STORMWATER ANALYSIS & CALCULATIONS REPORT

for

95 MAIN STREET
WILLIAMSBURG, MASSACHUSETTS

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MERIDIAN ASSOCIATES
100% employee owned

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SOURCE OF DATA

- Technical Report No. 20
- Technical Report No. 55
- National Oceanic and Atmospheric Administration Atlas 14
- Field Survey by Meridian Associates, Inc.
- Massachusetts Stormwater Handbook February 2008

REPORT SUMMARY:

Calculation Objective

The purpose of this drainage analysis is to design a stormwater management system that will not increase peak rates or volume of stormwater runoff that will flow offsite from pre to post development conditions. Three Design Points have been chosen around the perimeter of the site for measurement during the 2, 10, and 100-year design storm events, and these are represented in the calculations included in this report.

The following analysis is separated into existing conditions and proposed conditions for ease of comparison. Drainage maps have been incorporated into this report to depict existing and proposed watershed areas and subcatchments for the site.

This stormwater management hydrological study has been prepared in accordance with the Performance Standards set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook.

Classification of Soils:

Existing soil conditions within the limits of the watershed analyzed for this study have been categorized as:

- Paxton Fine Sandy Loam, Hydrological Soil Group C
- Ridgebury Fine Sandy Loam, Hydrological Soil Group D
- Sudbury Fine Sandy Loam, Hydrological Soil Group B
- Windsor Loamy Sand, Hydrological Soil Group A

These classifications are based upon the Natural Resource Conservation Service Maps obtained through its web soil survey website on July 31, 2018. A copy of this soil map is contained in the Appendix of this report. In addition, onsite soil testing was conducted by Meridian Associates Inc. (MAI) on August 14, 2018 in the areas depicted on the attached plans. This testing revealed a sandy loam parent material, and the soil test logs can be found in the design plan set.

Selection of Storm Events

The storm event rainfall frequencies used for this analysis have been selected based upon the National Oceanic and Atmospheric Administration Atlas 14, and the data was obtained from their website in July, 2018 and updated on September 28, 2018. Rainfall frequency data obtained is as follows for Williamsburg, MA:

Frequency (Years)	NOAA Precipitation [24 hour event (inches)]
2	3.12
10	4.93
100	7.81

Existing Site Overview

The project consists of a lot (95 Main Street) encompassing 35.74± acres of land in Williamsburg, Massachusetts. Some tree clearing work will also be conducted on a neighboring lot (5R Hatfield Road) encompassing 6.84± acres. The entire project area is currently undeveloped woodland, portions of which are in the process of being cleared for logging purposes. The project area is bordered by land now or formerly Susan E. Stebbins to the west, land now or formerly Lee. H. Lashaway to the north, land now or formerly Penelope Johnson to the East, and land now or formerly: Penelope Johnson, Poverty Mountain Partners LLC, or Lawrence E. & Linda A. West to the south. The area included within the drainage analysis currently drains towards either bordering vegetated wetlands to the southwest, abutters to the south, or bordering vegetated wetlands to the east. The stormwater runoff patterns established within the pre-development conditions are based on existing topography indicating that the runoff flows in general to three (3) design point areas which are listed below:

- **Design Point #1 (DP1)** is the southwestern bordering vegetated wetlands.
- **Design Point #2 (DP2)** is the eastern bordering vegetated wetlands.
- **Design Point #3 (DP3)** is the southern abutters.

The existing site has been broken into three (3) subcatchment as depicted on the Pre-Development Drainage Plan. The following summarizes the hydraulic condition and area comprising the pre-hydrologic model:

- **Subcatchment SC1.0 –** This is denoted as SC1.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely of wooded land. Stormwater runoff generated in this subcatchment flows southwesterly towards bordering vegetated wetlands. **(DP1)**

- **Subcatchment SC2.0 –** This is denoted as SC2.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land and a grassed field on land now or formerly Lee H. Lashaway. Stormwater runoff generated in this subcatchment flows southeasterly towards bordering vegetated wetlands. **(DP2)**

- **Subcatchment SC3.0 –** This is denoted as SC3.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely of wooded land.

Stormwater runoff generated in this subcatchment flows southerly towards abutting land. **(DP3)**

It should be noted that even though the property has been, and is also currently, in the process of being deforested for logging purposes, the comparison of conditions included in this drainage analysis assume a pre-development condition of a completely forested site in order to take a conservative approach to the stormwater design.

Proposed Site Overview

The proposed project entails the development of the existing wooded land into a solar energy generating facility, the improvement and extension of an existing gravel access drive, infiltration basins, a grassed drainage swale, stone trenches, concrete equipment pads, battery storage, electrical and interconnection equipment, electrical conduit, new utility poles and risers, fencing, gates, and associated seeding and soil stabilization. The existing general runoff patterns will be largely maintained, with selective grading. The proposed solar facility racking will be installed using a screw and/or driven post system which minimizes impact on the existing topography and reduces the need for excess earthwork.

The proposed site has been broken into subcatchments as depicted on the Post-Development Drainage Plan. The following summarizes the various hydraulic conditions and areas comprising the post-hydrologic model.

Subcatchment SC100 – This is denoted as SC100 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed gravel, and proposed meadow seeded with Conservation Wildlife Mix and a proposed concrete pad. Stormwater runoff generated in this subcatchment flows southwesterly towards bordering vegetated wetlands. **(DP1)**

Subcatchment SC200 – This is denoted as SC200 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed gravel and proposed meadow seeded with Conservation Wildlife Mix. Stormwater runoff generated in this subcatchment flows southwesterly to an intermittent stream that leads to the stream confluence. **(DP2)**

Subcatchment SC210 – This is denoted as SC210 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed meadow seeded with Conservation Wildlife Mix, and a proposed concrete pad. Stormwater runoff generated in this subcatchment flows southwesterly to an infiltration basin (P210) then to an intermittent stream that leads to the stream confluence. **(DP2)**

Subcatchment SC300 – This is denoted as SC300 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed meadow seeded with Conservation Wildlife Mix, Stormwater runoff generated in this

subcatchment flows southerly to abutting land now or formerly owned by Lisa A. Deitz, Statia Skwira and Poverty Mountain Partners LLC. **(DP3)**

Subcatchment SC310 – This is denoted as SC301 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely proposed meadow seeded with Conservation Wildlife Mix. Stormwater runoff generated in this subcatchment flows southerly to an infiltration basin (P310) then towards abutting land to the south.

Stormwater Management Standards

Standard 1: No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

This project does not direct any untreated stormwater towards neighboring resource areas. All runoff from the project will either be treated in one of two (2) surface basin BMP's before reaching an outlet with a large riprap apron or level spreader, or will run overland across large areas of vegetated land before reaching any resource area.

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

For the purpose of analyzing pre and post development stormwater peak rates of runoff, design points have been selected based on existing topographic conditions and were used for both the pre- and the post-development calculations. Comparison values for pre and post-development stormwater peak rates are given for the design points only.

The storm events used to calculate peak runoff rates for pre and post construction conditions, as previously mentioned, have been selected based upon the National Oceanic and Atmospheric Administration Atlas 14 and taken directly from the NOAA website. Full detail of peak rate attenuation along with supplemental stormwater calculations utilizing HydroCAD software as well as pre and post-construction drainage site plans can be found in the Appendix of this Stormwater Analysis report. The details of this report show that the peak rates of runoff for the 2-year, 10-year and 100-year events have been matched or reduced from pre to post conditions, and that overall stormwater volume leaving the site is also reduced.

The hydrologic calculations from HydroCAD model's Design Points have been included in the "Stormwater Analysis & Calculations Report".

Summary of Flows at Design Point 1

Storm Event	Existing Conditions (Pre) Peak Flow (CFS)	Existing Conditions (Pre) Volume (AF)	Proposed Conditions (Post) Peak Flow (CFS)	Proposed Conditions (Post) Volume (AF)
2-Year	11.3	1.13	9.8	0.94
10-Year	32.0	2.87	26.8	2.34
100-Year	71.1	6.22	58.5	5.00

Summary of Flows at Design Point 2

Storm Event	Existing Conditions (Pre) Peak Flow (CFS)	Existing Conditions (Pre) Volume (AF)	Proposed Conditions (Post) Peak Flow (CFS)	Proposed Conditions (Post) Volume (AF)
2-Year	7.5	1.08	6.1	0.83
10-Year	21.1	2.74	17.7	2.41
100-Year	46.6	5.93	39.9	5.55

Summary of Flows at Design Point 3

Storm Event	Existing Conditions (Pre) Peak Flow (CFS)	Existing Conditions (Pre) Volume (AF)	Proposed Conditions (Post) Peak Flow (CFS)	Proposed Conditions (Post) Volume (AF)
2-Year	0.4	0.10	0.1	0.04
10-Year	3.4	0.40	1.9	0.22
100-Year	11.6	1.13	9.3	1.17

Standard 3: Recharge - Loss of annual recharge to groundwater shall be eliminated or minimized…at a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume in accordance with the Mass Stormwater Handbook.

The project proposes a small amount of impervious area (approx. 2,500 s.f.) for the concrete equipment pads that will not have their runoff directed into a stormwater basin. In relation to the overall project area being developed, it is our opinion that this is a de minimus amount of impervious area that will have no impact in the overall design. These concrete pads will be surrounded by a crushed stone trench to allow for a measure of infiltration to treat any runoff coming directly off the concrete. Any runoff from the pads not entering the stone trench would flow overland where it can be infiltrated into the soils along the route towards the neighboring wetlands. Given this, as well as the recharge being provided by the proposed infiltration basins on site, we feel that the annual recharge from the proposed site approximates the annual recharge from pre-development conditions.

72-HOUR BASIN DRAW DOWN CALCULATIONS

$$\text{Time} = \frac{Rv}{(K)(BottomArea)}$$

R_v = Storage Volume
K = Saturated Hydraulic Conductivity for Sandy Loam= 1.02 in/hour
Bottom Area = Bottom Area of Recharge Structure

Pond 210

R_v = 3,580 cf
Bottom Area = 11,716 sf

Time = 2,974/(1.02(1/12)(11,716) = 2.98 hours

2.98 hours < 72 hours

Pond 310

R_v = 24,200 cf
Bottom Area = 10,395 sf

Time = 24,200/(1.02(1/12)(10,395) = 27.4 hours

27.4 hours < 72 hours

Standard 4: Water Quality – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The standard is met with pollution prevention plans, stormwater BMP's sized to capture required water quality volume, and pretreatment measures.

The project proposes a de-minimus amount of impervious area (approx. 2,500 s.f.) for the concrete equipment pads. These equipment pads will be surrounded by crushed stone infiltration trenches to treat the small amount of TSS generated. In addition, any excess runoff will travel overland before encountering any resource areas. Any TSS generated from impervious areas will receive treatment. As shown below, a very small water quality volume of 104 cf will be generated on site.

General Equation from Stormwater Management Handbook

Vwq = (Dwq)(A)
Vwq = required water quality volume
Dwq = water quality depth (1" for critical areas, 0.5" for non-critical areas)
A = impervious area

The following calculation is based on 0.5'' for non-critical areas:

Vwq = (2,500)(0.5"/12) = 104± cf

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs) – Source control and pollution prevention shall be implemented in accordance with the Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Stormwater Standard 5 is not applicable to this project. The proposed development will not subject the site to higher potential pollutant loads as defined in the Massachusetts Department of Environmental Protection Wetlands and Water Quality Regulations.

LUHPPLs are identified in 310 CMR 22.20B(2) and C(2)(a)-(k) and (m) and CMR 22.21(2)(a)(1)-(8) and (b)(1)-(6), areas within a site that are the location of activities that are subject to an individual National Pollutant Discharge Elimination System (NPDES) permit or the NPDES Multi-sector General Permit; auto fueling facilities, exterior fleet storage areas, exterior vehicle service and equipment cleaning areas; marinas and boatyards; parking lots with high-intensity-use; confined disposal facilities and disposal sites.

Standard 6: Critical Areas – Stormwater discharges to critical areas require the use of specific source control and pollution prevention measures and specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas.

Stormwater Standard 6 is not applicable to this project given that proposed stormwater does not discharge to a critical area. Critical areas being Outstanding Resource Waters and Special Resource Waters as designated in 314 CMR 4.0, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries and shellfish growing areas as defined in 314 CMR 9.02

and 310 CMR 10.04. The existing wetlands and streams are not considered critical areas therefore Standard #6 does not apply to this project.

Standard 7: Redevelopments – A redevelopment project is required to meet Standards 1-6 only to the maximum extent practicable. Remaining standards shall be met as well as the project shall improve the existing conditions.

Stormwater Standard 7 is not applicable to this project. Within the Stormwater Management Handbook (volume 1 chapter 1 page 20), the definition of a redevelopment project includes, "development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area".

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan shall be implemented.

An *Operation and Maintenance Program* is included with this report. The program details the construction period operation and maintenance plan and sequencing for pollution prevention measures and erosion and sedimentation controls. Locations of erosion control measures for the project are depicted on the design plan set accompanying this report.

Standard 9: A long term Operation and Maintenance Plan shall be implemented.

An *Operation and Maintenance Program for a Proposed Stormwater Management System* is included with this report. The long term operation and maintenance section of the program provides details and the schedule for routine and non-routine maintenance tasks to be implemented at the completion of the project.

Standard 10: Prohibition of Illicit Discharges – Illicit discharges to the stormwater management system are prohibited.

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: Firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. All other illicit discharges are prohibited.

There are no known illicit discharges anticipated through the completion of this project. During construction and post construction procedures are provided to dissipate the potential for illicit discharges to the drainage system. Post construction preventions of

illicit discharges are described in the Operation and Maintenance Program under the Good Housekeeping Practices section of the report.

Conclusion

The calculations demonstrate that the proposed development will not result in an increase in the peak rate or overall volume of stormwater runoff leaving the project site in the 2-year, 10-year, or 100-year 24-hour storm events.

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NOAA Atlas 14, Volume 10, Version 2
Location name: Haydenville, Massachusetts, USA*
Latitude: 42.378°, Longitude: -72.7049°
Elevation: 460.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.324** (0.250-0.417)	**0.382** (0.295-0.491)	**0.476** (0.366-0.615)	**0.555** (0.424-0.720)	**0.662** (0.491-0.895)	**0.745** (0.541-1.03)	**0.828** (0.584-1.18)	**0.924** (0.621-1.36)	**1.05** (0.681-1.60)	**1.15** (0.726-1.78)
10-min	**0.459** (0.355-0.590)	**0.541** (0.417-0.696)	**0.675** (0.519-0.871)	**0.786** (0.601-1.02)	**0.938** (0.695-1.27)	**1.06** (0.766-1.46)	**1.17** (0.827-1.68)	**1.31** (0.880-1.92)	**1.49** (0.965-2.26)	**1.63** (1.03-2.52)
15-min	**0.541** (0.417-0.694)	**0.637** (0.491-0.819)	**0.794** (0.610-1.02)	**0.924** (0.707-1.20)	**1.10** (0.818-1.49)	**1.24** (0.902-1.71)	**1.38** (0.973-1.97)	**1.54** (1.04-2.26)	**1.75** (1.14-2.66)	**1.91** (1.21-2.96)
30-min	**0.751** (0.580-0.965)	**0.885** (0.683-1.14)	**1.11** (0.849-1.43)	**1.29** (0.984-1.67)	**1.54** (1.14-2.08)	**1.73** (1.26-2.39)	**1.92** (1.36-2.74)	**2.15** (1.44-3.15)	**2.44** (1.58-3.71)	**2.66** (1.69-4.13)
60-min	**0.962** (0.743-1.24)	**1.13** (0.875-1.46)	**1.42** (1.09-1.83)	**1.65** (1.26-2.14)	**1.97** (1.46-2.66)	**2.22** (1.61-3.06)	**2.47** (1.74-3.52)	**2.75** (1.85-4.04)	**3.13** (2.03-4.75)	**3.41** (2.16-5.29)
2-hr	**1.22** (0.951-1.56)	**1.44** (1.12-1.85)	**1.80** (1.40-2.31)	**2.10** (1.62-2.71)	**2.52** (1.88-3.39)	**2.83** (2.07-3.90)	**3.15** (2.24-4.50)	**3.56** (2.40-5.19)	**4.09** (2.66-6.19)	**4.50** (2.86-6.94)
3-hr	**1.40** (1.09-1.78)	**1.66** (1.29-2.11)	**2.08** (1.62-2.66)	**2.43** (1.88-3.12)	**2.91** (2.18-3.92)	**3.29** (2.42-4.52)	**3.66** (2.62-5.23)	**4.16** (2.81-6.06)	**4.83** (3.14-7.28)	**5.34** (3.39-8.21)
6-hr	**1.74** (1.37-2.20)	**2.09** (1.64-2.64)	**2.66** (2.08-3.37)	**3.13** (2.43-3.99)	**3.78** (2.86-5.07)	**4.28** (3.18-5.88)	**4.78** (3.46-6.85)	**5.52** (3.74-8.00)	**6.49** (4.24-9.74)	**7.23** (4.61-11.1)
12-hr	**2.13** (1.69-2.67)	**2.60** (2.06-3.27)	**3.38** (2.66-4.25)	**4.02** (3.14-5.09)	**4.90** (3.73-6.54)	**5.58** (4.17-7.64)	**6.26** (4.57-8.96)	**7.31** (4.97-10.5)	**8.69** (5.69-13.0)	**9.73** (6.23-14.8)
24-hr	**2.52** (2.00-3.14)	**3.13** (2.48-3.90)	**4.12** (3.26-5.15)	**4.94** (3.89-6.22)	**6.08** (4.65-8.08)	**6.95** (5.23-9.48)	**7.82** (5.76-11.2)	**9.23** (6.30-13.2)	**11.1** (7.27-16.5)	**12.5** (8.01-18.9)
2-day	**2.88** (2.31-3.56)	**3.61** (2.89-4.47)	**4.80** (3.83-5.97)	**5.79** (4.59-7.24)	**7.15** (5.52-9.47)	**8.20** (6.22-11.2)	**9.25** (6.87-13.2)	**11.0** (7.55-15.7)	**13.4** (8.79-19.8)	**15.1** (9.74-22.8)
3-day	**3.15** (2.53-3.88)	**3.95** (3.17-4.87)	**5.25** (4.20-6.50)	**6.33** (5.04-7.88)	**7.82** (6.06-10.3)	**8.97** (6.83-12.2)	**10.1** (7.55-14.4)	**12.1** (8.30-17.2)	**14.7** (9.70-21.7)	**16.7** (10.8-25.1)
4-day	**3.39** (2.73-4.16)	**4.24** (3.41-5.21)	**5.62** (4.51-6.93)	**6.77** (5.40-8.40)	**8.35** (6.48-11.0)	**9.57** (7.30-12.9)	**10.8** (8.06-15.4)	**12.9** (8.86-18.3)	**15.6** (10.3-23.0)	**17.7** (11.5-26.6)
7-day	**4.06** (3.29-4.96)	**5.00** (4.05-6.11)	**6.53** (5.27-8.01)	**7.80** (6.25-9.63)	**9.55** (7.44-12.5)	**10.9** (8.34-14.6)	**12.2** (9.15-17.3)	**14.5** (9.99-20.4)	**17.4** (11.5-25.5)	**19.6** (12.7-29.3)
10-day	**4.74** (3.86-5.77)	**5.72** (4.65-6.97)	**7.33** (5.93-8.96)	**8.66** (6.96-10.6)	**10.5** (8.18-13.6)	**11.9** (9.11-15.9)	**13.3** (9.93-18.6)	**15.5** (10.7-21.9)	**18.4** (12.3-26.9)	**20.7** (13.4-30.8)
20-day	**6.85** (5.61-8.27)	**7.88** (6.45-9.53)	**9.57** (7.80-11.6)	**11.0** (8.89-13.4)	**12.9** (10.1-16.5)	**14.4** (11.0-18.9)	**15.9** (11.8-21.7)	**17.9** (12.4-24.9)	**20.5** (13.7-29.7)	**22.4** (14.6-33.3)
30-day	**8.59** (7.06-10.3)	**9.66** (7.93-11.6)	**11.4** (9.33-13.8)	**12.9** (10.5-15.6)	**14.9** (11.6-18.9)	**16.4** (12.5-21.3)	**17.9** (13.2-24.2)	**19.7** (13.8-27.4)	**22.1** (14.8-31.9)	**23.9** (15.6-35.3)
45-day	**10.7** (8.85-12.8)	**11.8** (9.77-14.2)	**13.7** (11.3-16.5)	**15.2** (12.4-18.5)	**17.4** (13.6-21.9)	**19.0** (14.5-24.4)	**20.6** (15.2-27.4)	**22.2** (15.6-30.8)	**24.4** (16.4-35.1)	**26.0** (17.0-38.3)
60-day	**12.5** (10.3-14.9)	**13.7** (11.3-16.3)	**15.6** (12.9-18.8)	**17.3** (14.1-20.9)	**19.5** (15.4-24.5)	**21.3** (16.3-27.2)	**23.0** (16.9-30.4)	**24.5** (17.3-33.9)	**26.6** (17.9-38.1)	**28.1** (18.4-41.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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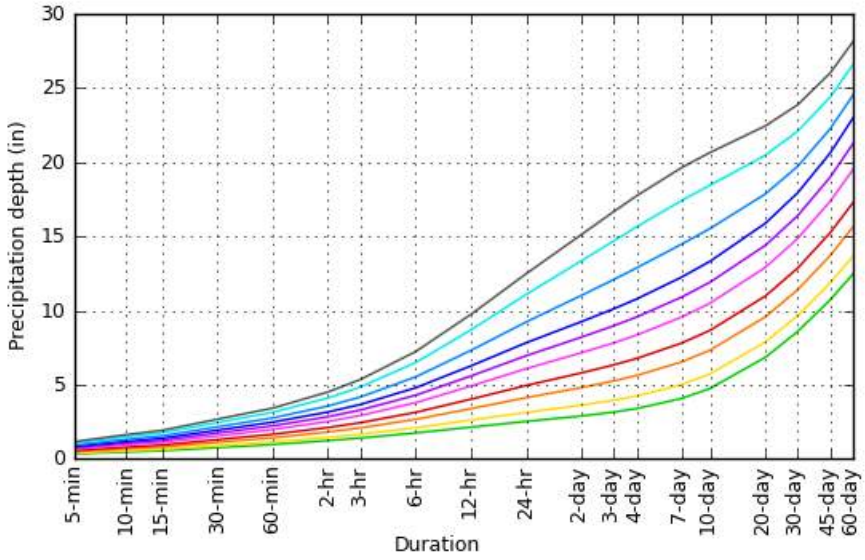
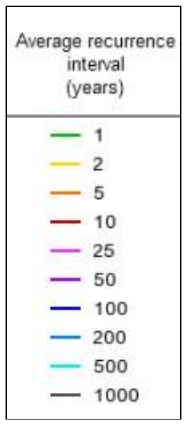
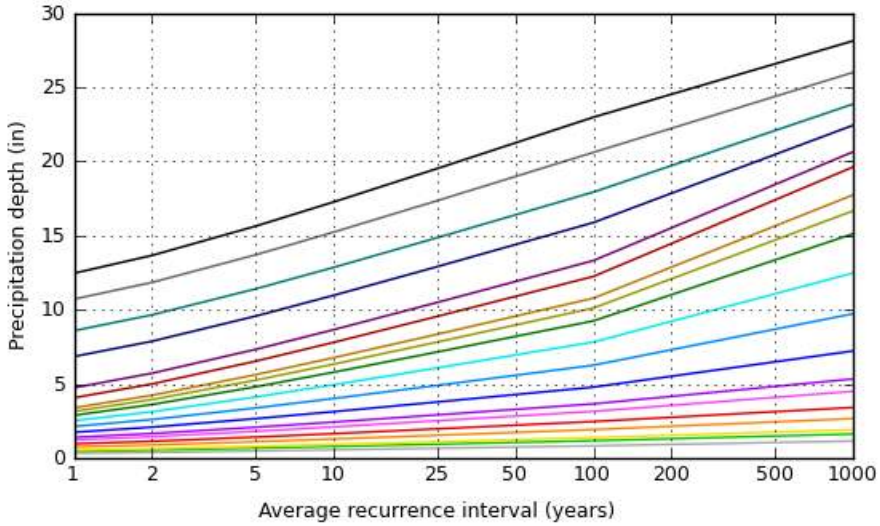
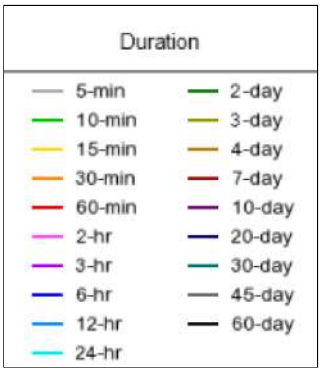
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.3780°, Longitude: -72.7049°









NOAA Atlas 14, Volume 10, Version 2

Created (GMT): Fri Sep 28 13:48:56 2018

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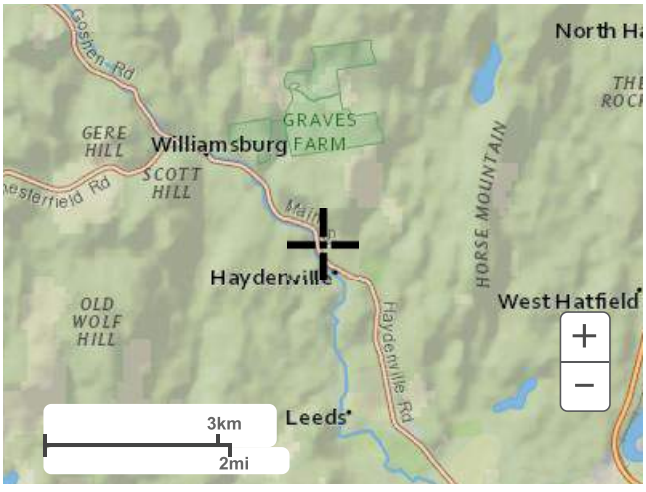
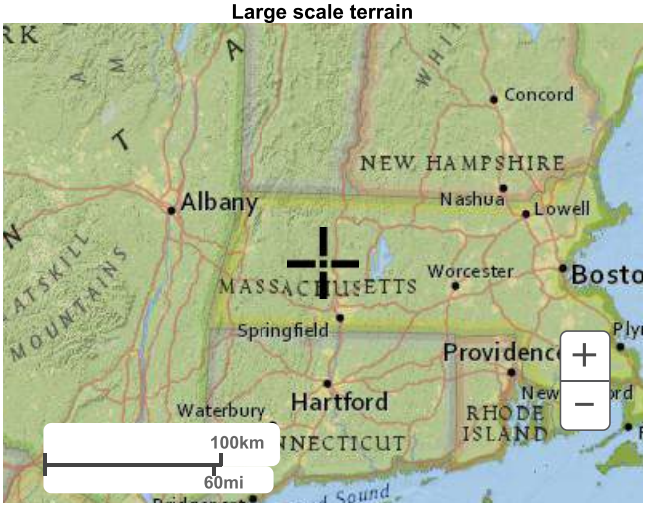
Maps & aerials

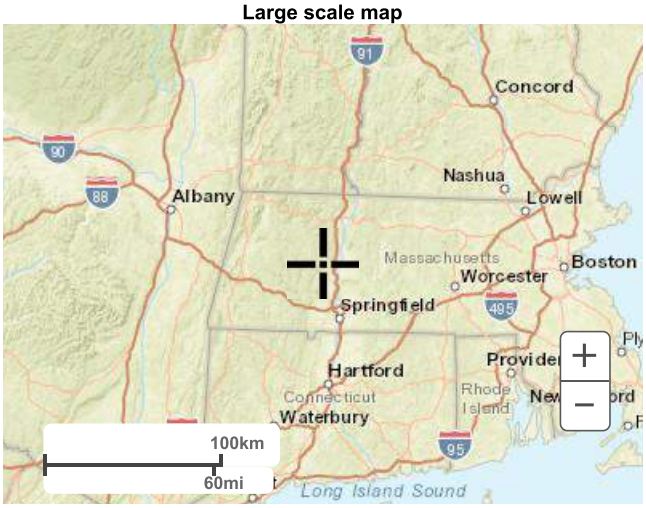
Small scale terrain



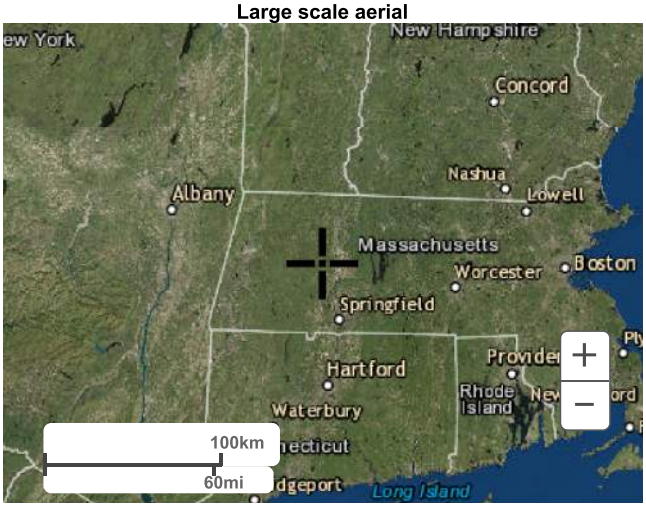
Large scale terrain



Large scale map



Large scale aerial



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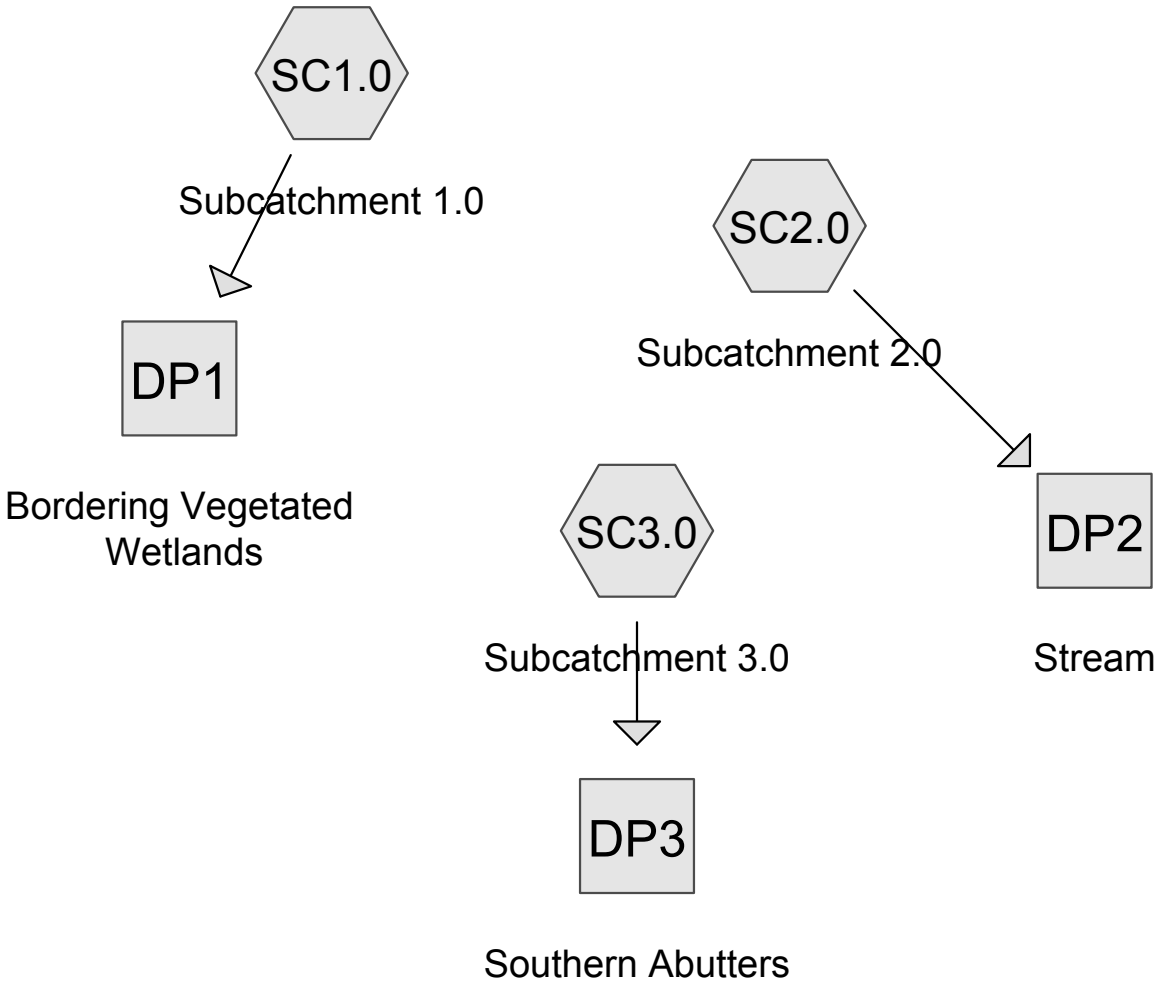
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

EXISTING CONDITIONS
WATERSHED ROUTING DIAGRAM



Subcat Reach Pond Link

Routing Diagram for 6091_PRE PH1
Prepared by Microsoft, Printed 9/28/2018

Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (F)** Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-Year event
Inflow = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af
Outflow = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-Year event
Inflow = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af
Outflow = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af
Outflow = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (F)** Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af
Outflow = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af
Outflow = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af
Outflow = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (F)** Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af
Outflow = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af
Outflow = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af, Atten= 0%, Lag= 0.0 min

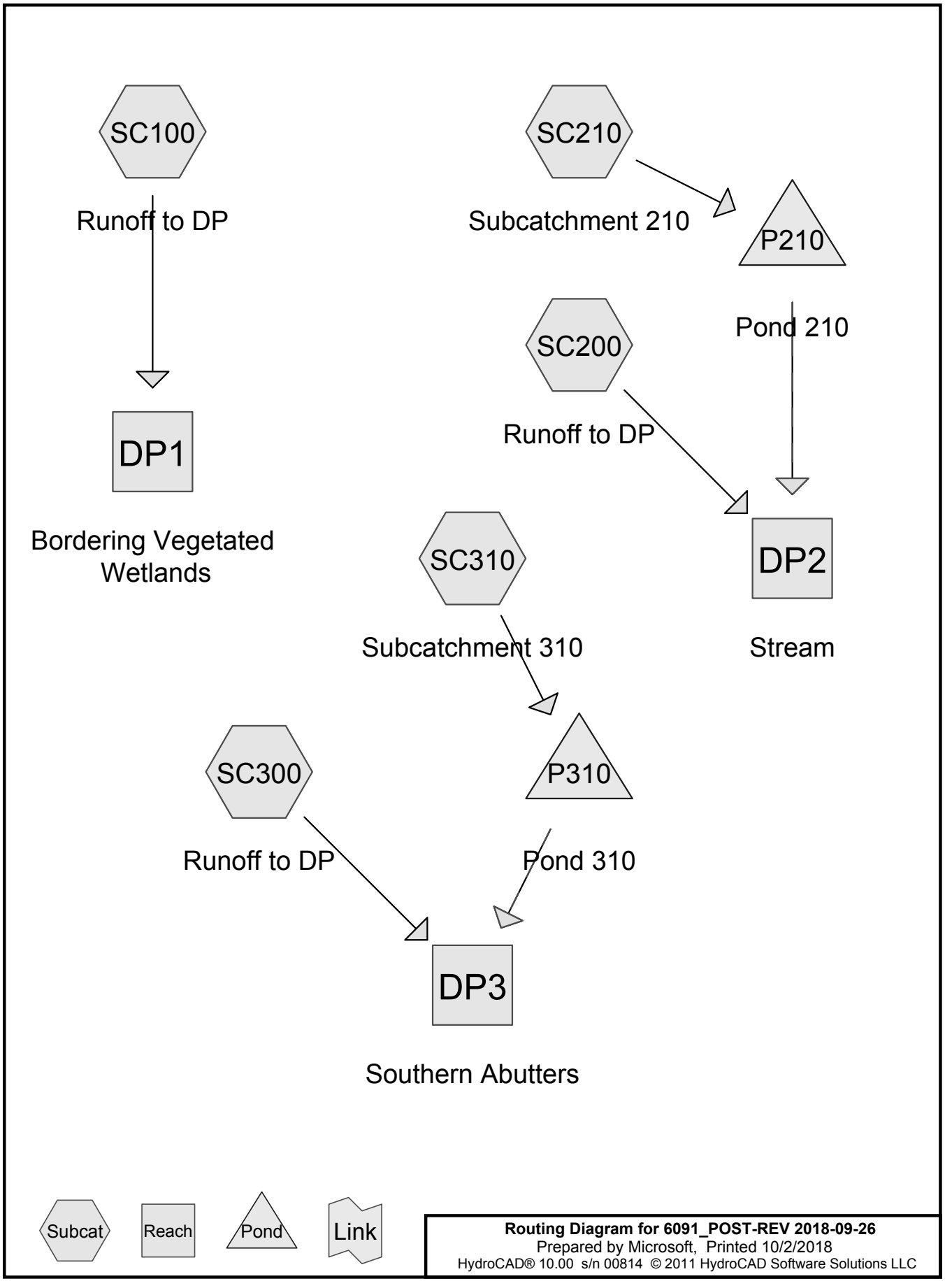
Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 2.66" for 100-Year event
Inflow = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af
Outflow = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

PROPOSED CONDITIONS
WATERSHED ROUTING DIAGRAM



Routing Diagram for 6091_POST-REV 2018-09-26
Prepared by Microsoft, Printed 10/2/2018

Summary for Subcatchment SC100: Runoff to DP

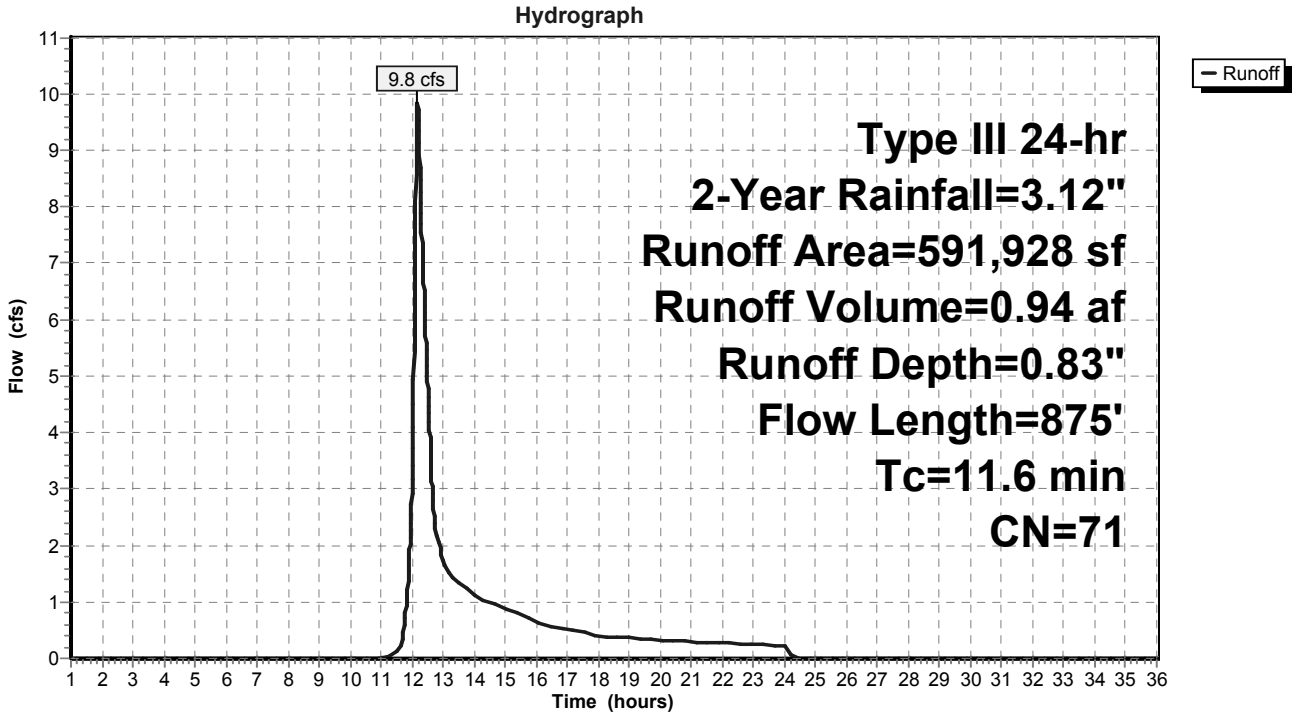
Runoff = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

	Area (sf)	CN	Description
	10,167	55	Woods, Good, HSG B
	274,355	70	Woods, Good, HSG C
*	297,729	71	Proposed Meadow, non-grazed, HSG C
*	7,085	89	Proposed Gravel roads, HSG C
*	2,592	98	Proposed Conc. Pad
	591,928	71	Weighted Average
	589,336		99.56% Pervious Area
	2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP



Summary for Subcatchment SC200: Runoff to DP

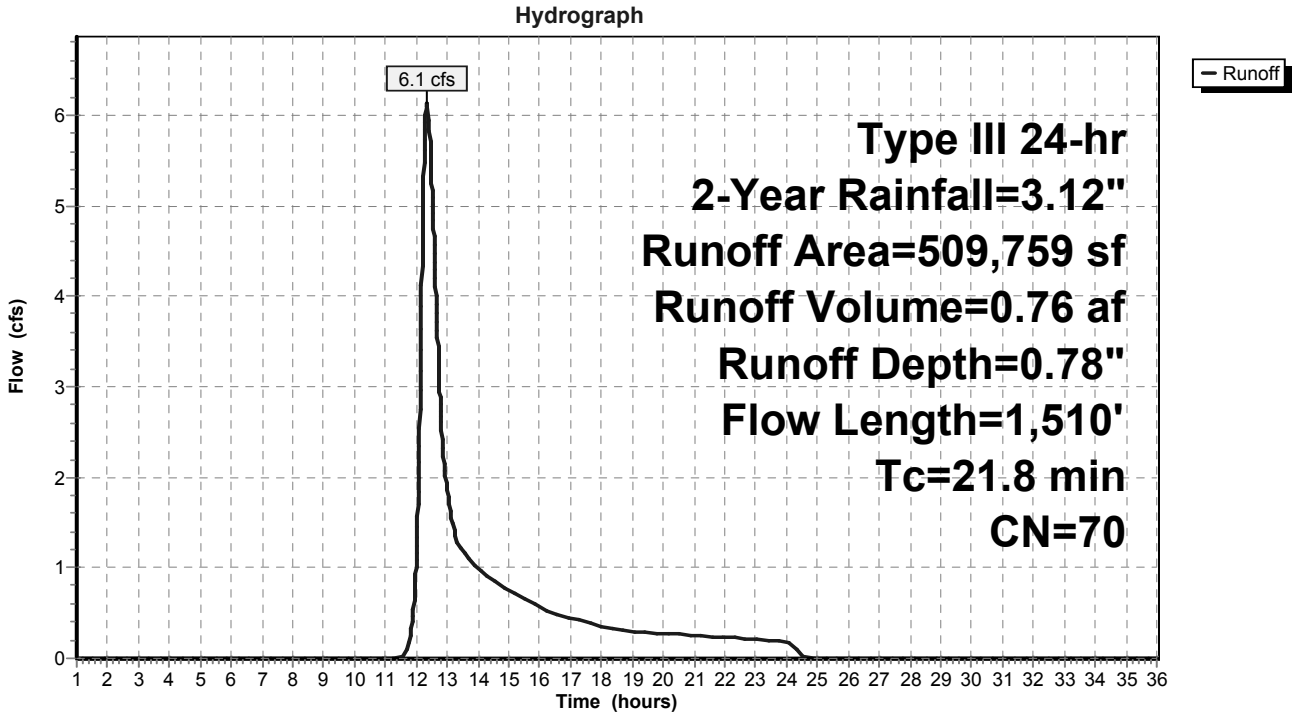
Runoff = 6.1 cfs @ 12.34 hrs, Volume= 0.76 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

	Area (sf)	CN	Description
	14,443	30	Woods, Good, HSG A
	258,670	70	Woods, Good, HSG C
	23,378	77	Woods, Good, HSG D
*	209,613	71	Proposed Meadow, non-grazed, HSG C
*	3,655	89	Proposed Gravel roads, HSG C
	509,759	70	Weighted Average
	509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP



Summary for Subcatchment SC210: Subcatchment 210

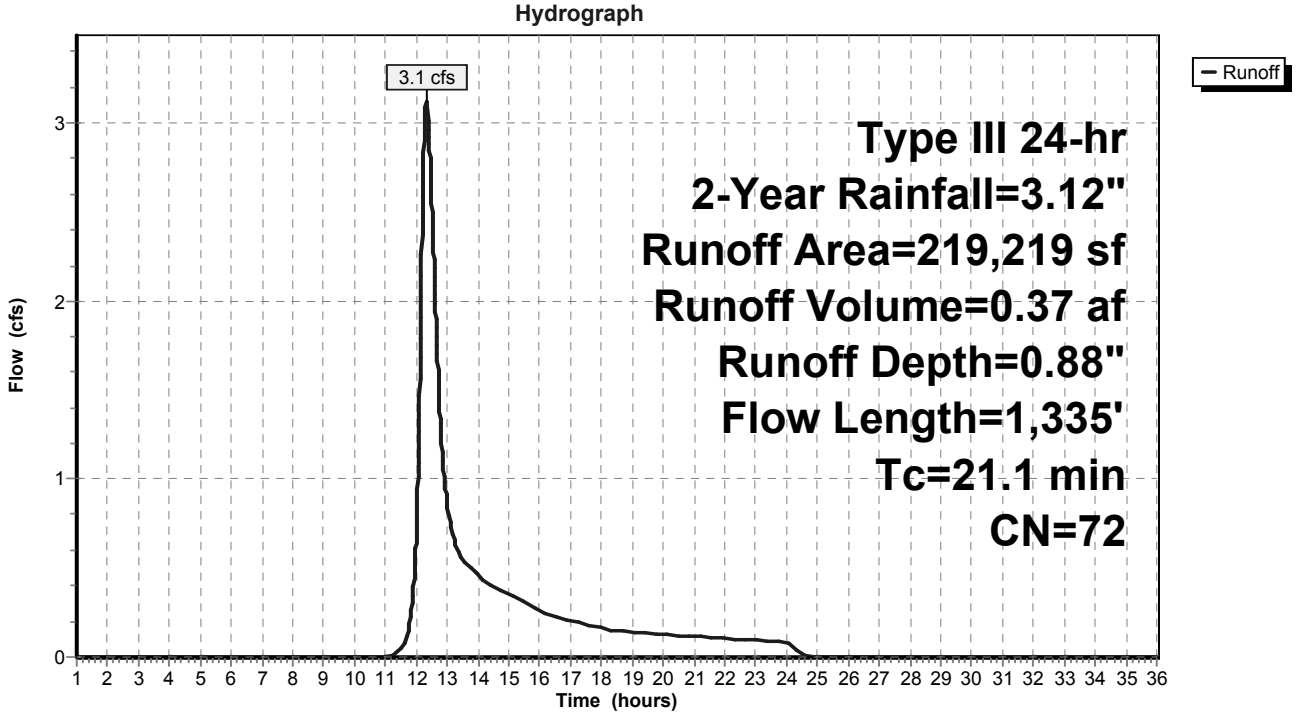
Runoff = 3.1 cfs @ 12.32 hrs, Volume= 0.37 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

	Area (sf)	CN	Description
	8,406	70	Woods, Good, HSG C
	48,590	74	>75% Grass cover, Good, HSG C
*	152,258	71	Proposed Meadow, non-grazed, HSG C
*	9,965	89	Proposed Gravel roads, HSG C
	219,219	72	Weighted Average
	219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210



Summary for Subcatchment SC300: Runoff to DP

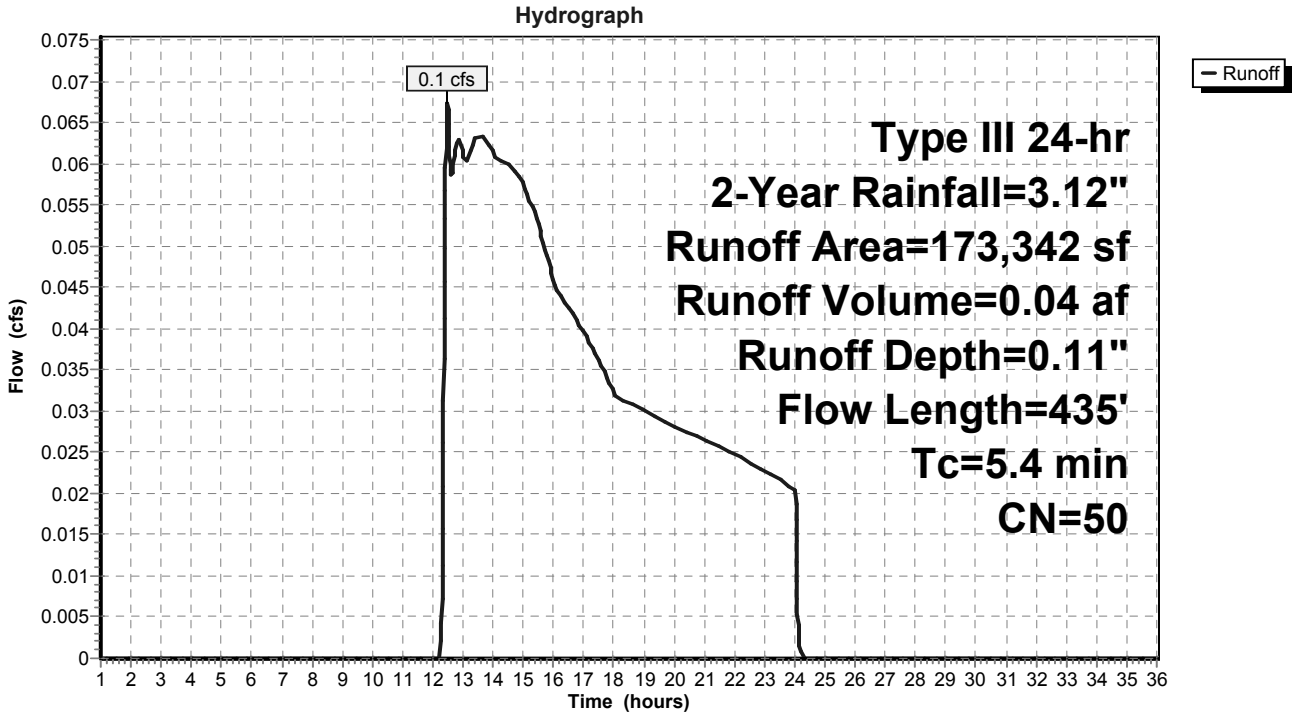
Runoff = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

	Area (sf)	CN	Description
	69,181	30	Woods, Good, HSG A
	35,738	55	Woods, Good, HSG B
	32,088	70	Woods, Good, HSG C
*	3,139	30	Proposed Meadow, non-grazed, HSG A
*	33,196	71	Proposed Meadow, non-grazed, HSG c
	173,342	50	Weighted Average
	173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP



Summary for Subcatchment SC310: Subcatchment 310

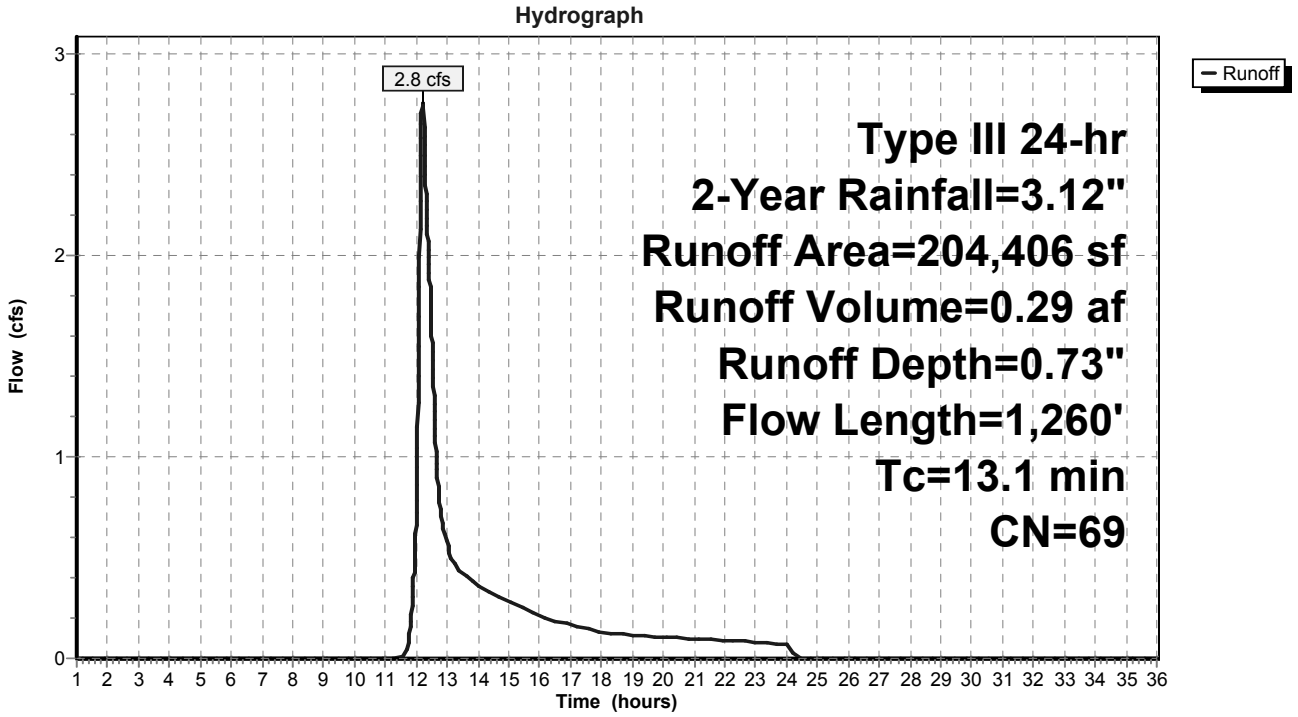
Runoff = 2.8 cfs @ 12.21 hrs, Volume= 0.29 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

	Area (sf)	CN	Description
	2,723	70	Woods, Good, HSG C
*	9,697	30	Proposed Meadow, non-grazed, HSG A
*	191,986	71	Proposed Meadow, non-grazed, HSG c
	204,406	69	Weighted Average
	204,406		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

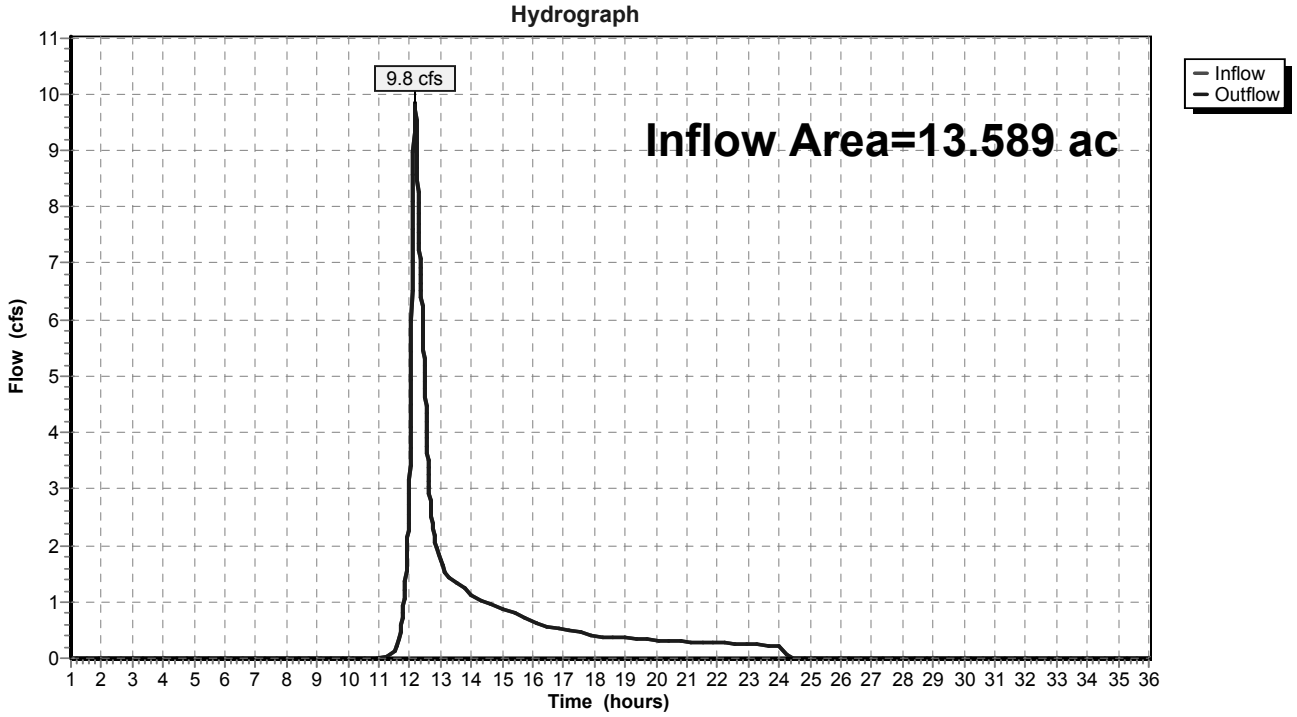


Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af
Outflow = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

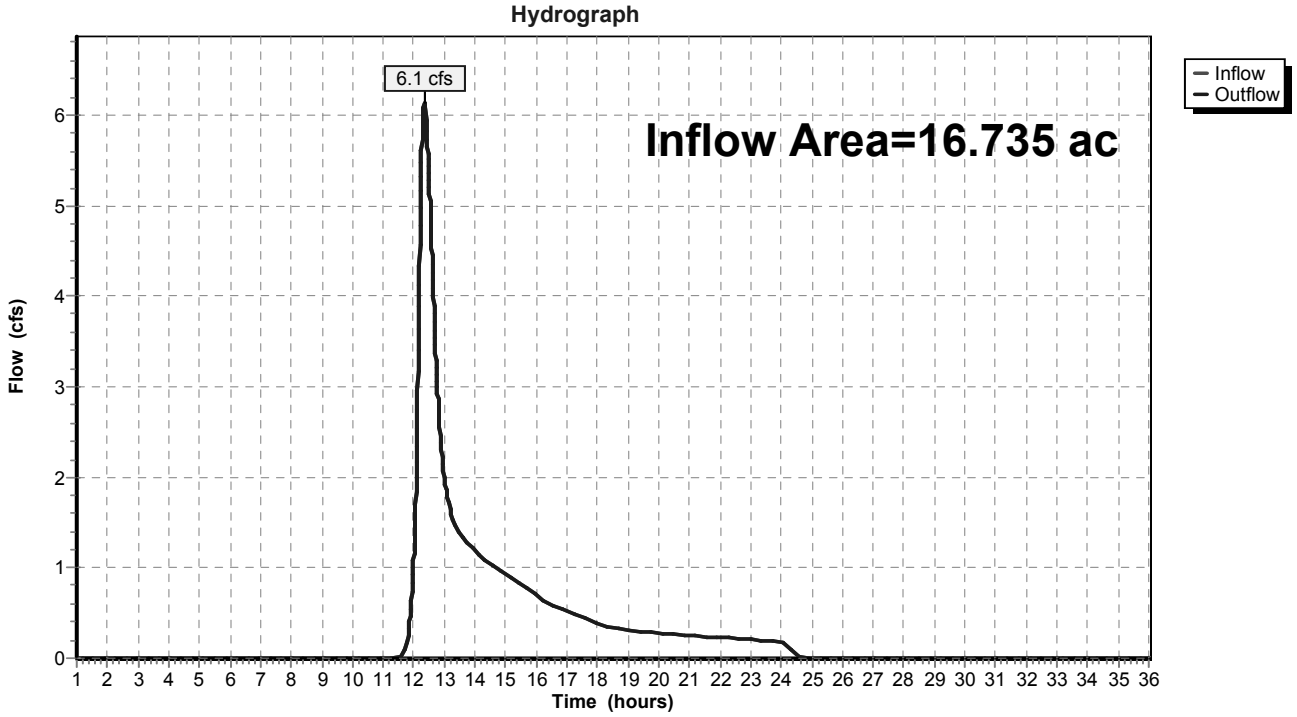


Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-Year event
Inflow = 6.1 cfs @ 12.34 hrs, Volume= 0.83 af
Outflow = 6.1 cfs @ 12.34 hrs, Volume= 0.83 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

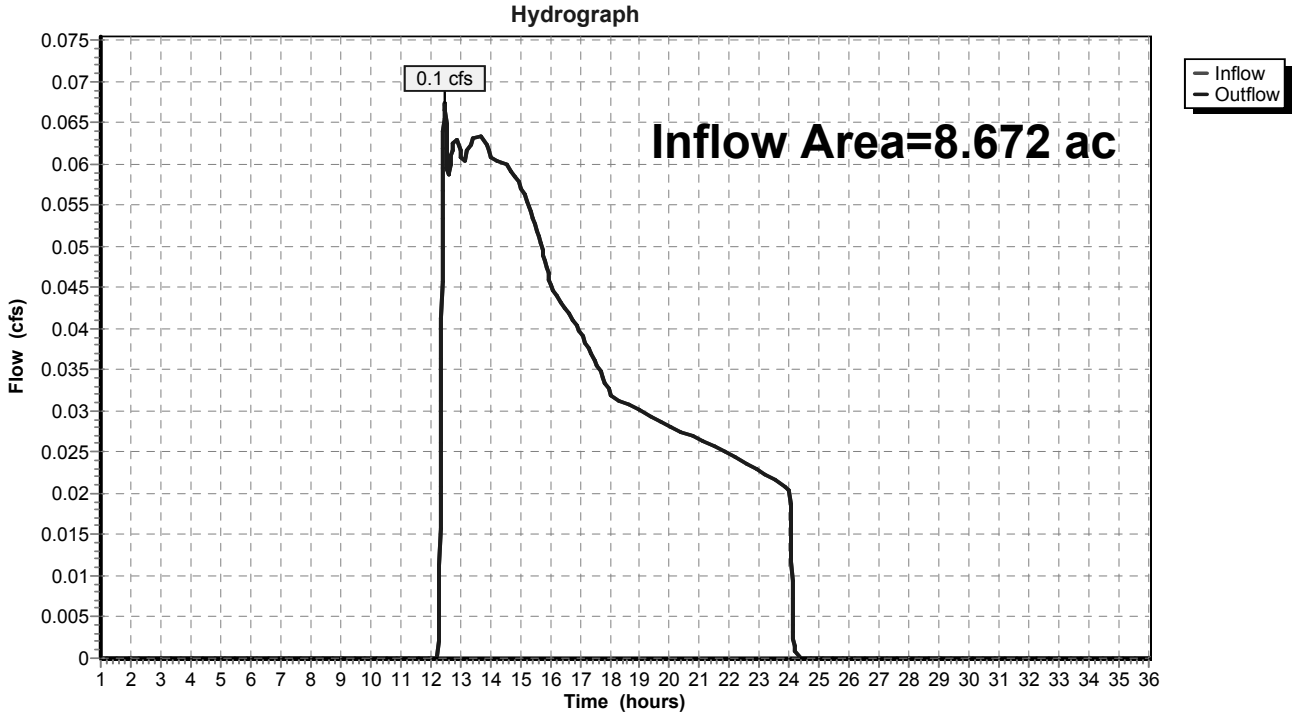


Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 0.05" for 2-Year event
Inflow = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af
Outflow = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters



Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 0.88" for 2-Year event
Inflow = 3.1 cfs @ 12.32 hrs, Volume= 0.37 af
Outflow = 0.5 cfs @ 13.81 hrs, Volume= 0.37 af, Atten= 84%, Lag= 89.5 min
Discarded = 0.3 cfs @ 13.81 hrs, Volume= 0.31 af
Primary = 0.2 cfs @ 13.81 hrs, Volume= 0.06 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 594.53' @ 13.81 hrs Surf.Area= 12,485 sf Storage= 6,367 cf

Plug-Flow detention time= 178.0 min calculated for 0.37 af (100% of inflow)
Center-of-Mass det. time= 177.9 min (1,062.4 - 884.5)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

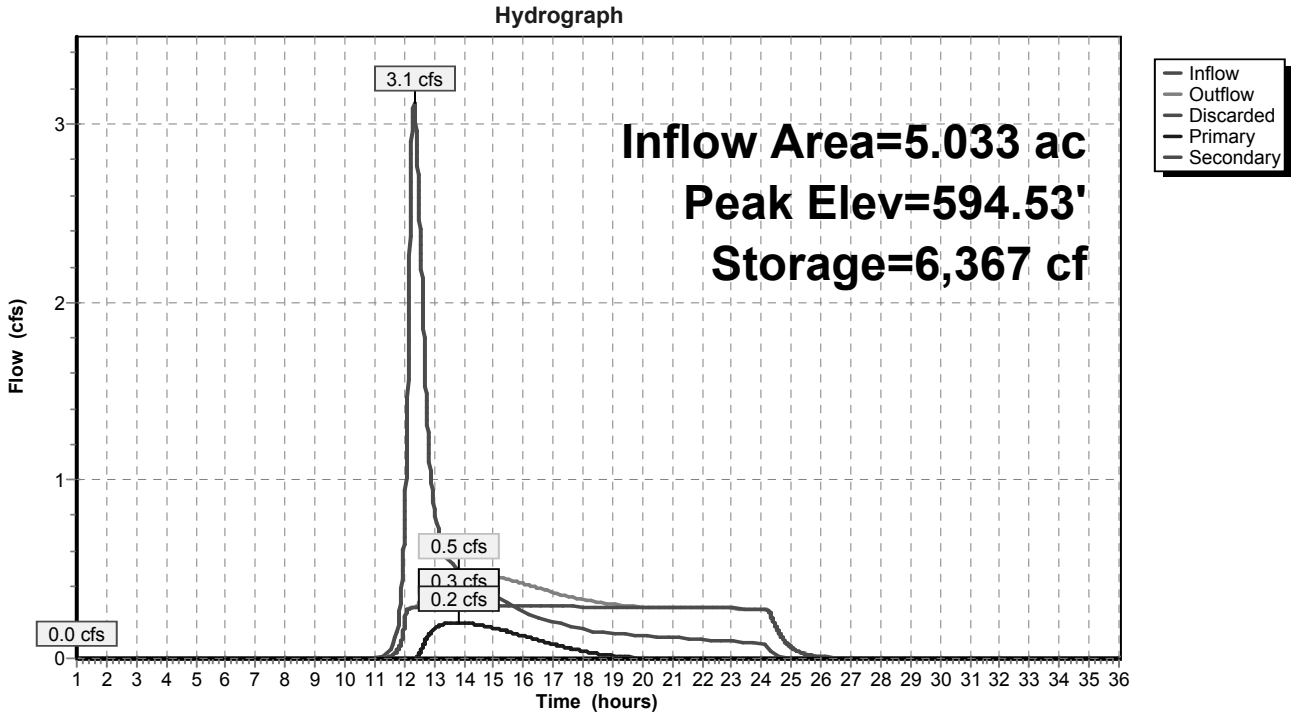
Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	589.00'	**12.0" Round Culvert** L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	595.00'	**6.0" Vert. Orifice** C= 0.600
#5	Device 2	597.00'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.3 cfs @ 13.81 hrs HW=594.53' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.2 cfs @ 13.81 hrs HW=594.53' (Free Discharge)
└**2=Culvert** (Passes 0.2 cfs of 8.5 cfs potential flow)
  ├**3=Orifice** (Orifice Controls 0.2 cfs @ 1.8 fps)
  ├**4=Orifice** (Controls 0.0 cfs)
  └**5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
└**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210



Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 0.73" for 2-Year event
Inflow = 2.8 cfs @ 12.21 hrs, Volume= 0.29 af
Outflow = 0.3 cfs @ 14.90 hrs, Volume= 0.29 af, Atten= 90%, Lag= 161.8 min
Discarded = 0.3 cfs @ 14.90 hrs, Volume= 0.29 af
Primary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 564.48' @ 14.90 hrs Surf.Area= 11,191 sf Storage= 5,202 cf

Plug-Flow detention time= 202.7 min calculated for 0.29 af (100% of inflow)
Center-of-Mass det. time= 202.7 min (1,090.6 - 888.0)

Volume	Invert	Avail.Storage	Storage Description
#1	564.00'	56,980 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

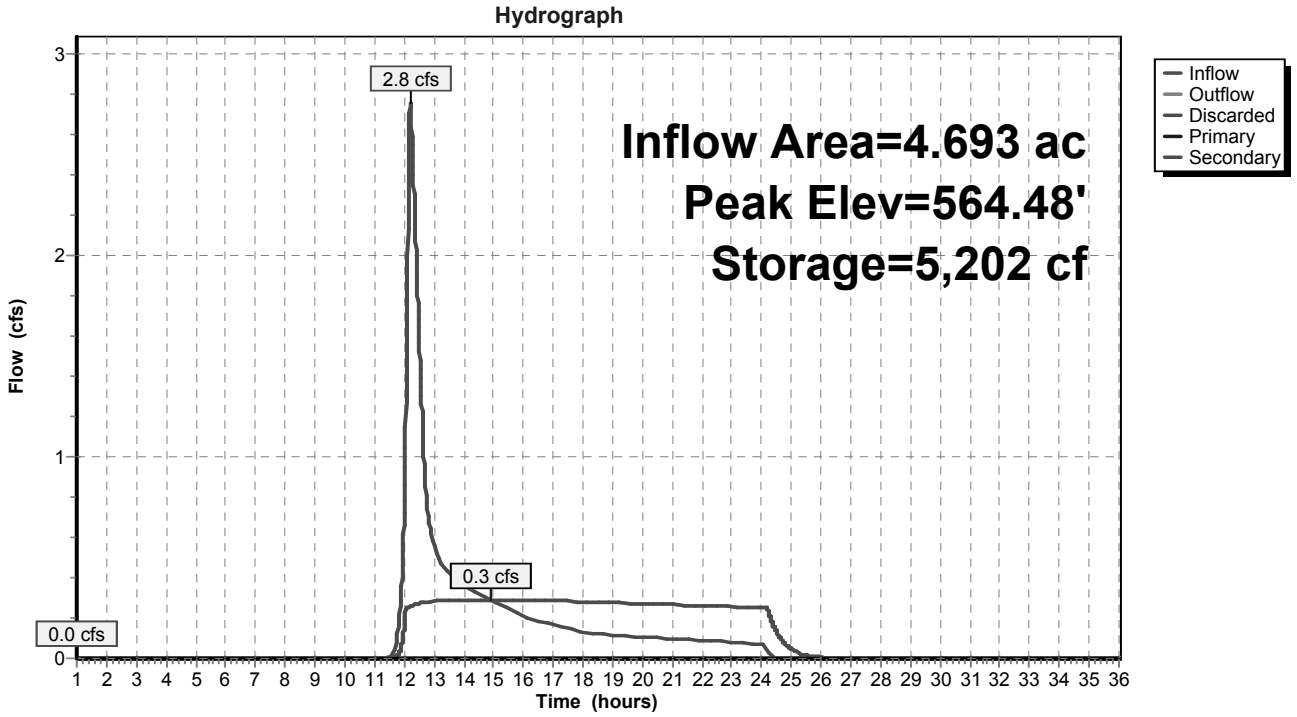
Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	559.00'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	566.90'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.3 cfs @ 14.90 hrs HW=564.48' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)
└**2=Culvert** (Passes 0.0 cfs of 6.3 cfs potential flow)
  └**3=Orifice** (Controls 0.0 cfs)
  └**4=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310



Summary for Subcatchment SC100: Runoff to DP

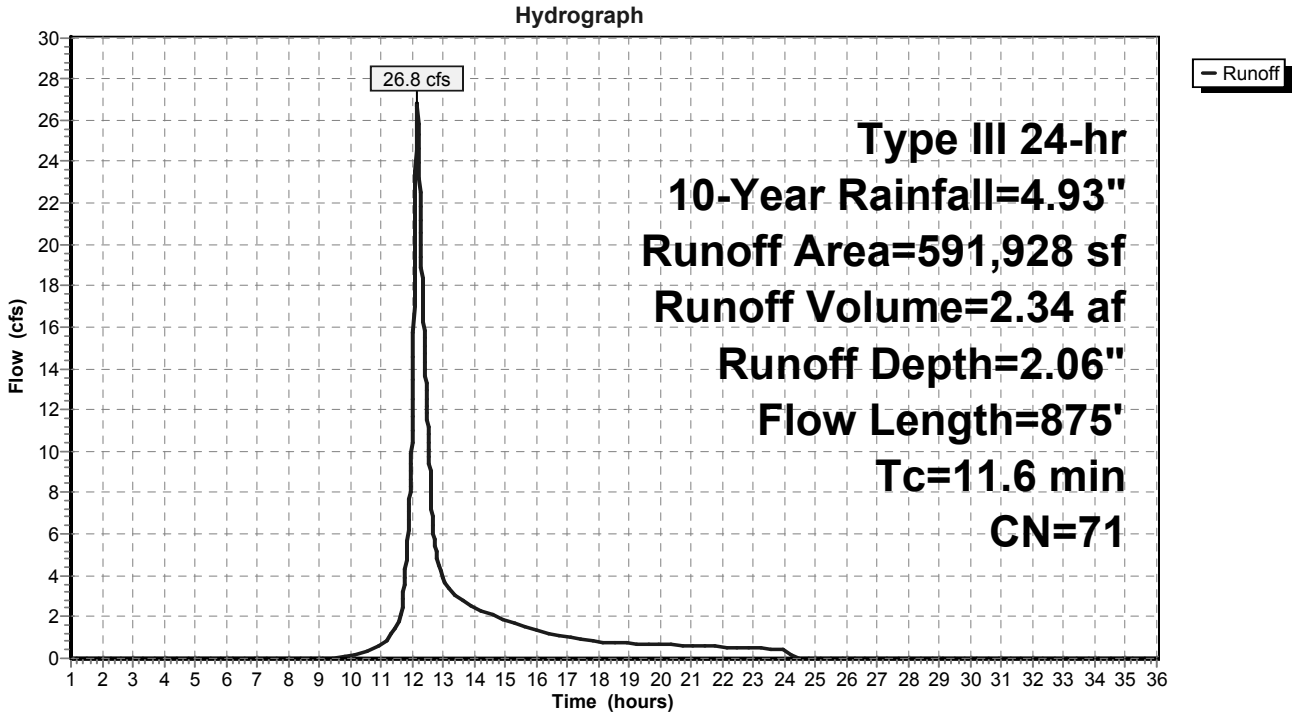
Runoff = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

	Area (sf)	CN	Description
	10,167	55	Woods, Good, HSG B
	274,355	70	Woods, Good, HSG C
*	297,729	71	Proposed Meadow, non-grazed, HSG C
*	7,085	89	Proposed Gravel roads, HSG C
*	2,592	98	Proposed Conc. Pad
	591,928	71	Weighted Average
	589,336		99.56% Pervious Area
	2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP



Summary for Subcatchment SC200: Runoff to DP

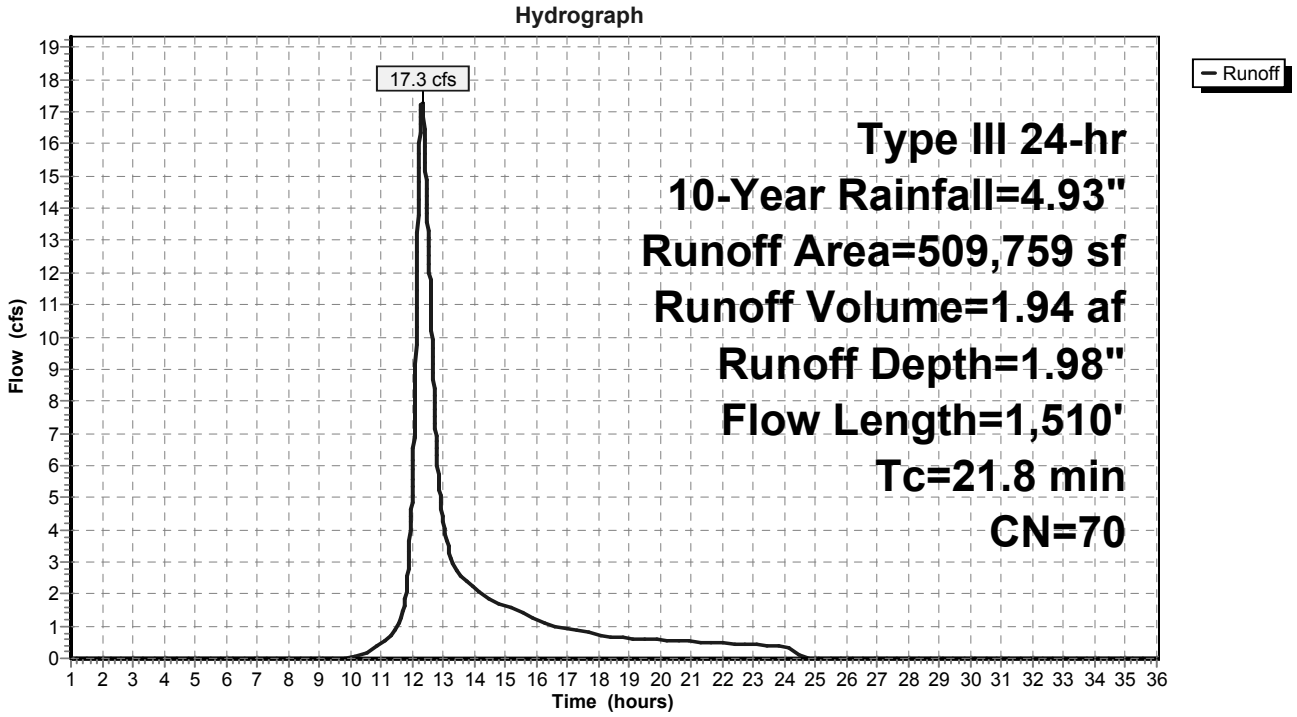
Runoff = 17.3 cfs @ 12.32 hrs, Volume= 1.94 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

	Area (sf)	CN	Description
	14,443	30	Woods, Good, HSG A
	258,670	70	Woods, Good, HSG C
	23,378	77	Woods, Good, HSG D
*	209,613	71	Proposed Meadow, non-grazed, HSG C
*	3,655	89	Proposed Gravel roads, HSG C
	509,759	70	Weighted Average
	509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP



Summary for Subcatchment SC210: Subcatchment 210

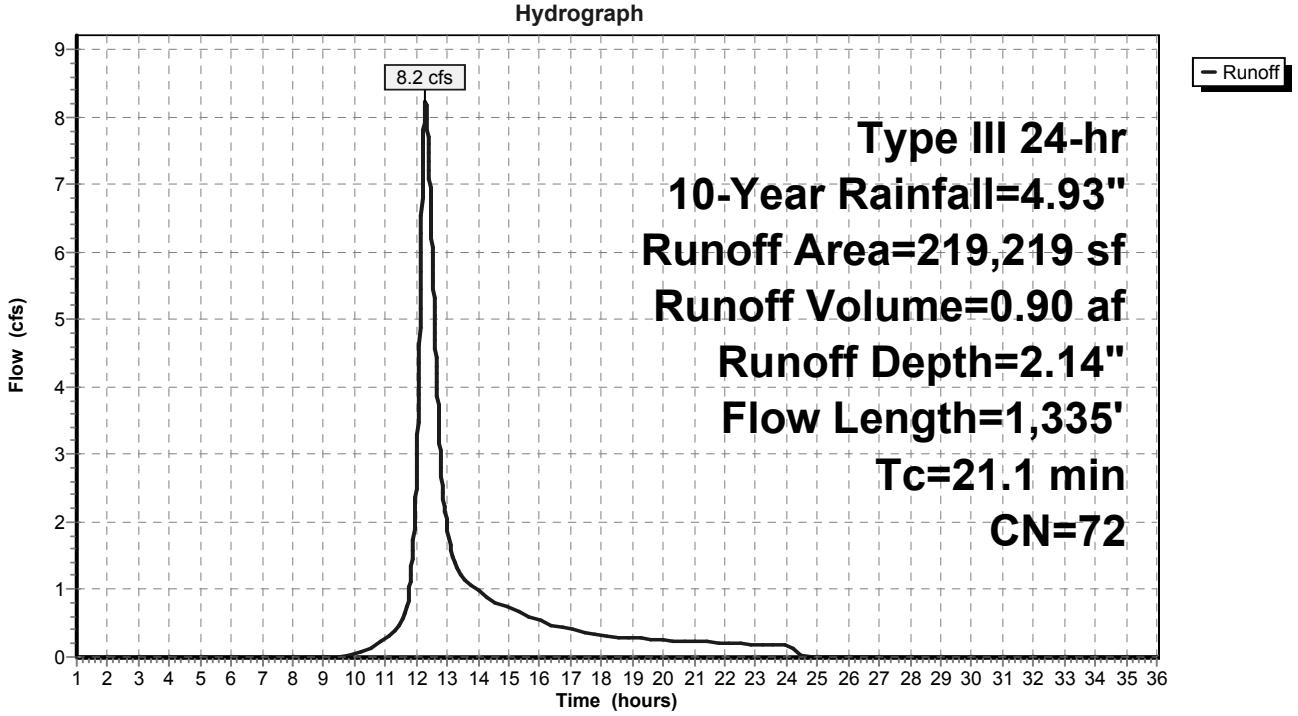
Runoff = 8.2 cfs @ 12.31 hrs, Volume= 0.90 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

	Area (sf)	CN	Description
	8,406	70	Woods, Good, HSG C
	48,590	74	>75% Grass cover, Good, HSG C
*	152,258	71	Proposed Meadow, non-grazed, HSG C
*	9,965	89	Proposed Gravel roads, HSG C
	219,219	72	Weighted Average
	219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210



Summary for Subcatchment SC300: Runoff to DP

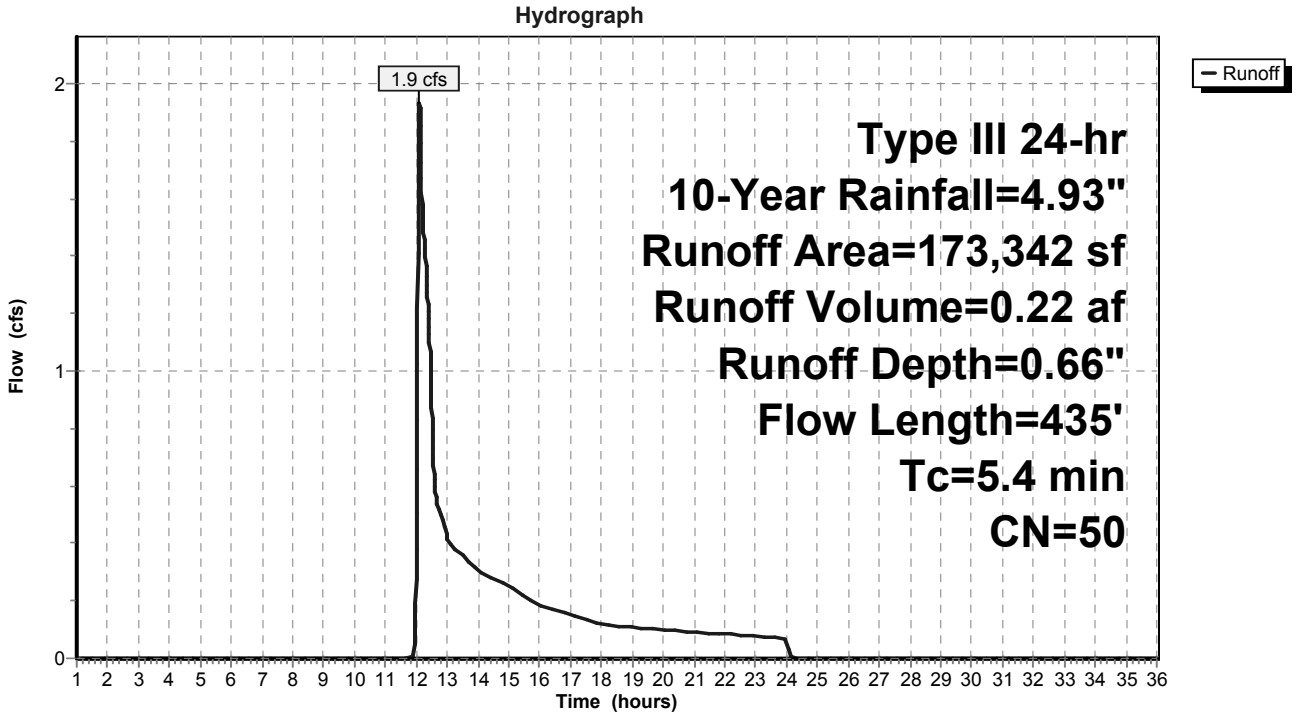
Runoff = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

	Area (sf)	CN	Description
	69,181	30	Woods, Good, HSG A
	35,738	55	Woods, Good, HSG B
	32,088	70	Woods, Good, HSG C
*	3,139	30	Proposed Meadow, non-grazed, HSG A
*	33,196	71	Proposed Meadow, non-grazed, HSG c
	173,342	50	Weighted Average
	173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP



Summary for Subcatchment SC310: Subcatchment 310

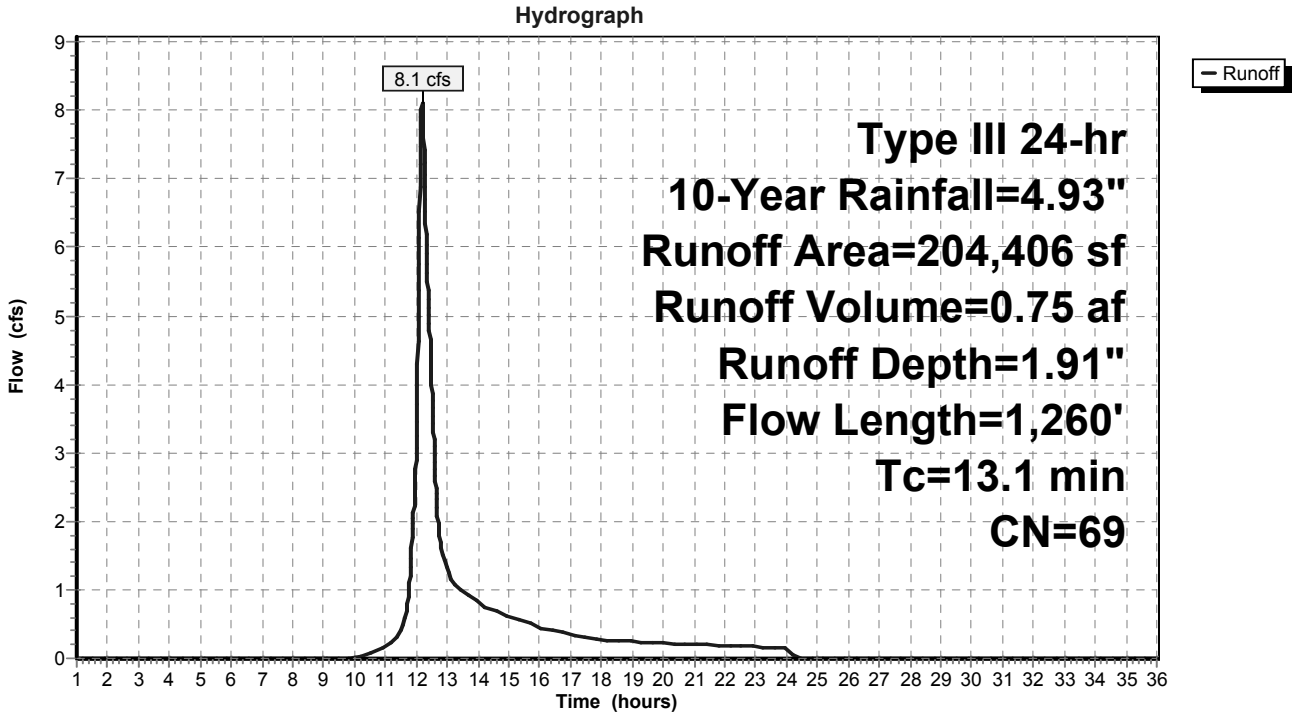
Runoff = 8.1 cfs @ 12.19 hrs, Volume= 0.75 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

	Area (sf)	CN	Description
	2,723	70	Woods, Good, HSG C
*	9,697	30	Proposed Meadow, non-grazed, HSG A
*	191,986	71	Proposed Meadow, non-grazed, HSG c
	204,406	69	Weighted Average
	204,406		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

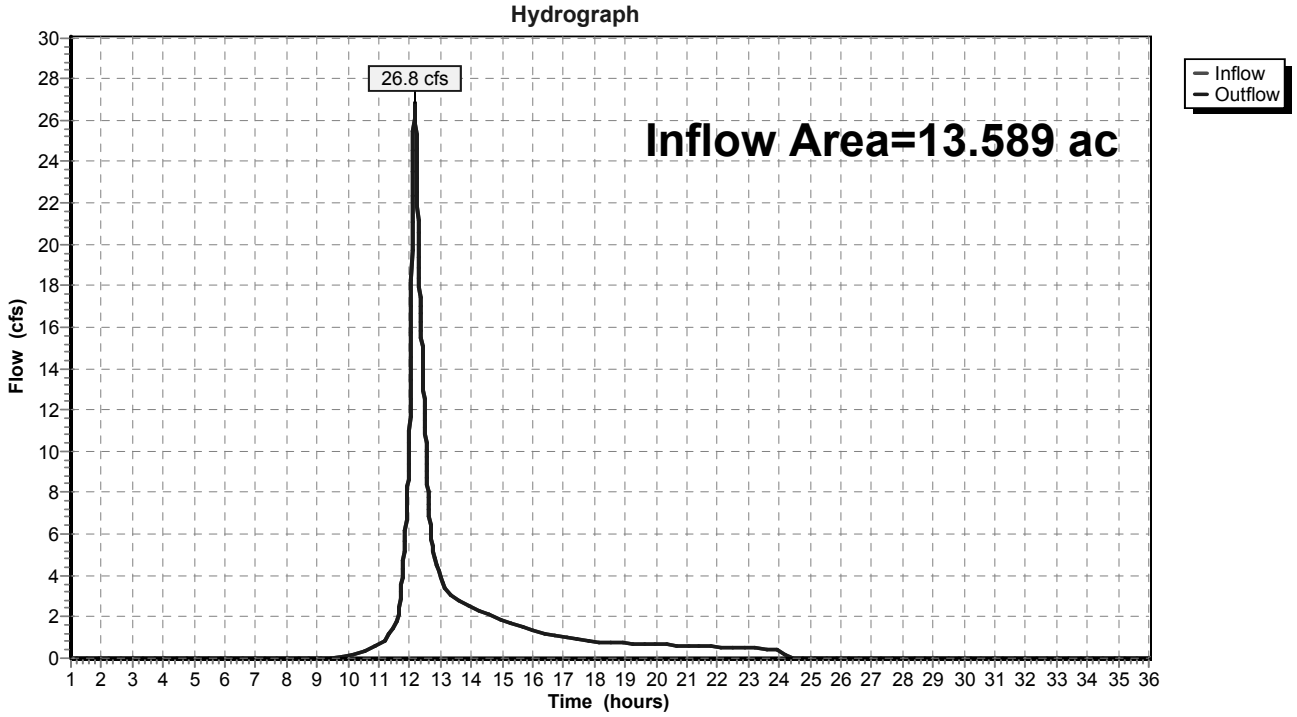


Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 2.06" for 10-Year event
Inflow = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af
Outflow = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

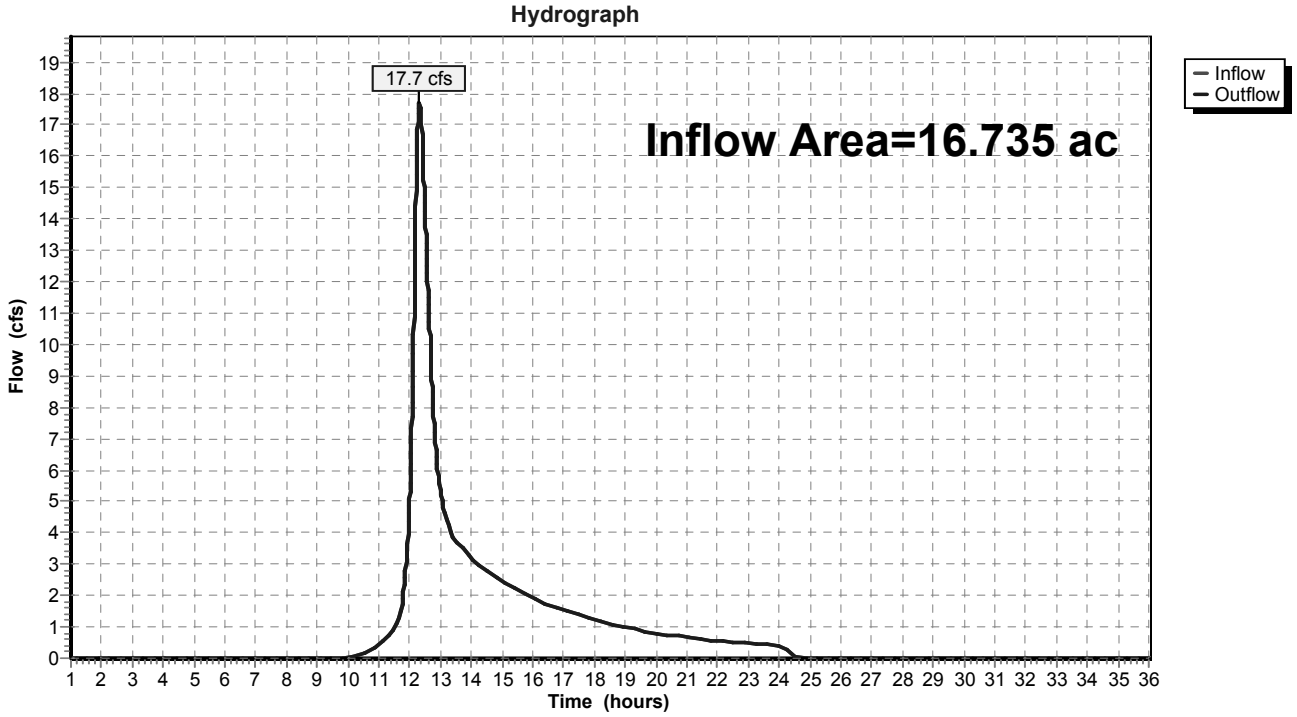


Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 1.73" for 10-Year event
Inflow = 17.7 cfs @ 12.33 hrs, Volume= 2.41 af
Outflow = 17.7 cfs @ 12.33 hrs, Volume= 2.41 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

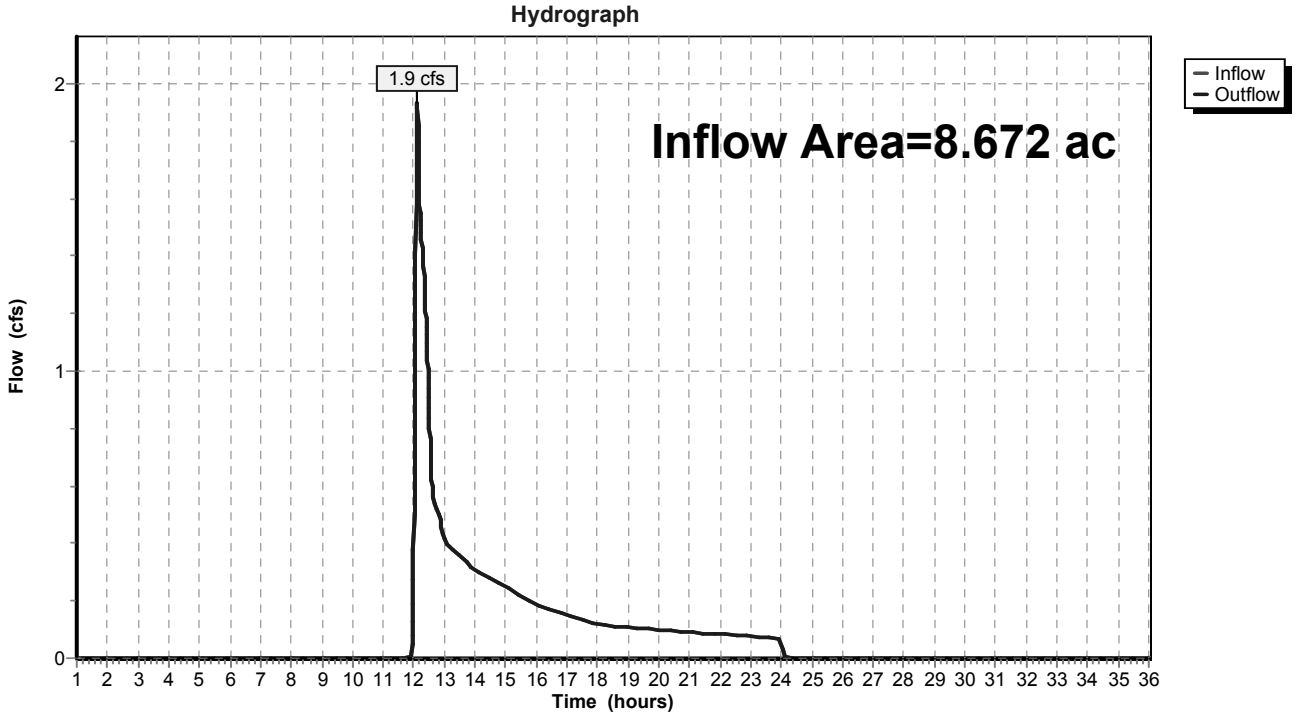


Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 0.30" for 10-Year event
Inflow = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af
Outflow = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters



Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 2.14" for 10-Year event
Inflow = 8.2 cfs @ 12.31 hrs, Volume= 0.90 af
Outflow = 1.4 cfs @ 13.22 hrs, Volume= 0.90 af, Atten= 83%, Lag= 54.8 min
Discarded = 0.3 cfs @ 13.22 hrs, Volume= 0.43 af
Primary = 1.1 cfs @ 13.22 hrs, Volume= 0.47 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 595.32' @ 13.22 hrs Surf.Area= 13,691 sf Storage= 16,758 cf

Plug-Flow detention time= 192.2 min calculated for 0.90 af (100% of inflow)
Center-of-Mass det. time= 192.2 min (1,049.5 - 857.3)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

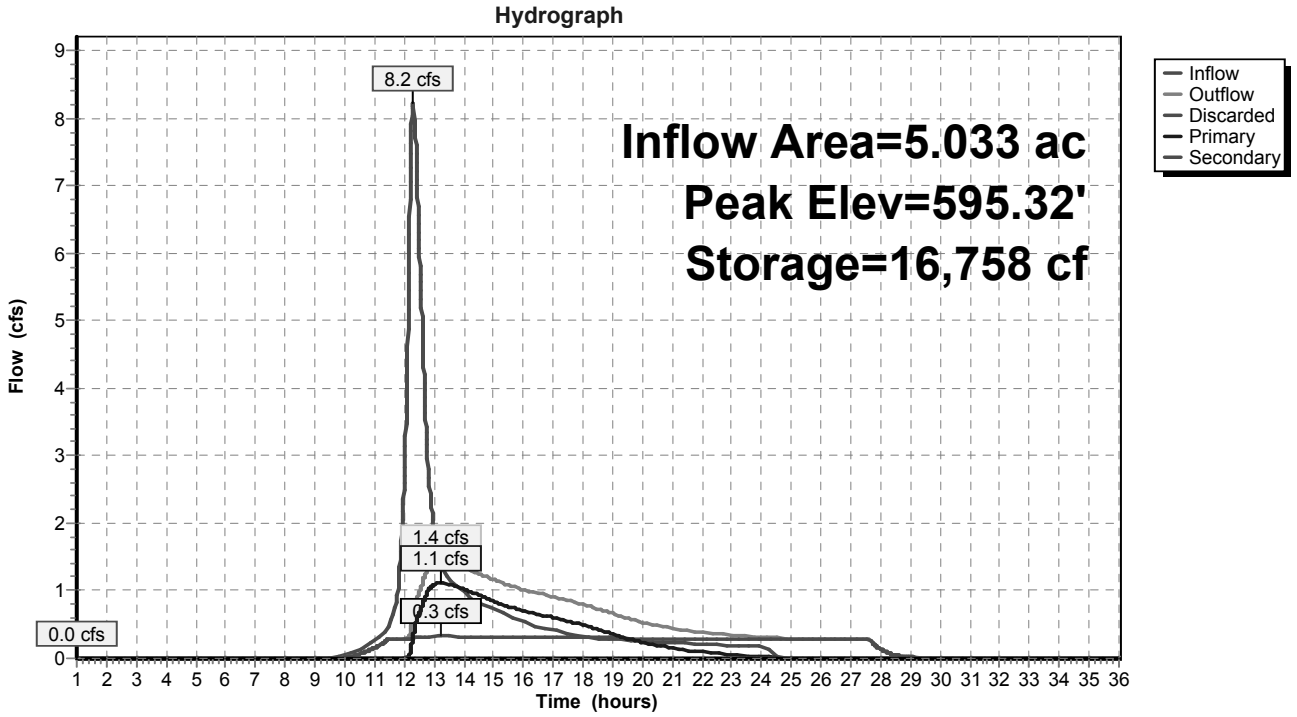
Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	589.00'	**12.0" Round Culvert** L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	595.00'	**6.0" Vert. Orifice** C= 0.600
#5	Device 2	597.00'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.3 cfs @ 13.22 hrs HW=595.32' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=1.1 cfs @ 13.22 hrs HW=595.32' (Free Discharge)
└**2=Culvert** (Passes 1.1 cfs of 9.1 cfs potential flow)
  ├**3=Orifice** (Orifice Controls 0.9 cfs @ 4.4 fps)
  ├**4=Orifice** (Orifice Controls 0.3 cfs @ 1.9 fps)
  └**5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
└**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210



Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 1.91" for 10-Year event
Inflow = 8.1 cfs @ 12.19 hrs, Volume= 0.75 af
Outflow = 0.4 cfs @ 16.37 hrs, Volume= 0.71 af, Atten= 95%, Lag= 250.8 min
Discarded = 0.4 cfs @ 16.37 hrs, Volume= 0.71 af
Primary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 565.63' @ 16.37 hrs Surf.Area= 13,207 sf Storage= 19,205 cf

Plug-Flow detention time= 543.1 min calculated for 0.71 af (95% of inflow)
Center-of-Mass det. time= 516.9 min (1,374.5 - 857.6)

Volume	Invert	Avail.Storage	Storage Description
#1	564.00'	56,980 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

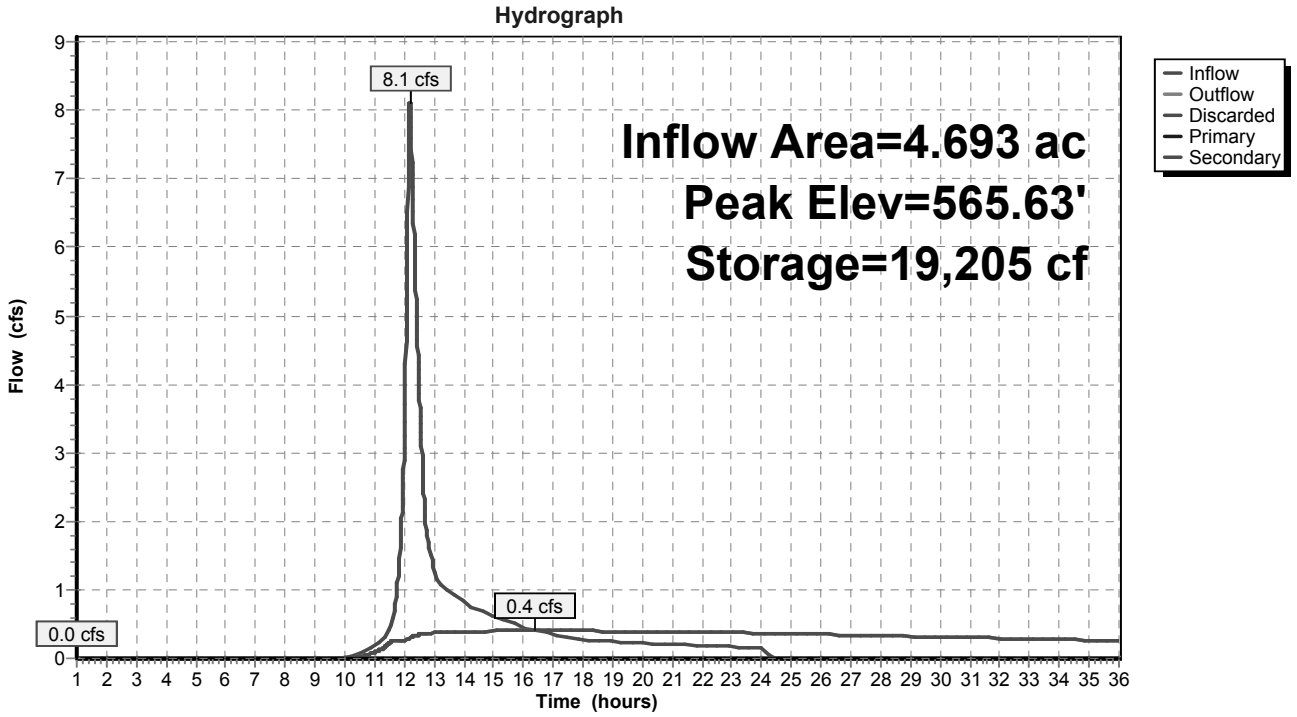
Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	559.00'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	566.90'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.4 cfs @ 16.37 hrs HW=565.63' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)
└**2=Culvert** (Passes 0.0 cfs of 6.3 cfs potential flow)
  └**3=Orifice** (Controls 0.0 cfs)
  └**4=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310



Summary for Subcatchment SC100: Runoff to DP

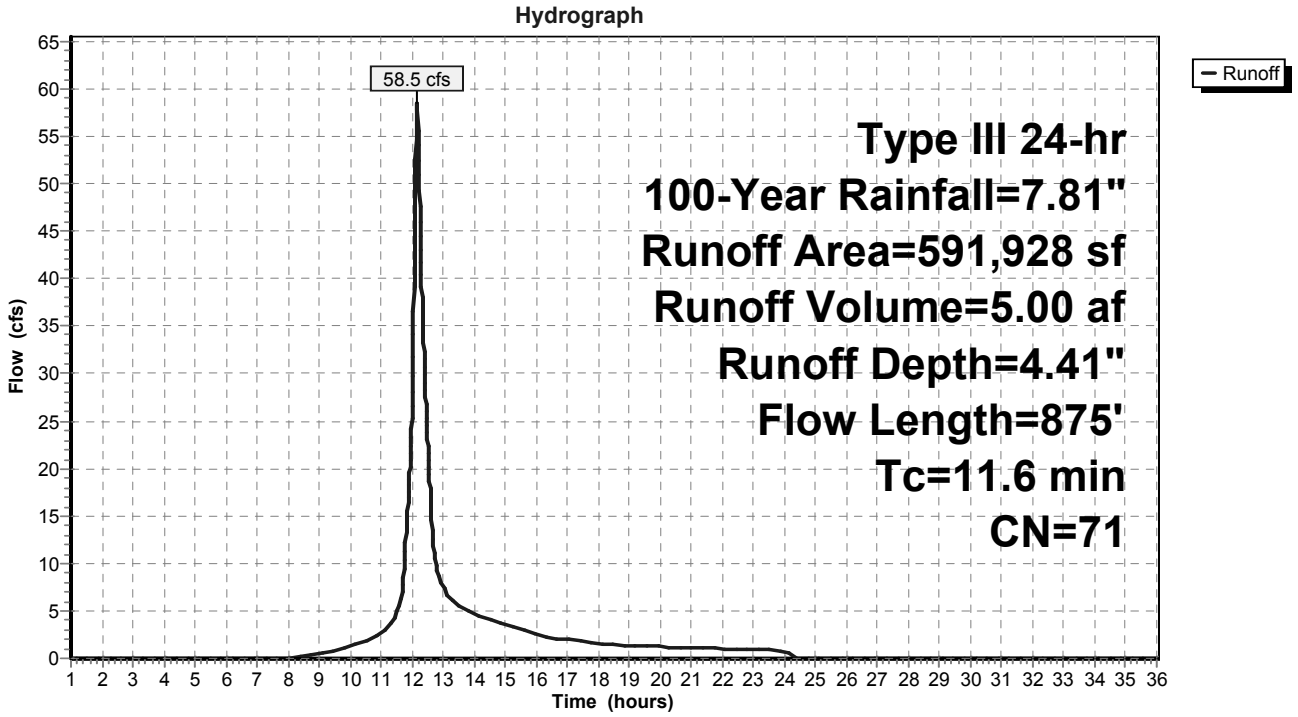
Runoff = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

	Area (sf)	CN	Description
	10,167	55	Woods, Good, HSG B
	274,355	70	Woods, Good, HSG C
*	297,729	71	Proposed Meadow, non-grazed, HSG C
*	7,085	89	Proposed Gravel roads, HSG C
*	2,592	98	Proposed Conc. Pad
	591,928	71	Weighted Average
	589,336		99.56% Pervious Area
	2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP



Summary for Subcatchment SC200: Runoff to DP

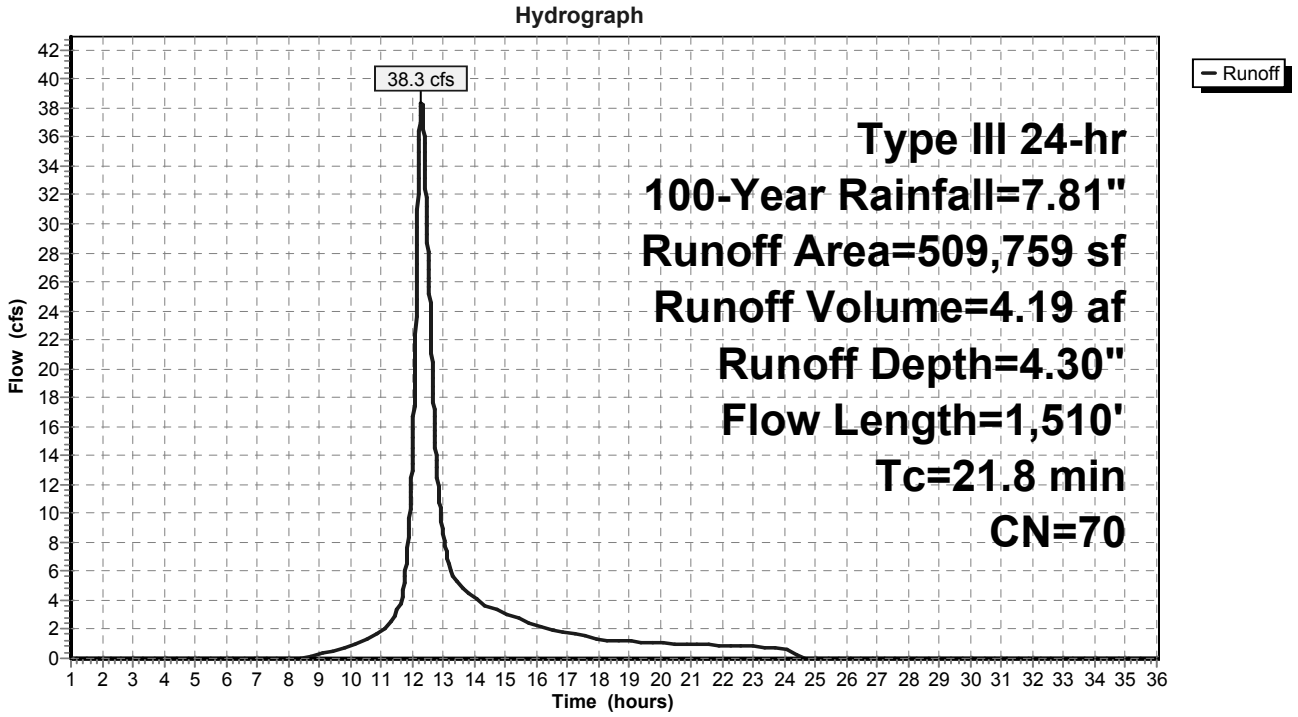
Runoff = 38.3 cfs @ 12.30 hrs, Volume= 4.19 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

	Area (sf)	CN	Description
	14,443	30	Woods, Good, HSG A
	258,670	70	Woods, Good, HSG C
	23,378	77	Woods, Good, HSG D
*	209,613	71	Proposed Meadow, non-grazed, HSG C
*	3,655	89	Proposed Gravel roads, HSG C
	509,759	70	Weighted Average
	509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		**Sheet Flow, Sheet Flow** Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP



Summary for Subcatchment SC210: Subcatchment 210

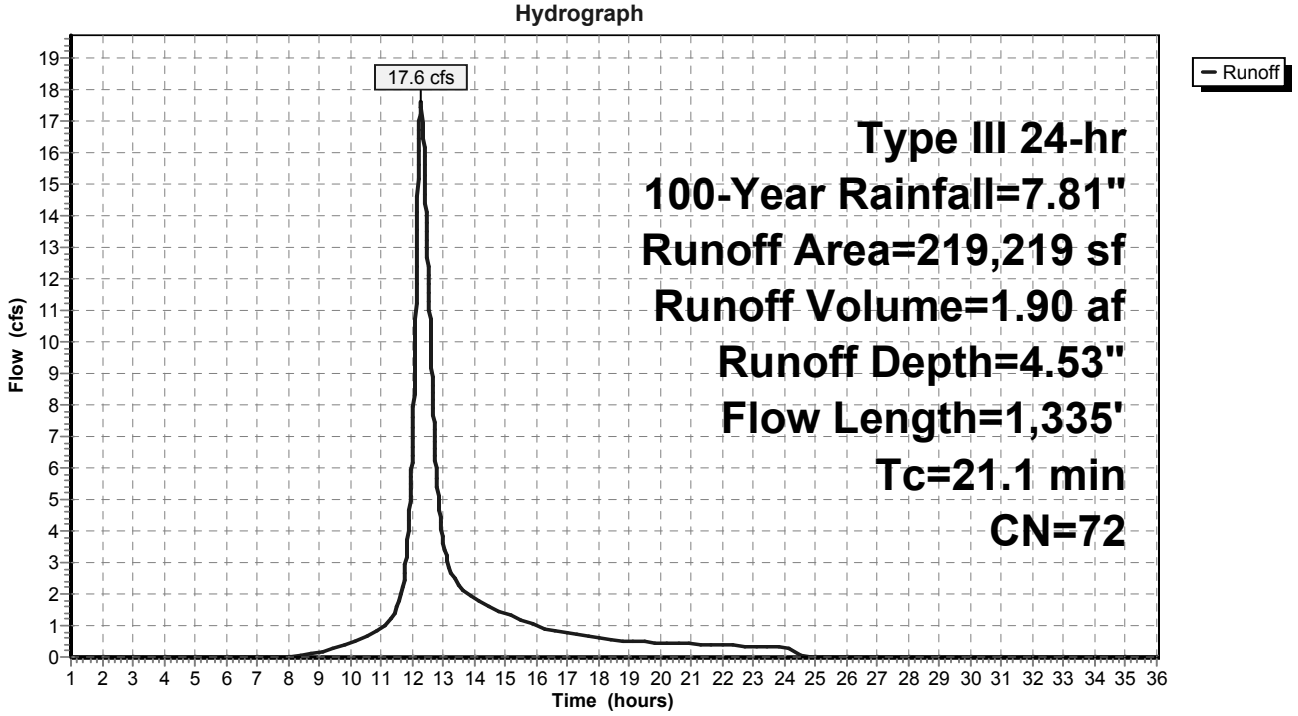
Runoff = 17.6 cfs @ 12.29 hrs, Volume= 1.90 af, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

	Area (sf)	CN	Description
	8,406	70	Woods, Good, HSG C
	48,590	74	>75% Grass cover, Good, HSG C
*	152,258	71	Proposed Meadow, non-grazed, HSG C
*	9,965	89	Proposed Gravel roads, HSG C
	219,219	72	Weighted Average
	219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210



Summary for Subcatchment SC300: Runoff to DP

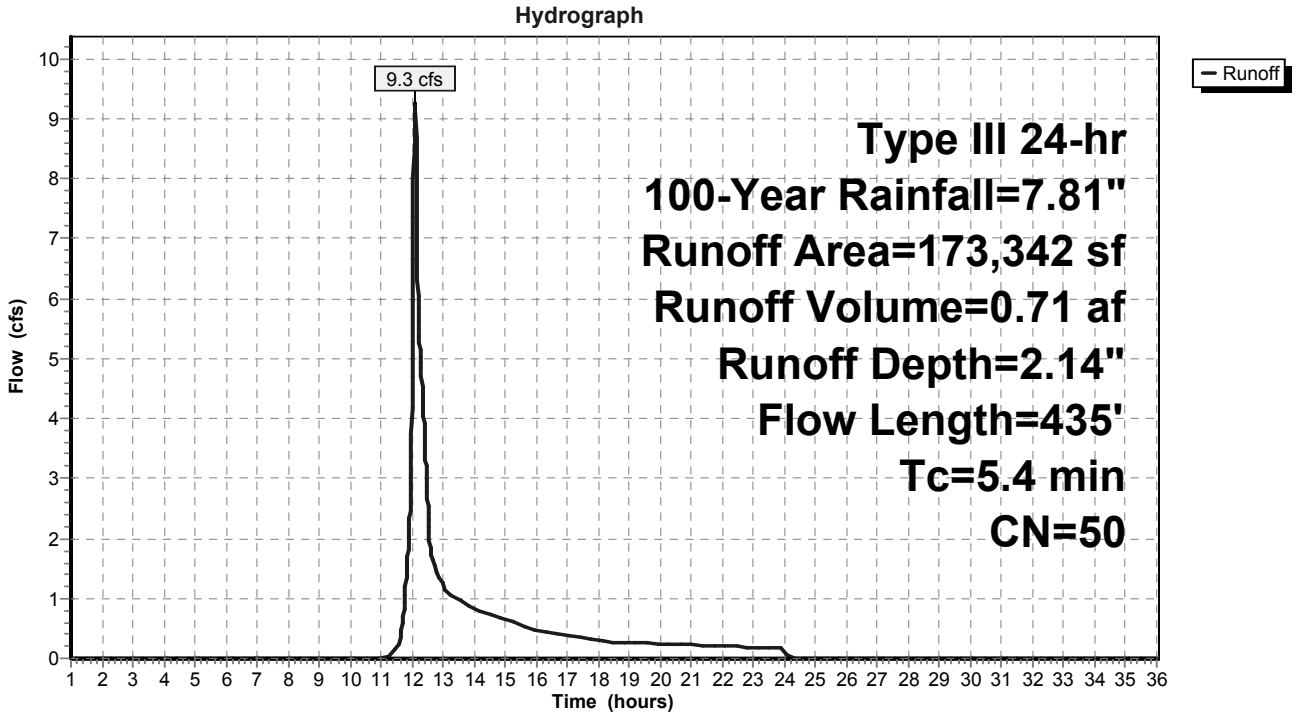
Runoff = 9.3 cfs @ 12.09 hrs, Volume= 0.71 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

	Area (sf)	CN	Description
	69,181	30	Woods, Good, HSG A
	35,738	55	Woods, Good, HSG B
	32,088	70	Woods, Good, HSG C
*	3,139	30	Proposed Meadow, non-grazed, HSG A
*	33,196	71	Proposed Meadow, non-grazed, HSG c
	173,342	50	Weighted Average
	173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP



Summary for Subcatchment SC310: Subcatchment 310

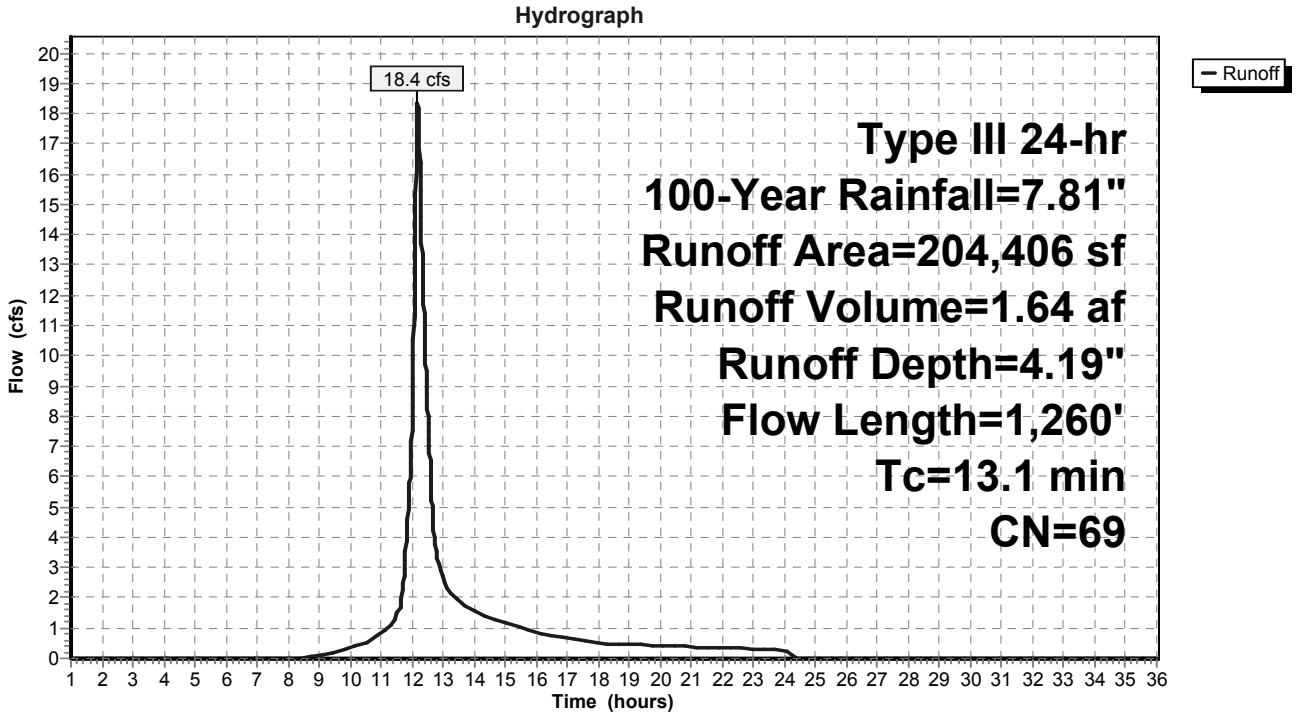
Runoff = 18.4 cfs @ 12.18 hrs, Volume= 1.64 af, Depth= 4.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

	Area (sf)	CN	Description
	2,723	70	Woods, Good, HSG C
*	9,697	30	Proposed Meadow, non-grazed, HSG A
*	191,986	71	Proposed Meadow, non-grazed, HSG c
	204,406	69	Weighted Average
	204,406		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (A)** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (B)** Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		**Shallow Concentrated Flow, Shallow Concentrated Flow (C)** Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		**Shallow Concentrated Flow, Shallow Concentrated Flow (D)** Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		**Shallow Concentrated Flow, Shallow Concentrated Flow (E)** Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

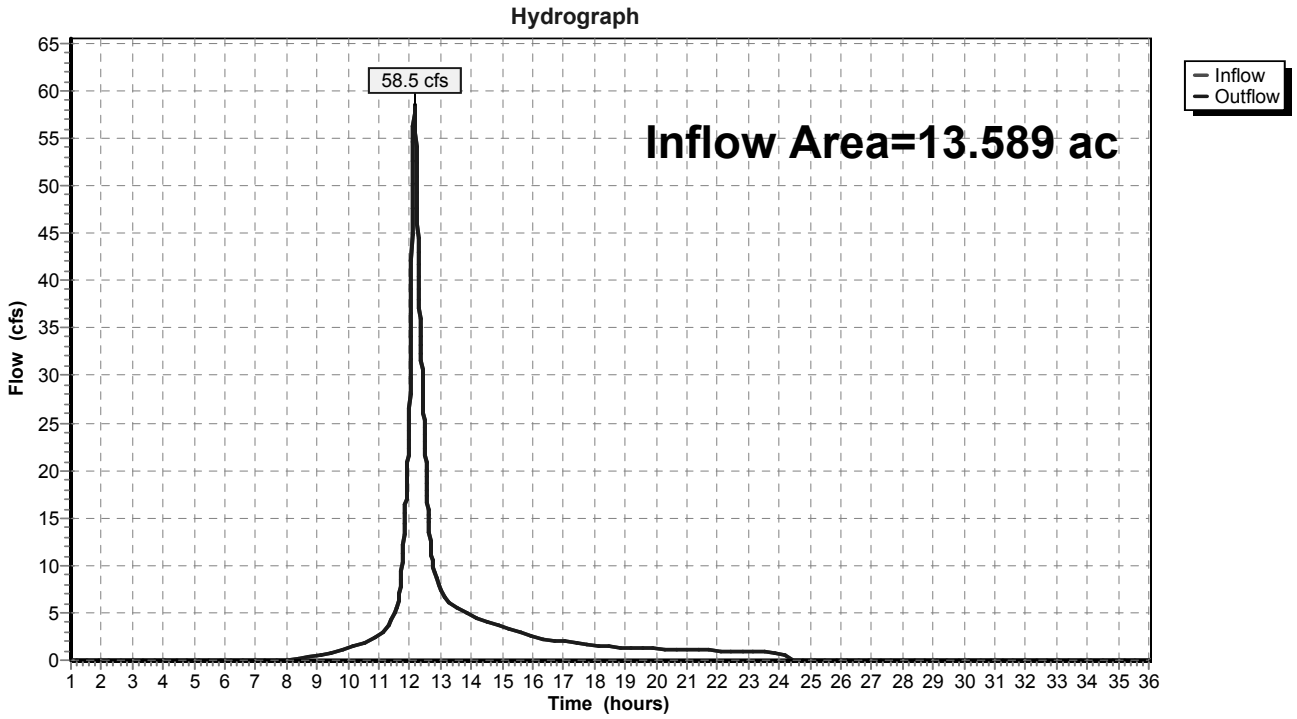


Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 4.41" for 100-Year event
Inflow = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af
Outflow = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

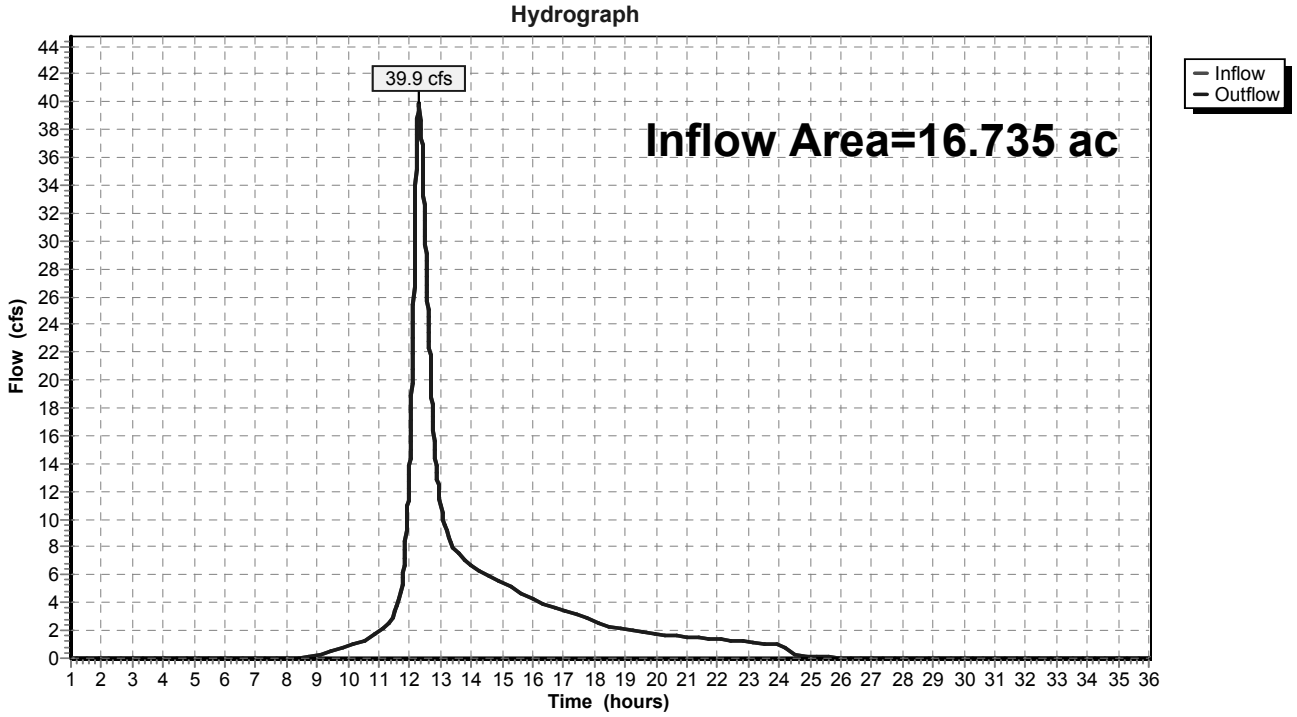


Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 3.98" for 100-Year event
Inflow = 39.9 cfs @ 12.31 hrs, Volume= 5.55 af
Outflow = 39.9 cfs @ 12.31 hrs, Volume= 5.55 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

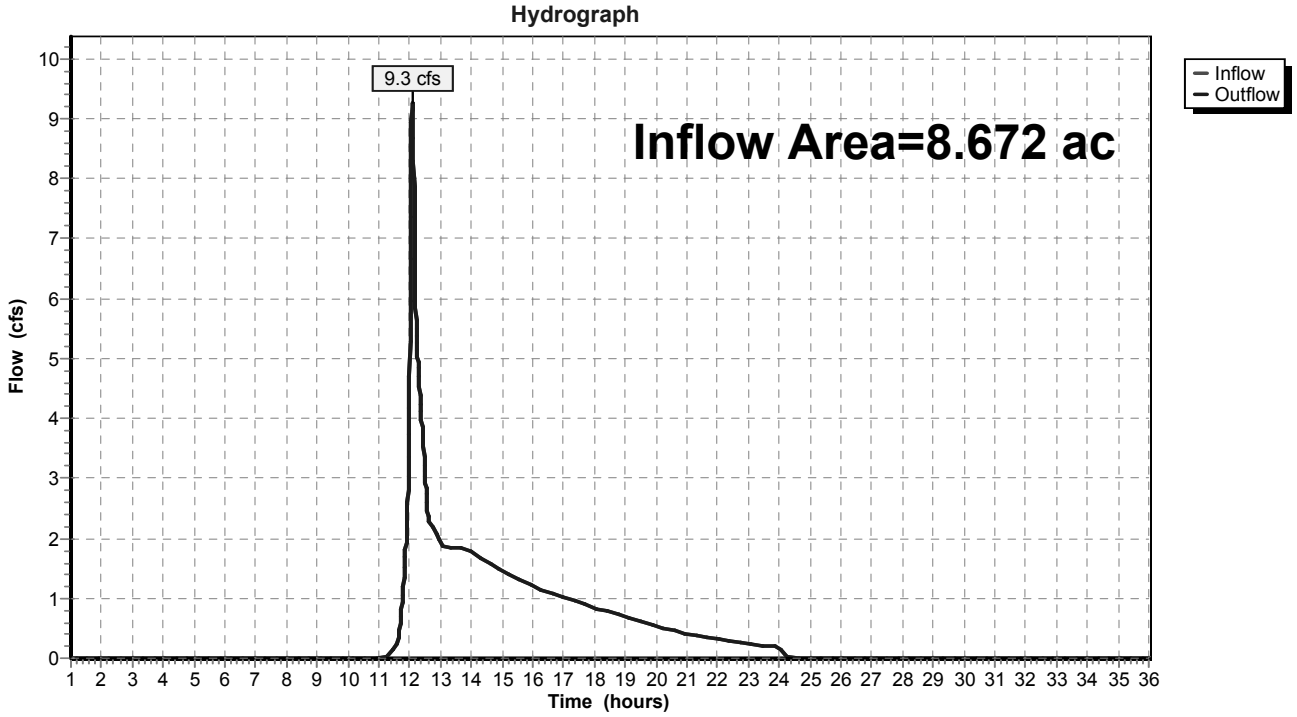


Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 1.62" for 100-Year event
Inflow = 9.3 cfs @ 12.09 hrs, Volume= 1.17 af
Outflow = 9.3 cfs @ 12.09 hrs, Volume= 1.17 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters



Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 4.53" for 100-Year event
Inflow = 17.6 cfs @ 12.29 hrs, Volume= 1.90 af
Outflow = 3.0 cfs @ 13.16 hrs, Volume= 1.90 af, Atten= 83%, Lag= 52.1 min
Discarded = 0.4 cfs @ 13.16 hrs, Volume= 0.54 af
Primary = 2.6 cfs @ 13.16 hrs, Volume= 1.36 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 596.76' @ 13.16 hrs Surf.Area= 15,914 sf Storage= 38,062 cf

Plug-Flow detention time= 193.0 min calculated for 1.90 af (100% of inflow)
Center-of-Mass det. time= 193.1 min (1,028.7 - 835.6)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

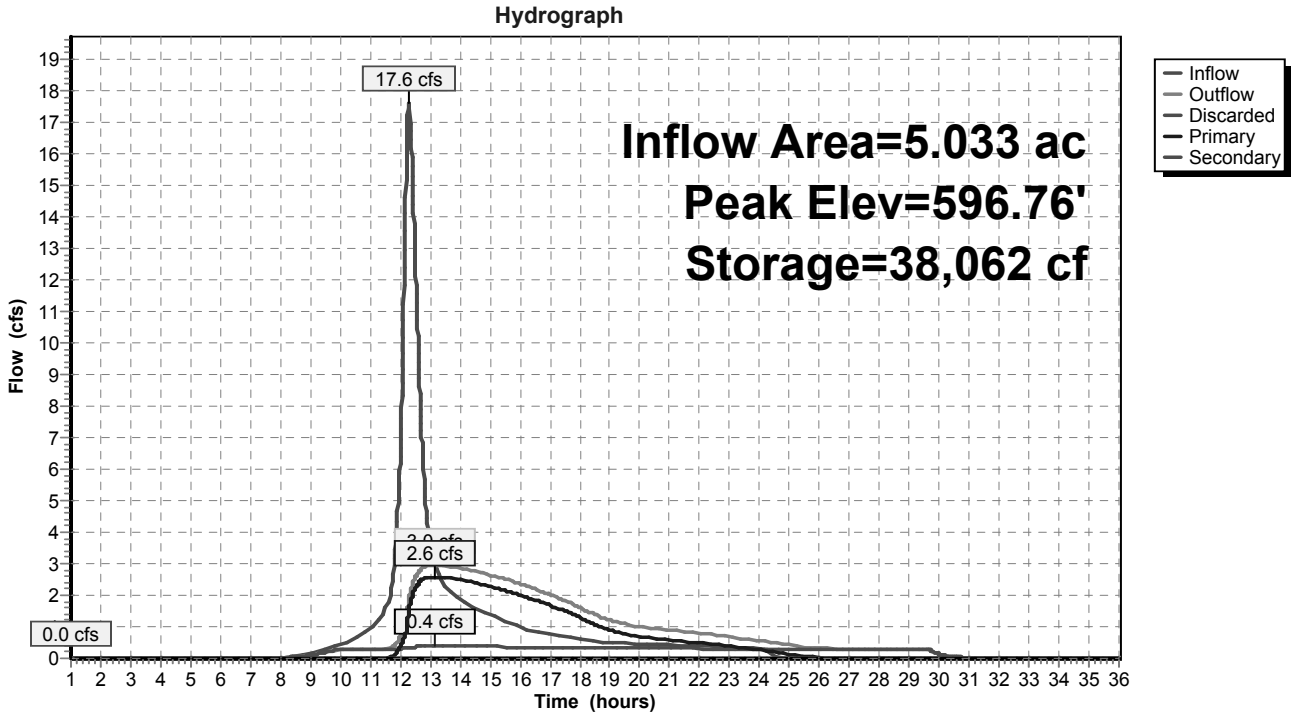
Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	589.00'	**12.0" Round Culvert** L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	595.00'	**6.0" Vert. Orifice** C= 0.600
#5	Device 2	597.00'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.4 cfs @ 13.16 hrs HW=596.76' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=2.6 cfs @ 13.16 hrs HW=596.76' (Free Discharge)
└**2=Culvert** (Passes 2.6 cfs of 10.2 cfs potential flow)
  ├**3=Orifice** (Orifice Controls 1.4 cfs @ 7.2 fps)
  ├**4=Orifice** (Orifice Controls 1.2 cfs @ 5.9 fps)
  └**5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
└**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210



Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 4.19" for 100-Year event
Inflow = 18.4 cfs @ 12.18 hrs, Volume= 1.64 af
Outflow = 1.6 cfs @ 13.98 hrs, Volume= 1.43 af, Atten= 91%, Lag= 108.1 min
Discarded = 0.6 cfs @ 13.98 hrs, Volume= 0.97 af
Primary = 1.0 cfs @ 13.98 hrs, Volume= 0.46 af
Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 566.96' @ 13.98 hrs Surf.Area= 16,259 sf Storage= 38,685 cf

Plug-Flow detention time= 431.9 min calculated for 1.43 af (87% of inflow)
Center-of-Mass det. time= 374.3 min (1,208.8 - 834.6)

Volume	Invert	Avail.Storage	Storage Description
#1	564.00'	56,980 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

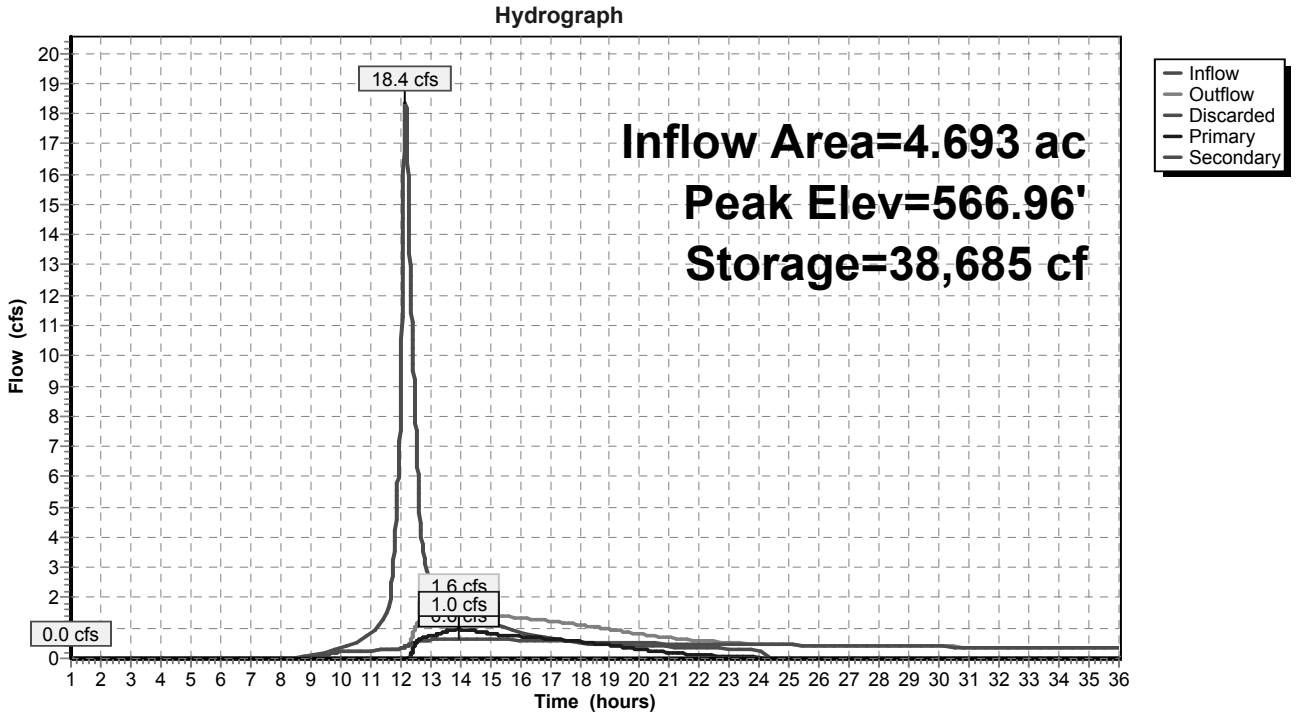
Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	**1.020 in/hr Exfiltration over Wetted area**
#2	Primary	559.00'	**12.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	**6.0" Vert. Orifice** C= 0.600
#4	Device 2	566.90'	**12.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.6 cfs @ 13.98 hrs HW=566.96' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=1.0 cfs @ 13.98 hrs HW=566.96' (Free Discharge)
└**2=Culvert** (Passes 1.0 cfs of 8.2 cfs potential flow)
  └**3=Orifice** (Orifice Controls 0.8 cfs @ 4.1 fps)
  └**4=Grate** (Weir Controls 0.2 cfs @ 0.8 fps)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310



APPENDIX

OPERATION & MAINTENANCE PROGRAM

OPERATION AND MAINTENANCE PROGRAM
for
A PROPOSED STORMWATER MANAGEMENT SYSTEM
located at
95 MAIN STREET
WILLIAMSBURG, MASSACHUSETTS

Applicant:

ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100
Worcester, MA 01605

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

October 28, 2018

Project Name: ZPTII-222 SOLAR ARRAY
95 Main Street
Williamsburg, Massachusetts 01039

Owner Name: **95 Main Street:**
Lawrence E. & Linda A. West
18 South Street
Williamsburg, Massachusetts

Party Responsible for Maintenance During and After Construction:
ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100
Worcester, MA 01605

Erosion and Sedimentation Control Measures during Construction Activities

Haybales/ Silt Fence/Silt Sock erosion control barriers

Staked haybales and silt fencing will be installed upgradient of the resource areas as depicted on the Erosion & Sediment Control Plan. The haybales and silt fence shall be installed prior to the commencement of any work on-site and in accordance with the design plans. An additional supply of haybales and silt fence shall be on-site to replace and/or repair any haybales or silt fence that have been disturbed or are in poor condition. The line of haybales and silt fence shall be inspected and maintained on a weekly basis and after every major storm event (0.5 inches of rain or greater) during construction. No construction activities are to occur beyond the haybale line at any time. Deposited sediments shall be removed when the volume of the deposition reaches approximately one-half the height of the hay bale.

Silt sock barrier locations are shown on the design plans and shall be installed at the intervals and locations along the slope as dimensioned on those plans. If, during construction, a barrier needs to be temporarily moved in order to allow construction in a specific area, the barrier shall be returned to its original location or as close to its original location as possible after the work is complete. These barriers shall be inspected at the same time intervals as the haybale barriers, and accumulated sediment shall be removed as needed to maintain proper functioning of the barrier. The means of creating new lengths of silt sock barrier shall be maintained on site during construction in order to replace damaged sections quickly as necessary.

Infiltration/Stormwater Basins

The Stormwater/Infiltration surface basins shall be checked weekly and after major storm events during construction for rilling, erosion, and debris removal. Avoid compaction of the parent material by working from the edge of the areas proposed as the locations of the Sedimentation Basins. Any uphill erosion control barriers shall be maintained so that runoff and sediment does not accumulate inside the basins, and allows vegetative cover to take hold. Care should be taken during regular inspections to remove any plants other than the recommended seed mix to avoid possible compromise of the interior side slopes. Any accumulated sediment shall be promptly removed.

Gravel Access Drive

During construction the gravel access drive and shall be inspected daily. The access drive shall be inspected for ruts, channelized drainage, gullying and sedimentation. Repairs to the drive shall be made with new clean stone, and shall be compacted into place. Large ruts may be filled with larger stone and set in place with dense grade material, then overlain by new crushed stone.

Stockpiles

All unused debris, soil, and other material shall be stockpiled in locations of relatively flat grades upgradient of the haybales. Stockpile side slopes shall not be greater than 2:1. All stockpiles shall be surrounded by a row of haybales. Surrounding haybales shall be inspected and maintained on a daily basis.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. All disturbed slopes will be stabilized with a permanent vegetative cover. Once the forested areas have been cleared and grubbed, the entire area will be tilled following the installation of the array; areas of exposed soils will be seeded with the *"New England Conservation/Wildlife Mix"* provided by New England Wetland Plants, Inc. This seed mix contains a variety of low-growing, low-maintenance fescues that will stabilize the ground surface.

Construction Tracking Pad

The construction tracking pad shall be installed at the designated entrance/exit north of the site as shown on the Erosion & Sediment Control plans to reduce the amount of sediment transported off site. The construction tracking pads shall be inspected weekly.

Removal of Sediment and Erosion Controls

At the completion of construction activities, when a permanent vegetative cover has been established on the site, and only after receiving approval from the Town of Williamsburg Conservation Commission, all physical sediment and erosion controls shall be removed from the site. The areas where the controls have been removed shall be seeded and stabilized immediately upon removal.

Long-Term Inspection and Maintenance Measures after Construction

Infiltration/Stormwater Basins

These basins should be inspected after the first several rainfall events or first few months after construction is complete, after all major storms (0.5 inches of rain or greater), and on regular bi-annual scheduled dates. Ponded water in the basin after several days often indicates that the bottom of the pond is clogged. At this point, material at the bottom of the pond shall be excavated to a minimum depth of 8 inches and replaced with sandy material to ensure infiltration. The area shall be re-seeded and monitored weekly until a new, permanent vegetative cover is established.

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Any eroding or barren areas should be immediately re-compacted and re-vegetated.

Gravel Access Drive

The gravel access drive shall be inspected bi-annually and after every major storm event for ruts, channelized drainage, gullying and sedimentation. Repairs to the drive shall be made with new clean stone, and shall be compacted into place. Large ruts may be filled with larger stone and set in place with dense grade material, then overlain by new crushed stone. This access drive must be maintained in order to facilitate emergency vehicles moving through the site.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed when necessary, and after each storm event. Sediment and debris collected from vacuuming and/or sweeping should be disposed of at a permitted waste disposal facility. Avoid disposing of this material on site.

Grass Mowing

Grass shall be inspected annually and maintenance mowing shall occur as needed. All lawn mowing to take place will be done with a mulch mower so grass clippings will not be an

issue. Any grassed access paths and driveways shall be mowed and maintained as necessary to allow movement of vehicles throughout the site.

<u>Good Housekeeping Practices</u> (in accordance with Standard 10 of the Stormwater Management Handbook to prevent illicit discharges)

Provisions for storing paints, cleaners, automotive waste and other potentially hazardous household waste products inside or under cover

- All materials on site will be stored inside in a neat, orderly, manner in their appropriate containers with the original manufacturer's label.
- Only store enough material necessary. Whenever possible, all of a product shall be used up before disposing of container.
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.

Vehicle washing controls

- A commercial car wash shall be used when possible. Car washes treat and/or recycle water.
- Cars shall be washed on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Use biodegradable soaps.
- A water hose with a nozzle that automatically turns off when left unattended.

Requirements for routine inspection and maintenance of stormwater BMPs

See Inspection and Maintenance Measures after Construction.

Spill prevention and response plans

Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

Provisions for maintenance of lawns, gardens, and other landscaped areas

- Grass shall not be cut shorter than 2 to 3 inches and mulch clipping should be left on lawn as a natural fertilizer.
- Use low volume water approaches such as drip-type or sprinkler systems. Water plants only when needed to enhance root growth and avoid runoff problems.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

Requirements for storage and use of fertilizers, herbicides and pesticides

- Fertilizers to be used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to

storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.
- Pesticides shall be applied on lawns and gardens only when necessary and applied only in the minimum amounts recommended by the manufacturer.

Pet waste management
- Scoop up and seal pet wastes in a plastic bag. Dispose of properly, in the garbage.

Provisions for operation and management of septic systems

Not Applicable

Provisions for solid waste management
- All solid waste shall be disposed of or recycled in accordance with local town regulations.

Snow disposal and plowing plans relative to Resource Area
- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand salt and debris shall be extracted from surface and properly disposed of.
- Snow shall not be disposed of in any resource area or waterbody.
- Avoid disposing snow on top of storm drain catch basins or stormwater drainage swale.

Winter Road Salt and/or Sand use and storage restrictions
- Salt storage piles should be located outside the 100-year buffer zone and shall be covered at all times.
- The amount of road salt applied should be regulated to prevent over salting of roadways and increasing runoff concentrations. Alternative materials, such as sand or gravel, should be used in especially sensitive areas.

Roadway and Parking Lot sweeping schedule
- Pavement sweeping shall be conducted at a frequency of not less than once per year.
- Removal of any accumulated sand, grit, and debris from driveway after the snow melts shall be completed shortly after snow melts for the season.

Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL

Not Applicable

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan

To be determined by the owner.

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan

To be determined by the owner.

STORMWATER MANAGEMENT
CONSTRUCTION PHASE

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 5 Hatfield Road, Williamsburg, Massachusetts **WEATHER:** _____

Inspection Date	***Inspector***	***Area Inspected***	***Required Inspection Frequency if BMP***	***Comments***	***Recommendation***	***Follow-up Inspection Required (yes/no)***
		Erosion Barriers	*Weekly and After Major Storm Events*			
		Construction Tracking Pads	*Weekly and After Major Storm Events*			
		Gravel Access Drive	*Weekly and After Major Storm Events*			
		Stormwater Basins and Outlets	*Weekly and After Major Storm Events*			
		Grassed Swales	*Weekly and After Major Storm Events*			
		Riprap Areas	*Weekly and After Major Storm Events*			

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

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

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

Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____

STORMWATER MANAGEMENT
POST- CONSTRUCTION

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 5 Hatfield Road, Williamsburg, Massachusetts **WEATHER:** _____

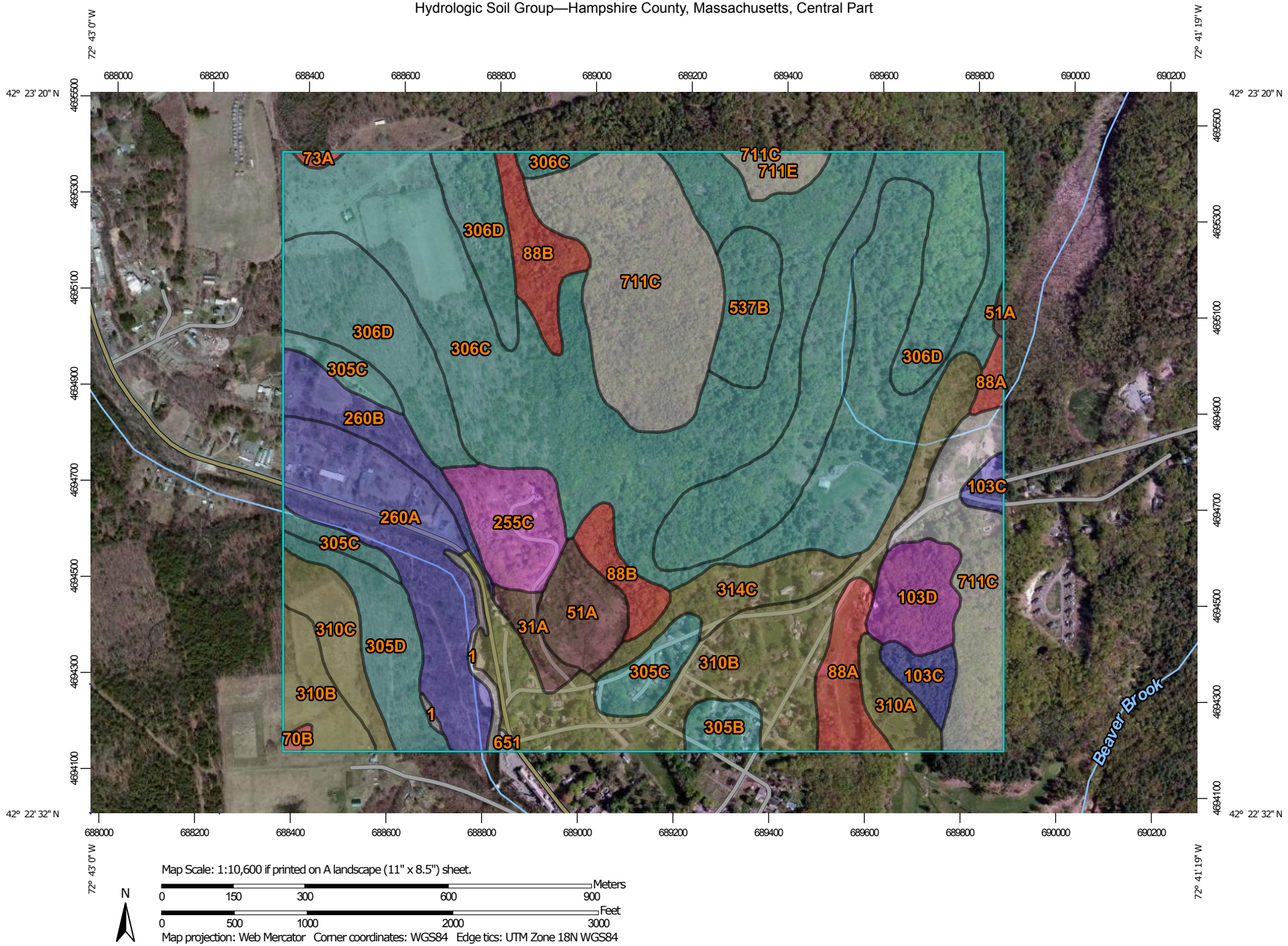
Inspection Date	*Inspector*	*Area Inspected*	*Required Inspection Frequency if BMP*	*Comments*	*Recommendation*	*Follow-up Inspection Required (yes/no)*
		Gravel Access Drive	*Bi-annually and After Major Storm Event*			
		Sedimentation Basins and Outlets	*Bi-annually and After Major Storm Event*			
		Grassed Swales	*Bi-annually and After Major Storm Event*			
		Riprap Areas	*Bi-annually and After Major Storm Event*			

(1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.
(2) Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
Stormwater Control Manager: _____

USDA NATURAL RESOURCE CONSERVATION SERVICE

NATIONAL COOPERATIVE SOIL SURVEY


72° 43' 0" W
72° 41' 19" W
42° 23' 20" N
42° 22' 32" N
688000
688200
688400
688600
688800
689000
689200
689400
689600
689800
690000
690200
4695500
4695300
4695100
4694900
4694700
4694500
4694300
4694100
73A
306C
711C
711E
306D
88B
711C
537B
51A
306D
306C
306D
88A
305C
260B
103C
260A
255C
305C
88B
314C
711C
103D
51A
31A
310C
305D
1
310B
305C
88A
103C
310A
1
310B
305B
70B
651
Beaver Brook
Map Scale: 1:10,600 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0
150
300
600
900
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 12, Oct 6, 2017

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

Date(s) aerial images were photographed: Mar 28, 2011—Mar 27, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		2.1	0.5%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	3.4	0.7%
51A	Swansea muck, 0 to 1 percent slopes	B/D	8.9	1.9%
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D	0.6	0.1%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.6	0.1%
88A	Ridgebury fine sandy loam, 0 to 3 percent slopes, very stony	D	9.6	2.1%
88B	Ridgebury fine sandy loam, 3 to 8 percent slopes, very stony	D	13.0	2.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	5.8	1.2%
103D	Charlton-Hollis- Rock outcrop complex, 15 to 25 percent slopes	A	9.1	2.0%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	11.7	2.5%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	29.3	6.3%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B	9.1	1.9%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	4.0	0.9%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	12.1	2.6%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	12.0	2.6%
306C	Paxton fine sandy loam, 8 to 15 percent slopes, very stony	C	124.4	26.7%
306D	Paxton fine sandy loam, 15 to 25 percent slopes, very stony	C	68.4	14.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D	5.4	1.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	47.0	10.1%
310C	Woodbridge fine sandy loam, 8 to 15 percent slopes	C/D	8.7	1.9%
314C	Woodbridge fine sandy loam, 8 to 15 percent slopes, stony	C/D	10.0	2.2%
537B	Paxton fine sandy loam, 3 to 8 percent slopes, stony	C	9.4	2.0%
651	Udorthents, smoothed		0.2	0.1%
711C	Charlton-Rock outcrop-Hollis complex, sloping		57.6	12.4%
711E	Charlton-Rock outcrop-Hollis complex, steep		3.7	0.8%
Totals for Area of Interest			**466.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

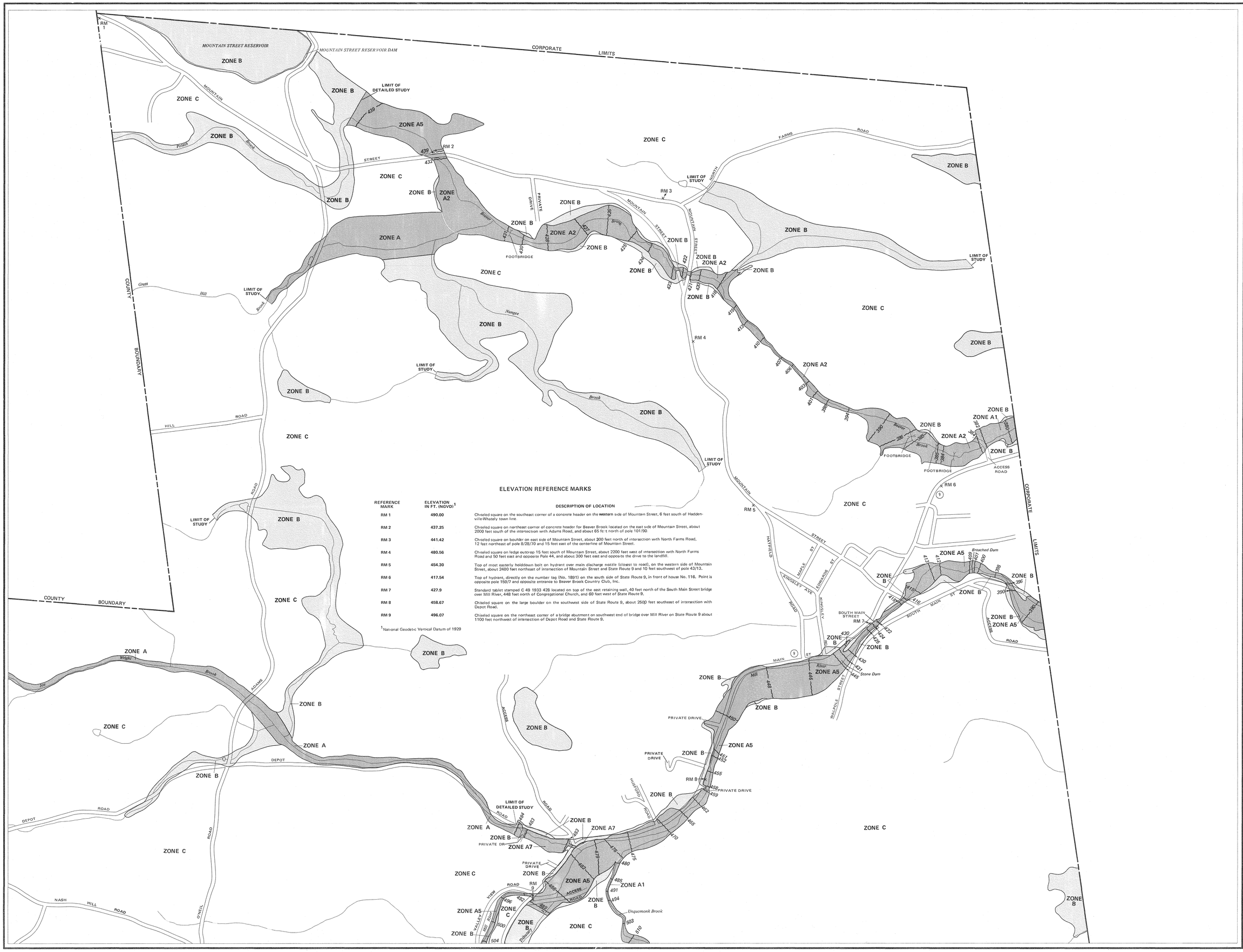
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD INSURANCE RATE MAP



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 1	490.00	Chiseled square on the southeast corner of a concrete header on the western side of Mountain Street, 6 feet south of Haddenville-Whately town line.
RM 2	437.25	Chiseled square on northeast corner of concrete header for Beaver Brook located on the east side of Mountain Street, about 2000 feet south of the intersection with Adams Road, and about 65 fe t north of pole 101/39.
RM 3	441.42	Chiseled square on boulder on east side of Mountain Street, about 300 feet north of intersection with North Farms Road, 12 feet northeast of pole 8/28/70 and 15 feet east of the centerline of Mountain Street.
RM 4	480.56	Chiseled square on ledge outcrop 15 feet south of Mountain Street, about 2200 feet west of intersection with North Farms Road and 50 feet east and opposite Pole 44, and about 300 feet east and opposite the drive to the landfill.
RM 5	454.30	Top of most easterly holddown bolt on hydrant over main discharge nozzle (closest to road), on the western side of Mountain Street, about 2400 feet northeast of intersection of Mountain Street and State Route 9 and 10 feet southwest of pole 43/13.
RM 6	417.54	Top of hydrant, directly on the number tag (No. 1891) on the south side of State Route 9, in front of house No. 116. Point is opposite pole 158/7 and opposite entrance to Beaver Brook Country Club, Inc.
RM 7	427.9	Standard tablet stamped C 49 1933 428 located on top of the east retaining wall, 40 feet north of the South Main Street bridge over Milll River, 448 feet north of Congregational Church, and 60 feet west of State Route 9.
RM 8	458.67	Chiseled square on the large boulder on the southwest side of State Route 9, about 2500 feet southeast of intersection with Depot Road.
RM 9	496.07	Chiseled square on the northeast corner of a bridge abutment on southwest end of bridge over Mill River on State Route 9 about 1100 feet northwest of intersection of Depot Road and State Route 9.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

- 500-Year Flood Boundary
- 100-Year Flood Boundary
- Zone Designations* With Date of Identification e.g., 12/3/74
- 100-Year Flood Boundary
- 500-Year Flood Boundary

ZONE B | ZONE A1 DATE | ZONE A5 DATE | ZONE B

Base Flood Elevation Line With Elevation in Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
SEPTEMBER 13, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 8, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
JUNE 1, 1981

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
600 0 600 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF
WILLIAMSBURG, MASSACHUSETTS
HAMPSHIRE COUNTY

PANEL 2 OF 4
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
250174 0002 B

EFFECTIVE DATE:
JUNE 1, 1981

federal emergency management agency
federal insurance administration