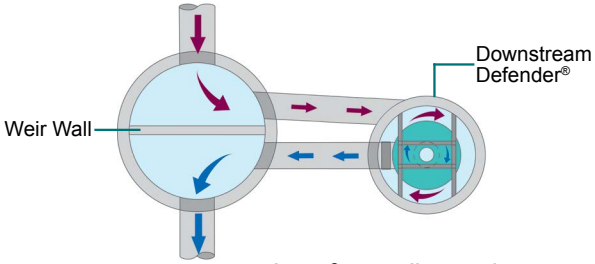



**Fig.3b** The Downstream Defender® in an offline configuration.

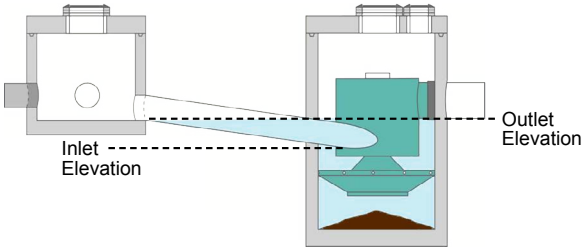



**Fig.2** The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

### Free *Stormwater Sizing Tool*

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

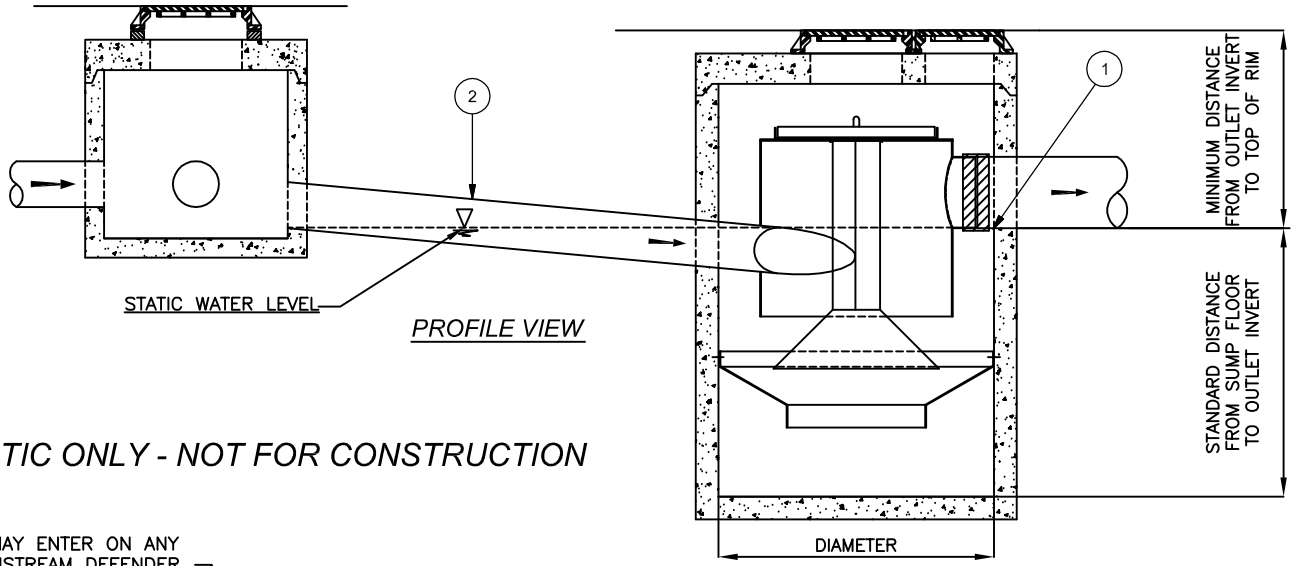
Go to hydro-int.com/sizing to access the tool.

**Table 1.** Downstream Defender® Design Chart.

| Model Number and Diameter | | Peak Treatment Flow Rate | | Maximum Pipe Diameter | | Oil Storage Capacity | | Sediment Storage Capacity | | Minimum Distance from Outlet Invert to Top of Rim | | Standard Height from Outlet Invert to Sump Floor | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ft) | (m) | (cfs ) | (L/s) | (in) | (mm) | (gal) | (L) | ($yd^3$) | ($m^3$) | (ft) | (m) | (ft) | (m) |
| 4 | 1.2 | 3.0 | 85 | 12 | 300 | 70 | 265 | 0.70 | 0.53 | 2.8 | 0.85 | 4.1 | 1.25 |
| 6 | 1.8 | 8.0 | 227 | 18 | 450 | 216 | 818 | 2.10 | 1.61 | 3.2 | 0.98 | 5.9 | 1.80 |
| 8 | 2.4 | 15.0 | 425 | 24 | 600 | 540 | 2,044 | 4.65 | 3.56 | 4.2 | 1.28 | 7.7 | 2.35 |
| 10 | 3.0 | 25.0 | 708 | 30 | 750 | 1,050 | 3,975 | 8.70 | 6.65 | 5.0 | 1.52 | 9.4 | 2.85 |
| 12* | 3.7 | 38.0 | 1,076 | 36 | 900 | 1,770 | 6,700 | 14.70 | 11.24 | 5.6 | 1.71 | 11.2 | 3.41 |

*Not available in all areas. Contact Hydro International for details.

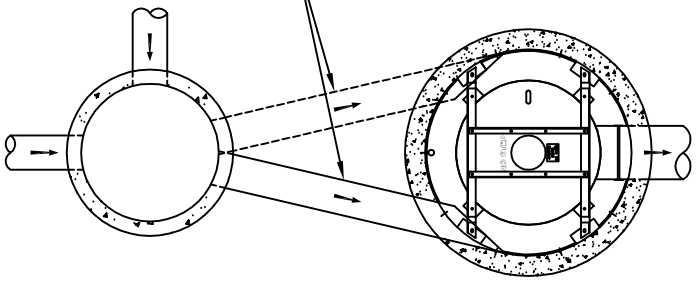
Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com




*PROFILE VIEW*

## *SCHEMATIC ONLY - NOT FOR CONSTRUCTION*

TANGENT INLET MAY ENTER ON ANY SIDE OF THE DOWNSTREAM DEFENDER



*PLAN VIEW*

**DESIGN NOTES:**

*1) THE OUTLET PIPE INVERT SHOULD BE AT THE SAME ELEVATION OR LOWER THAN INVERTS INTO THE UPSTREAM CHAMBER.*

2) THE DOWNSTREAM DEFENDER HAS A SUBMERGED INLET PIPE. THE INLET PIPE INVERT IS ONE INLET PIPE DIAMETER BELOW THE OUTLET PIPE INVERT. THE INLET PIPE ENTERS THE UNIT TANGENTIALLY. THE INLET PIPE SLOPE SHOULD NOT EXCEED 15%. HEADLOSS AT PEAK TREATMENT FLOW USES THE MAXIMUM PIPE DIAMETER FOR THAT UNIT. HEADLOSS WILL INCREASE WITH SMALLER INLET PIPES.

3) * DISTANCES ARE APPROXIMATE AND DEPEND ON TOP SLAB THICKNESS. ASSUMES A 4" FRAME AND COVER. CONFIRM WITH A HYDRO REPRESENTATIVE.

4) ** MAY NOT BE AVAILABLE IN ALL AREAS. CONFIRM WITH A HYDRO REPRESENTATIVE.

| MODEL NUMBER & DIAMETER (FT) | PEAK TREATMENT FLOW (CFS) | MAXIMUM PIPE DIAMETER (IN) | HEADLOSS AT PEAK TREATMENT FLOW (IN) | OIL STORAGE CAPACITY (GALLONS) | SEDIMENT STORAGE CAPACITY (CUBIC YARDS) | MIN. DIST. FROM OUTLET INVERT TO TOP OF RIM (FT) * | STANDARD DIST. FROM SUMP FLOOR TO OUTLET INVERT (FT) |
|---|---|---|---|---|---|---|---|
| 4 | 3.0 | 12 | 8 | 70 | 0.70 | 2.8 | 4.08 |
| 6 | 8.0 | 18 | 12 | 216 | 2.10 | 3.24 | 5.86 |
| 8 | 15.0 | 24 | 13 | 540 | 4.65 | 4.2 | 7.67 |
| 10 ** | 25.0 | 30 | 15 | 1,050 | 8.70 | 5.0 | 9.44 |
| 12 ** | 38.0 | 36 | 16 | 1,770 | 14.70 | 5.6 | 11.18 |

NOTES:

REVISION HISTORY

| REV | BY | DATE | DESCRIPTION |
|---|---|---|---|
| 1 | KJM | 6/7/12 | MIN RIM |

DATE: 11/1/2011

SCALE: NTS

DRAWN: EMH

CHECKED:

APPROVED:

TITLE

DOWNSTREAM DEFENDER®

STORM DRAIN FIT

Hydro International stormwater

94 Hutchins Drive
Portland, Maine 04102
Tel: (207) 756-6200
Fax: (207) 756-6212
Email:
stormwaterinquiry@hil-tech.com



CAD Ref.: SDFIT

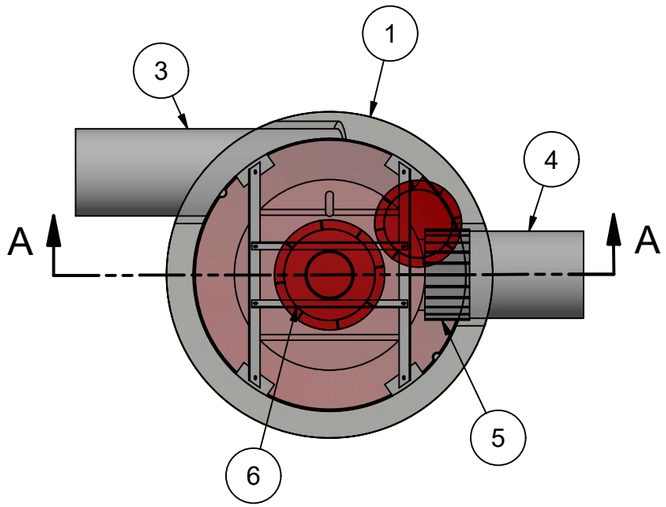
Project No.:

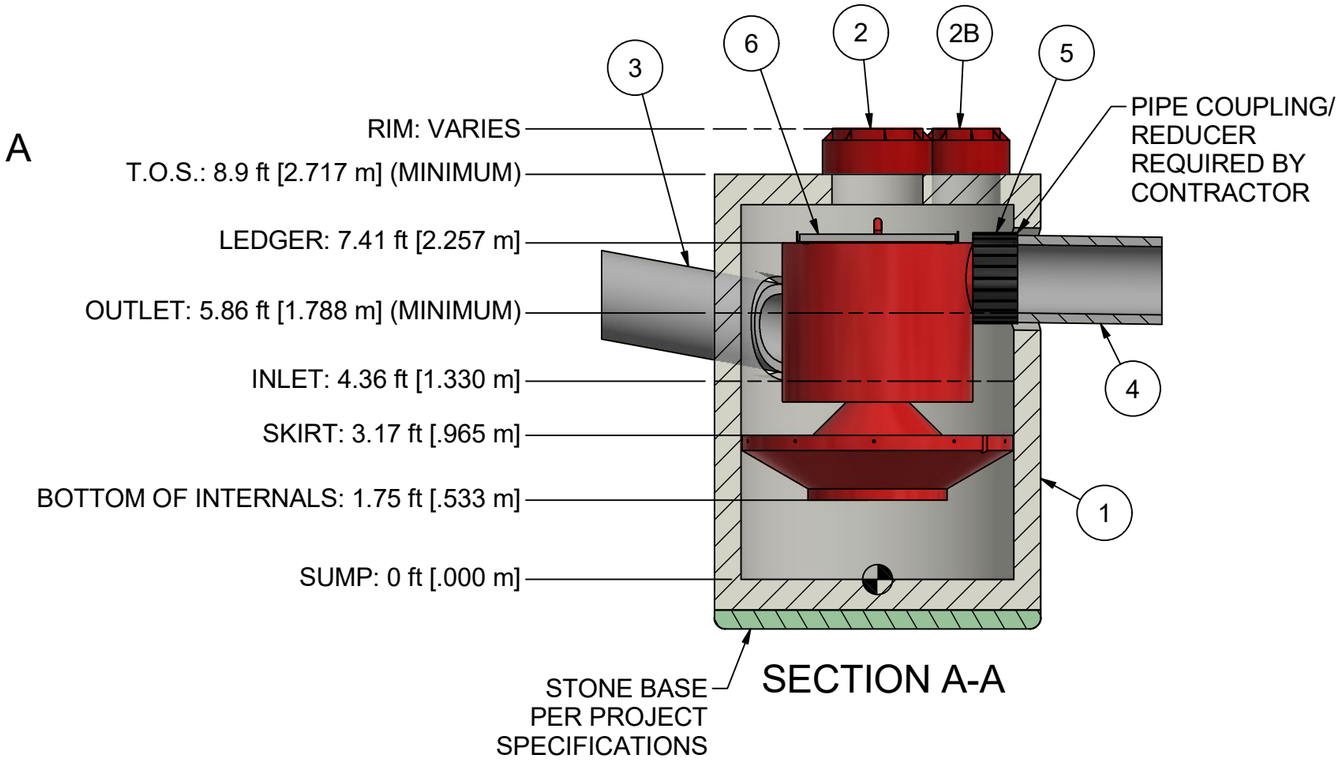
Drawing No.: SDFIT

# APPENDIX F:

Geotechnical Investigation

OUTLET STUB ID: 18" (450 mm)
OUTLET STUB OD: 18.7" (475 mm)




SECTION A-A

NOTE: NOT FOR CONSTRUCTION.
CONTACT HYDRO FOR SITE SPECIFIC DETAIL

HYDRO FRAME AND COVER (INLCUDED)
GRADE RINGS BY OTHERS AS REQUIRED

EQUIPMENT PERFORMANCE

The stormwater treatment unit shall adhere to the hydraulic parameters given in the chart below and provide the removal efficiencies and storage capacities as follows:

1. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
2. Peak Hydraulic Capacity: 8.0 cfs (227 l/s)
3. Sediment Storage Capacity: 2.10 cu. yd. (1.59 cu. m)
4. Continuous Oil Storage Capacity: 216 gal. (818 liters)
5. Sediment shall be stored in a zone that is isolated from the main flow path and protected from reintrainment by a benching skirt.
6. For more product information including regulatory acceptances, please visit https://hydro-int.com/en/products/downstream-defender

PARTS LIST

| ITEM | QTY | SIZE (in) | SIZE (mm) | DESCRIPTION |
|---|---|---|---|---|
| 1 | 1 | 72 | 1800 | PRECAST MANHOLE (BY HYDRO VIA PRECASTER) |
| 2 | 3 | 24 | 600 | FRAME AND COVER |
| 2B | 1 | 18 | 450 | FRAME AND COVER |
| 3 | 1 | 18 (MAX) | 450 (MAX) | MAX INLET PIPE (BY OTHERS) |
| 4 | 1 | 18 (MAX) | 450 (MAX) | MAX OUTLET PIPE (BY OTHERS) |
| 5 | 1 | | | PIPE COUPLING (BY OTHERS) |
| 6 | 1 | | | INTERNAL COMPONENTS (PRE-INTALLED) |

PROJECTION

**IF IN DOUBT ASK**

COMMENTS:

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.

| DATE: | SCALE: |
|---|---|
| 10/8/2019 | NTS |

| DRAWN BY: | CHECKED BY: | APPROVED BY |
|---|---|---|
| ER | MRJ | |

Title: 6ft-DIAMETER DOWNSTREAM DEFENDER

Hydro International®
hydro-int.com
HYDRO INTERNATIONAL

**DO NOT SCALE DRAWING**
**STEEL FABRICATION TOLERANCES**
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

| LINEAR | ANGULAR |
|---|---|
| 000 - 012in = ±0.04in | 000 - 120in = ±1° |
| 012 - 024in = ±0.06in | 120 - 240in = ±0.5° |
| 024 - 048in = ±0.08in | 240in >>>> = ±0.25° |
| 048 - 120in = ±0.12in | |
| 120in >>>> = ±0.20in | |

| WEIGHT: | MATERIAL: |
|---|---|
| N/A | |

REFERENCE NUMBER:

DRAWING NO.: 6'DD-GA

| SHEET SIZE: | SHEET: | Rev: |
|---|---|---|
| B | 1 OF 1 | A |

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