

Appendix K

PRELIMINARY STORMWATER  
POLLUTION PREVENTION PLAN





**PRELIMINARY  
STORMWATER POLLUTION PREVENTION PLAN**

**For**

**STATELINE RETAIL CENTER  
Town of Southeast, New York**

**October 16, 2007**

Prepared by:  
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**NOTE: This report in conjunction with the project plans make up the complete Stormwater  
Pollution Prevention Plan**



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### FIGURES

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- Figure 2: Pre-Development Drainage Map
- Figure 3: Post-Development Drainage Map

### PROJECT PLANS

The project plans are as follows:

- SP-1 “Overall Site Plan”
- SP-2.1 “Layout and Landscape Plan”
- SP-2.2 “Layout and Landscape Plan”
- SP-3.1 “Grading and Utilities Plan”
- SP-3.2 “Grading and Utilities Plan”
- SP-4.1 “Overall Phasing Plan”
- SP-4.2 “Erosion and Sediment Control Plan”
- SP-4.3 “Erosion and Sediment Control Plan”
- PR-1 “Profiles and Cross Sections”
- LP-1 “Lighting Plan”
- D-1 “Details”
- D-2” Details”
- D-3” Details”



## 1.0 INTRODUCTION

### 1.1 Project Description

The subject project is a 44.03± acre parcel located along U.S. Route 6 in the Town of Southeast. The project parcel is located between Interstate 84 and U.S. Route 6. The attached location map (Figure 1) delineates the subject property and its surroundings. The subject parcel is located in the GC-2 zoning district and is designated as Tax Map Number 68.-2-48.

The subject project is located in the East Branch Reservoir Basin. The on-site ground cover is characterized as a mixture of woods and meadow throughout the majority of the site. The property ranges in elevation from a high point of 534 in the central portion of the site adjacent to the southern property line to elevation 442 in the Town regulated wetland on the northeastern portion of the site. The slopes throughout the proposed project range from flat to generally steep slopes. Soil types on the property vary from very deep, well-drained soils to moderately drained soils. Figures 2 and 3 provide a breakdown of the soil types and a listing of these soils in accordance with the *Soils Survey of Putnam and Westchester Counties*.

Additional physical features of the property include two (2) Town-regulated wetlands. One (1) Town-regulated wetland is located in the northwestern portion of the site. An intermittent watercourse and reservoir stem are located within this Town-regulated wetland. The second Town-regulated wetland is located on the eastern portion of the site. Stormwater runoff from Interstate 84 is discharged to an unnamed stream that flows through the Town-regulated wetland on the eastern portion of the site. The unnamed stream crosses under U.S. Route 6 and discharges to the East Branch Reservoir Basin.

The subject property is proposed to be developed with approximately 184,800 s.f. of retail and 14,800 s.f. of office buildings and associated access roads, parking and landscaping. The development will include stormwater improvements, which will convey runoff to and through a series of stormwater management practices. The proposed practices will treat the stormwater runoff created by the development of the site.

### 1.2 Existing Stormwater Runoff Conditions

The subject property is a mixture of woods and meadow throughout the property. Currently the stormwater runoff from the property flows overland from the high point in the central portion of the site along the southern property line to the Town-regulated wetlands. A ridge in the central portion of the property divides the flow of the stormwater runoff between the two (2) onsite Town-regulated wetlands. An un-named stream tributary to the East Branch Reservoir Basin passes through the eastern portion of the site and originates from the discharge of the stormwater runoff from Interstate 84. The un-named stream crosses under U.S. Route 6 and discharges in the East Branch Reservoir. An intermittent watercourse and reservoir stem are located in the Town-regulated wetland in the northwestern portion of the site. Ultimately the stormwater runoff drains to the East Branch Reservoir. A design line, and design point were chosen to analyze the existing stormwater conditions of the site. The existing drainage area boundaries for the stormwater runoff can be seen on Figure 2.

### 1.3 Proposed Stormwater Runoff Conditions

The design line and point have been analyzed for the stormwater runoff produced from the proposed development of the property. The design line / point were chosen to analyze the stormwater runoff both qualitatively and quantitatively. Design Line 1 runs north to south along an existing wetland edge on the eastern portion of the property. Design Point 2 is located at the culvert in the Town-regulated wetland in the northwestern portion of the property. The design line / point are shown on Figure 3. The stormwater runoff from the proposed development will be collected and discharged to proposed stormwater ponds via a proposed stormwater collection system. Two (2) stormwater ponds and one (1) low gradient grass swales with check dams are proposed to treat stormwater for Design Line 1 and three (3) stormwater ponds and two (2) low gradient grass swale with check dams are proposed for Design Point 2. In general, the drainage patterns will remain the same from the existing conditions to the proposed conditions.

The proposed subsurface sewage treatment system (SSTS) for the bulk of development is located on the eastern portion of the site. This portion of the property is currently meadow, and will be

maintained as meadow after construction. Thus, there is no change in land cover and this area will generate a zero net increase in peak flows and pollutant loadings at Design Line 1. As a result, the proposed SSTS area has been omitted from the stormwater quantity and quality analyses.

## 2.0 STORMWATER MANAGEMENT

The stormwater management for the subject project requires compliance with several regulatory agencies and codes. To meet the requirements of the New York City Department of Environmental Protection (NYCDEP) and the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit No. GP-02-01, several publications were referenced to design the stormwater management systems' quantity and quality issues. The publications include *Reducing the Impacts of Stormwater Runoff from New Development*, April 1992 (Impacts), *Fundamentals of Urban Runoff Management: Technical and Institutional Issues* produced by the Terrene Institute, and the *New York State Stormwater Management Design Manual*, August 2003 (NYSSMM).

Water quality on this project has been addressed to meet the requirements of both the NYCDEP and NYSDEC. A series of stormwater ponds have been designed to capture and treat 90% of the average stormwater runoff to address the water quality requirements for the NYSDEC. To meet the water quality standards for the NYCDEP, stormwater ponds have been designed in series to provide 24-hour plug flow detention of the 2-year 24-hour storm. In addition, to provide a final polishing of runoff each of the terminal stormwater ponds will discharge to a low gradient grass swale with check dams.

To meet NYSDEC Stream Channel Protection requirements, 24-hour center of mass detention time of the 1-year, 24-hour storm event has been provided.

The stormwater management system has also been designed to attenuate post development peak flow rates from the 10 and 100-year storm events to predevelopment levels satisfying the NYSDEC requirements for Overbank and Extreme Flood Control.

### 2.1 Quantitative Analysis

The "HydroCAD" Stormwater Modeling System," by HydroCAD Software Solutions LLC of Tamworth, New Hampshire, was used to model and assess the 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. The program was used to analyze the 1-year, 2-year, 10-year, 25-year and 100-year, 24-hour design storms. Peak flows were calculated for both the pre-development condition and the post-development condition. 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 Ponds

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

The following is a general description of the input data used to calculate the pre- and post-development stormwater runoff values. For detailed information for each subcatchment and pond, see Appendices A & B.

The precipitation values for the various design storms analyzed were obtained from the local County Soil and Water Conservation District office. The values provided are for 24-hour design storms in Putnam County.



Design Storm	24-Hour Rainfall
1-Year	2.7"
2-Year	3.5"
10-Year	5.0"
25-Year	6.0"
100-Year	7.5"

The CN (runoff curve number) values utilized in this report were referenced from the USDA, SCS publication *Urban Hydrology for Small Watersheds*. The following is a summary of the various land uses/ground covers and their associated CN values utilized in this report.

Land Use/Ground Cover	CN Value
Woods, A Soil	30
Woods/Grass, A Soil	32
Meadow, A Soil	30
>75% Grass Cover, A Soil	39
Urban Commercial, 85% Imp, A Soil	89
Woods, C Soil	70
Woods/Grass, C Soil	72
Meadow, C Soil	71
>75% Grass Cover, C Soil	74
Urban Commercial, 85% Imp, C Soil	94
Paved Parking and Roofs	98

The hydrologic soils groups for the majority of the project consist of mainly A and C soils. The soils on the site consist of Chatfield – Charlton complex (CsD), Fredon silt loam (Fr), Knickerbocker fine sandy loam (KnB, KnC), Leicester loam (LcB), Paxton fine sandy loam (PnB, PnC), Ridgebury loam (RgB) and Sun loam (Sh).

The quantitative analysis performed for the subject project involves the assessment of design line and design point as shown on Figure 2 and Figure 3. The following table summarizes the calculated pre-development and post-development peak stormwater runoff flows:

**PEAK FLOW SUMMARY (C.F.S.)**

24-HOUR DESIGN STORM								
	2-YEAR		10-YEAR		25-YEAR		100-YEAR	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Design Line 1	0.21	0.21	2.71	1.19	6.55	4.19	14.73	13.83
Design Point 2	9.00	6.68	22.79	18.57	33.37	32.39	50.53	50.31

As seen in the table above, the post development peak flows at Design Line 1 and Design Point 2 have been attenuated to equal or less than predevelopment levels.

2.2. Qualitative Analysis

Estimates of pre-development and post-development discharges of BOD, TP, TN, and TSS have been calculated for the subject project. The pollutant loading coefficient method was utilized to calculate the annual export of the above-mentioned pollutants. The New York State Department of Environmental Conservation (NYSDEC) publication *Reducing the Impacts of Stormwater Runoff from New Development* was referenced to determine appropriate loading rates for BOD. The publication *Fundamentals of Urban Runoff Management: Technical and Institutional Issues* produced by the Terrene Institute was referenced to determine appropriate loading rates for TP, TN and TSS. The appropriate loading rates were then utilized to calculate the annual pollutant export values. Variables involved with this calculation include soil type and land use/ground cover characteristics. The following table summarizes the pollutant loading rates utilized for the subject project.

**SUMMARY OF POLLUTANT LOADING RATES (LBS/ACRE/YEAR)**

Land Use/Ground Cover	BOD	TP	TN	TSS
Forest	7.0	0.10	1.8	76.5
Pasture	32.0	0.11	3.7	305.3
Grass	6.0	0.12	3.7	308.0
Commercial	163.0	0.71	4.6	716.5
Road	113.0	0.98	2.1	446.8

The primary treatment for stormwater runoff discharging from the subject project will be stormwater basins. In addition to stormwater basins, grass swales are proposed to provide additional treatment of stormwater runoff. A monitored outlet is proposed to discharge the 2-year, 24-hour storm over 24 hours or more as required by the NYCDEP regulations.

The following pollutant removal efficiencies are referenced from the publication *Reducing the Impacts of Stormwater Runoff from New Development*, prepared by the NYSDEC.

**LONG TERM POLLUTANT REMOVAL EFFICIENCIES**

Treatment Method	BOD	TP	TN	TSS
Grass Swale	20%-40%	20%-40%	20%-40%	20%-40%
Design 2 Extended Detention Pond	40%-60%	40%-60%	20%-40%	80%-100%

The following table summarizes the estimated pre-development and post-development annual pollutant loads (calculated in Appendix C) calculated for the subject project.

**ANNUAL POLLUTANT SUMMARY TO DESIGN LINE 1**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	442.8	2.69	51.5	3808.9
<b>Post-Development Annual Pollutant Loads</b>	645.6 to 260.0	3.41 to 1.61	43.7 to 23.7	1025.9 to 579.7

**ANNUAL POLLUTANT SUMMARY TO DESIGN POINT 2**

	Annual Loads (lb/yr)			
	BOD	TP	TN	TSS
<b>Pre-Development Annual Pollutant Loads</b>	237.1	2.10	34.8	2072.7
<b>Post-Development Annual Pollutant Loads</b>	450.9 to 258.1	2.77 to 1.89	35.5 to 25.9	1908.8 to 1493.1

As seen in the previous summaries the post-development pollutant loads are comparable with pre-development loads as required by the NYCDEP regulations. With respect to phosphorus, which is the pollutant of concern in the subject watershed (East Branch Reservoir) the SWPPP for the project is expected to achieve better than the calculated mean removal efficiencies due to the stormwater treatment practices that have been incorporated into the project design, but not considered in the stormwater treatment calculations. These adjuncts include a detailed maintenance program to ensure optimum pollutant removal efficiency; specific plantings in ponds 1.0P, 2.0P and 2.2P to further pollutant removals; the presence of existing wooded filter strips down gradient of the proposed low gradient grass swales with check dams to further polish runoff; catch basin / drain inlet sumps; and the addition of permanent pools in the stormwater basins. The stormwater basin permanent pools will include landscaping capable of removing dissolved phosphorus. The project will therefore not impact the Town of Southeast's ability to achieve the established East Branch Reservoir TMDL, and the SWPPP does propose stormwater measures to reduce phosphorus loading to the maximum extent practicable.

The burden for reducing current phosphorous loading to achieve the TMDL presently lies with the Town of Southeast and its regional partners. The program for phosphorous reduction has been established in the NYSDEC draft document entitled *New York City Watershed Croton Reservoir System Phase II Phosphorous TMDL Nonpoint Source Implementation Plan* (TMDL Implementation Plan). This 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:

- NYSDEC SPDES General Permit for Stormwater Discharges for Municipal Separate Stormwater Sewer Systems (MS4s) Permit No. GP-02-02.
- Putnam and Westchester County "Croton Plans".
- NYCDEP "Croton Strategy".
- NYCDEP EOH Water Quality Investment Funds, including the Putnam County Septic Repair Program.

The subject project is consistent with the TMDL Implementation Plan and applicable portions of the above-cited programs.

The NYSDEC SPDES General Permit GP-02-01 requires that the Water Quality Volume (WQ<sub>v</sub>) be treated in order to provide pollutant removal. Treatment of the Water Quality Volume is intended to improve water quality by capturing and treating 90% of the average annual stormwater runoff volumes. The water quality volume is directly related to the amount of impervious cover proposed on the project area. Stormwater ponds will be utilized to meet the NYSDEC water quality treatment requirements. Stormwater ponds 1.0P 2.0P and 2.2P will be designed as P-1 Micropool Extended Detention Pond as defined in the *NYS Stormwater Management Design Manual*. It is assumed that by meeting the Water Quality Volume requirements through employment of the stormwater ponds, the water quality objectives of the NYSDEC have been met to capture and treat 90% of the stormwater runoff, see Appendix D for WQ<sub>v</sub> calculations.

In order to provide further water quality treatment as required by the NYCDEP stormwater ponds 1.1P and 2.1P have been placed in series with 1.0P and 2.0P respectively. These ponds have been designed as Design 2 Extended Detention Ponds as outlined in *Reducing the Impacts of Stormwater Runoff from New Development*. Both 1.1P and 2.1P have been located second in the treatment series to allow the settlement of suspended particles in the preceding permanent pools of 1.0P and 2.0P.

### 3.0 STORMWATER CONVEYANCE SYSTEM

The stormwater conveyance systems for the project consist of drain inlets, catch basins and HDPE pipe. The systems will be sized utilizing the Rational Method. The Rational Method is a standard method used by engineers to develop flow rates for sizing conveyance systems. The Rational Method calculates flows based on a one-hour design storm. The conveyance systems will be sized to convey, at a minimum, the 25-year design storm.

### 4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control will be accomplished by three basic principles: containment of sediment, treatment of dirty water, and stabilization of disturbed areas. Sediment will be contained with the use of silt fence at the toe of disturbed slopes and excavation of temporary sediment basins. Disturbed areas will be permanently stabilized within 14 days of final grading to limit the required length of time that the temporary facilities must be utilized.

#### 4.1 Temporary Erosion and Sediment Control Facilities

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

- Stabilized Construction Entrance
- Silt Fence Barriers
- Stone Check Dams
- Storm Drain Inlet Protection
- Sediment Basins

A stabilized construction entrance will be installed at the entrances 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 will be accomplished with water sprinkling trucks if required. During dry periods, sprinkler trucks will wet all exposed earth surfaces as required to prevent the transport of air-borne particles to adjoining properties.

Siltation barriers constructed of geosynthetic filter cloth will be installed liberally 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 numerous filters through which the stormwater must pass. Siltation barriers will also be installed around catch basins and drain inlets. The intent of these barriers is to prevent silt and sedimentation from entering the stormwater collection system.

The stormwater ponds will also act as temporary sediment basins during construction of the proposed road and utilities. Most stormwater runoff from disturbed areas will be directed to the sediment basins. These basins will be sized in accordance with the publication, *New York Standards and Specifications for Erosion & Sediment Control*, printed by the Empire State Chapter Soil and Water Conservation Society.

In addition to the temporary sediment and erosion control measures listed above, pollution prevention measures on the site will also be accomplished by the use of a dumpster. All waste and scrap building materials on site shall be disposed of in the dumpster, with no waste being buried or improperly discarded. The site should be cleaned daily of all site litter and construction debris. Portable toilets will be provided on site during construction for wastemanagment. No construction chemicals are anticipated to be used or stored on site during and after construction.

#### 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 temporary sediment basins will be cleaned of all sediment and debris, excavated to their final elevations and dimensions and stabilized with the vegetation as indicated on the plans. Rip rap aprons

will be used at the discharge end of all piped drainage systems. Runoff velocities will be reduced to levels that are non-erosive to the receiving waterbodies through use of these aprons.

Other than the actual buildings and driveway surfaces, the primary method for permanently stabilizing disturbed surfaces at the subject site is with vegetation. 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 21<sup>st</sup> through May 20<sup>th</sup> and in late summer from August 15<sup>th</sup> to October 15<sup>th</sup>. The stormwater basins will allow for settlement of suspended sediment that is generated by stormwater runoff from the site. These facilities provide a central collection area for sediment deposition and eventual disposal.

## 5.0 MAINTENANCE AND IMPLEMENTATION

### 5.1 Construction Phase

Details associated with the implementation and maintenance of the proposed stormwater facilities and erosion control measures during construction will be shown on the project plans. A construction sequence will be provided to guide the contractor in the installation of the erosion control measures as well as the site plan features. The erosion control plan includes associated details and notes to aid the contractor in implementing the plan.

During construction a Site Log Book is required to be kept per NYSDEC SPDES General Permit GP-02-01. Erosion and sediment control inspections are required to be conducted as necessary under coverage of the permit (minimum once a week and within 24 hours of a storm event of 0.5 inches or greater) and an updated logbook 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 *New York Standards and Specifications for Erosion and Sediment Control* (Blue Book).

The stormwater ponds have been designed to limit the routine maintenance requirements. Initially the basins will require regular maintenance until the permanent vegetation is established. Permanent vegetation is considered established when 80% of the final plant density is established. Vegetation should be inspected every 30 days and after every major storm event until established, after which inspections should take place on a quarterly basis and after every large storm event. Damaged areas should be immediately re-seeded and re-mulched. The floor of the ponds will be planted with a seed mixture that contains plants tolerant of occasional flooding. The seed mixtures contain several plant species that vary slightly in their needs for survival. It is expected that not all of the species will survive due to variations within each basin such as water, nutrients, and light. During the initial year of planting, the plants may require watering to germinate and become established. Note that several seedings may be required during the first year to completely establish vegetation within the ponds. After the initial year of establishment, the ponds do not need to be fertilized or watered. A natural selection process will occur over the first few years, such that the species within the seed mixture most suitable to the conditions will survive.

### 5.2 Long Term Maintenance Plan

The stormwater facilities for the subject project have been designed to minimize the required maintenance. This section discusses the minimum maintenance requirements to insure long term performance of the stormwater facilities. Initially the stormwater facilities will require an increased maintenance and inspection schedule until all portions of the site are stable. Generally the stormwater facilities consist of either collection/conveyance components or treatment components.

The stormwater collection and conveyance systems are composed of concrete drain inlets with cast iron frames and grates, and high-density polyethylene pipe. Minimal maintenance is typically required for these facilities. Each spring the paved areas will be cleaned to remove the winter's accumulation of traction sand. After this is completed, all drain inlets sumps will be cleaned. All pipes will be checked for debris and blockages and cleaned as required. During the cleaning process, the drain inlets and pipes will 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 ponds, 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:

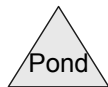
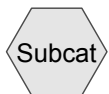
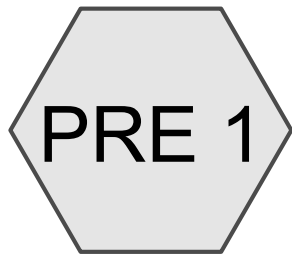
- Evidence of clogging of outlet structure.
- Erosion of the flow path through the pond.
- Subsidence, erosion, cracking or tree growth on the embankment/berm.
- Condition of the emergency spillway.
- Accumulation of sediment around the outlet structure.
- Adequacy of upstream/downstream channel erosion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

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

**APPENDIX A**  
**Pre-Development Computer Data**







**Drainage Diagram for Stateline Retail Center Pre Development**

Prepared by Insite Engineering, Surveying, and Landscapate Architecture, P.C. 11/2/2007

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**Stateline Retail Center Pre Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.

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11/2/2007

**Subcatchment PRE 1:**

Runoff = 0.02 cfs @ 23.33 hrs, Volume= 0.008 af, Depth= 0.01"

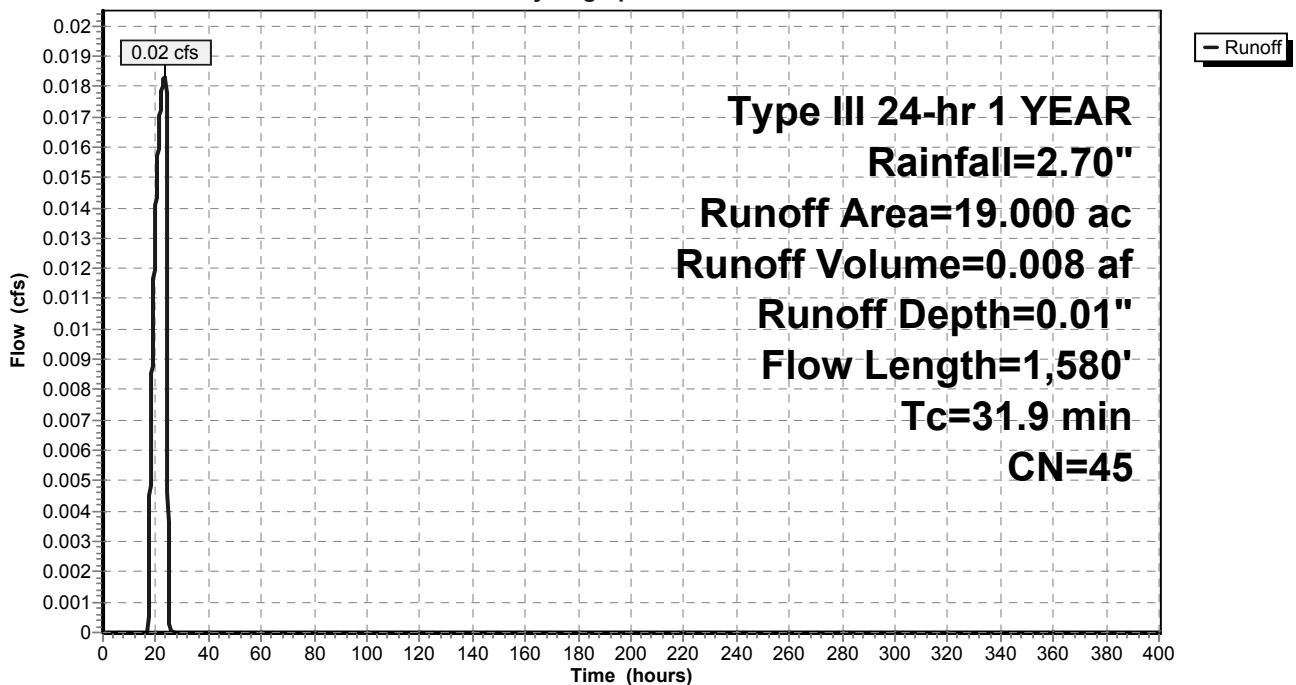
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
8.600	30	Meadow, non-grazed, HSG A
0.400	71	Meadow, non-grazed, HSG C
3.700	30	Woods, Good, HSG A
5.500	70	Woods, Good, HSG C
19.000	45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.1		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	120	0.1570	2.0		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.7	1,360	0.0375	1.4		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
31.9	1,580	Total			

**Subcatchment PRE 1:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

Prepared by Insite Engineering, Surveying, and Landscape Architecture, P.C.

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**Subcatchment PRE 2:**

Runoff = 3.46 cfs @ 12.30 hrs, Volume= 0.511 af, Depth= 0.38"

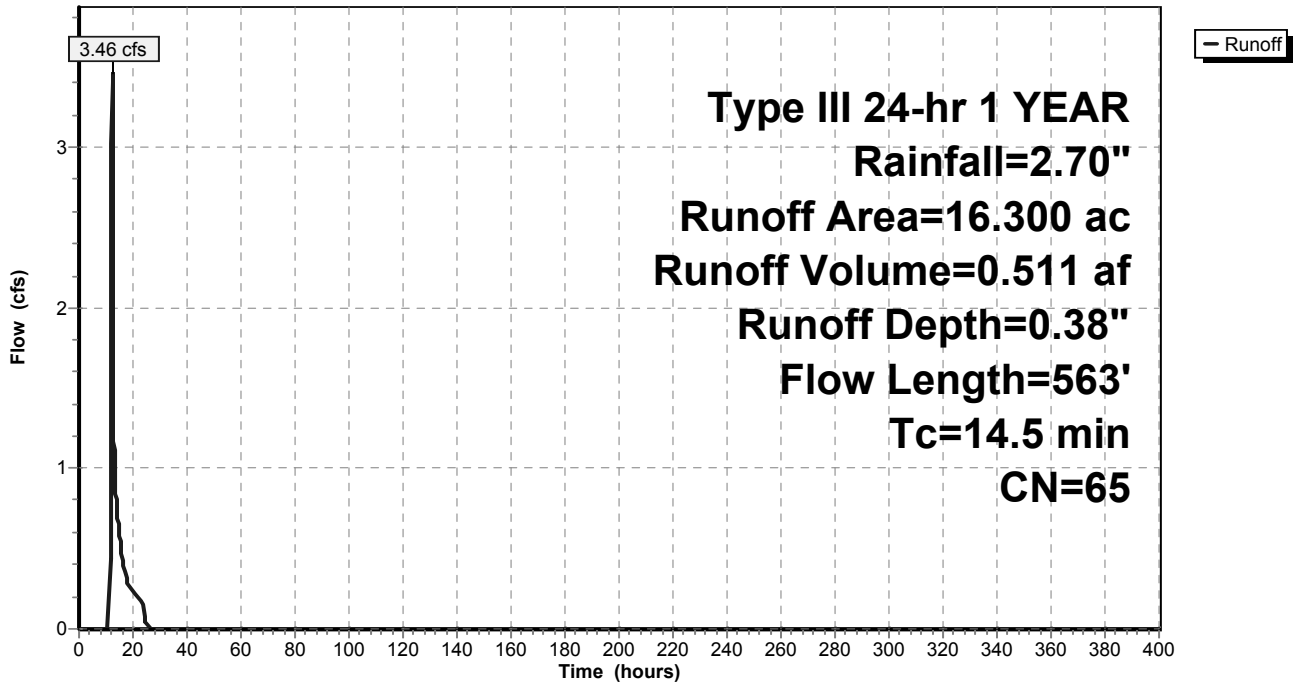
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
10.700	70	Woods, Good, HSG C
2.800	71	Meadow, non-grazed, HSG C
0.500	98	Paved parking & roofs
2.300	30	Woods, Good, HSG A
16.300	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment PRE 2:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment PRE 1:**

Runoff = 0.21 cfs @ 15.15 hrs, Volume= 0.133 af, Depth= 0.08"

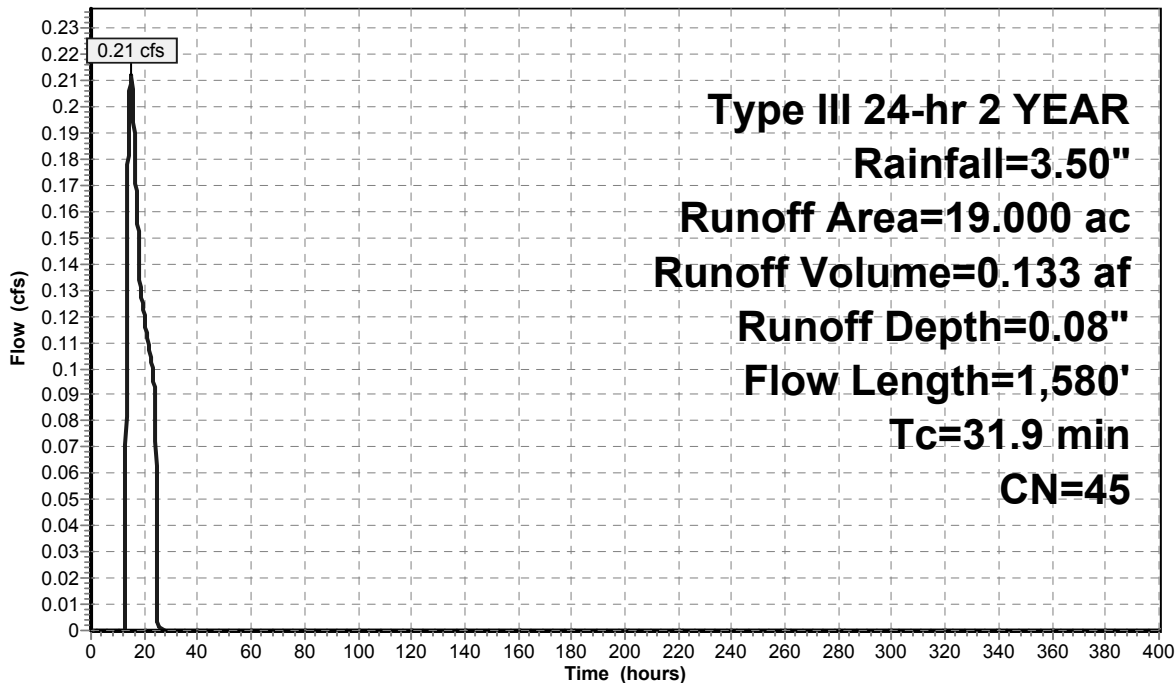
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
8.600	30	Meadow, non-grazed, HSG A
0.400	71	Meadow, non-grazed, HSG C
3.700	30	Woods, Good, HSG A
5.500	70	Woods, Good, HSG C
19.000	45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.1		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	120	0.1570	2.0		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.7	1,360	0.0375	1.4		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
31.9	1,580	Total			

**Subcatchment PRE 1:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment PRE 2:**

Runoff = 9.00 cfs @ 12.24 hrs, Volume= 1.021 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

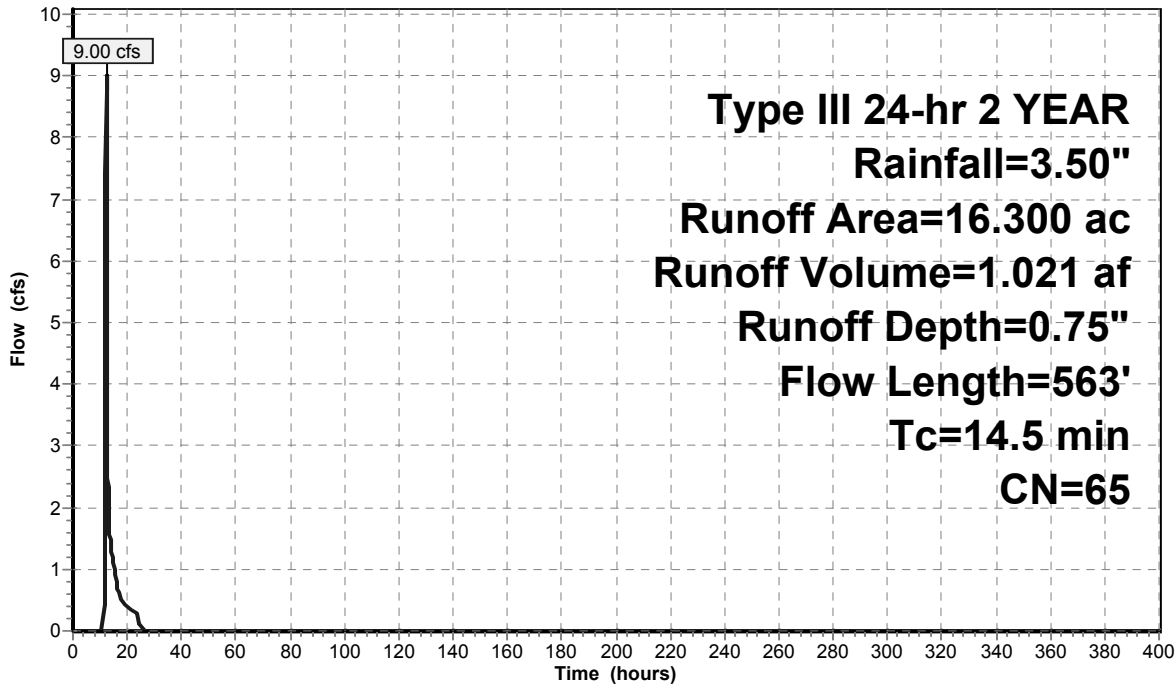
Area (ac)	CN	Description
10.700	70	Woods, Good, HSG C
2.800	71	Meadow, non-grazed, HSG C
0.500	98	Paved parking & roofs
2.300	30	Woods, Good, HSG A
16.300	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment PRE 2:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment PRE 1:**

Runoff = 2.71 cfs @ 12.69 hrs, Volume= 0.700 af, Depth= 0.44"

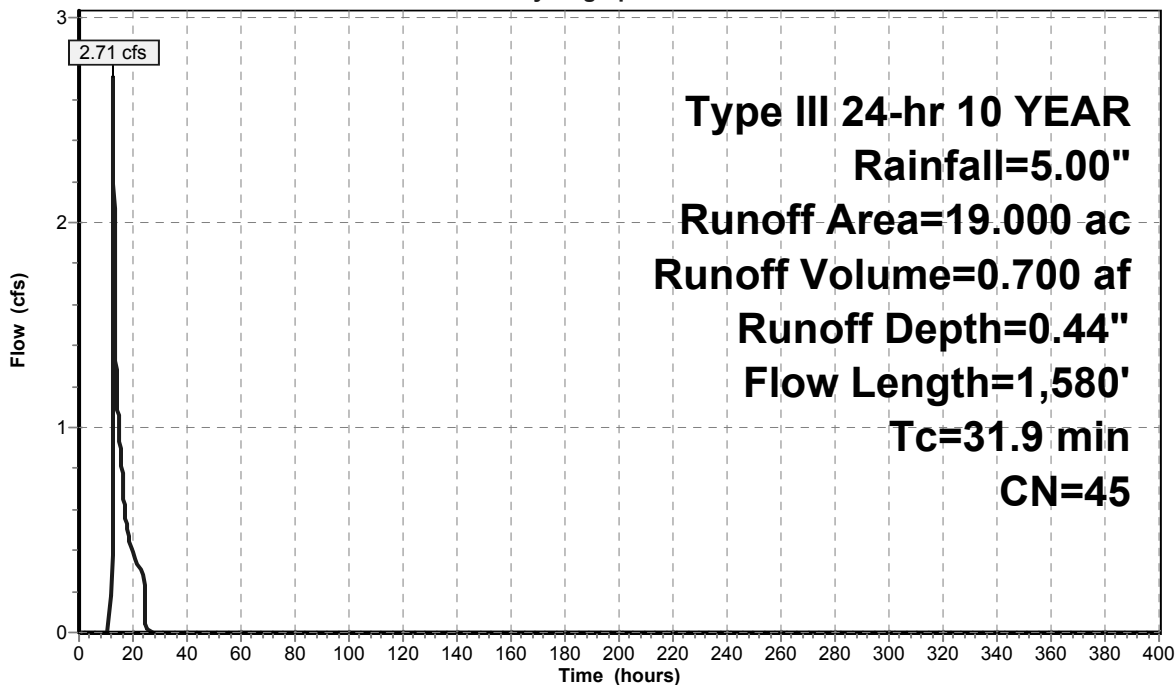
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
8.600	30	Meadow, non-grazed, HSG A
0.400	71	Meadow, non-grazed, HSG C
3.700	30	Woods, Good, HSG A
5.500	70	Woods, Good, HSG C
19.000	45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.1		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	120	0.1570	2.0		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.7	1,360	0.0375	1.4		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
31.9	1,580	Total			

**Subcatchment PRE 1:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment PRE 2:**

Runoff = 22.79 cfs @ 12.22 hrs, Volume= 2.246 af, Depth= 1.65"

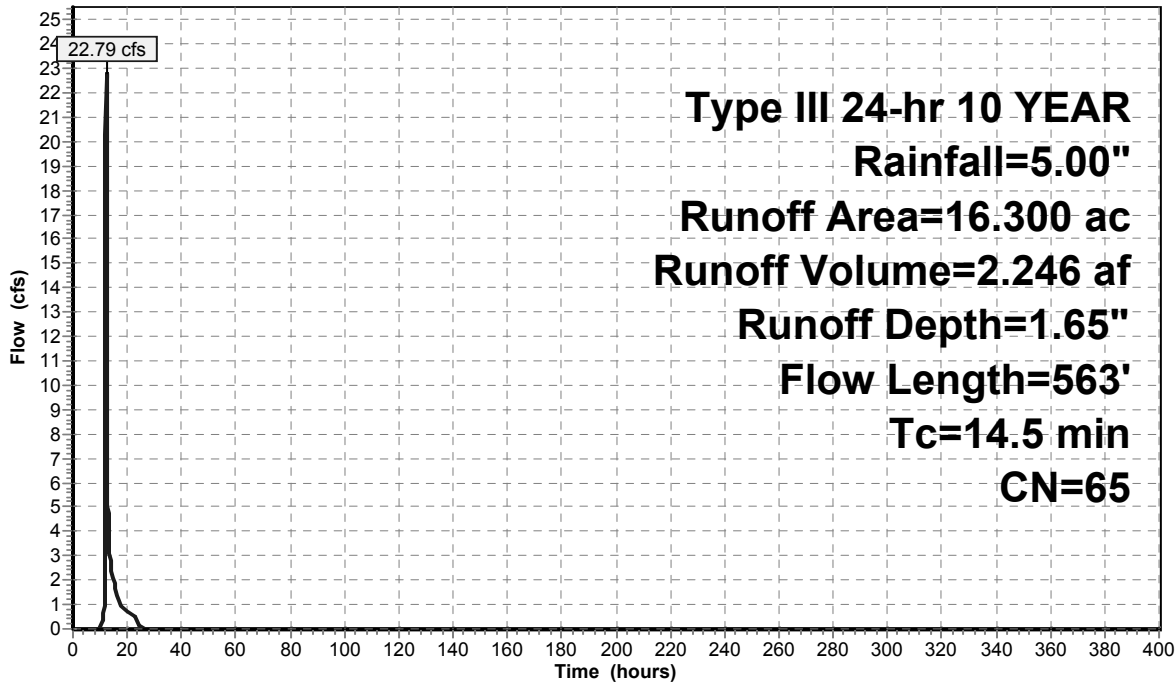
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
10.700	70	Woods, Good, HSG C
2.800	71	Meadow, non-grazed, HSG C
0.500	98	Paved parking & roofs
2.300	30	Woods, Good, HSG A
16.300	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment PRE 2:**

Hydrograph





**Stateline Retail Center Pre Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment PRE 1:**

Runoff = 6.55 cfs @ 12.60 hrs, Volume= 1.269 af, Depth= 0.80"

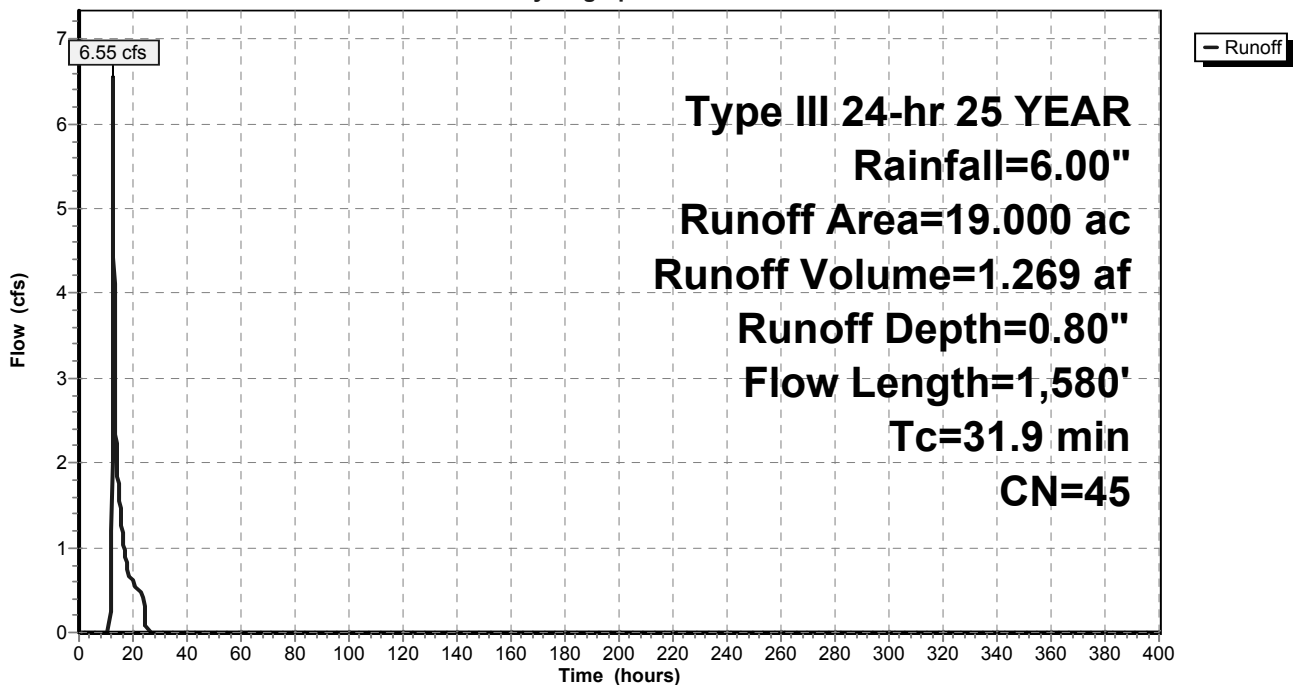
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
8.600	30	Meadow, non-grazed, HSG A
0.400	71	Meadow, non-grazed, HSG C
3.700	30	Woods, Good, HSG A
5.500	70	Woods, Good, HSG C
19.000	45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.1		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	120	0.1570	2.0		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.7	1,360	0.0375	1.4		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
31.9	1,580	Total			

**Subcatchment PRE 1:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment PRE 2:**

Runoff = 33.37 cfs @ 12.21 hrs, Volume= 3.194 af, Depth= 2.35"

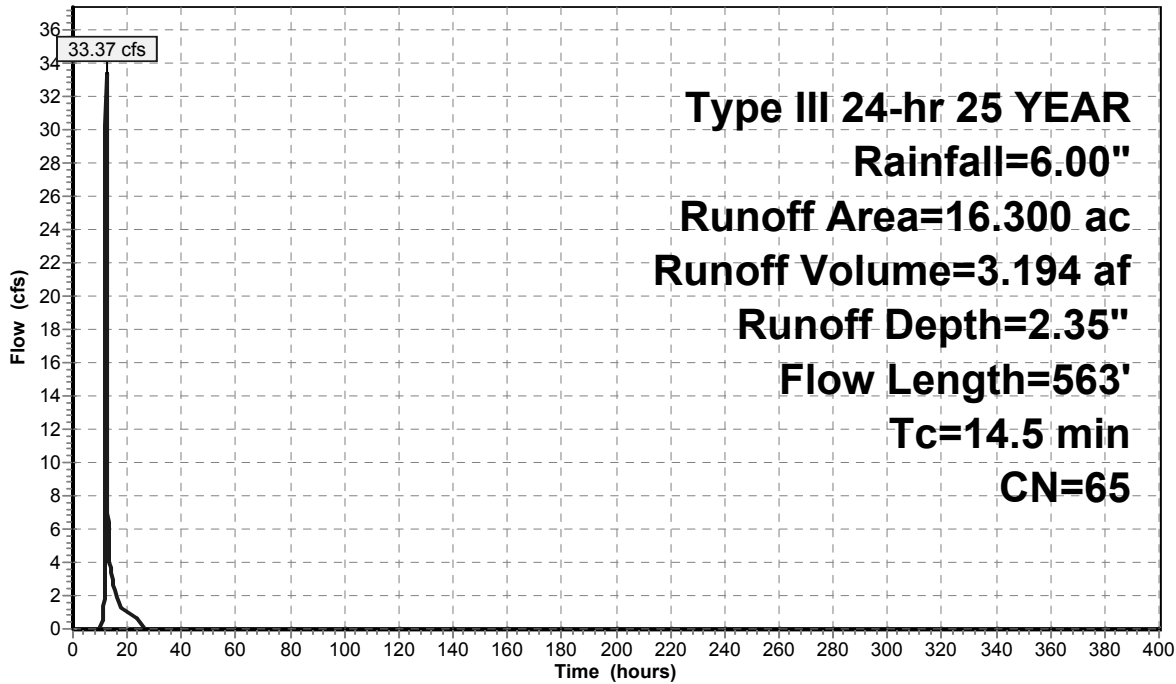
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
10.700	70	Woods, Good, HSG C
2.800	71	Meadow, non-grazed, HSG C
0.500	98	Paved parking & roofs
2.300	30	Woods, Good, HSG A
16.300	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment PRE 2:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment PRE 1:**

Runoff = 14.73 cfs @ 12.54 hrs, Volume= 2.342 af, Depth= 1.48"

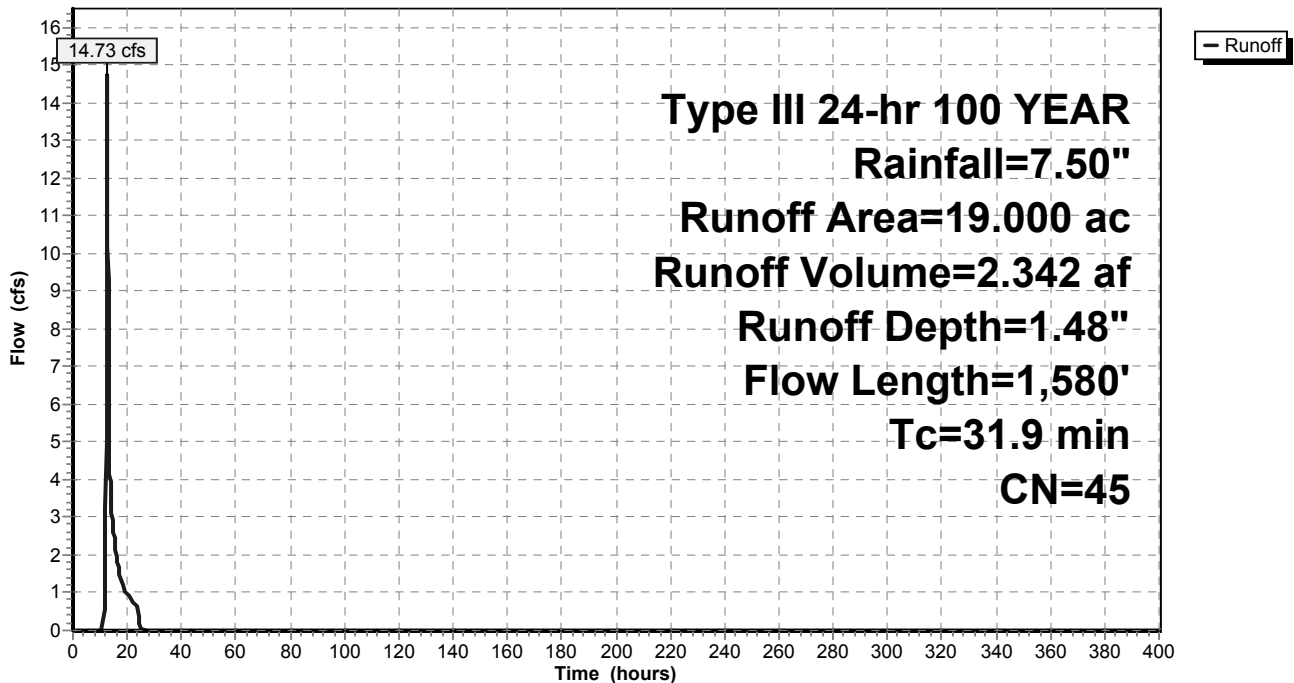
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
8.600	30	Meadow, non-grazed, HSG A
0.400	71	Meadow, non-grazed, HSG C
3.700	30	Woods, Good, HSG A
5.500	70	Woods, Good, HSG C
19.000	45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.1		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	120	0.1570	2.0		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.7	1,360	0.0375	1.4		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
31.9	1,580	Total			

**Subcatchment PRE 1:**

Hydrograph



**Stateline Retail Center Pre Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment PRE 2:**

Runoff = 50.53 cfs @ 12.21 hrs, Volume= 4.746 af, Depth= 3.49"

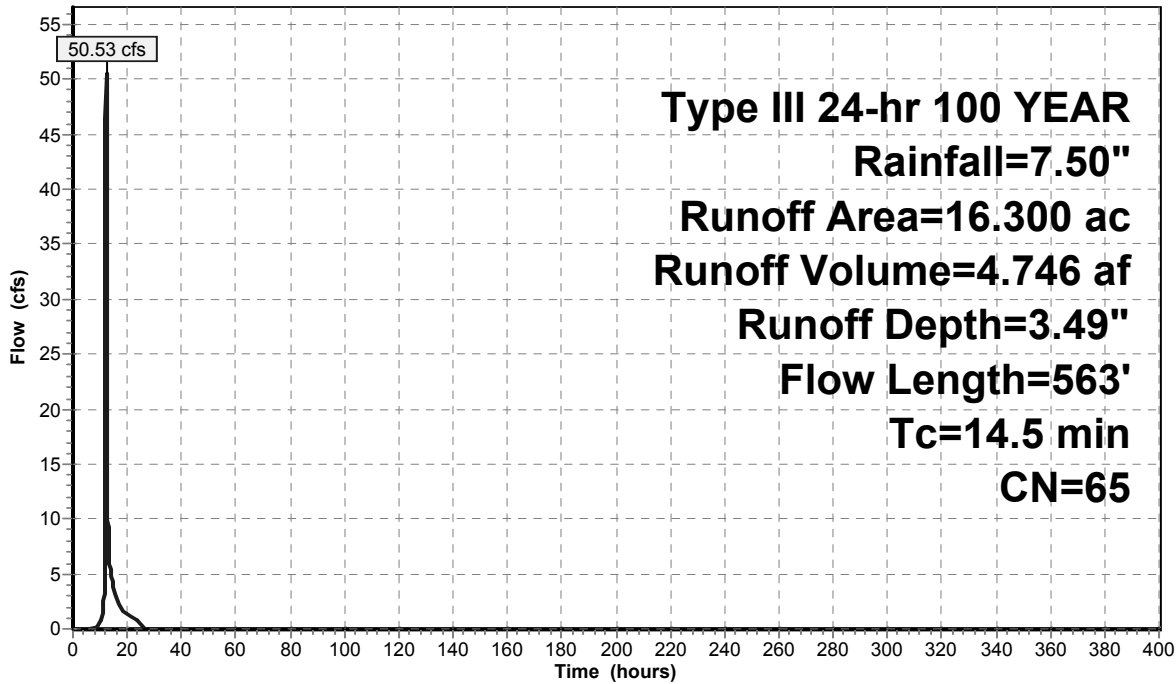
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
10.700	70	Woods, Good, HSG C
2.800	71	Meadow, non-grazed, HSG C
0.500	98	Paved parking & roofs
2.300	30	Woods, Good, HSG A
16.300	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

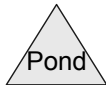
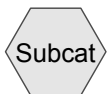
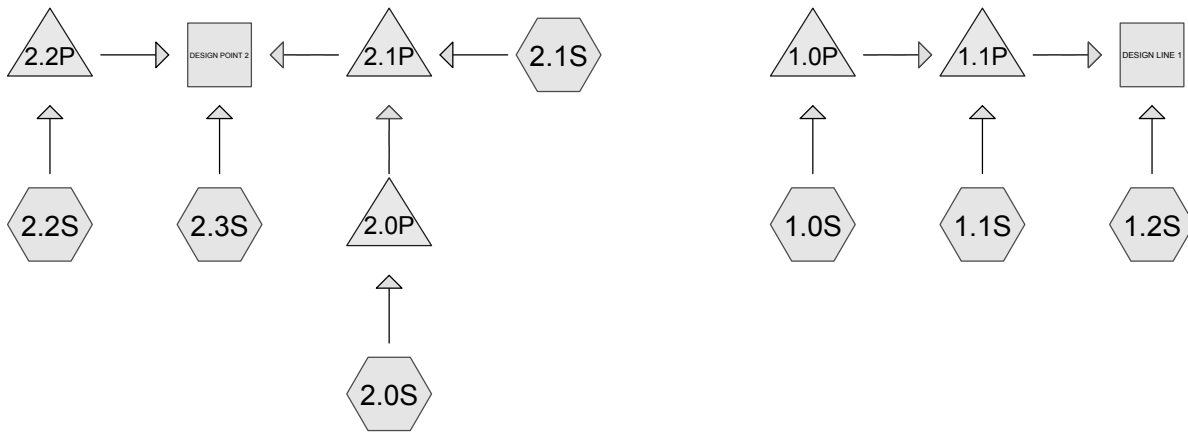
**Subcatchment PRE 2:**

Hydrograph



**APPENDIX B**  
**Post-Development Computer Data**









**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 1.0S:**

Runoff = 20.60 cfs @ 12.09 hrs, Volume= 1.496 af, Depth= 1.34"

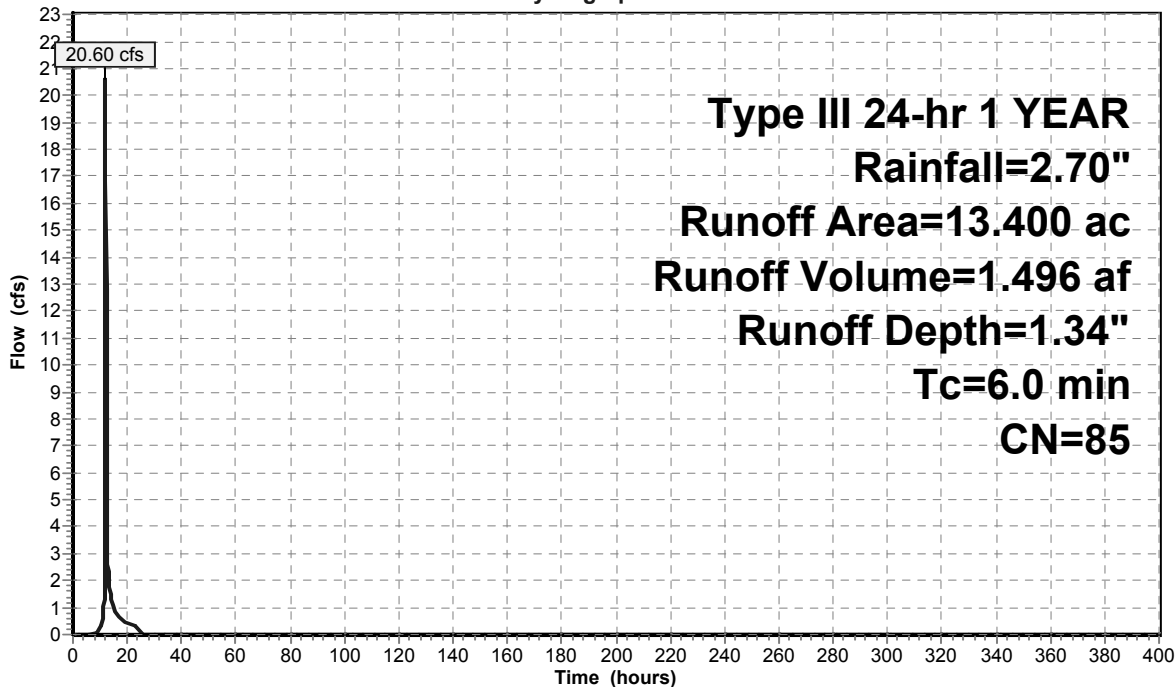
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
7.900	89	Urban commercial, 85% imp, HSG A
3.400	94	Urban commercial, 85% imp, HSG C
0.900	70	Woods, Good, HSG C
13.400	85	Weighted Average

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

**Subcatchment 1.0S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 1.1S:**

Runoff = 0.08 cfs @ 12.45 hrs, Volume= 0.029 af, Depth= 0.12"

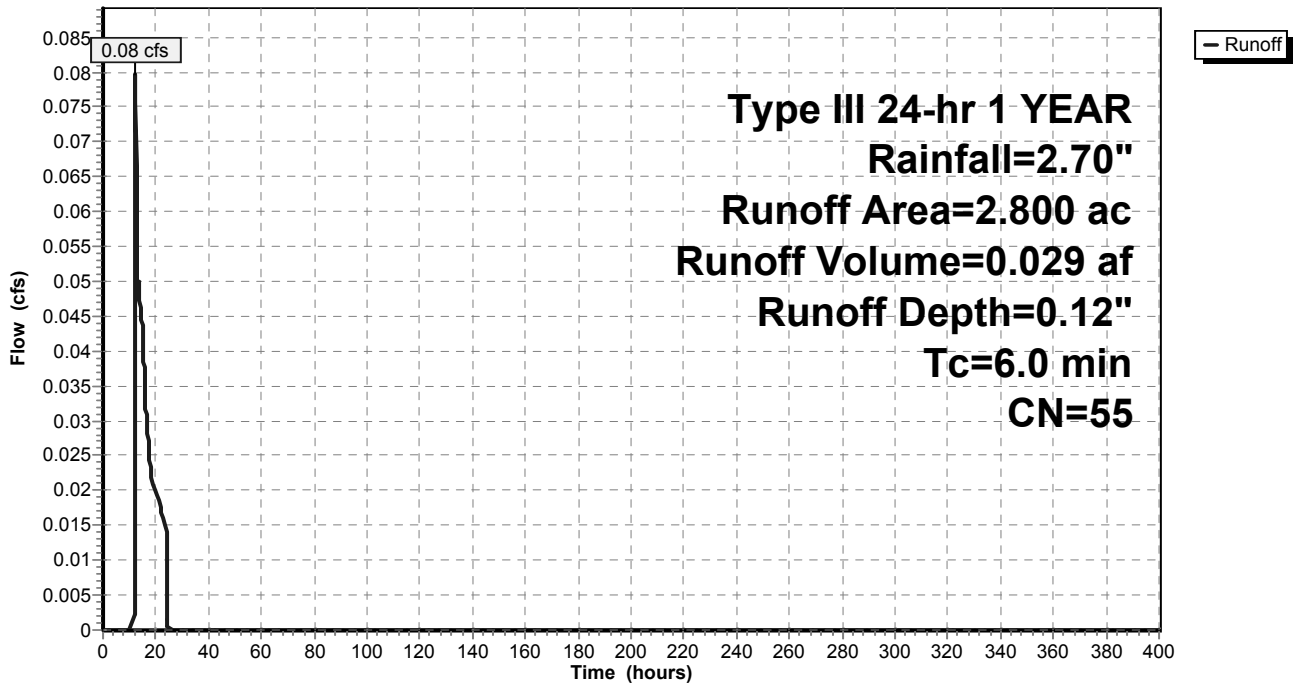
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
2.000	39	>75% Grass cover, Good, HSG A
0.400	89	Urban commercial, 85% imp, HSG A
0.400	98	Paved parking & roofs
2.800	55	Weighted Average

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

**Subcatchment 1.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 1.2S:**

Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Depth= 0.00"

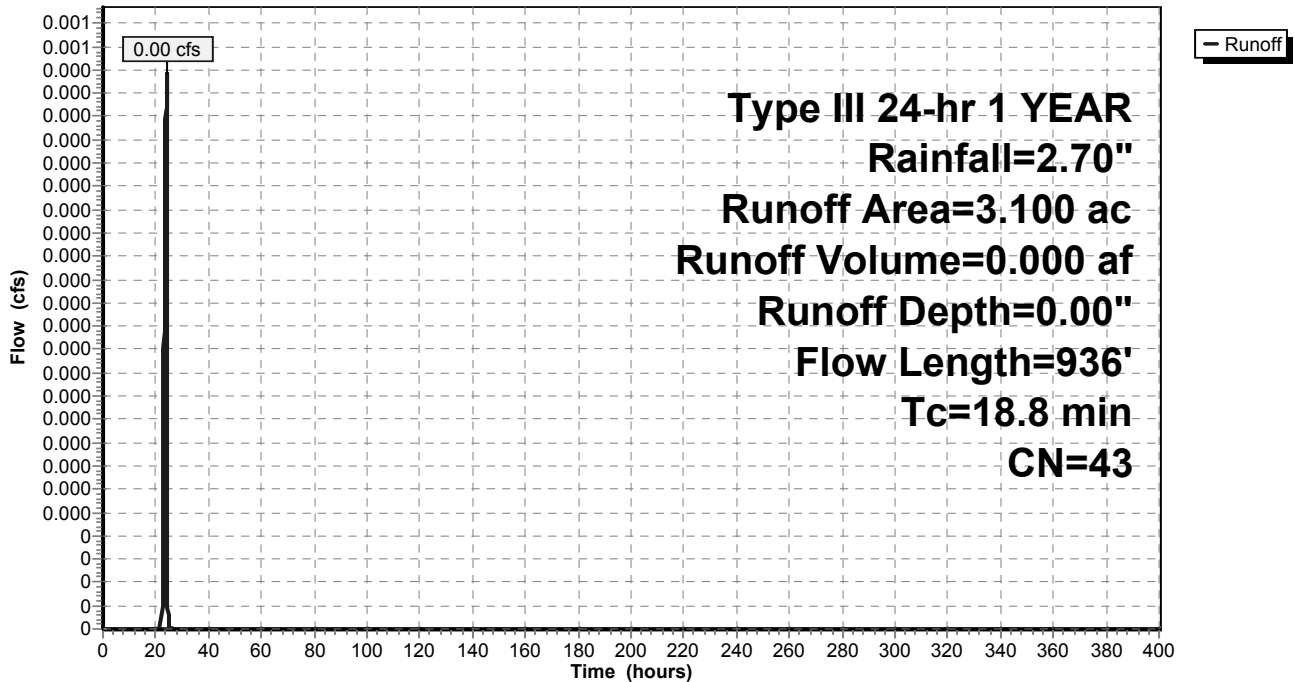
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
1.000	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.500	30	Woods, Good, HSG A
0.300	70	Woods, Good, HSG C
3.100	43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	17	0.0200	1.0		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
5.4	83	0.3900	0.3		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
13.1	836	0.0450	1.1		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
18.8	936	Total			

**Subcatchment 1.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 2.0S:**

Runoff = 9.97 cfs @ 12.09 hrs, Volume= 0.727 af, Depth= 1.71"

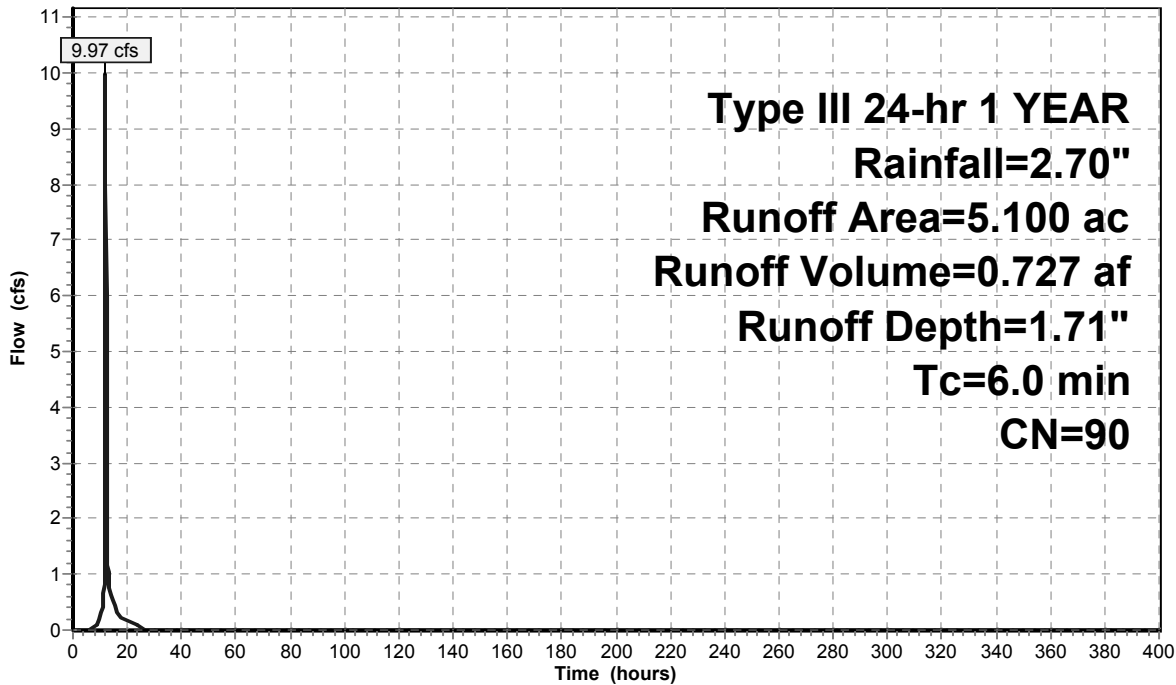
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
0.200	39	>75% Grass cover, Good, HSG A
0.100	74	>75% Grass cover, Good, HSG C
0.300	70	Woods, Good, HSG C
4.000	94	Urban commercial, 85% imp, HSG C
0.500	89	Urban commercial, 85% imp, HSG A
5.100	90	Weighted Average

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

**Subcatchment 2.0S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 2.1S:**

Runoff = 0.00 cfs @ 22.91 hrs, Volume= 0.000 af, Depth= 0.01"

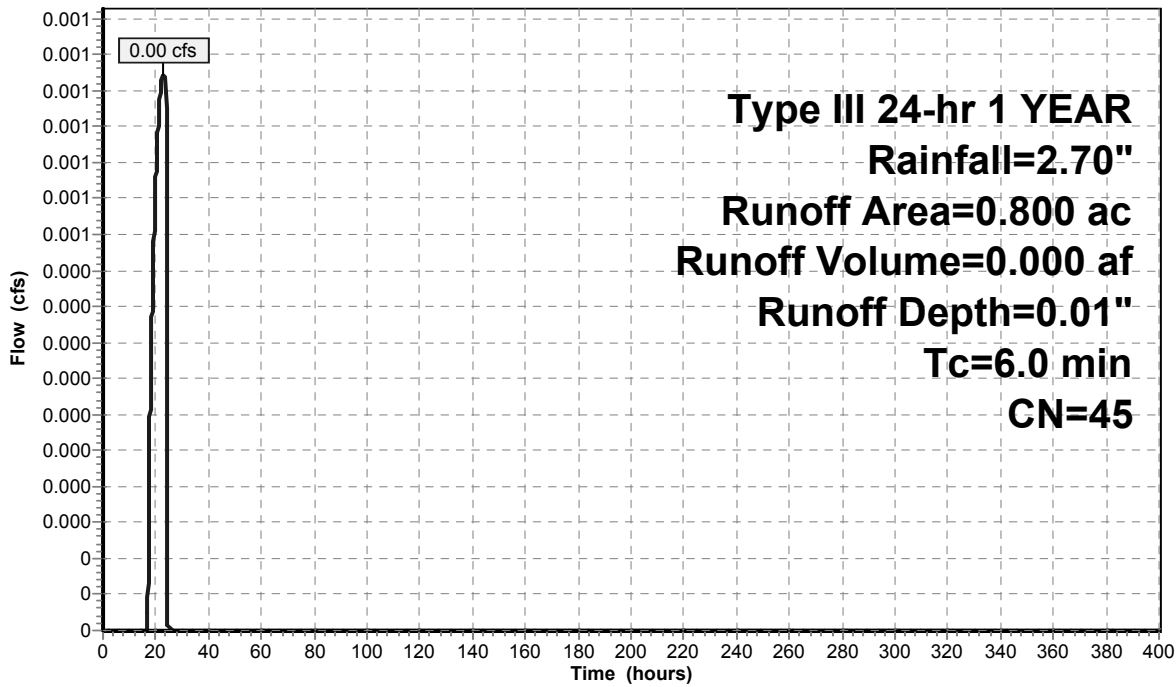
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.100	89	Urban commercial, 85% imp, HSG A
0.800	45	Weighted Average

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

**Subcatchment 2.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 2.2S:**

Runoff = 1.95 cfs @ 12.34 hrs, Volume= 0.223 af, Depth= 1.27"

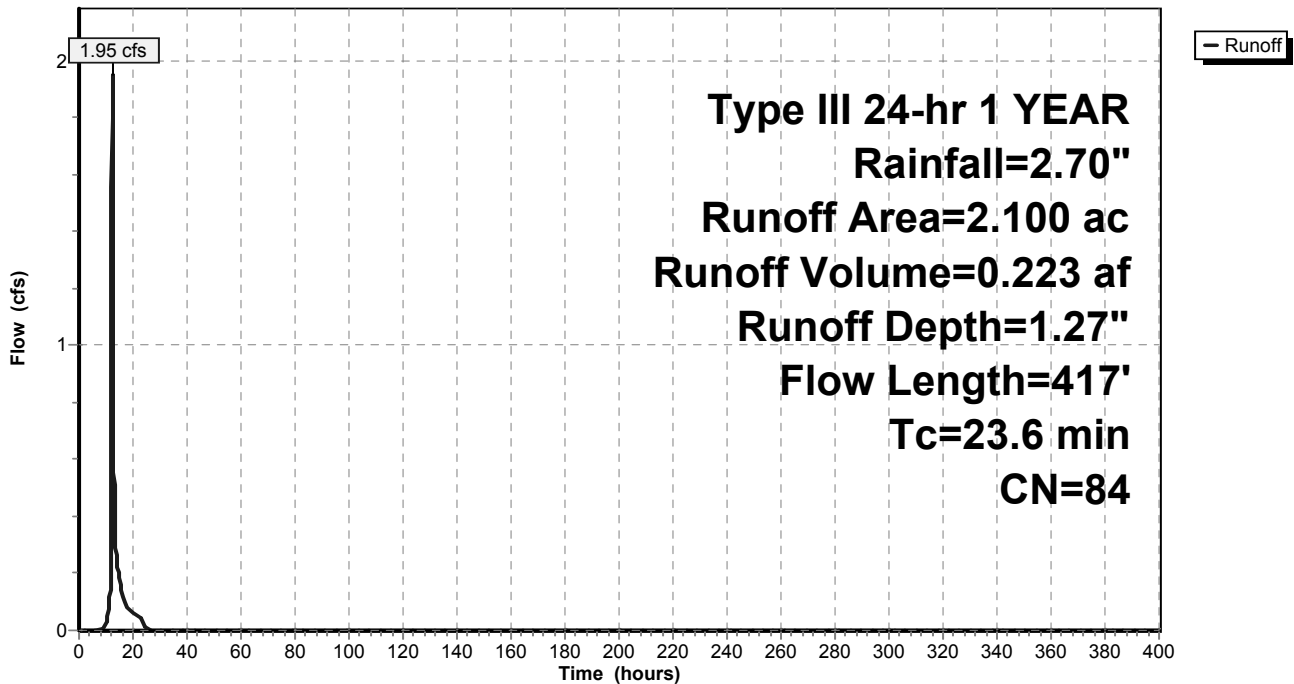
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
1.100	94	Urban commercial, 85% imp, HSG C
0.700	74	>75% Grass cover, Good, HSG C
0.300	71	Meadow, non-grazed, HSG C
2.100	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.1		<b>Sheet Flow,</b> Grass: Bermuda n= 0.410 P2= 3.50"
2.7	317	0.0800	2.0		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
23.6	417	Total			

**Subcatchment 2.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Subcatchment 2.3S:**

Runoff = 3.19 cfs @ 12.24 hrs, Volume= 0.369 af, Depth= 0.55"

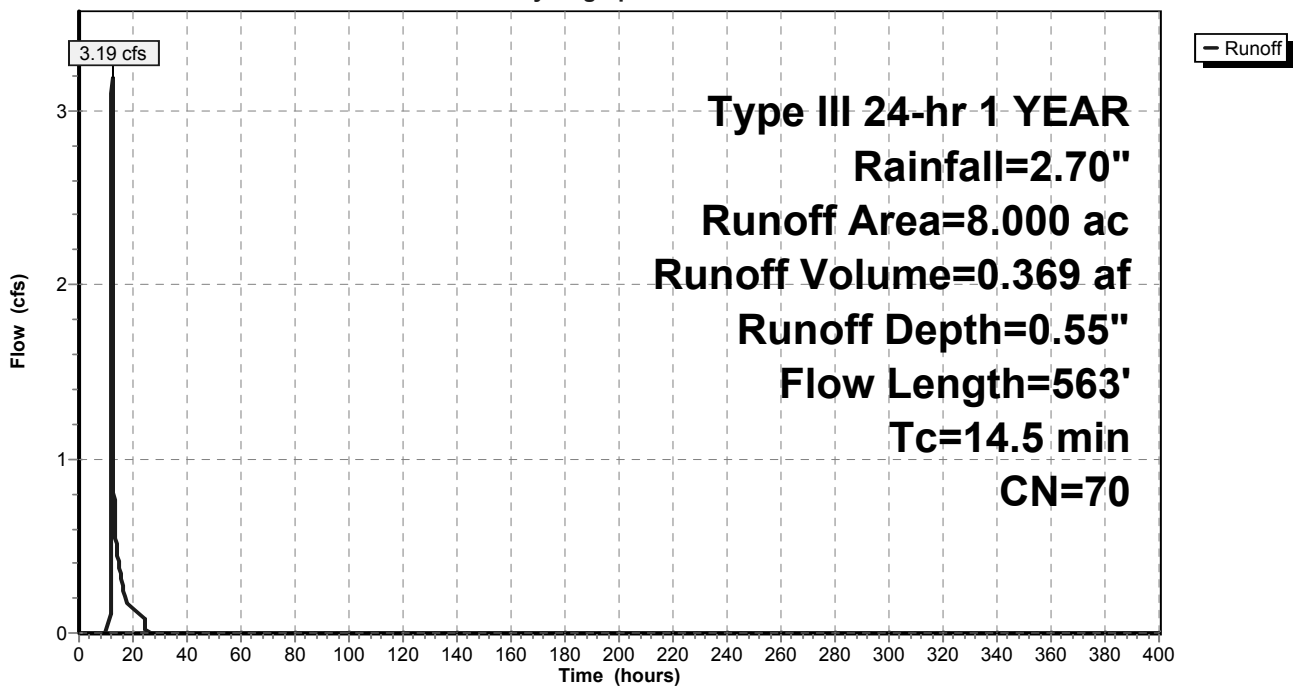
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1 YEAR Rainfall=2.70"

Area (ac)	CN	Description
5.500	70	Woods, Good, HSG C
0.200	39	>75% Grass cover, Good, HSG A
0.500	98	Paved parking & roofs
0.500	71	Meadow, non-grazed, HSG C
0.900	74	>75% Grass cover, Good, HSG C
0.300	30	Woods, Good, HSG A
0.050	94	Urban commercial, 85% imp, HSG C
0.050	89	Urban commercial, 85% imp, HSG A
8.000	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment 2.3S:**

Hydrograph



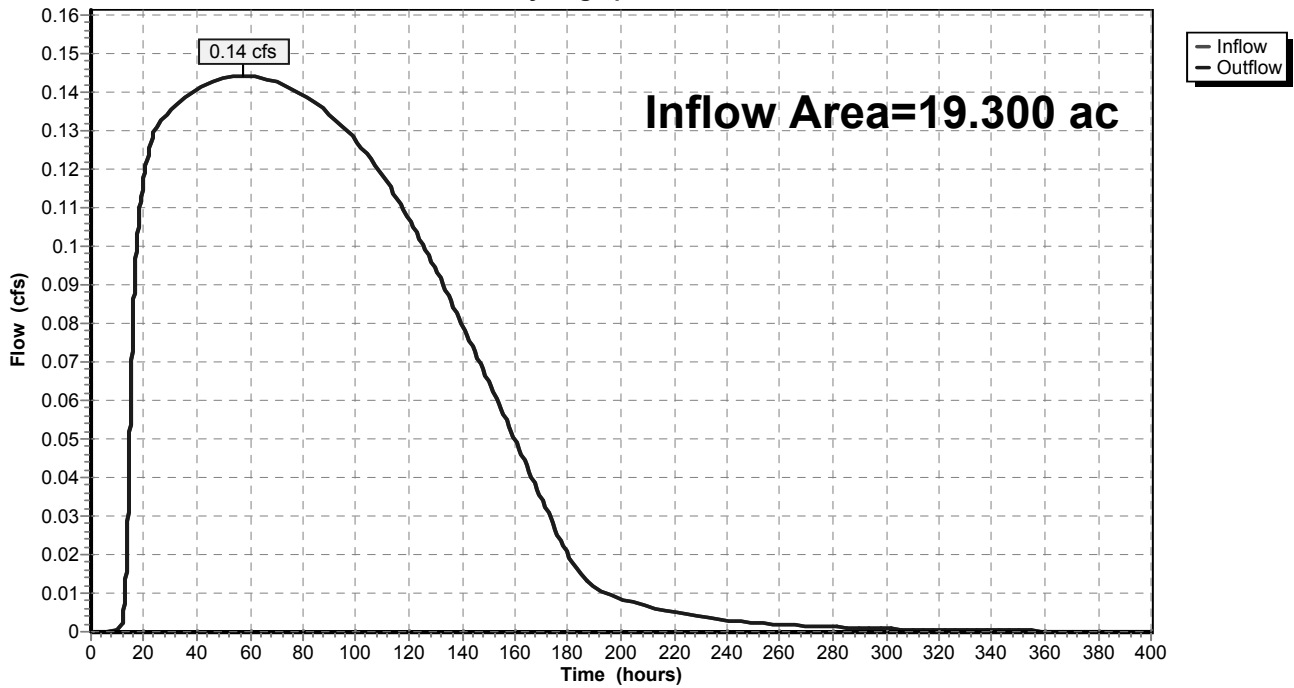
**Reach DESIGN LINE 1:**

Inflow Area = 19.300 ac, Inflow Depth > 0.95" for 1 YEAR event  
Inflow = 0.14 cfs @ 57.69 hrs, Volume= 1.524 af  
Outflow = 0.14 cfs @ 57.69 hrs, Volume= 1.524 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN LINE 1:**

Hydrograph



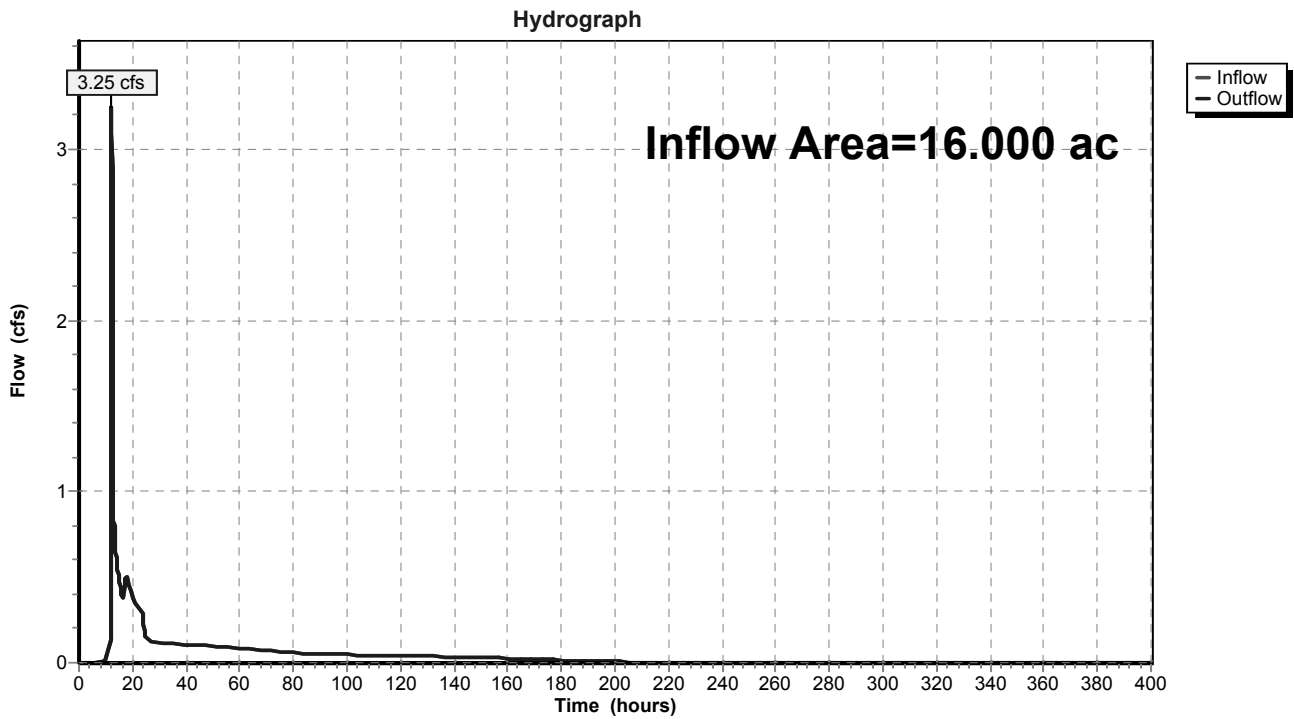


**Reach DESIGN POINT 2:**

Inflow Area = 16.000 ac, Inflow Depth = 0.99" for 1 YEAR event  
Inflow = 3.25 cfs @ 12.24 hrs, Volume= 1.320 af  
Outflow = 3.25 cfs @ 12.24 hrs, Volume= 1.320 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN POINT 2:**



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Pond 1.0P:**

Inflow Area = 13.400 ac, Inflow Depth = 1.34" for 1 YEAR event  
 Inflow = 20.60 cfs @ 12.09 hrs, Volume= 1.496 af  
 Outflow = 1.01 cfs @ 15.26 hrs, Volume= 1.496 af, Atten= 95%, Lag= 189.9 min  
 Primary = 0.22 cfs @ 15.26 hrs, Volume= 1.204 af  
 Secondary = 0.79 cfs @ 15.26 hrs, Volume= 0.292 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 472.00' Surf.Area= 25,000 sf Storage= 31,700 cf  
 Peak Elev= 473.86' @ 15.26 hrs Surf.Area= 23,701 sf Storage= 76,889 cf (45,189 cf above start)  
 Plug-Flow detention time= 3,881.9 min calculated for 0.768 af (51% of inflow)  
 Center-of-Mass det. time= 2,158.9 min ( 2,992.9 - 833.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	468.00'	158,150 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
468.00	600	0	0
470.00	3,050	3,650	3,650
472.00	25,000	28,050	31,700
474.00	23,600	48,600	80,300
476.00	35,400	59,000	139,300
476.50	40,000	18,850	158,150

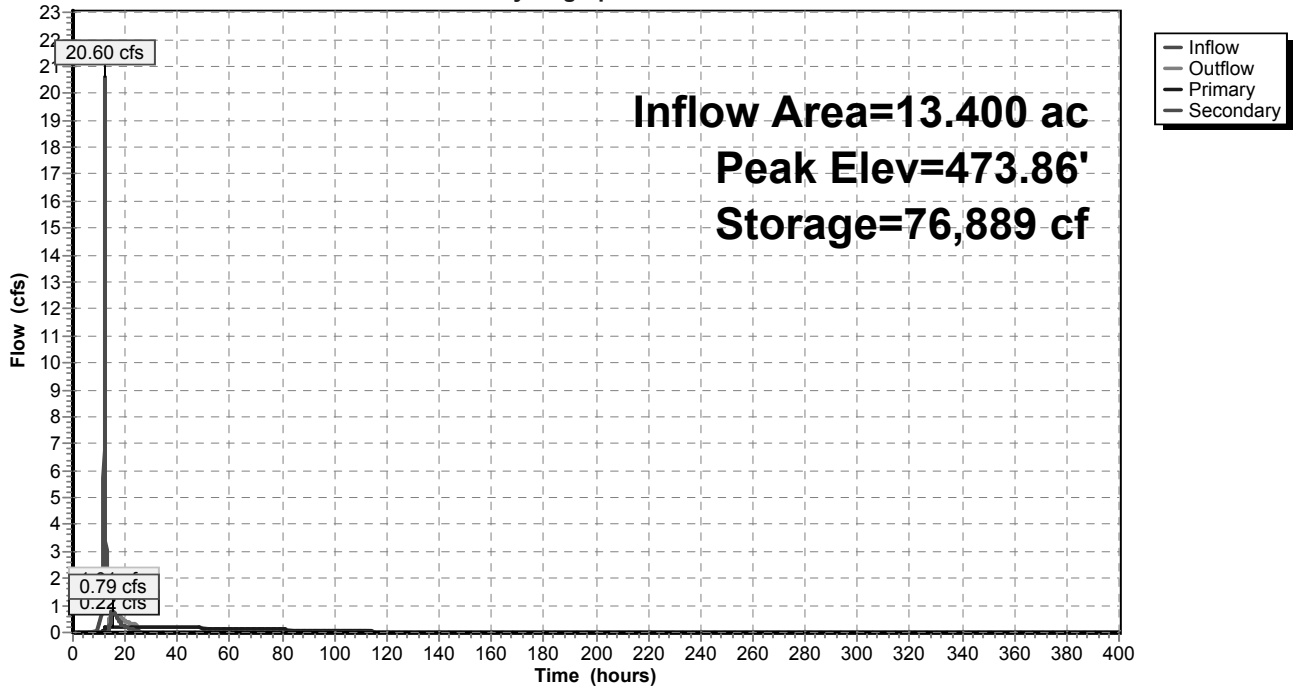
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	473.75'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.22 cfs @ 15.26 hrs HW=473.86' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.22 cfs @ 6.4 fps)

**Secondary OutFlow** Max=0.77 cfs @ 15.26 hrs HW=473.86' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.77 cfs @ 0.9 fps)

**Pond 1.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Pond 1.1P:**

Inflow Area = 16.200 ac, Inflow Depth = 1.13" for 1 YEAR event  
 Inflow = 1.05 cfs @ 15.24 hrs, Volume= 1.524 af  
 Outflow = 0.14 cfs @ 57.69 hrs, Volume= 1.524 af, Atten= 86%, Lag= 2,547.0 min  
 Primary = 0.14 cfs @ 57.69 hrs, Volume= 1.524 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 453.46' @ 57.69 hrs Surf.Area= 13,697 sf Storage= 24,024 cf  
 Plug-Flow detention time= 2,299.6 min calculated for 1.524 af (100% of inflow)  
 Center-of-Mass det. time= 2,297.3 min ( 5,252.8 - 2,955.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	451.50'	148,375 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
451.50	10,800	0	0
452.00	11,500	5,575	5,575
454.00	14,500	26,000	31,575
456.00	17,600	32,100	63,675
458.00	21,100	38,700	102,375
460.00	24,900	46,000	148,375

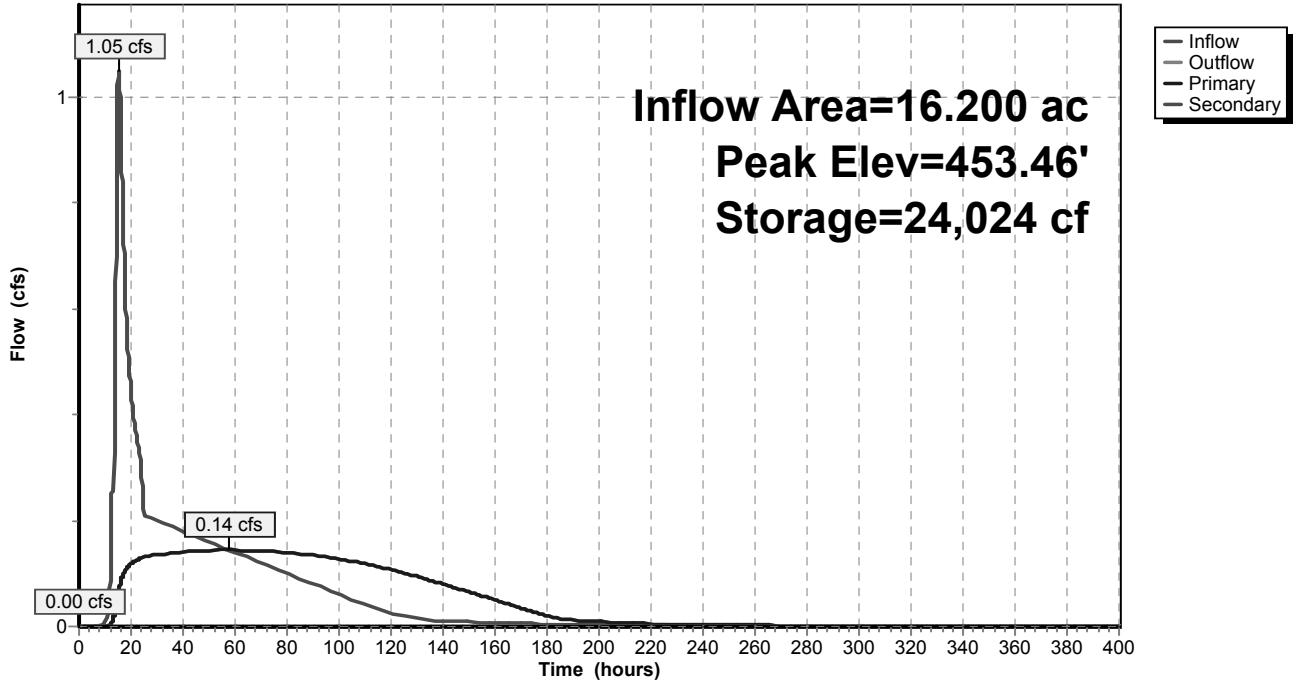
Device	Routing	Invert	Outlet Devices
#1	Primary	451.50'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	457.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.14 cfs @ 57.69 hrs HW=453.46' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.14 cfs @ 6.6 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=451.50' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 1.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Pond 2.0P:**

Inflow Area = 5.100 ac, Inflow Depth = 1.71" for 1 YEAR event  
 Inflow = 9.97 cfs @ 12.09 hrs, Volume= 0.727 af  
 Outflow = 3.65 cfs @ 12.37 hrs, Volume= 0.727 af, Atten= 63%, Lag= 16.7 min  
 Primary = 0.03 cfs @ 12.37 hrs, Volume= 0.258 af  
 Secondary = 3.62 cfs @ 12.37 hrs, Volume= 0.469 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 3,800 sf Storage= 5,900 cf  
 Peak Elev= 480.60' @ 12.37 hrs Surf.Area= 6,973 sf Storage= 19,736 cf (13,836 cf above start)  
 Plug-Flow detention time= 2,190.6 min calculated for 0.592 af (81% of inflow)  
 Center-of-Mass det. time= 1,709.0 min ( 2,522.7 - 813.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	40,050 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	100	0	0
476.00	1,000	1,100	1,100
478.00	3,800	4,800	5,900
480.00	6,100	9,900	15,800
482.00	9,000	15,100	30,900
483.00	9,300	9,150	40,050

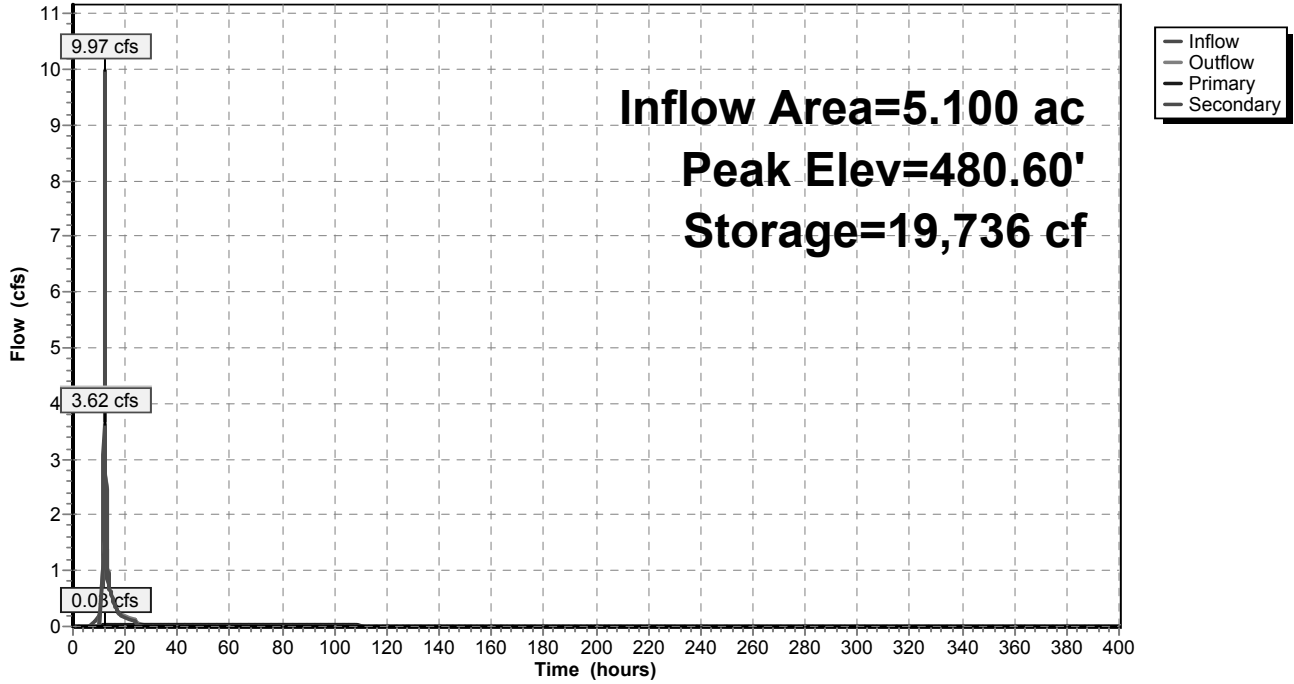
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>0.8" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	480.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.03 cfs @ 12.37 hrs HW=480.60' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.03 cfs @ 7.7 fps)

**Secondary OutFlow** Max=3.58 cfs @ 12.37 hrs HW=480.60' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 3.58 cfs @ 2.4 fps)

**Pond 2.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Pond 2.1P:**

Inflow Area = 5.900 ac, Inflow Depth = 1.48" for 1 YEAR event  
 Inflow = 3.65 cfs @ 12.37 hrs, Volume= 0.727 af  
 Outflow = 0.26 cfs @ 17.69 hrs, Volume= 0.727 af, Atten= 93%, Lag= 319.5 min  
 Primary = 0.26 cfs @ 17.69 hrs, Volume= 0.727 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 475.80' @ 17.69 hrs Surf.Area= 7,358 sf Storage= 15,928 cf  
 Plug-Flow detention time= 2,327.9 min calculated for 0.727 af (100% of inflow)  
 Center-of-Mass det. time= 2,327.9 min ( 4,850.0 - 2,522.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	472.00'	36,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.00	1,300	0	0
474.00	4,200	5,500	5,500
476.00	7,700	11,900	17,400
478.00	11,000	18,700	36,100

Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>1.1" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	475.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir X 2.00</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

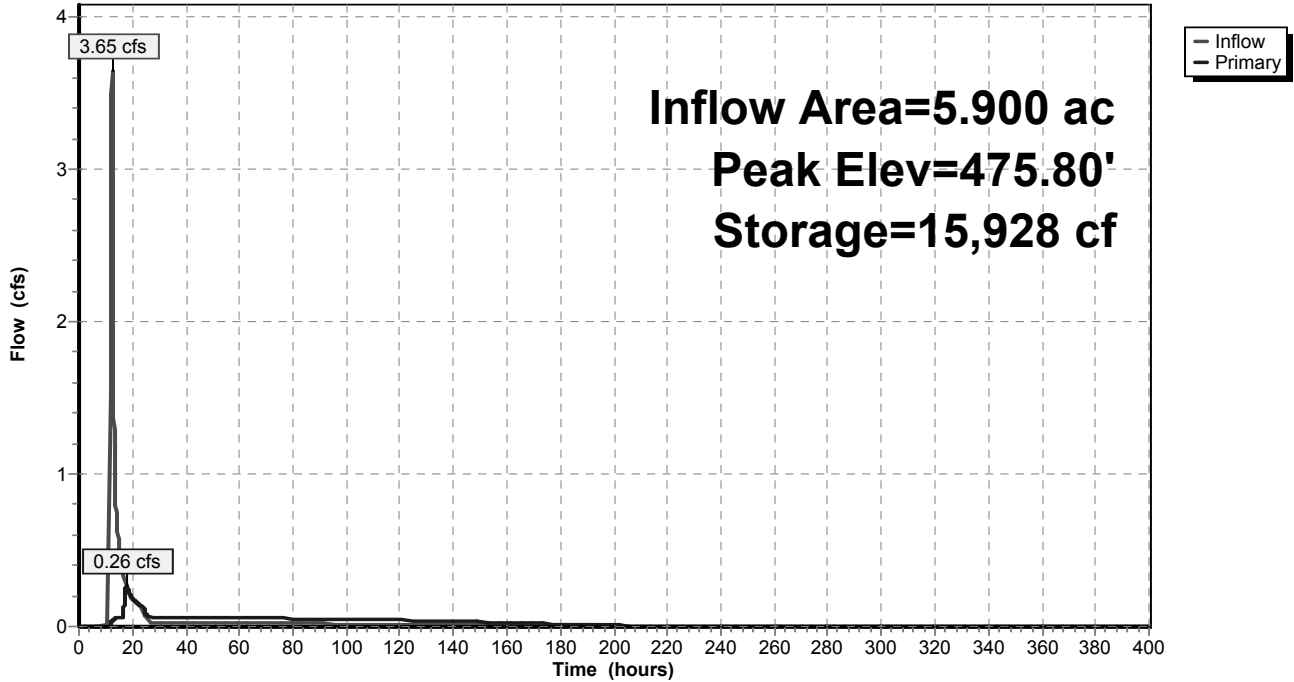
**Primary OutFlow** Max=0.24 cfs @ 17.69 hrs HW=475.80' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.06 cfs @ 9.3 fps)
- 2=Broad-Crested Rectangular Weir (Weir Controls 0.18 cfs @ 0.7 fps)



**Pond 2.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 1 YEAR Rainfall=2.70"

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**Pond 2.2P:**

Inflow Area = 2.100 ac, Inflow Depth = 1.27" for 1 YEAR event  
 Inflow = 1.95 cfs @ 12.34 hrs, Volume= 0.223 af  
 Outflow = 0.06 cfs @ 20.08 hrs, Volume= 0.223 af, Atten= 97%, Lag= 464.7 min  
 Primary = 0.06 cfs @ 20.08 hrs, Volume= 0.223 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 2,700 sf Storage= 3,700 cf  
 Peak Elev= 479.89' @ 20.08 hrs Surf.Area= 4,971 sf Storage= 10,957 cf (7,257 cf above start)  
 Plug-Flow detention time= 2,212.7 min calculated for 0.138 af (62% of inflow)  
 Center-of-Mass det. time= 1,452.3 min ( 2,306.3 - 853.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	32,275 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	0	0	0
476.00	500	500	500
478.00	2,700	3,200	3,700
480.00	5,100	7,800	11,500
482.00	7,500	12,600	24,100
483.00	8,850	8,175	32,275

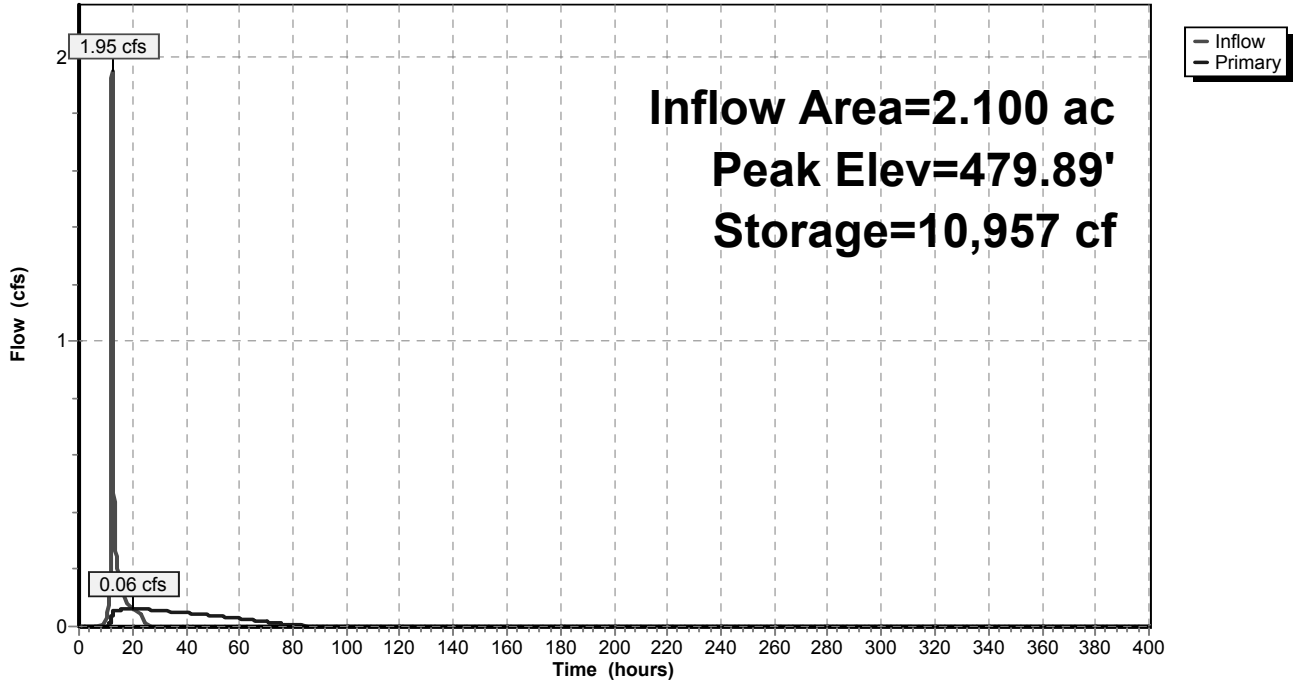
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>1.3" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	481.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.06 cfs @ 20.08 hrs HW=479.89' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.06 cfs @ 6.5 fps)
- 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 2.2P:**

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 2 YEAR Rainfall=3.50"

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## Subcatchment 1.0S:

Runoff = 31.04 cfs @ 12.09 hrs, Volume= 2.252 af, Depth= 2.02"

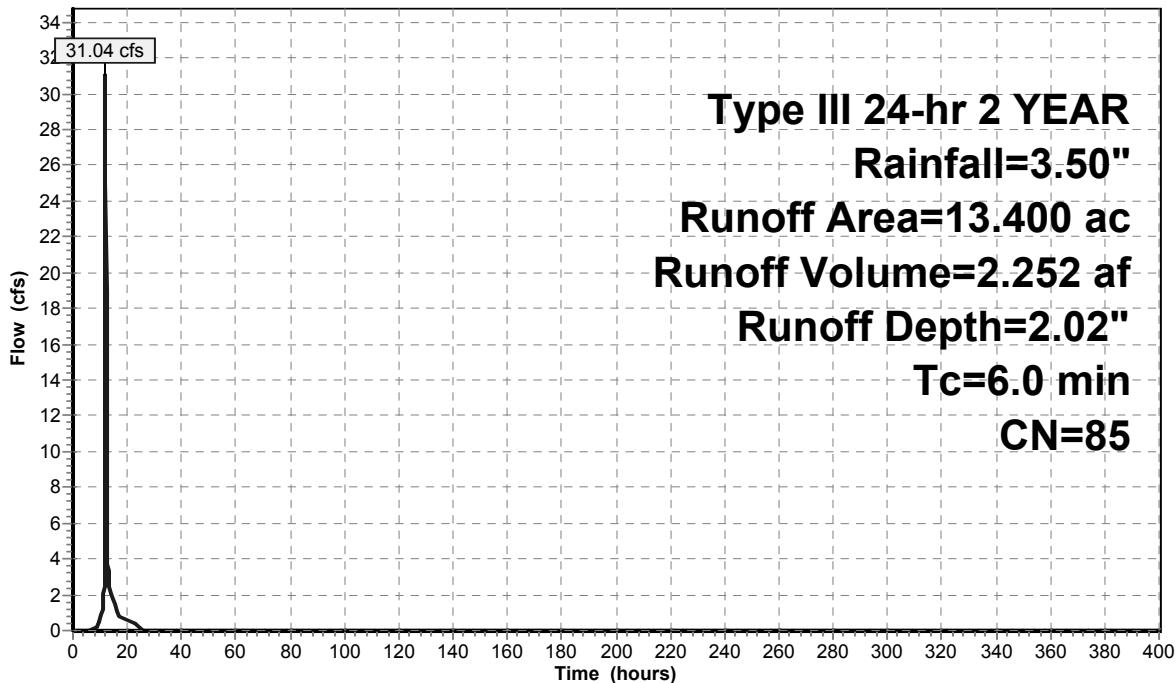
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
7.900	89	Urban commercial, 85% imp, HSG A
3.400	94	Urban commercial, 85% imp, HSG C
0.900	70	Woods, Good, HSG C
13.400	85	Weighted Average

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

## Subcatchment 1.0S:

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment 1.1S:**

Runoff = 0.46 cfs @ 12.26 hrs, Volume= 0.081 af, Depth= 0.35"

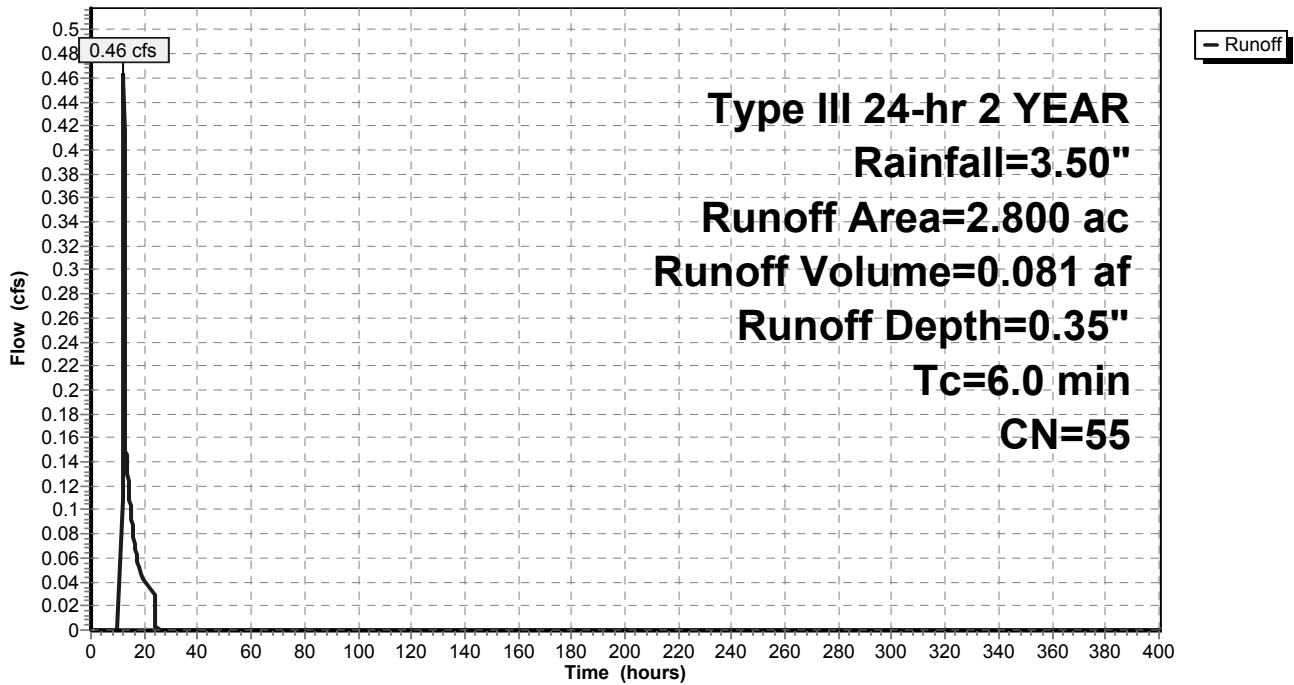
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
2.000	39	>75% Grass cover, Good, HSG A
0.400	89	Urban commercial, 85% imp, HSG A
0.400	98	Paved parking & roofs
2.800	55	Weighted Average

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

**Subcatchment 1.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment 1.2S:**

Runoff = 0.02 cfs @ 15.49 hrs, Volume= 0.013 af, Depth= 0.05"

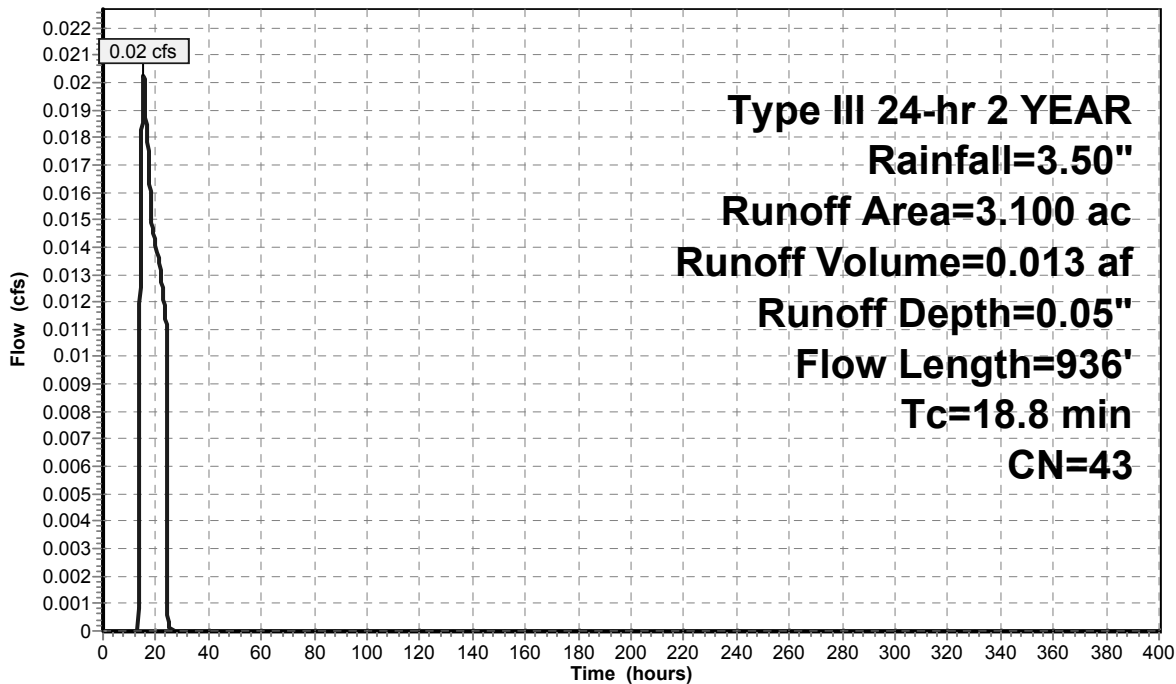
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
1.000	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.500	30	Woods, Good, HSG A
0.300	70	Woods, Good, HSG C
3.100	43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	17	0.0200	1.0		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
5.4	83	0.3900	0.3		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
13.1	836	0.0450	1.1		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
18.8	936	Total			

**Subcatchment 1.2S:**

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 2 YEAR Rainfall=3.50"

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## Subcatchment 2.0S:

Runoff = 14.10 cfs @ 12.09 hrs, Volume= 1.040 af, Depth= 2.45"

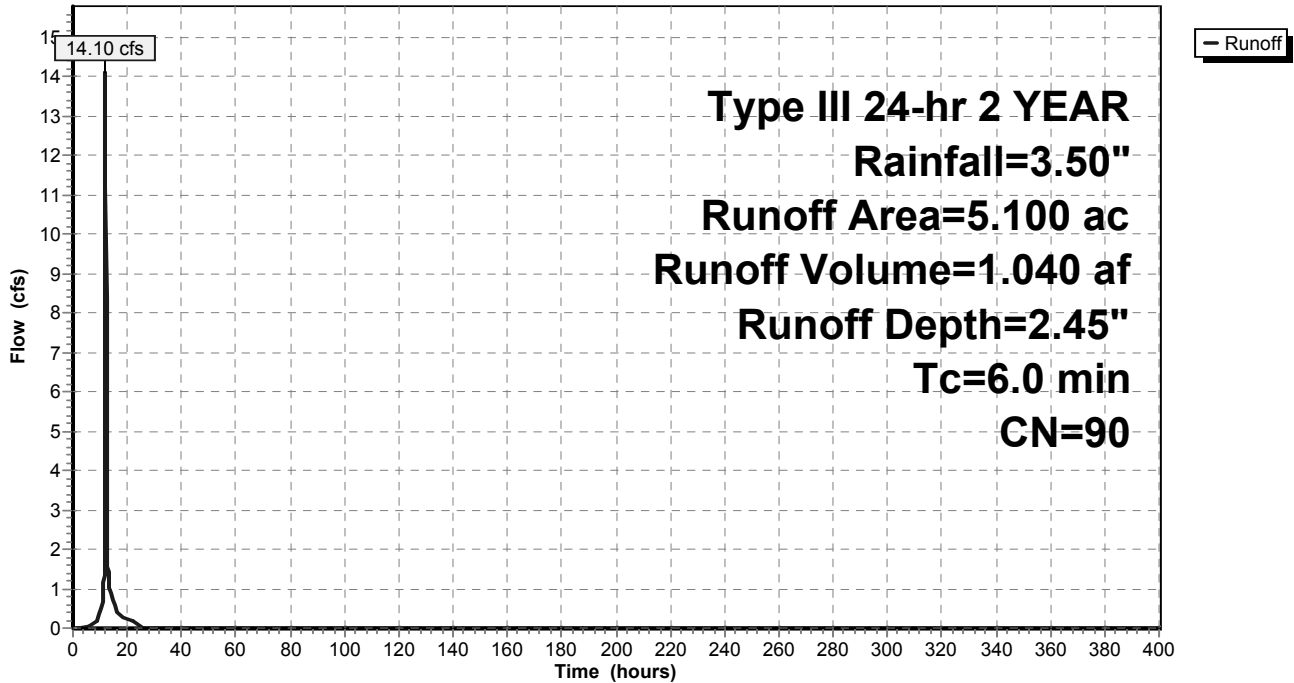
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
0.200	39	>75% Grass cover, Good, HSG A
0.100	74	>75% Grass cover, Good, HSG C
0.300	70	Woods, Good, HSG C
4.000	94	Urban commercial, 85% imp, HSG C
0.500	89	Urban commercial, 85% imp, HSG A
5.100	90	Weighted Average

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

## Subcatchment 2.0S:

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment 2.1S:**

Runoff = 0.01 cfs @ 14.74 hrs, Volume= 0.006 af, Depth= 0.08"

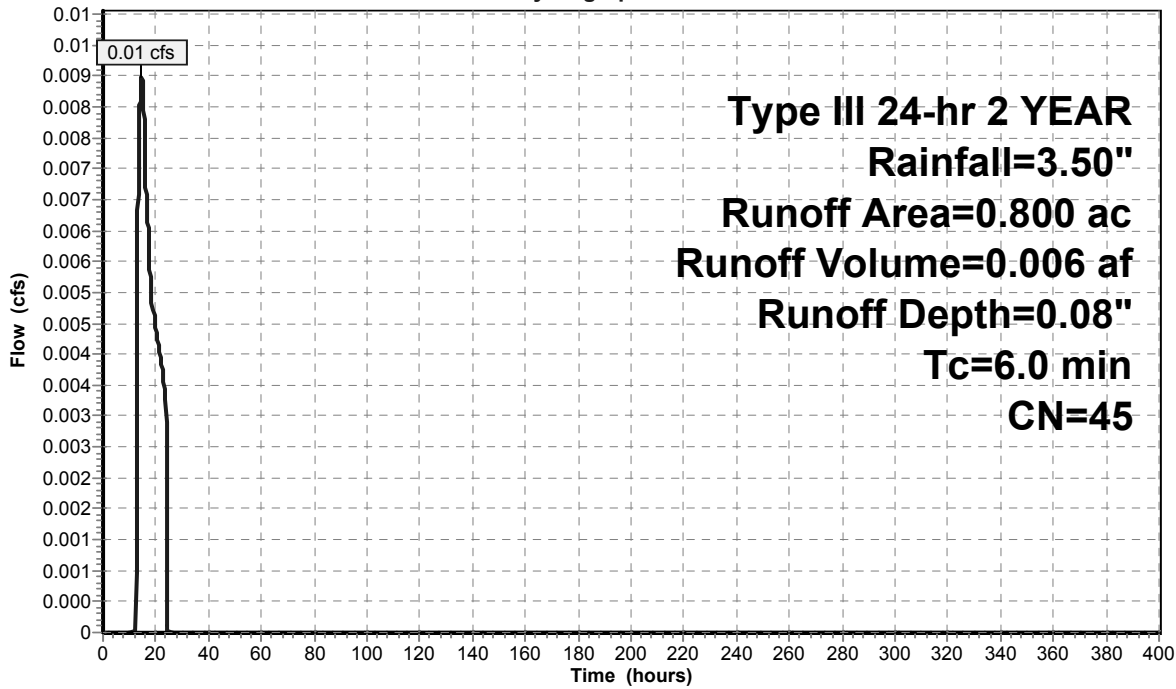
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.100	89	Urban commercial, 85% imp, HSG A
0.800	45	Weighted Average

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

**Subcatchment 2.1S:**

Hydrograph





**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment 2.2S:**

Runoff = 2.99 cfs @ 12.33 hrs, Volume= 0.339 af, Depth= 1.94"

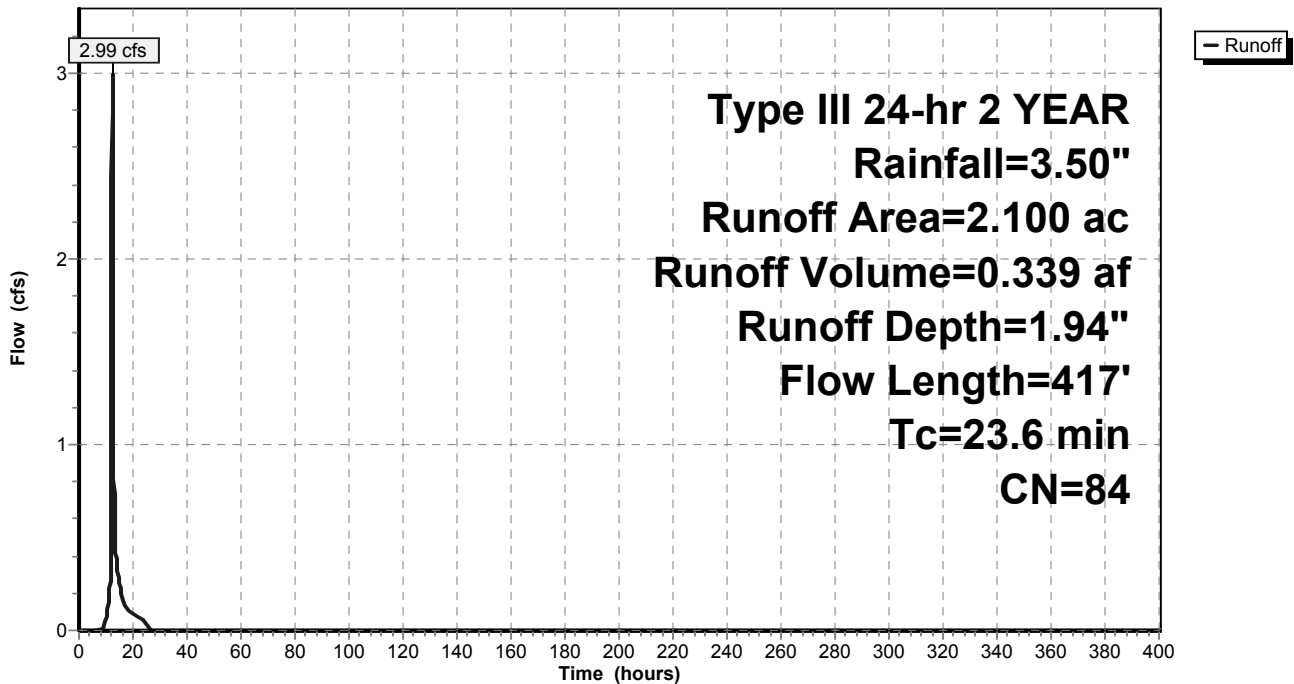
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
1.100	94	Urban commercial, 85% imp, HSG C
0.700	74	>75% Grass cover, Good, HSG C
0.300	71	Meadow, non-grazed, HSG C
2.100	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.1		<b>Sheet Flow,</b> Grass: Bermuda n= 0.410 P2= 3.50"
2.7	317	0.0800	2.0		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
23.6	417	Total			

**Subcatchment 2.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Subcatchment 2.3S:**

Runoff = 6.60 cfs @ 12.22 hrs, Volume= 0.672 af, Depth= 1.01"

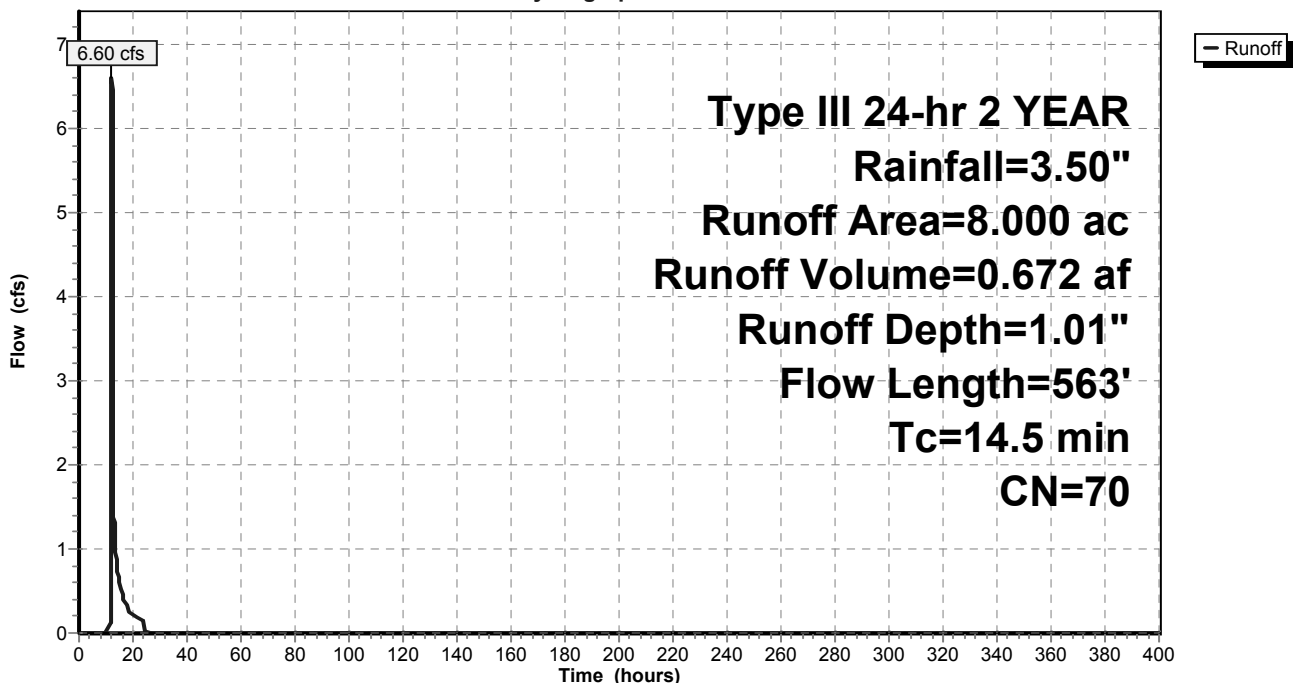
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YEAR Rainfall=3.50"

Area (ac)	CN	Description
5.500	70	Woods, Good, HSG C
0.200	39	>75% Grass cover, Good, HSG A
0.500	98	Paved parking & roofs
0.500	71	Meadow, non-grazed, HSG C
0.900	74	>75% Grass cover, Good, HSG C
0.300	30	Woods, Good, HSG A
0.050	94	Urban commercial, 85% imp, HSG C
0.050	89	Urban commercial, 85% imp, HSG A
8.000	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment 2.3S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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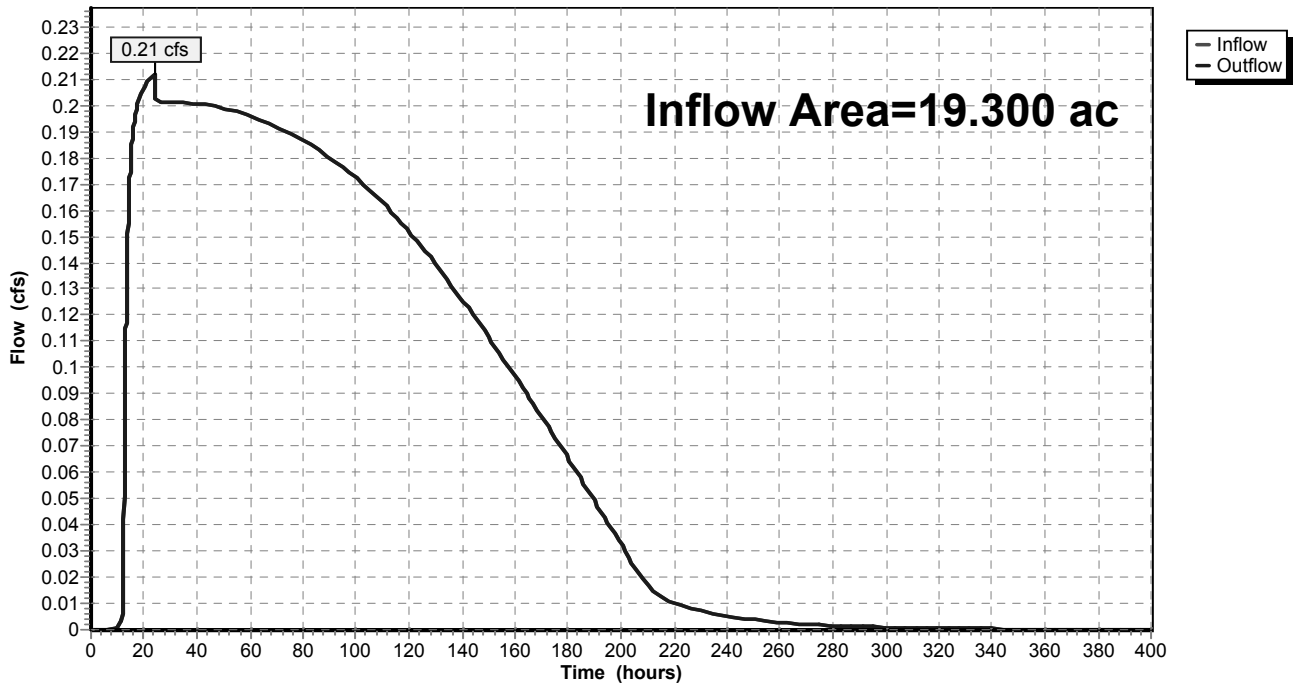
**Reach DESIGN LINE 1:**

Inflow Area = 19.300 ac, Inflow Depth > 1.46" for 2 YEAR event  
Inflow = 0.21 cfs @ 23.99 hrs, Volume= 2.345 af  
Outflow = 0.21 cfs @ 23.99 hrs, Volume= 2.345 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN LINE 1:**

Hydrograph

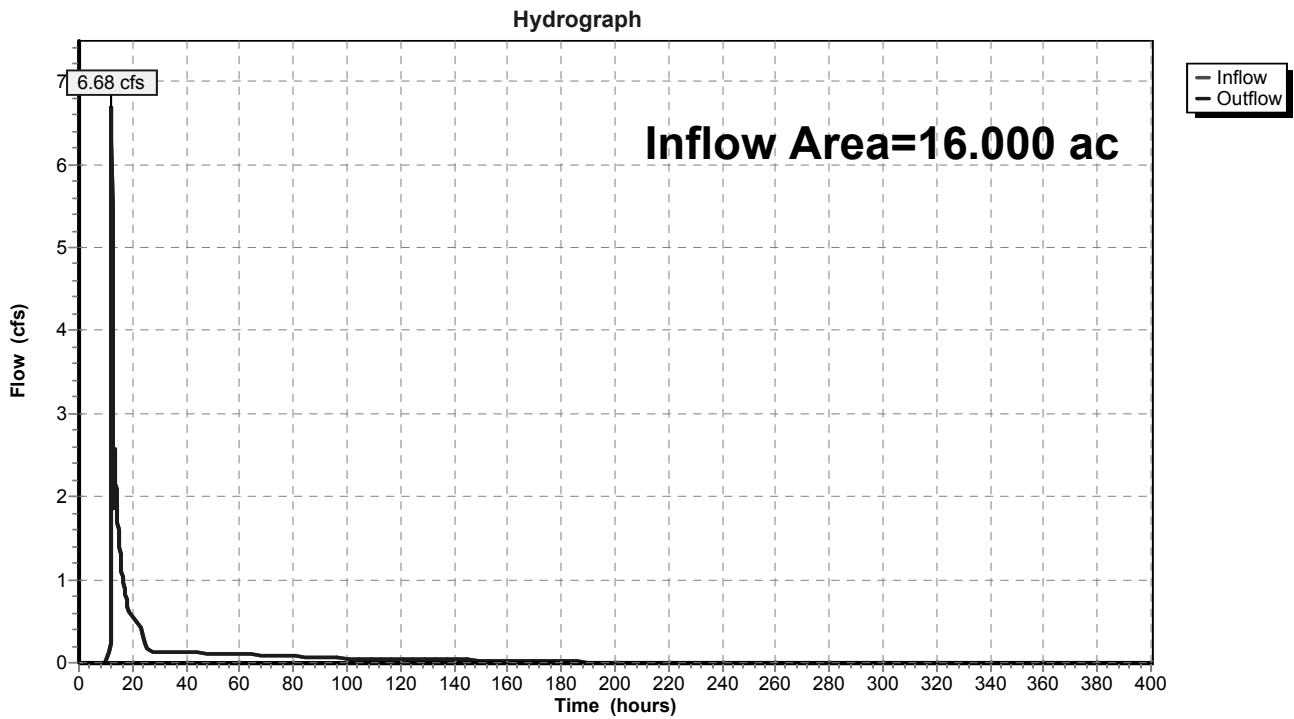


**Reach DESIGN POINT 2:**

Inflow Area = 16.000 ac, Inflow Depth = 1.54" for 2 YEAR event  
Inflow = 6.68 cfs @ 12.22 hrs, Volume= 2.057 af  
Outflow = 6.68 cfs @ 12.22 hrs, Volume= 2.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN POINT 2:**



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Pond 1.0P:**

Inflow Area = 13.400 ac, Inflow Depth = 2.02" for 2 YEAR event  
 Inflow = 31.04 cfs @ 12.09 hrs, Volume= 2.252 af  
 Outflow = 5.04 cfs @ 12.60 hrs, Volume= 2.251 af, Atten= 84%, Lag= 30.4 min  
 Primary = 0.23 cfs @ 12.60 hrs, Volume= 1.221 af  
 Secondary = 4.81 cfs @ 12.60 hrs, Volume= 1.030 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 472.00' Surf.Area= 25,000 sf Storage= 31,700 cf  
 Peak Elev= 474.10' @ 12.60 hrs Surf.Area= 24,190 sf Storage= 82,690 cf (50,990 cf above start)  
 Plug-Flow detention time= 2,268.2 min calculated for 1.524 af (68% of inflow)  
 Center-of-Mass det. time= 1,465.6 min ( 2,287.8 - 822.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	468.00'	158,150 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
468.00	600	0	0
470.00	3,050	3,650	3,650
472.00	25,000	28,050	31,700
474.00	23,600	48,600	80,300
476.00	35,400	59,000	139,300
476.50	40,000	18,850	158,150

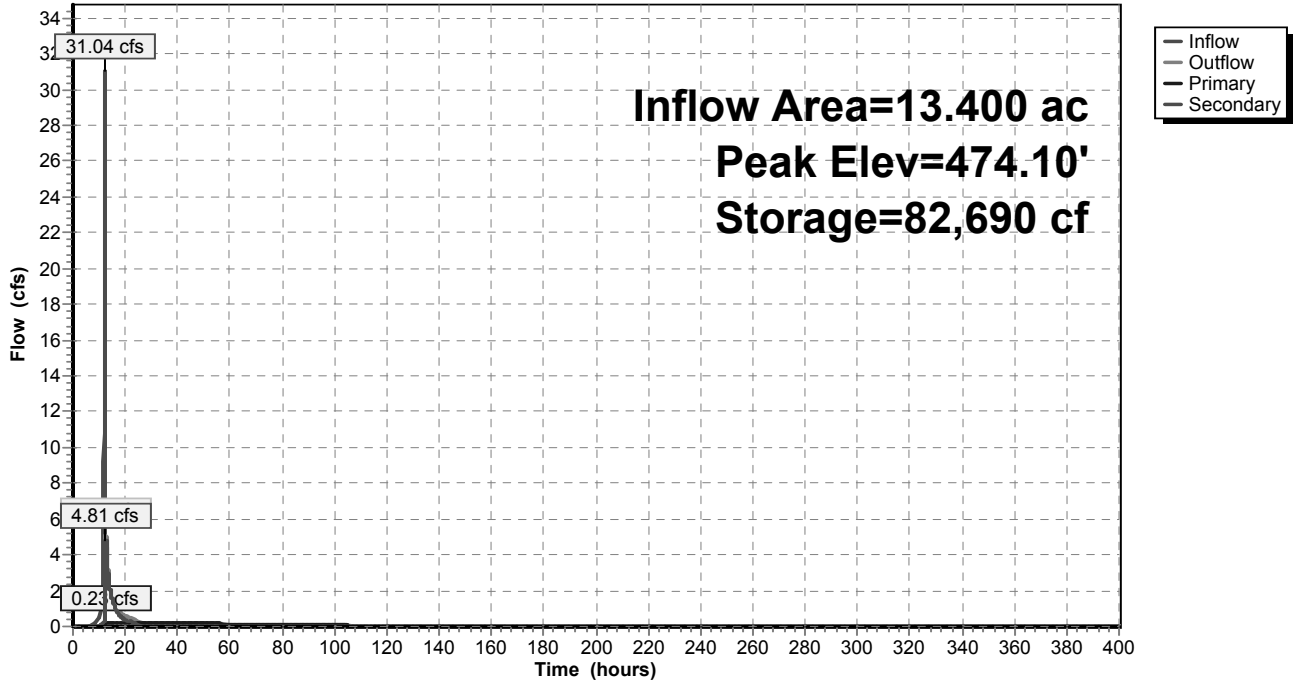
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	473.75'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.23 cfs @ 12.60 hrs HW=474.10' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.23 cfs @ 6.8 fps)

**Secondary OutFlow** Max=4.79 cfs @ 12.60 hrs HW=474.10' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 4.79 cfs @ 1.7 fps)

**Pond 1.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Pond 1.1P:**

Inflow Area = 16.200 ac, Inflow Depth = 1.73" for 2 YEAR event  
 Inflow = 5.27 cfs @ 12.58 hrs, Volume= 2.332 af  
 Outflow = 0.20 cfs @ 29.50 hrs, Volume= 2.332 af, Atten= 96%, Lag= 1,015.1 min  
 Primary = 0.20 cfs @ 29.50 hrs, Volume= 2.332 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 455.26' @ 29.50 hrs Surf.Area= 16,447 sf Storage= 51,009 cf  
 Plug-Flow detention time= 3,295.6 min calculated for 2.332 af (100% of inflow)  
 Center-of-Mass det. time= 3,293.9 min ( 5,535.0 - 2,241.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	451.50'	148,375 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
451.50	10,800	0	0
452.00	11,500	5,575	5,575
454.00	14,500	26,000	31,575
456.00	17,600	32,100	63,675
458.00	21,100	38,700	102,375
460.00	24,900	46,000	148,375

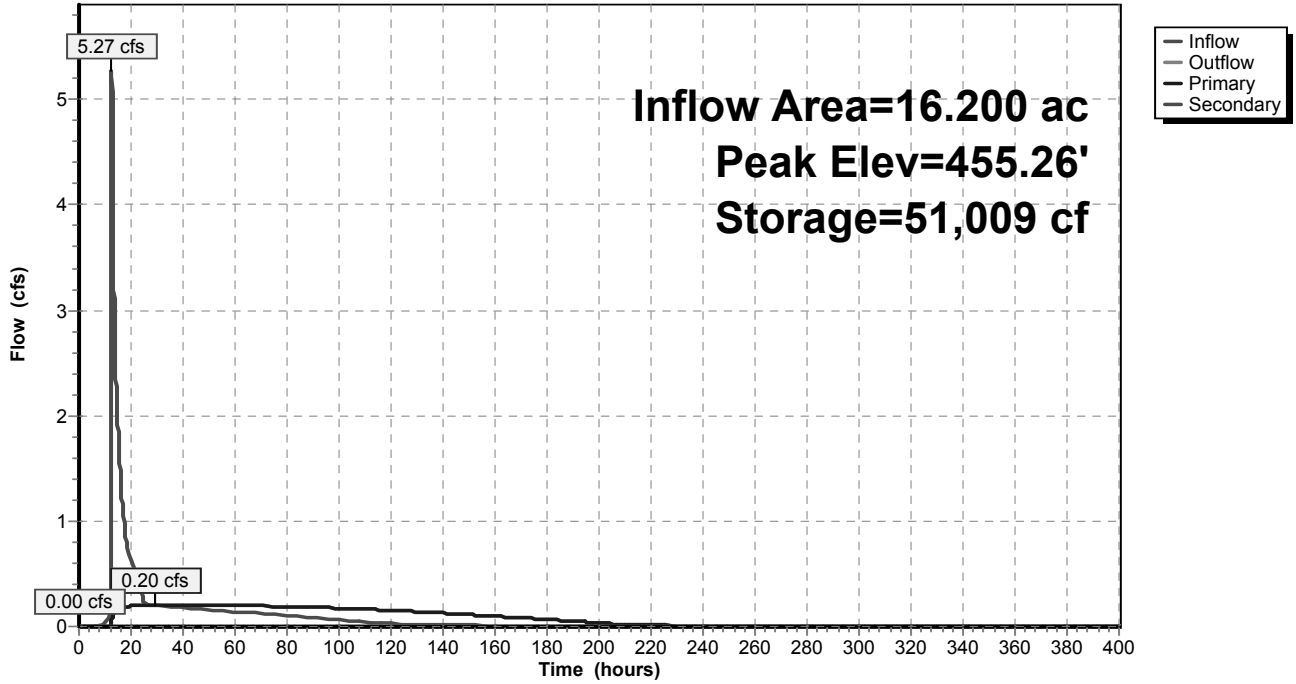
Device	Routing	Invert	Outlet Devices
#1	Primary	451.50'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	457.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.20 cfs @ 29.50 hrs HW=455.26' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.20 cfs @ 9.2 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=451.50' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 1.1P:**

Hydrograph





**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Pond 2.0P:**

Inflow Area = 5.100 ac, Inflow Depth = 2.45" for 2 YEAR event  
 Inflow = 14.10 cfs @ 12.09 hrs, Volume= 1.040 af  
 Outflow = 8.18 cfs @ 12.22 hrs, Volume= 1.040 af, Atten= 42%, Lag= 7.6 min  
 Primary = 0.03 cfs @ 12.22 hrs, Volume= 0.260 af  
 Secondary = 8.15 cfs @ 12.22 hrs, Volume= 0.781 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 3,800 sf Storage= 5,900 cf  
 Peak Elev= 480.99' @ 12.22 hrs Surf.Area= 7,532 sf Storage= 22,532 cf (16,632 cf above start)  
 Plug-Flow detention time= 1,460.7 min calculated for 0.905 af (87% of inflow)  
 Center-of-Mass det. time= 1,209.4 min ( 2,012.9 - 803.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	40,050 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	100	0	0
476.00	1,000	1,100	1,100
478.00	3,800	4,800	5,900
480.00	6,100	9,900	15,800
482.00	9,000	15,100	30,900
483.00	9,300	9,150	40,050

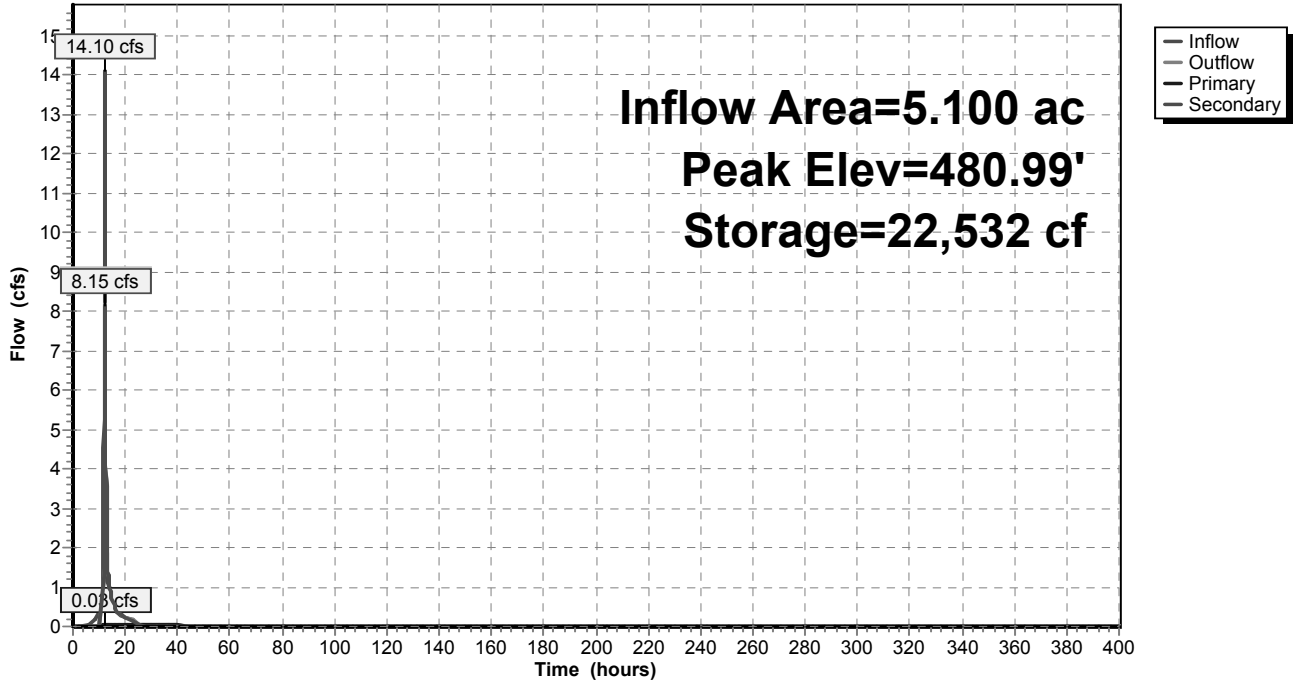
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>0.8" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	480.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.03 cfs @ 12.22 hrs HW=480.98' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.03 cfs @ 8.3 fps)

**Secondary OutFlow** Max=8.07 cfs @ 12.22 hrs HW=480.98' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 8.07 cfs @ 3.3 fps)

**Pond 2.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Pond 2.1P:**

Inflow Area = 5.900 ac, Inflow Depth = 2.13" for 2 YEAR event  
 Inflow = 8.18 cfs @ 12.22 hrs, Volume= 1.046 af  
 Outflow = 1.48 cfs @ 13.26 hrs, Volume= 1.046 af, Atten= 82%, Lag= 62.9 min  
 Primary = 1.48 cfs @ 13.26 hrs, Volume= 1.046 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 475.97' @ 13.26 hrs Surf.Area= 7,640 sf Storage= 17,139 cf  
 Plug-Flow detention time= 1,651.9 min calculated for 1.046 af (100% of inflow)  
 Center-of-Mass det. time= 1,651.7 min ( 3,659.4 - 2,007.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	472.00'	36,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.00	1,300	0	0
474.00	4,200	5,500	5,500
476.00	7,700	11,900	17,400
478.00	11,000	18,700	36,100

Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>1.1" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	475.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir X 2.00</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

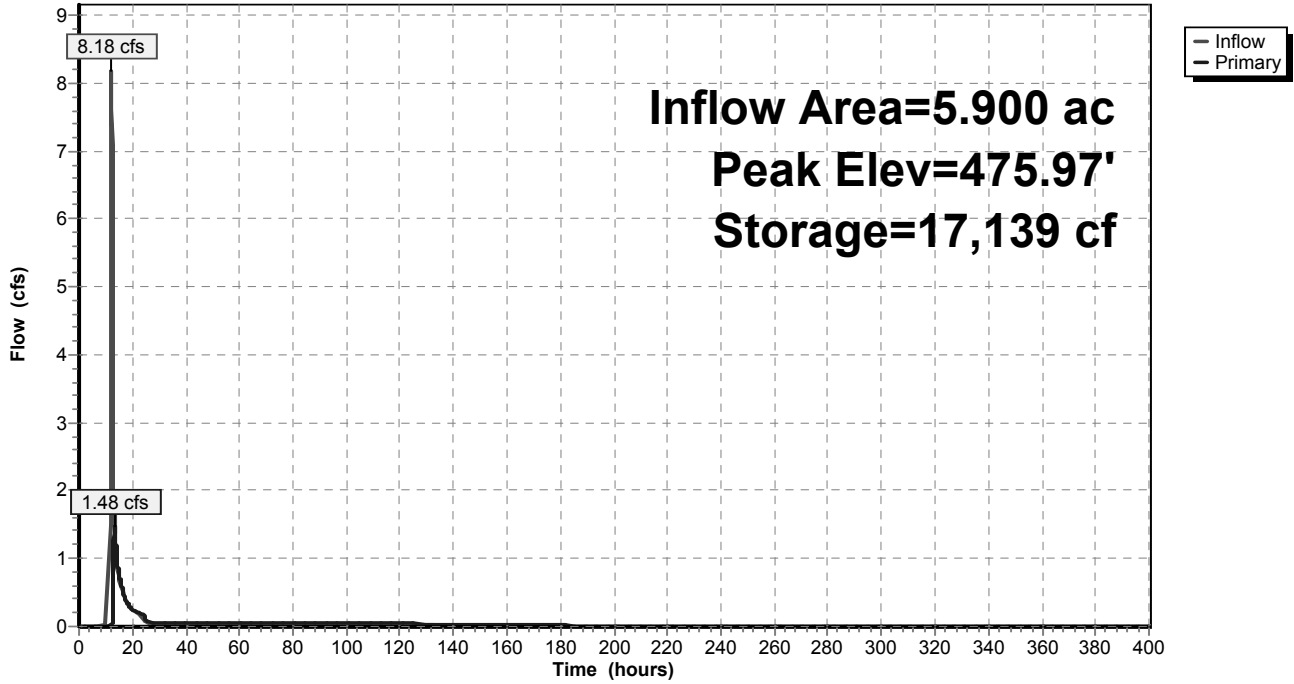
**Primary OutFlow** Max=1.47 cfs @ 13.26 hrs HW=475.97' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.06 cfs @ 9.5 fps)

2=Broad-Crested Rectangular Weir (Weir Controls 1.41 cfs @ 1.3 fps)

**Pond 2.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 2 YEAR Rainfall=3.50"

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**Pond 2.2P:**

Inflow Area = 2.100 ac, Inflow Depth = 1.94" for 2 YEAR event  
 Inflow = 2.99 cfs @ 12.33 hrs, Volume= 0.339 af  
 Outflow = 0.07 cfs @ 21.75 hrs, Volume= 0.339 af, Atten= 98%, Lag= 565.4 min  
 Primary = 0.07 cfs @ 21.75 hrs, Volume= 0.339 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 2,700 sf Storage= 3,700 cf  
 Peak Elev= 480.70' @ 21.75 hrs Surf.Area= 5,936 sf Storage= 15,343 cf (11,643 cf above start)  
 Plug-Flow detention time= 2,476.2 min calculated for 0.254 af (75% of inflow)  
 Center-of-Mass det. time= 1,866.0 min ( 2,707.8 - 841.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	32,275 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	0	0	0
476.00	500	500	500
478.00	2,700	3,200	3,700
480.00	5,100	7,800	11,500
482.00	7,500	12,600	24,100
483.00	8,850	8,175	32,275

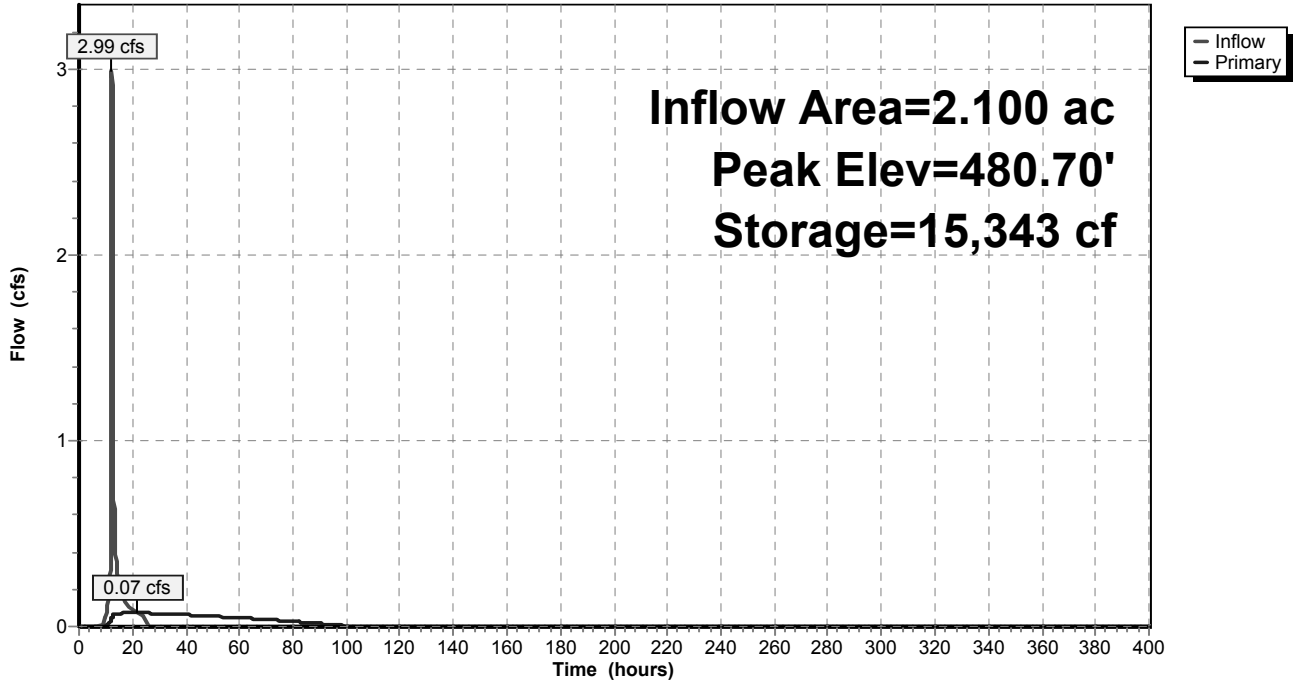
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>1.3" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	481.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.07 cfs @ 21.75 hrs HW=480.70' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.07 cfs @ 7.8 fps)
- 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 2.2P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 1.0S:**

Runoff = 51.25 cfs @ 12.09 hrs, Volume= 3.761 af, Depth= 3.37"

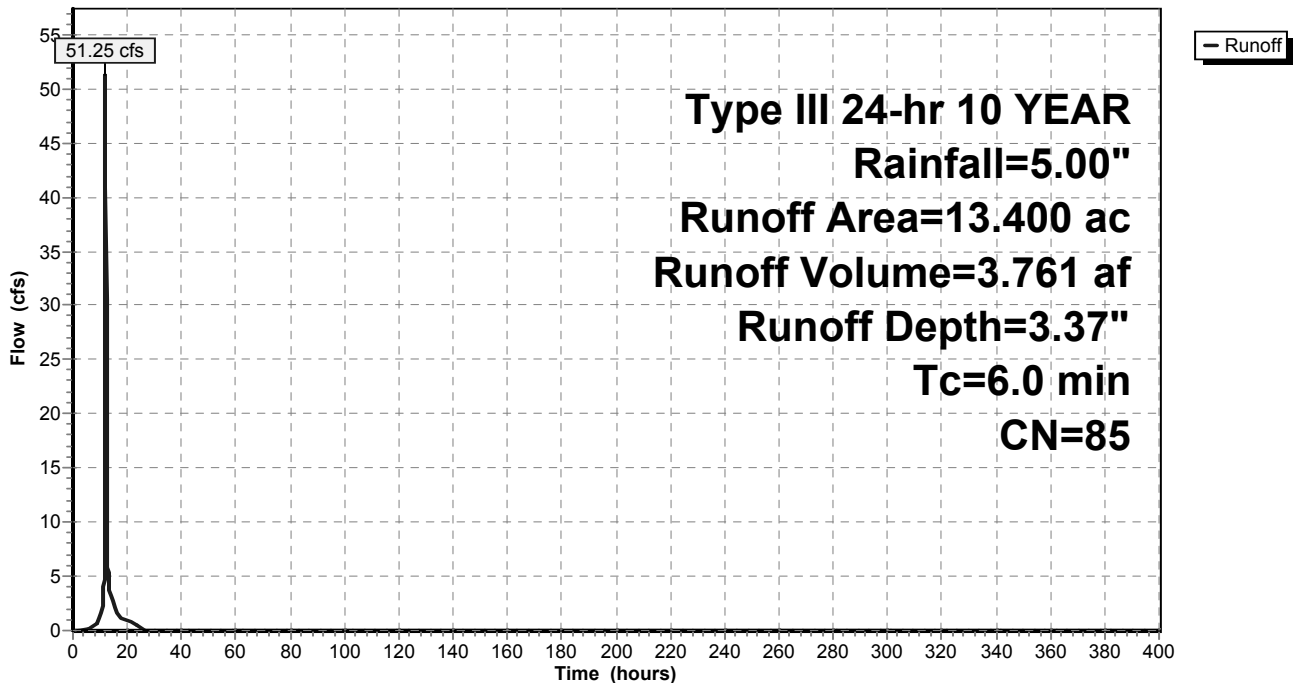
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
7.900	89	Urban commercial, 85% imp, HSG A
3.400	94	Urban commercial, 85% imp, HSG C
0.900	70	Woods, Good, HSG C
13.400	85	Weighted Average

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

**Subcatchment 1.0S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 1.1S:**

Runoff = 2.54 cfs @ 12.11 hrs, Volume= 0.229 af, Depth= 0.98"

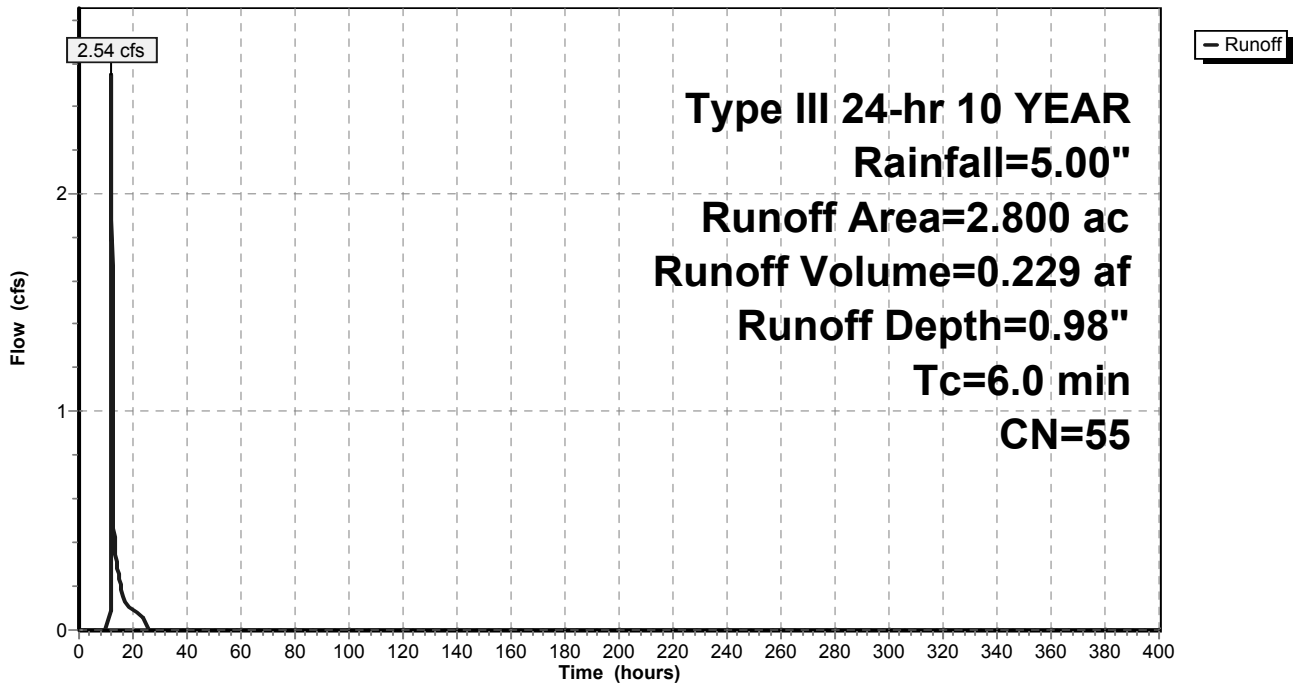
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
2.000	39	>75% Grass cover, Good, HSG A
0.400	89	Urban commercial, 85% imp, HSG A
0.400	98	Paved parking & roofs
2.800	55	Weighted Average

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

**Subcatchment 1.1S:**

Hydrograph





**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 1.2S:**

Runoff = 0.35 cfs @ 12.55 hrs, Volume= 0.091 af, Depth= 0.35"

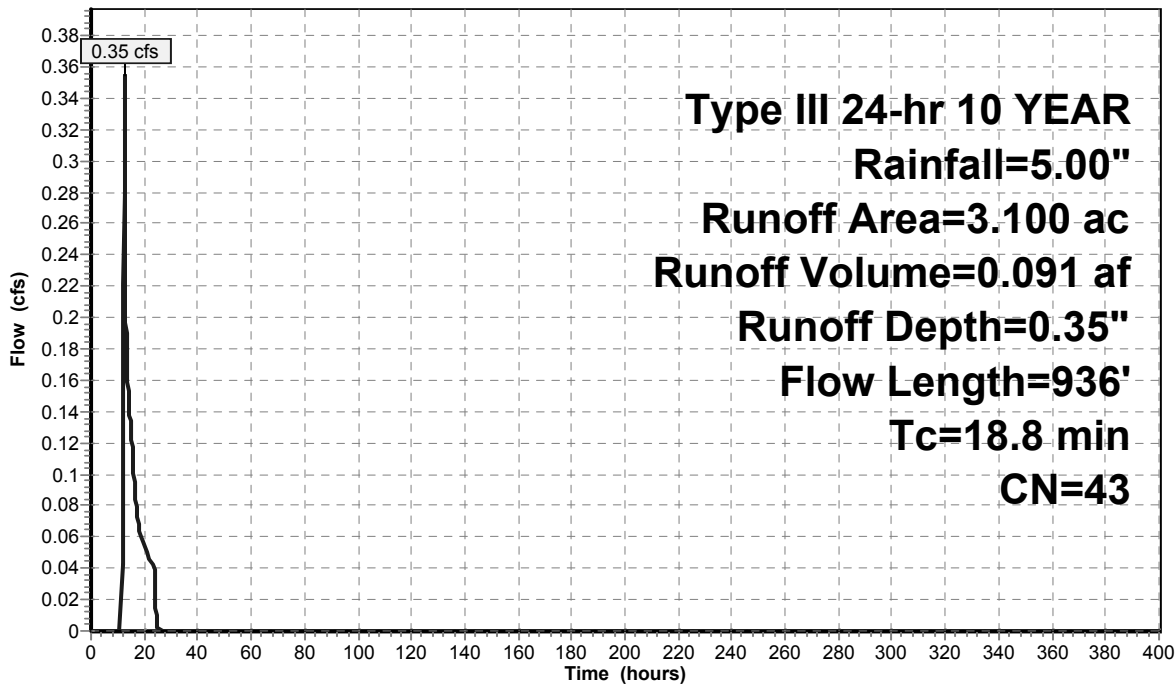
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
1.000	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.500	30	Woods, Good, HSG A
0.300	70	Woods, Good, HSG C
3.100	43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	17	0.0200	1.0		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
5.4	83	0.3900	0.3		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
13.1	836	0.0450	1.1		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
18.8	936	Total			

**Subcatchment 1.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 2.0S:**

Runoff = 21.86 cfs @ 12.09 hrs, Volume= 1.647 af, Depth= 3.88"

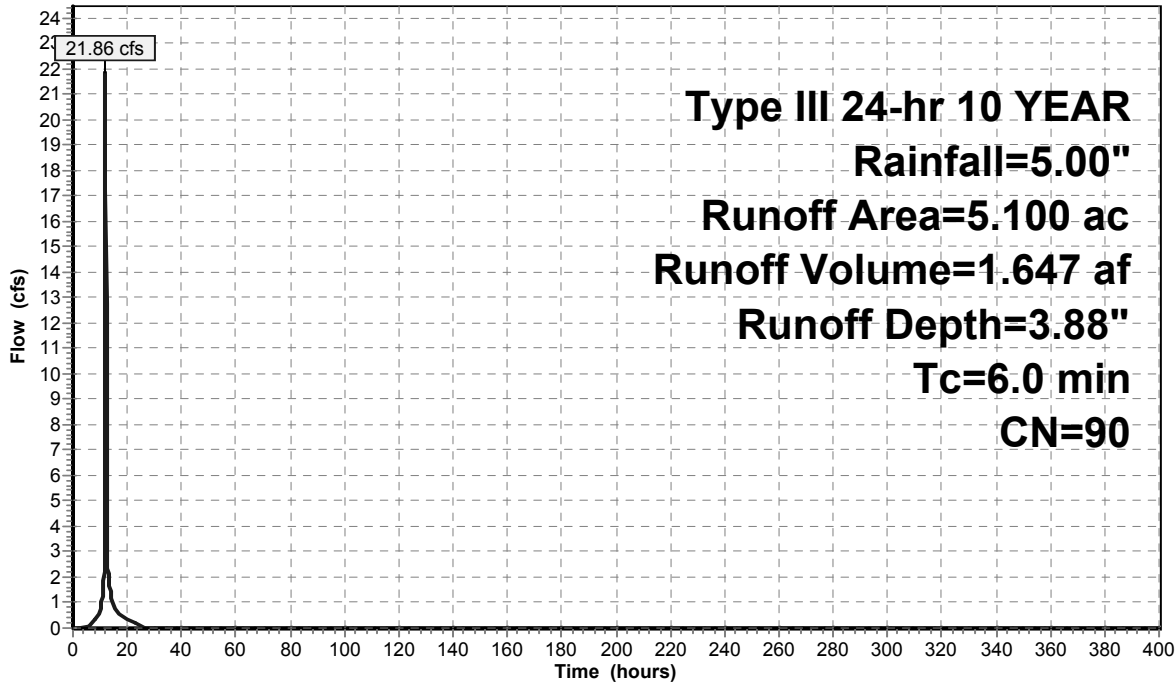
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
0.200	39	>75% Grass cover, Good, HSG A
0.100	74	>75% Grass cover, Good, HSG C
0.300	70	Woods, Good, HSG C
4.000	94	Urban commercial, 85% imp, HSG C
0.500	89	Urban commercial, 85% imp, HSG A
5.100	90	Weighted Average

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

**Subcatchment 2.0S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 2.1S:**

Runoff = 0.16 cfs @ 12.30 hrs, Volume= 0.029 af, Depth= 0.44"

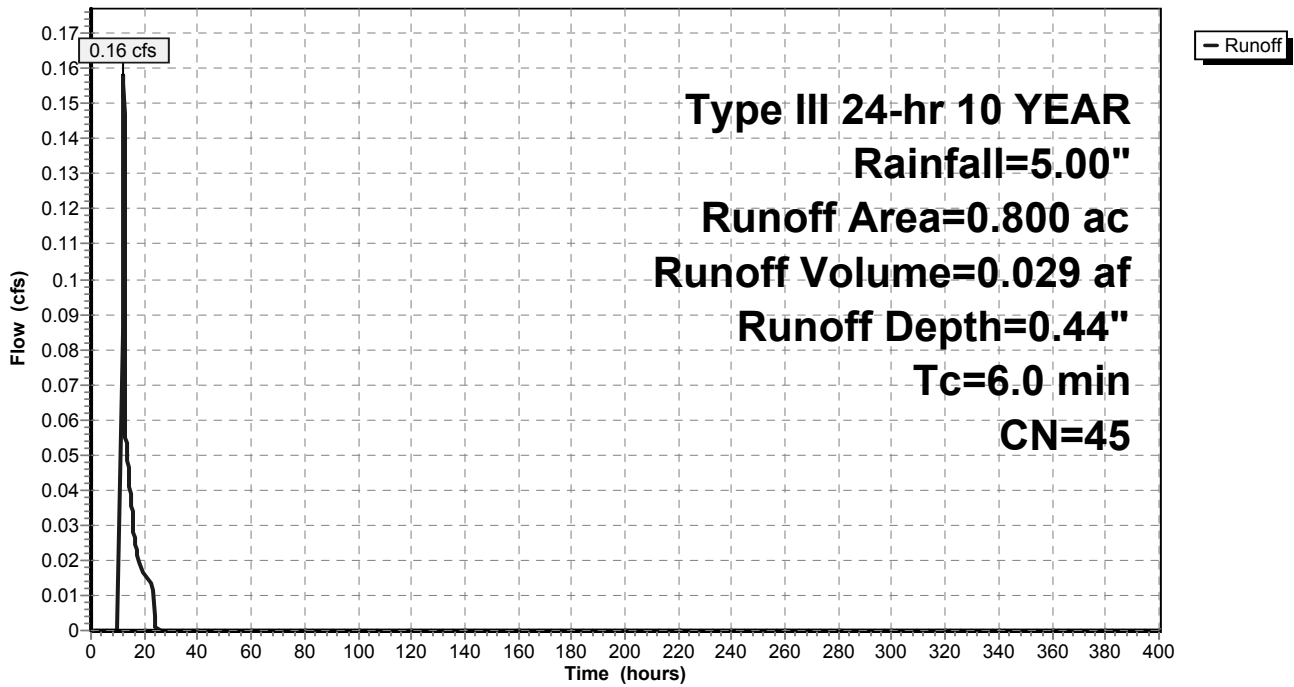
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.100	89	Urban commercial, 85% imp, HSG A
0.800	45	Weighted Average

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

**Subcatchment 2.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 2.2S:**

Runoff = 5.03 cfs @ 12.32 hrs, Volume= 0.572 af, Depth= 3.27"

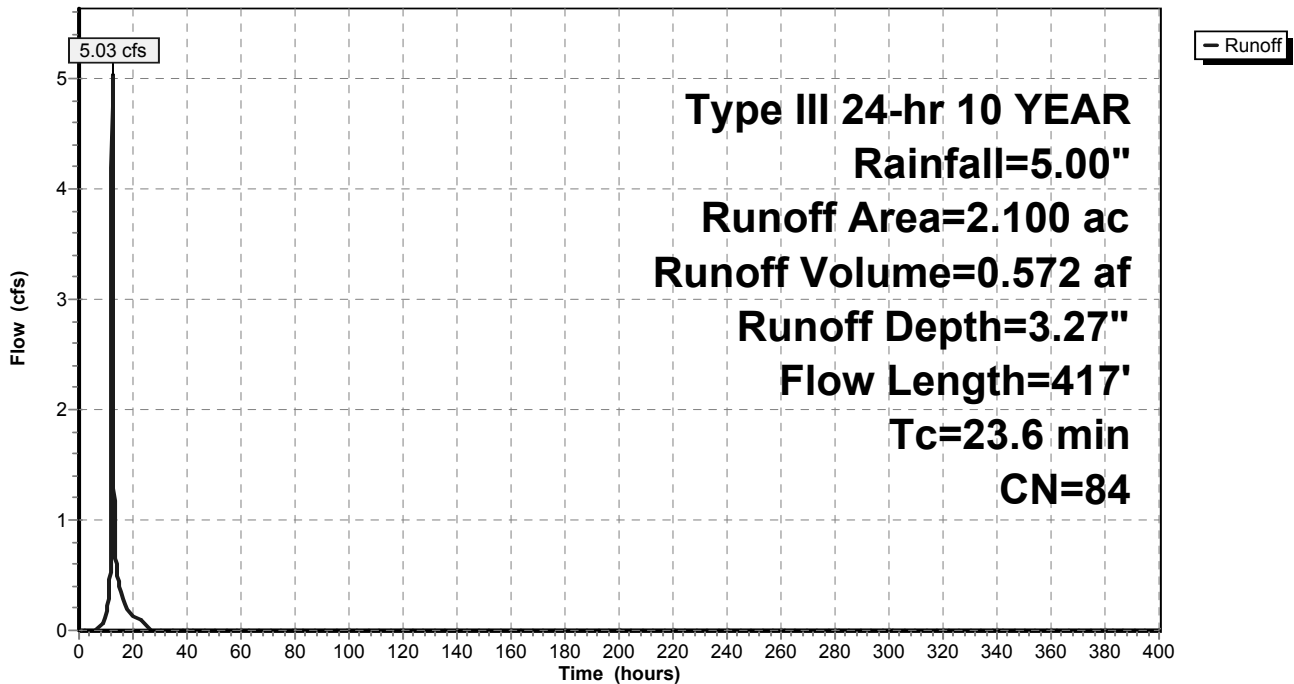
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
1.100	94	Urban commercial, 85% imp, HSG C
0.700	74	>75% Grass cover, Good, HSG C
0.300	71	Meadow, non-grazed, HSG C
2.100	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.1		<b>Sheet Flow,</b> Grass: Bermuda n= 0.410 P2= 3.50"
2.7	317	0.0800	2.0		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
23.6	417	Total			

**Subcatchment 2.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Subcatchment 2.3S:**

Runoff = 14.26 cfs @ 12.21 hrs, Volume= 1.358 af, Depth= 2.04"

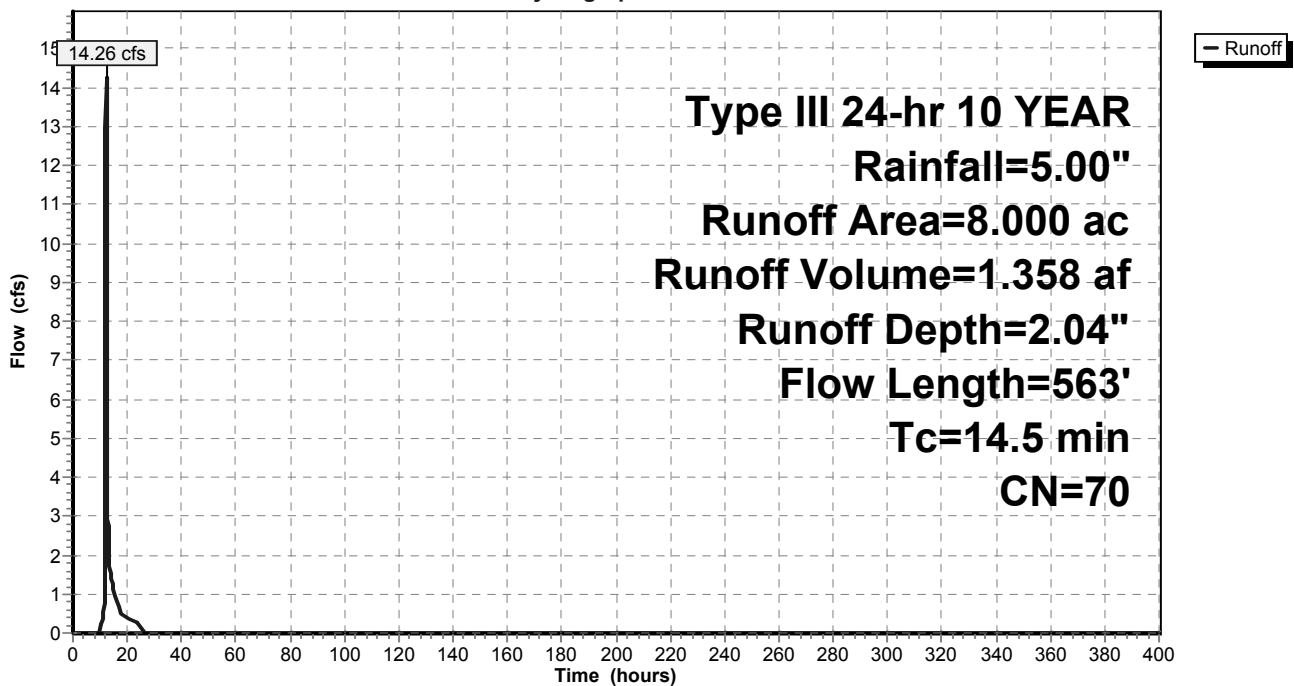
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YEAR Rainfall=5.00"

Area (ac)	CN	Description
5.500	70	Woods, Good, HSG C
0.200	39	>75% Grass cover, Good, HSG A
0.500	98	Paved parking & roofs
0.500	71	Meadow, non-grazed, HSG C
0.900	74	>75% Grass cover, Good, HSG C
0.300	30	Woods, Good, HSG A
0.050	94	Urban commercial, 85% imp, HSG C
0.050	89	Urban commercial, 85% imp, HSG A
8.000	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment 2.3S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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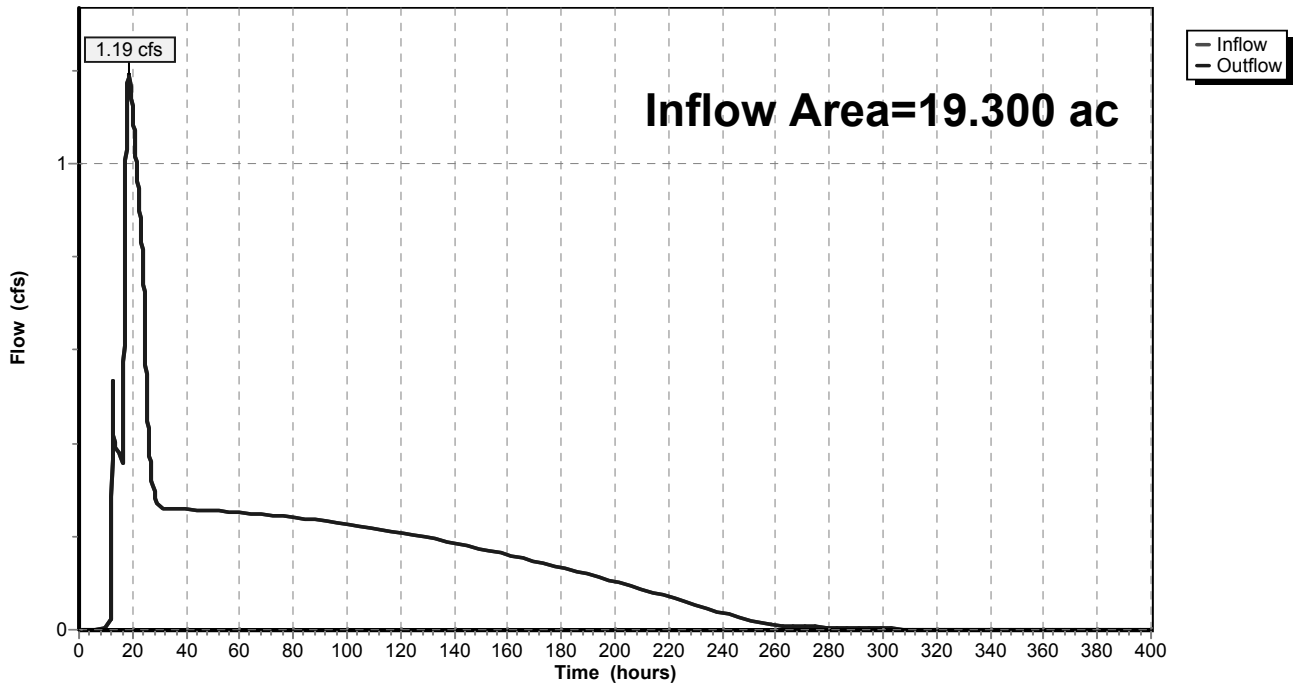
**Reach DESIGN LINE 1:**

Inflow Area = 19.300 ac, Inflow Depth = 2.54" for 10 YEAR event  
Inflow = 1.19 cfs @ 18.65 hrs, Volume= 4.081 af  
Outflow = 1.19 cfs @ 18.65 hrs, Volume= 4.081 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN LINE 1:**

Hydrograph



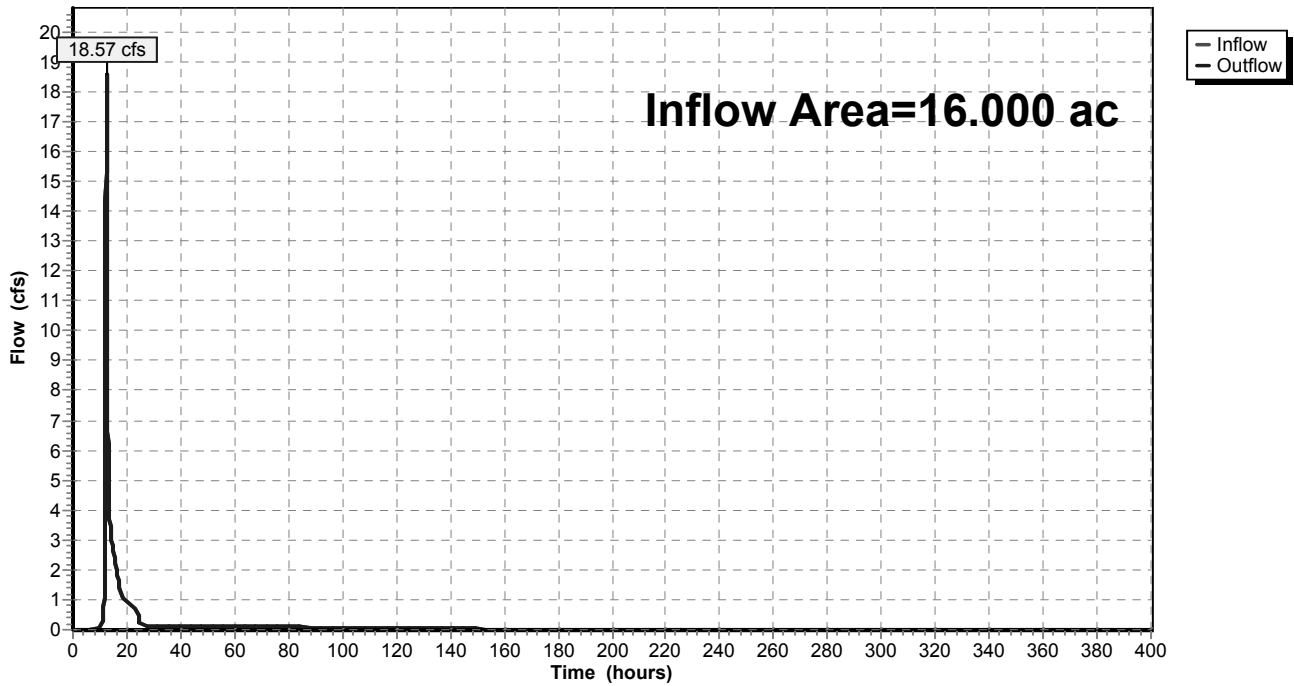
**Reach DESIGN POINT 2:**

Inflow Area = 16.000 ac, Inflow Depth = 2.71" for 10 YEAR event  
Inflow = 18.57 cfs @ 12.39 hrs, Volume= 3.607 af  
Outflow = 18.57 cfs @ 12.39 hrs, Volume= 3.607 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN POINT 2:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Pond 1.0P:**

Inflow Area = 13.400 ac, Inflow Depth = 3.37" for 10 YEAR event  
 Inflow = 51.25 cfs @ 12.09 hrs, Volume= 3.761 af  
 Outflow = 23.77 cfs @ 12.27 hrs, Volume= 3.761 af, Atten= 54%, Lag= 11.1 min  
 Primary = 0.26 cfs @ 12.27 hrs, Volume= 1.246 af  
 Secondary = 23.50 cfs @ 12.27 hrs, Volume= 2.515 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 472.00' Surf.Area= 25,000 sf Storage= 31,700 cf  
 Peak Elev= 474.67' @ 12.27 hrs Surf.Area= 27,569 sf Storage= 97,509 cf (65,809 cf above start)  
 Plug-Flow detention time= 1,206.1 min calculated for 3.033 af (81% of inflow)  
 Center-of-Mass det. time= 900.2 min ( 1,707.7 - 807.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	468.00'	158,150 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
468.00	600	0	0
470.00	3,050	3,650	3,650
472.00	25,000	28,050	31,700
474.00	23,600	48,600	80,300
476.00	35,400	59,000	139,300
476.50	40,000	18,850	158,150

Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	473.75'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

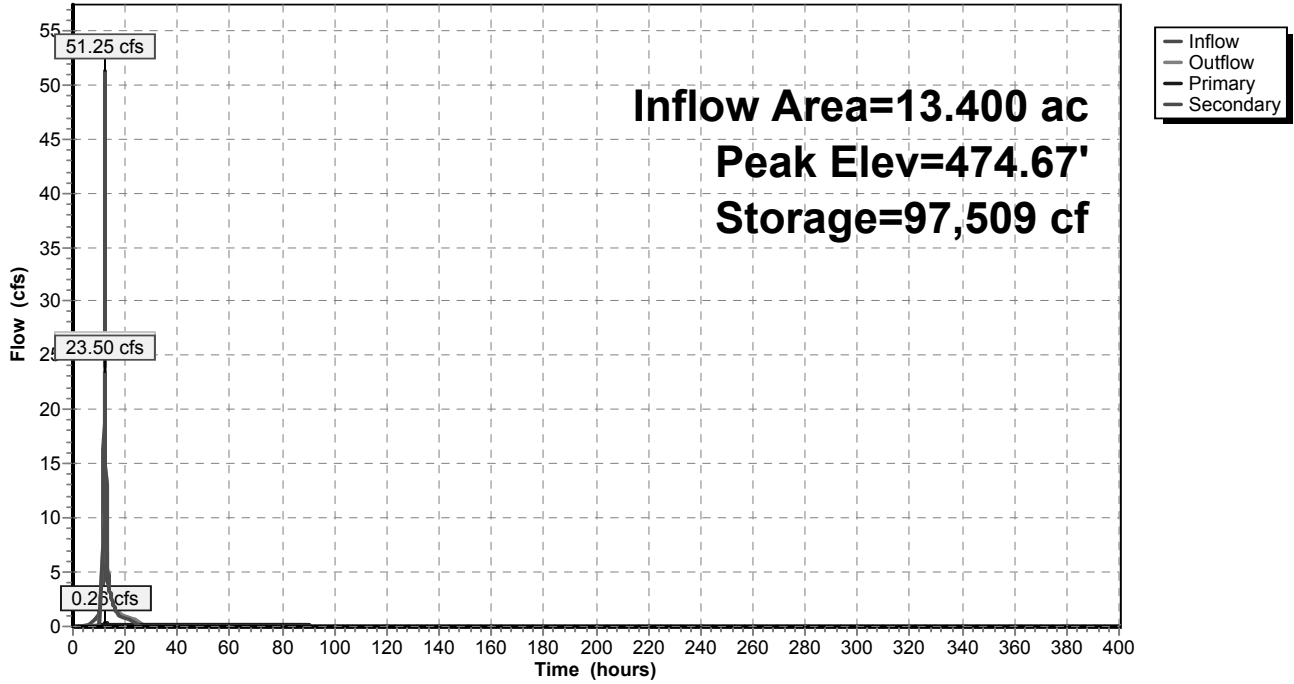
**Primary OutFlow** Max=0.26 cfs @ 12.27 hrs HW=474.67' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.26 cfs @ 7.7 fps)

**Secondary OutFlow** Max=23.33 cfs @ 12.27 hrs HW=474.67' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 23.33 cfs @ 3.2 fps)



**Pond 1.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Pond 1.1P:**

Inflow Area = 16.200 ac, Inflow Depth = 2.96" for 10 YEAR event  
 Inflow = 25.37 cfs @ 12.27 hrs, Volume= 3.989 af  
 Outflow = 1.13 cfs @ 18.68 hrs, Volume= 3.989 af, Atten= 96%, Lag= 384.9 min  
 Primary = 0.27 cfs @ 18.68 hrs, Volume= 3.508 af  
 Secondary = 0.87 cfs @ 18.68 hrs, Volume= 0.481 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 458.00' @ 18.68 hrs Surf.Area= 21,094 sf Storage= 102,303 cf  
 Plug-Flow detention time= 4,028.5 min calculated for 3.989 af (100% of inflow)  
 Center-of-Mass det. time= 4,027.4 min ( 5,688.4 - 1,661.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	451.50'	148,375 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
451.50	10,800	0	0
452.00	11,500	5,575	5,575
454.00	14,500	26,000	31,575
456.00	17,600	32,100	63,675
458.00	21,100	38,700	102,375
460.00	24,900	46,000	148,375

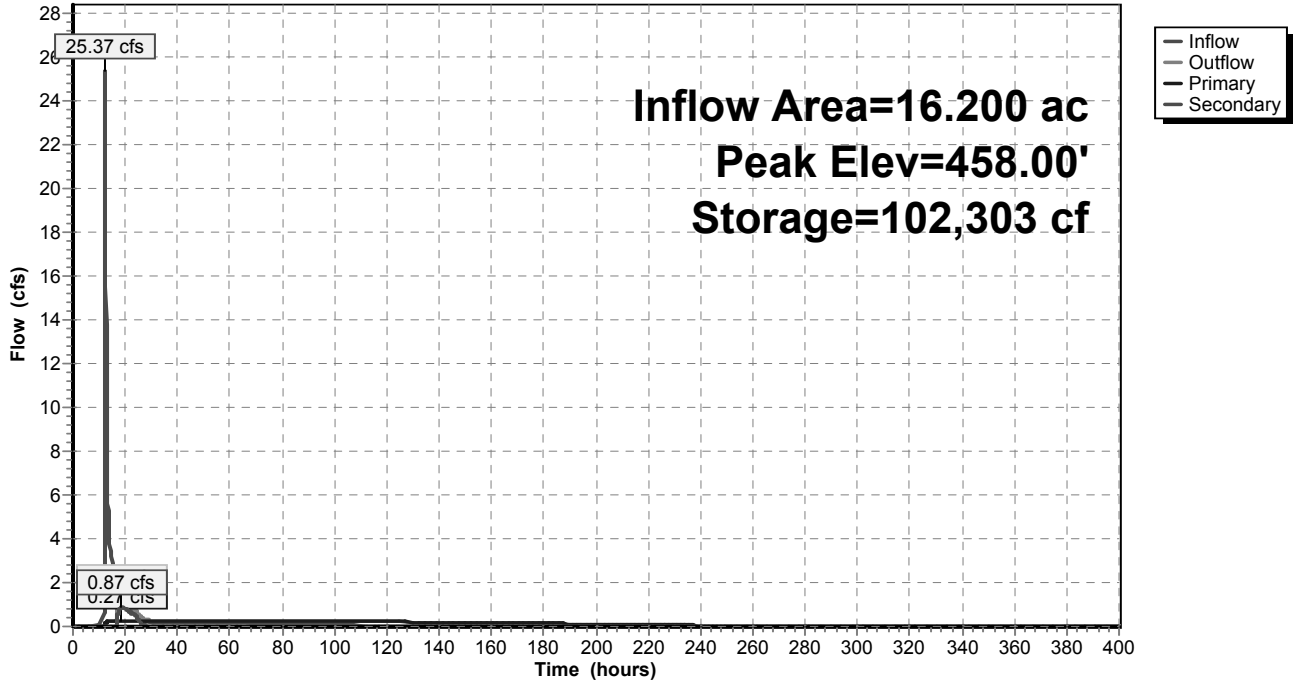
Device	Routing	Invert	Outlet Devices
#1	Primary	451.50'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	457.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.27 cfs @ 18.68 hrs HW=458.00' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.27 cfs @ 12.2 fps)

**Secondary OutFlow** Max=0.87 cfs @ 18.68 hrs HW=458.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.87 cfs @ 1.4 fps)

**Pond 1.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Pond 2.0P:**

Inflow Area = 5.100 ac, Inflow Depth = 3.88" for 10 YEAR event  
 Inflow = 21.86 cfs @ 12.09 hrs, Volume= 1.647 af  
 Outflow = 14.95 cfs @ 12.18 hrs, Volume= 1.647 af, Atten= 32%, Lag= 5.4 min  
 Primary = 0.03 cfs @ 12.18 hrs, Volume= 0.263 af  
 Secondary = 14.92 cfs @ 12.18 hrs, Volume= 1.384 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 3,800 sf Storage= 5,900 cf  
 Peak Elev= 481.48' @ 12.18 hrs Surf.Area= 8,244 sf Storage= 26,404 cf (20,504 cf above start)  
 Plug-Flow detention time= 901.5 min calculated for 1.512 af (92% of inflow)  
 Center-of-Mass det. time= 781.3 min ( 1,572.0 - 790.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	40,050 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	100	0	0
476.00	1,000	1,100	1,100
478.00	3,800	4,800	5,900
480.00	6,100	9,900	15,800
482.00	9,000	15,100	30,900
483.00	9,300	9,150	40,050

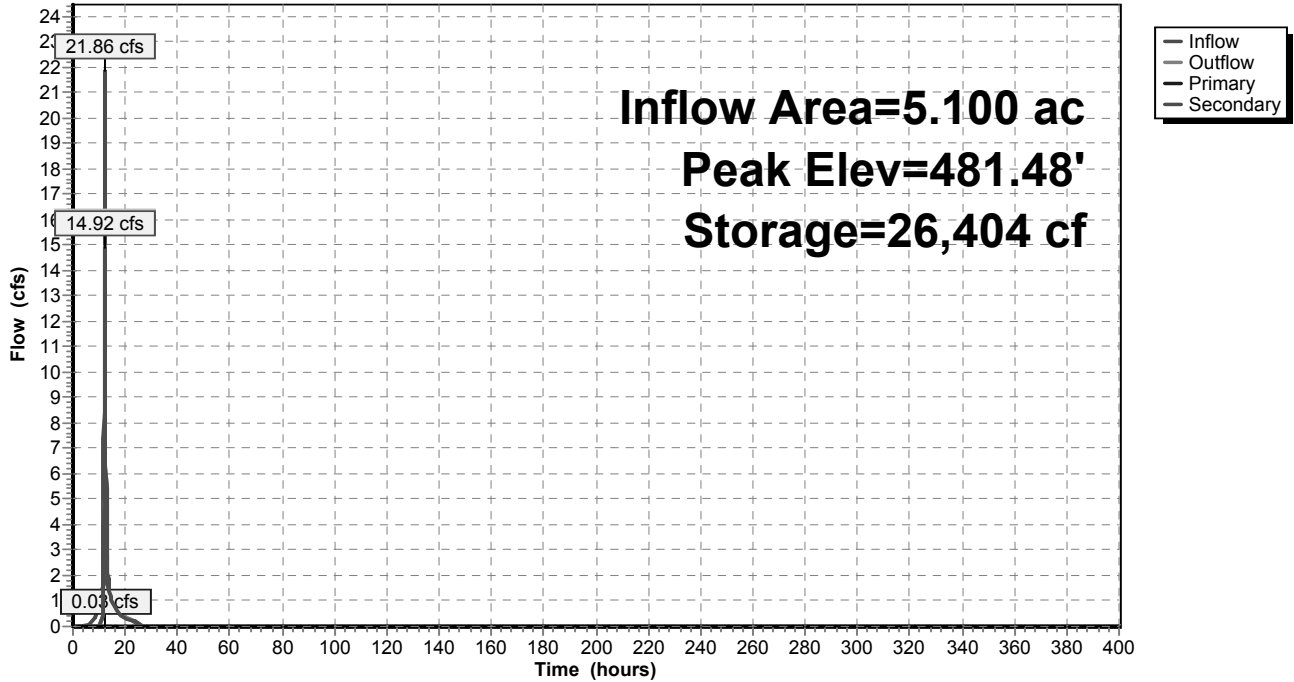
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>0.8" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	480.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.03 cfs @ 12.18 hrs HW=481.47' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.03 cfs @ 8.9 fps)

**Secondary OutFlow** Max=14.80 cfs @ 12.18 hrs HW=481.47' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 14.80 cfs @ 4.0 fps)

**Pond 2.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Pond 2.1P:**

Inflow Area = 5.900 ac, Inflow Depth = 3.41" for 10 YEAR event  
 Inflow = 15.09 cfs @ 12.18 hrs, Volume= 1.677 af  
 Outflow = 9.29 cfs @ 12.47 hrs, Volume= 1.677 af, Atten= 38%, Lag= 17.3 min  
 Primary = 9.29 cfs @ 12.47 hrs, Volume= 1.677 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 476.44' @ 12.47 hrs Surf.Area= 8,434 sf Storage= 20,988 cf  
 Plug-Flow detention time= 1,043.3 min calculated for 1.677 af (100% of inflow)  
 Center-of-Mass det. time= 1,043.2 min ( 2,604.2 - 1,561.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	472.00'	36,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.00	1,300	0	0
474.00	4,200	5,500	5,500
476.00	7,700	11,900	17,400
478.00	11,000	18,700	36,100

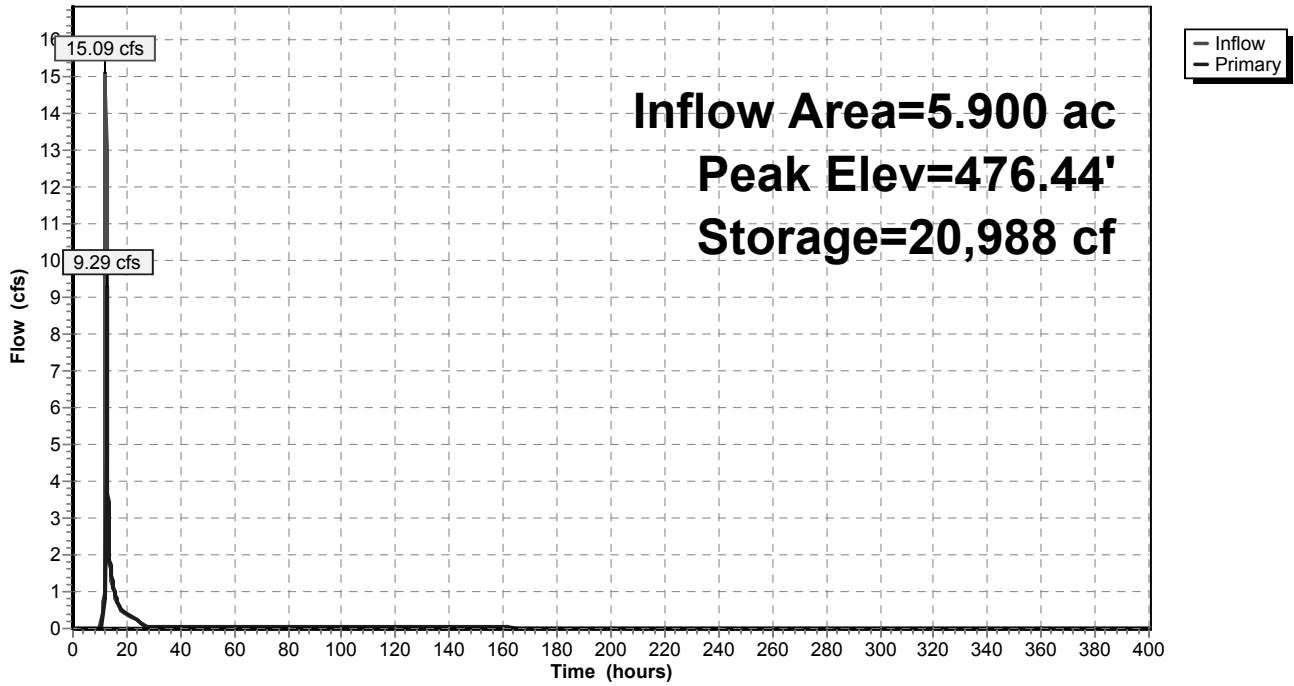
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>1.1" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	475.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir X 2.00</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=9.22 cfs @ 12.47 hrs HW=476.44' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.07 cfs @ 10.1 fps)
- 2=Broad-Crested Rectangular Weir (Weir Controls 9.15 cfs @ 2.6 fps)

**Pond 2.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 10 YEAR Rainfall=5.00"

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**Pond 2.2P:**

Inflow Area = 2.100 ac, Inflow Depth = 3.27" for 10 YEAR event  
 Inflow = 5.03 cfs @ 12.32 hrs, Volume= 0.572 af  
 Outflow = 0.37 cfs @ 15.20 hrs, Volume= 0.572 af, Atten= 93%, Lag= 172.7 min  
 Primary = 0.37 cfs @ 15.20 hrs, Volume= 0.572 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 2,700 sf Storage= 3,700 cf  
 Peak Elev= 481.61' @ 15.20 hrs Surf.Area= 7,038 sf Storage= 21,300 cf (17,600 cf above start)  
 Plug-Flow detention time= 2,325.0 min calculated for 0.487 af (85% of inflow)  
 Center-of-Mass det. time= 1,932.6 min ( 2,759.5 - 826.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	32,275 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	0	0	0
476.00	500	500	500
478.00	2,700	3,200	3,700
480.00	5,100	7,800	11,500
482.00	7,500	12,600	24,100
483.00	8,850	8,175	32,275

Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>1.3" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	481.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

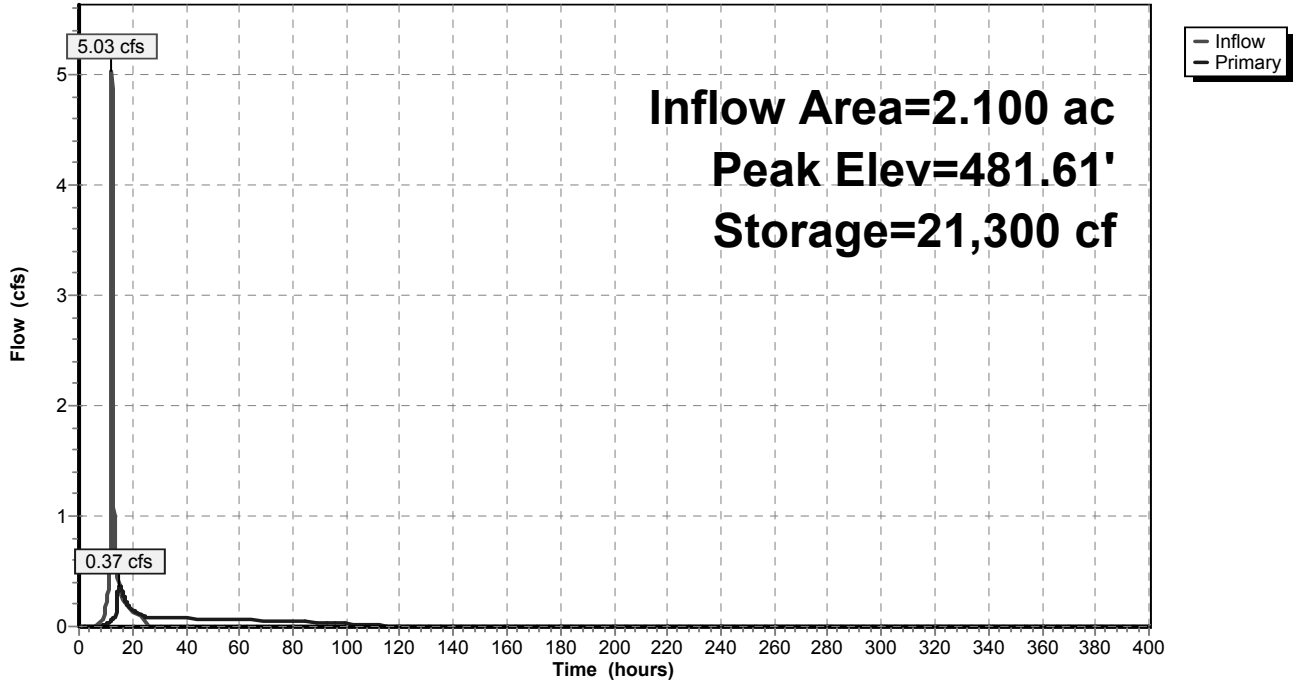
**Primary OutFlow** Max=0.36 cfs @ 15.20 hrs HW=481.61' (Free Discharge)

- ↑ 1=Orifice/Grate (Orifice Controls 0.08 cfs @ 9.1 fps)
- └ 2=Broad-Crested Rectangular Weir (Weir Controls 0.27 cfs @ 0.9 fps)



**Pond 2.2P:**

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 25 YEAR Rainfall=6.00"

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## Subcatchment 1.0S:

Runoff = 64.86 cfs @ 12.09 hrs, Volume= 4.804 af, Depth= 4.30"

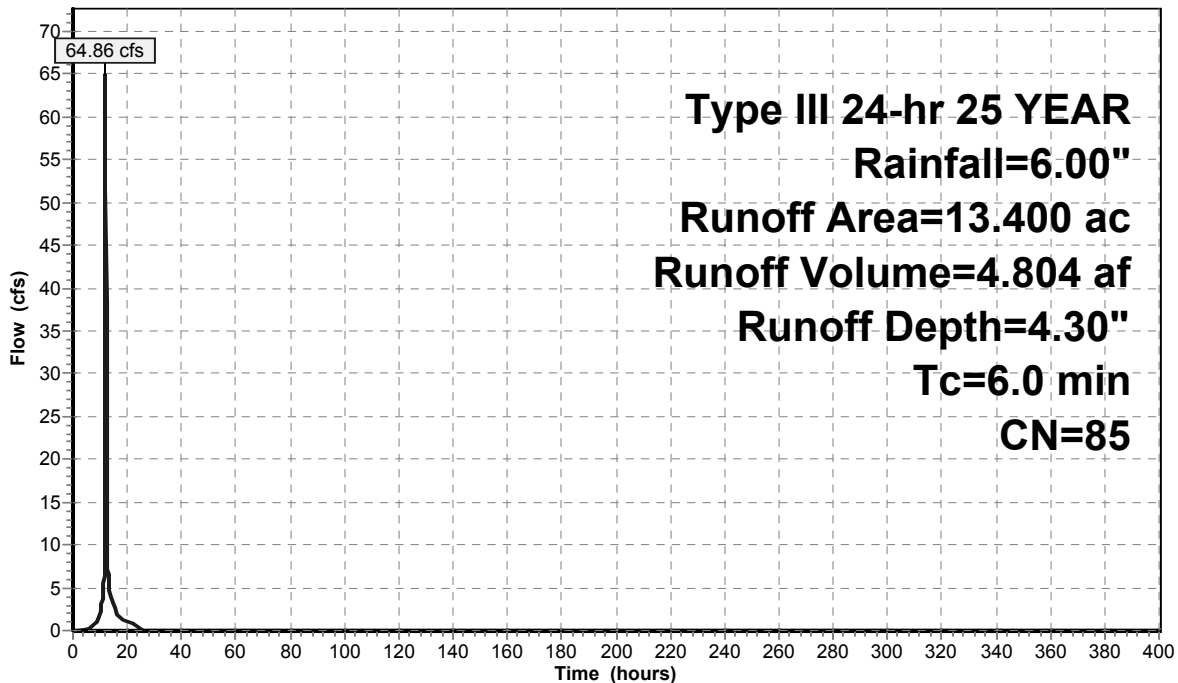
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
7.900	89	Urban commercial, 85% imp, HSG A
3.400	94	Urban commercial, 85% imp, HSG C
0.900	70	Woods, Good, HSG C
13.400	85	Weighted Average

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

## Subcatchment 1.0S:

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 25 YEAR Rainfall=6.00"

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## Subcatchment 1.1S:

Runoff = 4.37 cfs @ 12.10 hrs, Volume= 0.354 af, Depth= 1.52"

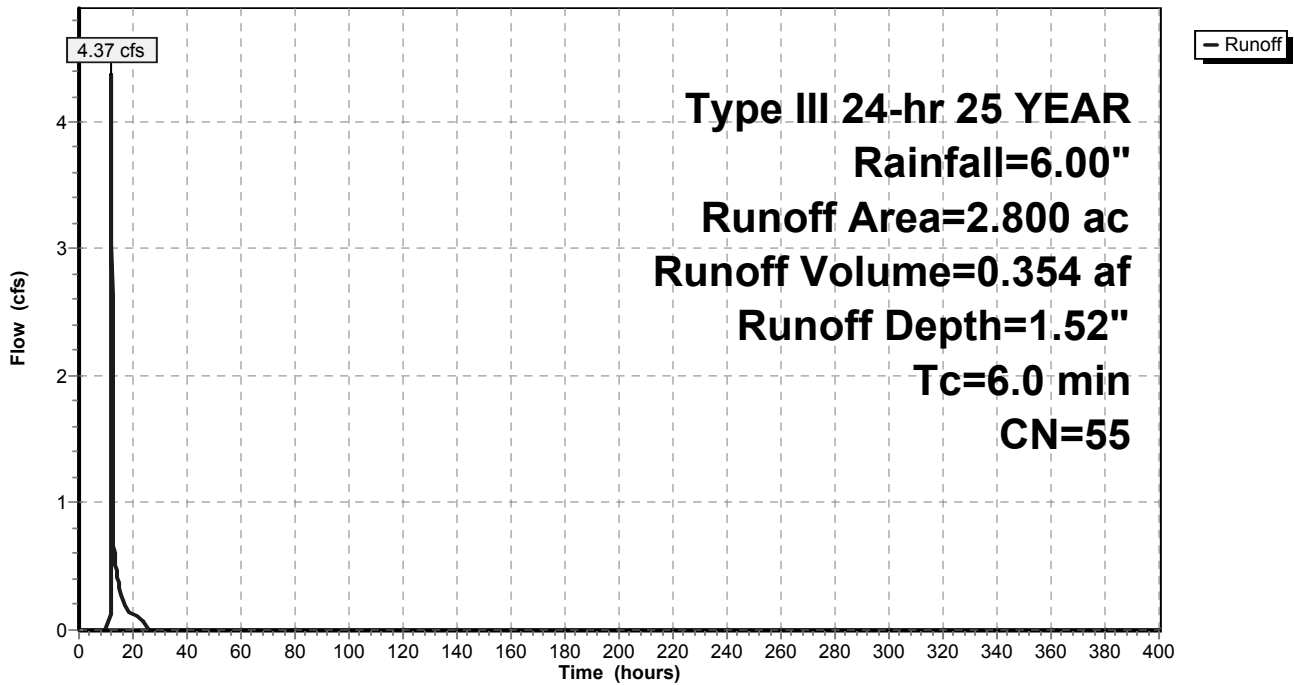
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
2.000	39	>75% Grass cover, Good, HSG A
0.400	89	Urban commercial, 85% imp, HSG A
0.400	98	Paved parking & roofs
2.800	55	Weighted Average

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

## Subcatchment 1.1S:

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment 1.2S:**

Runoff = 0.96 cfs @ 12.44 hrs, Volume= 0.174 af, Depth= 0.68"

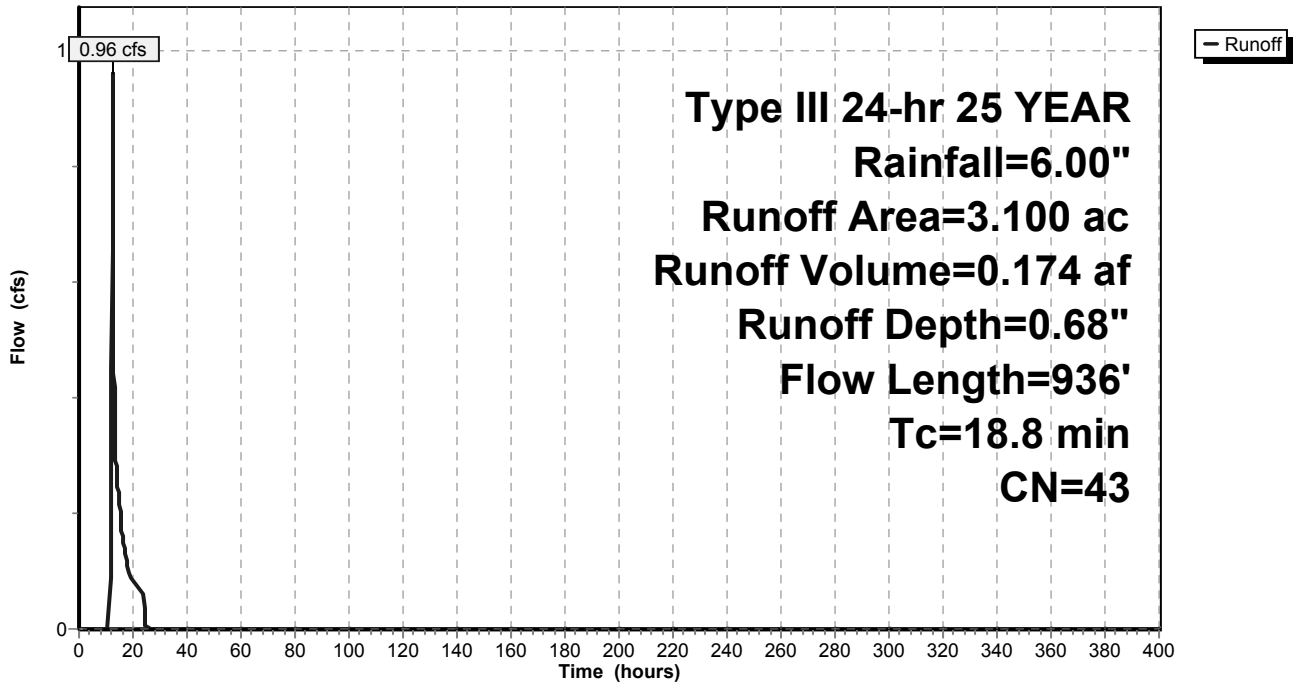
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
1.000	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.500	30	Woods, Good, HSG A
0.300	70	Woods, Good, HSG C
3.100	43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	17	0.0200	1.0		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
5.4	83	0.3900	0.3		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
13.1	836	0.0450	1.1		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
18.8	936	Total			

**Subcatchment 1.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment 2.0S:**

Runoff = 26.99 cfs @ 12.09 hrs, Volume= 2.059 af, Depth= 4.85"

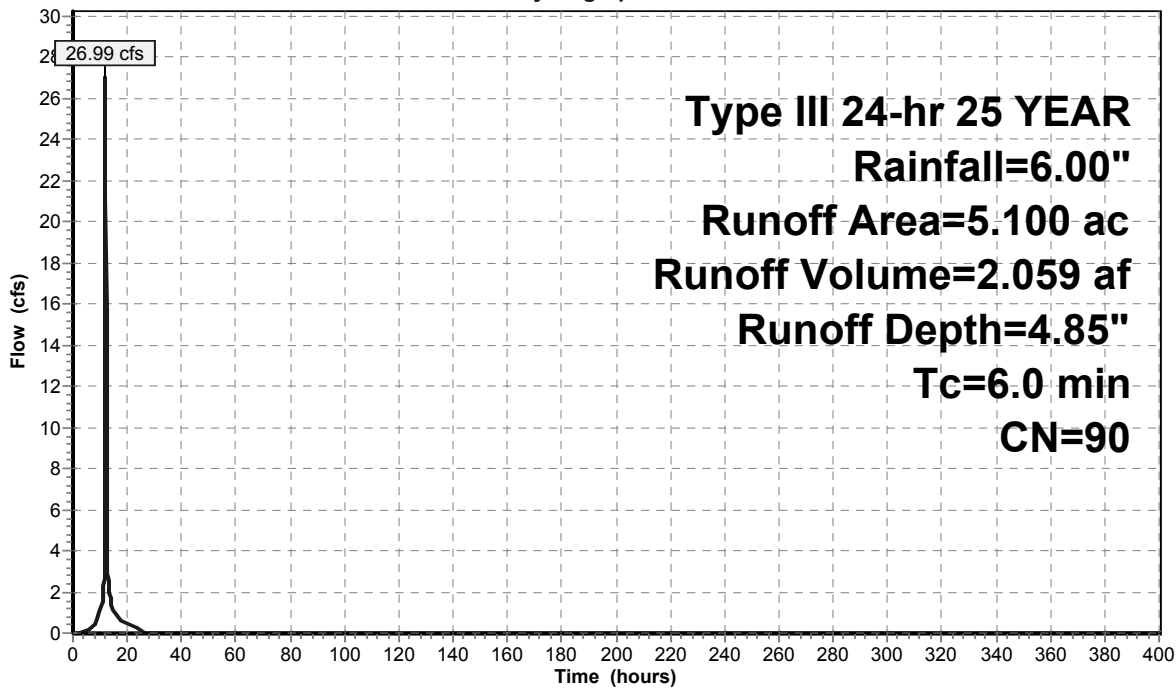
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
0.200	39	>75% Grass cover, Good, HSG A
0.100	74	>75% Grass cover, Good, HSG C
0.300	70	Woods, Good, HSG C
4.000	94	Urban commercial, 85% imp, HSG C
0.500	89	Urban commercial, 85% imp, HSG A
5.100	90	Weighted Average

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

**Subcatchment 2.0S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment 2.1S:**

Runoff = 0.44 cfs @ 12.13 hrs, Volume= 0.053 af, Depth= 0.80"

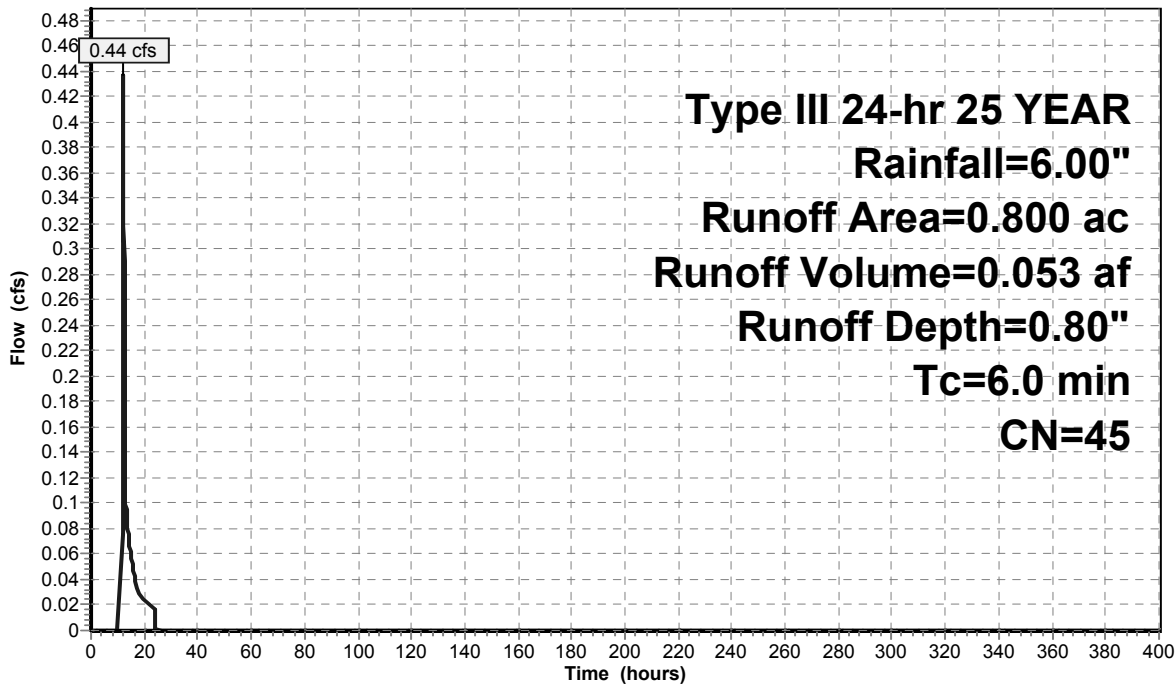
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.100	89	Urban commercial, 85% imp, HSG A
0.800	45	Weighted Average

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

**Subcatchment 2.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment 2.2S:**

Runoff = 6.42 cfs @ 12.32 hrs, Volume= 0.734 af, Depth= 4.20"

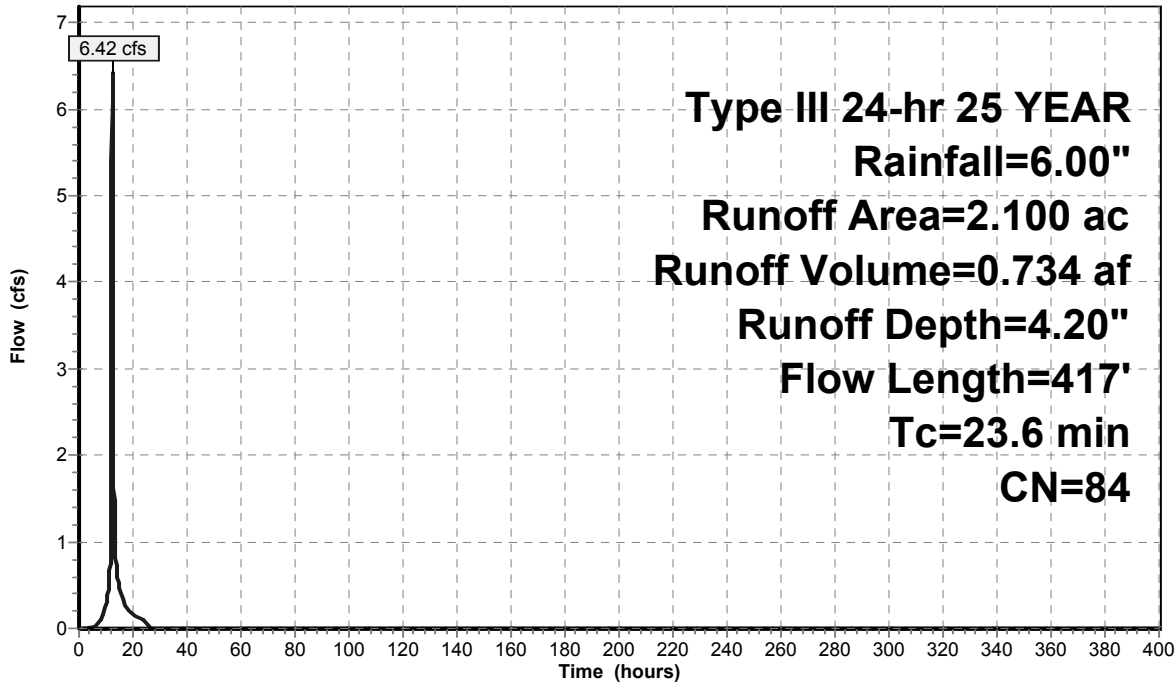
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
1.100	94	Urban commercial, 85% imp, HSG C
0.700	74	>75% Grass cover, Good, HSG C
0.300	71	Meadow, non-grazed, HSG C
2.100	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.1		<b>Sheet Flow,</b> Grass: Bermuda n= 0.410 P2= 3.50"
2.7	317	0.0800	2.0		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
23.6	417	Total			

**Subcatchment 2.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Subcatchment 2.3S:**

Runoff = 19.92 cfs @ 12.21 hrs, Volume= 1.870 af, Depth= 2.81"

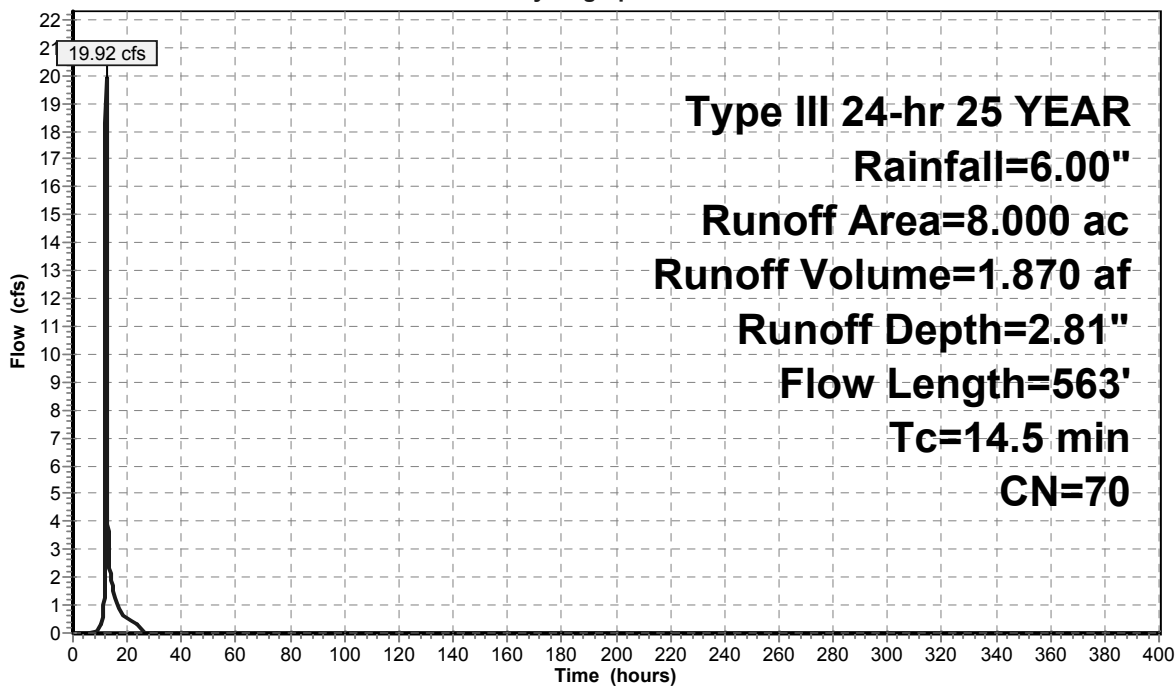
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YEAR Rainfall=6.00"

Area (ac)	CN	Description
5.500	70	Woods, Good, HSG C
0.200	39	>75% Grass cover, Good, HSG A
0.500	98	Paved parking & roofs
0.500	71	Meadow, non-grazed, HSG C
0.900	74	>75% Grass cover, Good, HSG C
0.300	30	Woods, Good, HSG A
0.050	94	Urban commercial, 85% imp, HSG C
0.050	89	Urban commercial, 85% imp, HSG A
8.000	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment 2.3S:**

Hydrograph



Runoff

**Type III 24-hr 25 YEAR  
Rainfall=6.00"  
Runoff Area=8.000 ac  
Runoff Volume=1.870 af  
Runoff Depth=2.81"  
Flow Length=563'  
Tc=14.5 min  
CN=70**



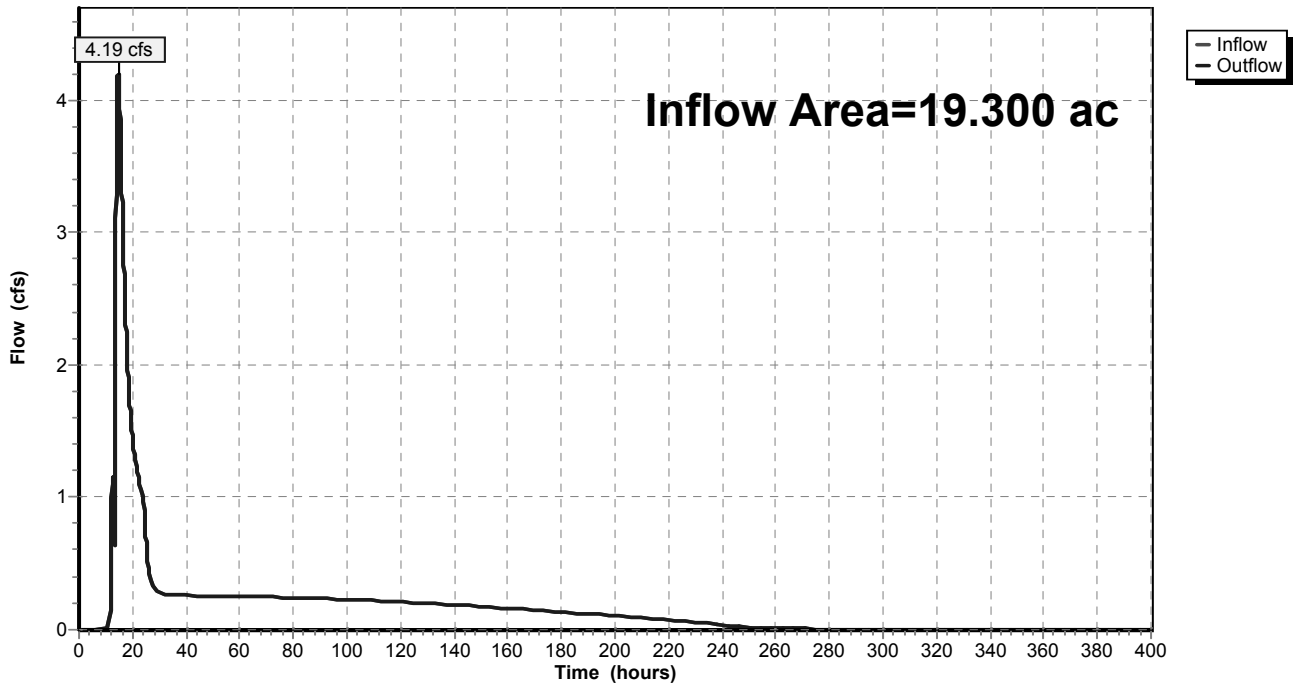
**Reach DESIGN LINE 1:**

Inflow Area = 19.300 ac, Inflow Depth = 3.32" for 25 YEAR event  
Inflow = 4.19 cfs @ 14.57 hrs, Volume= 5.333 af  
Outflow = 4.19 cfs @ 14.57 hrs, Volume= 5.333 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN LINE 1:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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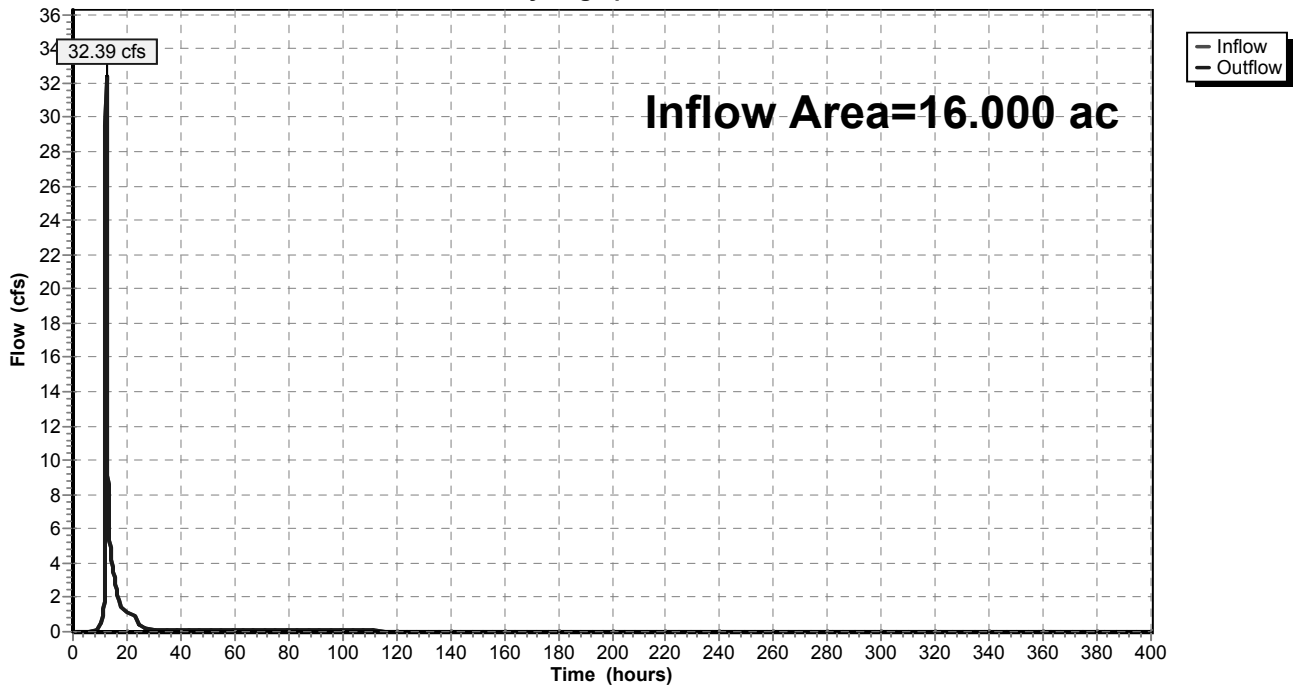
**Reach DESIGN POINT 2:**

Inflow Area = 16.000 ac, Inflow Depth = 3.54" for 25 YEAR event  
Inflow = 32.39 cfs @ 12.27 hrs, Volume= 4.717 af  
Outflow = 32.39 cfs @ 12.27 hrs, Volume= 4.717 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN POINT 2:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Pond 1.0P:**

Inflow Area = 13.400 ac, Inflow Depth = 4.30" for 25 YEAR event  
 Inflow = 64.86 cfs @ 12.09 hrs, Volume= 4.804 af  
 Outflow = 37.75 cfs @ 12.21 hrs, Volume= 4.804 af, Atten= 42%, Lag= 7.5 min  
 Primary = 0.28 cfs @ 12.21 hrs, Volume= 1.260 af  
 Secondary = 37.47 cfs @ 12.21 hrs, Volume= 3.544 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 472.00' Surf.Area= 25,000 sf Storage= 31,700 cf  
 Peak Elev= 475.01' @ 12.21 hrs Surf.Area= 29,544 sf Storage= 107,072 cf (75,372 cf above start)  
 Plug-Flow detention time= 919.4 min calculated for 4.076 af (85% of inflow)  
 Center-of-Mass det. time= 716.0 min ( 1,516.7 - 800.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	468.00'	158,150 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
468.00	600	0	0
470.00	3,050	3,650	3,650
472.00	25,000	28,050	31,700
474.00	23,600	48,600	80,300
476.00	35,400	59,000	139,300
476.50	40,000	18,850	158,150

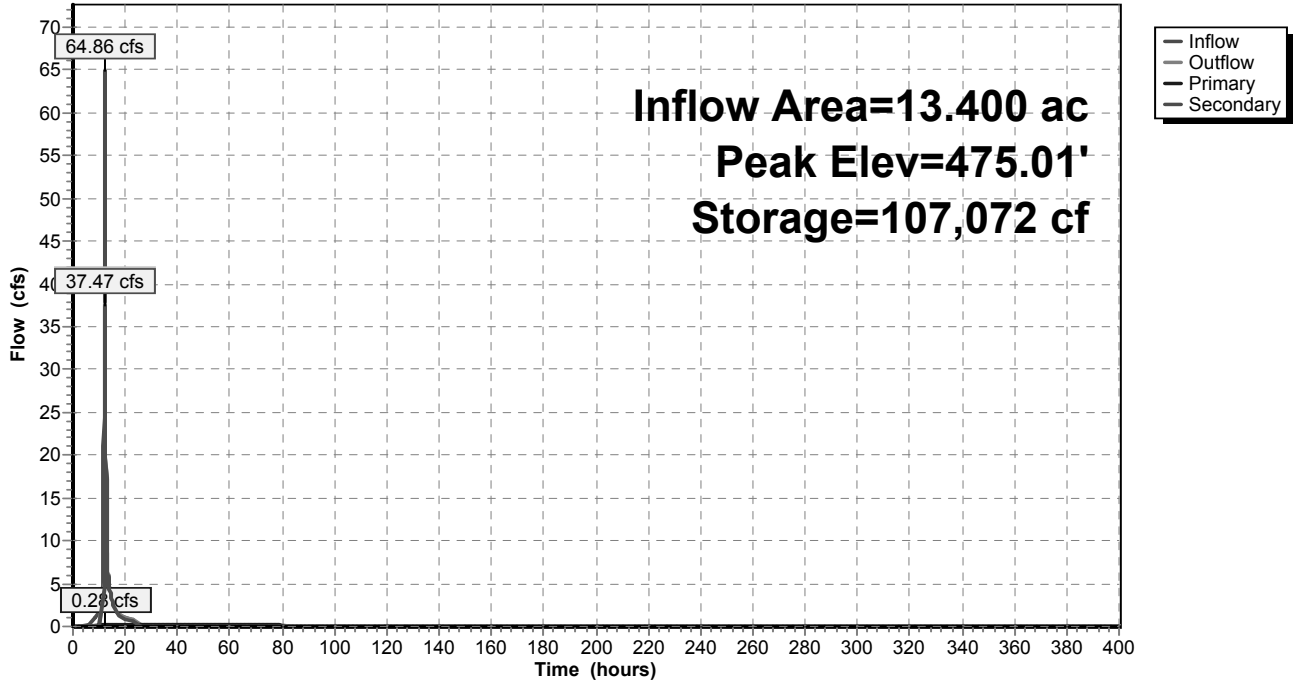
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	473.75'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.28 cfs @ 12.21 hrs HW=475.00' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.28 cfs @ 8.2 fps)

**Secondary OutFlow** Max=37.16 cfs @ 12.21 hrs HW=475.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 37.16 cfs @ 3.7 fps)

**Pond 1.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Pond 1.1P:**

Inflow Area = 16.200 ac, Inflow Depth = 3.82" for 25 YEAR event  
 Inflow = 40.68 cfs @ 12.20 hrs, Volume= 5.158 af  
 Outflow = 3.96 cfs @ 14.60 hrs, Volume= 5.158 af, Atten= 90%, Lag= 143.4 min  
 Primary = 0.27 cfs @ 14.60 hrs, Volume= 3.526 af  
 Secondary = 3.69 cfs @ 14.60 hrs, Volume= 1.632 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 458.36' @ 14.60 hrs Surf.Area= 21,782 sf Storage= 110,074 cf  
 Plug-Flow detention time= 3,155.6 min calculated for 5.158 af (100% of inflow)  
 Center-of-Mass det. time= 3,154.7 min ( 4,627.4 - 1,472.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	451.50'	148,375 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
451.50	10,800	0	0
452.00	11,500	5,575	5,575
454.00	14,500	26,000	31,575
456.00	17,600	32,100	63,675
458.00	21,100	38,700	102,375
460.00	24,900	46,000	148,375

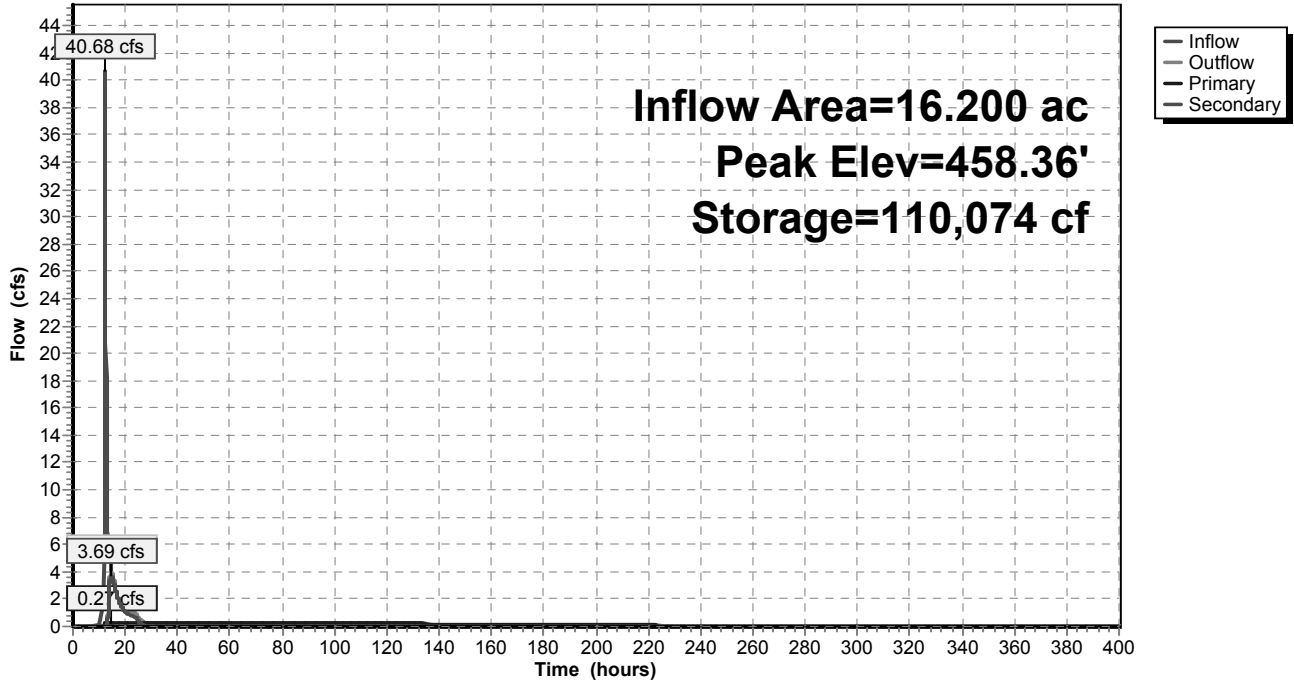
Device	Routing	Invert	Outlet Devices
#1	Primary	451.50'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	457.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.27 cfs @ 14.60 hrs HW=458.36' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.27 cfs @ 12.5 fps)

**Secondary OutFlow** Max=3.67 cfs @ 14.60 hrs HW=458.36' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 3.67 cfs @ 2.4 fps)

**Pond 1.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Pond 2.0P:**

Inflow Area = 5.100 ac, Inflow Depth = 4.85" for 25 YEAR event  
 Inflow = 26.99 cfs @ 12.09 hrs, Volume= 2.059 af  
 Outflow = 18.92 cfs @ 12.17 hrs, Volume= 2.059 af, Atten= 30%, Lag= 5.1 min  
 Primary = 0.03 cfs @ 12.17 hrs, Volume= 0.265 af  
 Secondary = 18.89 cfs @ 12.17 hrs, Volume= 1.794 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 3,800 sf Storage= 5,900 cf  
 Peak Elev= 481.73' @ 12.17 hrs Surf.Area= 8,609 sf Storage= 28,526 cf (22,626 cf above start)  
 Plug-Flow detention time= 719.0 min calculated for 1.924 af (93% of inflow)  
 Center-of-Mass det. time= 633.6 min ( 1,418.3 - 784.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	40,050 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	100	0	0
476.00	1,000	1,100	1,100
478.00	3,800	4,800	5,900
480.00	6,100	9,900	15,800
482.00	9,000	15,100	30,900
483.00	9,300	9,150	40,050

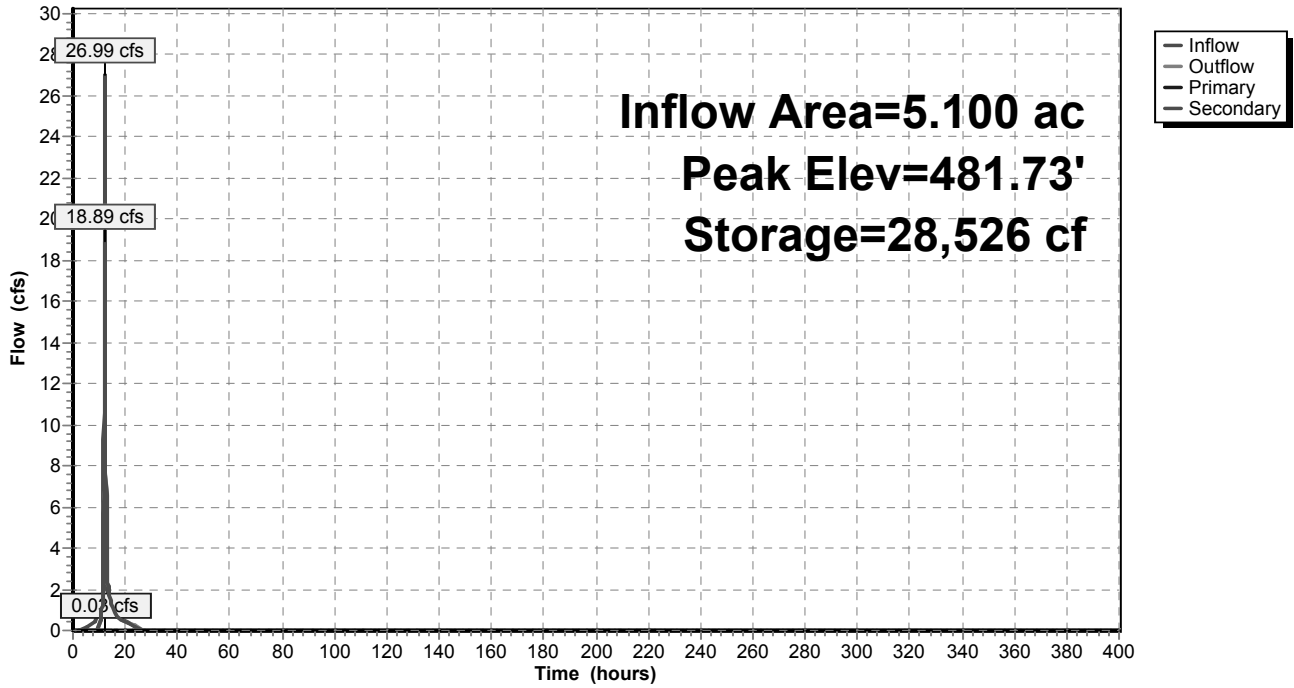
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>0.8" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	480.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.03 cfs @ 12.17 hrs HW=481.71' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.03 cfs @ 9.2 fps)

**Secondary OutFlow** Max=18.61 cfs @ 12.17 hrs HW=481.71' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 18.61 cfs @ 4.3 fps)

**Pond 2.0P:**

Hydrograph





**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Pond 2.1P:**

Inflow Area = 5.900 ac, Inflow Depth = 4.30" for 25 YEAR event  
 Inflow = 19.34 cfs @ 12.17 hrs, Volume= 2.113 af  
 Outflow = 14.92 cfs @ 12.35 hrs, Volume= 2.113 af, Atten= 23%, Lag= 10.4 min  
 Primary = 14.92 cfs @ 12.35 hrs, Volume= 2.113 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 476.68' @ 12.35 hrs Surf.Area= 8,822 sf Storage= 23,015 cf  
 Plug-Flow detention time= 833.9 min calculated for 2.113 af (100% of inflow)  
 Center-of-Mass det. time= 833.9 min ( 2,239.5 - 1,405.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	472.00'	36,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.00	1,300	0	0
474.00	4,200	5,500	5,500
476.00	7,700	11,900	17,400
478.00	11,000	18,700	36,100

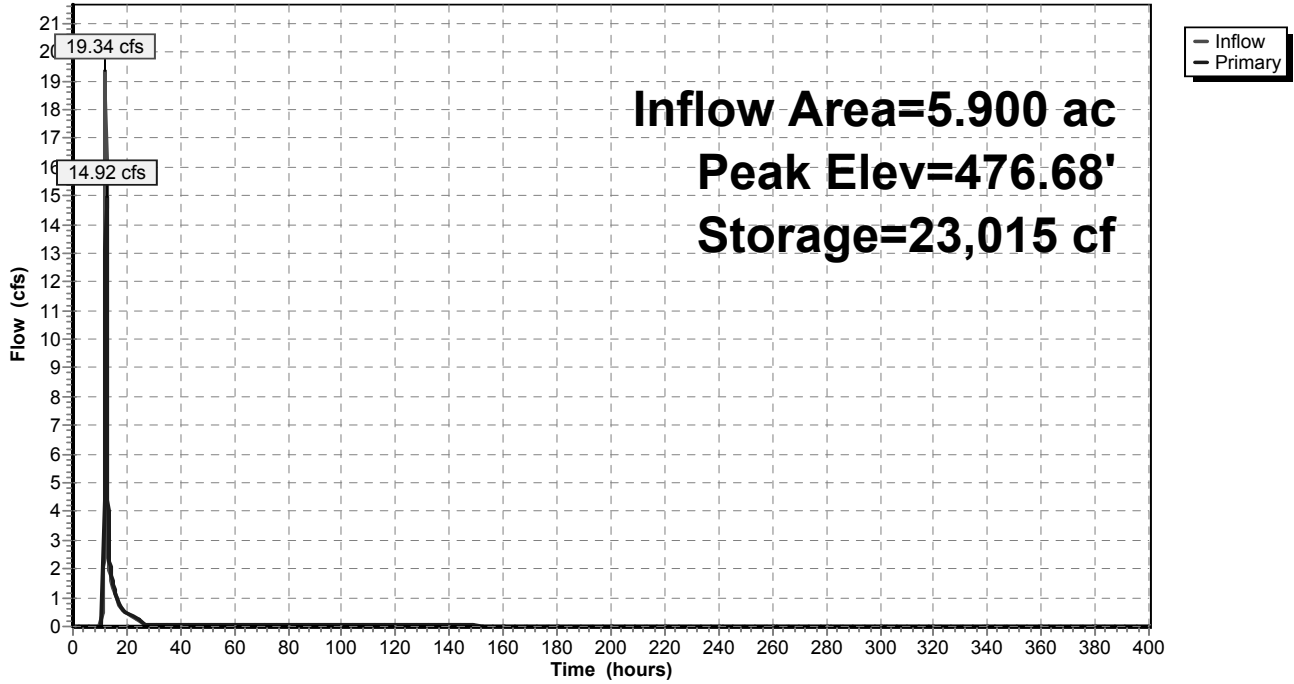
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>1.1" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	475.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir X 2.00</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=14.89 cfs @ 12.35 hrs HW=476.68' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.07 cfs @ 10.4 fps)
- 2=Broad-Crested Rectangular Weir (Weir Controls 14.82 cfs @ 3.2 fps)

**Pond 2.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 25 YEAR Rainfall=6.00"

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**Pond 2.2P:**

Inflow Area = 2.100 ac, Inflow Depth = 4.20" for 25 YEAR event  
 Inflow = 6.42 cfs @ 12.32 hrs, Volume= 0.734 af  
 Outflow = 1.13 cfs @ 13.17 hrs, Volume= 0.734 af, Atten= 82%, Lag= 51.2 min  
 Primary = 1.13 cfs @ 13.17 hrs, Volume= 0.734 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 2,700 sf Storage= 3,700 cf  
 Peak Elev= 481.78' @ 13.17 hrs Surf.Area= 7,231 sf Storage= 22,449 cf (18,749 cf above start)  
 Plug-Flow detention time= 1,793.9 min calculated for 0.649 af (88% of inflow)  
 Center-of-Mass det. time= 1,532.5 min ( 2,352.3 - 819.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	32,275 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	0	0	0
476.00	500	500	500
478.00	2,700	3,200	3,700
480.00	5,100	7,800	11,500
482.00	7,500	12,600	24,100
483.00	8,850	8,175	32,275

Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>1.3" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	481.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

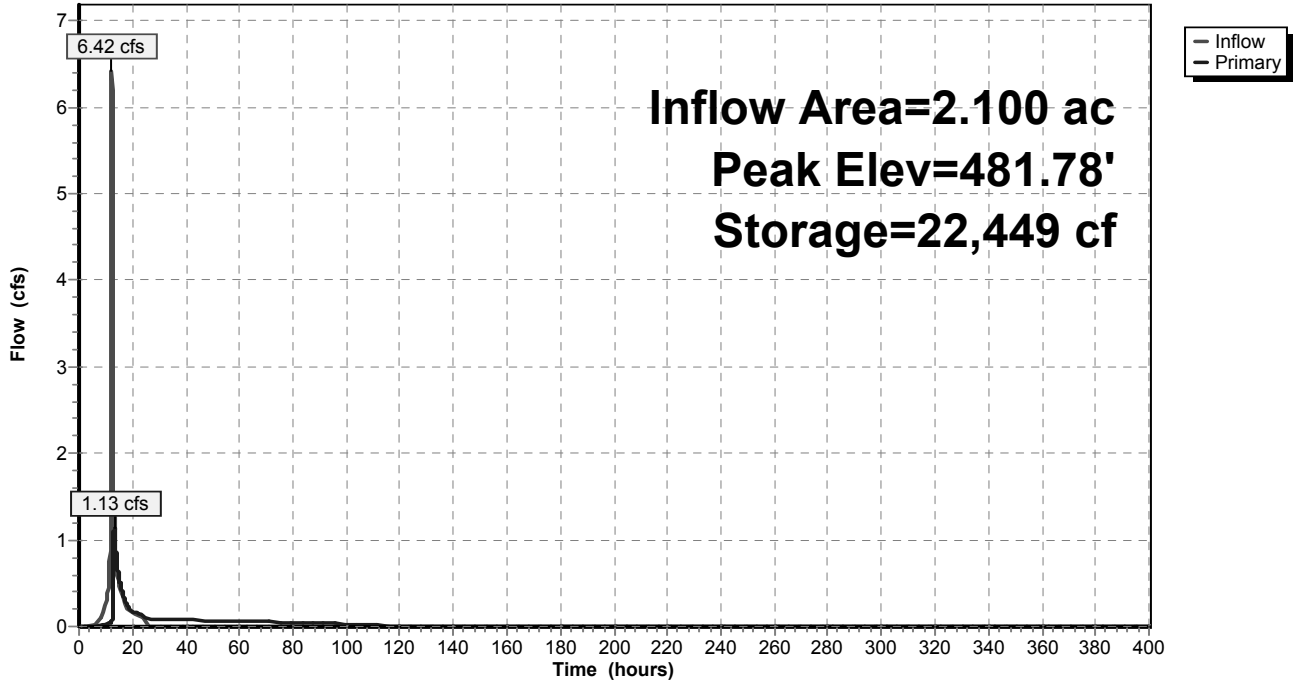
**Primary OutFlow** Max=1.11 cfs @ 13.17 hrs HW=481.78' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.09 cfs @ 9.3 fps)

2=Broad-Crested Rectangular Weir (Weir Controls 1.03 cfs @ 1.5 fps)

**Pond 2.2P:**

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 100 YEAR Rainfall=7.50"

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## Subcatchment 1.0S:

Runoff = 85.23 cfs @ 12.09 hrs, Volume= 6.401 af, Depth= 5.73"

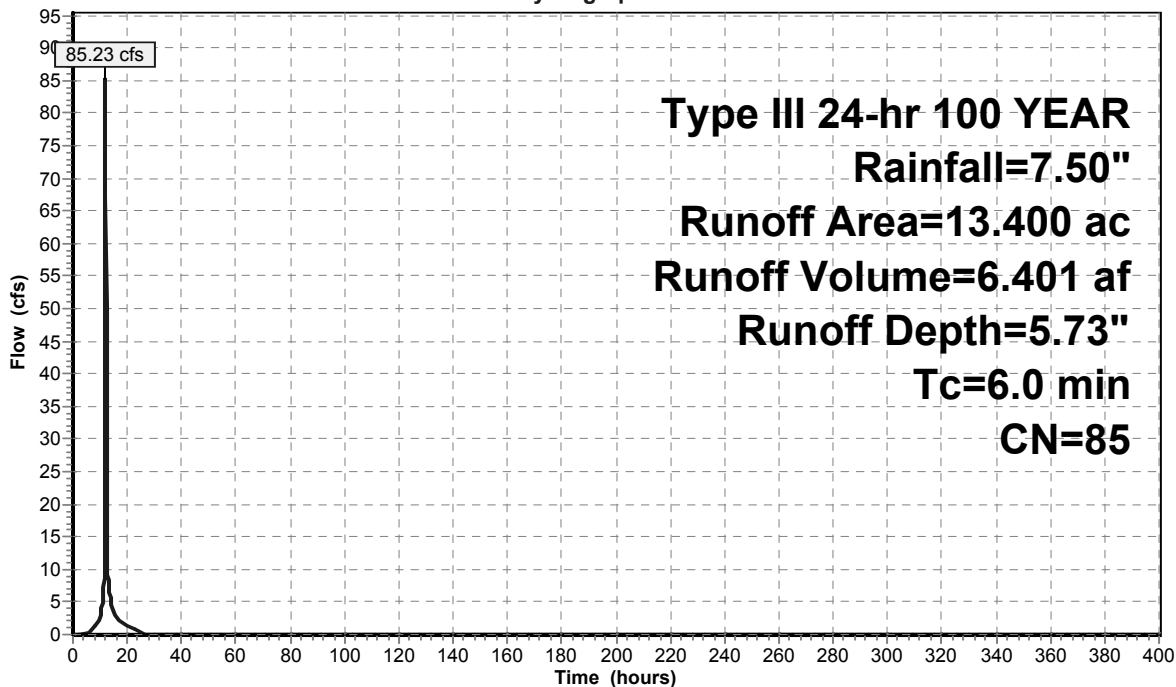
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
7.900	89	Urban commercial, 85% imp, HSG A
3.400	94	Urban commercial, 85% imp, HSG C
0.900	70	Woods, Good, HSG C
13.400	85	Weighted Average

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

## Subcatchment 1.0S:

Hydrograph



# Stateline Retail Center Post Development

Type III 24-hr 100 YEAR Rainfall=7.50"

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## Subcatchment 1.1S:

Runoff = 7.50 cfs @ 12.10 hrs, Volume= 0.571 af, Depth= 2.45"

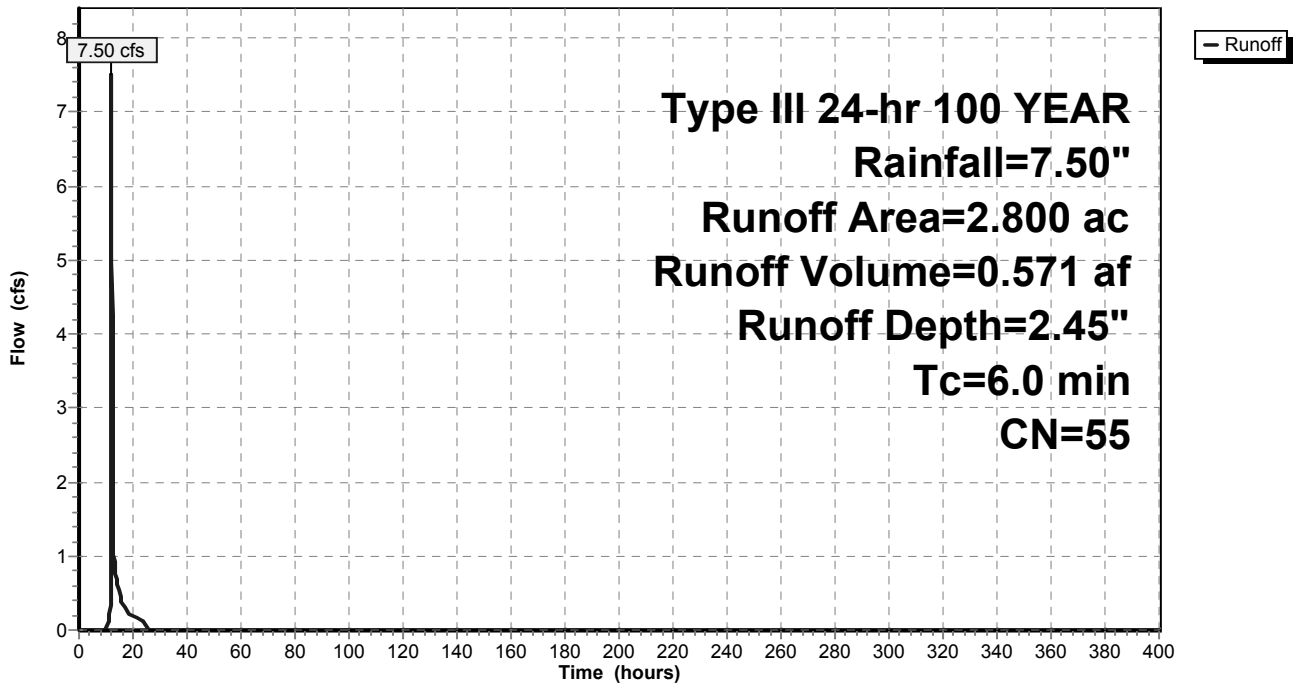
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
2.000	39	>75% Grass cover, Good, HSG A
0.400	89	Urban commercial, 85% imp, HSG A
0.400	98	Paved parking & roofs
2.800	55	Weighted Average

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

## Subcatchment 1.1S:

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment 1.2S:**

Runoff = 2.42 cfs @ 12.34 hrs, Volume= 0.335 af, Depth= 1.30"

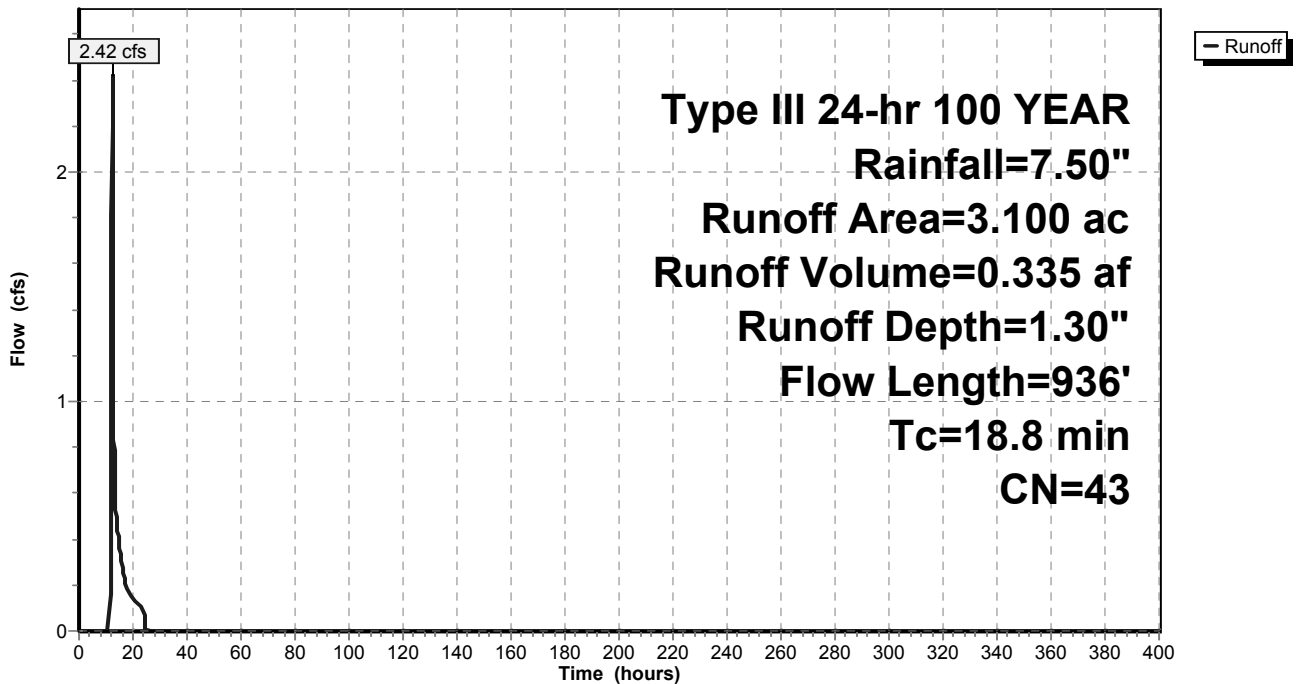
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
1.000	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.500	30	Woods, Good, HSG A
0.300	70	Woods, Good, HSG C
3.100	43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	17	0.0200	1.0		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
5.4	83	0.3900	0.3		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
13.1	836	0.0450	1.1		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
18.8	936	Total			

**Subcatchment 1.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment 2.0S:**

Runoff = 34.63 cfs @ 12.09 hrs, Volume= 2.683 af, Depth= 6.31"

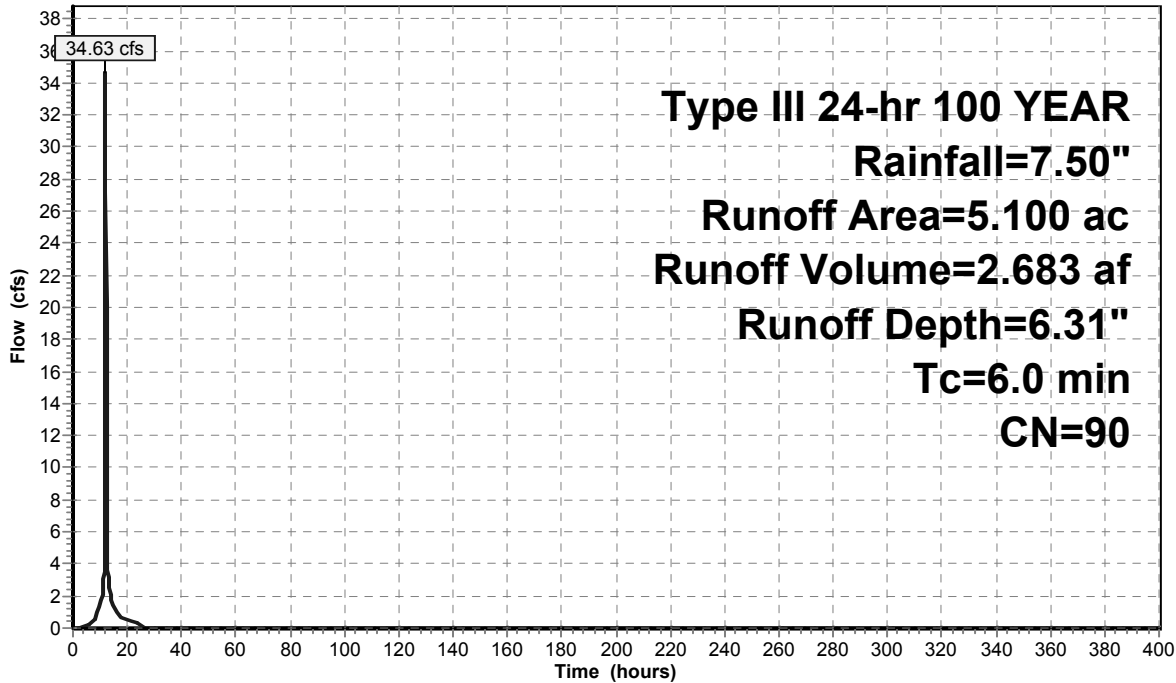
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
0.200	39	>75% Grass cover, Good, HSG A
0.100	74	>75% Grass cover, Good, HSG C
0.300	70	Woods, Good, HSG C
4.000	94	Urban commercial, 85% imp, HSG C
0.500	89	Urban commercial, 85% imp, HSG A
5.100	90	Weighted Average

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

**Subcatchment 2.0S:**

Hydrograph





**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment 2.1S:**

Runoff = 1.10 cfs @ 12.11 hrs, Volume= 0.099 af, Depth= 1.48"

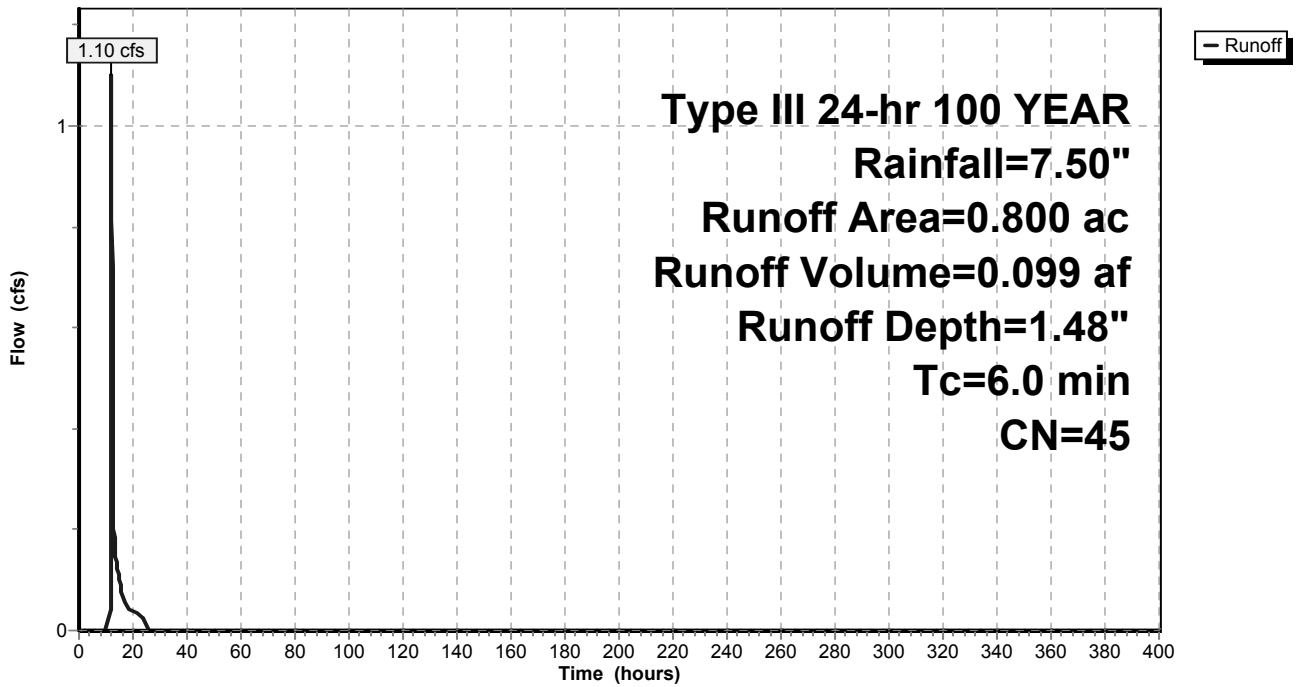
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.100	89	Urban commercial, 85% imp, HSG A
0.800	45	Weighted Average

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

**Subcatchment 2.1S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment 2.2S:**

Runoff = 8.50 cfs @ 12.32 hrs, Volume= 0.983 af, Depth= 5.62"

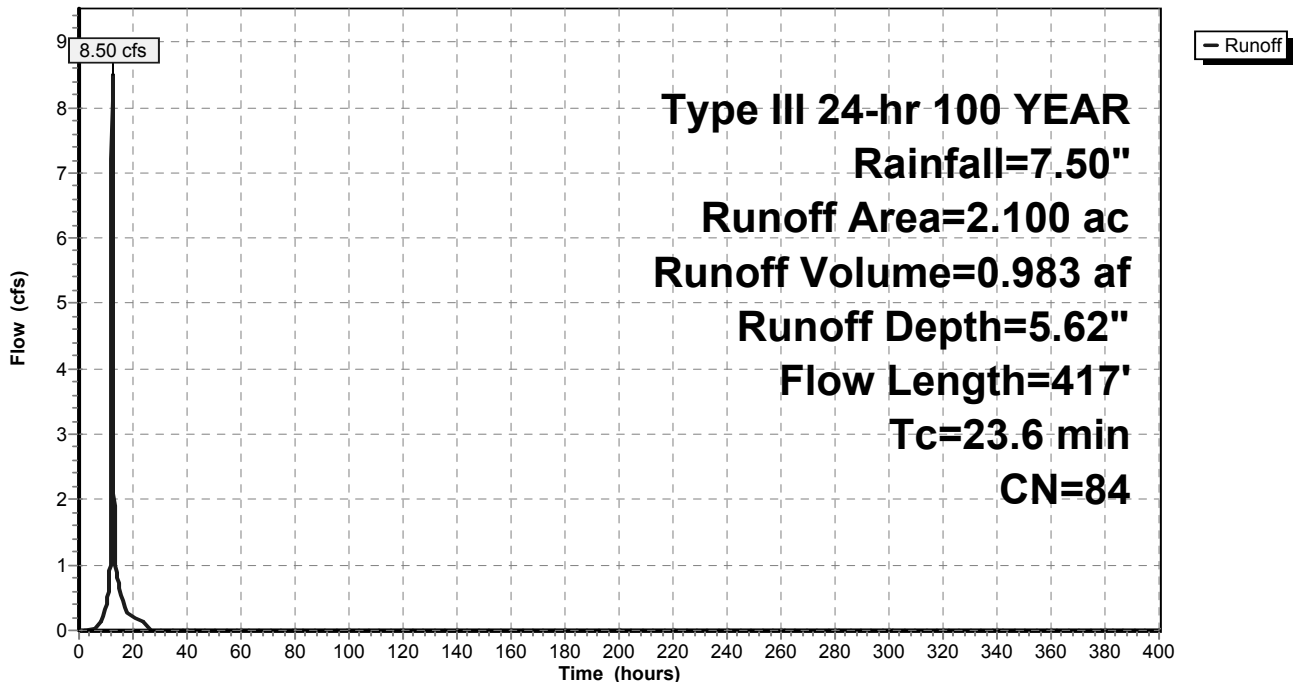
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
1.100	94	Urban commercial, 85% imp, HSG C
0.700	74	>75% Grass cover, Good, HSG C
0.300	71	Meadow, non-grazed, HSG C
2.100	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.1		<b>Sheet Flow,</b> Grass: Bermuda n= 0.410 P2= 3.50"
2.7	317	0.0800	2.0		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
23.6	417	Total			

**Subcatchment 2.2S:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Subcatchment 2.3S:**

Runoff = 28.87 cfs @ 12.20 hrs, Volume= 2.692 af, Depth= 4.04"

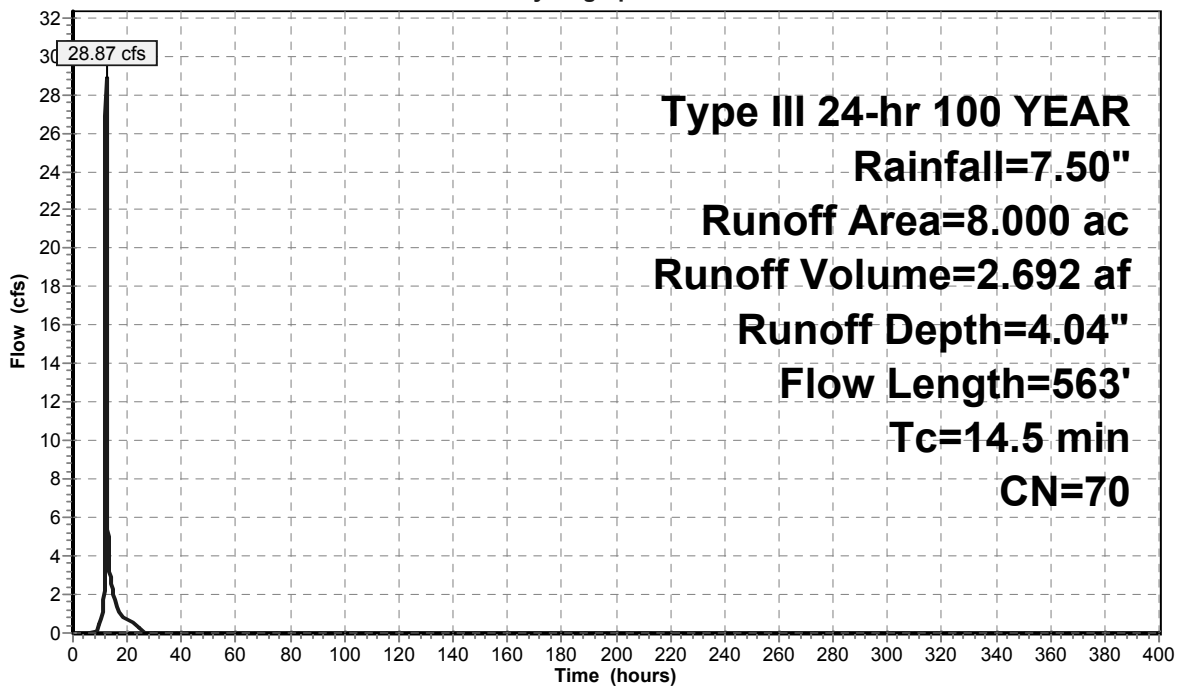
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YEAR Rainfall=7.50"

Area (ac)	CN	Description
5.500	70	Woods, Good, HSG C
0.200	39	>75% Grass cover, Good, HSG A
0.500	98	Paved parking & roofs
0.500	71	Meadow, non-grazed, HSG C
0.900	74	>75% Grass cover, Good, HSG C
0.300	30	Woods, Good, HSG A
0.050	94	Urban commercial, 85% imp, HSG C
0.050	89	Urban commercial, 85% imp, HSG A
8.000	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.2		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
4.5	463	0.1200	1.7		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.5	563	Total			

**Subcatchment 2.3S:**

Hydrograph



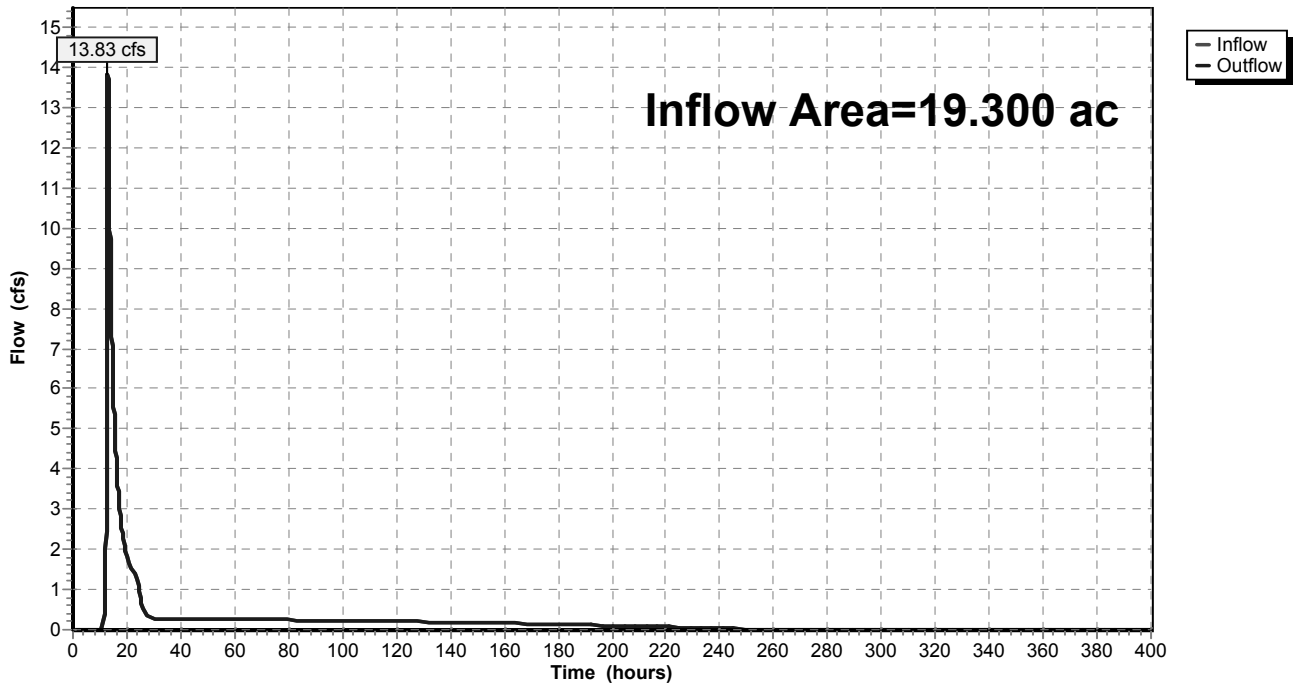
**Reach DESIGN LINE 1:**

Inflow Area = 19.300 ac, Inflow Depth = 4.54" for 100 YEAR event  
Inflow = 13.83 cfs @ 12.94 hrs, Volume= 7.307 af  
Outflow = 13.83 cfs @ 12.94 hrs, Volume= 7.307 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN LINE 1:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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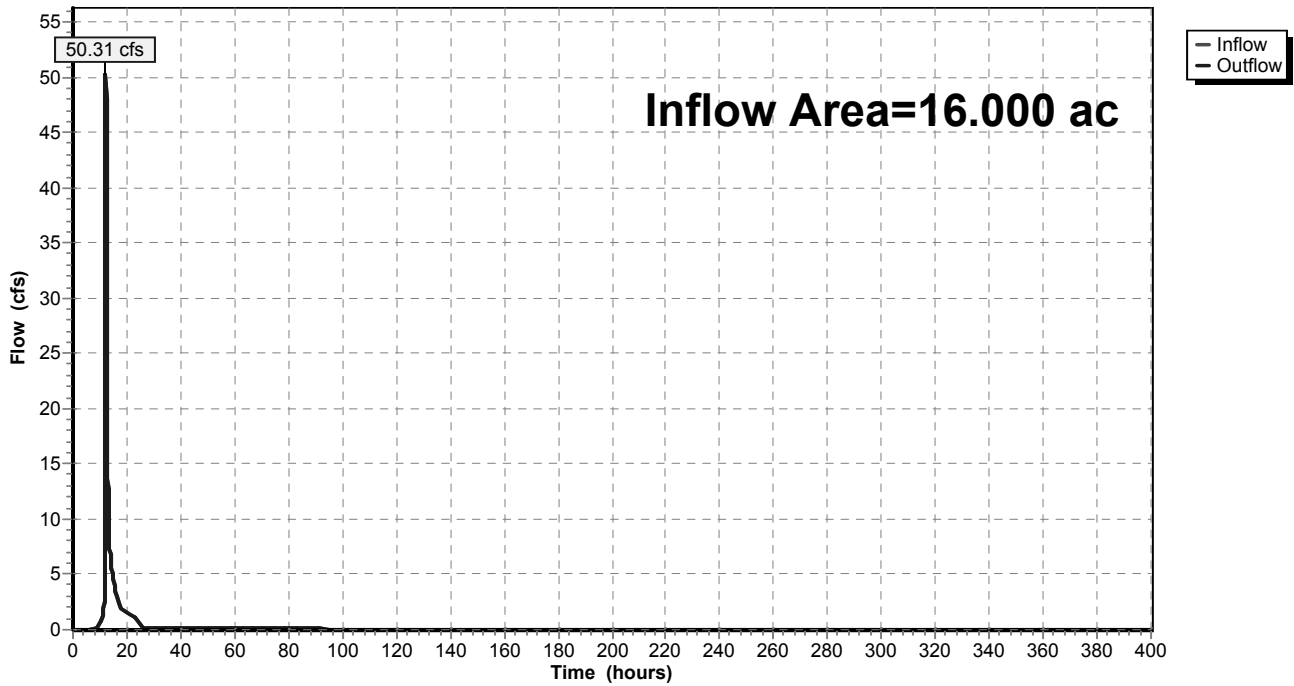
**Reach DESIGN POINT 2:**

Inflow Area = 16.000 ac, Inflow Depth = 4.84" for 100 YEAR event  
Inflow = 50.31 cfs @ 12.22 hrs, Volume= 6.457 af  
Outflow = 50.31 cfs @ 12.22 hrs, Volume= 6.457 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs

**Reach DESIGN POINT 2:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Pond 1.0P:**

Inflow Area = 13.400 ac, Inflow Depth = 5.73" for 100 YEAR event  
 Inflow = 85.23 cfs @ 12.09 hrs, Volume= 6.401 af  
 Outflow = 55.28 cfs @ 12.19 hrs, Volume= 6.400 af, Atten= 35%, Lag= 6.1 min  
 Primary = 0.30 cfs @ 12.19 hrs, Volume= 1.281 af  
 Secondary = 54.98 cfs @ 12.19 hrs, Volume= 5.119 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 472.00' Surf.Area= 25,000 sf Storage= 31,700 cf  
 Peak Elev= 475.37' @ 12.19 hrs Surf.Area= 31,707 sf Storage= 118,298 cf (86,598 cf above start)  
 Plug-Flow detention time= 681.9 min calculated for 5.672 af (89% of inflow)  
 Center-of-Mass det. time= 550.0 min ( 1,342.7 - 792.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	468.00'	158,150 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
468.00	600	0	0
470.00	3,050	3,650	3,650
472.00	25,000	28,050	31,700
474.00	23,600	48,600	80,300
476.00	35,400	59,000	139,300
476.50	40,000	18,850	158,150

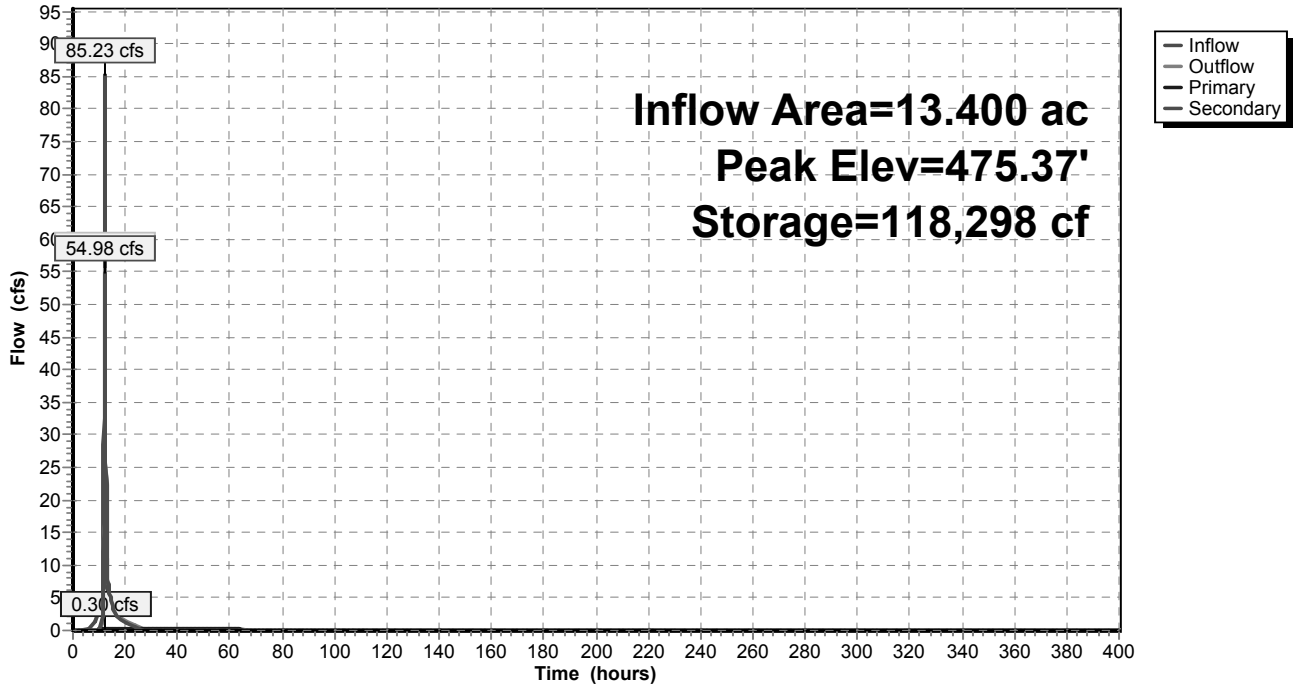
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	473.75'	<b>8.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.30 cfs @ 12.19 hrs HW=475.37' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.30 cfs @ 8.7 fps)

**Secondary OutFlow** Max=54.70 cfs @ 12.19 hrs HW=475.37' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 54.70 cfs @ 4.2 fps)

**Pond 1.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Pond 1.1P:**

Inflow Area = 16.200 ac, Inflow Depth = 5.16" for 100 YEAR event  
 Inflow = 61.12 cfs @ 12.17 hrs, Volume= 6.972 af  
 Outflow = 12.99 cfs @ 12.96 hrs, Volume= 6.971 af, Atten= 79%, Lag= 47.3 min  
 Primary = 0.29 cfs @ 12.96 hrs, Volume= 3.542 af  
 Secondary = 12.70 cfs @ 12.96 hrs, Volume= 3.430 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 459.08' @ 12.96 hrs Surf.Area= 23,148 sf Storage= 126,224 cf  
 Plug-Flow detention time= 2,355.2 min calculated for 6.971 af (100% of inflow)  
 Center-of-Mass det. time= 2,354.6 min ( 3,657.9 - 1,303.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	451.50'	148,375 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
451.50	10,800	0	0
452.00	11,500	5,575	5,575
454.00	14,500	26,000	31,575
456.00	17,600	32,100	63,675
458.00	21,100	38,700	102,375
460.00	24,900	46,000	148,375

Device	Routing	Invert	Outlet Devices
#1	Primary	451.50'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	457.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

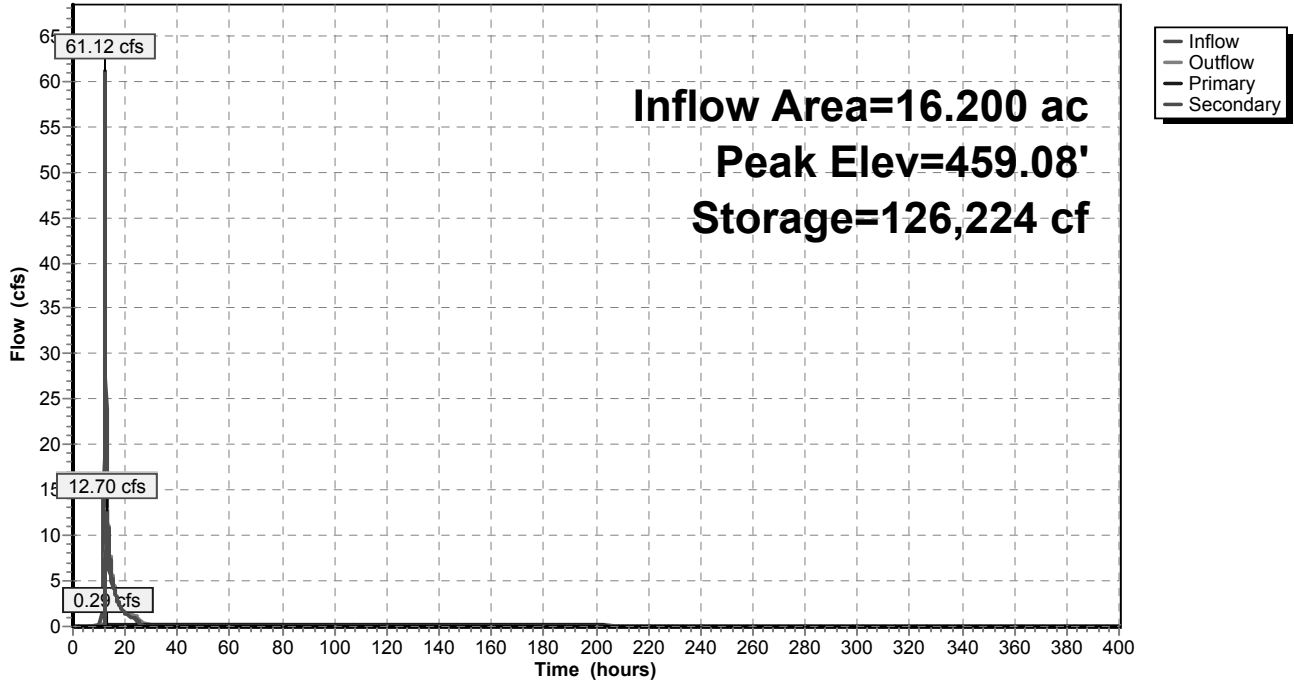
**Primary OutFlow** Max=0.29 cfs @ 12.96 hrs HW=459.08' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.29 cfs @ 13.2 fps)

**Secondary OutFlow** Max=12.69 cfs @ 12.96 hrs HW=459.08' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 12.69 cfs @ 3.8 fps)



**Pond 1.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Pond 2.0P:**

Inflow Area = 5.100 ac, Inflow Depth = 6.31" for 100 YEAR event  
 Inflow = 34.63 cfs @ 12.09 hrs, Volume= 2.683 af  
 Outflow = 24.65 cfs @ 12.17 hrs, Volume= 2.683 af, Atten= 29%, Lag= 5.0 min  
 Primary = 0.03 cfs @ 12.17 hrs, Volume= 0.268 af  
 Secondary = 24.62 cfs @ 12.17 hrs, Volume= 2.416 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 3,800 sf Storage= 5,900 cf  
 Peak Elev= 482.06' @ 12.17 hrs Surf.Area= 9,019 sf Storage= 31,481 cf (25,581 cf above start)  
 Plug-Flow detention time= 557.8 min calculated for 2.548 af (95% of inflow)  
 Center-of-Mass det. time= 494.9 min ( 1,272.7 - 777.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	40,050 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	100	0	0
476.00	1,000	1,100	1,100
478.00	3,800	4,800	5,900
480.00	6,100	9,900	15,800
482.00	9,000	15,100	30,900
483.00	9,300	9,150	40,050

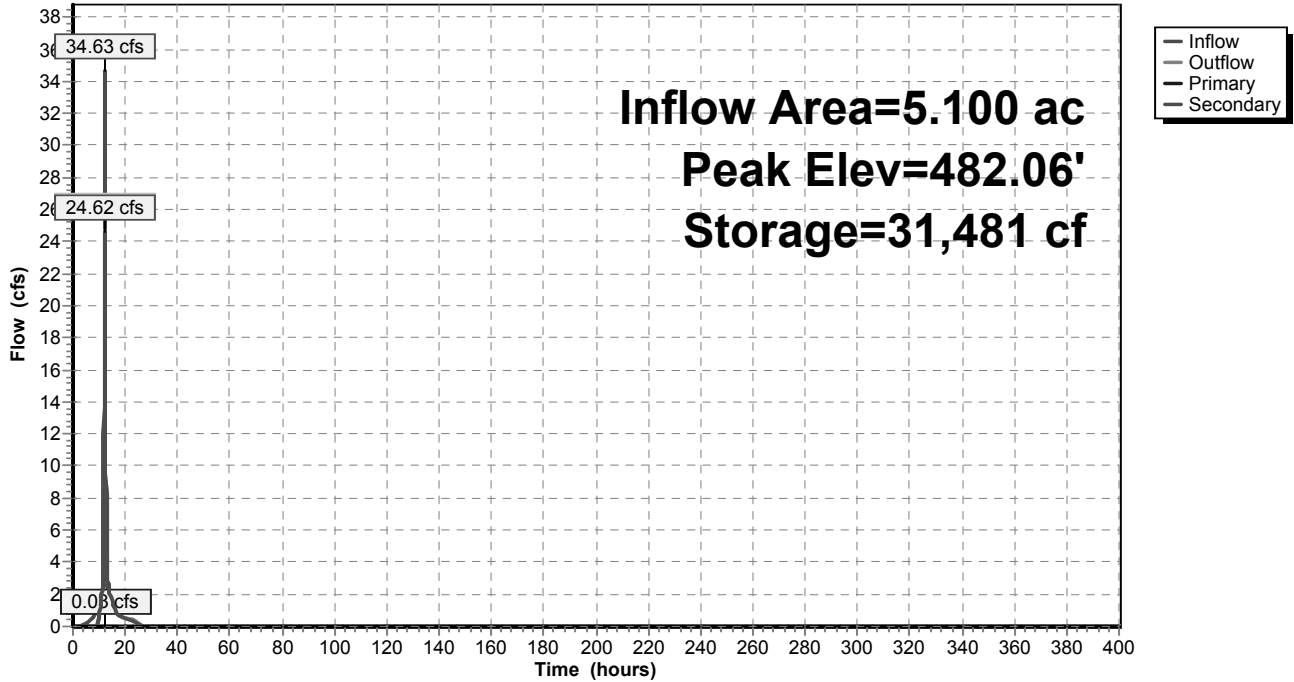
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>0.8" Vert. Orifice/Grate</b> C= 0.600
#2	Secondary	480.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.03 cfs @ 12.17 hrs HW=482.04' (Free Discharge)  
 ↑1=Orifice/Grate (Orifice Controls 0.03 cfs @ 9.6 fps)

**Secondary OutFlow** Max=24.25 cfs @ 12.17 hrs HW=482.04' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 24.25 cfs @ 4.7 fps)

**Pond 2.0P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Pond 2.1P:**

Inflow Area = 5.900 ac, Inflow Depth = 5.66" for 100 YEAR event  
 Inflow = 25.58 cfs @ 12.17 hrs, Volume= 2.782 af  
 Outflow = 22.29 cfs @ 12.27 hrs, Volume= 2.782 af, Atten= 13%, Lag= 6.3 min  
 Primary = 22.29 cfs @ 12.27 hrs, Volume= 2.782 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Peak Elev= 476.96' @ 12.27 hrs Surf.Area= 9,291 sf Storage= 25,593 cf  
 Plug-Flow detention time= 640.5 min calculated for 2.782 af (100% of inflow)  
 Center-of-Mass det. time= 640.5 min ( 1,899.7 - 1,259.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	472.00'	36,100 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.00	1,300	0	0
474.00	4,200	5,500	5,500
476.00	7,700	11,900	17,400
478.00	11,000	18,700	36,100

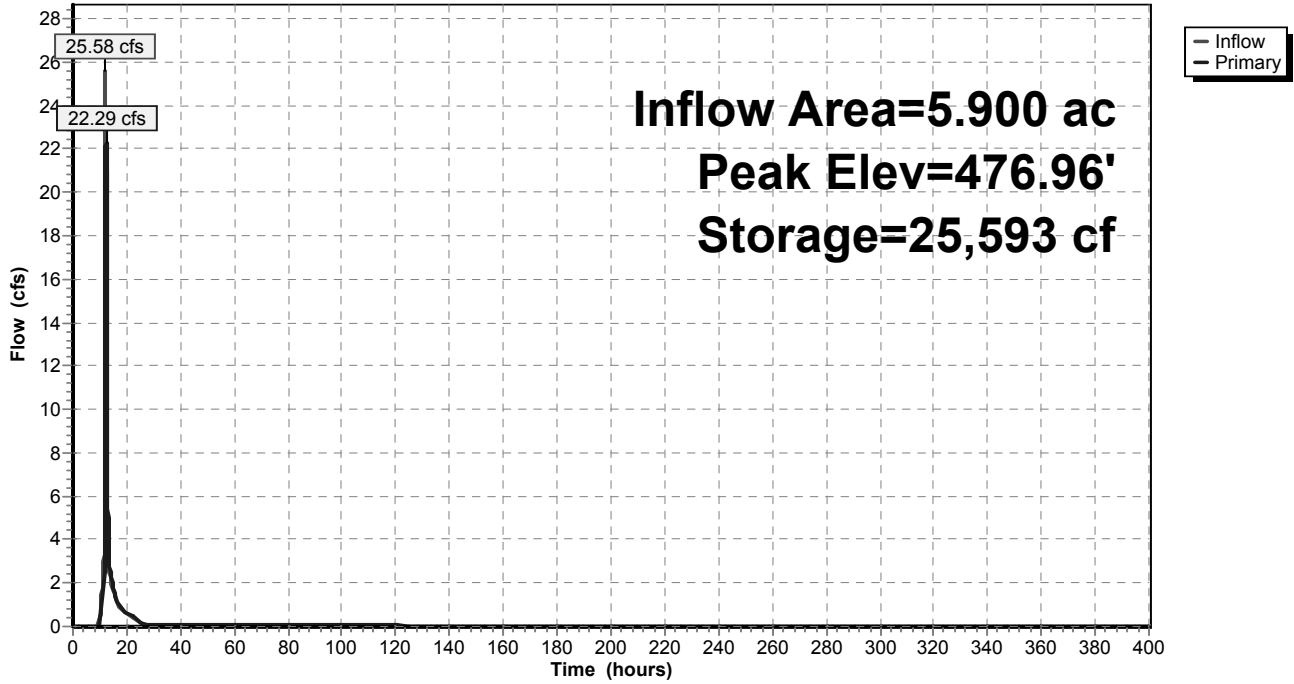
Device	Routing	Invert	Outlet Devices
#1	Primary	472.00'	<b>1.1" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	475.75'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir X 2.00</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=22.11 cfs @ 12.27 hrs HW=476.96' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.07 cfs @ 10.7 fps)
- 2=Broad-Crested Rectangular Weir (Weir Controls 22.04 cfs @ 3.6 fps)

**Pond 2.1P:**

Hydrograph



**Stateline Retail Center Post Development**

Type III 24-hr 100 YEAR Rainfall=7.50"

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**Pond 2.2P:**

Inflow Area = 2.100 ac, Inflow Depth = 5.62" for 100 YEAR event  
 Inflow = 8.50 cfs @ 12.32 hrs, Volume= 0.983 af  
 Outflow = 3.69 cfs @ 12.73 hrs, Volume= 0.983 af, Atten= 57%, Lag= 24.8 min  
 Primary = 3.69 cfs @ 12.73 hrs, Volume= 0.983 af

Routing by Stor-Ind method, Time Span= 0.00-400.00 hrs, dt= 0.05 hrs  
 Starting Elev= 478.00' Surf.Area= 2,700 sf Storage= 3,700 cf  
 Peak Elev= 482.10' @ 12.73 hrs Surf.Area= 7,638 sf Storage= 24,875 cf (21,175 cf above start)  
 Plug-Flow detention time= 1,326.7 min calculated for 0.898 af (91% of inflow)  
 Center-of-Mass det. time= 1,166.3 min ( 1,978.0 - 811.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	32,275 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
474.00	0	0	0
476.00	500	500	500
478.00	2,700	3,200	3,700
480.00	5,100	7,800	11,500
482.00	7,500	12,600	24,100
483.00	8,850	8,175	32,275

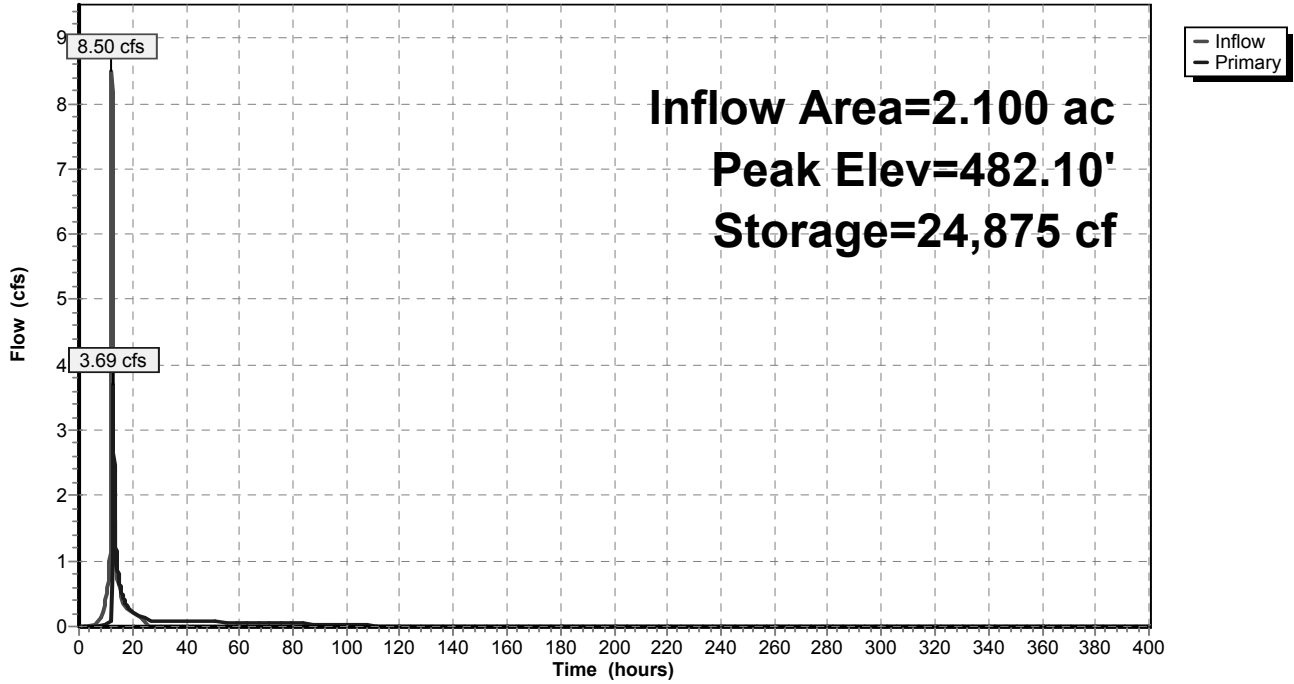
Device	Routing	Invert	Outlet Devices
#1	Primary	478.00'	<b>1.3" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	481.50'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=3.68 cfs @ 12.73 hrs HW=482.10' (Free Discharge)

- ↑ 1=Orifice/Grate (Orifice Controls 0.09 cfs @ 9.7 fps)
- └ 2=Broad-Crested Rectangular Weir (Weir Controls 3.59 cfs @ 2.4 fps)

**Pond 2.2P:**

Hydrograph







**APPENDIX C**  
**Annual Pollutant Loading Rate Calculations**



DESIGN LINE 1									
PRE-DEVELOPMENT STATELINE RETAIL CENTER									
ANNUAL POLLUTANT LOADS									
SUB 1S									
NO TREATMENT									
Land use/Ground Cover	Area (Acres)	BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	9.20	7.0	0.10	1.8	76.5	64.4	0.92	16.6	703.8
Pasture	9.00	32.0	0.11	3.7	305.3	288.0	0.99	33.3	2747.7
Road	0.80	113.0	0.98	2.1	446.8	90.4	0.78	1.7	357.4
<b>TOTALS</b>						<b>442.8</b>	<b>2.69</b>	<b>51.5</b>	<b>3808.9</b>
DESIGN LINE 1									
POST-DEVELOPMENT STATELINE RETAIL CENTER									
ANNUAL POLLUTANT LOADS									
SUB 1.0S									
Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	0.90	7.0	0.10	1.8	76.5	6.3	0.09	1.6	68.9
Grass	1.20	6.0	0.12	3.7	308.0	7.2	0.14	4.4	369.6
Commercial	11.30	163.0	0.71	4.6	716.5	1841.9	8.02	52.0	8096.5
<b>TOTALS PRIOR TO TREATMENT</b>						<b>1855.4</b>	<b>8.26</b>	<b>58.0</b>	<b>8534.9</b>
<b>DESIGN 2 EXTENDED DETENTION POND 1.0P POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTAL</b>						1113.2	4.95	46.4	1707.0
						to	to	to	to
<b>DESIGN 2 EXTENDED DETENTION POND 1.1P POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTAL</b>						667.9	2.97	37.1	341.4
						to	to	to	to
<b>DESIGN 14 LOW GRADIENT GRASS SWALE WITH STONE CHECKDAMS</b>						20%	20%	20%	20%
						to	to	to	to
<b>TOTALS AFTER TREATMENT</b>						<b>534.4</b>	<b>2.38</b>	<b>29.7</b>	<b>273.1</b>
						<b>178.1</b>	<b>0.79</b>	<b>12.5</b>	<b>0.0</b>

**SUB 1.1S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Grass	2.00	6.0	0.12	3.7	308.0	12.0	0.24	7.4	616.0
Road	0.40	113.0	0.98	2.1	446.8	45.2	0.39	0.8	178.7
Commercial	0.40	163.0	0.71	4.6	716.5	65.2	0.28	1.8	286.6
<b>TOTALS PRIOR TO TREATMENT</b>						<b>122.4</b>	<b>0.92</b>	<b>10.1</b>	<b>1081.3</b>
<b>DESIGN 2 EXTENDED DETENTION POND 1.1P POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTAL</b>						60%	60%	40%	100%
						73.4	0.55	8.1	216.3
<b>DESIGN 14 LOW GRADIENT GRASS SWALE WITH STONE CHECKDAMS</b>						to	to	to	to
						40%	40%	40%	40%
<b>TOTALS AFTER TREATMENT</b>						<b>58.8</b>	<b>0.44</b>	<b>6.5</b>	<b>173.0</b>
						to	to	to	to
						<b>29.4</b>	<b>0.22</b>	<b>3.6</b>	<b>0.0</b>

**SUB 1.2S**

**NO TREATMENT**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	1.80	7.0	0.10	1.8	76.5	12.6	0.18	3.2	137.7
Grass	1.00	6.0	0.12	3.7	308.0	6.0	0.12	3.7	308.0
Road	0.30	113.0	0.98	2.1	446.8	33.9	0.29	0.6	134.0
<b>TOTALS</b>						<b>52.5</b>	<b>0.59</b>	<b>7.6</b>	<b>579.7</b>

**POST-DEVELOPMENT TOTAL FOR SUB 1.0S to 1.3S**

						BOD	TP	TN	TSS
<b>TOTALS AFTER TREATMENT</b>						<b>645.6</b>	<b>3.41</b>	<b>43.7</b>	<b>1025.9</b>
						to	to	to	to
						<b>260.0</b>	<b>1.61</b>	<b>23.7</b>	<b>579.7</b>

**DESIGN POINT 2**

**PRE-DEVELOPMENT STATELINE RETAIL CENTER  
ANNUAL POLLUTANT LOADS**

**PRE 2**

**NO TREATMENT**

Land use/Ground Cover	Area (Acres)	BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	13.00	7.0	0.10	1.8	76.5	91.0	1.30	23.4	994.5
Pasture	2.80	32.0	0.11	3.7	305.3	89.6	0.31	10.4	854.8
Road	0.50	113.0	0.98	2.1	446.8	56.5	0.49	1.1	223.4
<b>TOTALS</b>						<b>237.1</b>	<b>2.10</b>	<b>34.8</b>	<b>2072.7</b>

**DESIGN POINT 2**

**POST-DEVELOPMENT STATELINE RETAIL CENTER  
ANNUAL POLLUTANT LOADS**

**SUB 2.0S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	0.30	7.0	0.10	1.8	76.5	2.1	0.03	0.5	23.0
Grass	0.30	6.0	0.12	3.7	308.0	1.8	0.04	1.1	92.4
Commercial	4.50	163.0	0.71	4.6	716.5	733.5	3.20	20.7	3224.3
<b>TOTALS PRIOR TO TREATMENT</b>						<b>737.4</b>	<b>3.26</b>	<b>22.4</b>	<b>3339.6</b>

<b>DESIGN 2 EXTENDED DETENTION POND 2.0P POLLUTANT REMOVAL EFFICIENCIES</b>	40%	40%	20%	80%
	to	to	to	to
	60%	60%	40%	100%
<b>SUBTOTAL</b>	442.4	2.0	17.9	667.9
	to	to	to	to
	295.0	1.3	13.4	0.0
<b>DESIGN 2 EXTENDED DETENTION POND 2.1P POLLUTANT REMOVAL EFFICIENCIES</b>	40%	40%	20%	80%
	to	to	to	to
	60%	60%	40%	100%
<b>SUBTOTAL</b>	<b>265.5</b>	<b>1.17</b>	<b>14.3</b>	<b>133.6</b>
	to	to	to	to
	<b>118.0</b>	<b>0.52</b>	<b>8.0</b>	<b>0.0</b>
<b>DESIGN 14 LOW GRADIENT GRASS SWALE WITH STONE CHECKDAMS</b>	20%	20%	20%	20%
	to	to	to	to
	40%	40%	40%	40%
<b>TOTALS AFTER TREATMENT</b>	<b>212.4</b>	<b>0.94</b>	<b>11.4</b>	<b>106.9</b>
	to	to	to	to
	<b>70.8</b>	<b>0.31</b>	<b>4.8</b>	<b>0.0</b>

**SUB 2.1S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Grass	0.70	6.0	0.12	3.7	308.0	4.2	0.08	2.6	215.6
Commercial	0.10	163.0	0.71	4.6	716.5	16.3	0.07	0.5	71.7
<b>TOTALS PRIOR TO TREATMENT</b>						20.5	0.16	3.1	287.3
<b>DESIGN 2 EXTENDED DETENTION POND 1.1P POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	20%	80%
						to	to	to	to
<b>SUBTOTAL</b>						60%	60%	40%	100%
						12.3	0.09	2.4	57.5
<b>DESIGN 14 LOW GRADIENT GRASS SWALE WITH STONE CHECKDAMS</b>						to	to	to	to
						8.2	0.06	1.8	0.0
<b>TOTALS AFTER TREATMENT</b>						20%	20%	20%	20%
						40%	40%	40%	40%
<b>TOTALS AFTER TREATMENT</b>						<b>9.8</b>	<b>0.07</b>	<b>2.0</b>	<b>46.0</b>
						to	to	to	to
						<b>4.9</b>	<b>0.04</b>	<b>1.1</b>	<b>0.0</b>

**SUB 2.2S**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Grass	0.70	6.0	0.12	3.7	308.0	4.2	0.08	2.6	215.6
Commercial	1.10	163.0	0.71	4.6	716.5	179.3	0.78	5.1	788.2
Pasture	0.30	32.0	0.11	3.7	305.3	9.6	0.03	1.1	91.6
<b>TOTALS PRIOR TO TREATMENT</b>						193.1	0.90	8.8	1095.3
<b>DESIGN 2 EXTENDED DETENTION POND 2.3P POLLUTANT REMOVAL EFFICIENCIES</b>						40%	40%	40%	40%
						to	to	to	to
<b>SUBTOTAL</b>						60%	60%	60%	60%
						115.9	0.54	5.3	657.2
<b>DESIGN 14 LOW GRADIENT GRASS SWALE WITH STONE CHECKDAMS</b>						to	to	to	to
						77.2	0.36	3.5	438.1
<b>TOTALS AFTER TREATMENT</b>						20%	20%	20%	20%
						40%	40%	40%	40%
<b>TOTALS AFTER TREATMENT</b>						<b>92.7</b>	<b>0.43</b>	<b>4.2</b>	<b>525.8</b>
						to	to	to	to
						<b>46.3</b>	<b>0.22</b>	<b>2.1</b>	<b>262.9</b>

**SUB 2.3S**

**NO TREATMENT**

Land use/Ground Cover	Area (Acres)	Rates (lb/ac/yr)				Annual Loads (lb/yr)			
		BOD	TP	TN	TSS	BOD	TP	TN	TSS
Forest	5.80	7.0	0.10	1.8	76.5	40.6	0.58	10.4	443.7
Grass	1.10	6.0	0.12	3.7	308.0	6.6	0.13	4.1	338.8
Pasture	0.50	32.0	0.11	3.7	305.3	16.0	0.06	1.9	152.7
Road	0.50	113.0	0.98	2.1	446.8	56.5	0.49	1.1	223.4
Commercial	0.10	163.0	0.71	4.6	716.5	16.3	0.07	0.5	71.7
<b>TOTALS</b>						<b>136.0</b>	<b>1.33</b>	<b>17.9</b>	<b>1230.2</b>

**POST-DEVELOPMENT TOTAL FOR SUB 2.0S to 2.2S**

						BOD	TP	TN	TSS
<b>TOTALS AFTER TREATMENT</b>						<b>450.9</b>	<b>2.77</b>	<b>35.5</b>	<b>1908.8</b>
						to	to	to	to
						<b>258.1</b>	<b>1.89</b>	<b>25.9</b>	<b>1493.1</b>

**APPENDIX D**  
**NYSDEC WQ<sub>v</sub> Calculations**

The water quality volume shall be  $WQ_v = \frac{(P)(R_v)(A)}{12}$

Where,

- WQ<sub>v</sub> = water quality volume (in acre-feet)
- P = 90% Rainfall Event Number
- R<sub>v</sub> = 0.05 + 0.009(I), where I is percent impervious cover  
Minimum R<sub>v</sub> = 0.2
- A = site area in acres

The following applies for **Pond 1.0P (P-1 Pond)**:

- P = 1.2
- R<sub>v</sub> = 0.80
- A = 13.40 acres

Therefore,

$$WQ_v = \frac{(1.2)(0.80)(13.40)}{12}$$

$$WQ_v = 1.07 \text{ acre-feet} \rightarrow 46,609 \text{ cubic-feet}$$

P-1 Pocket Pond requires minimum of 20% WQ<sub>v</sub> in Permanent Pool:

$$20\% WQ_v = 9,321 \text{ cubic-feet}$$

$$\text{Permanent Pool Volume} = 31,700 \text{ cubic-feet} > 9,321 \text{ cubic-feet}$$

The following applies for **Pond 2.0P (P-1 Micropool Extended Detention Pond)**:

- P = 1.2
- R<sub>v</sub> = 0.73
- A = 5.10 acres

Therefore,

$$WQ_v = \frac{(1.2)(0.73)(5.10)}{12}$$

$$WQ_v = 0.37 \text{ acre-feet} \rightarrow 16,117 \text{ cubic-feet}$$

P-1 Micropool Extended Detention Pond requires minimum of 20% WQ<sub>v</sub> in Permanent Pool:

$$20\% WQ_v = 3,223 \text{ cubic-feet}$$

$$\text{Permanent Pool Volume} = 5,900 \text{ cubic-feet} > 3,223 \text{ cubic-feet}$$

The following applies for **Pond 2.2P (P-1 Micropool Extended Detention Pond)**:

$$\begin{aligned} P &= 1.2 \\ R_v &= 0.45 \\ A &= 2.10 \text{ acres} \end{aligned}$$

Therefore,

$$WQ_v = \frac{(1.2)(0.45)(2.10)}{12}$$

$$WQ_v = 0.09 \text{ acre-feet} \rightarrow 3,920 \text{ cubic-feet}$$

P-1 Pocket Pond requires minimum of 20%  $WQ_v$  in Permanent Pool:

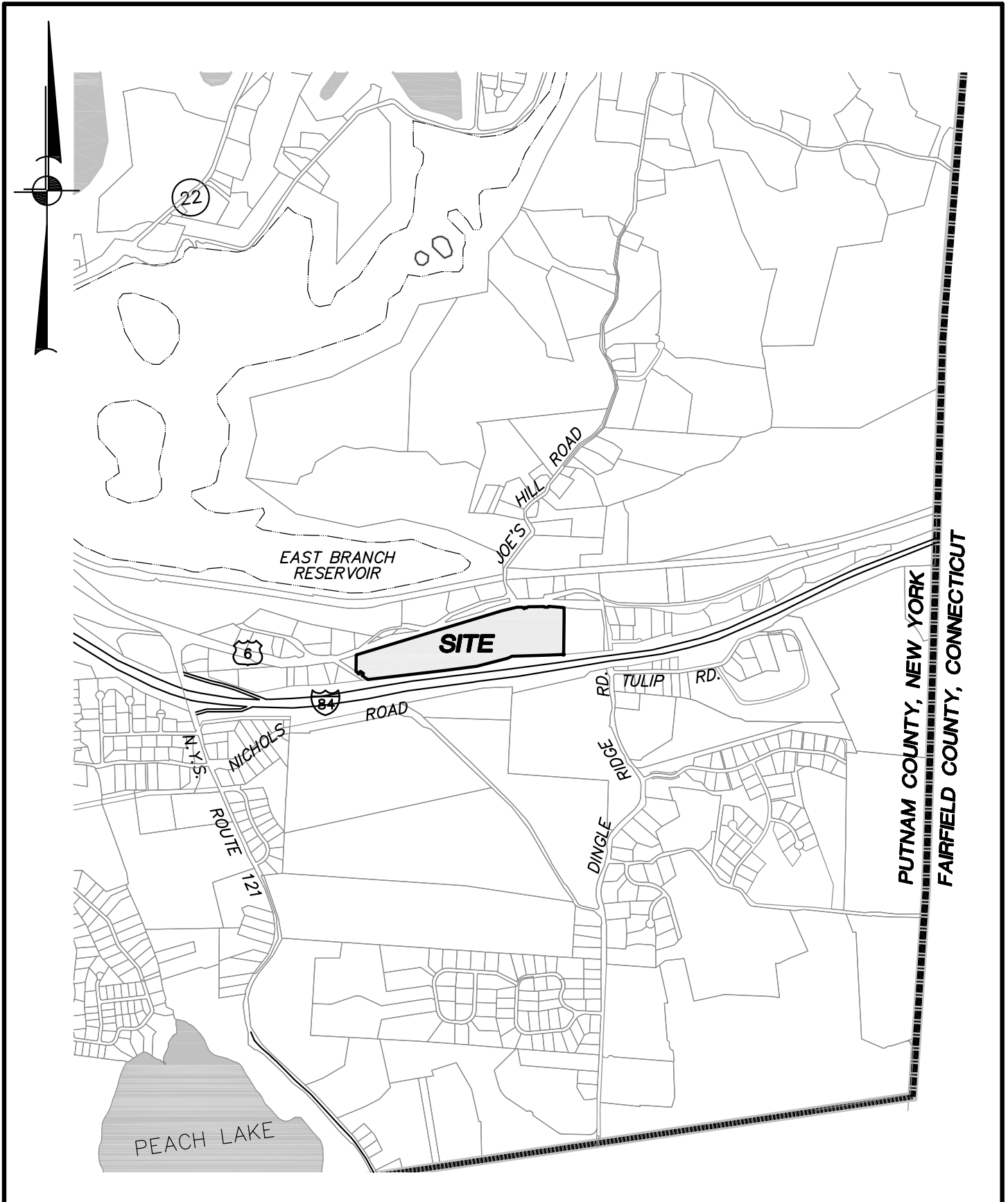
$$20\% WQ_v = 784 \text{ cubic-feet}$$

$$\text{Permanent Pool Volume} = 3,700 \text{ cubic-feet} > 784 \text{ cubic-feet}$$



## **FIGURES**





PROJECT:  
**STATELINE RETAIL CENTER**  
 U.S. ROUTE 6, TOWN OF SOUTHEAST, PUTNAM COUNTY, NEW YORK

DRAWING:  
**LOCATION MAP**

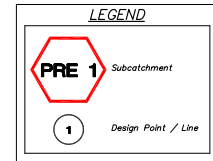
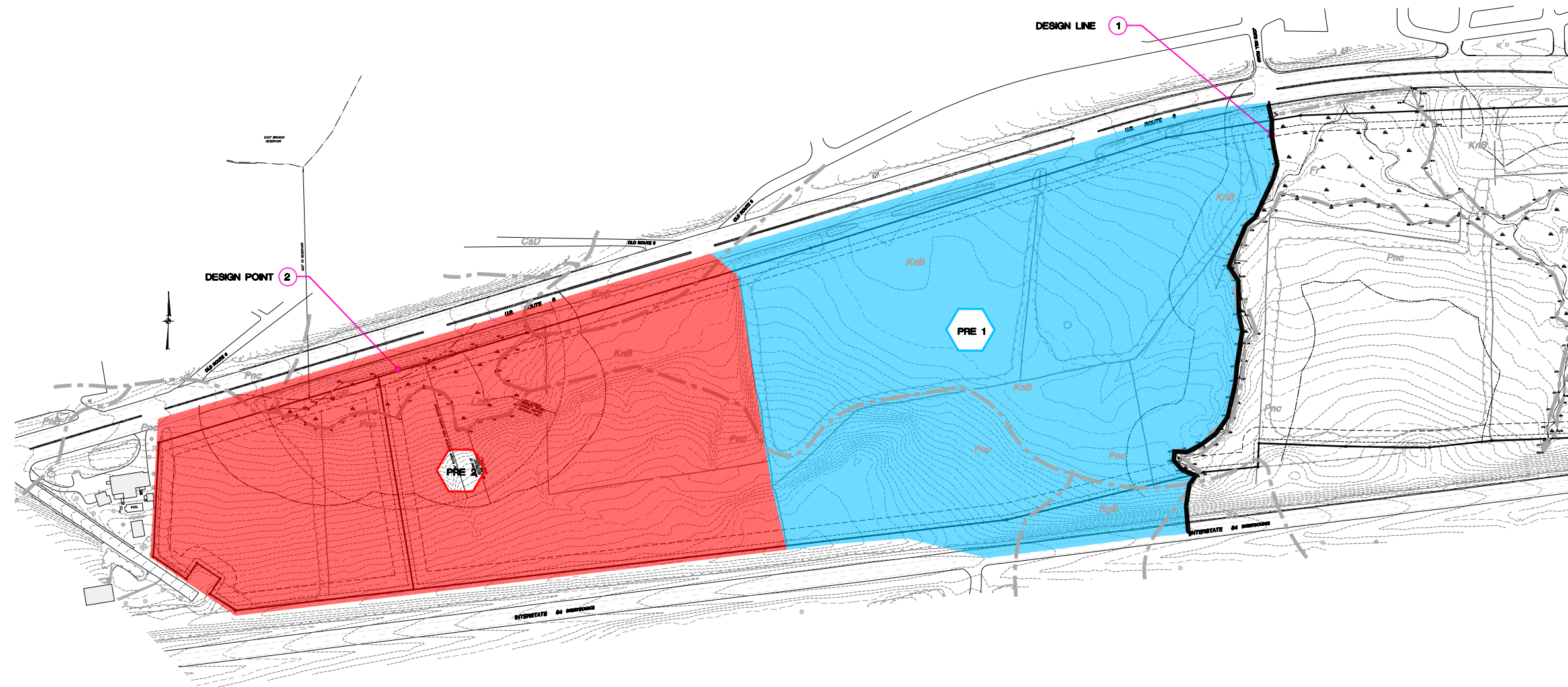


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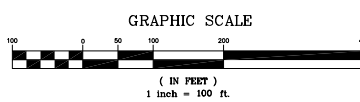
DATE: 3-30-06  
 SCALE: 1" = 2000'  
 PROJECT NO.: 03157.100  
 FIGURE: 1





**SOILS LEGEND**

SOILS	DESCRIPTION	HYDROLOGICAL GROUP
	Soils Boundary	-
CeD	Chaffield-Charlton complex, hilly, very rocky	B
Fr	Fredon Silt loam	C
KnB	Knickerbocker fine sandy loam, 2% to 8% slopes	A
KnC	Knickerbocker fine sandy loam, 2% to 8% slopes	A
LcB	Leicester loam, 3% to 8% slopes, stony	C
PnB	Paxton fine sandy loam, 2% to 8% slopes	C
PnC	Paxton fine sandy loam, 8% to 15% slopes	C
RdB	Ridgebury loam, 2% to 8% slopes, very stony	C
Sh	Sun loam	D

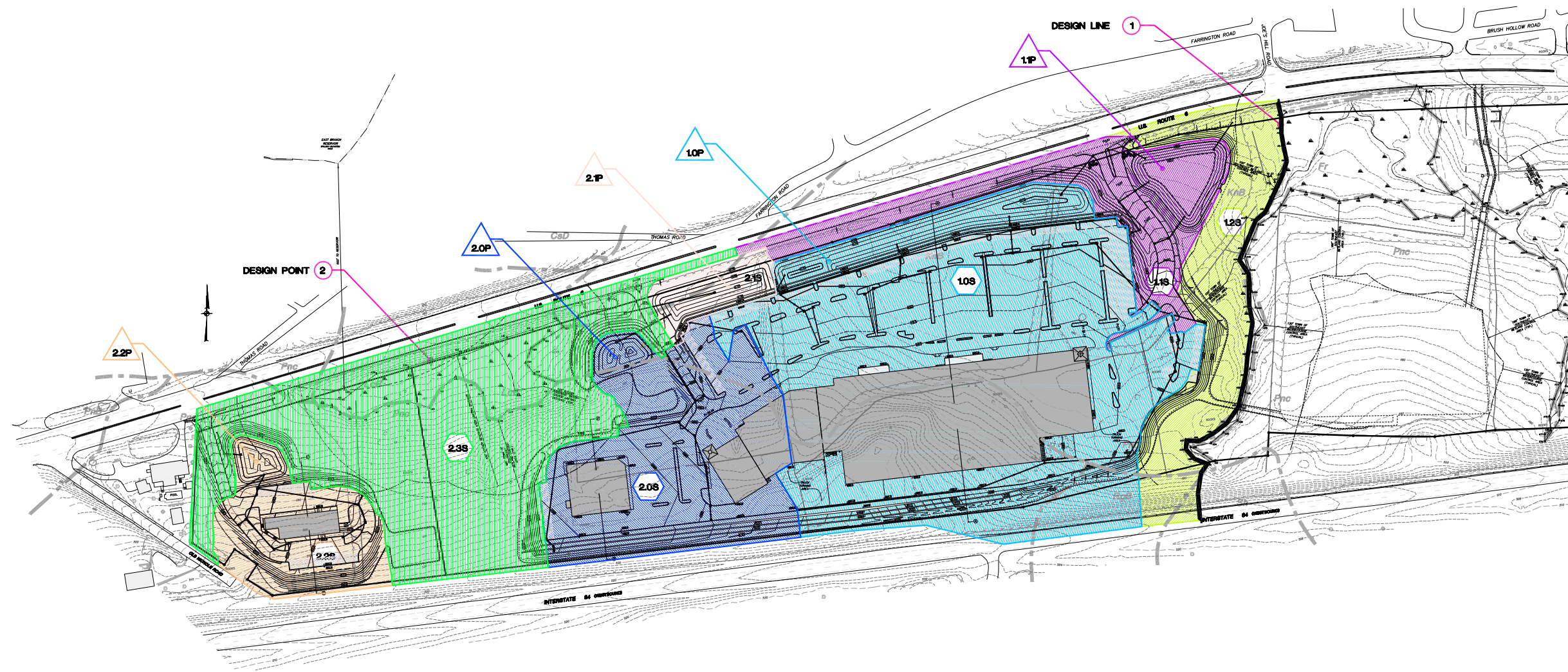


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NO.	DATE	REVISION	BY
PROJECT: <b>STATELINE RETAIL CENTER</b> <small>U.S. ROUTE 6, TOWN OF SOUTHEAST, PUTNAM COUNTY, NEW YORK</small>			
DRAWING: <b>PRE-DEVELOPMENT DRAINAGE MAP</b>			
PROJECT NO.	03157.100	PROJECT MANAGER	J.J.C.
DATE	3-30-06	DRAWN BY	M.D.M.
SCALE	1" = 100'	CHECKED BY	
			2

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**LEGEND**

	Subcatchment
	Pond
	Design Point

**SOILS LEGEND**

SOILS	DESCRIPTION	HYDROLOGICAL GROUP
-----	Soils Boundary	-
CeD	Chatfield-Charlton complex, hilly, very rocky	B
Fr	Fredon Silt loam	C
KnB	Knickerbocker fine sandy loam, 2% to 8% slopes	A
KnC	Knickerbocker fine sandy loam, 2% to 8% slopes	A
LcB	Lelcester loam, 3% to 8% slopes, stony	C
PnB	Paxton fine sandy loam, 2% to 8% slopes	C
PnC	Paxton fine sandy loam, 8% to 15% slopes	C
RdB	Ridgebury loam, 2% to 8% slopes, very stony	C
Sh	Sun loam	D

NO.	DATE	REVISION	BY
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PROJECT:  
**STATELINE RETAIL CENTER**  
 U.S. ROUTE 6, TOWN OF SOUTHEAST, PUTNAM COUNTY, NEW YORK

DRAWING:  
**POST-DEVELOPMENT DRAINAGE MAP**

PROJECT NO.	DATE	SCALE	PROJECT MANAGER	DRYING BY	CHECKED BY	FIGURE NO.
03157.100	3-30-06	1" = 100'	J.J.C.	M.D.M.		3

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