INSITE
ENGINEERING, SURVEYING &
LANDSCAPE ARCHITECTURE, P.C.

# STORMWATER POLLUTION PREVENTION PLAN

## For

## FWL Group, LLC

## 200/280 Fields Lane

## Town of Southeast, New York

**July 23, 2018**

**Revised September 5, 2018**

**Owner/Applicant Information:**

FWL Group, LLC
200/280 Fields Lane
Southeast, NY 10509

**Note: This report in conjunction with the project plans make up the complete Stormwater Pollution Prevention Plan.**

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## 1.0 INTRODUCTION

### 1.1 Project Description

The FWL Group, LLC is proposing to construct a commercial building on an undeveloped property. The total area of the property is 13.05± acres and is located in the OP-1 Zoning District in the Town of Southeast. The property is identified as Town of Southeast Tax Map No. 78.-2-1 & No. 78.-2-2.

Construction of a 28,500-sf commercial building (office and warehouse) with associated parking, lighting, landscaping, mitigation areas, stormwater management areas, a private well and private septic system. The property contains a pond and is bordered by wetlands on all sides with Fields Lane on the southern side of the property. Portions of the access drives are proposed within the wetland-controlled areas as shown on the attached plans. All impervious surfaces are located outside the NYCDEP limiting distance to a wetland or watercourse. The two subject lots are proposed to be merged under the 280 Fields Lane parcel (Tax Map No. 78.-2-1).

Stormwater runoff for the site will be captured in an onsite stormwater collection and conveyance system consisting of catch basins, manholes and HDPE pipe. The stormwater collection system will convey the stormwater runoff to stormwater management practices (SMP's) for treatment. All components of the stormwater collection, conveyance, and treatment system have been designed to meet the following requirements:

- New York State Stormwater Management Design Manual (Design Manual)
- *NYCDEP Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and its Sources* (Rules and Regulations).
- *Town of Southeast Town Code, Chapter 119 – Stormwater Management and Erosion and Sediment Control (Chapter 119)*

The following permits are required for the subject property:

| **TOWN OF SOUTHEAST** |
|---|
| Site Plan Approval |
| **PUTNAM COUNTY DEPARTMENT OF HEALTH** |
| Water and Sewer System Approval |
| **NEW YORK CITY DEPARTMENT OF ENVIROMENTAL PROTECTION** |
| SWPPP Approval |
| Sewer Approval |
| **NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION** |
| SWPPP General Permit Coverage |

## 1.2 Existing Site Conditions

The existing property is primarily forested and undeveloped. Existing features of the site include a 3.7-acres pond, a concrete block pump house used for the pond and a gravel trail that circles around a portion of the property. There are approximately 4.3 acres of existing impervious surface including the pond.

The property is bound on the northwest by Route 684, by commercial development to the east, and undeveloped properties to the south. The property contains a town of Southeast regulated wetland on the north, east and west property lines.

The eastern portion of the property contains a high point in the center and slopes downward toward the property lines. All of the runoff from the site sheet flows into the wetland or the Pond. The western portion of the wetland contains a pond and stream/channel that flows out of the northeast corner of the pond. The eastern portion of the wetland also contains a stream/channel that is conveyed North until it converges with the stream from the pond. This will be the point at which the drainage design is analyzed.

## 1.3 Proposed Site Conditions

It is proposed to redevelop the property as cited Section 1.1. A total of 5.8 acres of impervious surfaces are proposed (including the pond), which is an increase of 1.5 acres from the existing conditions. A parking area will be located on the West and North side of the proposed building.

There will be disturbance associated with this project within the controlled areas of the wetlands and pond. Mitigation plantings are proposed to offset the disturbance to the controlled areas along with enhance the existing environment by removing invasive species, debris and surfaces not natural to the environmental that are existing onsite.

## 2.0 STORMWATER MANAGEMENT

The proposed stormwater management system for this SWPPP has been designed to meet the requirements of local, regional, and state stormwater ordinances and guidelines, including but not limited to those of the Town of Somers, the NYSDEC, and the NYCDEP. Specifically, the following codes / regulations have been used to design this SWPPP:

- *NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities, General Permit GP-0-15-002* (GP-0-15-002).
- *NYCDEP Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and its Sources* (Rules and Regulations).
- *Town of Southeast Town Code, Chapter 119 – Stormwater Management and Erosion and Sediment Control* (Chapter 119).

The subject parcel is located within the Muscoot Reservoir Watershed for which a TMDL has been established. The TMDL Implementation Plan clearly states, that for simplicity and ease of local government administration, the plan is largely structured to use existing programs to achieve reductions. These programs include:

- Potential additional point source reductions.
- NYSDEC SPDES General Permit for Stormwater Discharges for Municipal Separate Stormwater Sewer Systems (MS4s) Permit No. GP-0-15-003.
- State and regional source control and agricultural programs.
- US EPA Filtration Avoidance Determination Program.
- Westchester County "Croton Plan".
- NYCDEP "Croton Strategy".
- NYCDEP EOH Water Quality Investment Funds.
- New York State non-point source programs.
- NYSDEC – NYCDEP Coordinated Stormwater Enforcement Protocol.

This SWPPP is consistent with the TMDL Implementation Plan and applicable portions of the above-cited programs. Although the TMDL Implementation Plan in large part utilizes GP-0-15-003 to achieve phosphorus reductions it is also noteworthy to mention General Permit GP-0-15-002, for which this application will be required to receive coverage under. Through compliance with this permit, which requires enhanced stormwater design in the NYC East of Hudson Watershed targeted at removing phosphorus, this SWPPP is consistent with TMDL Implementation Plan.

Relative to stormwater permitting this project will require the following permits:

1. *NYSDEC Coverage under SPDES General Permit for Stormwater Discharges from Construction Activities, General Permit No. GP-0-15-002* (General Permit).
2. *NYCDEP Stormwater Pollution Prevention Plan Approval* because over 40,000 square feet of impervious surfaces are proposed and the project is proposing over 2 acres of disturbance and on slopes greater than 15%.

Since the subject project proposes the disturbance of more than 1 acre the Town of Southeast and General Permit require post construction stormwater management controls for the project. As such, the latest edition of the NYSDEC *New York State Stormwater Management Design Manual* (Design Manual), including Chapter 10: *Enhanced Phosphorus Removal Standards* (Chapter 10), was referenced for the design of the proposed stormwater collection, conveyance and treatment system. A discussion of the requirements of Chapter 10 is included below.

The Design Manual specifies five design criteria that are discussed in detail below. They are Runoff Reduction Volume ($RR_v$), Water Quality Volume ($WQ_v$), Stream Channel Protection Volume ($CP_v$), Overbank Flood Control ($Q_f$), and Extreme Flood Control ($Q_p$). The first two requirements relate to treating water quality, while the latter pertain to stormwater quantity (peak flow) attenuation.

With regard to NYCDEP requirements, Section 18-39 of the Rules and Regulations requires a SWPPP Approval for this project. For further discussion on NYCDEP requirements, refer to Section 2.6 below. However, it should be noted that in addition to the Design Manual requirements, two different SMP's are required to be placed in series.

To meet the above referenced requirements, the following post construction stormwater management practices (not including green infrastructure practices – these are discussed separately) are proposed for the project:

**Table 2.0.1 – Proposed SMP Design Criteria Summary Table**

| Proposed SMP ID | NYSSMDM Ch. 6/Ch.5 Design Designation | NYSDEC Uniform Stormwater Sizing Criteria | NYCDEP Requirement Satisfied |
|---|---|---|---|
| HDS 1.1 | Verified Proprietary Practice | Not applicable, Provided solely to meet Rules and Regulations | Pre-treatment to subsurface infiltration. |
| SMP 1.1P | I-4, Subsurface Infiltration | $WQ_v$, $CP_v$ | First practice in series. |
| Cistern 1 | Rain Barrels and Cisterns | $WQ_v$, $CP_v$ | Second practice in series |

To address stormwater quantity requirements of both the NYSDEC and NYCDEP, the "HydroCAD" Stormwater Modeling System," by HydroCAD Software Solutions LLC in Tamworth, New Hampshire, was used to model and assess the peak stormwater flows for the subject project. HydroCAD is a computer aided design program for modeling the hydrology and hydraulics of stormwater runoff. It is based primarily on hydrology techniques developed by the United States Department of Agriculture, Soil Conservation Service (USDA, SCS) TR-20 method combined with standard hydraulic calculations. For details on the input data for the subcatchments and design storms, refer to Appendices A, G and H:

The input requirements for the HydroCAD computer program are as follows:

Subcatchments (contributing watershed/sub-watersheds)

- Design storm rainfall in inches
- CN (runoff curve number) values which are based on soil type and land use/ground cover
- Tc (time of concentration) flow path information

Stormwater Basins

- Surface area at appropriate elevations
- Flood elevation
- Outlet structure information

**Table 2.0.2 – Precipitation Values for Corresponding Design Storms**

| Design Storm | 24-Hour Rainfall |
|---|---|
| 1-Year | 2.8" |
| 10-Year | 5.0" |
| 100-Year | 8.9" |

## 2.1 Chapter 10: Enhanced Phosphorus Removal Standards

As noted above, the New York City East of Hudson Watershed has been identified in the SPDES General Permit GP-0-15-002 as a watershed requiring compliance with the Enhanced Phosphorus Removal Standards when post-construction stormwater management practices are proposed. Chapter 10 requires additional treatment requirements for new development, establishing a larger water quality volume, as well additional design standards for each proposed SMP. Chapter 10 establishes four goals to meet sizing performance standards:

- Goal 1: Reducing Runoff Volumes
- Goal 2: Effective Bypass Treatment
- Goal 3: Achieving Effluent Concentrations for Particulate Phosphorus
- Goal 4: Achieving Effluent Concentrations for Dissolved Phosphorus

In order to achieve the first goal, the site design shall," assess the feasibility of hydrological source controls and reduce the total water quality volume by source control, implementation of green infrastructure, or standard SMP's with $RR_v$ capacity, according to the process defined in Chapters 3, 4 and 5 of the Design Manual. Each plan must include a rationale for acceptance and rejection of the various controls." A discussion on $RR_v$ can be found in Section 2.2 below. As mentioned above the site consists of soils belonging to the Hydrologic Soil Group B. Preliminary onsite soil testing was performed in order to determine the feasibility of using infiltration. Based on the results, there is an opportunity to provide infiltration. Where possible it has been provided. Therefore, it is possible to provide the entire $RR_v$ at the site (refer to Section 2.2). This SWPPP will demonstrate that it maximizes the RRv that can be provided based upon the onsite soils, and provides more than the required $RR_v$ minimum.

Goal 2 cites that proposed stormwater management practices (SMP's) should achieve less than 15% effective treatment bypass of the long-term runoff volume. Chapter 10 further notes this goal is satisfied by capturing and treating the 1-year 24-hour design storm. The NYSDEC / NYCDEP stormwater quality treatment practices proposed for this project listed in Table 2.0.1 above. Additional detail has been presented in the following sections. All practices have been designed in accordance with Chapter 10 by utilizing the 1-yr, 24-hour design storm to generate the $WQ_v$ / $RR_v$. As such, Goal 2 has been achieved in this SWPPP.

Achieving effluent concentrations for particulate phosphorus, Goal 3, is satisfied by achieving an 80% net removal of particulate phosphorus for a median influent concentration of 0.5mg/l. Chapter 10 states that through designing proposed SMP's in accordance with Section 10.4 this goal will be achieved. All proposed SMP's have been designed in accordance with Section 10.4.4 of Chapter 10 thus satisfying the requirements of this goal.

Goal 4, achieving effluent concentration for dissolved phosphorus, is achieved by obtaining a 60% net removal of dissolved phosphorus given a median influent concentration of 0.15mg/l. As with Goal 3, Goal 4 is achieved by designing the proposed SMP's in accordance with Section 10.4 of Chapter 10. All proposed SMP's have been designed in accordance with section 10.4.4 of Chapter 10 thus satisfying the requirements of this goal.

## 2.2 NYSDEC Initial Water Quality Volume, $WQ_v$

Subcatchments 1.1S and 1.2S contain the proposed development. The following table summarizes the initial $WQ_v$ as calculated in Appendix B & C.

**Table 2.2.1 – Initial $WQ_v$ Summary Table**

| Subcatchment | Initial $WQ_v$ |
|---|---|
| 1.1S | 0.260 a.f. |
| 1.2S | 0.037 a.f. |
| Total | 0.297 a.f. |

## 2.3 NYSDEC Runoff Reduction Volume, $RR_v$, & Downstream SMP's

The Runoff Reduction Volume ($RR_v$) criterion is intended to replicate pre-development hydrology by maintaining preconstruction infiltration, peak flow runoff, discharge volume, as well as minimizing concentrated stormwater flow. As stated in Chapter 4 of the Design Manual, $RR_v$ may be treated with standard SMP's with runoff reduction capacity sized in accordance with the Chapter 4/6 requirements, or with green infrastructure practices (GIP's) sized in accordance with the requirements set forth in Chapter 5. Runoff reduction is achieved when runoff from a site is captured, directed to a SMP or a GIP, infiltrated to the ground, reused, or removed by evapotranspiration, so it does not contribute to the stormwater discharge from the site. The goal for each site is to reduce the entire $WQ_v$ (100%) through the implementation of GIP's and standard SMP's with runoff reduction capacity. However, if 100% of the $WQ_v$ cannot be reduced by applying a combination of green infrastructure techniques and standard SMP's with $RR_v$ capacity, "they must, at a minimum, reduce runoff from a percentage of the impervious area constructed as part of the project using the green infrastructure techniques and standard SMPs with $RR_v$ capacity.

The RRv Calculations are provided in Appendix C and are summarized as follows:

| | | |
|---|---|---|
| Initial $WQ_v$ (0.297 acre-feet) | = | 12,937 c.f. |
| $RR_v$ Minimum | = | 5,388 c.f. |
| $RR_v$ Provided | = | 12,938 c.f. |
| Remaining $WQ_v$ to be treated in downstream SMP | = | 0 c.f. |

## 2.4 NYSDEC Stream Channel Protection Volume, $CP_v$

The Stream Channel Protection ($CP_v$) criterion is intended to protect stream channels from erosion and is accomplished by the 24-hour extended detention of the one-year, 24-hour storm event, using either the center of mass or plug flow methods. Section 4.4 of the *Design Manual* states the $CP_v$ requirement does not apply when the entire $CP_v$ volume is achieved at a site through infiltration. This project has met the Cpv requirement by providing an infiltration system & Rainwater Harvesting Cistern.

2.5 NYSDEC Overbank Flood Control, $Q_p$, and Extreme Flood Control, $Q_f$

**Table 2.5.1 Pre and Post-Development Peak Flows at Design Point 1**

| 24-HOUR DESIGN STORM PEAK FLOWS (c.f.s.) | | | | |
|---|---|---|---|---|
| | 10-Year (Overbank Flood Control) | | 100-Year (Extreme Flood Control) | |
| | Pre | Post | Pre | Post |
| Design Point 1 | 5.2 | 3.3 | 17.0 | 16.8 |

2.6 NYCDEP Requirements

As the proposed project involves the creation of more than 40,000 square feet of new impervious surfaces and land clearing or grading involving more than 2 acres and on slopes greater than 15%, a SWPPP approval is required from the NYCDEP. The Rules and Regulations parallel the requirements of the NYSDEC and the Town of Somers, with the exception that two different NYSDEC standard SMP's are required in series when the drainage area to a SMP is greater than 20% impervious and an infiltration practice is not provided. By providing an infiltration system and rainwater harvesting system only one practice is required.

Per the Rules and Regulations, the stormwater treatment volume used shall be the greater of the runoff volume from the 1-year, 24-hour storm event or the volume generated by the 90% storm. The initial $WQ_v$ from the 1-year storm event was discussed above. The following equation, per Chapter 4, was used to determine the water quality volume for the 90% storm event for Subcatchment 1.1S. Again a 25% reduction was applied for the appropriate redeveloped areas:

The water quality volume shall be $WQ_v$ =

$$\frac{(P)(R_vn)(An) \times 43{,}560\ (ac/s.f.)}{12} + \frac{(25\%)(P)(R_vr)(Ar) \times 43{,}560\ (ac/s.f.)}{12}$$

Where,

$WQ_{v90}$ = water quality volume (in c.f.)

P = 90% Rainfall Event Number (1.5 in)

$R_v$ = 0.05 + 0.009(I), where I is percent impervious cover

A = site area in acres

**Table 2.6.1 - Water Quality Volume Calculation Summary 90% Storm vs. 1-Year Storm Comparison**

| Subcatchments | P (in.) | $R_v$[1] | A (ac.) | $WQ_{v90}$ (c.f.) | $WQ_v$[2] 1-year (c.f.) |
|---|---|---|---|---|---|
| 1.1S | 1.5 | 0.65 | 2.1 | 7,432 | 11,326 |
| 1.2S | 1.5 | 0.35 | 0.8 | 1,143 | 1,612 |

[1] A minimum $R_v$ of 0.2 is required

[2] Refer to Section 2.2

As shown in Table 2.6.1 above, the volume produced by the 1-year, 24-hour design storm for subcatchment 1.1S is larger than the volume produced by the 90% storm. Therefore, the 1-year, 24-hour design storm volumes shall be used for the WQv sizing for all of the proposed stormwater management practices.

The following table summarizes the amount of proposed impervious surfaces for each subcatchment and shows the proposed stormwater management practice that will treat each sub-watershed:

**Table 2.6.2 – Contributory Area Analysis**

| | Pre-Development | | | | | Post-Development | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Design Point | Woods, HSG D | Woods ,HSG B | Grass, HSG B | Impervious | Total | Woods, HSG D | Woods , HSG B | Grass, HSG B | Impervious | Total |
| Design Point 1 | 0.1 | 5.1 | 0.6 | 0.3 | 6.4 | 0.1 | 3.4 | 1.1 | 1.8 | 6.4 |
| Design Point 2 | 0.0 | 3.3 | 0.4 | 4.0 | 7.7 | 0.0 | 3.3 | 0.4 | 4.0 | 7.7 |

Per the area analysis it can be seen that there is a large increase in impervious area to Design Point 1. Also, Design Point 2 includes the area that will be undeveloped. The increase in impervious area tributary to Design Point 1 has been mitigated by the proposed stormwater management practices. Post-development peak flows have been mitigated to pre-development levels at Design Point 1.

## 3.0 STORMWATER CONVEYANCE SYSTEM

### 3.1 Onsite Stormwater Collection System

The stormwater collection and conveyance systems for the project will consist of catch basins, drain inlets, drainage manholes and HDPE pipe. The onsite pipe system has been sized to collect and convey at minimum the 100-year, 1-hour design storm using the Rational Method. The 100-year storm was selected based on the presence of the underground parking and ability for the parking lot to capture and hold the 100-year storm event based on the site grading. The Rational Method is a standard method used by engineers to develop flow rates for sizing collection systems. The Rational Method calculates flows based on a one-hour design storm.

## 4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control should be accomplished by four basic principles: diversion of clean water, containment of sediment, treatment of dirty water, and stabilization of disturbed areas. Diversion of clean water should be accomplished with swales. This diverted water should be safely conveyed around the construction area as necessary and discharged downstream of the disturbed areas. Sediment should be contained with the use of silt fence at the toe of disturbed slopes and excavation of the temporary sediment trap. Diversion swales will be used to convey runoff during construction to the temporary sediment trap. Disturbed areas should be permanently stabilized within 14 days of final grading to limit the required length of time that the temporary facilities must be utilized. The owner will be responsible for the maintenance of the temporary erosion control facilities. Refer to the Project Drawings for further information implementation of the Erosion Control Plan and Construction Sequence.

All erosion and sediment controls have been designed in accordance with the *New York Standards and Specifications for Erosion and Sediment Control* (Blue Book).

## 4.1 Temporary Erosion and Sediment Control Facilities

Temporary erosion and sediment control facilities should be installed and maintained as required to reduce the impacts to off-site properties. The owner will be required to provide maintenance for the temporary erosion and sediment control facilities. In general, the following temporary methods and materials should be used to control erosion and sedimentation from the project site:

- Stabilized Construction Entrance
- Dust Control
- Silt Fence Barriers
- Storm Drain Inlet Protection
- Temporary Soil Stabilization
- Sediment Trap with optional Dewatering Devices

All temporary erosion control measures shall be maintained as discussed below. In accordance with GP-0-15-002 a NYSDEC trained contractor shall be onsite at all times soil disturbing activities are commencing. In addition, the owner shall retain a Qualified Professional to perform weekly inspections of the erosion control facilities.

A stabilized construction entrance should be installed at the entrance to the site as shown on the plan. The design drawings will include details to guide the contractor in the construction of this entrance. The intent of the stabilized construction entrance is to prevent the "tracking" of soil from the site.

Dust control should be accomplished with water sprinkling trucks if required. During dry periods, sprinkler trucks should wet all exposed earth surfaces as required to prevent the transport of air-borne particles to adjoining areas.

Siltation barriers constructed of geosynthetic filter cloth should be installed at the toe of all disturbed slopes. The intent of these barriers is to contain silt and sediment at the source and inhibit its transport by stormwater runoff. The siltation barriers will also help reduce the rate of runoff by creating filters through which the stormwater must pass. During construction the siltation barriers shall be inspected weekly and after a rainfall event and shall be cleaned/replaced when needed.

Storm drain inlet protection in the form of stone drop inlet protection will be installed around all proposed inlets. The stone drop inlet protection will serve to filter stormwater runoff before it enters the collection system. Throughout construction the concrete drainage structures, associated piping and inlet protections shall be inspected weekly and after a rainfall event. These items shall be cleaned, repaired and/or replaced when needed.

The proposed pocket wetland will also act as a sediment trap with optional dewatering device during construction of the site. The sediment trap will be sized in accordance with the Blue Book. Sizing calculations for the sediment trap are provided in the Appendix of the SWPPP. The bottom of the sediment traps will be set equal to the natural water level for the practice. During construction the sediment traps will be dewatered with the optional dewatering devices illustrated in the Blue Book. The optional dewatering devices will make use of the permanent outlet structures to eliminate berm reconstruction when the final practice is constructed. Once construction is complete the temporary sediment traps will be converted to the proposed permanent stormwater management practice.

When land is exposed during development, the exposure shall be kept to the shortest practical period, but in no case more than 14 days. Temporary grass seed and mulch shall be applied to any construction area idle for seven days. The temporary seeding and mulching shall be performed in accordance with the seeding notes illustrated the Project Drawings. Disturbance shall be minimized in the areas required to perform construction. Upon completion of final grading, topsoil, permanent seeding and mulch shall be applied in accordance the Project Drawings.

The stormwater runoff will be managed by the temporary erosion and sediment control facilities during construction. The temporary sediment trap and the temporary diversion swales shall be installed and stabilized

prior to proceeding with disturbing the remainder of the site construction. Coupled with silt fence installed along the down hill perimeter of where soil disturbing activities will occur, stormwater runoff will be contained on-site.

4.2 Permanent Erosion and Sediment Control Facilities

Permanent erosion and sediment control will be accomplished by diverting stormwater runoff from steep slopes, controlling/reducing stormwater runoff velocities and volumes, and vegetative and structural surface stabilization. All of the permanent facilities are relatively maintenance free and only require periodic inspections. The owner will provide maintenance for all the permanent erosion and sediment control facilities.

The temporary sediment trap shall be cleaned of all sediment and debris, excavated to it's final elevations and dimensions, and stabilized with the vegetation / plantings as indicated on the Project Drawings.

Rock outlet protection will be provided at the discharge end where the piped drainage system discharges to daylight, and is in accordance with the Blue Book. The purpose of the rock outlet protection is to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach. The rock outlet protection shall be inspected for evidence of scour beneath the riprap and/or for any dislodged stones. Inspections of the rock outlet protection shall be performed during the inspections of the post-construction SMP's for the project.

Lined waterways have been provided at the discharge end of piped drainage systems where they discharge to a natural water level in a stormwater management practice. The purpose of the lined waterway protection is to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach. The lined waterway shall be inspected for evidence of scour beneath the riprap and/or for any dislodged stones. Inspections of the lined waterway shall be performed during the inspections of the post-construction SMP's for the project.

Other than the buildings and paved surfaces, disturbed surfaces will be stabilized with vegetation within 10 days of final grading. Permanent seed mix and mulch shall be applied to idle areas to minimize the amount of exposed soil. Types and application rates for the seed and mulch are provided on the Project Drawings. The vegetation will control stormwater runoff by preventing soil erosion, reducing runoff volume and velocities, and providing a filter medium. Permanent seeding should optimally be undertaken in the spring from March 21st through May 20th and in late summer from August 15th to October 15th.

## 5.0 IMPLEMENTATION, MAINTENANCE & GENERAL HOUSEKEEPING

5.1 Construction Phase

Details associated with the implementation and maintenance of the proposed stormwater facilities and erosion control measures during construction are shown on the Project Drawings. Soil disturbance shall not exceed five acres unless permitted under Part II.C.3 of the General Permit GP-0-15-002. The erosion control plan will include associated details and notes to aid the contractor in implementing the plan. Construction is anticipated to begin in the fall of 2016 and anticipated to be completed by the summer of 2018.

During construction, a Site Log Book, Appendix E, is required to be kept per NYSDEC SPDES General Permit GP-0-15-002. Erosion and sediment control inspections are required to be conducted as necessary under coverage of the permit (minimum once a week) and an updated logbook and a copy of the SWPPP is required to be kept on site for the duration of the construction activities. The Construction Site Log Book is an appendix taken from the Blue Book.

In addition to the proposed erosion and sediment control facilities, the following good housekeeping best management practices shall be implemented to mitigate potential pollution during the construction phase of the project. The general contractor overseeing the day-to-day site operation shall be responsible for the good housekeeping best management practices included in the following general categories:

- Material Handling and Waste Management
- Establishment of Building Material Staging Areas
- Establishment of Washout Areas
- Proper Equipment Fueling and Maintenance Practices
- Spill Prevention and Control Plan

All construction waste materials shall be collected and removed from the site regularly by the general contractor. The general contractor shall supply waste barrels for proper disposal of waste materials. All personnel working on the site shall be instructed of the proper procedures for construction waste disposal.

Although it is not anticipated any hazardous waste materials will be utilized during construction, any hazardous waste materials shall be disposed of in accordance with federal, state, and local regulations. No hazardous waste shall be disposed of on-site. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from the other non-waste materials. All hazardous waste shall be stored in a structurally sound and sealed shipping containers located in the staging areas. Material safety data sheets, material inventory, and emergency contact numbers will be maintained in the office trailer. All personnel working on the site shall be instructed of the proper procedures for hazardous waste disposal.

Temporary sanitary facilities (portable toilets) shall be provided on site during the entire length of construction. The sanitary facilities shall be located in the staging areas, or in an alternate area away from the construction activities on the site. The portable toilets shall be inspected weekly for evidence of leaking holding tanks.

All recyclables, including wood pallets, cardboard boxes, and all other recyclable construction scraps shall be disposed of in a designated recycling barrel provided by the contractor and removed from the site regularly. All personnel working on the site shall be instructed of the proper procedures for construction waste recycling.

All construction equipment and maintenance materials shall be stored in a designated staging area. Silt fence shall be installed down gradient of the construction staging area. Shipping containers shall be utilized to store hand tools, small parts, and other construction materials, not taken off site daily. Construction waste barrels, recycling barrels and if necessary hazardous waste containers shall be located within the limits of the construction staging area.

Throughout the construction of the project several types of vehicles and equipment will be used on-site. Fueling of the equipment shall occur within the limits of the construction staging area. Fuel will be delivered to the site as needed, by the general contractor, or a party chosen by the general contractor. Only minor vehicle equipment maintenance shall occur on-site, all major maintenance shall be performed off-site. All equipment fluids generated from minor maintenance activities shall be disposed of into designated drums and stored in accordance with the hazardous waste storage as previously discussed.

Vehicles and equipment shall be inspected on each day of use. Any leak discovered shall be repaired immediately. All leaking equipment unable to be repaired shall be removed from the site. Ample supplies of absorbent, spill-cleanup materials, and spill kits shall be located in the construction staging area. All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned for disposal at a local landfill. All personnel working on the site shall be instructed of the proper procedures for spill prevention and control. Any spill large enough to discharge to surface water will be immediately reported to the local fire / police departments, NYCDEP, and the National Response Center 1-800-424-8802.

Initially the sand filter and pocket wetlands will require regular maintenance until the permanent vegetation is established. Vegetation should be inspected every 30 days and after every major storm event until established, after which inspections should take place in accordance with the inspection checklists contained the Appendix. Damaged areas should be immediately re-seeded and re-mulched.

## 5.2 Soil Restoration

Soil Restoration is required to be applied across areas of the development site where soils have been disturbed and will be vegetated. The purpose is to recover the original properties and porosity of the soil compacted during construction activity. Soil Restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure. Soil restoration includes mechanical decompaction and compost amendment. The table below describes various soil disturbance activities related to land development, soil types and the requirements for soil restoration for each activity as identified in the Design Manual. Restoration is applied across areas of a development site where soils have been compacted and will be vegetated according to the criteria defined in the table below:

| **Soil Restoration Requirements[1, 2,4]**<br>(Onsite soils within the limit of disturbance belong to Hydrologic Soil Groups (HSG) B & D) | | | |
|---|---|---|---|
| **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[3] and apply 6 inches of topsoil | |
| Areas of cut or fill | HSG A &B | HSG C&D | |
| | Aerate[1] and apply 6 inches of topsoil | Apply full Soil Restoration [2] | |
| 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 (decompaction and compost Enhancement[6]) | | |
| Areas where Runoff Reduction and/or Infiltration practices 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. | | |

1. Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
2. Per "Deep Ripping and De-compaction, DEC 2008".
3. Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which functions like a mini-subsoiler.
4. During periods of relatively low to moderate subsoil moisture, the disturbed soils are returned to rough grade and the following Soil Restoration steps applied:
   - 5.1. Apply 3 inches of compost over subsoil.
   - 5.2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
   - 5.3. Rock-pick until uplifted stone/rock materials of four inches and larger size area cleaned off the site.
   - 5.4. Apply topsoil to a depth of 6 inches.
   - 5.5. Vegetate as required by seeding notes located on the project drawings.
   - 5.6. Tilling should not be performed within the drip line of any existing trees or over any utility installations that are within 24 inches of the surface.
6. Compost shall be aged, from plant derived materials, free of viable weed seeds, have no visible free water or dust produced when handling, pass through a half inch screen and have a pH suitable to grow desired plants.

After soil restoration is completed an inspector should be able to push a 3/8" metal bar twelve inches into the soil with just body weight. Following decompaction/soil restoration activities, the following maintenance is anticipated during the first year:

- Initial inspections for the first six months (once after each storm greater than a half-inch).
- Reseeding to repair bare or eroding areas to assure grass stabilization.

- Water once every three days for first month, and then provide a half inch of water per week during first year. Irrigation plan may be adjusted according to the rain event.
- Fertilization may be needed in the fall after the first growing season to increase plant vigor.

In order to ensure the soil remains decompacted the following ongoing maintenance is recommended:

- Planting the appropriate ground cover with deep roots to maintain the soil structure.
- Keeping the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths (sometimes it may be necessary to de-thatch the turf every few years).

5.3 Long Term Maintenance Plan

The owner will be responsible for the maintenance of the permanent erosion control and stormwater facilities. Each spring the paved areas should be cleaned to remove the winter's accumulation of traction sand. After this is completed, all drain inlets sumps and the stormwater management practices should be cleaned. All pipes should be checked for debris and blockages and cleaned as required. During the cleaning process, the drain inlets and pipes should be inspected for structural integrity and overall condition; repairs and/or replacement will be made as required.

Once the desired vegetative cover is established in the basins, only limited maintenance is required. The basins and outlet structures should be inspected after major storm events and semi-annually. During the inspections, the following should be checked:

- Evidence of clogging of outlet structure.
- Erosion of the flow path through the basin.
- Subsidence, erosion, cracking or tree growth on the embankment/berm.
- Condition of the emergency spillway.
- Accumulation of sediment around the outlet structure.
- Adequacy of upstream/downstream channel erosion control measures.
- Erosion of the basin bed and banks.
- Sources of erosion in the contributory drainage, which should be stabilized.

The vegetated swales, sand filter, bioretention filter, dry swales, porous pavement, and pocket wetlands shall be inspected monthly and annually in accordance with the Design Manual Maintenance and Inspection Checklists contained in the Appendix.

The vegetated swale shall be inspected monthly and maintained in accordance with the maintenance requirements of Section 5.3 of the Design Manual. Fertilizer and lime shall be added as determined to be necessary through soil testing to maintain a dense vegetated cover. Dead or diseased vegetation shall be removed and replaced in accordance with the project landscape plan. Routine mowing should be performed in proposed lawn areas to maintain a 4 inch to 6-inch vegetation height. During the mowing operations, debris and litter should be removed from all parts of the vegetated swale. Accumulated sediment shall be removed from the swale if it accumulates to a depth greater than 2 inches. The outlet structure should be inspected for blockages and kept free and clear to ensure the swale drains. The swale should be inspected for pools or standing water and regraded / revegetated as necessary to eliminate pools / standing water. Any rills that are observed shall be repaired with compacted topsoil and anchored with mesh or filter fabric, then seeded and mulched. Heavy equipment for mowing and removing plants / debris should be avoided to minimize soil compaction.

Access to the SMP's will be through stabilized basin accesses. The accesses are proposed to be graded to final grades and seeded and mulched in accordance with the Erosion & Sedimentation Control Plan. The graded basin accesses, and the side slopes and berms of the basins should be mowed annually as applicable to prevent the establishment of woody plants within the swales, accesses, or basin berms. The bottoms of the basins should not be mowed. During the mowing operations, debris and litter should be removed from all parts of the swales, accesses, and basins. Accumulated sediment will need to be removed from the swales and basins approximately every 10 to 20 years, or when 50 percent of their capacity has been reached.

In order to clean accumulated sediment in a SMP with a permanent pool (where no pond drain was able to be provided) dewatering pumps shall be used. Initially the dewatering pump shall be set approximately 2 feet below the permanent pool elevation to lower the natural water level such that the water in the forebay and micropool is separate. All pumped water shall be discharged to a pumped silt control system (i.e. dirtbag) such that no turbid discharge occurs from the pumped water.

In addition to guidelines discussed above:

1. All maintenance requirements outlined in the Design Manual shall be followed, including the requirements of the Design Manual checklists contained in the Appendix of this SWPPP.

2. For the manufacture's maintenance recommendations for the Hydrodynamic Separator, as included in the Appendix, shall be followed.

# APPENDIX A

## Pre-development HydroCAD Output



Subcat Reach Pond Link

**Routing Diagram for FWL Pre Development**

Prepared by Insite Engineering, Surveying, and Landscape Architecture, Printed 7/20/2018

## Summary for Subcatchment 1.0S:

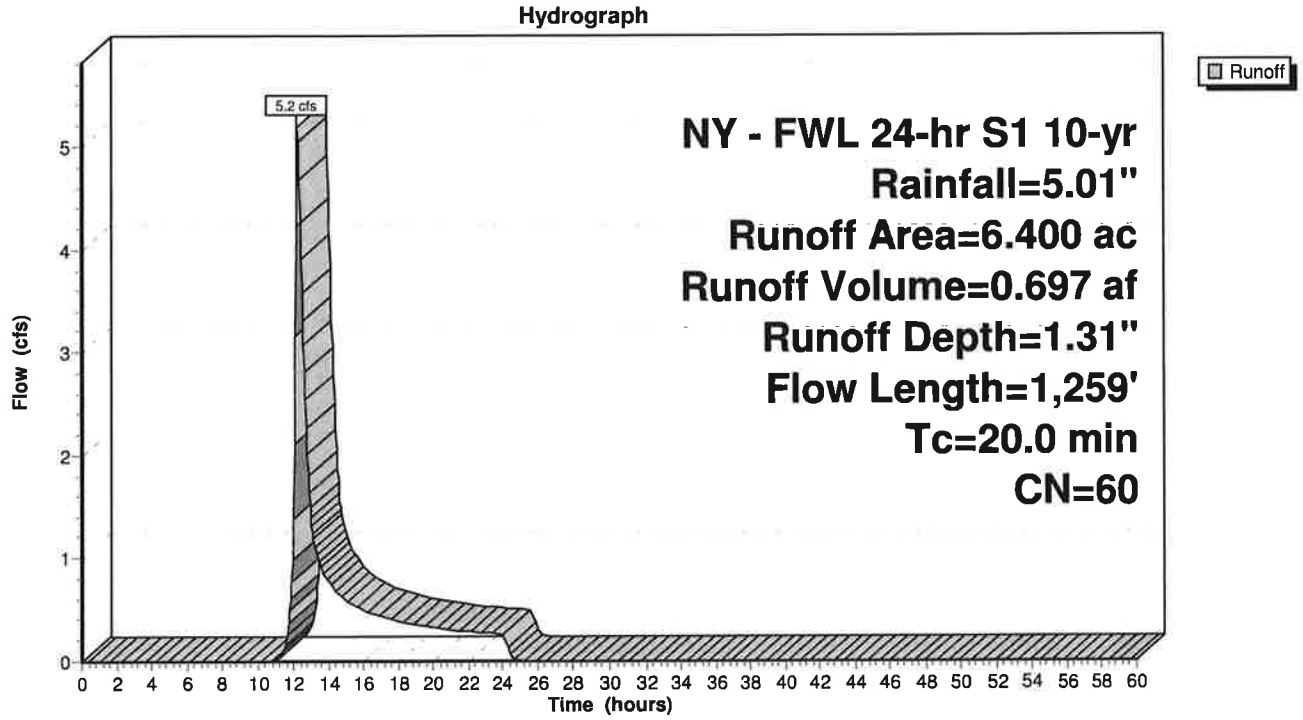
Runoff = 5.2 cfs @ 12.26 hrs, Volume= 0.697 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 0.600 | 61 | >75% Grass cover, Good, HSG B |
| 5.100 | 55 | Woods, Good, HSG B |
| 0.300 | 96 | Gravel surface, HSG B |
| 0.100 | 77 | Woods, Good, HSG D |
| 6.400 | 60 | Weighted Average |
| 6.100 | | 95.31% Pervious Area |
| 0.300 | | 4.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.4 | 100 | 0.0200 | 0.13 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 2.00" |
| 3.3 | 391 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 25 | 0.0700 | 5.37 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.2 | 80 | 0.1450 | 6.13 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 4.0 | 663 | 0.0290 | 2.73 | 2.29 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 20.0 | 1,259 | Total | | | |

## Subcatchment 1.0S:



## Summary for Subcatchment 2.0S:

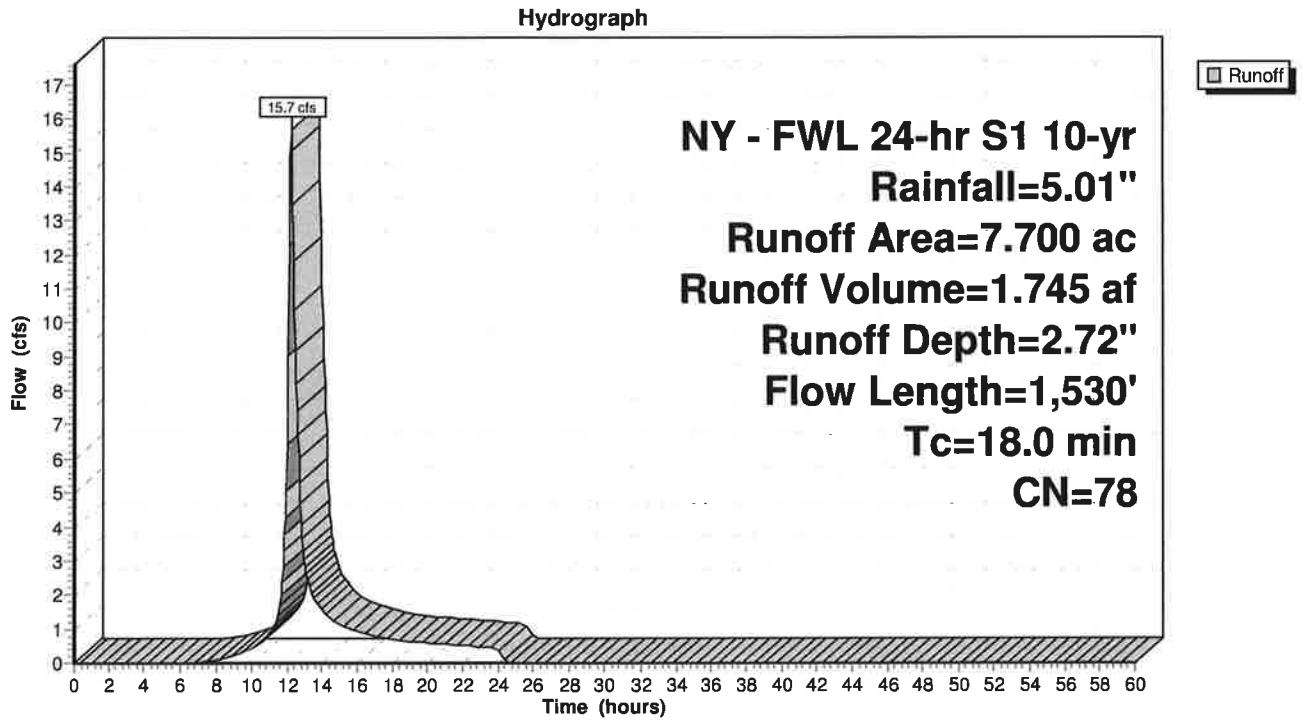
Runoff = 15.7 cfs @ 12.20 hrs, Volume= 1.745 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 3.300 | 55 | Woods, Good, HSG B |
| 3.700 | 98 | Water Surface, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 7.700 | 78 | Weighted Average |
| 3.700 | | 48.05% Pervious Area |
| 4.000 | | 51.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.1 | 100 | 0.2400 | 0.17 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.00" |
| 4.8 | 328 | 0.0520 | 1.14 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.0 | 322 | 0.0270 | 2.63 | 2.21 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 0.7 | 700 | | 17.94 | | **Lake or Reservoir,** Mean Depth= 10.00' |
| 0.4 | 80 | 0.0500 | 3.58 | 3.01 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 18.0 | 1,530 | Total | | | |

## Subcatchment 2.0S:



## Summary for Subcatchment 1.0S:

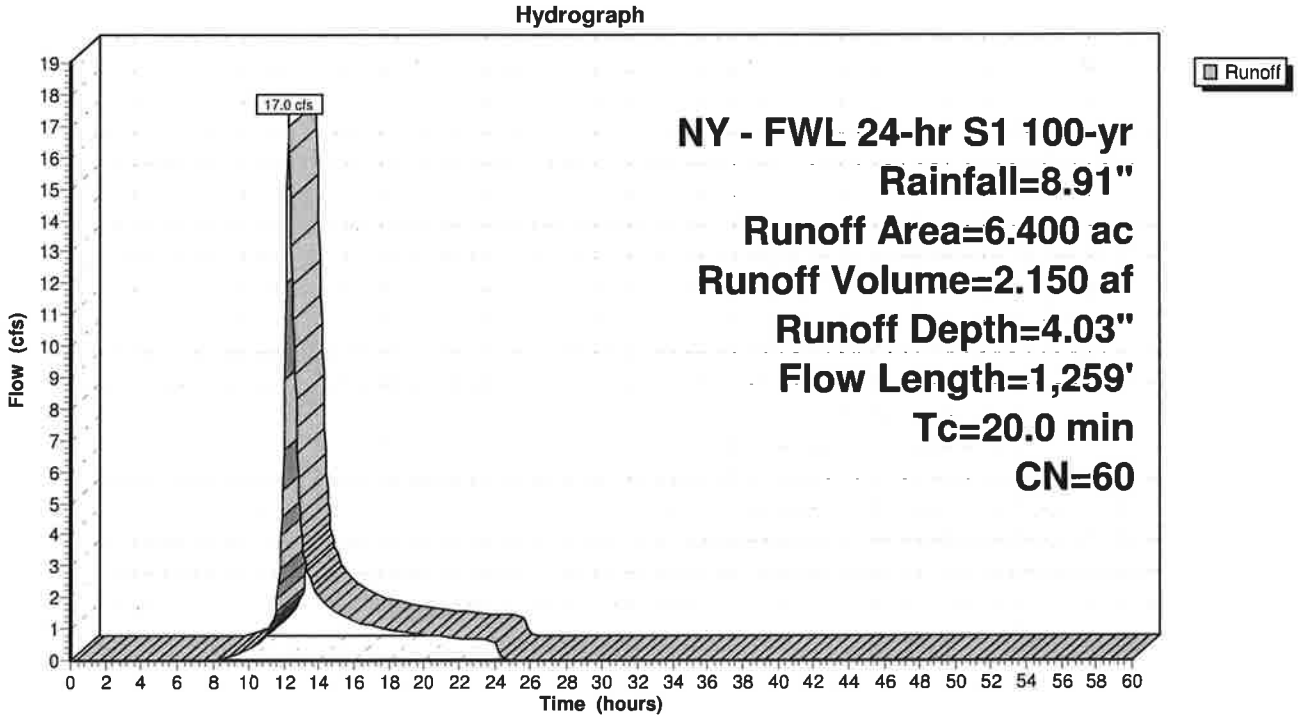
Runoff = 17.0 cfs @ 12.24 hrs, Volume= 2.150 af, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 0.600 | 61 | >75% Grass cover, Good, HSG B |
| 5.100 | 55 | Woods, Good, HSG B |
| 0.300 | 96 | Gravel surface, HSG B |
| 0.100 | 77 | Woods, Good, HSG D |
| 6.400 | 60 | Weighted Average |
| 6.100 | | 95.31% Pervious Area |
| 0.300 | | 4.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.4 | 100 | 0.0200 | 0.13 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 2.00" |
| 3.3 | 391 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 25 | 0.0700 | 5.37 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.2 | 80 | 0.1450 | 6.13 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 4.0 | 663 | 0.0290 | 2.73 | 2.29 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 20.0 | 1,259 | Total | | | |

## Subcatchment 1.0S:



## Summary for Subcatchment 2.0S:

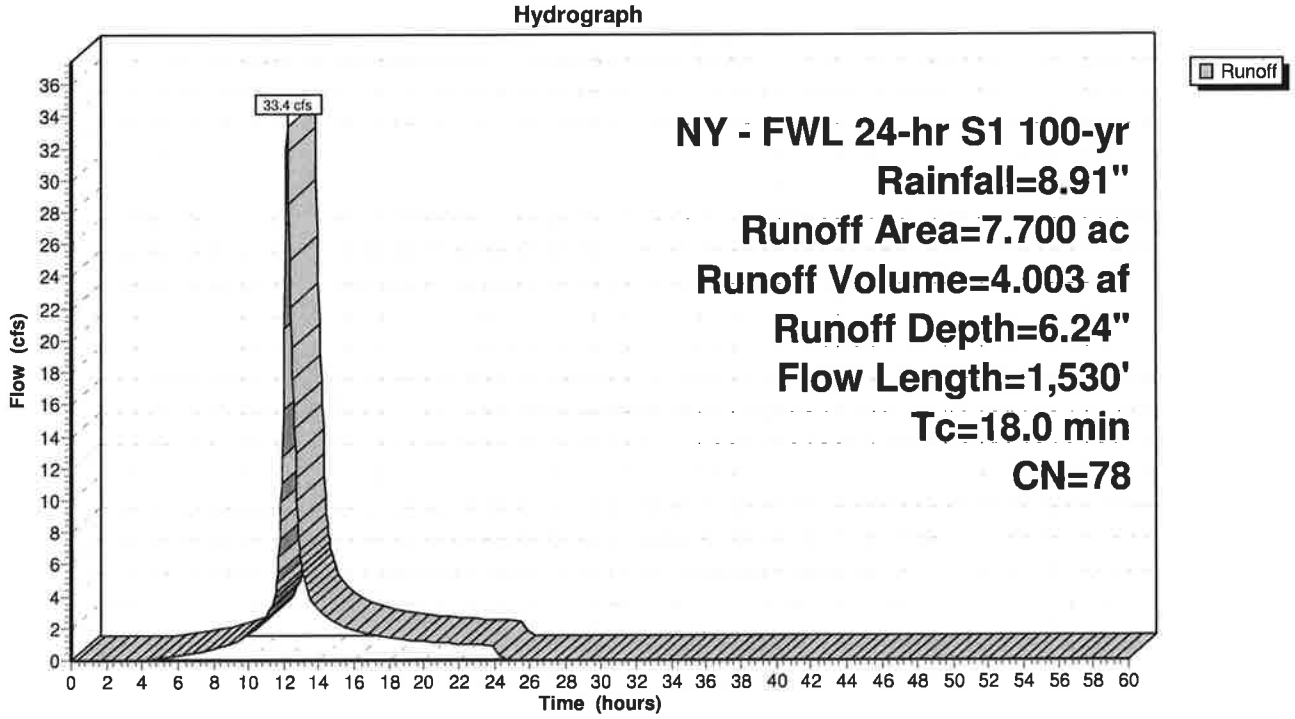
Runoff = 33.4 cfs @ 12.20 hrs, Volume= 4.003 af, Depth= 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 3.300 | 55 | Woods, Good, HSG B |
| 3.700 | 98 | Water Surface, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 7.700 | 78 | Weighted Average |
| 3.700 | | 48.05% Pervious Area |
| 4.000 | | 51.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.1 | 100 | 0.2400 | 0.17 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.00" |
| 4.8 | 328 | 0.0520 | 1.14 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.0 | 322 | 0.0270 | 2.63 | 2.21 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 0.7 | 700 | | 17.94 | | **Lake or Reservoir,** Mean Depth= 10.00' |
| 0.4 | 80 | 0.0500 | 3.58 | 3.01 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 18.0 | 1,530 | Total | | | |

## Subcatchment 2.0S:



# APPENDIX B

## Runoff Reduction Volume (RRv) Calculations

## RRv Calculation Worksheet - 1.2P Cistern

Project: FWL
Project #: 17206.100
Date: 7/23/2018

INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.

*1. RRv Initial = Water Quality Volume (WQv)* *0.037 ac-ft* = *1,612 c.f.*
(refer to HydroCAD Subcatchments 1.1S for Water Quality Volume)

2. *RRv Minimum* = [ (P) (Rv) (S) (Aic)] /12 where...

| | | | |
|---|---|---|---|
| P = Rainfall (in.) | = | 2.79 | in. |
| Rv = 0.05 + 0.009 (100%) | = | 0.95 | |
| S = Hydrologic Soil Group Specific Reduction Factor [HSG A = 0.55] [HSG B = 0.40] [HSG C = 0.30] [HSG D = 0.20] | = | 0.40 | |
| Aic = Total area of new impervious cover | = | 0.2 | Acres |
| *RRv Minimum* | = | *770* | *c.f.* |

3. *RRv Required* = RRv Initial - Green Infrastructure Practice (GIP) with Area Reduction

GIP with Area Reduction Applied in Project

| | | |
|---|---|---|
| 5.3.1 Conservation of Natural Area | N/A | |
| 5.3.2 Sheet Flow to Riparian Buffers or Filter Strips | N/A | |
| 5.3.4 Tree Planting / Tree Box (37 trees at 100 s.f. per tree) | | c.f. |
| 5.3.5 Disconnection of Rooftop Runoff | | - |
| 5.3.6 Stream Daylighting | N/A | |

RRv Required(=WQv-RRV by area)(Refer to HydroCAD output in this Appendix) = 1,612 c.f.

4. *RRv Provided*

| GIP with Volume Reduction Applied in Project | WQv Treated (c.f.) | % of WQv Applied to *RRv Provided* | *RRv Provided (c.f.)* |
|---|---|---|---|
| 5.3.3 Vegetated Open Swales [HSG A / B = 20%] [HSG C / D = 10%] {Modified HSG C - D = 15% - 12%] | | 20%<br>10% | 0<br>0 |
| 5.3.7 Rain Garden [No underdrains / Good Soils = 100%] [With underdrains / Poor Soils = 40%] | | 40% | 0 |
| 5.3.8 Green Roof [RRv provided equals volume provided in Green Roof] | | 100% | N/A |
| 5.3.9 Stormwater Planters [Infiltration Planters = 100%] [Flow Through HSG C = 45%] [Flow Though HSG D = 30%] | | 45% | N/A |
| 5.3.10 Rain Tank / Cisterns | 1612 | 100% | 1612 |
| 5.3.11 Porous Pavement | | 100% | 0 |
| Infiltration Practice (Standard SMP) | | 90% | N/A |
| Bioretention Practice (Standard SMP) [Without Underdrains HSG A/B = 80%] [With Underdrain HSG C\D = 40%] | | 80% | 0 |
| Dry Swale (Open Channel Practice) (Standard SMP) [HSG A/B = 40%] [HSG C/D = 20%] | | 20% | N/A |
| *RRv Provided =* | | | *1,612* |

5. Summary

| | | | |
|---|---|---|---|
| RRv Initial | = | 1,612 c.f. | |
| RRv Required | = | 1,612 c.f. | |
| RRv Minimum | = | 770 c.f. | |
| RRv Provided | = | 1,612 c.f. | |
| WQv Required for Downstream SMP | = | 0 c.f. | (= RRv Required - RRv Provided) |

Is RRv Provided greater than or equal to RRv Minimum? Yes

**Refer to the " Analysis of Green Infrastructure Practices" contained in Appendix F for an explanation demonstrating the maximum RRv Provided has been achieved for the site.**

## RRv Calculation Worksheet - 1.1P Infilatrion

Project: FWL
Project #: 17206.100
Date: 7/23/2018

INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.

*1. RRv Initial = Water Quality Volume (WQv)* *0.260 ac-ft* = *11,326 c.f.*
(refer to HydroCAD Subcatchments 1.1S for Water Quality Volume)

2. *RRv Minimum* = [ (P) (Rv) (S) (Aic)] /12 where…

| | | | |
|---|---|---|---|
| P = Rainfall (in.) | = | 2.79 | in. |
| Rv = 0.05 + 0.009 (100%) | = | 0.95 | |
| S = Hydrologic Soil Group Specific Reduction Factor<br>[HSG A = 0.55] [HSG B = 0.40] [HSG C = 0.30] [HSG D = 0.20] | = | 0.40 | |
| Aic = Total area of new impervious cover | = | 1.2 | Acres |
| *RRv Minimum* | = | *4,618* | *c.f.* |

3. *RRv Required* = RRv Initial - Green Infrastructure Practice (GIP) with Area Reduction

GIP with Area Reduction Applied in Project

| | | |
|---|---|---|
| 5.3.1 Conservation of Natural Area | N/A | |
| 5.3.2 Sheet Flow to Riparian Buffers or Filter Strips | N/A | |
| 5.3.4 Tree Planting / Tree Box (37 trees at 100 s.f. per tree) | N/A | c.f. |
| 5.3.5 Disconnection of Rooftop Runoff | N/A | |
| 5.3.6 Stream Daylighting | N/A | |

RRv Required(=WQv-RRV by area)(Refer to HydroCAD output in this Appendix) = 11,326 c.f.

4. *RRv Provided*

| GIP with Volume Reduction Applied in Project | WQv Treated (c.f.) | % of WQv Applied to *RRv Provided* | *RRv Provided (c.f.)* |
|---|---|---|---|
| 5.3.3 Vegetated Open Swales<br>[HSG A / B = 20%] [HSG C / D = 10%] {Modified HSG C - D = 15% - 12%] | | 20%<br>10% | 0<br>0 |
| 5.3.7 Rain Garden<br>[No underdrains / Good Soils = 100%] [With underdrains / Poor Soils = 40%] | | 40% | 0 |
| 5.3.8 Green Roof<br>[RRv provided equals volume provided in Green Roof] | | 100% | N/A |
| 5.3.9 Stormwater Planters<br>[Infiltration Planters = 100%] [Flow Through HSG C = 45%] [Flow Though HSG D = 30%] | | 45% | N/A |
| 5.3.10 Rain Tank / Cisterns | | 100% | N/A |
| 5.3.11 Porous Pavement | | 100% | 0 |
| Infiltration Practice (Standard SMP) | 11326 | 100% | 11326 |
| Bioretention Practice (Standard SMP)<br>[Without Underdrains HSG A/B = 80%] [With Underdrain HSG C\D = 40%] | | 80% | N/A |
| Dry Swale (Open Channel Practice) (Standard SMP)<br>[HSG A/B = 40%] [HSG C/D = 20%] | | 40% | N/A |
| *RRv Provided =* | | | *11,326* |

5. Summary

| | | | |
|---|---|---|---|
| RRv Initial | = | 11,326 c.f. | |
| RRv Required | = | 11,326 c.f. | |
| RRv Minimum | = | 4,618 c.f. | |
| RRv Provided | = | 11,326 c.f. | |
| WQv Required for Downstream SMP | = | 0 c.f. | (= RRv Required - RRv Provided) |

Is RRv Provided greater than or equal to RRv Minimum? Yes

**Refer to the " Analysis of Green Infrastructure Practices" contained in Appendix F for an explanation demonstrating the maximum RRv Provided has been achieved for the site.**

# APPENDIX C

## Stormwater Cistern Sizing Calculations

Stormwater Cistern sizing to treat the NYSDEC WQv for the contributing area from the proposed reconfiguration

Assumed Values:

Water Quality Volume ($WQ_v$)

WQv = 0.037 acre-feet = 1,612 cubic feet from Appendix C

Required Storage Volume of Stormwater Cisterns:

$V_f = (WQ_v \times 7.5)$

The following applies for the detention system:

| | |
|---|---|
| WQv | = 1,612 cf |
| 7.5 | = conversion factor to gallons |

Therefore,

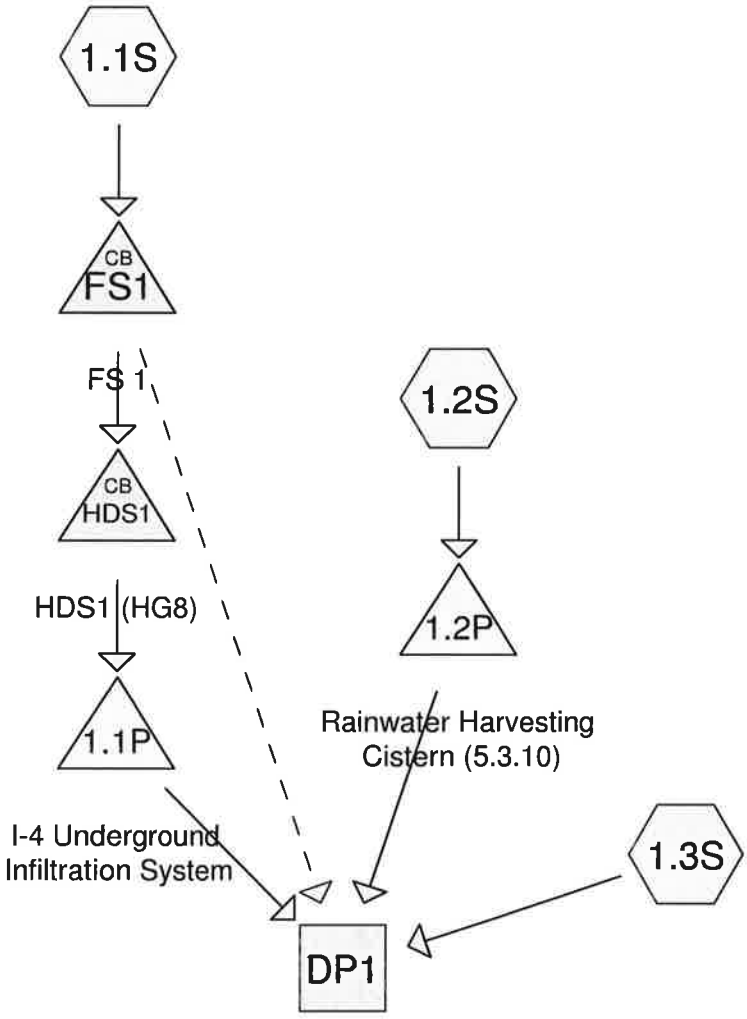
$V_f =$ (1612)(7.5)

$V_f$ = 12,100 gallons storage volume required

The dimensions of the stormwater cistern as shown on the project plans is 12,800 gallons > 12,100 gallons required, therefore the stormwater cistern has been sized in general accordance with the NYSDEC Design Manual.

# APPENDIX D

## Post-development HydroCAD Output




Subcat Reach Pond Link

**Routing Diagram for FWL Post Development**

Prepared by Insite Engineering, Surveying, and Landscape Architecture, Printed 9/5/2018

## Summary for Subcatchment 1.1S:

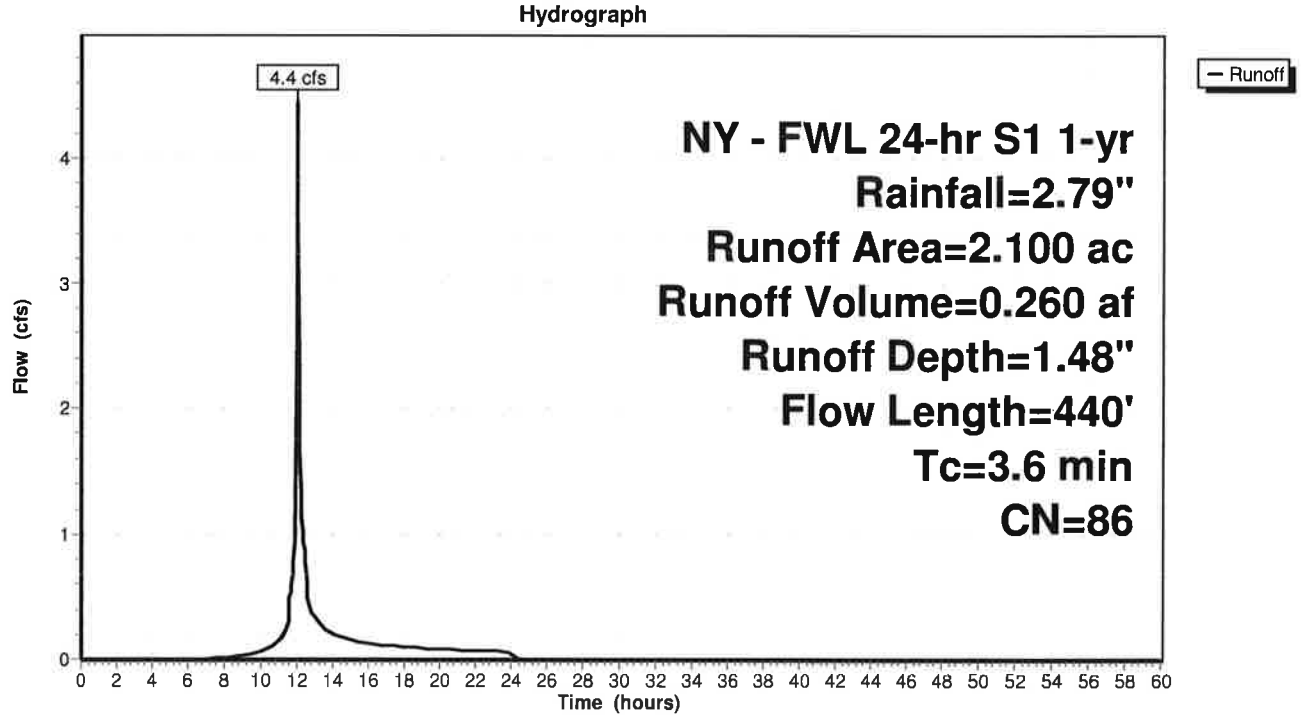
Runoff = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 1-yr Rainfall=2.79"

| Area (ac) | CN | Description |
|---|---|---|
| 1.400 | 98 | Paved parking, HSG B |
| 0.700 | 61 | >75% Grass cover, Good, HSG B |
| 2.100 | 86 | Weighted Average |
| 0.700 | | 33.33% Pervious Area |
| 1.400 | | 66.67% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.7 | 100 | 0.0150 | 0.97 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 60 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.2 | 160 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.3 | 120 | 0.0100 | 6.22 | 7.63 | **Pipe Channel, CMP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 |
| 3.6 | 440 | Total | | | |

## Subcatchment 1.1S:



## Summary for Subcatchment 1.2S:

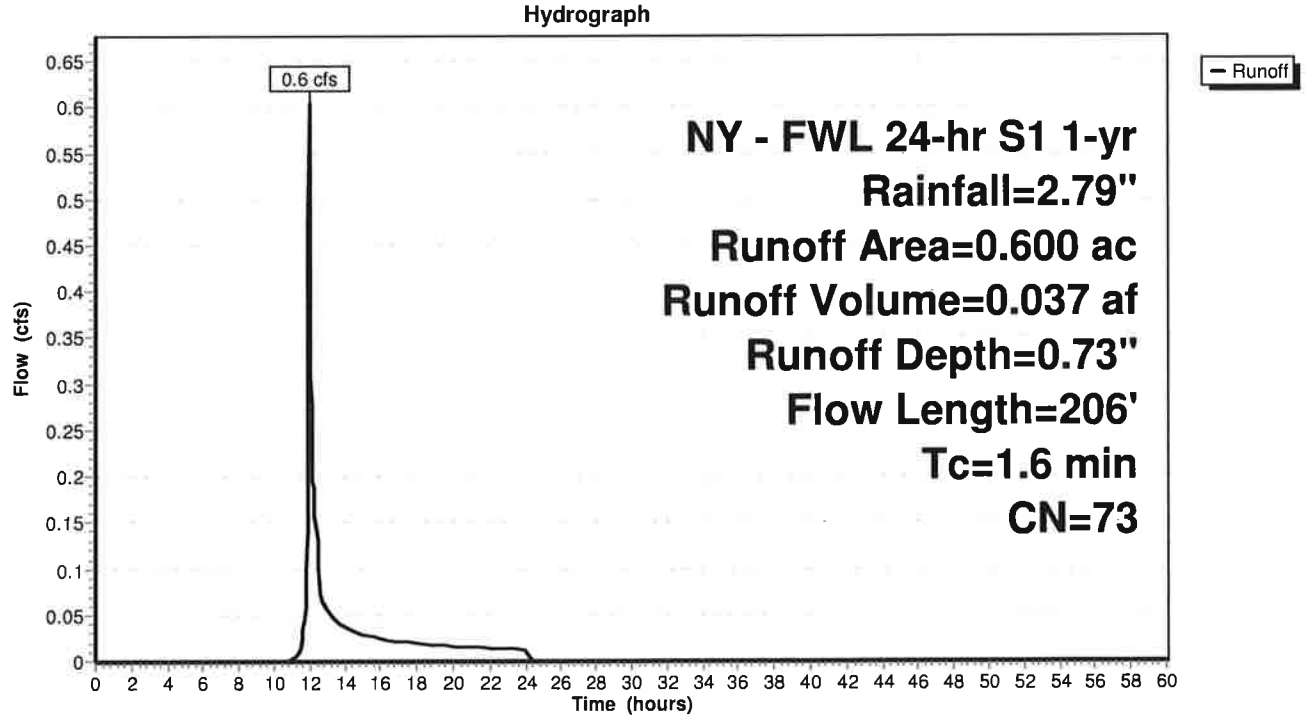
Runoff = 0.6 cfs @ 11.99 hrs, Volume= 0.037 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 1-yr Rainfall=2.79"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 0.600 | 73 | Weighted Average |
| 0.400 | | 66.67% Pervious Area |
| 0.200 | | 33.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.2 | 100 | 0.0350 | 1.36 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 106 | 0.0470 | 4.40 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.6 | 206 | Total | | | |

## Subcatchment 1.2S:



## Summary for Subcatchment 1.3S:

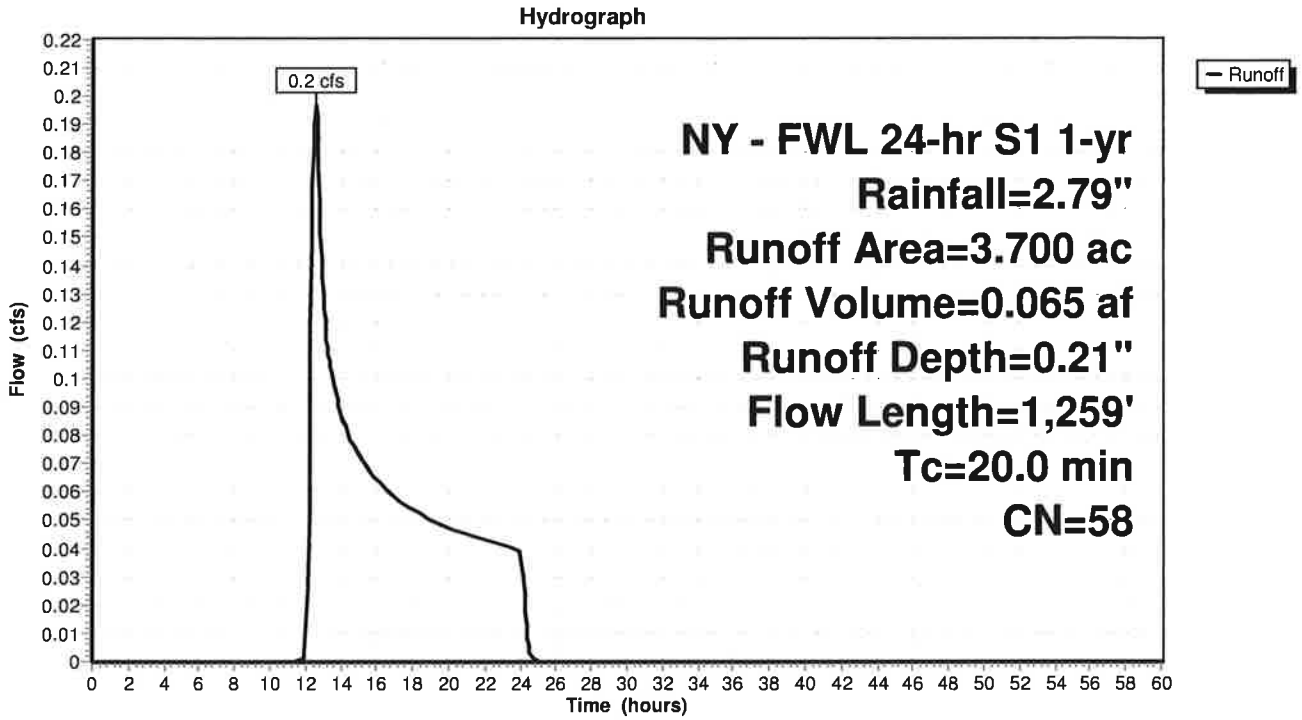
Runoff = 0.2 cfs @ 12.59 hrs, Volume= 0.065 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 1-yr Rainfall=2.79"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 3.400 | 55 | Woods, Good, HSG B |
| 0.100 | 77 | Woods, Good, HSG D |
| 3.700 | 58 | Weighted Average |
| 3.500 | | 94.59% Pervious Area |
| 0.200 | | 5.41% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.4 | 100 | 0.0200 | 0.13 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 2.00" |
| 3.3 | 391 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 25 | 0.0700 | 5.37 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.2 | 80 | 0.1450 | 6.13 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 4.0 | 663 | 0.0290 | 2.73 | 2.29 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 20.0 | 1,259 | Total | | | |

## Subcatchment 1.3S:



## Summary for Subcatchment 2.1S:

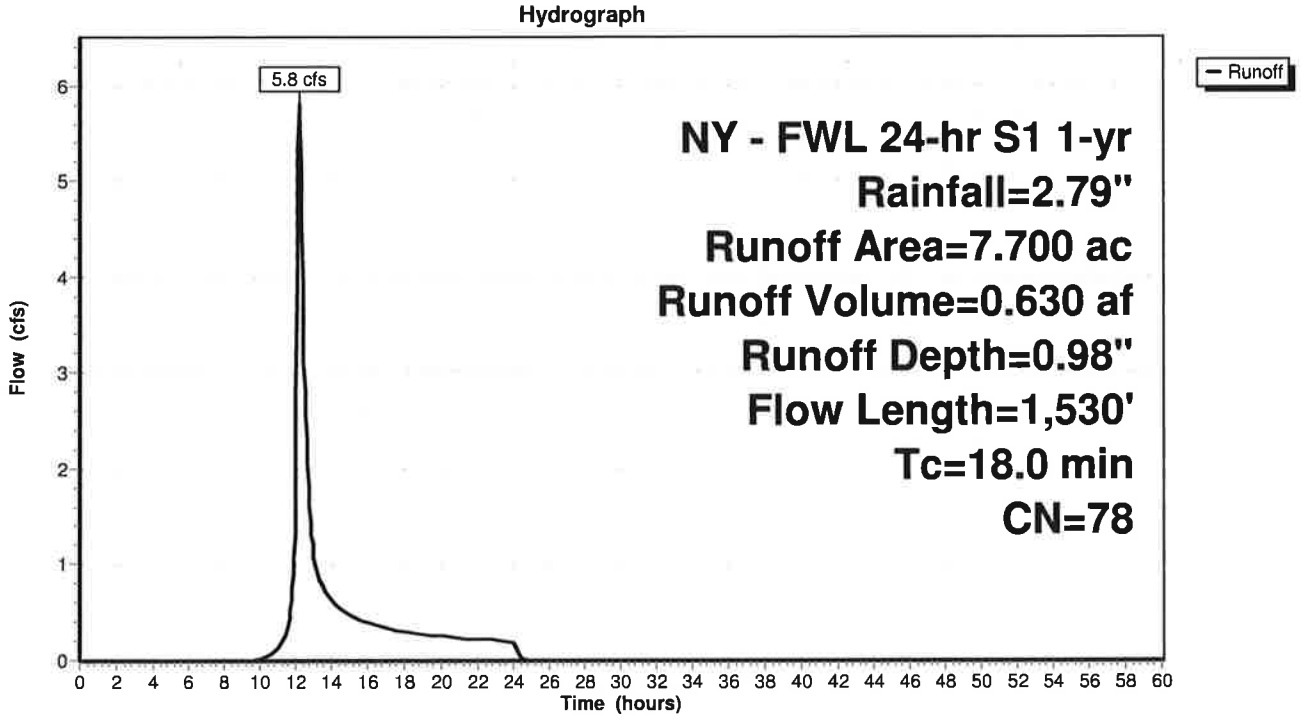
Runoff = 5.8 cfs @ 12.21 hrs, Volume= 0.630 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 1-yr Rainfall=2.79"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 3.300 | 55 | Woods, Good, HSG B |
| 3.700 | 98 | Water Surface, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 7.700 | 78 | Weighted Average |
| 3.700 | | 48.05% Pervious Area |
| 4.000 | | 51.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.1 | 100 | 0.2400 | 0.17 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.00" |
| 4.8 | 328 | 0.0520 | 1.14 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.0 | 322 | 0.0270 | 2.63 | 2.21 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 0.7 | 700 | | 17.94 | | **Lake or Reservoir,** Mean Depth= 10.00' |
| 0.4 | 80 | 0.0500 | 3.58 | 3.01 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 18.0 | 1,530 | Total | | | |

## Subcatchment 2.1S:

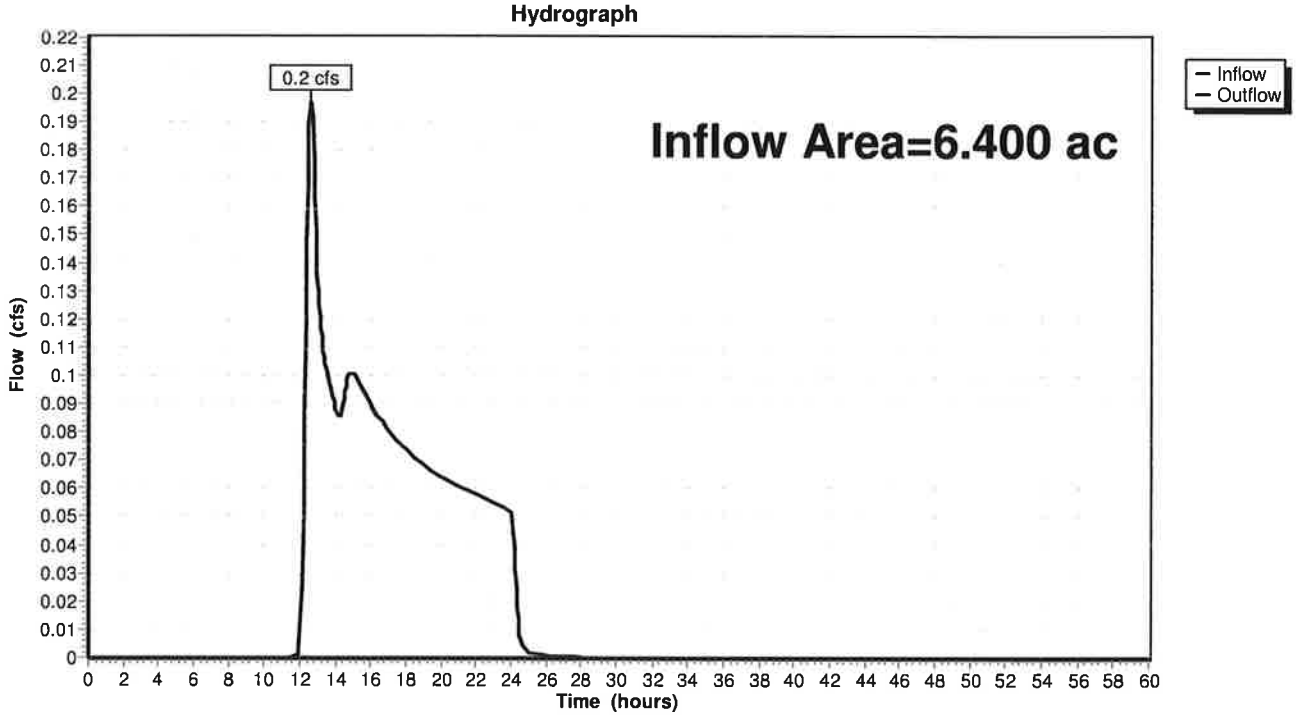


## Summary for Reach DP1: Design Point 1

Inflow Area = 6.400 ac, 28.13% Impervious, Inflow Depth = 0.15" for 1-yr event
Inflow = 0.2 cfs @ 12.59 hrs, Volume= 0.080 af
Outflow = 0.2 cfs @ 12.59 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP1: Design Point 1

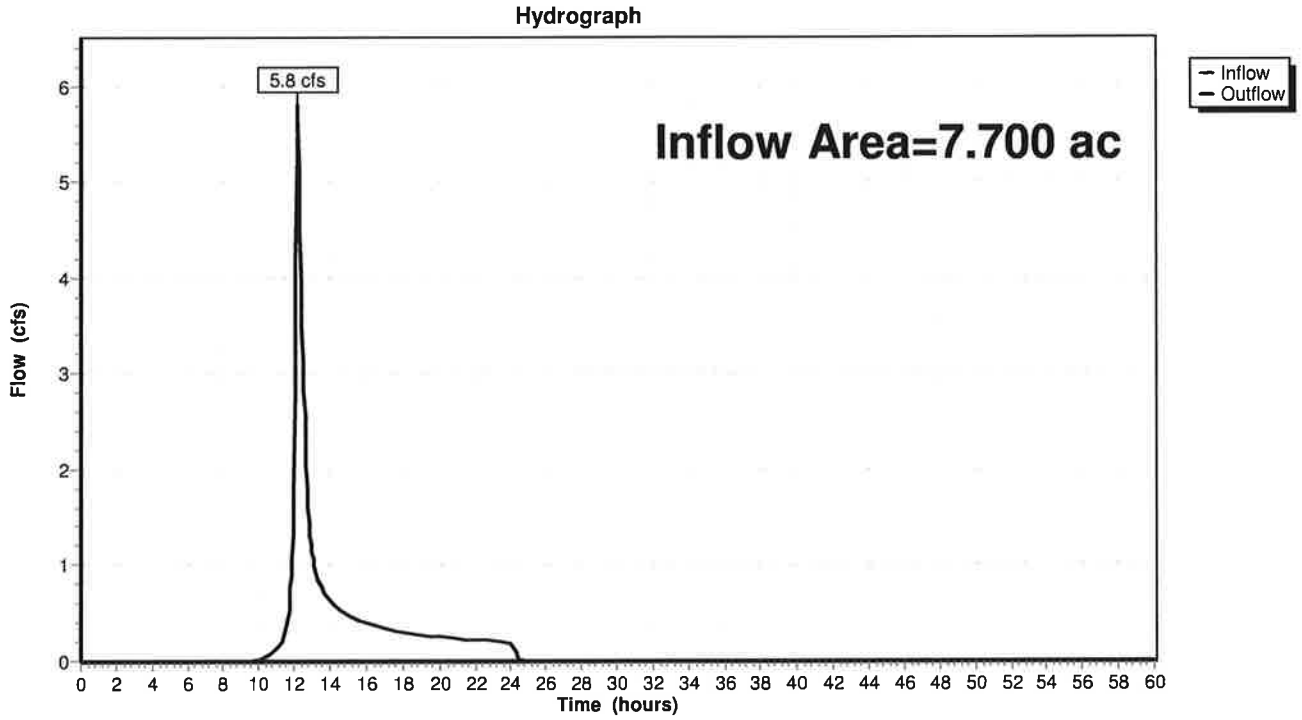


## Summary for Reach DP2: Design Point 2

Inflow Area = 7.700 ac, 51.95% Impervious, Inflow Depth = 0.98" for 1-yr event
Inflow = 5.8 cfs @ 12.21 hrs, Volume= 0.630 af
Outflow = 5.8 cfs @ 12.21 hrs, Volume= 0.630 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP2: Design Point 2



## Summary for Pond 1.1P: I-4 Underground Infiltration System

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 1.48" for 1-yr event
Inflow = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af
Outflow = 0.4 cfs @ 11.75 hrs, Volume= 0.260 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.4 cfs @ 11.75 hrs, Volume= 0.260 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 348.74' @ 12.76 hrs Surf.Area= 0.166 ac Storage= 0.080 af

Plug-Flow detention time= 62.0 min calculated for 0.259 af (100% of inflow)
Center-of-Mass det. time= 61.9 min ( 906.0 - 844.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 347.90' | 0.146 af | **58.50'W x 123.48'L x 3.50'H Field A**<br>0.580 af Overall - 0.216 af Embedded = 0.364 af x 40.0% Voids |
| #2A | 348.40' | 0.216 af | **ADS_StormTech SC-740** x 204 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>Row Length Adjustment= +0.44' x 6.45 sf x 12 rows |
| | | 0.362 af | Total Available Storage |

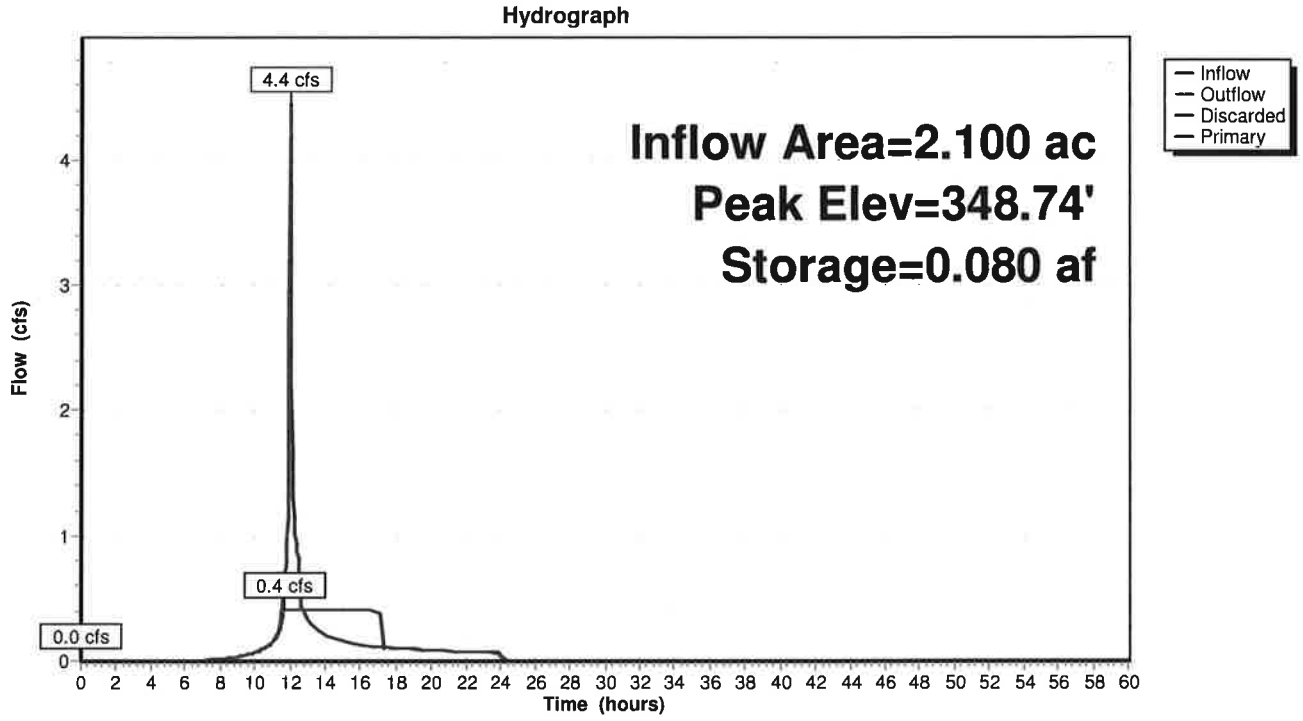
Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.40' | **8.0" Round Culvert**<br>L= 10.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.40' / 349.30' S= 0.0100 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.35 sf |
| #2 | Discarded | 347.90' | **0.4 cfs Exfiltration at all elevations** Phase-In= 0.01' |

**Discarded OutFlow** Max=0.4 cfs @ 11.75 hrs HW=347.95' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.4 cfs)

**Primary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=347.90' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** ( Controls 0.0 cfs)

## Pond 1.1P: I-4 Underground Infiltration System



## Summary for Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)

Inflow Area = 0.600 ac, 33.33% Impervious, Inflow Depth = 0.73" for 1-yr event
Inflow = 0.6 cfs @ 11.99 hrs, Volume= 0.037 af
Outflow = 0.0 cfs @ 15.12 hrs, Volume= 0.016 af, Atten= 95%, Lag= 187.5 min
Primary = 0.0 cfs @ 15.12 hrs, Volume= 0.016 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 343.68' @ 15.12 hrs Surf.Area= 595 sf Storage= 955 cf

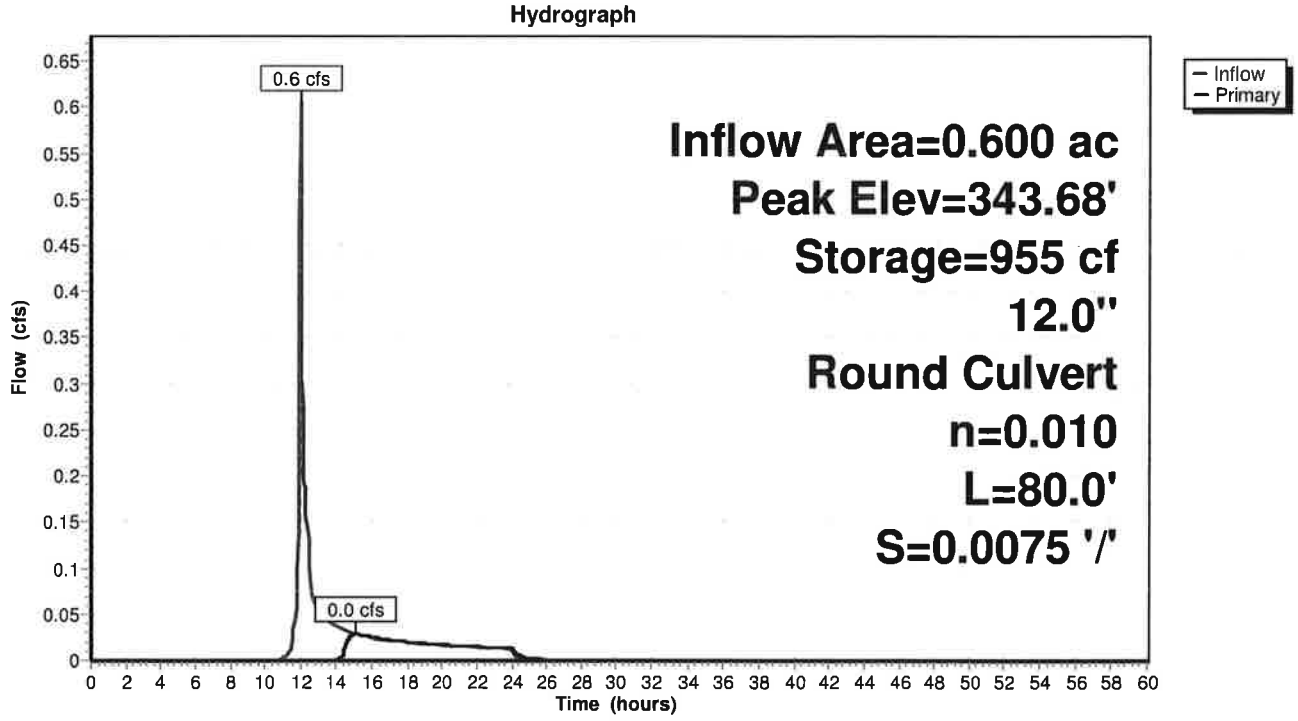
Plug-Flow detention time= 409.6 min calculated for 0.016 af (43% of inflow)
Center-of-Mass det. time= 239.2 min ( 1,136.9 - 897.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 342.00' | 1,705 cf | **Oldcastle_Storm_Capture SC1 3 @ 85.00' L**<br>Inside= 84.0"W x 36.0"H => 20.06 sf x 85.00'L = 1,705.3 cf<br>Outside= 96.0"W x 43.0"H => 28.67 sf x 85.00'L = 2,436.7 cf |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 343.60' | **12.0" Round Culvert**<br>L= 80.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 343.60' / 343.00' S= 0.0075 '/' Cc= 0.900<br>n= 0.010, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.0 cfs @ 15.12 hrs HW=343.68' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.0 cfs @ 1.45 fps)

## Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)



## Summary for Pond FS1: FS 1

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 1.48" for 1-yr event
Inflow = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af
Outflow = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.0 min
Primary = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

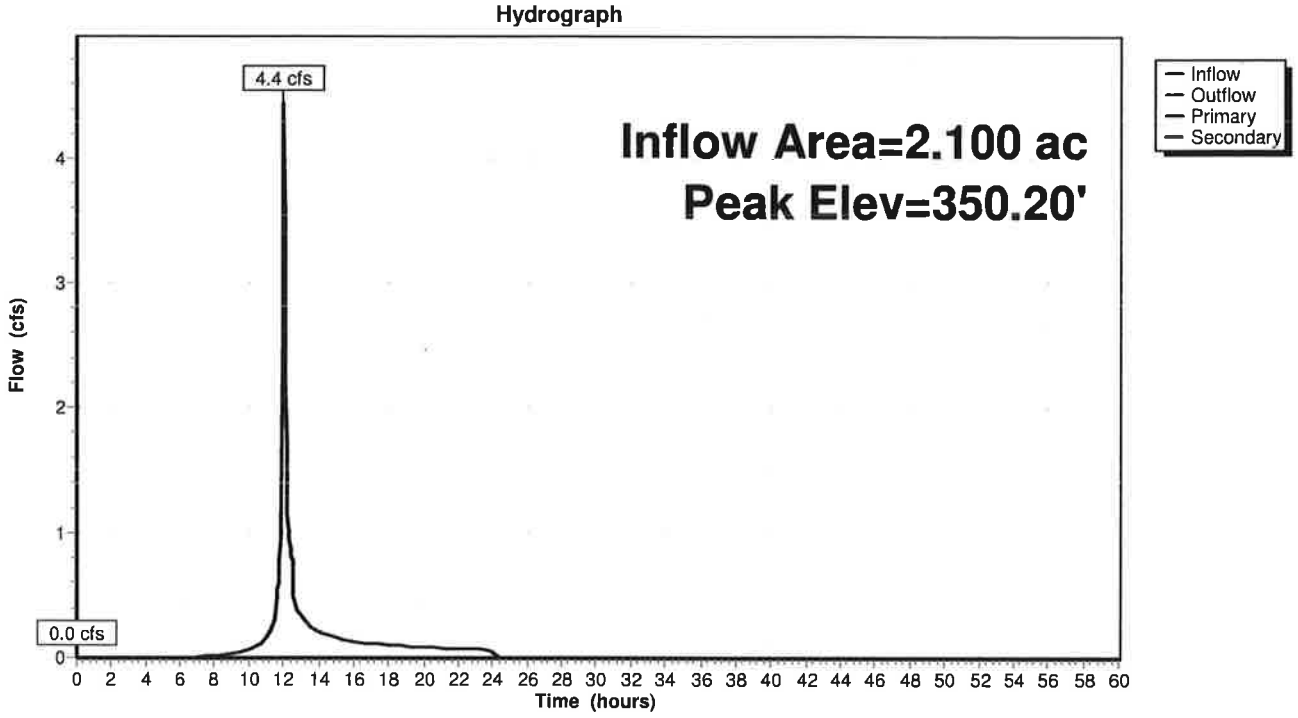
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 350.20' @ 12.01 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.00' | **15.0" Round Culvert**<br>L= 54.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.00' / 348.50' S= 0.0093 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Secondary | 349.10' | **18.0" Round Culvert**<br>L= 85.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.10' / 348.50' S= 0.0071 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |
| #3 | Device 2 | 351.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=4.3 cfs @ 12.01 hrs HW=350.17' TW=348.70' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 4.3 cfs @ 4.66 fps)

**Secondary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=349.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** ( Controls 0.0 cfs)
↑—**3=Broad-Crested Rectangular Weir** ( Controls 0.0 cfs)

## Pond FS1: FS 1


Hydrograph
4.4 cfs
0.0 cfs
Inflow Area=2.100 ac
Peak Elev=350.20'
Inflow
Outflow
Primary
Secondary
Flow (cfs)
0
1
2
3
4
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
Time (hours)

## Summary for Pond HDS1: HDS1 (HG8)

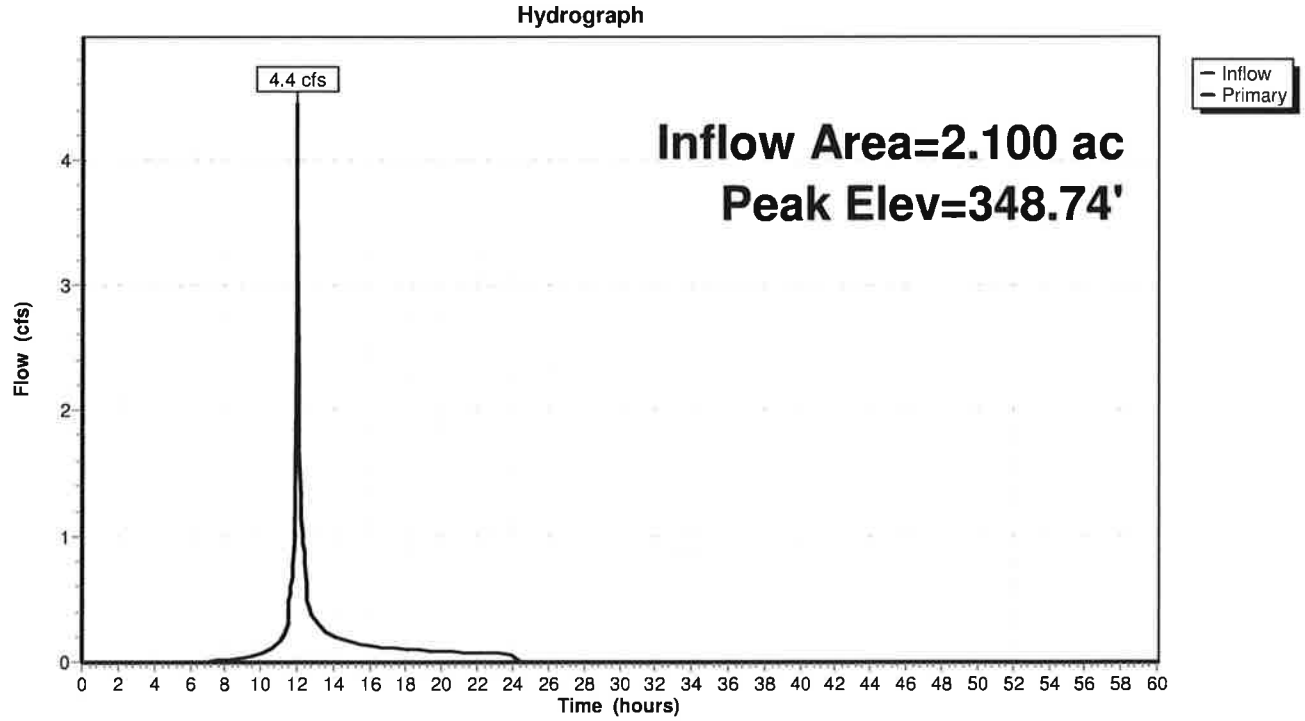
Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 1.48" for 1-yr event
Inflow = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af
Outflow = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.0 min
Primary = 4.4 cfs @ 12.01 hrs, Volume= 0.260 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 348.74' @ 12.79 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 348.50' | **15.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 348.50' / 348.40' S= 0.0063 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Primary | 348.50' | **Special & User-Defined**<br>Loss (feet) 0.00 0.01 0.25 1.01 2.28 4.06 6.34 9.13<br>Disch. (cfs) 0.000 1.000 5.000 10.000 15.000 20.000 25.000 30.000 |

**Primary OutFlow** Max=4.3 cfs @ 12.01 hrs HW=348.70' TW=348.35' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.1 cfs @ 1.77 fps)
└─**2=Special & User-Defined** (Custom Controls 4.1 cfs)

## Pond HDS1: HDS1 (HG8)



## Summary for Subcatchment 1.1S:

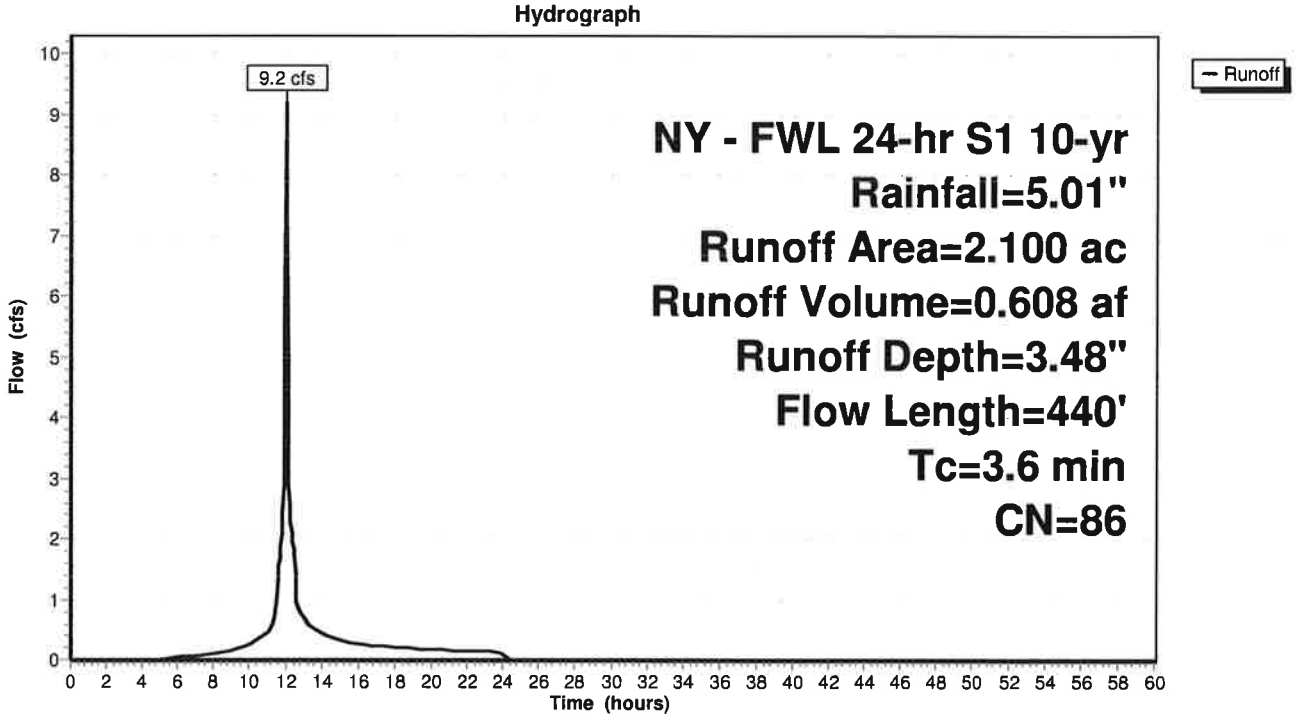
Runoff = 9.2 cfs @ 12.01 hrs, Volume= 0.608 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 1.400 | 98 | Paved parking, HSG B |
| 0.700 | 61 | >75% Grass cover, Good, HSG B |
| 2.100 | 86 | Weighted Average |
| 0.700 | | 33.33% Pervious Area |
| 1.400 | | 66.67% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.7 | 100 | 0.0150 | 0.97 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 60 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.2 | 160 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.3 | 120 | 0.0100 | 6.22 | 7.63 | **Pipe Channel, CMP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 |
| 3.6 | 440 | Total | | | |

## Subcatchment 1.1S:



## Summary for Subcatchment 1.2S:

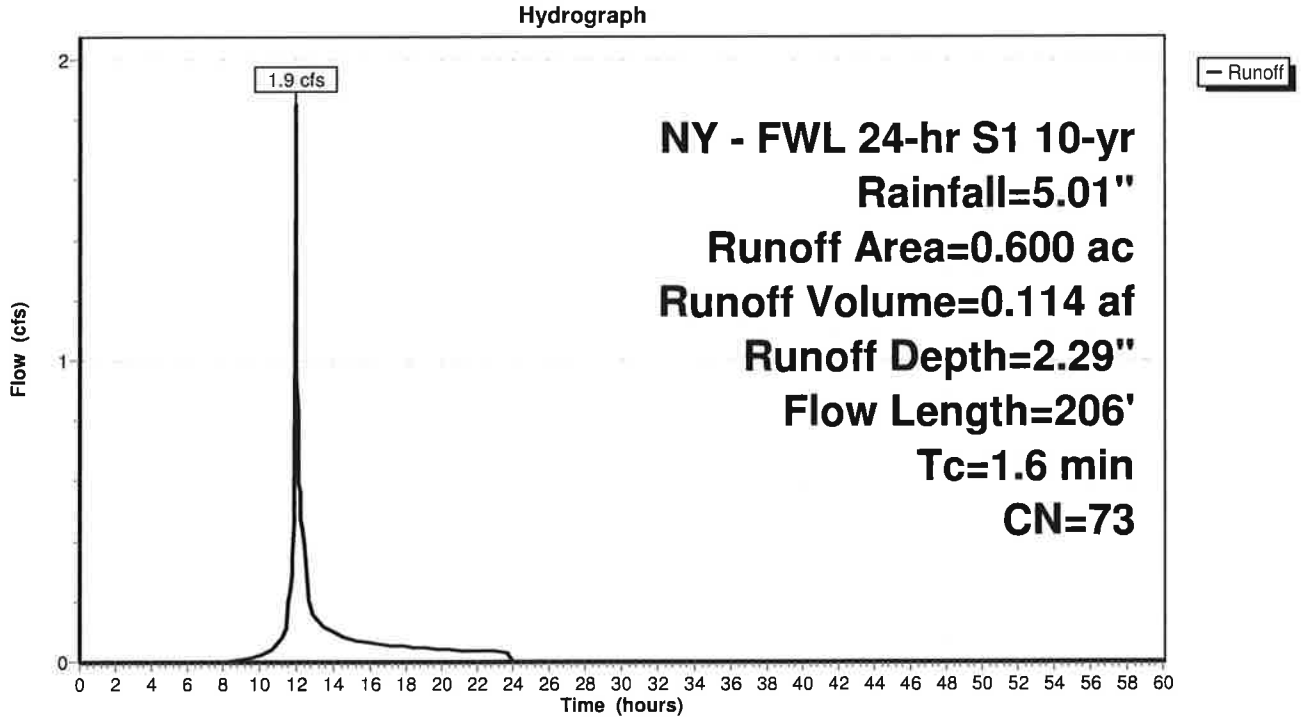
Runoff = 1.9 cfs @ 11.98 hrs, Volume= 0.114 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 0.600 | 73 | Weighted Average |
| 0.400 | | 66.67% Pervious Area |
| 0.200 | | 33.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.2 | 100 | 0.0350 | 1.36 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 106 | 0.0470 | 4.40 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.6 | 206 | Total | | | |

## Subcatchment 1.2S:



## Summary for Subcatchment 1.3S:

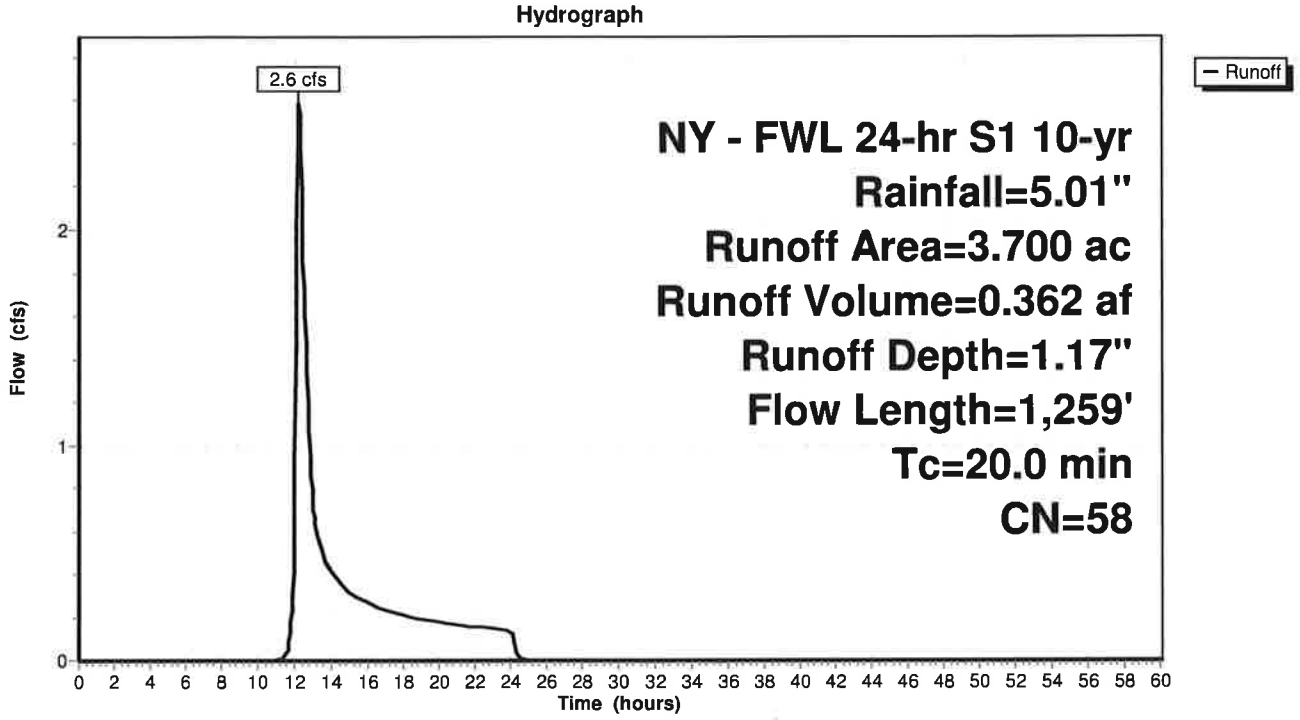
Runoff = 2.6 cfs @ 12.26 hrs, Volume= 0.362 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 3.400 | 55 | Woods, Good, HSG B |
| 0.100 | 77 | Woods, Good, HSG D |
| 3.700 | 58 | Weighted Average |
| 3.500 | | 94.59% Pervious Area |
| 0.200 | | 5.41% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.4 | 100 | 0.0200 | 0.13 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 2.00" |
| 3.3 | 391 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 25 | 0.0700 | 5.37 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.2 | 80 | 0.1450 | 6.13 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 4.0 | 663 | 0.0290 | 2.73 | 2.29 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 20.0 | 1,259 | Total | | | |

## Subcatchment 1.3S:



## Summary for Subcatchment 2.1S:

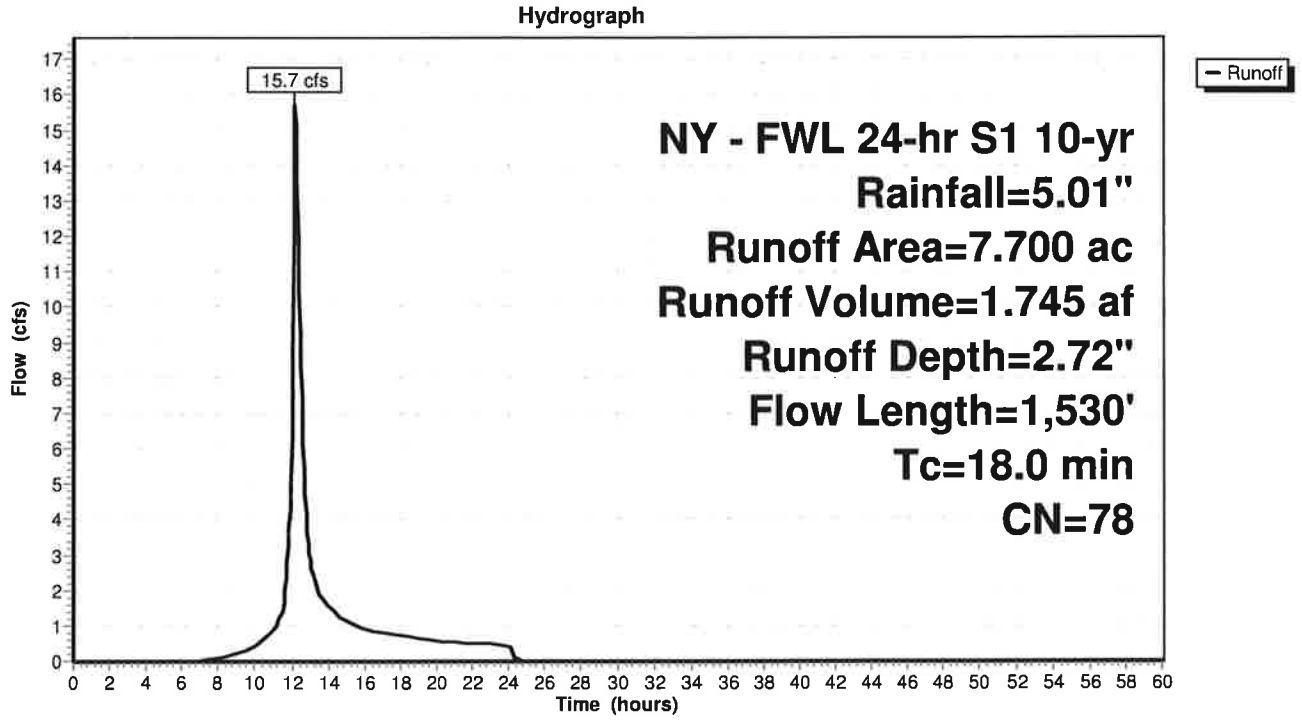
Runoff = 15.7 cfs @ 12.20 hrs, Volume= 1.745 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 10-yr Rainfall=5.01"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 3.300 | 55 | Woods, Good, HSG B |
| 3.700 | 98 | Water Surface, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 7.700 | 78 | Weighted Average |
| 3.700 | | 48.05% Pervious Area |
| 4.000 | | 51.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.1 | 100 | 0.2400 | 0.17 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.00" |
| 4.8 | 328 | 0.0520 | 1.14 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.0 | 322 | 0.0270 | 2.63 | 2.21 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 0.7 | 700 | | 17.94 | | **Lake or Reservoir,** Mean Depth= 10.00' |
| 0.4 | 80 | 0.0500 | 3.58 | 3.01 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 18.0 | 1,530 | Total | | | |

## Subcatchment 2.1S:

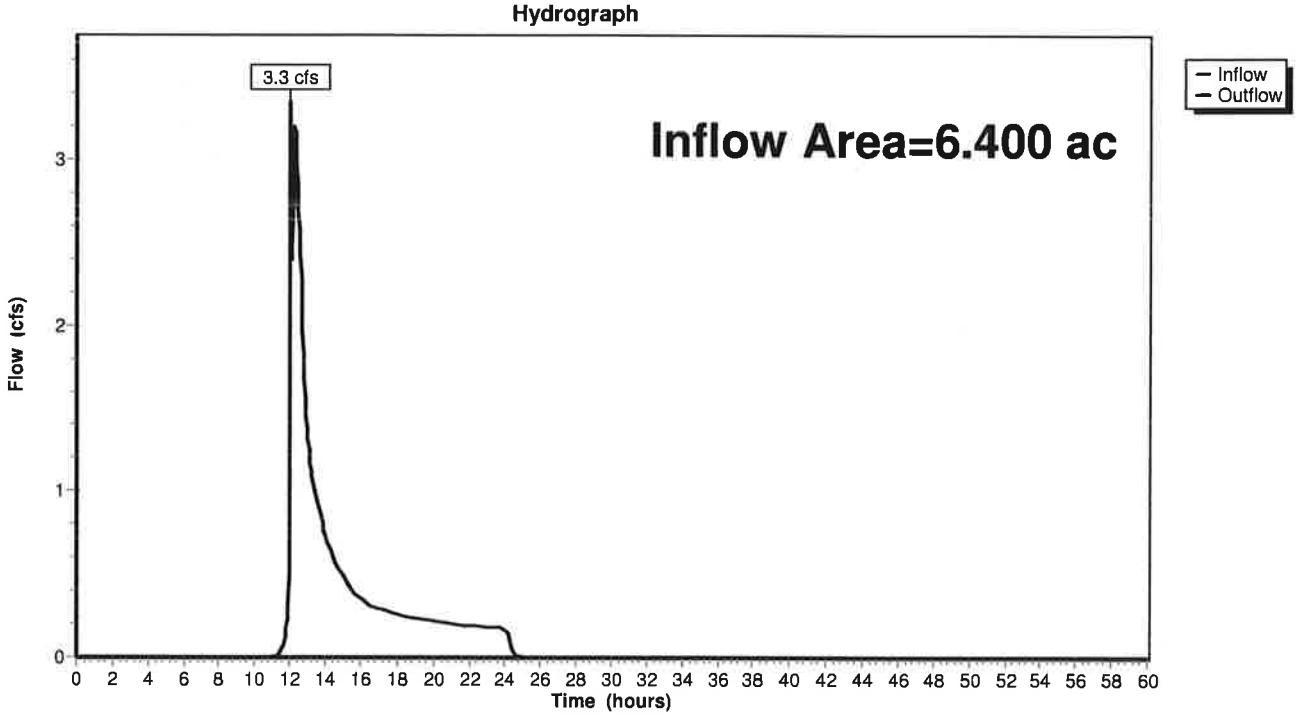


## Summary for Reach DP1: Design Point 1

Inflow Area = 6.400 ac, 28.13% Impervious, Inflow Depth = 0.99" for 10-yr event
Inflow = 3.3 cfs @ 12.01 hrs, Volume= 0.527 af
Outflow = 3.3 cfs @ 12.01 hrs, Volume= 0.527 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP1: Design Point 1

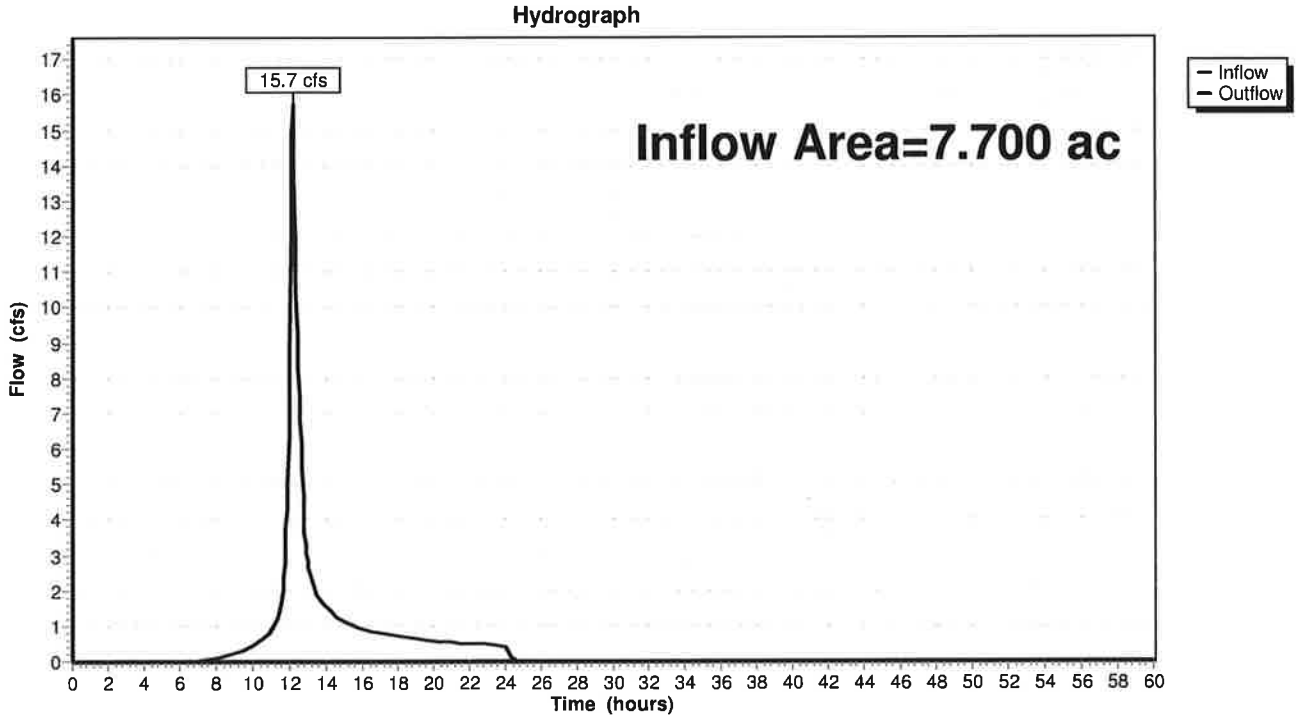


## Summary for Reach DP2: Design Point 2

Inflow Area = 7.700 ac, 51.95% Impervious, Inflow Depth = 2.72" for 10-yr event
Inflow = 15.7 cfs @ 12.20 hrs, Volume= 1.745 af
Outflow = 15.7 cfs @ 12.20 hrs, Volume= 1.745 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP2: Design Point 2



## Summary for Pond 1.1P: I-4 Underground Infiltration System

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 3.44" for 10-yr event
Inflow = 7.6 cfs @ 12.01 hrs, Volume= 0.601 af
Outflow = 0.8 cfs @ 12.80 hrs, Volume= 0.601 af, Atten= 89%, Lag= 47.0 min
Discarded = 0.4 cfs @ 11.15 hrs, Volume= 0.537 af
Primary = 0.4 cfs @ 12.80 hrs, Volume= 0.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 349.82' @ 12.80 hrs Surf.Area= 0.166 ac Storage= 0.222 af

Plug-Flow detention time= 176.1 min calculated for 0.601 af (100% of inflow)
Center-of-Mass det. time= 176.2 min ( 992.9 - 816.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 347.90' | 0.146 af | **58.50'W x 123.48'L x 3.50'H Field A**<br>0.580 af Overall - 0.216 af Embedded = 0.364 af x 40.0% Voids |
| #2A | 348.40' | 0.216 af | **ADS_StormTech SC-740** x 204 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>Row Length Adjustment= +0.44' x 6.45 sf x 12 rows |
| | | 0.362 af | Total Available Storage |

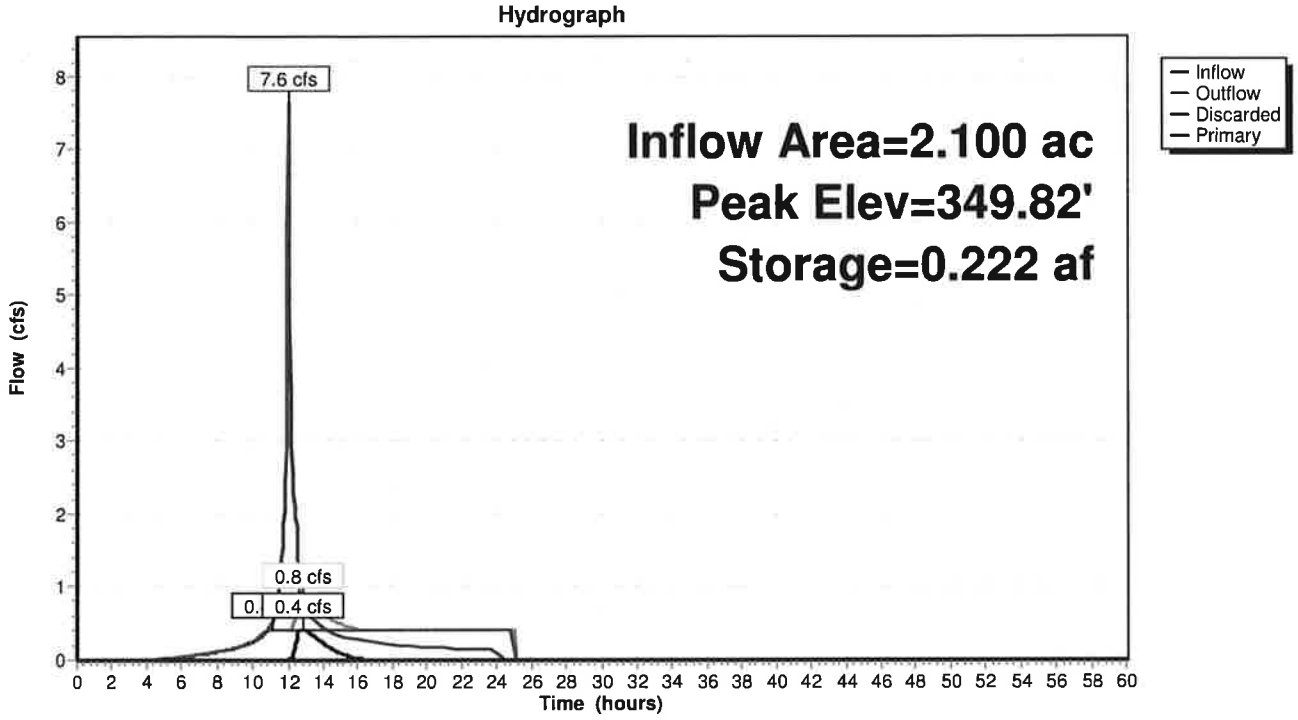
Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.40' | **8.0" Round Culvert**<br>L= 10.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.40' / 349.30' S= 0.0100 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.35 sf |
| #2 | Discarded | 347.90' | **0.4 cfs Exfiltration at all elevations** Phase-In= 0.01' |

**Discarded OutFlow** Max=0.4 cfs @ 11.15 hrs HW=347.94' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.4 cfs)

**Primary OutFlow** Max=0.4 cfs @ 12.80 hrs HW=349.82' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.4 cfs @ 2.58 fps)

## Pond 1.1P: I-4 Underground Infiltration System



## Summary for Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)

Inflow Area = 0.600 ac, 33.33% Impervious, Inflow Depth = 2.29" for 10-yr event
Inflow = 1.9 cfs @ 11.98 hrs, Volume= 0.114 af
Outflow = 1.3 cfs @ 12.05 hrs, Volume= 0.094 af, Atten= 32%, Lag= 4.0 min
Primary = 1.3 cfs @ 12.05 hrs, Volume= 0.094 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 344.19' @ 12.05 hrs Surf.Area= 595 sf Storage= 1,245 cf

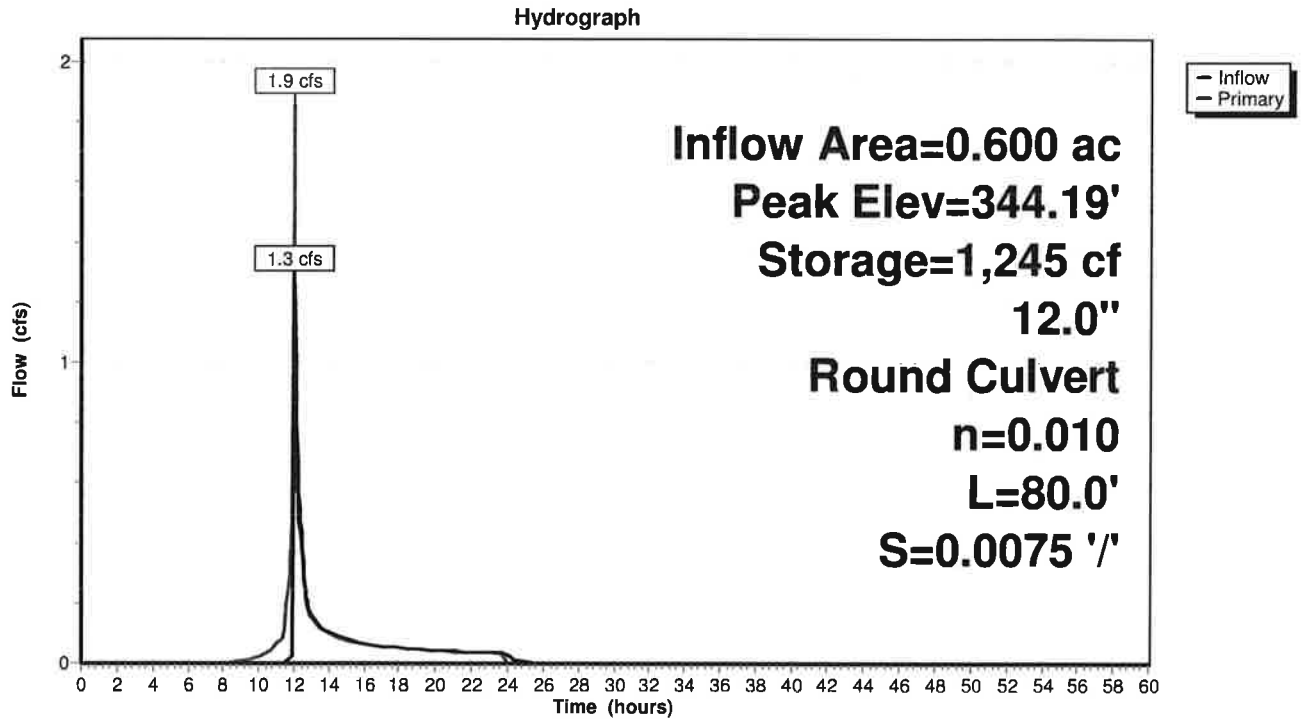
Plug-Flow detention time= 137.3 min calculated for 0.093 af (82% of inflow)
Center-of-Mass det. time= 54.1 min ( 912.4 - 858.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 342.00' | 1,705 cf | **Oldcastle_Storm_Capture SC1 3 @ 85.00' L**<br>Inside= 84.0"W x 36.0"H => 20.06 sf x 85.00'L = 1,705.3 cf<br>Outside= 96.0"W x 43.0"H => 28.67 sf x 85.00'L = 2,436.7 cf |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 343.60' | **12.0" Round Culvert**<br>L= 80.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 343.60' / 343.00' S= 0.0075 '/' Cc= 0.900<br>n= 0.010, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.3 cfs @ 12.05 hrs HW=344.19' TW=0.00' (Dynamic Tailwater)
**1=Culvert** (Inlet Controls 1.3 cfs @ 2.61 fps)

## Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)



## Summary for Pond FS1: FS 1

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 3.48" for 10-yr event
Inflow = 9.2 cfs @ 12.01 hrs, Volume= 0.608 af
Outflow = 9.2 cfs @ 12.01 hrs, Volume= 0.608 af, Atten= 0%, Lag= 0.0 min
Primary = 7.6 cfs @ 12.01 hrs, Volume= 0.601 af
Secondary = 1.6 cfs @ 12.00 hrs, Volume= 0.007 af

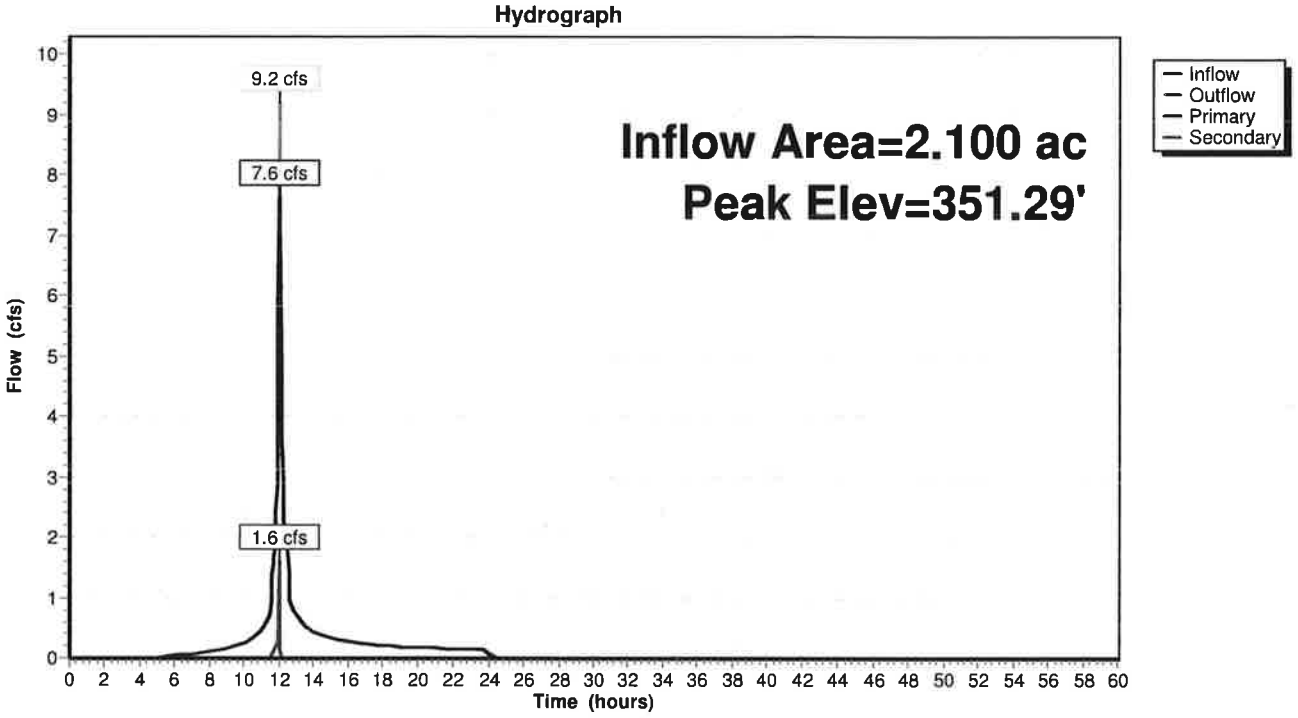
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 351.29' @ 12.01 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.00' | **15.0" Round Culvert**<br>L= 54.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.00' / 348.50' S= 0.0093 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Secondary | 349.10' | **18.0" Round Culvert**<br>L= 85.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.10' / 348.50' S= 0.0071 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |
| #3 | Device 2 | 351.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=7.4 cfs @ 12.01 hrs HW=351.22' TW=349.14' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.4 cfs @ 6.06 fps)

**Secondary OutFlow** Max=1.5 cfs @ 12.00 hrs HW=351.26' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 1.5 cfs of 9.5 cfs potential flow)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 1.5 cfs @ 1.46 fps)

## Pond FS1: FS 1


Hydrograph
Inflow Area=2.100 ac
Peak Elev=351.29'
9.2 cfs
7.6 cfs
1.6 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
0 1 2 3 4 5 6 7 8 9 10

## Summary for Pond HDS1: HDS1 (HG8)

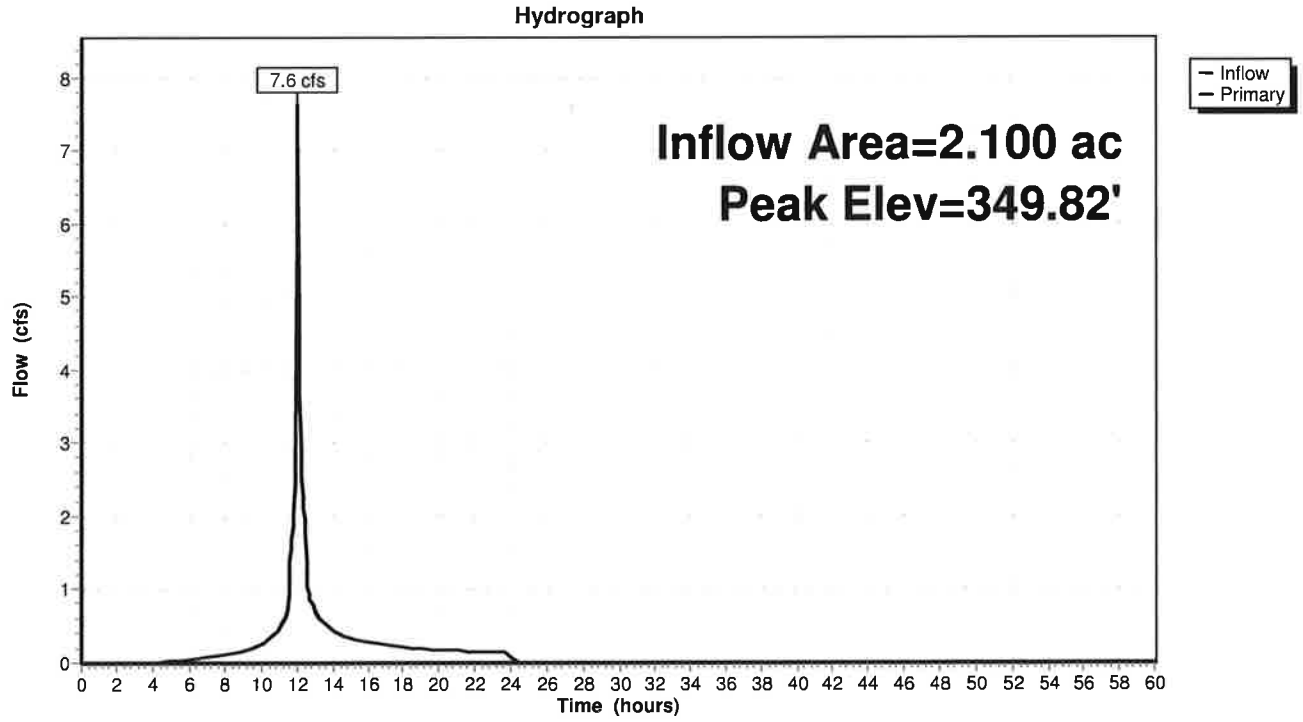
Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 3.44" for 10-yr event
Inflow = 7.6 cfs @ 12.01 hrs, Volume= 0.601 af
Outflow = 7.6 cfs @ 12.01 hrs, Volume= 0.601 af, Atten= 0%, Lag= 0.0 min
Primary = 7.6 cfs @ 12.01 hrs, Volume= 0.601 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 349.82' @ 12.84 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 348.50' | **15.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 348.50' / 348.40' S= 0.0063 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Primary | 348.50' | **Special & User-Defined**<br>Loss (feet) 0.00 0.01 0.25 1.01 2.28 4.06 6.34 9.13<br>Disch. (cfs) 0.000 1.000 5.000 10.000 15.000 20.000 25.000 30.000 |

**Primary OutFlow** Max=5.8 cfs @ 12.01 hrs HW=349.14' TW=348.91' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.2 cfs @ 2.78 fps)
└─**2=Special & User-Defined** (Custom Controls 4.6 cfs)

## Pond HDS1: HDS1 (HG8)



## Summary for Subcatchment 1.1S:

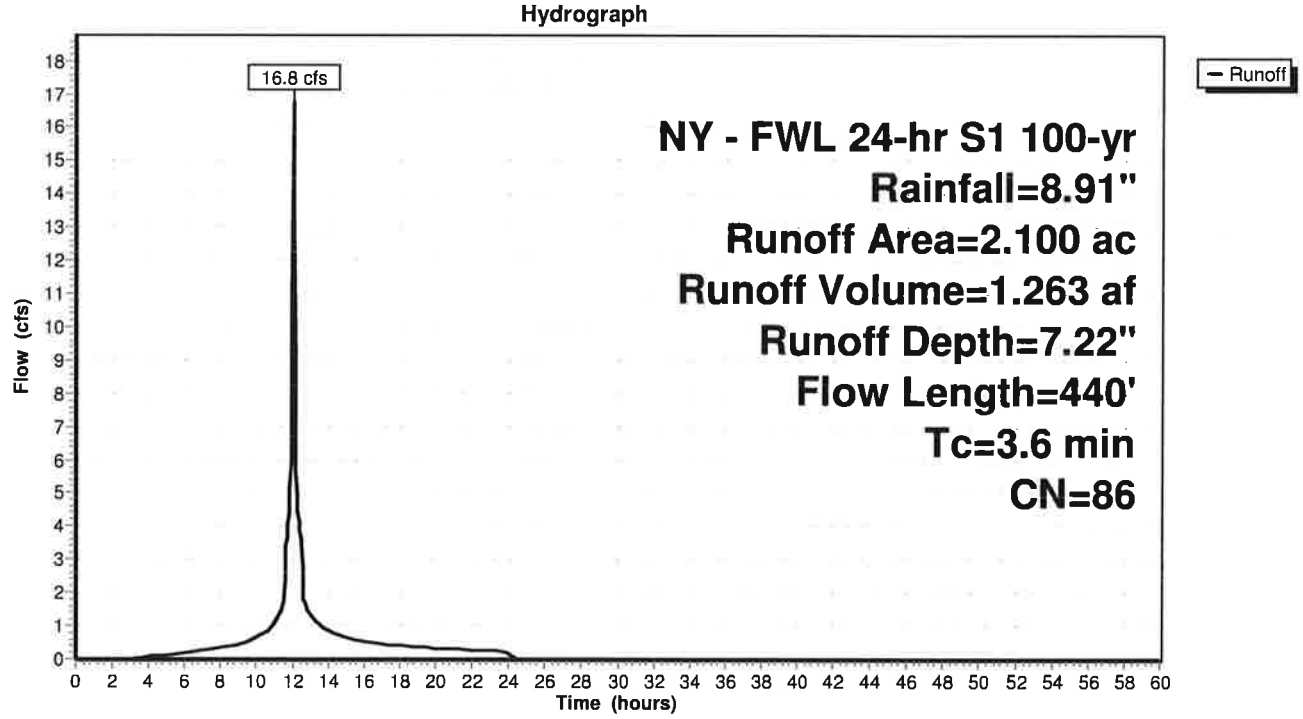
Runoff = 16.8 cfs @ 12.00 hrs, Volume= 1.263 af, Depth= 7.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 1.400 | 98 | Paved parking, HSG B |
| 0.700 | 61 | >75% Grass cover, Good, HSG B |
| 2.100 | 86 | Weighted Average |
| 0.700 | | 33.33% Pervious Area |
| 1.400 | | 66.67% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.7 | 100 | 0.0150 | 0.97 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 60 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.2 | 160 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.3 | 120 | 0.0100 | 6.22 | 7.63 | **Pipe Channel, CMP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 |
| 3.6 | 440 | Total | | | |

## Subcatchment 1.1S:



## Summary for Subcatchment 1.2S:

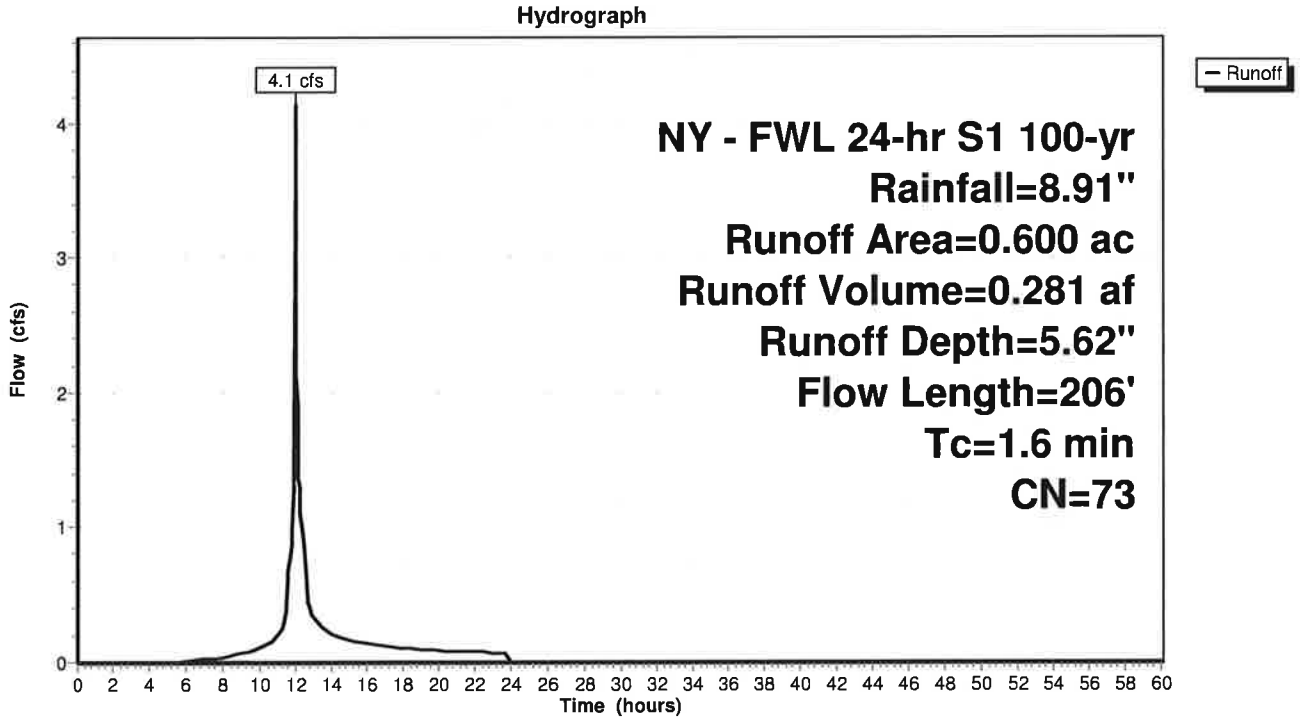
Runoff = 4.1 cfs @ 11.98 hrs, Volume= 0.281 af, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 0.600 | 73 | Weighted Average |
| 0.400 | | 66.67% Pervious Area |
| 0.200 | | 33.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.2 | 100 | 0.0350 | 1.36 | | **Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00" |
| 0.4 | 106 | 0.0470 | 4.40 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.6 | 206 | Total | | | |

## Subcatchment 1.2S:



## Summary for Subcatchment 1.3S:

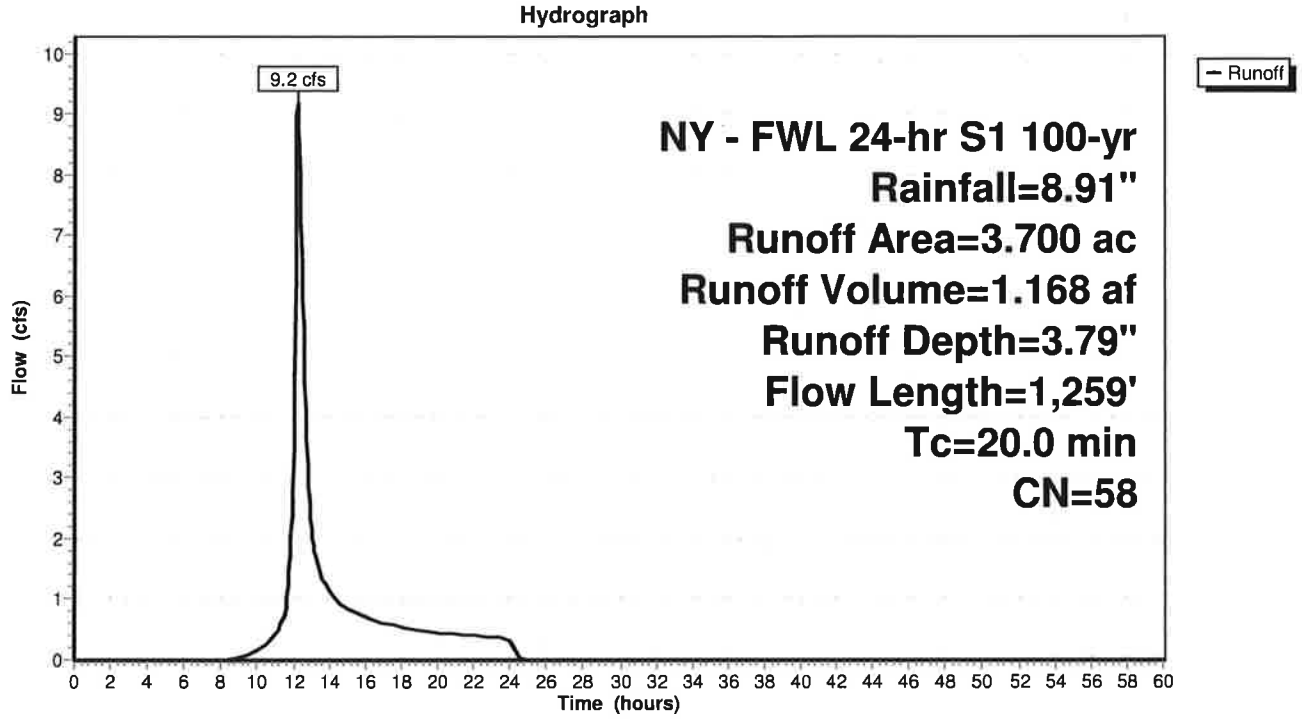
Runoff = 9.2 cfs @ 12.24 hrs, Volume= 1.168 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 0.200 | 98 | Paved parking, HSG B |
| 3.400 | 55 | Woods, Good, HSG B |
| 0.100 | 77 | Woods, Good, HSG D |
| 3.700 | 58 | Weighted Average |
| 3.500 | | 94.59% Pervious Area |
| 0.200 | | 5.41% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.4 | 100 | 0.0200 | 0.13 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 2.00" |
| 3.3 | 391 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 25 | 0.0700 | 5.37 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.2 | 80 | 0.1450 | 6.13 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 4.0 | 663 | 0.0290 | 2.73 | 2.29 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 20.0 | 1,259 | Total | | | |

## Subcatchment 1.3S:



## Summary for Subcatchment 2.1S:

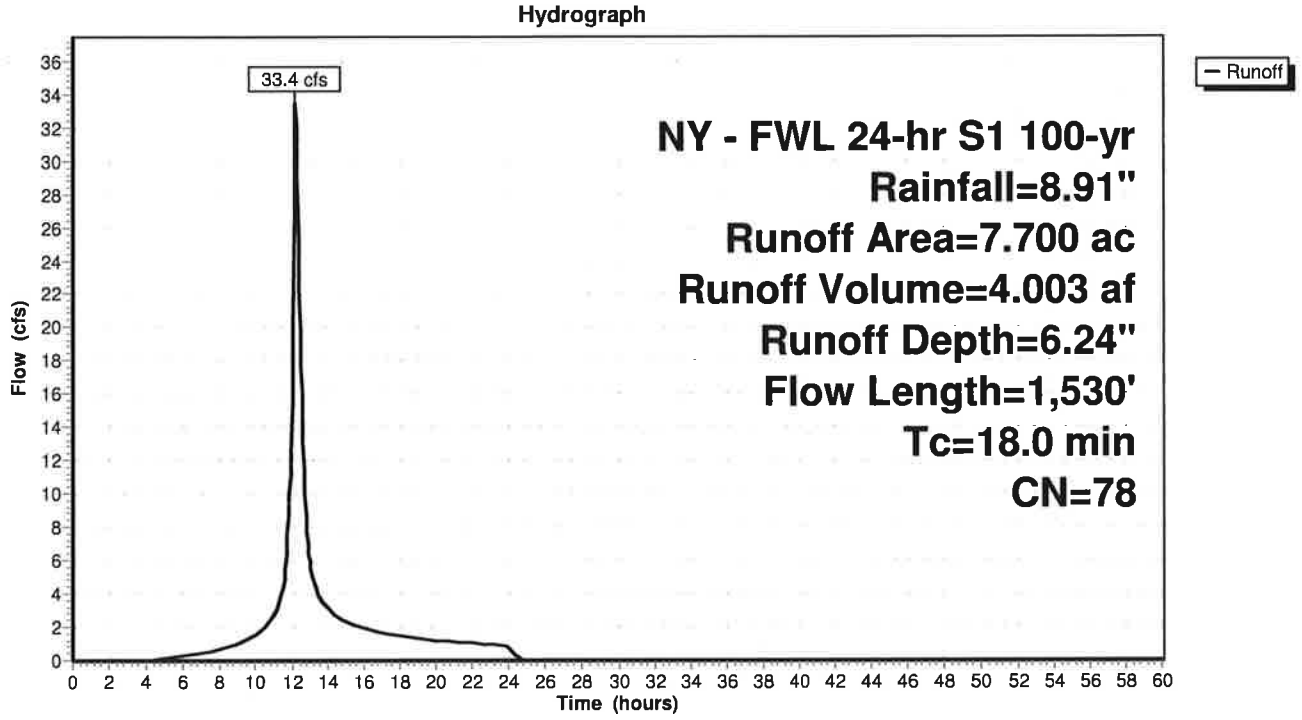
Runoff = 33.4 cfs @ 12.20 hrs, Volume= 4.003 af, Depth= 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NY - FWL 24-hr S1 100-yr Rainfall=8.91"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG B |
| 3.300 | 55 | Woods, Good, HSG B |
| 3.700 | 98 | Water Surface, HSG B |
| 0.400 | 61 | >75% Grass cover, Good, HSG B |
| 7.700 | 78 | Weighted Average |
| 3.700 | | 48.05% Pervious Area |
| 4.000 | | 51.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.1 | 100 | 0.2400 | 0.17 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.00" |
| 4.8 | 328 | 0.0520 | 1.14 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.0 | 322 | 0.0270 | 2.63 | 2.21 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 0.7 | 700 | | 17.94 | | **Lake or Reservoir,** Mean Depth= 10.00' |
| 0.4 | 80 | 0.0500 | 3.58 | 3.01 | **Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=0.20' Z= 1.0 '/' Top.W=4.40' n= 0.030 Earth, grassed & winding |
| 18.0 | 1,530 | Total | | | |

## Subcatchment 2.1S:

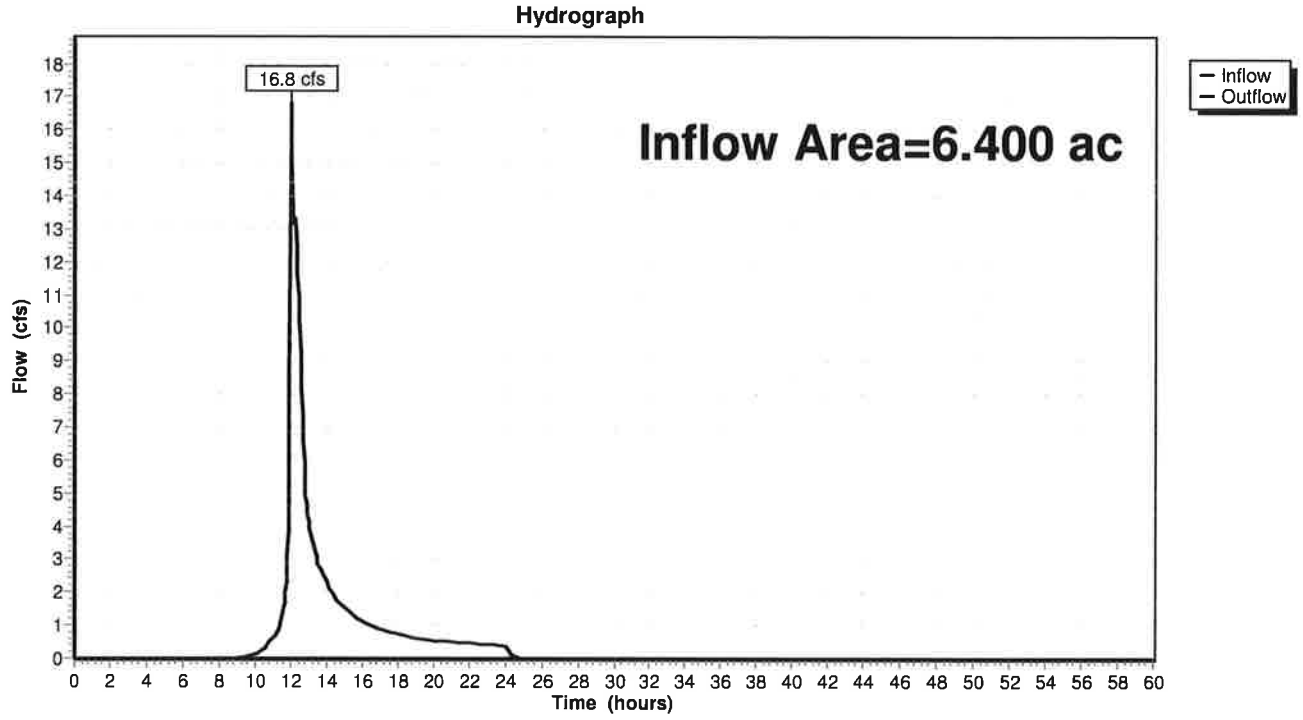


## Summary for Reach DP1: Design Point 1

Inflow Area = 6.400 ac, 28.13% Impervious, Inflow Depth = 3.66" for 100-yr event
Inflow = 16.8 cfs @ 12.02 hrs, Volume= 1.952 af
Outflow = 16.8 cfs @ 12.02 hrs, Volume= 1.952 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP1: Design Point 1

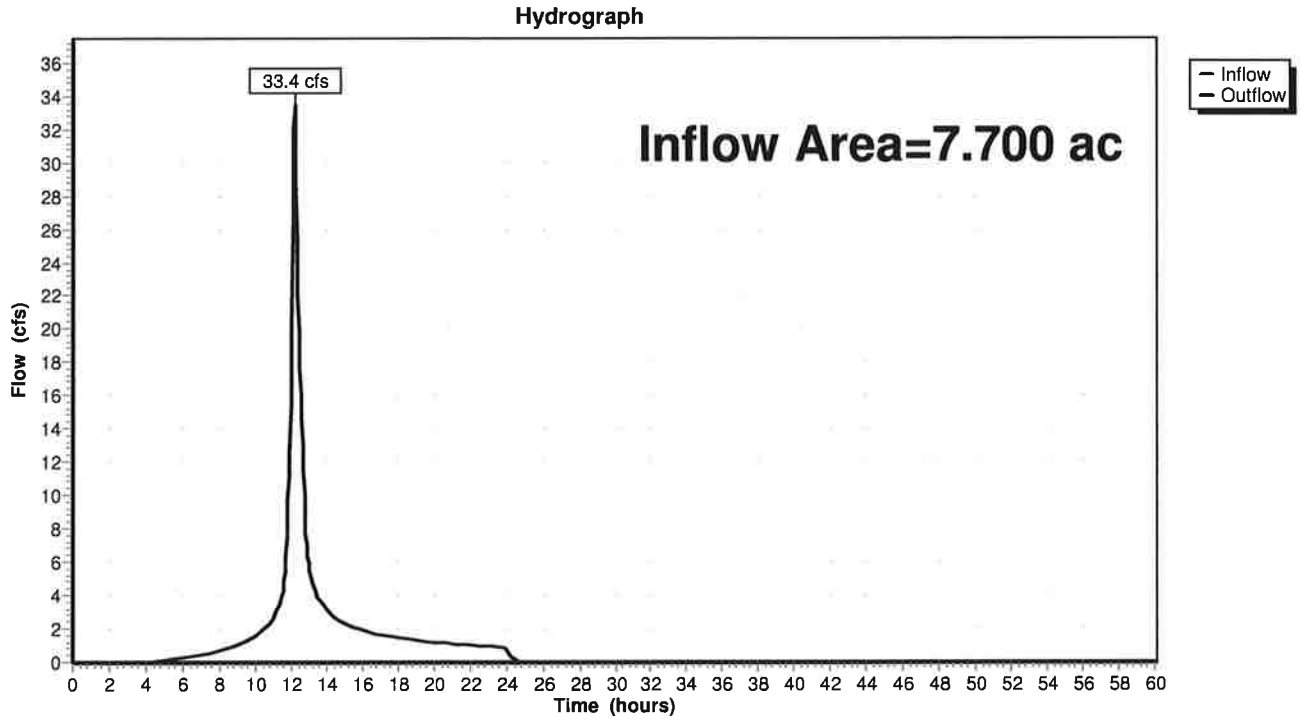


## Summary for Reach DP2: Design Point 2

Inflow Area = 7.700 ac, 51.95% Impervious, Inflow Depth = 6.24" for 100-yr event
Inflow = 33.4 cfs @ 12.20 hrs, Volume= 4.003 af
Outflow = 33.4 cfs @ 12.20 hrs, Volume= 4.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

## Reach DP2: Design Point 2



## Summary for Pond 1.1P: I-4 Underground Infiltration System

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 6.41" for 100-yr event
Inflow = 8.1 cfs @ 11.98 hrs, Volume= 1.121 af
Outflow = 2.4 cfs @ 12.40 hrs, Volume= 1.121 af, Atten= 71%, Lag= 25.2 min
Discarded = 0.4 cfs @ 9.20 hrs, Volume= 0.739 af
Primary = 2.0 cfs @ 12.40 hrs, Volume= 0.383 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 351.11' @ 12.40 hrs Surf.Area= 0.166 ac Storage= 0.342 af

Plug-Flow detention time= 157.6 min calculated for 1.120 af (100% of inflow)
Center-of-Mass det. time= 157.7 min ( 956.8 - 799.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 347.90' | 0.146 af | **58.50'W x 123.48'L x 3.50'H Field A**<br>0.580 af Overall - 0.216 af Embedded = 0.364 af x 40.0% Voids |
| #2A | 348.40' | 0.216 af | **ADS_StormTech SC-740** x 204 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>Row Length Adjustment= +0.44' x 6.45 sf x 12 rows |
| | | 0.362 af | Total Available Storage |

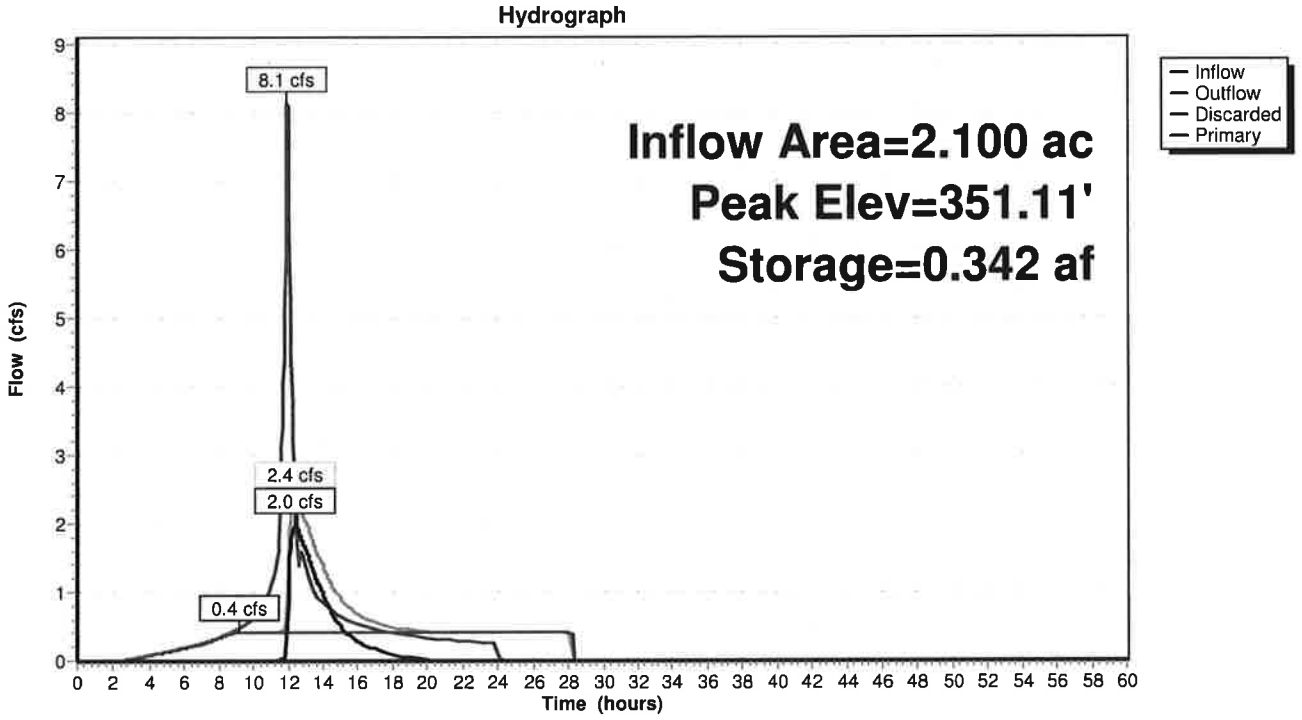
Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.40' | **8.0" Round Culvert**<br>L= 10.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.40' / 349.30' S= 0.0100 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.35 sf |
| #2 | Discarded | 347.90' | **0.4 cfs Exfiltration at all elevations** Phase-In= 0.01' |

**Discarded OutFlow** Max=0.4 cfs @ 9.20 hrs HW=347.94' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.4 cfs)

**Primary OutFlow** Max=2.0 cfs @ 12.40 hrs HW=351.11' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.0 cfs @ 5.64 fps)

## Pond 1.1P: I-4 Underground Infiltration System



## Summary for Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)

Inflow Area = 0.600 ac, 33.33% Impervious, Inflow Depth = 5.62" for 100-yr event
Inflow = 4.1 cfs @ 11.98 hrs, Volume= 0.281 af
Outflow = 3.3 cfs @ 12.02 hrs, Volume= 0.260 af, Atten= 20%, Lag= 2.4 min
Primary = 3.3 cfs @ 12.02 hrs, Volume= 0.260 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 344.86' @ 12.02 hrs Surf.Area= 595 sf Storage= 1,624 cf

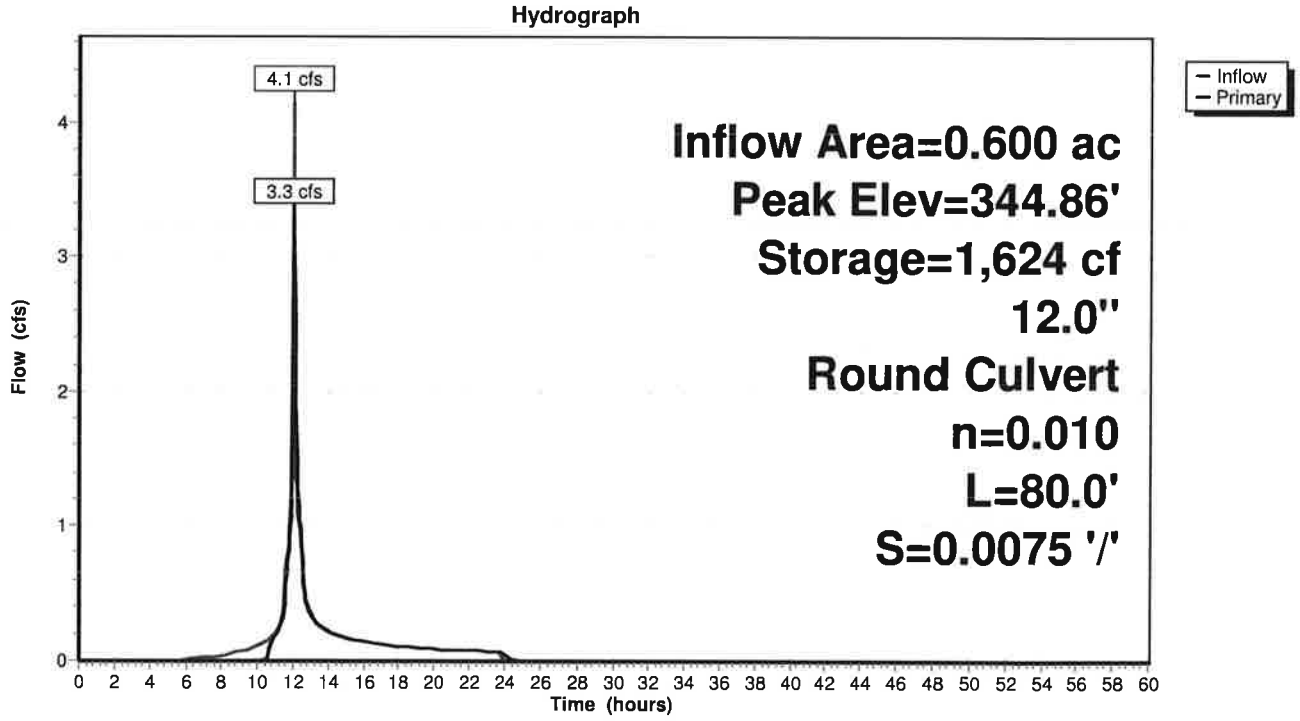
Plug-Flow detention time= 73.3 min calculated for 0.260 af (93% of inflow)
Center-of-Mass det. time= 32.0 min ( 859.6 - 827.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 342.00' | 1,705 cf | **Oldcastle_Storm_Capture SC1 3 @ 85.00' L**<br>Inside= 84.0"W x 36.0"H => 20.06 sf x 85.00'L = 1,705.3 cf<br>Outside= 96.0"W x 43.0"H => 28.67 sf x 85.00'L = 2,436.7 cf |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 343.60' | **12.0" Round Culvert**<br>L= 80.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 343.60' / 343.00' S= 0.0075 '/' Cc= 0.900<br>n= 0.010, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.2 cfs @ 12.02 hrs HW=344.81' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.2 cfs @ 4.06 fps)

## Pond 1.2P: Rainwater Harvesting Cistern (5.3.10)



## Summary for Pond FS1: FS 1

Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 7.22" for 100-yr event
Inflow = 16.8 cfs @ 12.00 hrs, Volume= 1.263 af
Outflow = 16.8 cfs @ 12.00 hrs, Volume= 1.263 af, Atten= 0%, Lag= 0.0 min
Primary = 8.1 cfs @ 11.98 hrs, Volume= 1.121 af
Secondary = 8.7 cfs @ 12.01 hrs, Volume= 0.142 af

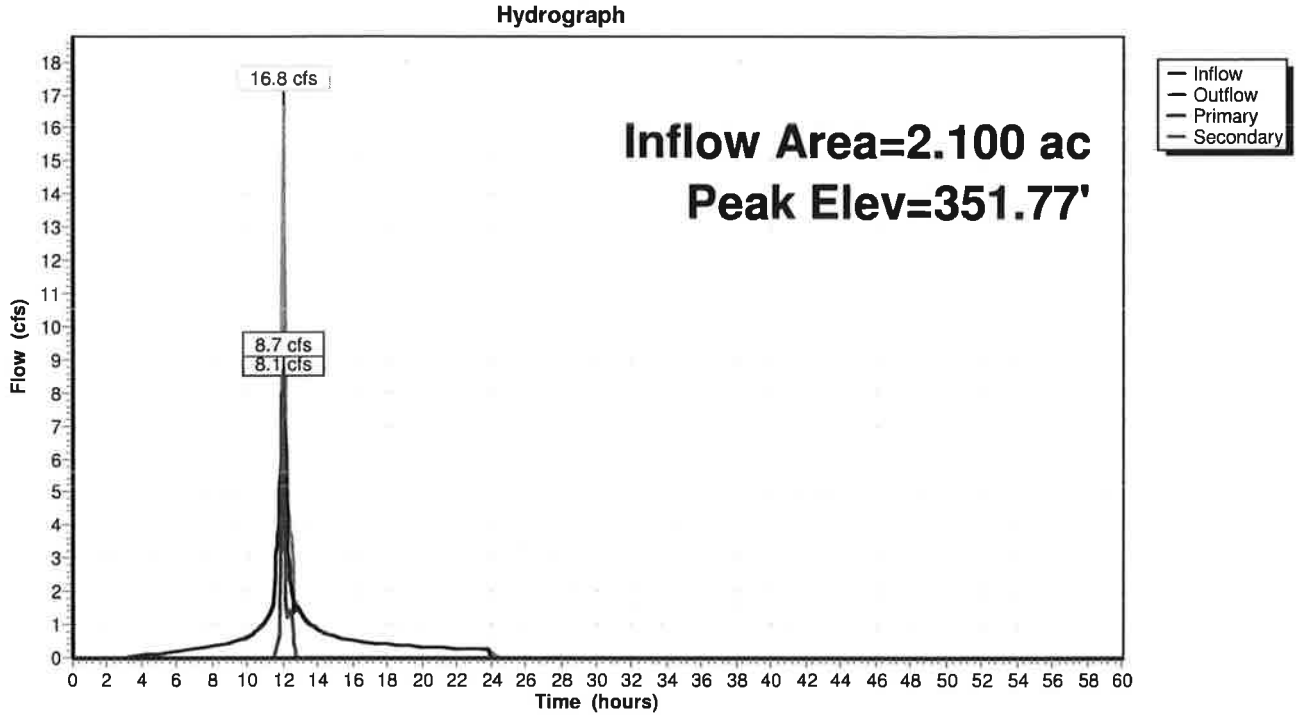
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 351.77' @ 12.01 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 349.00' | **15.0" Round Culvert**<br>L= 54.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.00' / 348.50' S= 0.0093 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Secondary | 349.10' | **18.0" Round Culvert**<br>L= 85.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 349.10' / 348.50' S= 0.0071 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |
| #3 | Device 2 | 351.00' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |

**Primary OutFlow** Max=7.5 cfs @ 11.98 hrs HW=351.65' TW=350.04' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.5 cfs @ 6.12 fps)

**Secondary OutFlow** Max=8.2 cfs @ 12.01 hrs HW=351.74' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 8.2 cfs of 11.1 cfs potential flow)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 8.2 cfs @ 2.78 fps)

## Pond FS1: FS 1


Hydrograph
16.8 cfs
8.7 cfs
8.1 cfs
Inflow Area=2.100 ac
Peak Elev=351.77'
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

## Summary for Pond HDS1: HDS1 (HG8)

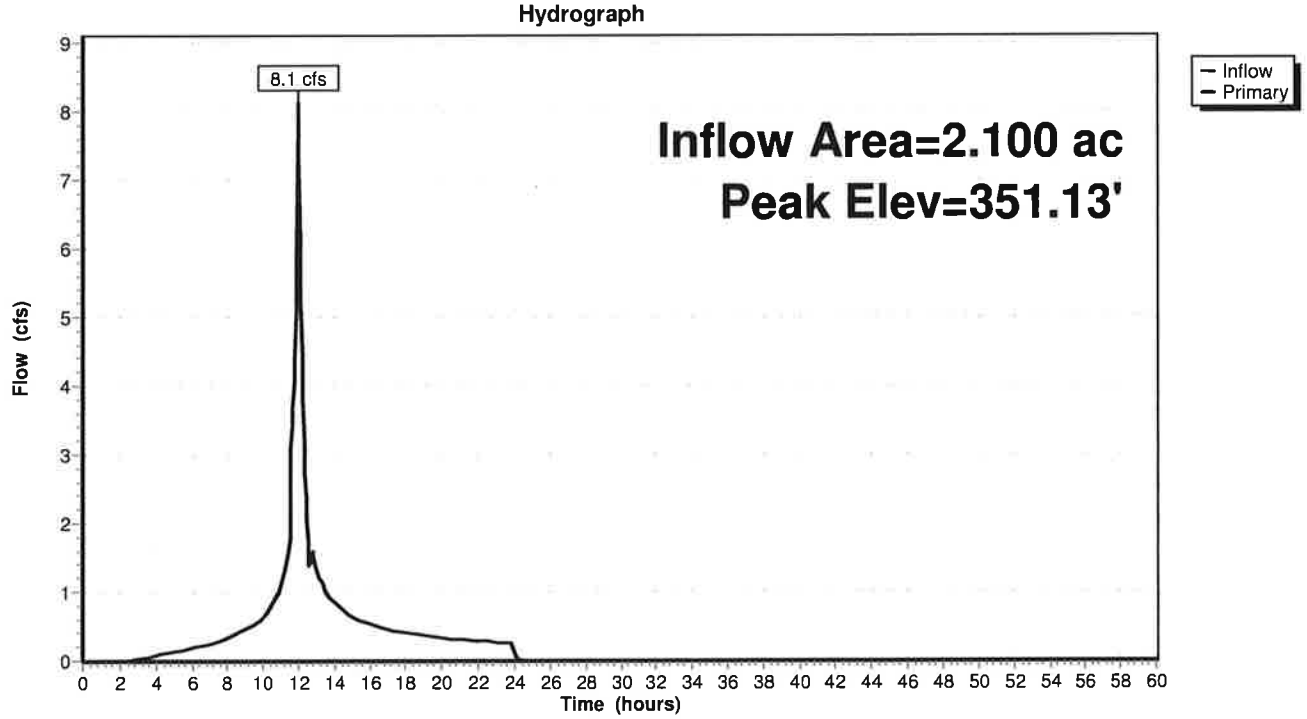
Inflow Area = 2.100 ac, 66.67% Impervious, Inflow Depth = 6.41" for 100-yr event
Inflow = 8.1 cfs @ 11.98 hrs, Volume= 1.121 af
Outflow = 8.1 cfs @ 11.98 hrs, Volume= 1.121 af, Atten= 0%, Lag= 0.0 min
Primary = 8.1 cfs @ 11.98 hrs, Volume= 1.121 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 351.13' @ 12.44 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 348.50' | **15.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 348.50' / 348.40' S= 0.0063 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.23 sf |
| #2 | Primary | 348.50' | **Special & User-Defined**<br>Loss (feet) 0.00 0.01 0.25 1.01 2.28 4.06 6.34 9.13<br>Disch. (cfs) 0.000 1.000 5.000 10.000 15.000 20.000 25.000 30.000 |

**Primary OutFlow** Max=2.1 cfs @ 11.98 hrs HW=350.04' TW=350.01' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.9 cfs @ 0.73 fps)
└─**2=Special & User-Defined** (Custom Controls 1.2 cfs)

## Pond HDS1: HDS1 (HG8)



# APPENDIX E

## Project and Owner Information

Site Data:

200/280 Fields Lane
Southeast, NY 10509

Party Responsible for implementation of the Short and Long Term Maintenance Plan:

FWL Group, LLC
200/280 Fields Lane
Southeast, NY 10509

Qualified Professional Responsible for Inspection of the Stormwater Pollution Prevention Plan:

Insite Engineering, Surveying, and Landscape Architecture, P.C.
3 Garrett Place
Carmel, NY 10512
Phone: 845-225-9690

# APPENDIX F

## NYSDEC SPDES for Construction Activities Construction Site Log Book

**STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM**
**FOR CONSTRUCTION ACTIVITIES**

# CONSTRUCTION SITE LOG BOOK

## Table of Contents



Properly completing forms such as those contained in this document meet the inspection requirement of NYSDEC SPDES GP 0-10-001 for Construction Activities, or superceding permit. Completed forms shall be kept on site at all times and made available to authorities upon request.

## I. PRE-CONSTRUCTION MEETING DOCUMENTS

**Project Name** _____

**Permit No.** _____ **Date of Authorization** _____

**Name of Operator** _____

**Prime Contractor** _____

**a. Preamble to Site Assessment and Inspections** -The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).

2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (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.

**b. Operators Certification**

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. 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 (please print):**_____

**Title** _____ **Date:**_____

**Address:** _____

**Phone:** _____ **Email:**_____

**Signature:**_____