SWPPP REPORT

October 24, 2024

20233707.0001

MARLBOROUGH RESORT

MARLBOROUGH, NY

Revised 10/24/24

PREPARED FOR:
Marlborough Resort, LLC
100 Ring Road West Suite 101
Garden City, NY 11530

242 West Main Street, Suite 100 | Rochester, NY 14614 | 585.325.1000 | www.passero.com

PASSERO
engineering architecture

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1.0 EXECUTIVE SUMMARY

The proposed project is located at 626 Lattintown Road and 255 Ridge Road, Marlborough, New York. The project consists of a parcel situated on approximately 152.55 acres. The lot will consist of renovations to existing roads, cabins, and main lodge; and construction of new roads, parking areas, two event centers, two dining rooms, spa and gym, twenty eight room hotel, staff dorms, distillery, maintenance buildings, and housing for one, two, or five guests.

Stormwater generally drains overland as sheet flow and/or shallow concentrated flow to Lattintown Creek from both the east and the west, and the east side of the site drains to the east toward Ridge Road.

Under developed conditions runoff generally flows to proposed stormwater management areas. Porous pavement is located in the main hotel campus and treats that portion of the site. A Bioretention Area is located adjacent to the upper dining room building and treats that building and parking area. The east portion of the site drains to an infiltration basin located adjacent to Ridge Road. The majority of the impervious areas are treated with rooftop disconnects and vegetated buffers. Additionally, the site uses green infrastructure and runoff reduction practices to meet NYSDEC stormwater quality minimum requirements, which include water quality volume, runoff reduction volume, and channel protection volume (Section 5 of this report provides more detail on this subject). The summary table below shows the site water quantity and quality comparisons between existing and proposed conditions:

Table 1: *Summary Table*

Summary Table

Water Quantity

	Existing	Proposed	Reduction (%)
1-Year Runoff (cfs)	63.16	48.03	23.96%
10-Year Runoff (cfs)	214.31	164.52	23.23%
100-Year Runoff (cfs)	363.30	281.66	22.47%

Water Quality

	Required	Provided
Water Quality Volume (WQv) (acre-ft)	1.836	1.836
Minimum Allowable Runoff Reduction Volume (RRv) (acre-ft)	0.054	0.103
Channel Protection Volume (CPv) (acre-ft)	0.010	0.103
	Existing	**Proposed**
Qp (cfs)	214.31	164.52
Qf (cfs)	363.30	281.66

As shown above, the proposed stormwater pollution prevention plan meets minimum stormwater quality and quantity requirements set forth by the NYSDEC.

2.0 INTRODUCTION

The proposed project is located at 626 Lattintown Road and 255 Ridge Road, Marlborough, New York. The project consists of a parcel situated on approximately 152.55 acres. The lot will consist of renovations to existing roads, cabins, and main lodge; and construction of new roads, parking areas, two event centers, two dining rooms, spa and gym, twenty eight room hotel, staff dorms, distillery, maintenance buildings, and chousing for one, two, or five guests. The project consists of approximately ±41.4 acres of disturbance.

Public sewer, water, electric and telecommunications/cable will be connected along Ridge Road and/or Lattintown Road, some of which already serve the site.

The provided Stormwater Pollution Prevention Plan (SWPPP) materials adhere to the State Pollutant Discharge Elimination System (SPDES) General Permit (GP-0-20-01) for Stormwater Discharges from Construction Activity. The guidelines specified by the *New York State Stormwater Management Design Manual, January 2015* (SWDM) were used to analyze the proposed stormwater management facilities for this project. Erosion and Sediment controls were designed in conformance with New York Standards and Specifications for Erosion and Sediment Controls.

A copy of this SWPPP and associated inspection logs will be kept on site in the proposed office space and job trailer/SWPPP mailbox.

Owner/Operator
Marlborough Resort LLC
100 Ring Road West Suite 101
Garden City, NY 11530
Contact: Michael Achenbaum

SWPPP Preparer
Passero Associates
242 West Main Street. Suite 100
Rochester, NY 14614
(585) 325-1000
Contact: Jess Sudol, P.E.

3.0 EXISTING SITE CONDITIONS

3.1 Topography/ Drainage

The parcel has varied land cover, which ranges from wetlands to woodland, to open lawns, and some developed areas including existing buildings and roads. The land also varies in slope throughout the site, with slopes between 0-25%.

Existing Drainage Area 1:

The area is 23.4 acres and encompasses the entrance road and southwest woodlands on the site. Stormwater flows as sheet and shallow concentrated flow to Analysis Point 2 at the wetland border directly south of the existing yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 52 and 44.5 minutes respectively.

Existing Drainage Area 2:

The area is 6.2 acres and encompasses the northwest woodlands of the site. Stormwater flows as sheet and shallow concentrated flow to Analysis Point 2 to the north. The Curve Number (CN) and Time of Concentration (Tc) are 43 and 25.7 minutes respectively.

Existing Drainage Area 3:

This area is 7.0 acres and is composed primarily of a portion of the entrance road as well as two guest cabins and the existing yoga cabin. Stormwater flows via sheet and shallow concentrated flow to Analysis Point 2 at the wetland border directly south of the yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 60 and 14.9 minutes respectively.

Existing Drainage Area 4:

The area is 7.4 acres and encompasses the main lodge and dining areas and the associated landscaped areas. Stormwater flows via sheet and shallow concentrated flow to Analysis point 2 east of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 63 and 7.4 minutes respectively.

Existing Drainage Area 5:

The area is 5.6 acres and encompasses a portion of the southern woodlands of the site. Stormwater from this area flows via sheet and shallow concentrated flow towards analysis point 2 to the northwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 70 and 16.0 minutes respectively.

Existing Drainage Area 6:

The area is 11.6 acres and encompasses a portion of the northern woodlands of the site. Stormwater from this area travels via sheet and shallow concentrated flow towards Analysis Point 2 to the southwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 72 and 26.0 minutes respectively.

Existing Drainage Area 7:

The area is 14.7 acres and encompasses a central woodland portion of the site. Stormwater from this area travels via sheet and shallow concentrated flow to Analysis Point 2 to the northwest corner of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 73 and 18.7 minutes respectively.

Existing Drainage Area 8:

The area is 18.9 acres and encompasses the northern most portion of woodlands on site. Stormwater from this are travels via sheet and shallow concentrated flow to Analysis Point 2 to the southwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 76 and 12.2 minutes respectively.

Existing Drainage Area 9:

The area is 29.9 acres and encompasses the southeast portion of woodlands and orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 2, where it then enters Lattintown Creek. The Curve Number (CN) and Time of Concentration (Tc) are 76 and 14.8 minutes respectively.

Existing Drainage Area 10:

The area is 19.9 acres and encompasses a portion of orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 10 to the south before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 79 and 16.8 minutes respectively.

Existing Drainage Area 11:

The area is 4.3 acres and encompasses a small portion of woodlands and orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 11 before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 77 and 11.3 minutes respectively.

Existing Drainage Area 12:

The area is 4.3 acres and encompasses the remaining portion of woodlands and orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 3 before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 81 and 10.0 minutes respectively.

The provided existing drainage map in Appendix J graphically shows this drainage area, as well as the other hydraulic characteristics:

3.2 Wetlands/Tributary

The site was reviewed for the existence of federal and state regulated wetlands within the property boundaries. Federal wetlands were researched using the National Wetlands Inventory (NWI) using an online U.S. Fish and Wildlife website search. State regulated wetlands were researched using the NYSDEC's online Environmental Resource Mapper website. Refer to Appendix B and C for the federal and state regulated wetlands mapping. In addition to online mapping, a wetland delineation report was conducted.

Online wetland mapping is shown in appendix B and C.

3.3 Floodplain

Floodplains were researched using the online Firmette tools found at FEMA Map Service Center. Review of the floodplain mapping indicates there are not floodplains located on the site according to FEMA maps 36111C0790E, EFFECTIVE date 09/25/2009. Appendix E provides the FEMA Firmette maps showing the location of the floodplains.

3.4 NYSDEC Environmental Resources

The NYSDEC has an Environmental Resource Mapper on its website. The Environmental Resource Mapper is an interactive mapping application that can be used to identify some of New York State's natural resources and environmental features that are state protected, or of conservation concern. It displays the following:

- Animals and plants that are rare in New York, including those listed as Endangered or Threatened (generalized locations). [Updated May 2008]
- Significant natural communities, such as rare or high-quality forests, wetlands, and other habitat types.
- New York's streams, rivers, lakes, and ponds; water quality classifications are also displayed

According to this database, there are no potential for rare and endangered animals in the vicinity of the project. The environmental mapper is shown on Appendix C.

3.5 State Historic Preservation Office Review

The site was reviewed for the presence of an archeological sensitive area within the property boundary. The archeo-sensitive areas were located using online GIS tools found at the NYS Historic Preservation Office (SHPO).

A Phase 1A archeological investigation is being performed.

3.6 Soils

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
At	Atherton silt loam	B/D	17.3	10.7%
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	C	40.8	25.1%
BgD	Bath gravelly silt loam, 15 to 25 percent slopes	C	16.9	10.4%
BHE	Bath very stony soils, steep	C	5.3	3.3%

BnC	Bath-Nassau complex, 8 to 25 percent slopes	C	0.0	0.0%
Cd	Canandaigua silt loam, till substratum	C/D	9.2	5.6%
CF	Cut and fill land	B	0.1	0.1%
CgB	Castile gravelly silt loam, 3 to 8 percent slopes	A/D	0.6	0.4%
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	A	12.8	7.9%
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	A	2.3	1.4%
HgC	Hoosic gravelly loam, rolling	A	8.4	5.2%
LY	Lyons-Atherton complex, very stony	C/D	6.0	3.7%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	D	3.8	2.3%
MgB	Mardin-Nassau complex, 3 to 8 percent slopes	D	0.3	0.2%
Pa	Palms muck	A/D	17.2	10.6%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	D	9.8	6.1%
VoC	Volusia gravelly silt loam, 8 to 15 percent slopes	D	6.3	3.9%
VSB	Volusia channery silt loam, 0 to 8 percent slopes, very stony	D	4.9	3.0%
Totals for Area of Interest			**162.1**	**100.0%**

4.0 DEVELOPED SITE CONDITIONS

The site will be segmented into 14 proposed drainage areas. See below for a description of these drainage areas:

4.1 Proposed Drainage Area 1:

The area is 23.5 acres and encompasses the entrance road and southwest woodlands on the site. Stormwater flows as sheet and shallow concentrated flow to Analysis Point 2 at the wetland border directly south of the existing yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 50 and 44.5 minutes respectively.

4.2 Proposed Drainage Area 2:

The area is 6.4 acres and encompasses the northwest woodlands of the site. Stormwater flows as sheet and shallow concentrated flow to Analysis Point 2 to the north. The Curve Number (CN) and Time of Concentration (Tc) are 44 and 26.4 minutes respectively.

4.3 Proposed Drainage Area 3:

This area is 7.4 acres and is composed primarily of a portion of the entrance road as well as two guest cabins and the existing yoga cabin, the new hotel, events center, spa and surrounding parking. Stormwater flows via sheet and shallow concentrated flow through the porous pavement to Analysis Point 2 at the wetland border directly south of the yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 71 and 6.0 minutes respectively.

4.4 Proposed Drainage Area 4:

The area is 6.96 acres and encompasses the main lodge and dining areas and the associated landscaped areas. Stormwater flows via sheet and shallow concentrated flow to Analysis point 2 east of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 70 and 13.8 minutes respectively.

4.5 Proposed Drainage Area 5:

The area is 21.4 acres and encompasses a portion of the southern woodlands of the site. Stormwater from this area flows via sheet and shallow concentrated flow towards analysis point 2 to the northwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 72 and 20.1 minutes respectively.

4.6 Proposed Drainage Area 6:

The area is 5.7 acres and encompasses a portion of the northern woodlands of the site. Stormwater from this area travels via sheet and shallow concentrated flow towards Analysis Point 2 to the southwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 67 and 26.3 minutes respectively.

4.7 Proposed Drainage Area 7:

The area is 11.3 acres and encompasses a central woodland portion of the site. Stormwater from this area travels via sheet and shallow concentrated flow to Analysis Point 2 to the northwest corner of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 75 and 26.0 minutes respectively.

4.8 Proposed Drainage Area 8:

The area is 17.5 acres and encompasses the northern most portion of woodlands on site. Stormwater from this are travels via sheet and shallow concentrated flow to Analysis Point 2 to the southwest of the drainage area. The Curve Number (CN) and Time of Concentration (Tc) are 77 and 21.5 minutes respectively.

4.9 Proposed Drainage Area 9:

The area is 30.5 acres and encompasses the southeast portion of woodlands and orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 2, where it then enters Lattintown Creek. The Curve Number (CN) and Time of Concentration (Tc) are 78 and 10.2 minutes respectively.

4.10 Proposed Drainage Area 10:

The area is 16.5 acres and encompasses a portion of orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 10 to the south before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 79 and 58 minutes respectively.

4.11 Proposed Drainage Area 11:

The area is 2.1 acres and encompasses a small portion of woodlands and orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow to Analysis Point 11 before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 77 and 10.1 minutes respectively.

4.12 Proposed Drainage Area 12:

The area is 3.9 acres and encompasses a the distillery area, the staff dorms area and a portion of the orchards found on site. Stormwater from this area drains via sheet and shallow concentrated flow through an infiltration basin to Analysis Point 3 before leaving the site. The Curve Number (CN) and Time of Concentration (Tc) are 81 and 7.2 minutes respectively.

4.13 Proposed Drainage Area 13:

The area is 1.51 acres and encompasses the parking lot and building surrounds for the upper dining hall near the water tank. Stormwater flows as sheet and shallow concentrated flow through a bioretention area to Analysis Point 2 at the wetland border directly south of the existing yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 86 and 6.0 minutes respectively.

4.14 Proposed Drainage Area 14:

The area is 0.4 acres and encompasses a portion of the entrance road from Ridge Road. Stormwater flows as sheet and shallow concentrated flow to Analysis Point 3 at the wetland border directly south of the existing yoga building. The Curve Number (CN) and Time of Concentration (Tc) are 83 and 6.0 minutes respectively.

Add more subtitles and drainage area descriptions if applicable.

5.0 STORMWATER QUALITY

Stormwater quality requirements will be achieved using green infrastructure practices as well as standard stormwater practices. Chapter 5 of the NYSDEC Stormwater Management Design Manual was used to design the green infrastructure for this project. The design manual outlines which practices are best suited for specific scenarios, and how to properly size these practices. Water Quality Volume (WQv) and Runoff Reduction Volume (RRv) requirements are met using green infrastructure practices as well as other standard stormwater management practices.

This project will use rooftop disconnects, vegetated buffers, porous pavement, infiltration basin and a bioretention to meet all NYSDEC requirements for stormwater quality.

5.1 Infrastructure Practice: Bioretention:

The bioretention areas shown on the plans will treat runoff from a portion of the proposed roads, roofs, and parking areas. Water will filter through the soil media to underdrains, which connect to outlet control structures that discharge to the proposed deep pool. A stabilized overflow weir will be utilized to ensure excessive ponding does not occur in the infiltration-bioretention area during extreme storm events which will allow stormwater to overflow the basin.

5.2 Infrastructure: Infiltration Basin:

The forebay will be used for pretreatment and the basin will be used to treat WQv by allowing infiltration of the runoff and controlling the quantity with an outlet structure. The proposed stormwater management practice (SMP) is a infiltration basin.

Table 2: *Stormwater Quality Comparison*

Water Quality		
	Required	**Provided**
Water Quality Volume (WQv) (acre-ft)	1.836	1.836
Minimum Allowable Runoff Reduction Volume (RRv) (acre-ft)	0.054	0.103
Channel Protection Volume (CPv) (acre-ft)	0.010	0.103
	Existing	**Proposed**
Qp (cfs)	214.31	164.52
Qf (cfs)	363.30	281.66

See the Appendix K for all green infrastructure calculations, and see the green infrastructure map below which details the catchment areas that go to each GI practice:

6.0 STORMWATER QUANTITY

The proposed development will increase impervious area on site, which increases the rate of stormwater runoff from the site. This runoff must be reduced to a rate that is less than the offsite flow rate during existing conditions. Reduction for this project is achieved through new stormwater management practices that will be used to release stormwater runoff at a controlled rate via an outlet control structure or infiltration.

See the comparison table below for the sites analysis points under existing and proposed conditions:

Table 3: *Stormwater Quantity Comparison*

Summary Table			
Water Quantity			
	Existing	**Proposed**	**Reduction (%)**
1-Year Runoff (cfs)	63.16	48.03	23.96%
10-Year Runoff (cfs)	214.31	164.52	23.23%
100-Year Runoff (cfs)	363.30	281.66	22.47%

As shown above, the proposed design meets the requirements of stormwater management by releasing the water at a reduced rate that does not lead to erosion or high levels or pollution. The design does meet the NYSDEC requirement of providing water quality and quantity management.

Refer to Appendix I for the HydroCAD analysis and the breakdown of each hydrograph.

7.0 CONSTRUCTION EROSION CONTROL PRACTICES & INSPECTIONS

The Owner is responsible for having monthly inspections of the storm water management facility completed. The inspections shall review and document the following at a minimum: visual inspection of the outlet structure, check of the outlets for excessive sediment accumulation, burrowing, vegetation degradation, or any other issues of concern. A certified copy of the annual summary of inspections report will be provided to the Town of Marlborough by the first of December. The owner is also responsible for having SWPPP inspections once per week once disturbance of the site starts. Copies of the SWPPP inspection reports will be sent to the town, owner, and contractor and deficiencies should be addressed immediately.

Several erosion control practices will be utilized during construction by the contractor under direct supervision by the owner and a qualified SWPPP inspector (S.W.T.). These practices are explained below and shown in detail in the appendix of this report and the construction plans:

- Silt Fence → Silt fencing shall be installed at the toe of all slopes along the perimeter of the disturbed areas and at the toe of slope for any soil stock pile areas. Also, a row of silt fence will be installed around the perimeter of all wetlands in an effort to delineate its boundary. The fencing will be installed in accordance with the NYSDEC construction standards and at the instruction of this plan. The silt fencing shall be buried in the ground at least 6 inches. The contractor shall provide continued monitoring to ensure the silt fencing remains intact, and shall repair as needed. When the silt accumulates to greater than 1/3 the height of the fence the contractor shall remove and dispose of the silt.

- Stabilized Construction Entrance → The existing project entrance shall serve as the construction entrance to the project. The contractor shall ensure that mud is not tracked onto the adjacent roadways and that the stone entrance properly removes mud and debris from construction vehicles.

- Drop Inlet Protection → All field inlets and catch basins shall have inlet protection in accordance with the detail the Appendix. Drop Inlet protection can be removed from catch basins in the roadway when the sub base is installed, and from the field inlets when the adjacent area is brought to final grade and stabilized.

- Seeding and Stabilization → The contractor shall seed and stabilize all disturbed areas not to be worked for 7 days within 7 days of the last disturbance. Stabilization measures may include but are not limited to straw mulching, wood chip mulching, jute mesh and hydroseeding. The SMA and adjacent areas shall be stabilized immediately following their shaping and installation. All embankments greater than 3:1 shall be stabilized with jute mesh.

- Check Dam → 24 inch high stone check dams will be installed in all temporary and permanent diversion swales. The check dams will be installed every 2 vertical feet. Once the site is stabilized, these check dams will be removed.

- Truck Washdown area → a truck washdown area will be provided adjacent to the construction entrance. This area will be constructed such that it drains to a sediment basin immediately adjacent prior to discharging offsite.

- Winter Shutdown → The contractor may request to enter winter shutdown provided the contractor has fulfilled the requirements set forth in the NYSDEC Blue Book Standard and Specifications for Winter Stabilization contained in Appendix Q of this report. The certified SWPPP inspector will then perform an inspection and upon agreement with the contractor's practice, shall complete the "Notice to reduce Frequency of SPDES Site Inspections" Form contained in Appendix Q of this report. The form will then be submitted to the regulatory MS4 (or NYSDEC regional office should there be no MS4 for the project area) for review. After the regulatory MS4 or NYSDEC regional office has approved the request, the site will enter winter shutdown and SPDES site inspections may drop to monthly. Should the certified SWPPP inspector find any problems during winter shutdown, the contractor is liable to correct the issues on site in the same timely manner as an active project

Additional measures may be required during construction at the guidance of the owner or certified SWPPP Inspector. The contractor shall begin to make all adjustments to the erosion control within 24 hours of receipt of any deficiencies. The owner will be responsible for providing weekly reports when the site disturbance totals less than 5 acres. Inspections are to be completed by a qualified inspector in accordance with the GP-0-20-001, during construction to the Town of Marlborough.

A 5-acre waiver is not anticipated as demonstrated by the Phasing Plan in Appendix If the developer of site plans to increase the disturbance greater than 5 acres at any given time, a 5 acre waiver must be submitted to the NYSDEC and approval granted prior to reaching this limit. The developer must adhere to the conditions set forth in the SPDES General Permit GP-0-20-001 Part II.D.3, located as Appendix L of this report. The conditions of Part II.D.3 are outlined below:

1. The owner or operator shall have a qualified inspector conduct at least two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

2. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

3. The owner or operator shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

4. The owner or operator shall install any additional site-specific practices needed to protect water quality.

Any modifications to the SWPPP will be reported and approved by the Town in writing prior to implementation. See Appendix A for additional SWPPP information. The owner is responsible for having a qualified operator on site at all times who has at least 4 hours of erosion control training in accordance with the GP-0-20-001. Once the site has

achieved 80% stabilization and ground cover, the Town may sign off on the Notice of Termination prior to submission to the NYSDEC. Removal of all temporary erosion and sediment control practices is required prior to demobilization.

8.0 POST CONSTRUCTION

The owner of the subject project will be responsible for all post construction practices. The contact information for the owner is illustrated on the cover of this plan as well as the design plans for the project. The post construction practices include performing annual inspections of the SMAs to ensure proper working conditions and ensure continual stabilized cover of all project areas to 80% cover, minimum. All applicable inspection and maintenance activities shall continue until the 80% cover is met. Any silt removal will be disposed either off site or on site and immediately stabilized in accordance with the practices of this plan.

Additionally, annual monitoring of the storm sewer structures will be provided by the owner to ensure that they are functioning properly. All documentation related to this SWPPP and post construction monitoring reports, shall be kept by the owner for five years after project completion. These inspections will be certified by a Professional Engineer and a copy of the inspection report will be furnished to the Town of Marlborough.

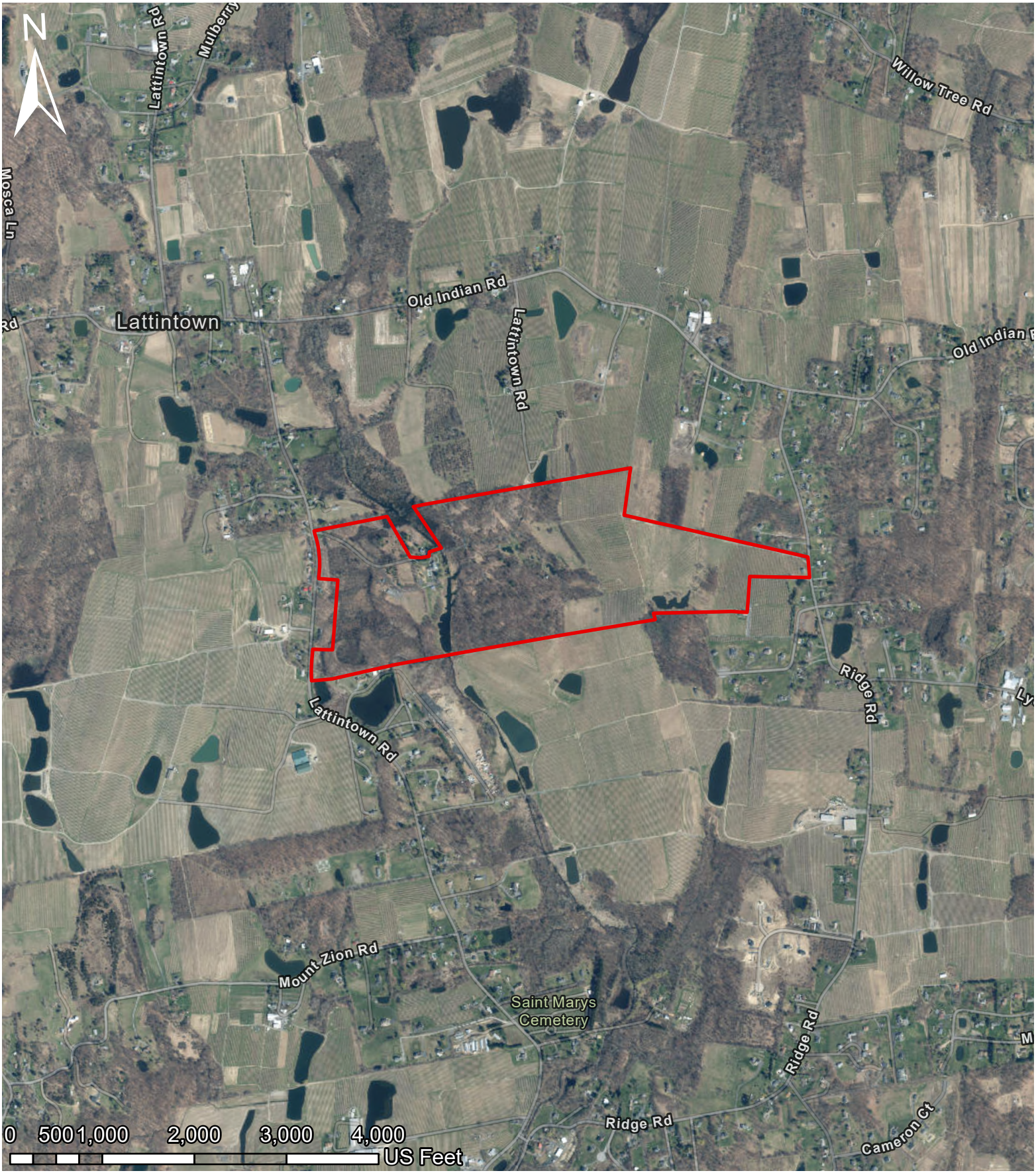
9.0 SUMMARY

The proposed project requires stormwater management practices which conform to NYSDEC regulations. The proposed standard stormwater management practices will also result in a net decrease in peak runoff from the site while meeting the NYSDEC requirements for Runoff Reduction, Water Quality and Channel Protection. Continued monitoring of the practices included in this plan will be provided by the owner and a designated SWPPP Inspector.

The following appendices of this report illustrate the additional requirements and specifications for stormwater pollution prevention. All practices included in this report and incorporated in the proposed project have been designed in compliance with the NYS Storm Water Design Manual and NYS Standards and Specifications for Erosion and Sediment Control.

APPENDICES

APPENDIX A: LOCATION MAP & USGS MAP



Legend

Project Area

Marlborough Resort Location Map

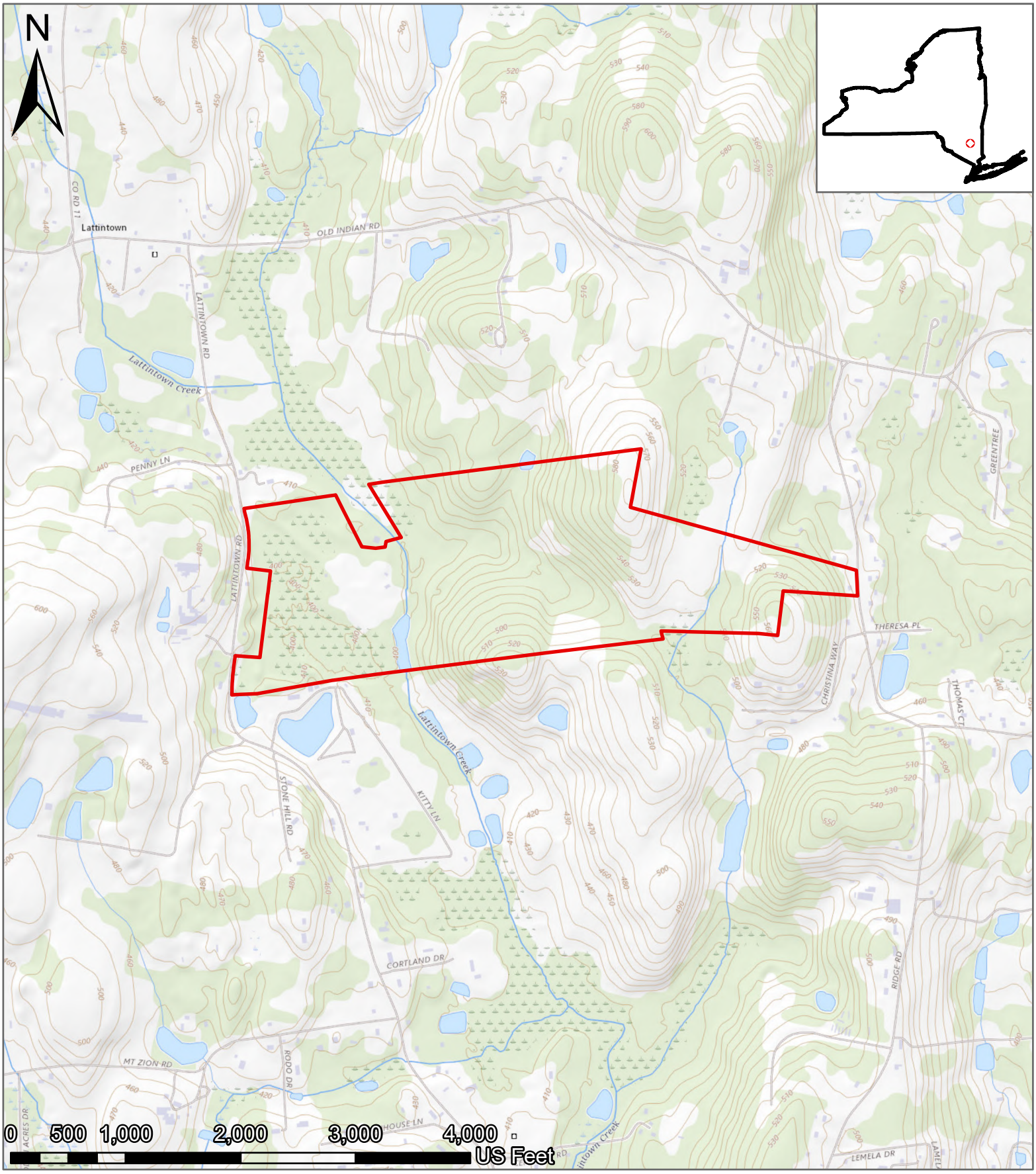
Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: Ulster County GIS

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architecture engineering

Service Credits:

New York State, Maxar, Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Date: 4/25/2024



Legend

Project Area

Marlborough Resort USGS Map

Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: United States Geological Survey

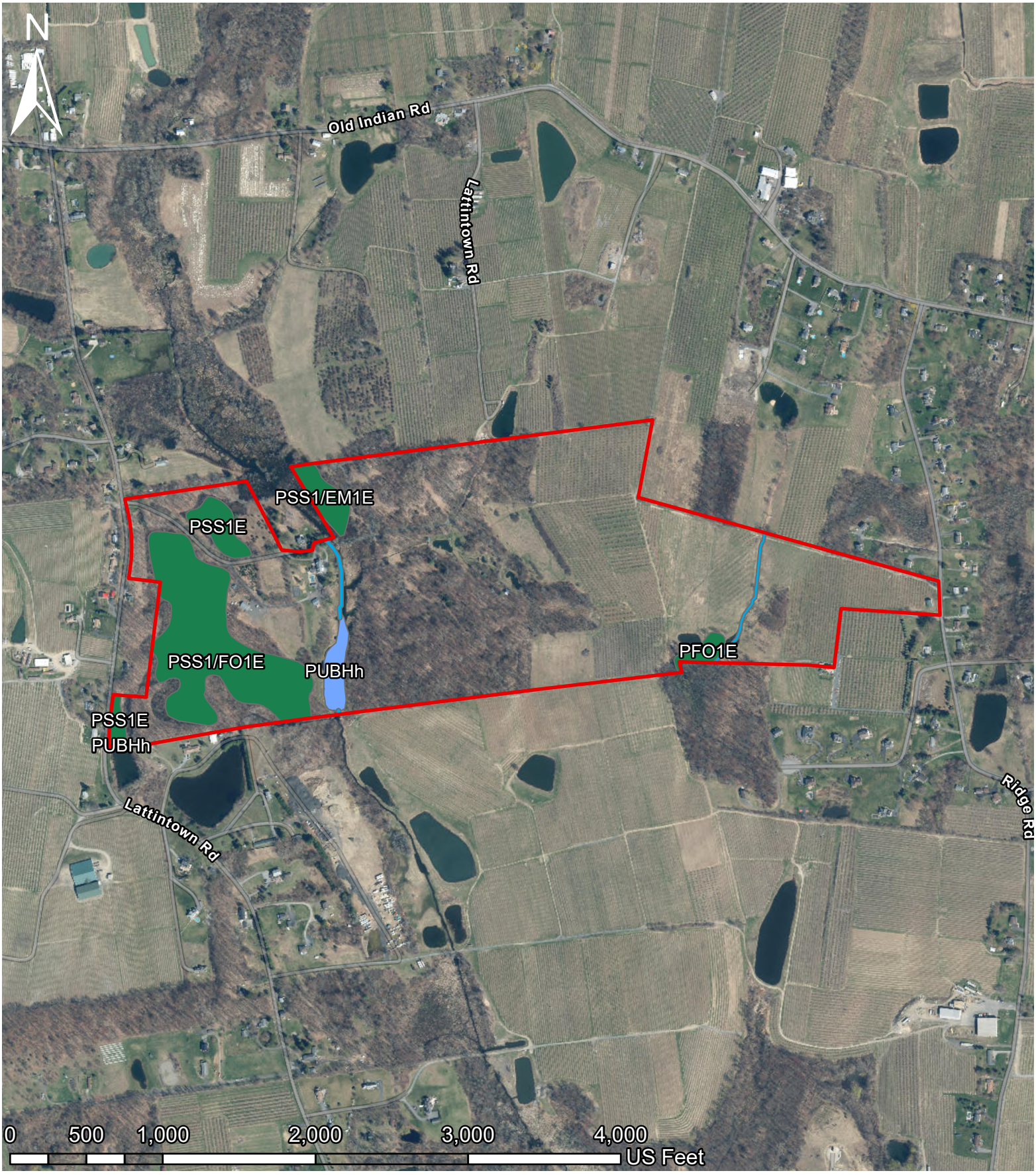
PASSERO
architecture engineering

Service Credits:

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information

Date: 4/25/2024

APPENDIX B: WETLANDS MAPPING



Legend

Wetlands

- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine

USFWS National Wetlands Inventory

Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: U.S. Fish and Wildlife Service

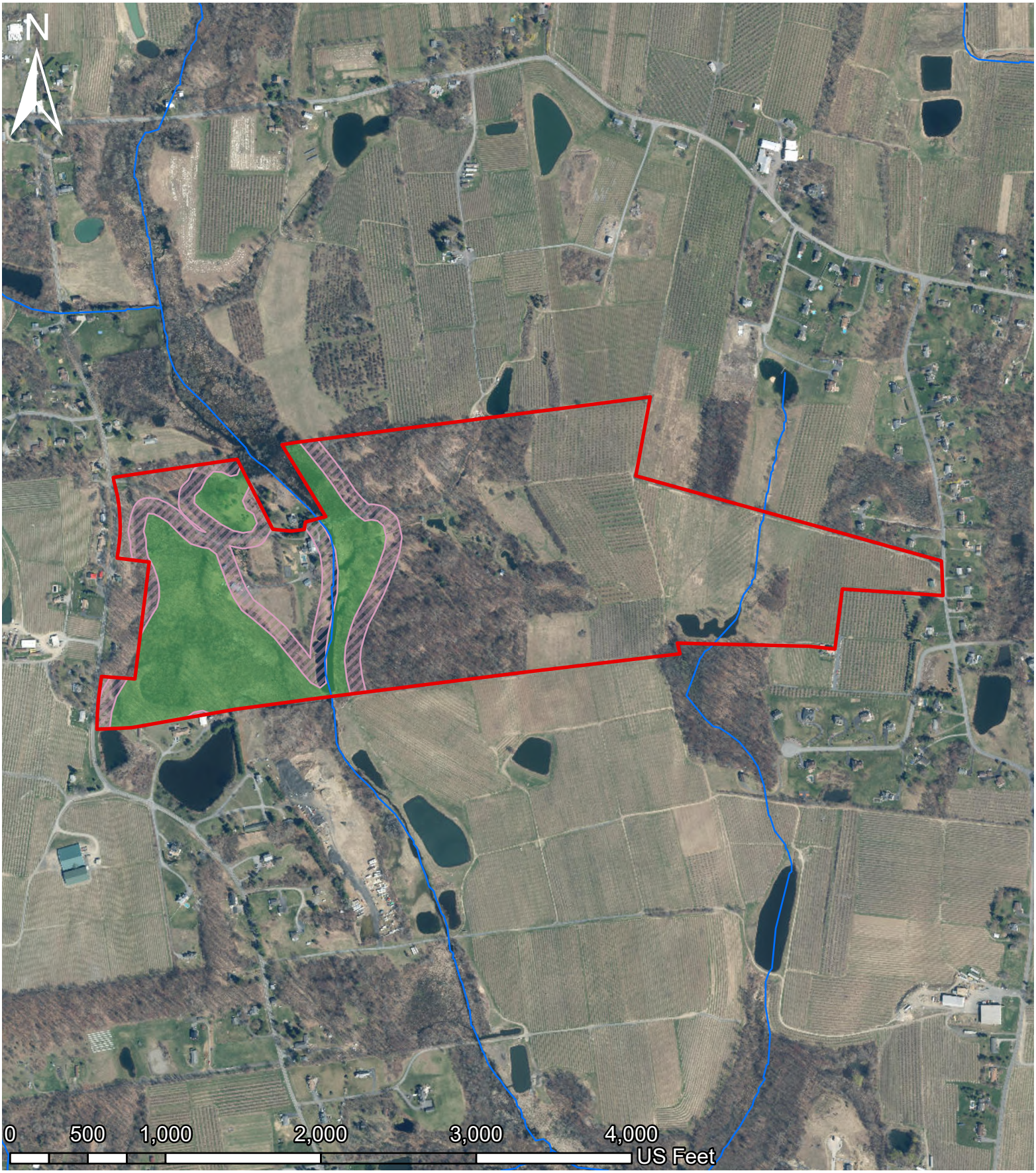
PASSERO architecture engineering

Service Credits:

New York State, Maxar, Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Date: 4/25/2024

APPENDIX C: ENVIRONMENTAL RESOURCE MAPPER



Legend

- Significant Natural Communities
- Rare Plants & Animals
- NYSDEC Wetlands
- 100ft Buffer
- Water Classifications for Rivers & Streams

Environmental Resource Map

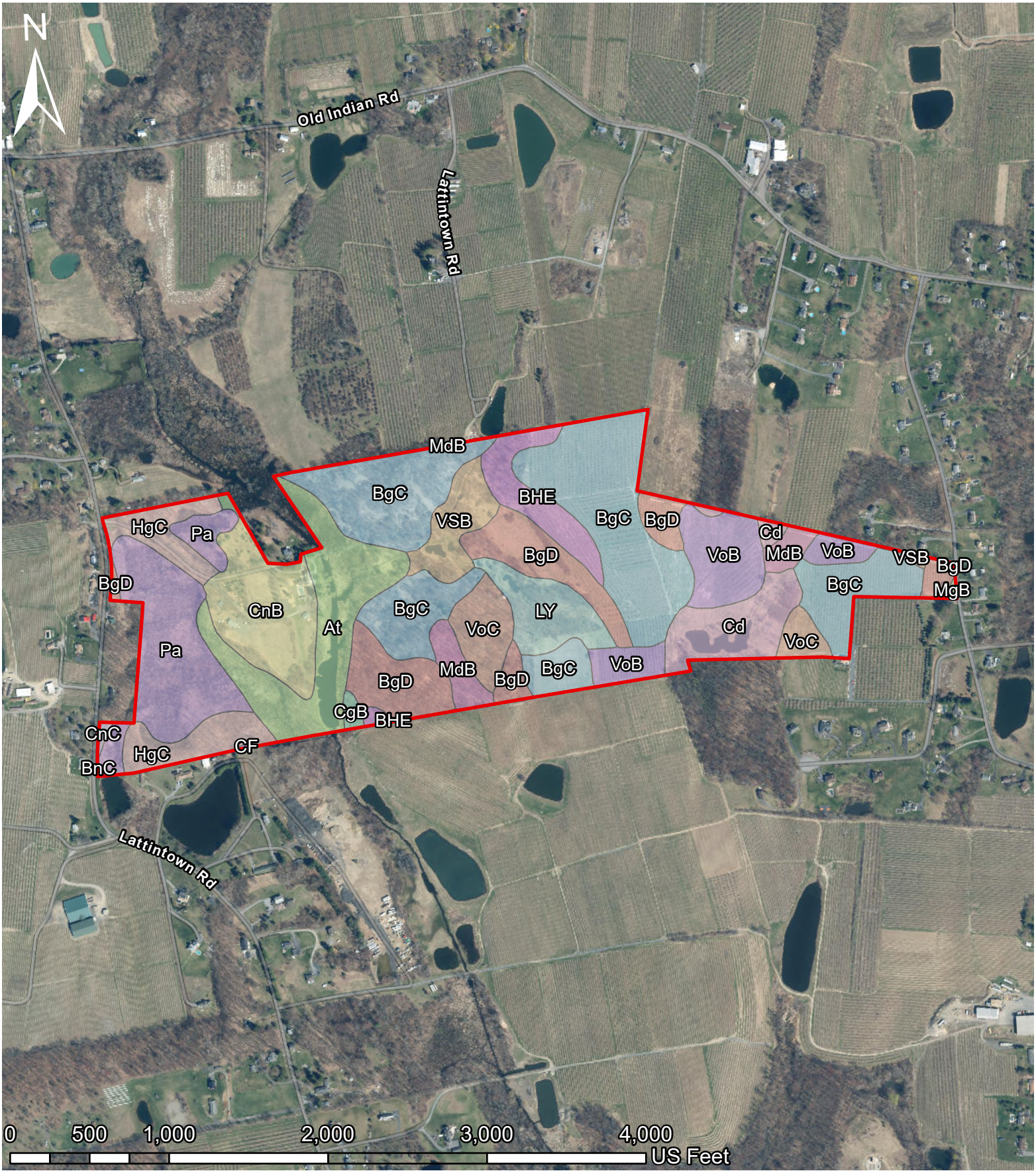
Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: Environmental Resource Mapper

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architecture engineering

Service Credits:
New York State, Maxar

Date: 4/25/2024

APPENDIX D: SOILS MAP



Legend

Soils

- At
- BHE
- BgC
- BgD
- BnC
- CF
- Cd
- CgB
- CnB
- CnC
- HgC
- LY
- MdB
- MgB
- Pa
- VSB
- VoB
- VoC

Soil Map

Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: NRCS Web Soil Survey

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Service Credits:

New York State, Maxar, Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Date: 4/25/2024

APPENDIX E: FEMA FLOOD MAP

National Flood Hazard Layer FIRMette

FEMA

73°59'44"W 41°38'15"N



Feet
0 250 500 1,000 1,500 2,000

1:6,000

73°59'7"W 41°37'48"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/18/2024 at 1:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX F: RAINFALL DATA

Metadata for Point

Smoothing	Yes
State	New York
Location	New York, United States
Latitude	41.637 degrees North
Longitude	73.992 degrees West
Elevation	120 feet
Date/Time	Sun Aug 18 2024 11:56:23 GMT-0400 (Eastern Daylight Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2da
1yr	0.32	0.49	0.61	0.80	1.00	1.24	**1yr**	0.86	1.16	1.42	1.75	2.14	2.61	2.97	**1yr**	2.31	2.8
2yr	0.38	0.59	0.73	0.96	1.21	1.51	**2yr**	1.04	1.40	1.73	2.12	2.59	3.15	3.56	**2yr**	2.79	3.4
5yr	0.45	0.70	0.88	1.18	1.51	1.89	**5yr**	1.30	1.73	2.18	2.67	3.25	3.93	4.49	**5yr**	3.48	4.3
10yr	0.51	0.80	1.01	1.37	1.78	2.25	**10yr**	1.53	2.03	2.60	3.19	3.87	4.65	5.35	**10yr**	4.12	5.1
25yr	0.59	0.95	1.20	1.67	2.22	2.84	**25yr**	1.91	2.52	3.28	4.02	4.87	5.81	6.74	**25yr**	5.14	6.4
50yr	0.68	1.09	1.39	1.95	2.63	3.38	**50yr**	2.27	2.96	3.91	4.80	5.78	6.88	8.05	**50yr**	6.09	7.7
100yr	0.77	1.25	1.61	2.28	3.11	4.03	**100yr**	2.69	3.48	4.67	5.72	6.87	8.14	9.60	**100yr**	7.21	9.2
200yr	0.88	1.44	1.86	2.67	3.69	4.80	**200yr**	3.19	4.10	5.57	6.83	8.18	9.65	11.46	**200yr**	8.54	11.0
500yr	1.06	1.75	2.28	3.31	4.64	6.06	**500yr**	4.01	5.09	7.04	8.61	10.29	12.08	14.50	**500yr**	10.69	13.9

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2da
1yr	0.28	0.44	0.53	0.72	0.88	1.05	**1yr**	0.76	1.02	1.22	1.53	1.95	2.35	2.48	**1yr**	2.08	2.3
2yr	0.37	0.57	0.70	0.95	1.17	1.38	**2yr**	1.01	1.35	1.57	2.01	2.53	3.06	3.48	**2yr**	2.71	3.3
5yr	0.41	0.64	0.79	1.09	1.38	1.61	**5yr**	1.19	1.57	1.82	2.35	2.93	3.67	4.15	**5yr**	3.25	3.9
10yr	0.46	0.71	0.88	1.22	1.58	1.80	**10yr**	1.37	1.76	2.04	2.63	3.28	4.17	4.75	**10yr**	3.69	4.5
25yr	0.53	0.81	1.00	1.43	1.89	2.07	**25yr**	1.63	2.03	2.36	2.95	3.78	4.93	5.67	**25yr**	4.36	5.4

APPENDIX G: GEOTECHNICAL REPORT

Foundation Design, P.C.

SOIL ● BEDROCK ● GROUNDWATER

August 6, 2024

Passero Associates
6 Front Street
Newburgh, New York 12550

Attention: Chris LaPorta, PE, CDT

Reference: Marlborough Resort Additions
626 Lattintown Road, Marlboro, NY 12542
Geotechnical Evaluation, 24.05642

Dear Mr. LaPorta:

This report summarizes our Geotechnical Evaluation for the referenced project. We understand that the development will consist of new additions located at the existing Marlborough Resort in Marlboro, New York. We understand that the new additions to the Resort will consist of a new Welcome Center, Restaurant, Spa Building, Events Center, a new bridge, and staff housing. New cabins in the center of the site will also be constructed, with access roads. A new water tank, solar array, and wastewater treatment plant are also planned to serve the site. We have assumed cuts/fills will be relatively small (under three feet); if cuts/fills are larger please reach out so we can evaluate the impacts on our recommendations. We base this evaluation on a review of U.S.G.S. topographic and geologic mapping; conceptual site plans; soil probe/boring exploration; laboratory test results; and consultation with the design team. Passero Associates retained Foundation Design, P.C. to provide the services outlined in our March 18, 2024, *Geotechnical Services Proposal, P5639.0.* We intend the conclusions and recommendations outlined in this report exclusively for use in the design and construction of this project.

The Marlborough Resort is located at 626 Lattintown Road in Marlboro, New York. The site currently consists of a mixture of asphalt, lawn area, and light tree growth to the west of the creek. To the east of the creek there is an area of hardwoods followed by apple orchards and fallow fields extending to Ridge Road. There are currently a few structures residing on the west end of the parcel and one barn residing on the east end. A mixture of fields and hardwoods lie to the north and south of the proposed development. Ridge Road lies to the east, and Lattintown Road lies to the west. A *General Location Plan*, depicting the site on 2023 U.S.G.S. topographic mapping, is attached. The surface grades in the resort area remain relatively flat, with grades

varying by a few feet across the lot. The area east of the resort is a large hill that rises by as much as 200 feet. Lattintown Creek divides the middle of the parcel.

Core Down Drilling (CDD) was subcontracted by Passero Associates to perform 32 borings and 17 soil probes between April 25 and May 10, 2024. For the soil borings CDD used a Geoprobe 7822 drill rig to recover samples using SPT sampling to record N-values. CDD field logged the majority of the soil boring profiles and provided us with representative soil samples of each layer encountered. Our staff reviewed the field logs and soil samples in our lab. For the soil probe work CDD provided a Geoprobe 7822 rig and a macro-core barrel to recover samples to a depth of 10.0 feet. Our staff observed the majority of the soil probe operations; logging the subsurface profiles, collecting representative soil samples, and adjusting the program based on the field conditions encountered. Passero Associates provided staked locations for the test holes. The soil probe/boring logs and a *Boring/Soil Probe Location Plan* are attached.

We reviewed the soil samples and selected representative samples for laboratory analysis. Our office performed nine sieve analyses, nine moisture content determinations, and three organic content determinations. We discuss the test results below. The laboratory report is enclosed.

The following interpretations of the soil, bedrock, and groundwater conditions are based on the widely spaced soil probe/borings and our site observations. See the attached logs for soil descriptions at the test locations. Variations from the inferred profile are possible. Contact us immediately if variations are found during construction so we may evaluate the impact on our recommendations.

Eastern Portion of Parcel (east side of Lattintown Creek)

At the cabin/water tank locations (B-17 through B-88) we encountered a general subsurface profile consisting of topsoil over glacial till. The topsoil thicknesses ranged from 2 inches to 30 inches at the test locations, averaging 8 inches. The underlying glacial till consists of a silty sand/sandy silt that classifies as SM (silty sand) and ML (sandy silt) in the Unified Soil Classification System. We noted numerous cobbles/boulders within this formation during exploration. Due to shallow refusal depths noted at the water tank location, CDD returned to site to perform a core run in this area. The drillers recovered a core consisting of dense glacial till and boulders.

We encountered groundwater at boring B-18 and B-21 at depths of 6.0 feet and 4.0 feet below grade, respectively. We expect water will tend to perch above the dense glacial till. Expect groundwater to fluctuate seasonally and to be heavily influenced by the nearby Lattintown Creek.

Bedrock was not encountered during exploration. Geologic mapping indicates that the bedrock is of the Austin Glen Formation part of the Trenton Group and Metamorphic Equivalents. This formation consists of shale and graywacke. Bedrock should not impact this project.

Bridge Location

At the bridge borings (B-15 and B-16) we encountered a general subsurface profile consisting of topsoil over glacial fluvial deposits then glacial till. The topsoil thicknesses were noted to be 2 inches and 12 inches at the test locations. The glaciofluvial deposit consisted of a sandy silt to silty sand with varying amounts of gravel and clay. At B-16 we noted a two-foot layer of peat (organic soil) at a depth between 3 feet and 5 feet below grade. Organic content testing of this peat showed 43.5 percent by weight (a high amount), and a moisture content of 236.5 percent by weight. The underlying glacial till was encountered at depths ranging from 25 feet to 30 feet below grade. The till consisted of a sandy silt with gravel and clay.

We encountered groundwater at a depth of 1.0 foot below grade (roughly creek elevation). Expect groundwater to fluctuate seasonally and to be heavily influenced by the adjacent Lattintown Creek.

Bedrock was not encountered at these boring locations. Geologic mapping indicates that the bedrock is of the Austin Glen Formation part of the Trenton Group and Metamorphic Equivalents. This formation consists of shale and graywacke.

Resort Area (west of Lattintown Creek)

At the Resort borings (B-1 through B-14) we encountered a general subsurface profile consisting of topsoil over glacial fluvial deposits, then glacial till. The topsoil thicknesses were noted to be 2 inches and 12 inches at the test locations, averaging 4 inches. The glaciofluvial deposit consisted of a sandy silt to silty sand with varying amounts of gravel and clay, classifying as SM (silty sand), ML (sandy silt), and SP-SM (poorly graded sand) in the Unified Soil Classification System. Moisture contents of this deposit ranged from 10.0 to 28.6 percent by weight, wet of optimum. At B-6 we noted a ten foot layer of peat (organic soil) at a depth of 6 feet

to 16 feet below grade. Organic content testing of this peat showed 12.1 percent to 52.7 percent by weight (a high amount), with moisture contents of 105.7 percent and 340.9 percent by weight, respectively. The underlying glacial till was encountered at a depth of 40 feet below grade at B-5. Additional exploration will be conducted to better define this dense layer for the proposed deep foundation system. The till consisted of a sandy silt with gravel and clay.

We encountered groundwater at depths of 2.0 feet to 6.0 feet below grade. Expect groundwater to fluctuate seasonally and to be heavily influenced by the nearby Lattintown Creek.

Bedrock was not encountered at these boring locations. Geologic mapping indicates that the bedrock is of the Austin Glen Formation part of the Trenton Group and Metamorphic Equivalents. This formation consists of shale and graywacke.

In conclusion, buildings/structures located on the east side of the bridge (14, 15, 16, 19, etc.) will be able to be supported on spread footings bearing on the glacial till soils. We note that Building 1 will also be able to be supported on spread footings bearing on the native soils. The buildings located on the west side of the bridge (4, 5, 6, 9, 10, 12, 17, 18) will require a deep foundation system (rigid inclusions), due to the heavy design loads and poor/loose soil conditions. Groundwater is shallow on the west side of the parcel so any excavations below the water table will require extensive pumping operations if below grade work/cuts are performed on this side.

Based on this background, we offer the following specific recommendations:

1. Clear, grub and strip the in-place surface topsoil/asphalt from the new development area. Avoid stripping topsoil during the wetter times of year (October-May) to limit mixing topsoil with the underlying soil. Remove/reroute utilities that lie within the proposed building footprints. Completely remove existing structures in the new building footprints and backfill with structural fill. The Geotechnical Engineer should observe a proof roll of the building subgrades to verify that the topsoil/unsuitable soil has been removed and the subgrade is ready for fill placement. The contractor should provide a loaded ten-wheel truck for proof rolling. Rework or replace areas that rut, weave, quake or are otherwise deemed to be unsuitable or unstable.

2. On-site native soil, free of organic and debris, can be used for structural fill. Use of the material will prove weather dependent. The silty sand soils can become wet of optimum moisture for compaction and require drying in order to achieve proper compaction. The native soils are frost susceptible;

this will result in the need to protect exposed areas from frost penetration during cold weather and from changes in moisture. We recommend a construction schedule that would allow for the mass earthwork to be performed during the drier summer months, typically May to September. Alternatively, use an imported granular material similar in gradation to N.Y.S.D.O.T. Item 304.12 (crusher-run stone) or 304.14 (Item 4 gravel) for the structural fill. Submit other materials to the Geotechnical Engineer for review and approval on a case-by-case basis. Maintain good surface drainage.

We define structural fill as the new fill placed under and around footings, floor slabs, sidewalks, and pavements. Place structural fill in lifts of 12 inches or less in loose thickness and within two percent of the optimum moisture content. Compact structural fill to at least 95 percent of maximum dry density as determined by the Modified Proctor test (ASTM D-1557). Compact other fill as otherwise determined by the engineer.

3. **Buildings (4, 5, 6, 9, 10, 12, 17, 18)**

We believe these buildings can be founded on improved soils using rigid inclusions (RIs) or controlled modulus columns (CMCs), to provide an adequate bearing strata. We understand this will be confirmed by Keller. We offer the following measures to incorporate into the soil improvement design and preliminary cost comparisons:

- A specialty geotechnical contractor (Keller) should develop a soil improvement approach as part of a delegated-design. The design should improve the soil adequately to support the proposed building using conventional spread footing construction. Require that specialty geotechnical contractor submit a full design, stamped by a NY State licensed engineer for review and comment.

- We recommend terminating the soil improvement member in the firm/compact glacial till formation, roughly 40 feet below grade (currently scheduled deep exploration will confirm this).

- Design the building to be supported on a spread footing foundation system. Assume that the soil improvement system will improve the soil adequately to support an allowable bearing pressure of at least 3,000 psf, to be confirmed by Keller. All foundations should bear at least four feet below exterior grade for frost protection. The specialty geotechnical contractor's design should be developed so that differential settlement is less than 0.50 inch and total settlement is under 0.75 inch.

- If large fills are planned across the parcel, this should be accounted for in the ground improvement design and foundation schedule.

- During the initial installations, the parameters that the specialty geotechnical contractor used in their design should be confirmed using full scale load testing.

- The specialty geotechnical contractor should generate installation records of their soil improvement system using real-time data acquisition equipment. This information should include the column diameter, length, start time, end time, penetration depth, pump stroke

count, neat aggregate/grout volume (theoretical), actual aggregate/grout volume, penetration rate, and crowd pressure (or applied torque).

- As part of their cost estimate, the specialty contractor should include the cost associated with the installation of any bridging layer required between the RIs, or CMCs and the bottom of the foundation, including any soil testing required for the work.
- The specialty contractor should outline any limitations that the use of their system may have on future horizontal expansion.
- Concrete cylinders and compressive strength testing should be performed on grout/concrete used to develop the RIs and CMCs. We recommend treating the grout/concrete as foundation concrete, with a testing regiment utilized similar to the foundation concrete.
- Upon completion of the soil improvement installation, the specialty geotechnical contractor should provide a certification that the improvement system, as-installed, is capable of developing the bearing pressure determined during bidding the work (or higher bearing pressure if approved) to support the foundations. The certification should be stamped by a NY State licensed engineer and contain all of the installation records for permanent storage.

Buildings (1, 14, 15, 16, 19)

Support these structures on spread footing foundations bearing on the native soil or new structural fill at a bearing pressure of 3,000 psf. Size footings to be at least two feet wide or square. Size interior load bearing haunches to be at least 18 inches wide and to bear at 1,500 psf on native soil. Design footings to bear at least four feet below exterior grade where frost protection is required. Hand-clean the loose/disturbed soil from the bearing surface prior to placing concrete. We estimate settlement based on these sizes, depths, and pressures at less than an inch. We recommend your Structural Engineer confirm that this magnitude of settlement is within the 'normal' tolerances for the new structure(s).

Cabins

We understand that helical piles is the preferred foundation option for the cabins, but due to the dense soil conditions, it is our opinion that light-weight helical piles are not a viable foundation option. The helical piles would prove difficult to install in the cobble/boulder soil conditions expected and penetration depths would be limited.

Support these structures on spread footing foundations bearing on the native soil or new structural fill at a bearing pressure of 3,000 psf. Size footings to be at least two feet wide or square. Size interior load bearing haunches to be at least 18 inches wide and to bear at 1,500 psf on native soil. Design footings to bear at least four feet below exterior grade where frost protection is required. Hand-clean the loose/disturbed soil from the bearing surface prior to placing concrete. We estimate settlement based on these sizes, depths, and pressures at less than half an inch. We recommend your Structural Engineer confirm that this magnitude of settlement is within the 'normal' tolerances for the new structure(s).

An alternate method to supporting these structures would be installing sonotubes, bearing on the native soils. If sonotubes are used in lieu of spread footings for the cabins we make the following recommendations. The sonotubes need to be a minimum of 30 inches in diameter. Design footings to bear at least four feet below exterior grade where frost protection is required. Hand-clean the loose/disturbed soil from the bearing surface prior to placing concrete.

Water Tank

We understand the water tank will be nominally 70 ft in diameter and supported on a mat foundation bearing on the native soil or new structural fill. Design footings bearing on structural fill or native soil at a bearing pressure of 3,000 psf. Hand clean loosened soil from the bearing surface. Large boulders/cobbles were noted during drilling and may cause larger pockets that will require backfill to structural standards. Set exterior footings four feet below the adjacent exterior grade. Footings with design loads of up to 2,300 kips will experience total settlements of up to half an inch. If the intended design loads are greater than 2,300 kips or the anticipated settlements are unacceptable, let us know and we will reexamine the bearing pressure recommendation.

4. Place six inches of N.Y.S.D.O.T. Item 304.12, No. 2 crusher-run stone or N.Y.S.D.O.T. Item 304.14, Item 4 Gravel, below the slab-on-grade. Proof-roll the floor subgrade prior to placing the subbase. Rework or replace areas that rut, weave, quake, appear saturated, or are otherwise deemed unsatisfactory. Call us if subgrade conditions prove difficult to stabilize.

   Design the slab using a Modulus of Subgrade Reaction (K_{vi}) of 125 psi/in over the subbase and then the prepared/approved subgrade. The architect and/or structural engineer should review the proposed interior finishes and humidity control requirements to determine whether a vapor barrier is appropriate under the slab and if so, where it should be installed. See the American Concrete Institute Document 302.1R, *Concrete Floor and Slab Construction*, for more information.

5. Design walls where soil is retained to act as retaining walls. Design loading docks and perimeter foundations as retaining walls. For retaining walls the pressure distribution may be taken as triangular and equivalent to a fluid with a specified weight. Design walls based on at-rest earth pressures tabulated below for the on-site silty sand/sandy silt soil and imported crusher-run stone materials. (At-rest pressures imply very little or no lateral wall movement.) Provide position drainage from behind the retaining walls. Use a sliding coefficient of 0.35 between the concrete and the sandy silt soil.

Table No. 1 – Lateral Earth Pressures

Backfill Material	Internal Friction	K_a	K_p	K_o	Active Pressure	Passive Pressure	At Rest Pressure
NYSDOT Item 304.12 (new backfill)	34	.28	3.53	.44	41	513	64
Silty Sand (native soil)	28	.36	2.77	.53	42	319	61

We recommend waterproofing the basement walls.

6. The NYS Building Code identifies various seismic design criteria for this project. We identify the west half of the site as having a Site Classification of D (Stiff Soil). Based on the ASCE 7-16 guidelines, we recommend using the parameters tabulated below.

Table No. 2a – Seismic Design Parameters (ASCE 7-16) (East Half)					
Spectral Response Acceleration		Soil Factors		Design Spectral Response Acceleration	
S_S	S_1	S_{MS}	S_{M1}	S_{DS}	S_{D1}
0.205g	0.055g	0.328g	0.132g	0.219g	0.088g

We identify the west half of the site as having a Site Classification of E (Soft Soil). Based on the ASCE 7-16 guidelines, we recommend using the parameters tabulated below.

Table No. 2b – Seismic Design Parameters (ASCE 7-16) (West Half)					
Spectral Response Acceleration		Soil Factors		Design Spectral Response Acceleration	
S_S	S_1	S_{MS}	S_{M1}	S_{DS}	S_{D1}
0.205g	0.055g	0.492g	0.231g	0.328g	0.154g

7. Perform trenching and excavating in accordance with the Occupational Safety and Health Administration (OSHA) and New York State Building Code Standards. The contractor is responsible for determining measures required to meet these standards. Cut unsupported temporary excavations to a stable slope, but in no case steeper than 1 horizontal on 1 vertical. Remove groundwater and stormwater that accumulates using open sumps and pumps to keep the exposed subgrade from deteriorating. We note that extensive dewatering operations will be required if excavations extend below the water table on the west half of the site (2 feet to 6 feet below grade).

8. The pavement subgrade will be the in-place native silty sand. We recommend that the new pavement areas be cut/filled to grade, the top eight-inches re-compacted to the structural standards and the subgrade proof-rolled under the observation of a Geotechnical Engineer. Re-compact or replace areas that rut, weave, quake, or are otherwise deemed unstable under proof-rolling traffic.

   Slope both the pavement surface and subgrade at slopes of at least 2.0 percent to facilitate water flow toward the stormwater system and to prolong the pavement life. Install weeps to allow water out of the subbase and into the drainage system (or to daylight).

   Install the Standard and Heavy Duty pavement sections tabulated below. Use the Standard Duty Section in car parking spaces and the Heavy Duty Section in the access driveway and drive lanes.

Table No. 3 - Standard Asphalt Section		
1.5"	Asphalt Topcoat	NYSDOT Item 403.178902
2.5"	Asphalt Binder	NYSDOT Item 403.138902
9.0"	Crusher Run Gravel	NYSDOT Item 304.12
	Subgrade	Approved Proof Roll

Table No. 4 – Heavy Duty Asphalt Section		
1.5"	Asphalt Topcoat	NYSDOT Item 403.178902
4.5"	Asphalt Binder	NYSDOT Item 403.138902
12.0"	Crusher Run Gravel	NYSDOT Item 304.12
	Subgrade	Approved Proof Roll

It is our experience that flexible pavements do not perform well in locations where repetitive traffic occurs (i.e., loading docks, dumpster locations, etc.). We recommend installing rigid concrete pavement in these areas.

9. The NYS Building Code requires special inspection services. We recommend the following inspections and ask that you include them on the List of Special Inspections developed as part of the Building Permitting Process:

- We recommend that Foundation Design, P.C. make periodic site visits to confirm that the actual soil conditions are as expected and provide recommendations to address areas where conditions differ.

  Specifically, we should perform the following activities:

  A. IBC Table 1705.6 – 2: Spot-check the contractor's means and methods during the proof rolling operations. Observe the subgrade and verify the extent of the required removal of the potential unsuitable material and topsoil. Review and approve of structural fill materials. Review the soils-related test results and consult on compaction-related issues as they arise.

  B. IBC Table 1705.6 – 1: Observe/verify that the materials below the shallow spread footings are adequate to achieve the design bearing pressure.

  C. Have part-time coverage during the soil improvement installation and review/observe the column load test. Review the column installation records.

  D. IBC Table 1705.6 – 5: Observe/approve proof-rolling of pavement subgrades prior to new fill placement.

  E. Consult on soil related issues as they arise.

- We recommend that an independent test agency perform observation/confirmation of mass fill placement and backfilling operations. Specific testing requirements follow:

  A. IBC Table 1705.6 – 3 and 4: Conduct at least one field density test per 2,500 square feet of mass fill placed, per lift.

B. IBC Table 1705.6 – 3 and 4: Conduct at least one density test per 50 lineal feet of foundation backfill on alternating lifts.

C. IBC Table 1705.6 – 3 and 4: Witness/confirm that structural fill was placed in lifts not to exceed 12-inches in loose thickness.

D. IBC Table 1705.6 – 3 and 4: Witness/confirm that structural fill was compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557).

Attached is a Geoprofessional Business Association paper entitled *Important Information about This Geotechnical Engineering Report*. This paper describes many of the risks inherent in geotechnical engineering and how, in light of those risks, we intend this evaluation to be used. We will continue to work cooperatively with the project principals and interested parties to achieve win/win solutions that benefit all.

This concludes our design phase services. Forward a copy of the near final plans, anticipated loads, and specifications for our review and comment so that we can confirm the applicability of these recommendations. It has been a pleasure working with you on this project and we look forward to working with you and the rest of the design/construction team as the project proceeds.

Sincerely,

FOUNDATION DESIGN, P.C.

Brennan J. Valentino, P.E.
Staff Engineer



Ryan J. Radford, P.E.
Vice President
Enc.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

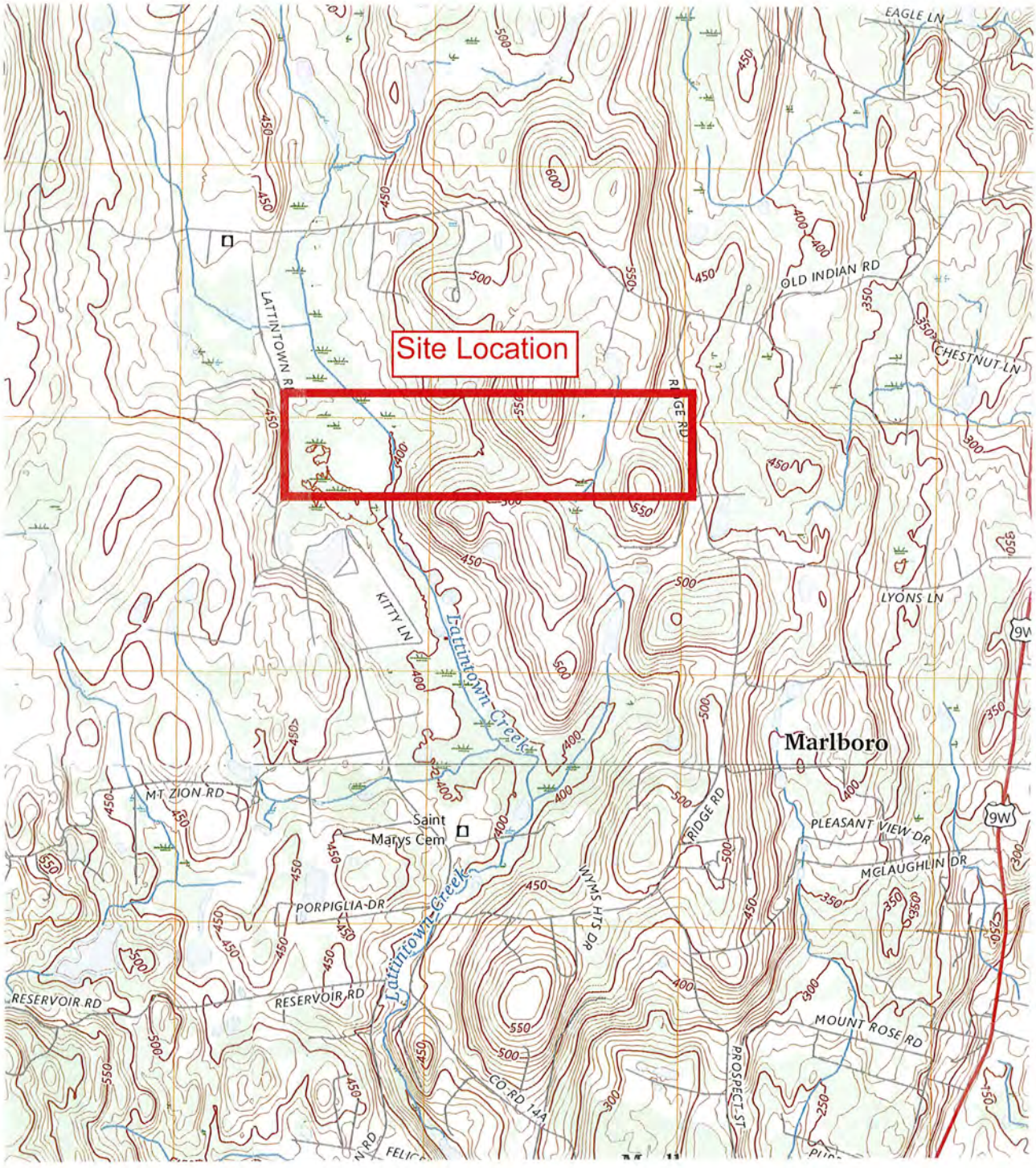
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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Foundation Design, P.C.

46A Sager Drive
Rochester, New York 14607
Phone (585) 458-0824
FAX (585) 458-3323

Marlborough Resort Additions
626 Lattintown Road, Marlboro, New York
General Location Plan
Adapted from: USGS Topographic Mapping
2023 Poughkeepsie, Clintondale, Wappingers Falls, and Newburgh Quadrangle

CHECKED BY:	**RJR**	Scale 1"= 2000'	**DATE: 5/15/24**
DRAWN BY:	**LMB**		**JOB NO.: 5642.0**



Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

46A Sager Drive
Rochester, New York 14607
Phone (585) 458-0824
FAX (585) 458-3323

Marlborough Resort Additions

626 Lattintown Road, Marlboro, New York

Boring Location Plan

Adapted from: Passero Associates

Overall Site Plan – Dated: May 16, 2024

CHECKED BY:	**RJR**	Scale: 1"- 400'	**DATE: 8-5-2024**
DRAWN BY:	**TJB**		**JOB NO.: 5642.0**

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SOIL • BEDROCK • GROUNDWATER

SOIL DESCRIPTIONS

COHESIVE SOIL

Very fine grained soils. Plastic soils that can be rolled into a thin thread if moist. Clays and silty clays show cohesion.

DESCRIPTION	SPT –BLOWS/FOOT
Very Soft	0-2
Soft	3-5
Medium	6-15
Stiff	16-25
Hard	26 or more

NON-COHESIVE SOIL

Soils composed of silt, sand and gravel, showing no cohesion or very slight cohesion

DESCRIPTION	SPT –BLOWS/FOOT
Loose	0-10
Firm	11-25
Compact	26-40
Dense	41-50
Very Dense	51 or more

SOIL COMPOSITION	DESCRIPTION	ESTIMATED PERCENTAGE
	and	50
	some	30-49
	little	11-29
	trace	0-10

MOISTURE CONDITIONS Dry, Damp, Moist, Wet, Saturated
Groundwater measured in the boring or test pit may not have reached equilibrium

SOIL STRATA:	TERM	DESCRIPTION
	layer	Soil deposit more than 6" thick
	seam	Soil deposit less than 6" thick
	parting	Soil deposit less than 1/8" thick
	varved	Horizontal uniform layers or seams of soil

GRAIN SIZE

MATERIAL		SIEVE SIZE
Boulder		Larger than 12 inches
Cobble		3 inches to 12 inches
Gravel	- coarse	1 inch to 3 inches
	- medium	3/8 inch to 1 inch
	- fine	No. 4 to 3/8 inch
Sand	- coarse	No. 10 to No. 4
	- medium	No. 40 to No. 10
	- fine	No. 200 to No. 40
Silt and Clay		Less than No. 200

Standard Penetration Test: The number of blows required to drive a split spoon sampler into the soil with a 140 pound hammer dropped 30 inches. The number of blows required for each 6-inches of penetration is recorded. The total number of blows required for the second and third 6-inches of penetration is termed the penetration resistance, or the "N" value.

Split Spoon Sampler: Typically a 2-foot long, 2-inch diameter hollow steel tube that breaks apart or splits in two down the tube length.

Refusal: Depth in the boring where more than 100 blows per 5-inches are needed to advance the sample spoon.

Core Recovery (%): The total length of rock core recovered divided by the total core run.

RQD (%): Rock Quality Designation – the total length of all the pieces of the rock core longer than 4-inches divided by the total length of the rock core run.

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 1		**Test Boring No.**	B24-1
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**		**Engineer**	J. Herrera
Date Started		**Completed**		**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
									(Falling Head test)
5									
10									
15									
20									
25									
30									

Notes:
1. Dry upon completion.
2. Advanced hole using hollow stem augers.
3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 1		**Test Boring No.**	B24-2
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 40s	**Engineer**	J. Herrera
Date Started	5/10/2024	**Completed**	5/10/2024	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
	1	1							TOPSOIL 1'0"
			1	1	2	S-1	0'-2'	13"	Loose brown wet SILT, little gravel, little sand, trace rootlets 2'0"
	1	5							Loose light olive-gray mottled wet SILT,
			5	4	10	S-2	2'-4'	12"	some gravel, some sand 4'6"
5	1	2							Loose gray wet SAND, some gravel,
			6	8	8	S-3	4'-6'	18"	little to some silt
	8	6							
			4	5	10	S-4	6'-8'	19"	S-4: Saturated, sand and gravel, little silt, water in spoon
	5	4							
10			4	3	8	S-5	8'-10'	12"	S-5: Brown staining from 8'-8'6", gray, saturated 8'6"-10' 10'0"
	3	2				S-6	10'-11'	12"	Loose gray saturated SAND, some gravel 11'0"
			2	2	4	S-6A	11'-12'	12"	Loose gray saturated SAND and GRAVEL, trace to little silt
									13'6"
									Loose gray saturated SAND, little gravel,
15									trace silt
	1	WH							
			1	WH	1	S-7	15'-17'	22"	
									18'6"
									Loose tan-brown saturated SAND,
20									little silt seams
	1	1							
			1	1	2	S-8	20'-22'	23"	22'0"
									Boring Terminated at 22'0"
25									
30									

Notes:
1. Water encountered at 6'.
2. Advanced hole using hollow stem augers.
3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 2		**Test Boring No.**	B24-3
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 60s	**Engineer**	J. Herrera
Date Started	5/9/24	**Completed**	5/9/24	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
	1	2							TOPSOIL 0'3"
			2	2	4	S-1	0'-2'	18"	Loose brown moist GRAVEL, some sand, trace silt 0'9"
	2	3							Loose tan-brown moist to wet SAND,
			3	2	6	S-2	2'-4'	19"	some gravel, trace silt 2'0"
5	1	1							Loose tan-brown-gray (mottled) wet to saturated
			WH	WH	1	S-3	4'-6'	20"	SAND, little silt
	WH	WH							S-3: Saturated, trace silt, water in spoon 7'0"
			1	1	1	S-4	6'-8'	18"	Loose gray saturated SAND, some silt
	WH	1							
10			WH	1	1	S-5	8'-10'	18"	S-5: Little silt
	1	WH							
			WH	1	0	S-6	10'-12'	20"	S-6: Same as S-5
15									
	1	2							
			3	2	5	S-7	15'-17'	14"	
20									
	WH	3							
			2	2	5	S-8	20'-22'	22"	
									(Sand 'blew' 1' into augers at 23')
25									
30									

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 2 **of** 2		**Test Boring No.**	B24-3
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 60s	**Engineer**	J. Herrera
Date Started	5/9/24	**Completed**	5/9/24	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
35									
									(Sand 'blew' 5' into augers at 38')
40	6	3							
			2	6	5	S-9	40'-42'	6"	41'6"
									Loose gray saturated SILT, some sand, some gravel 42'0"
45									
50									
55									
60									Notes: 1. Water encountered at 4', sand tends to 'run'. Water at 10' with augers in. 2. Advanced hole using hollow stem augers. 3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 1		**Test Boring No.**	B24-4
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 60s	**Engineer**	J. Herrera
Date Started	5/9/2024	**Completed**	5/9/2024	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
	2	3							TOPSOIL 0'3"
			2	3	5	S-1	0'-2'	18"	Loose brown wet SAND and GRAVL (possible fill)
	1	2							
			3	2	5	S-2	2'-4'	20"	
5	1	2							3'6"
			1	1	3	S-3	4'-6'	16"	Loose tan-brown mottled wet to saturated SAND, little to some silt
	1	WH							S-3: Gray, saturated, little gravel, water noted in spoon
			1	WH	1	S-4	6'-8'	23"	S-4: Same as S-3, water noted in spoon
	WH	WH							
10			1	WH	1	S-5	8'-10'	23"	S-5: Tan-brown, water noted in spoon
	1	WH							
			1	WH	1	S-6	10'-12'	23"	S-6: Tan-brown-gray, water noted in spoon
15									13'6"
	1	1							Loose gray saturated SAND, some silt
			1	2	2	S-7	15'-17'	23"	
20									S-8: Sand, trace to little silt
	WH	1							20'0"
			2	1	3	S-8	20'-22'	22"	Boring Terminated at 20'0"
25									
30									Notes: 1. Water encountered at 4'. 2. Advanced hole using hollow stem augers. 3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 2		**Test Boring No.**	B24-5
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 40s	**Engineer**	J. Herrera
Date Started	5/10/2024	**Completed**	5/10/2024	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
	2	5							TOPSOIL 0'4"
			5	5	10	S-1	0'-2'	17"	Loose brown wet SAND and GRAVEL, little silt (possible fill) 2'0"
	3	5							Loose brown wet SAND, some gravel, trace silt
			4	5	9	S-2	2'-4'	18"	4'6"
5	5	3							Loose brown saturated SAND, 5" saturated silt seam from 4'6"-5', water noted in spoon
			3	2	6	S-3	4'-6'	13"	
	2	2							S-4: Tan-brown, some silt, varved, water noted in spoon
			1	1	3	S-4	6'-8'	12"	
	1	WH							9'0"
10			WH	2	0	S-5	8'-10'	16"	Loose gray saturated SAND, some silt, varved
	3	2							S-6: Saturated
			3	3	5	S-6	10'-12'	12"	
15									
	WH	1							
			1	1	2	S-7	15'-17'	16"	
									18'6"
									Loose gray saturated SILT, some sand, water in spoon
20									
	WH	1							
			1	1	2	S-8	20'-22'	20"	
25									
30									

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 2 **of** 2		**Test Boring No.**	B24-5
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 40s	**Engineer**	J. Herrera
Date Started	5/10/2024	**Completed**	5/10/2024	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
35									
									38'6"
									Firm gray saturated SILT, some sand, some gravel
40									
	10	11							
			14	9	25	S-9	40'-42'	12"	
	32	15							
			10	7	25	S-10	42'-44'	12"	
45									44'0"
									Boring Terminated at 44'0"
50									
55									
60									

Notes:
1. Water encountered at 5', sand tends to 'run'.
2. Advanced hole using hollow stem augers.
3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Foundation Design, P.C.

Boring Log

Project No.	24.05642	**Page** 1 **of** 1		**Test Boring No.**	B24-6
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Overcast 60s	**Engineer**	J. Herrera
Date Started	5/9/2024	**Completed**	5/9/2024	**Driller**	B. Johnson
Drilling Company:	Core Down Drilling			**Drilling Equipment:**	Geoprobe 7822DT

Ft.	Blows Per Six Inches 0"/6"	6"/12"	12"/18"	18"/24"	N Value	Sample No.	Depth	Rec	Visual Soil and Rock Classifications / Remarks
	2	1							TOPSOIL 0'3"
			2	1	3	S-1	0'-2'	10"	FILL: Loose brown wet SAND and GRAVEL, little silt 2'0"
	2	2							FILL: Loose wet to saturated SAND, some silt, some gravel, few sporadic 3" clay and silt seams
			1	1	3	S-2	2'-4'	21"	
5	WH	1							S-3: Poor recovery
			WH	WH	1	S-3	4'-6'	2"	
	WH	WH							S-4: No recovery 6'0"
			WH	WH	0	S-4	6'-8'	0	FILL: Loose brown-black saturated decomposed WOOD, some silt (peat), water in spoon
	WH	WH							
10			WH	WH	0	S-5	8'-10'	17"	
	WH	WH							11'0"
			WH	WH	0	S-6	10'-12'	23"	FILL: Loose dark brown wet to saturated SILT, some sand, some gravel, little wood chips, little organics
	WH	WH							
			WH	WH	0	S-7	12'-14'	22"	
15	WH	WH							S-8: No recovery
			WH	WH	0	S-8	14'-16'	0	
	WH	2							16'0" Loose gray saturated SILT, little sand, little gravel, trace to little clay, trace organics
			2	2	4	S-9	16'-18'	22"	18'0"
	1	2				S-10A	18'-19'6"	10"	Loose gray saturated SAND, trace to little gravel
20			1	1	3	S-10	19'6"-20'	6"	water in spoon 19'6"
									Loose gray saturated SAND and GRAVEL, some silt 20'0"
									Boring Terminated at 20'0"
25									
30									

Notes:
1. Water encountered at 2'. Water at 3' with augers in upon completion.
2. Advanced hole using hollow stem augers.
3. Bore hole backfilled using auger spoils.

N=No. of blows to Drive 2" Spoon 12" with 140 lb. Wt. 30" Ea. Blow Hammer: Auto Size Rod: 2"

Core Down Drilling, LLC

Boring ID: B-7
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/7
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	WH	1	10	1	2" Topsoil, Dry, Brown, Sand & Gravel
2							
3	1	1	1	WH	12	2	same
4							
5	1	WH	3	5	12	3	moist, Brown, Sand & gravel
6							
7	4	2	2	2	20	4	wet, Brown, Fine Sand
8							
9	1	WH	WH	1	20	5	same
10							
11	1	2	3	4	14	6	wet, Brown, Fine Sand & Silt
12							
13							
14							
15							
16	1	3	2	2	14	7	same
17							
18							
19							
20							
21	WH	2	3	4	20	8	wet, Grey, Fine Sand & Silt
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-8 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/8	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	3	6	12	1	2" Top Soil, Dry, Brown, sand & gravel
2							
3	5	9	9	7	14	2	No Top Soil, Same
4							
5	6	4	4	4	20	3	Same
6							
7	3	3	2	1	18	4	Wet, Brown, sand & gravel, Thin layer of wet silty sand
8							
9	2	3	3	3	22	5	Wet, Brown, fine sand & silt
10							
11	3	3	3	2	24	6	Same, color change to grey at 12'
12							
13							
14							
15							
16	WH	1	2	2	24	7	wet, grey, sand & silt
17							
18							
19							
20							
21	WH	WH	1	5	24	8	Same
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC								Boring ID: B-9 Sheet 1 of 2
Project Location: 626 Lattintown Road, Marlborough NY							Project Manager: Chris LaPorta	
Ground Elevation: N/A							Dated Started: 5/17	Borehole Dia:
Depth to Ground Water:							Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:							Drilling contractor: Core Down Drilling, LLC	
							Drill Rig: Geoprobe 7822DT	
Sampler				Notes			Driller's Name: William Johnson	
Type: 2" Split Spoon							Boring logged by: William Johnson	
Hammer: Percussion 140 lb							Owner/Client Rep:	
Fall:								

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0 1	1	1	3	4	12	1	4" Top Soil, DRY, BROWN, SAND & GRAVEL
2 3	6	6	7	5	0	2	NO RECOVERY
4 5	3	1	3	1	14	3	DRY, BROWN, SAND & GRAVEL
6 7	4	4	3	2	16	4	MOIST AT TOP, WET AT BOTTOM, BROWN, SAND & GRAVEL
8 9	1	WH	1	WH	18	5	WET, BROWN, FINE SAND & SILT
10 11	2	3	3	2	18	6	SAME
12 13 14							
15 16	1	2	1	2	12	7	WET, GREY, SILT
17 18 19							
20 21	1	2	2	3	12	8	SAME
22 23 24							
25 26	1	2	3	4	20	9	SAME
27 28 29							
30 31	1	2	3	3	22	10	SAME

CONTINUED...

Core Down Drilling, LLC	(continued)	Boring ID: B-9 Sheet 2 of 2
Project Location: 626 Lattintown Road, Marlborough NY	Project Manager: Chris LaPorta	
Ground Elevation: N/A	Dated Started: 5/7	Borehole Dia:
Depth to Ground Water:	Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:	Drilling contractor: Core Down Drilling, LLC	
	Drill Rig: Geoprobe 7822DT	
Sampler	Notes	Driller's Name: William Johnson
Type: 2" Split Spoon		Boring logged by: William Johnson
Hammer: Percussion 140 lb		Owner/Client Rep:
Fall:		

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
32							
33							
34							
35	1	3	3	10	24	11	wet, grey, silt + SAND with gravel
36							At the bottom
37	7	7	5	6	18	12	wet, grey, mostly gravel + coarse SAND
38							
39							
40							
41							
42							End of boring @ feet bgs based on

Core Down Drilling, LLC								Boring ID: B-10 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY							Project Manager: Chris LaPorta	
Ground Elevation: N/A							Dated Started: 5/6	Borehole Dia:
Depth to Ground Water:							Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:							Drilling contractor: Core Down Drilling, LLC	
							Drill Rig: Geoprobe 7822DT	
Sampler				Notes			Driller's Name: William Johnson	
Type: 2" Split Spoon							Boring logged by: William Johnson	
Hammer: Percussion 140 lb							Owner/Client Rep:	
Fall:								

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0	WH	1	2	3	14	1	6" Top Soil, Dry, Brown, Sand + gravel
1							
2	1	2	4	6	12	2	Dry, Brown, Sand + gravel
3							
4	5	5	5	4	13	3	same
5							
6	2	3	2	3	12	4	wet, Brown, Sand
7							
8	1	WH	1	2	14	5	wet, Brown, Silt + Sand
9							
10	2	2	2	3	12	6	wet, Grey, mostly Silt
11							
12							
13							
14							
15	1	1	1	1	16	7	same
16							
17							
18							
19							
20	1	1	1	1	20	8	same
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-11 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/6	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	7	5	18	1	4" Topsoil, Dry, Brown, Sand + Gravel
2							Dry, Brown, Sand + Gravel
3	4	7	5	7	18	2	
4							
5	6	6	7	9	16	3	Same
6							Moist, Brown, Sand + Silt
7	6	5	4	3	15	4	
8							Wet, Brown, Sand + Silt
9	2	2	1	1	18	5	
10							Same
11	1	1	1	2	16	6	
12							
13							
14							
15							Wet, Grey, Silt + Some Clay
16	2	3	2	3	20	7	
17							
18							
19							
20							Same
21	1	1	1	2	16	8	
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-12 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/8	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	2	4	8	1	2" Top Soil, Dry, Brown, Sand & Gravel
2							
3	5	5	5	4	14	2	No top Soil, then Same
4							
5	6	5	5	3	20	3	Same
6							
7	3	1	2	2	20	4	Same, then wet Silt at 8'
8							
9	2	3	1	1	16	5	Wet, Brown, fine to coarse Sand + Silt
10							
11	1	1	WH	1	24	6	Same
12							
13	1	1	1	1	20	7	Wet, Brown, Fine Sand + Silt
14							
15	1	WH	1	2	18	8	Same
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-13 Sheet 1 of 2
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/8	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	4	5	16	1	3" Top Soil, DRY, BROWN, SAND & GRAVEL
2	4	4	4	4	16	2	NO Top Soil, Flow SAME
3							
4	4	6	6	5	18	3	SAME
5							
6	5	4	4	3	20	4	MOIST/WET, BROWN, FINE SAND & SILT
7							
8	1	1	1	1	22	5	WET, BROWN, FINE TO COARSE SAND & SILT
9							
10	1	WH	1	WH	18	6	SAME
11							
12							
13							
14							
15	WH	1	WH	1	20	7	SAME
16							
17							
18							
19							
20	1	WH	1	WH	24	8	SAME
21							
22							
23							
24							
25	1	WH	WH	WH	24	9	SAME
26							
27							
28							
29							
30	1	WH	1	1	20	10	SAME
31							

CONTINUED ...

Core Down Drilling, LLC							Boring ID: B-13 Sheet 2 of 2
Project Location: 626 Lattintown Road, Marlborough NY Ground Elevation: N/A Depth to Ground Water: Depth of Boring:						Project Manager: Chris LaPorta Dated Started: 5/8 Drill Type: HSA (3.25" ID) Drilling contractor: Core Down Drilling, LLC Drill Rig: Geoprobe 7822DT Driller's Name: William Johnson Boring logged by: William Johnson Owner/Client Rep:	Borehole Dia: (OD)
Sampler Type: 2" Split Spoon Hammer: Percussion 140 lb Fall:					Notes		
Depth (feet)	Blow Counts 0-6"	Blow Counts 6-12"	Blow Counts 12-18"	Blow Counts 18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
32							
33							
34							
35	1	2	3	3	20	11	wet, BROWN, fine SAND + SILT
36							
37							
38							
39							
40	4	5	4	6	20	12	wet, grey, SAND + CLAY + GRAVEL
41							
42							
							End of boring @ feet bgs based on

Core Down Drilling, LLC							Boring ID: B-15 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/6	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	WH	1	WH	1	3	1	moist, brown, mostly top soil and some gravel
2							
3	2	2	1	1	8	2	moist/wet, grey, sand silt & gravel
4							
5	1	1	2	4	10	3	same
6							
7	5	5	6	5	18	4	saturated, grey, sand & silt
8							
9	3	5	3	3	12	5	wet, grey, mostly sand & silt
10							
11	4	3	3	5	18	6	same
12							
13							
14							
15							
16	1	1	1	1	24	7	same
17							
18							
19							
20							
21	7	6	6	5	16	8	same, with some gravel
22							
23							
24							
25							
26	40	19	10	9	15	9	same
27							
28							
29							
30							
31	13	17	22	29	18	10	dry, grey, sand, silt, gravel & clay (till)

Core Down Drilling, LLC

Boring ID: B-16
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/3
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	WH	WH	1	12	1	24" Top Soil, wet, CRUSHED STONE AND ROAD BASE
2							
3	1	1	1	1	15	2	wet, CRUSHED STONE, THEN 12" PEAT
4							
5	1	WH	1	1	14	3	wet, 8" PEAT; THEN Grey, Silty SAND
6							
7	1	WH	WH	1	18	4	wet, Grey, Silty Sand
8							
9	WH	1	2	3	24	5	SAME
10							
11	3	4	3	4	24	6	SAME
12							
13							
14							
15							
16	5	6	6	5		7	SAME
17							
18							
19							
20							
21	4	1	2	2	18	8	wet, grey, COARSE SAND & SILT
22							
23							
24							
25							
26	18	24	50/4"		14	9	DENSE, SANDY, SILT & GRAVEL & some CLAY (FILL)
27							
28							
29							
30							
31	45	42	66	50/4"	16	10	SAME

Core Down Drilling, LLC

Boring ID: B-18
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 6/3
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	4	5	3	3	6	1	2" Top Soil, Dry, Brown, Sandy Silt,
2							
3	1	1	1	1	0	2	No Recovery
4							
5	1	1	8	10	18	3	Dry, Brown, Silt, Sand, Gravel, Few wet Silty layer at 5.5'
6							
7	12	12	11	8	18	4	wet, Brown, Silty Sand + Gravel
8							
9	8	7	8	9	19	5	Same
10							
11	10	13	11	12	12	6	Same
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-21
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/3
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia:
(OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	2	WH	1	3	13	1	DRY, BROWN, 3" CRUSHED STONE, SILTY, SAND & GRAVEL
2							
3	9	10	10	4	12	2	DRY, BROWN, SILTY SAND & GRAVEL THEN WET LAYER AT 3.5'
4							
5	4	6	47	26	8	3	WET, BROWN, SILTY SAND & ROCK
6	50/3"						ROCK DUST, AUGER REFUSAL AT 6.5'
7					0	4	
8							
9	16	6	9	15	12	5	WET, BROWN/GREY, SAND, SILT & SOME GRAVEL
10							
11	30	24	38	39	20	6	DRY, SANDY, SILT, GRAVEL & ROCK FRAGMENTS AUGER REFUSAL AT 12'
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-35
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/2
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	1	2	14	1	3" top Soil, DRY, BROWN, SAND, SILT, GRAVEL & SOME CLAY (TILL)
2							
3	4	6	7	9	22	2	No top Soil, then, SAME
4							
5	15	18	14	11	24	3	SAME
6							
7	8	8	10	11	22	4	SAME
8							
9	6	10	9	16	11	5	SAME
10							
11	15	18	12	28	21	6	SAME
12							
13							
14							
15							
16	50/4"				1	7	Rock Fragments
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-39 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/2	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	1	3	10	1	3' Top Soil, Dry, Brown, fill
2							Dry, Brown, fill, then a wet
3	6	7	5	5	24	2	silt Layer of 3.5'
4							
5	1	3	6	6	14	3	Dry, Brown, fill
6							
7	7	7	6	10	9	4	Same
8							Dry, Brown fill w crushed Rock
9	38	30	37		20	5	Stopped as spoon was Bending
10							Dry, Grey, fill (Auger Refusal
11	24	41	50/5"		24	6	at 9.5')
12							
13							* Stopped off
14							Auger Refusal at 11'
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-47 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 5/2	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	WH	1	2	12	1	WET, BROWN, SILTY SAND & SOME CLAY
2							
3	5	11	10	11	20	2	MOIST, BROWN, SAND, SILT, GRAVEL + SOME CLAY
4							
5	8	19	11	10	20	3	DRY, BROWN, CRUSHED ROCK, SAND, SILT, GRAVEL + SOME CLAY
6							
7	13	10	9	6	20	4	SAME
8							
9	5	50/5"			12	5	SAME
10							
11	4	10	10	8	14	6	DAMP, BROWN, FILL
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: 13-51
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/2
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	5	12	2	1	2" Top Soil, then No Recovery, except some Rock Fragments
2							
3	11	31	13	15	19	2	DRY, BROWN, Till & some Rock Fragments
4							
5	4	5	4	3	18	3	DRY, BROWN, Till
6							
7	6	6	4	4	18	4	SAME
8							
9	3	7	8	6	20	5	SAME
10							
11	3	3	10	9	20	6	SAME
12							
13							
14							
15							
16	17	13	11	21	24	7	SAME
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-59
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/2
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	6	12	9	12	13	1	4" Top Soil, DRY, BROWN, sand, Silt, gravel & trace Clay (fill)
2							No Top Soil, then
3	6	12	9	12	15	2	Same
4							
5	4	5	6	7	8	3	Same
6							
7	7	9	9	11	10	4	Same
8							
9	35	13	14	12	16	5	Same & some crushed Rock
10							
11	13	9	15	16	12	6	Same
12							
13							
14							
15							
16	13	13	8	10	9	7	Same
17							
18							
19							
20							
21							
22							
23							
24							
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27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-64
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 4/30
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							6" Top Soil, then DRY, BROWN, sand, silt, gravel + TRACE Clay, (+ill)
1	1	1	2	3	8	1	
2							DRY, BROWN, till + FRACTURED
3	9	50/5"			6	2	weathered ROCK (Auger Refusal)
4							
5							(* Stepped off and got Augen Refusal
6							At 3.5')
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-65
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 4/30
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	2	3	15	1	4" top Soil, then Slightly moist, BROWN, sand, silt, gravel trace clay (fill)
2							
3	4	8	8	9	20	2	DRY, BROWN, till
4							
5	4	7	9	11	20	3	SAME
6							
7	14	14	20	20	24	4	SAME
8							
9	18	25	32	50/1"	4	5	DRY, GREY, weathered Rock (Auger Refusal at 9.5')
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
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27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-66
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 4/30
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	2	4	18	1	4" Top Soil, then Slightly moist, BROWN, Sand, Silt, gravel, trace Clay (Till)
2							
3	5	9	14	19	20	2	DRY, BROWN, till
4							
5	4	8	11	17	17	3	SAME
6							
7	19	31	23	24	20	4	SAME
8							
9	14	21	23	25	18	5	SAME
10							
11	14	31	30	50/3"	24	6	SAME (Auger Refusal At 12')
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Project Manager: Chris LaPorta
Dated Started: 4/30
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Boring ID: B-67
Sheet 1 of 1
Borehole Dia: (OD)

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	3	2	3	20	1	6" Top Soil, then Dry Brown, till
2							
3	3	3	5	4	18	2	No top Soil then, Same
4							
5	3	3	6	7	20	3	Same
6							
7	7	11	22	18	18	4	Same
8							
9	15	25	50/3"		16	5	Same (Auger Refusal At 10')
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-68
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/1
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia:
(OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	4	4	18	1	6" Top Soil, DRY, BROWN, Till
2							
3	4	17	16	9	17	2	NO Top Soil, SAME
4							
5	4	5	7	9	20	3	SAME
6							
7	11	21	33	50/1"	16	4	SAME (Auger Refusal At 8')
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
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27							
28							
29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-69
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/1
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia:
(OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	3	3	6	8	12	1	4" Top Soil, then Dry, Brown till
2							
3	3	3	6	9	22	2	No Top Soil, then same
4							
5	5	6	10	10	15	3	same
6							
7	14	30	50/2"		16	4	same (Auger Refusal at 7.5')
8							
9							(* Stepped off 2x + got Auger Refusal at 4' and 8'
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
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29							
30							
31							

Core Down Drilling, LLC

Boring ID: B-70
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/1
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep.

Borehole Dia:
(OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	4	4	4	12	1	4" Top Soil, Dry, Brown, Till
2							No Top Soil, same
3	5	4	5	5	18	2	
4							
5	7	7	8	9	16	3	same
6							
7	7	15	19	28	20	4	same
8							
9	15	18	29	33	16	5	same
10							
11	23	50/4"			15	6	same (Auger Refusal at 11")
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
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29							
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31							

Core Down Drilling, LLC

Boring ID: B-73
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/1
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia:
(OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	5	6	3	3	20	1	4" Topsoil, then Dry, Brown, till
2							
3	8	21	16	8	10	2	No Topsoil, same
4							
5	8	9	6	6	18	3	Slightly moist, Brown, till
6							
7	6	8	8	6	8	4	Dry, Brown, till
8							
9	4	5	17	50/5"	18	5	Layer of moist silt, then Dry, Brown, till over bedrock
10							(Auger Refusal at 10.5')
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
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Core Down Drilling, LLC

Boring ID: B-80
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 5/1
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0	4	1	4	10	16	1	3" Top Soil, Dry, DARK BROWN, SAND AND SILT
1							
2	2	1	WH	1	2	2	NO TOP SOIL, SAME
3							
4	4	17	4	4	14	3	SLIGHTLY MOIST, DARK BROWN, MOSTLY SAND + SILT + SOME GRAVEL
5							
6	6	6	5	5	16	4	MOIST, BROWN, FILL
7							
8	6	7	14	23	18	5	SAME
9							
10	50/5"				6	6	DRY, BROWN, FILL
11							(AUGER REFUSAL AT 10.5')
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
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31							

Core Down Drilling, LLC

Boring ID: B-87
Sheet 1 of 1

Project Location: 626 Lattintown Road, Marlborough NY
Ground Elevation: N/A
Depth to Ground Water:
Depth of Boring:

Project Manager: Chris LaPorta
Dated Started: 4/29
Drill Type: HSA (3.25" ID)
Drilling contractor: Core Down Drilling, LLC
Drill Rig: Geoprobe 7822DT
Driller's Name: William Johnson
Boring logged by: William Johnson
Owner/Client Rep:

Borehole Dia: (OD)

Sampler
Type: 2" Split Spoon
Hammer: Percussion 140 lb
Fall:

Notes

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	1	2	4	20	1	6" Top Soil, then DRY, BROWN, SAND silt + gravel (Till) trace clay
2							
3	3	6	16	30	16	2	SAME
4							
5	12	8	8	9	4	3	DRY, GREY, Rock Fragments
6							
7	7	8	8	19	20	4	Slightly moist, BROWN/GREY, sand, silt, gravel + trace clay (till)
8							
9	10	10	9	22	14	5	SAME
10							
11	13	19	20	20	20	6	SAME (Auger Refusal at 12')
12							
13	25	30	12	14	16	7	SAME
14							
15							
16							
17							
18							
19							
20							
21							
22							
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26							
27							
28							
29							
30							
31							

Core Down Drilling, LLC							Boring ID: B-88 Sheet 1 of 1
Project Location: 626 Lattintown Road, Marlborough NY						Project Manager: Chris LaPorta	
Ground Elevation: N/A						Dated Started: 4/29	Borehole Dia:
Depth to Ground Water:						Drill Type: HSA (3.25" ID)	(OD)
Depth of Boring:						Drilling contractor: Core Down Drilling, LLC	
						Drill Rig: Geoprobe 7822DT	
Sampler				Notes		Driller's Name: William Johnson	
Type: 2" Split Spoon						Boring logged by: William Johnson	
Hammer: Percussion 140 lb						Owner/Client Rep:	
Fall:							

Depth (feet)	Blow Counts 0-6"	6-12"	12-18"	18-24"	Recovery / Penetration (inches)	Sample #	Sample Description
0							
1	1	2	4	4	12	1	DRY, BROWN, MIX OF SAND, SILT GRAVEL & SOME CLAY (TILL)
2							
3	4	5	5	50/2"	16	2	SAME
4							
5	14	9	10	11	24	3	MOIST, BROWN, SAND, SILT, GRAVEL & TRACE CLAY (TILL)
6							
7	6	9	25	31	24	4	SAME
8							SAME, WITH A SEAM OF WET SILT/GRAVEL
9	7	12	10	10	16	5	
10							
11	8	12	10	12	18	6	MOIST, BROWN, (TILL)
12							
13							
14							
15							
16	8	12	14	16	20	7	DRY, BROWN, SAND, SILT, GRAVEL & TRACE CLAY (TILL)
17							
18							
19							
20							
21	50/4"					8	DRY, GREY, WEATHERED ROCK FRAGMENTS (REFUSAL)
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-17
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Loose to firm tan-brown moist SILT, some sand, little to some gravel, little clay
4			(Firm to compact, damp below 2'6")
6			
8			(Dense, moist to wet below 7')
10			10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-19
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Firm to compact tan-brown moist SILT, some sand, little to some gravel, little clay
4			(Damp below 2')
6			(Compact to dense below 5')
8			(Wet sand and gravel seam at 7'-8')
10			10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-23
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
			TOPSOIL
			1′0″
2			Firm tan-brown damp SILT, some sand, little to some gravel, trace clay
4			(Firm to compact below 3′)
6			(Compact to dense below 5′)
8			
10			10′0″
12			Probe Terminated at 10′0″

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-24
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Firm to compact tan-brown damp SILT, some sand, little to some gravel, little clay
4			
6			
8			
10			10'0"
12			Probe Terminated at 10'0"

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-26
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Firm tan-brown moist SILT, some sand, little to some gravel, little clay
4			(Firm to compact below 3')
6			(Compact to dense, wet below 4'6")
8			
10			10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-30
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
			TOPSOIL 1'0" Firm tan-brown wet SILT and SAND, little to some gravel, little clay
2			
4			(Firm to compact below 3')
6			
8			(Dense below 7')
10			10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page** _____ **of** _____		**Soil Probe #**	B-32
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Firm to compact tan-brown damp SILT, some sand, little to some gravel, little clay
4			
6			(Wet below 5')
8			
10			10'0"
12			Probe Terminated at 10'0"

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page** _____ **of** _____		**Soil Probe #**	B-37
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 0'6" Firm tan-brown moist SILT, some sand, little to some gravel, little clay
4			
6			(Compact below 5', shale fragments noted)
8			
10			(Dense below 9') 10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-40
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
			TOPSOIL 1′0″ Loose tan-brown wet SILT, some sand, some gravel, little clay
2			
			(Firm to compact, damp below 2′)
4			
			(Compact to dense below 5′)
6			
8			
10			10′0″ Probe Terminated at 10′0″
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

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Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-46
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL 1'0" Firm to compact tan-brown moist SILT, some sand, little to some gravel, little clay
4			
6			(Dense below 5') 10'0" Probe Terminated at 10'0"
8			
10			
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

Soil Probe Log

Project No.	24.05642	**Page**	**of**	**Soil Probe #**	B-78
Project Name	Marlborough Resort Additions, 626 Lattintown Road, Marlboro, NY				
Client	Passero Associates, 6 Front Street, Newburgh, NY				
Elevation		**Weather**	Sunny 50s	**Technician**	B. Valentino
Date Started	4/25/2024	**Completed**	4/25/2024	**Operator**	B. Johnson
Subcontractor	Core Down Drilling			**Equipment**	Geoprobe 7822

Depth Below Surface	Sample Number	Depth of Sample	Soil and Rock Classifications Remarks
2			TOPSOIL
4			2'6" Loose to firm tan-brown moist SILT, some sand, little to some gravel, little clay (Dense below 3') (Cobble fragments at 4')
6			(Wet, numerous cobbles/boulders below 5')
8			
10			10'0" Probe Terminated at 10'0"
12			

Site Pictures



Notes:
1. Sides vertical upon completion.
2. Dry on completion.
3. Staked location provided by Passero Associates.

Foundation Design, P.C.

SOIL • BEDROCK • GROUNDWATER

May 28, 2024

Passero Associates
6 Front Street
Newburgh, New York 12550

Attention: Chris LaPorta, PE, CDT

Reference: Marlborough Resort Additions
626 Lattintown Road, Marlboro, NY 12542
Laboratory Test Results, 24.05642

Dear Mr. LaPorta:

Foundation Design, P.C. is pleased to present the following results of the laboratory testing performed on the referenced project. The testing was performed in accordance with the following ASTM test methods:

9	Sieve Analysis	ASTM D-1140
9	Moisture Content Test	ASTM D-2216
3	Organic Content Determination	ASTM D-2974

We appreciate the opportunity to provide these testing services and look forward to hearing from you again in the near future.

Sincerely,

FOUNDATION DESIGN, P.C.

Ryan Radford, P.E.
Vice President

Foundation Design, P.C.

Marlborough Resort Additions
626 Lattintown Road, Marlboro, NY
24.05642

05/28/2024

Moisture and Organic Content Test Report
(ASTM D-2216 and ASTM D-2974)

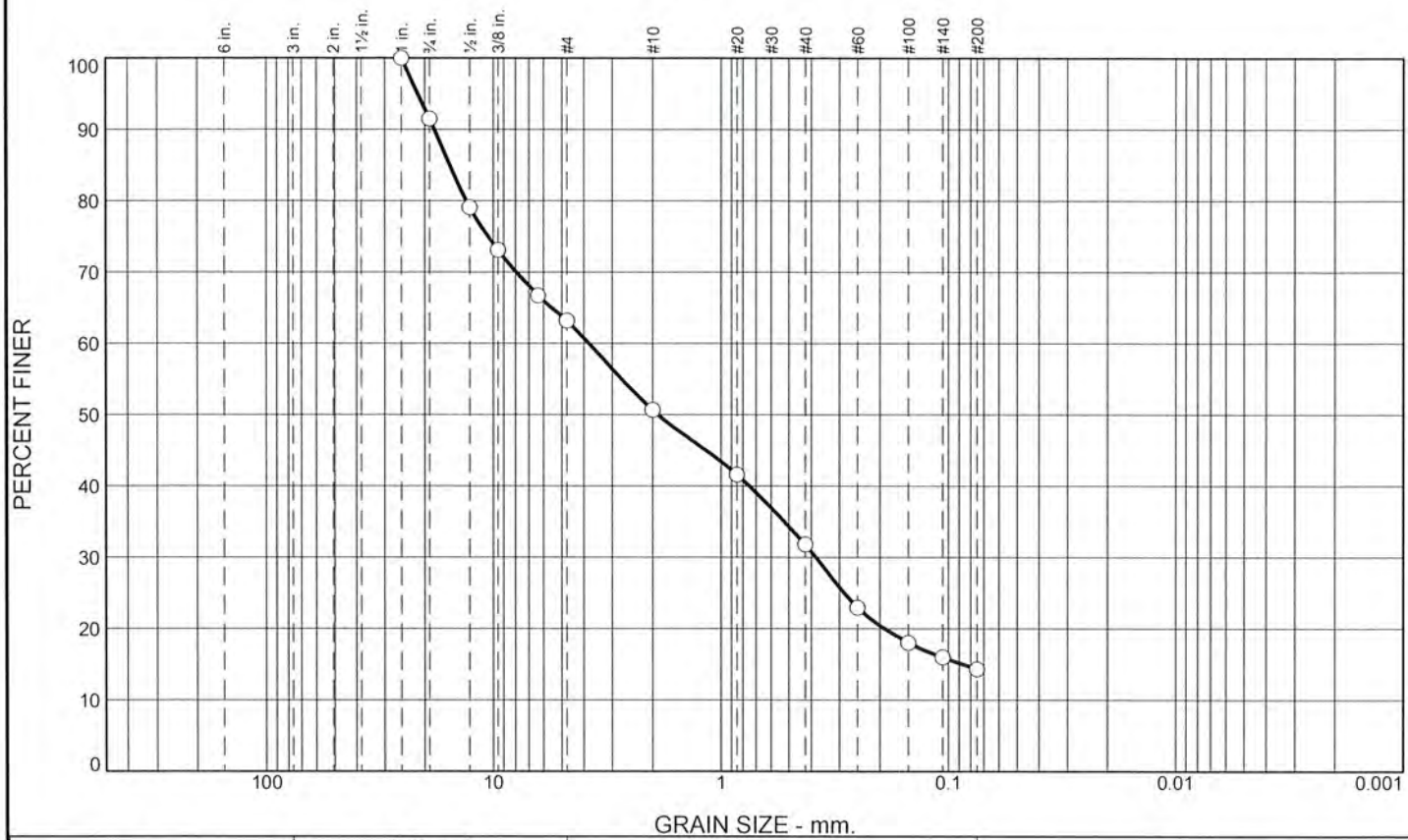
Moisture and Organic Content Test Results				
Boring Number	B24-2	B24-3	B24-5	B24-6
Sample Number	S-3	S-2	S-6	S-5
Depth	4'-6'	2'-4'	10'-12'	8'-10'
Moisture Content (%)	**11.6**	**28.0**	**27.0**	**340.9**
Ash Content (%)	-	-	-	**47.3**
Organic Content (%)	-	-	-	**52.7**

Moisture and Organic Content Test Results				
Boring Number	B24-6	B24-7	B24-9	B24-13
Sample Number	S-7	S-4	S-3	S-5
Depth	12'-14'	6'-8'	4'-6'	8'-10'
Moisture Content (%)	**105.7**	**28.6**	**10.0**	**26.0**
Ash Content (%)	**87.9**	-	-	-
Organic Content (%)	**12.1**	-	-	-

Moisture and Organic Content Test Results				
Boring Number	B24-16	B24-35	B24-59	B24-65
Sample Number	S-2	S-3	S-4	S-3
Depth	2'-4'	4'-6'	6'-8'	4'-6'
Moisture Content (%)	**236.5**	**12.9**	**16.8**	**8.0**
Ash Content (%)	**56.5**	-	-	-
Organic Content (%)	**43.5**	-	-	-

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	8	29	12	19	18	14

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1"	100			
3/4"	92			
1/2"	79			
3/8"	73			
1/4"	67			
#4	63			
#10	51			
#20	42			
#40	32			
#60	23			
#100	18			
#140	16			
#200	14			

* (no specification provided)

Material Description

SM: Gray silty sand with gravel per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 264.92 grams of oven dried sample

Source of Sample: B24-2 **Depth:** 4'-6'
Sample Number: S-3

Sample Date: 05/28/2024

Foundation Design, P.C.

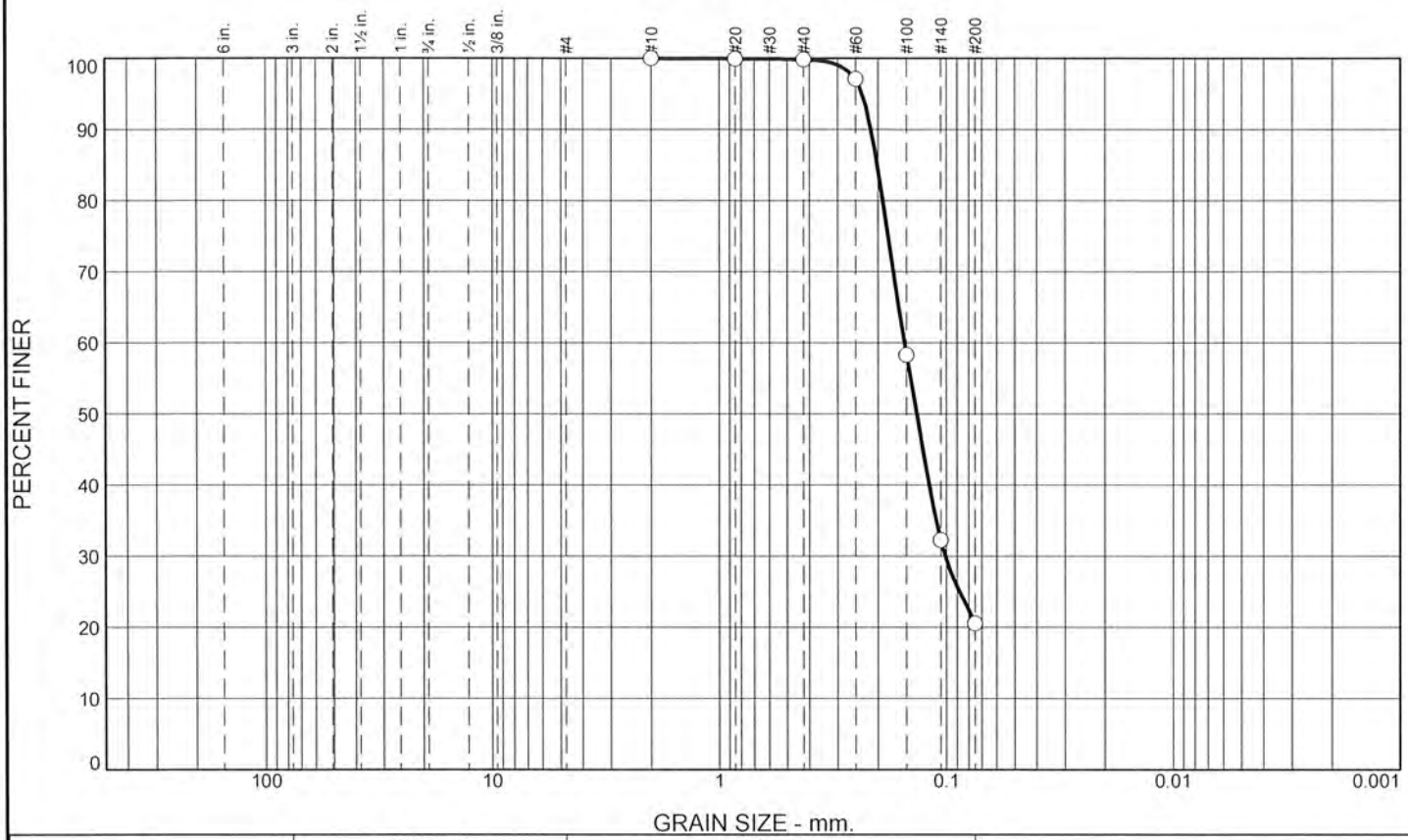
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	0	0	79	21

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#10	100			
#20	100			
#40	100			
#60	97			
#100	58			
#140	32			
#200	21			

* (no specification provided)

Material Description

SM: Tan-brown silty sand per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 190.28 grams of oven dried sample

Source of Sample: B24-3 **Depth:** 2'-4'
Sample Number: S-2 **Sample Date:** 05/28/2024

Foundation Design, P.C.

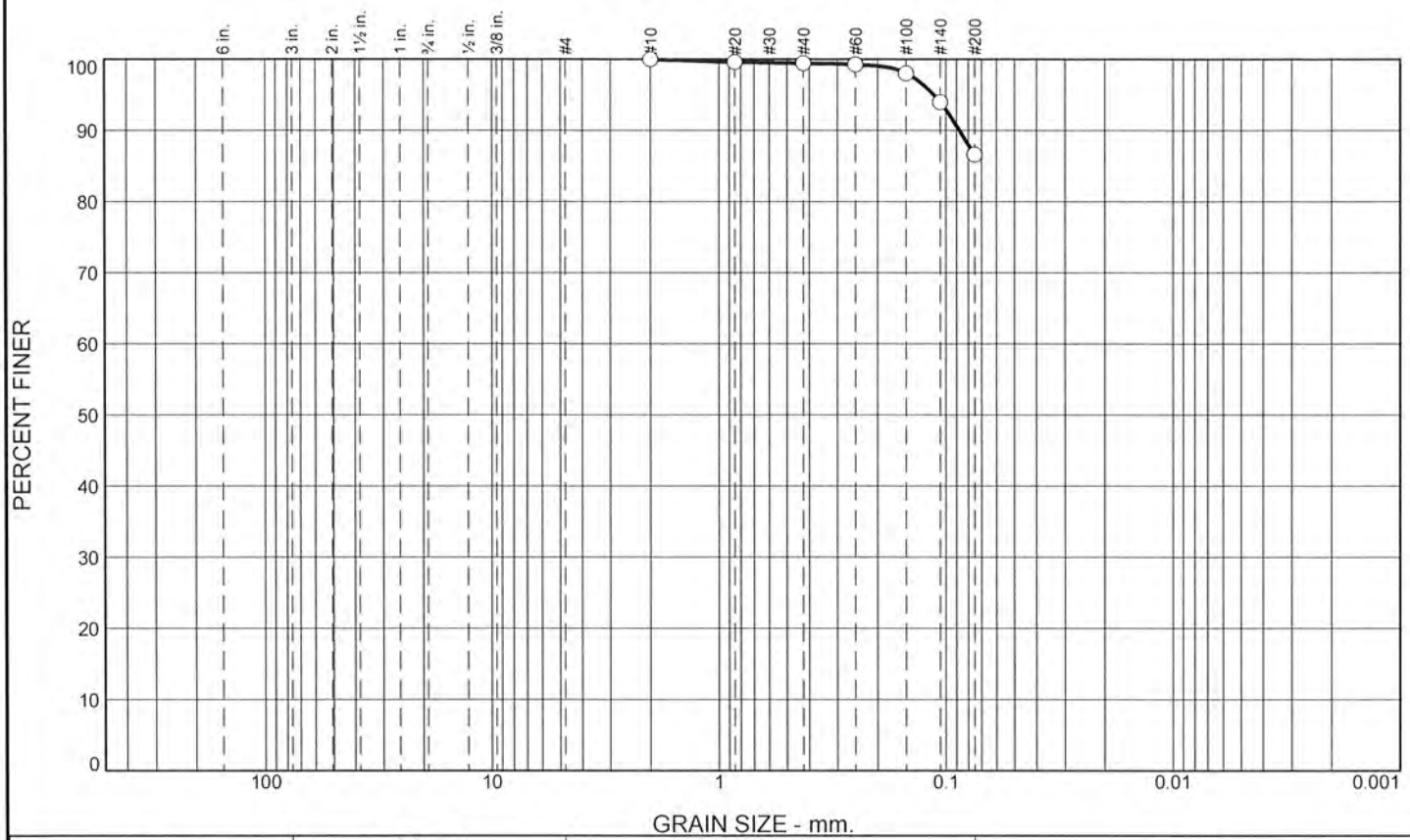
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	0	1	12	87

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#10	100			
#20	100			
#40	99			
#60	99			
#100	98			
#140	94			
#200	87			

* (no specification provided)

Material Description

ML: Gray silt per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 207.45 grams of oven dried sample

Source of Sample: B24-5 **Depth:** 10'-12'
Sample Number: S-6

Sample Date: 05/28/2024

Foundation Design, P.C.

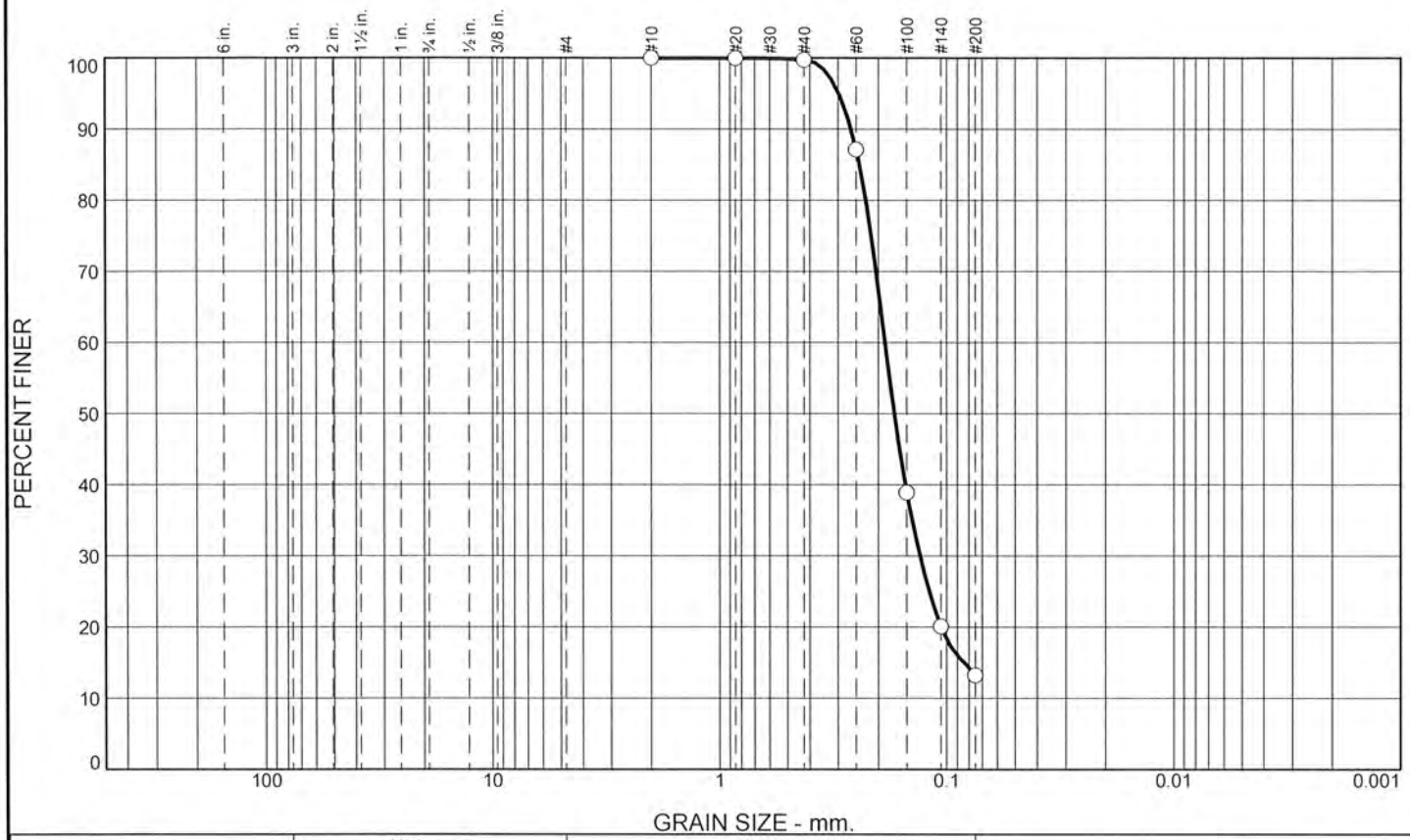
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	0	0	87	13

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#10	100			
#20	100			
#40	100			
#60	87			
#100	39			
#140	20			
#200	13			

* (no specification provided)

Material Description

SM: Brown silty sand per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 216.75 grams of oven dried sample

Source of Sample: B24-7 **Depth:** 6'-8'
Sample Number: S-4

Sample Date: 05/28/2024

Foundation Design, P.C.

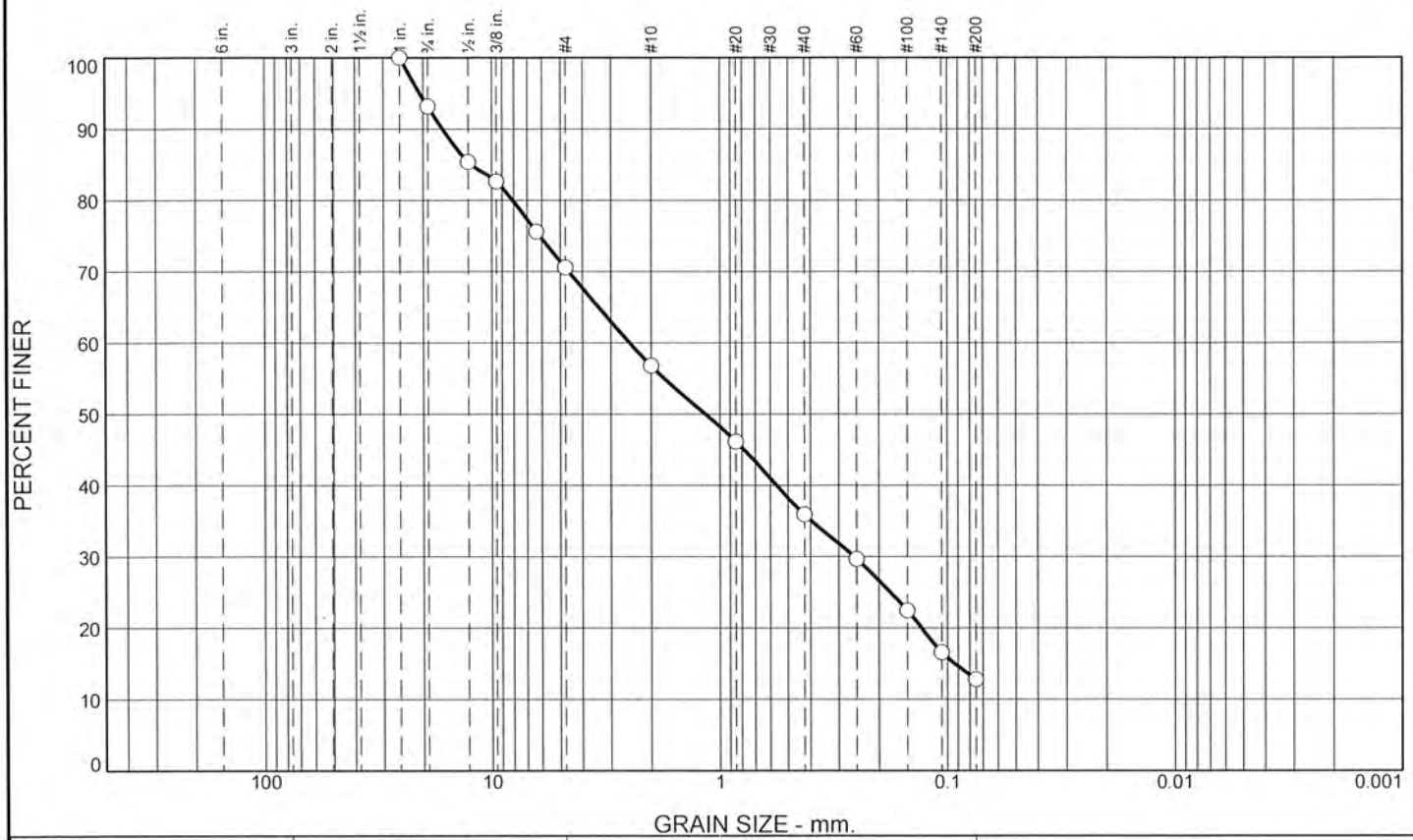
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	7	22	14	21	23	13

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1"	100			
3/4"	93			
1/2"	85			
3/8"	83			
1/4"	76			
#4	71			
#10	57			
#20	46			
#40	36			
#60	30			
#100	22			
#140	17			
#200	13			

* (no specification provided)

Material Description

SM: Brown silty sand with gravel per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 245.35 grams of oven dried sample

Source of Sample: B24-9 **Depth:** 4'-6'
Sample Number: S-3 **Sample Date:** 05/28/2024

Foundation Design, P.C.

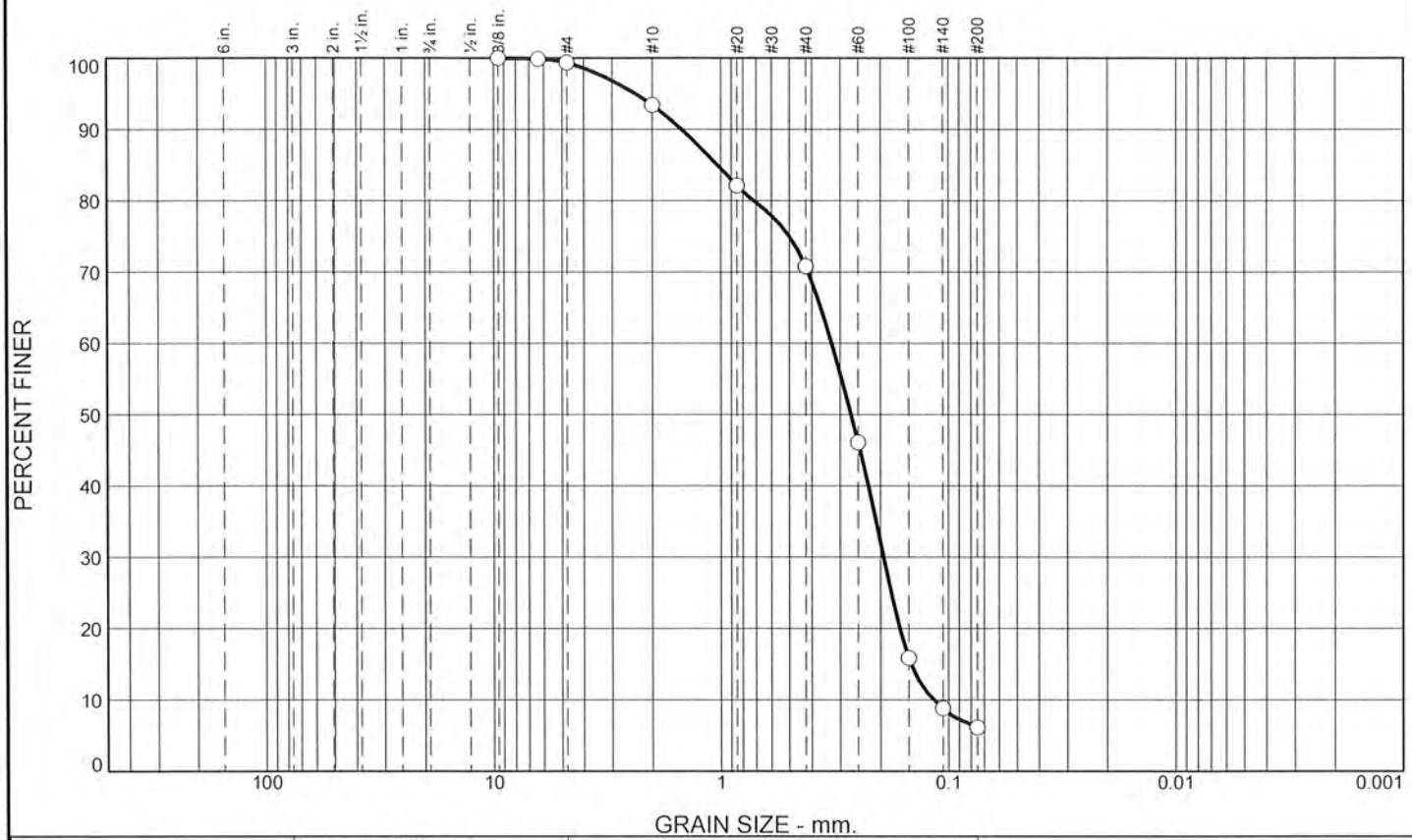
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	1	6	22	65	6

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/8"	100			
1/4"	100			
#4	99			
#10	93			
#20	82			
#40	71			
#60	46			
#100	16			
#140	9			
#200	6			

* (no specification provided)

Material Description

SP-SM: Brown poorly graded sand with silt per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 285.47 grams of oven dried sample

Source of Sample: B24-13 **Depth:** 8'-10'
Sample Number: S-5 **Sample Date:** 05/28/2024

Foundation Design, P.C.

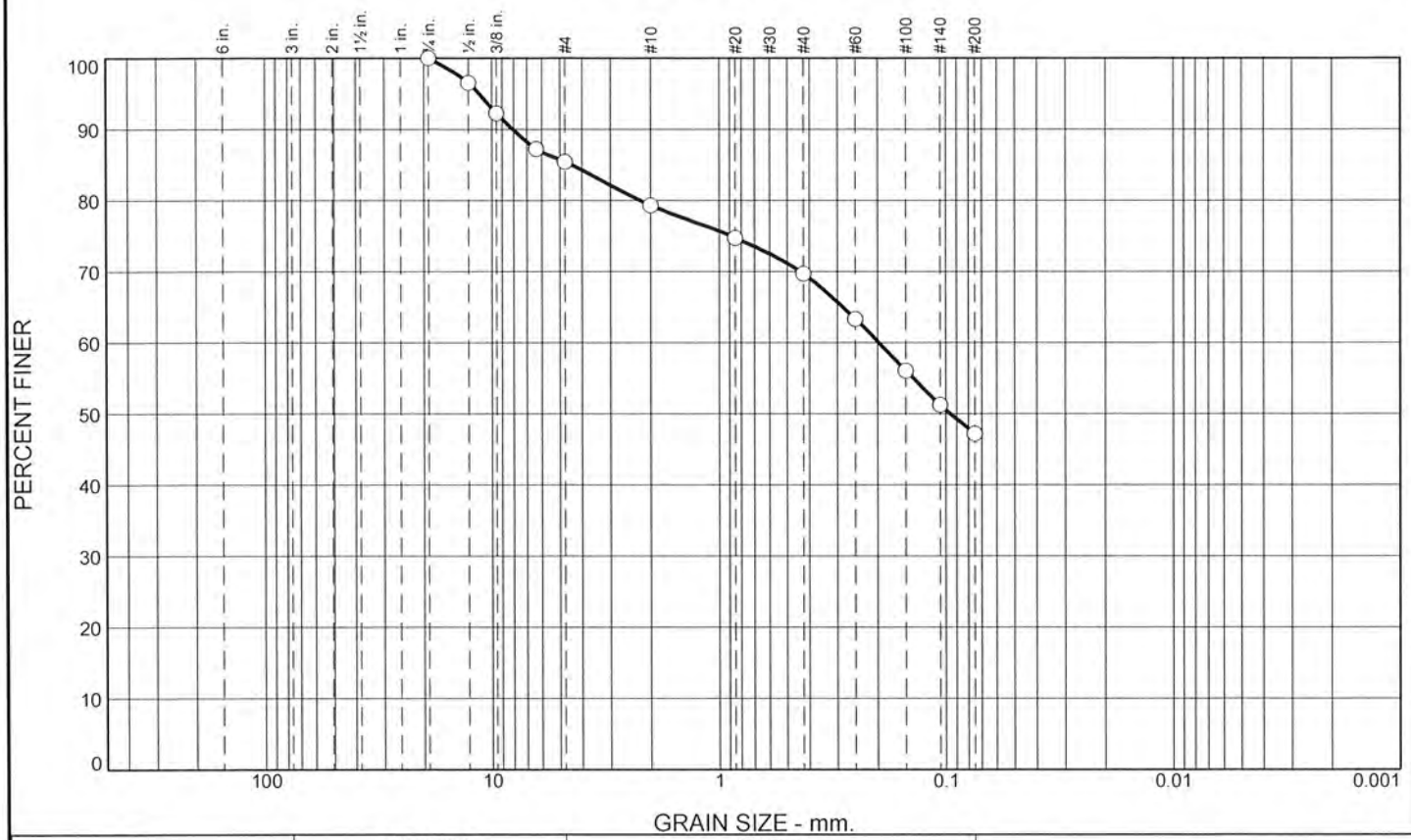
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	15	6	9	23	47

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/4	100			
1/2	97			
3/8	92			
1/4	87			
#4	85			
#10	79			
#20	75			
#40	70			
#60	63			
#100	56			
#140	51			
#200	47			

* (no specification provided)

Material Description

SM: Brown silty sand with gravel per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 243.76 grams of oven dried sample

Source of Sample: B24-35 **Depth:** 4'-6'
Sample Number: S-3

Sample Date: 05/28/2024

Foundation Design, P.C.

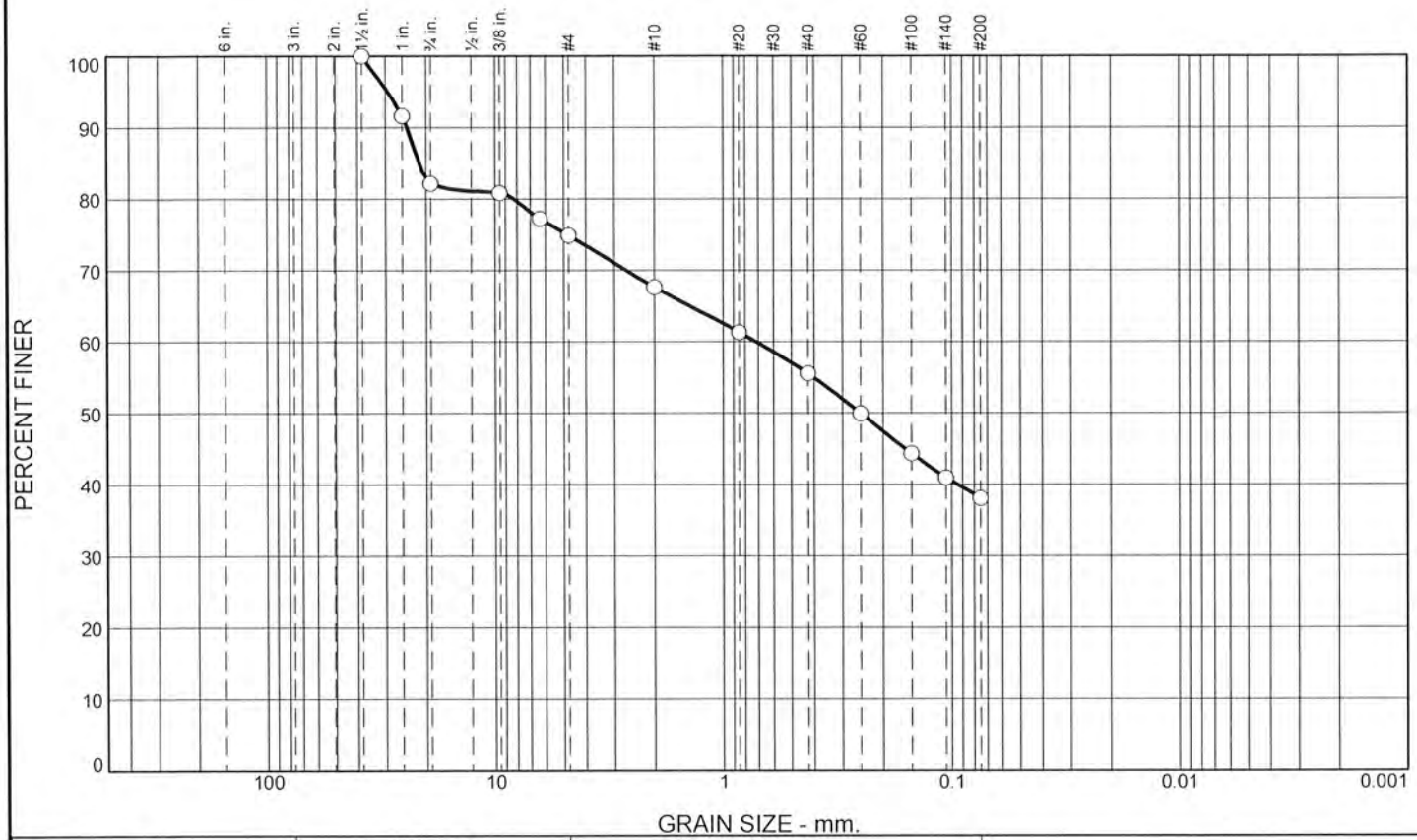
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	18	7	7	12	18	38

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1.5"	100			
1"	92			
3/4"	82			
3/8"	81			
1/4"	77			
#4	75			
#10	68			
#20	61			
#40	56			
#60	50			
#100	44			
#140	41			
#200	38			

* (no specification provided)

Material Description

SM: Brown silty sand with gravel per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 254.09 grams of oven dried sample

Source of Sample: B24-59 **Depth:** 6'-8'
Sample Number: S-4

Sample Date: 05/28/2024

Foundation Design, P.C.

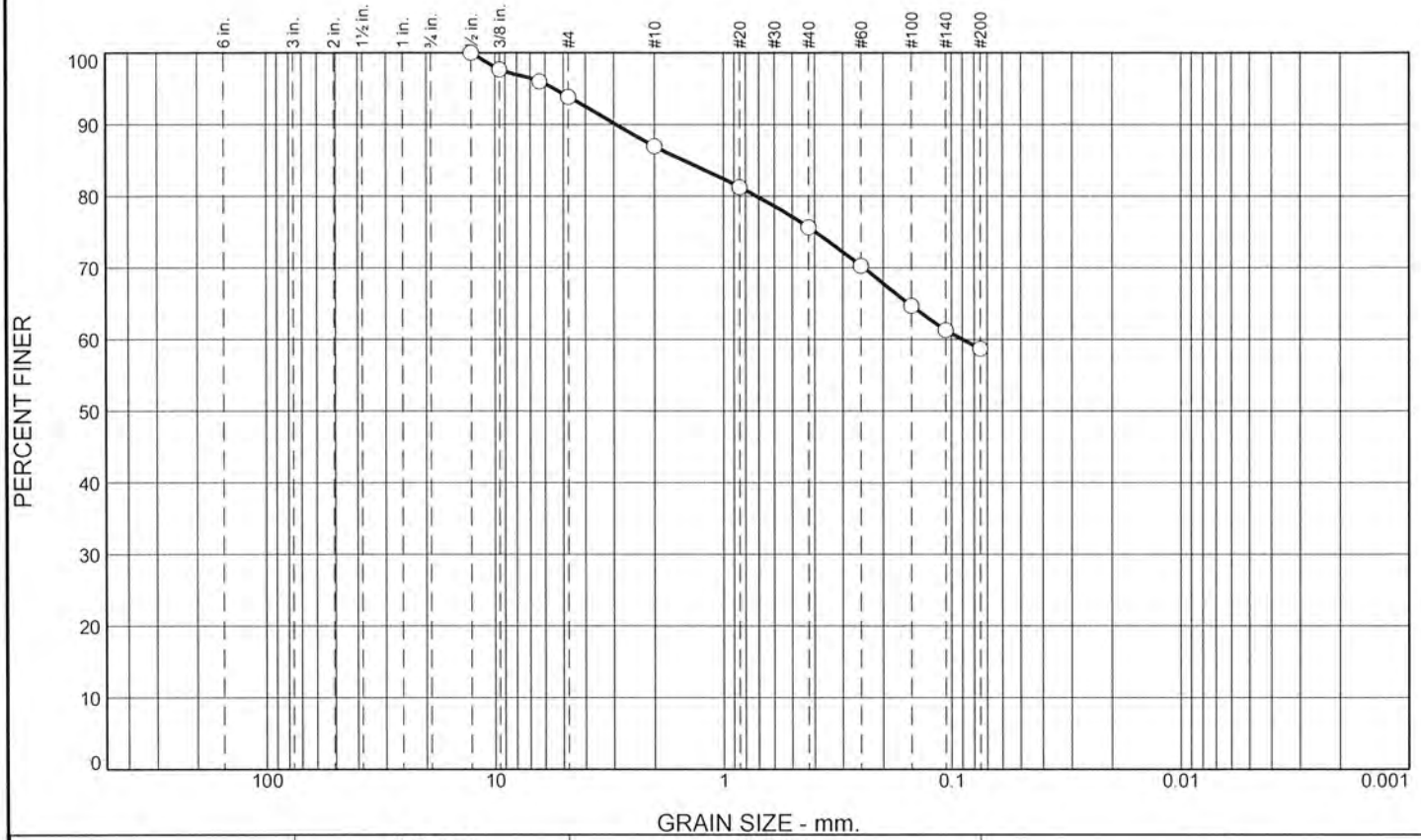
Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	6	7	11	17	59

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1/2"	100			
3/8"	98			
1/4"	96			
#4	94			
#10	87			
#20	81			
#40	76			
#60	70			
#100	65			
#140	61			
#200	59			

* (no specification provided)

Material Description

ML: Brown sandy silt per ASTM D-2488

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Test Remarks

Test performed on 248.94 grams of oven dried sample

Source of Sample: B24-65 **Depth:** 4'-6'
Sample Number: S-3

Sample Date: 05/28/2024

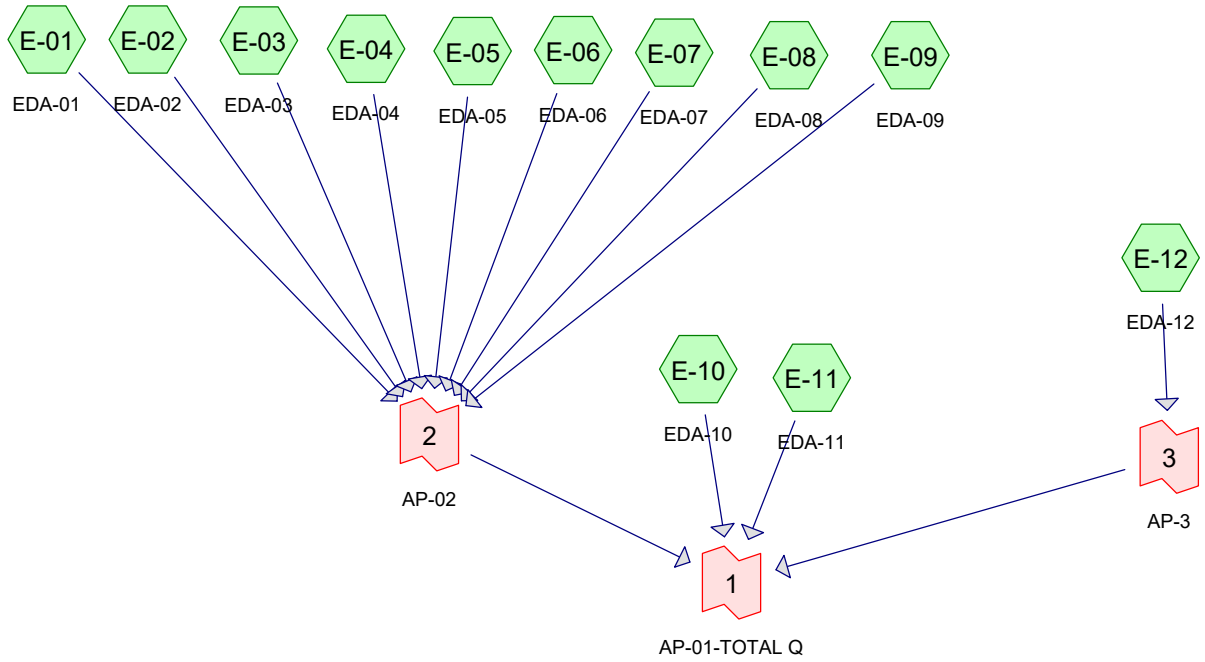
Foundation Design, P.C.

Client: Passero Associates, 6 Front St, Newburgh, NY
Project: Marlborough Resort Additions, 626 Lattintown Rd Marlboro, NY

Project No: 24.05642 **Figure**

Tested By: RLS **Checked By:** RJR

APPENDIX H: EXISTING CONDITIONS HYDROCAD



Subcat Reach Pond Link

Routing Diagram for EXISTING - MARLBOROUGH RESORT
Prepared by Passero Associates, Printed 8/18/2024
HydroCAD® 10.20-4a s/n 13263 © 2023 HydroCAD Software Solutions LLC

EXISTING - MARLBOROUGH RESORT

Prepared by Passero Associates

HydroCAD® 10.20-4a s/n 13263 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	1-YEAR	Type III 24-hr		Default	24.00	1	2.61	2	3.15
2	10-YEAR	Type III 24-hr		Default	24.00	1	4.65	2	3.15
3	100-YEAR	Type III 24-hr		Default	24.00	1	6.36	2	3.15
4	WQv Event	Type III 24-hr		Default	24.00	1	1.40	2	3.15

EXISTING - MARLBOROUGH RESORT

Prepared by Passero Associates

HydroCAD® 10.20-4a s/n 13263 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.731	39	>75% Grass cover, Good, HSG A (E-04)
1.880	61	>75% Grass cover, Good, HSG B (E-04)
39.476	74	>75% Grass cover, Good, HSG C (E-08, E-09, E-10, E-11)
28.521	80	>75% Grass cover, Good, HSG D (E-04, E-08, E-09, E-10, E-11)
1.735	98	IMP A (E-03, E-04)
0.146	98	IMP B (E-04, E-07)
2.185	98	IMP C (E-06, E-07, E-08, E-09, E-10, E-11, E-12)
1.135	98	IMP D (E-04, E-07, E-08, E-09, E-10, E-11, E-12)
0.500	98	Paved parking, HSG A (E-01)
4.980	49	SOIL A (E-03)
0.530	69	SOIL B (E-03)
3.750	79	SOIL C (E-12)
0.810	84	SOIL D (E-03, E-12)
4.463	70	Woods, Good, HSG C (E-09)
18.374	32	Woods/grass comb., Good, HSG A (E-01, E-02, E-05)
5.142	58	Woods/grass comb., Good, HSG B (E-01, E-05, E-06, E-07)
20.483	72	Woods/grass comb., Good, HSG C (E-05, E-06, E-07)
16.386	79	Woods/grass comb., Good, HSG D (E-01, E-02, E-05, E-06, E-07)
153.227	**69**	**TOTAL AREA**

EXISTING - MARLBOROUGH RESORT

Prepared by Passero Associates

Printed 8/18/2024

HydroCAD® 10.20-4a s/n 13263 © 2023 HydroCAD Software Solutions LLC

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.731	1.880	39.476	28.521	0.000	72.608	>75% Grass cover, Good	E-04, E-08, E-09, E-10, E-11
0.000	0.000	0.000	0.000	1.735	1.735	IMP A	E-03, E-04
0.000	0.000	0.000	0.000	0.146	0.146	IMP B	E-04, E-07
0.000	0.000	0.000	0.000	2.185	2.185	IMP C	E-06, E-07, E-08, E-09, E-10, E-11, E-12
0.000	0.000	0.000	0.000	1.135	1.135	IMP D	E-04, E-07, E-08, E-09, E-10, E-11, E-12
0.500	0.000	0.000	0.000	0.000	0.500	Paved parking	E-01
0.000	0.000	0.000	0.000	4.980	4.980	SOIL A	E-03
0.000	0.000	0.000	0.000	0.530	0.530	SOIL B	E-03
0.000	0.000	0.000	0.000	3.750	3.750	SOIL C	E-12
0.000	0.000	0.000	0.000	0.810	0.810	SOIL D	E-03, E-12
0.000	0.000	4.463	0.000	0.000	4.463	Woods, Good	E-09
18.374	5.142	20.483	16.386	0.000	60.385	Woods/grass comb., Good	E-01, E-02, E-05, E-06, E-07
21.605	**7.022**	**64.422**	**44.907**	**15.271**	**153.227**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-01: EDA-01 Runoff Area=23.430 ac 2.13% Impervious Runoff Depth>0.04"
Flow Length=845' Tc=44.5 min CN=52 Runoff=0.18 cfs 0.078 af

SubcatchmentE-02: EDA-02 Runoff Area=6.224 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=600' Tc=25.7 min CN=40 Runoff=0.00 cfs 0.000 af

SubcatchmentE-03: EDA-03 Runoff Area=6.955 ac 12.72% Impervious Runoff Depth>0.17"
Flow Length=230' Tc=14.9 min CN=60 Runoff=0.54 cfs 0.099 af

SubcatchmentE-04: EDA-04 Runoff Area=7.441 ac 13.44% Impervious Runoff Depth>0.24"
Flow Length=219' Tc=7.4 min CN=63 Runoff=1.08 cfs 0.150 af

SubcatchmentE-05: EDA-05 Runoff Area=5.642 ac 0.00% Impervious Runoff Depth>0.45"
Flow Length=743' Tc=16.0 min CN=70 Runoff=1.95 cfs 0.212 af

SubcatchmentE-06: EDA-06 Runoff Area=11.592 ac 2.85% Impervious Runoff Depth>0.52"
Flow Length=725' Tc=26.0 min CN=72 Runoff=4.09 cfs 0.503 af

SubcatchmentE-07: EDA-07 Runoff Area=14.685 ac 2.44% Impervious Runoff Depth>0.56"
Flow Length=1,049' Tc=18.7 min CN=73 Runoff=6.47 cfs 0.687 af

SubcatchmentE-08: EDA-08 Runoff Area=18.876 ac 3.95% Impervious Runoff Depth>0.69"
Flow Length=1,663' Tc=12.2 min CN=76 Runoff=12.50 cfs 1.085 af

SubcatchmentE-09: EDA-09 Runoff Area=29.922 ac 2.45% Impervious Runoff Depth>0.69"
Flow Length=1,606' Tc=14.8 min CN=76 Runoff=18.58 cfs 1.718 af

SubcatchmentE-10: EDA-10 Runoff Area=19.931 ac 3.61% Impervious Runoff Depth>0.83"
Flow Length=1,388' Tc=16.8 min CN=79 Runoff=14.66 cfs 1.379 af

SubcatchmentE-11: EDA-11 Runoff Area=4.256 ac 3.67% Impervious Runoff Depth>0.74"
Flow Length=595' Tc=11.3 min CN=77 Runoff=3.14 cfs 0.261 af

SubcatchmentE-12: EDA-12 Runoff Area=4.273 ac 6.39% Impervious Runoff Depth>0.94"
Flow Length=812' Tc=10.0 min CN=81 Runoff=4.31 cfs 0.334 af

Link 1: AP-01-TOTALQ Inflow=63.16 cfs 6.507 af
Primary=63.16 cfs 6.507 af

Link 2: AP-02 Inflow=42.27 cfs 4.532 af
Primary=42.27 cfs 4.532 af

Link 3: AP-3 Inflow=4.31 cfs 0.334 af
Primary=4.31 cfs 0.334 af

Total Runoff Area = 153.227 ac Runoff Volume = 6.507 af Average Runoff Depth = 0.51"
96.28% Pervious = 147.526 ac 3.72% Impervious = 5.701 ac

Summary for Subcatchment E-01: EDA-01

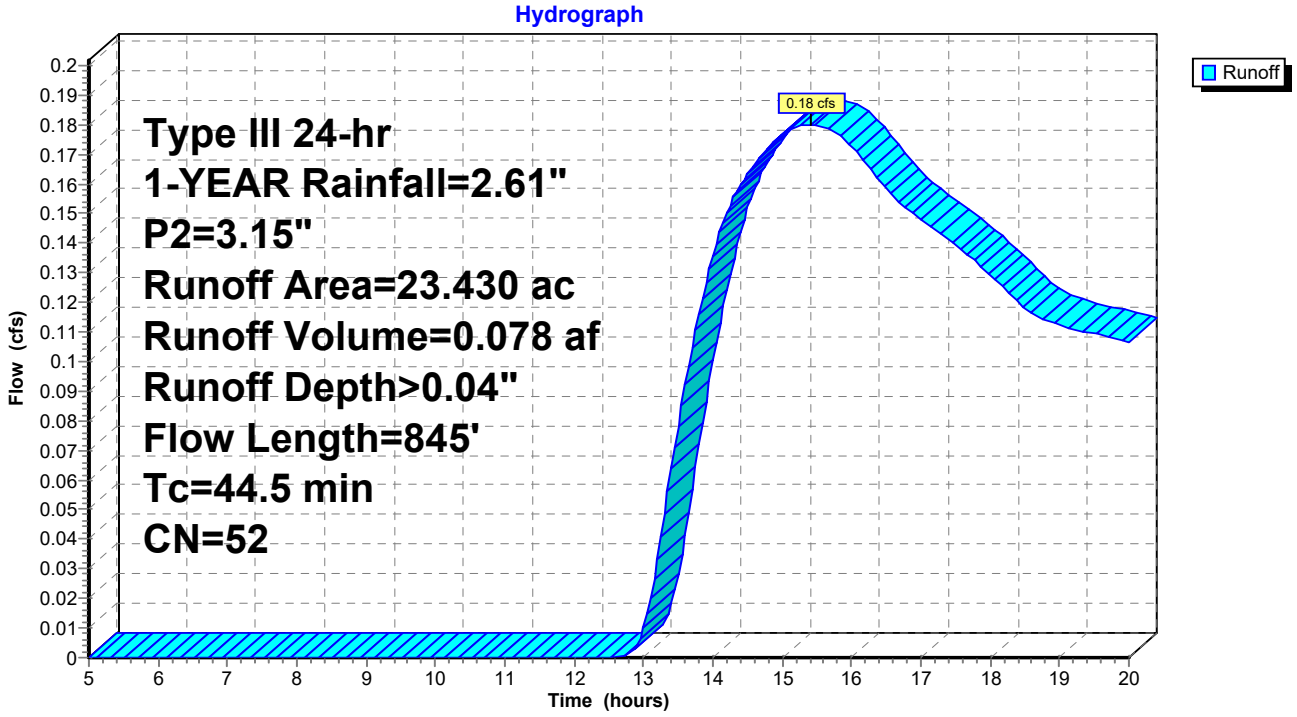
Runoff = 0.18 cfs @ 15.41 hrs, Volume= 0.078 af, Depth> 0.04"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

Area (ac)	CN	Description
12.890	32	Woods/grass comb., Good, HSG A
0.500	98	Paved parking, HSG A
1.700	58	Woods/grass comb., Good, HSG B
8.340	79	Woods/grass comb., Good, HSG D
23.430	52	Weighted Average
22.930		97.87% Pervious Area
0.500		2.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment E-01: EDA-01



Summary for Subcatchment E-02: EDA-02

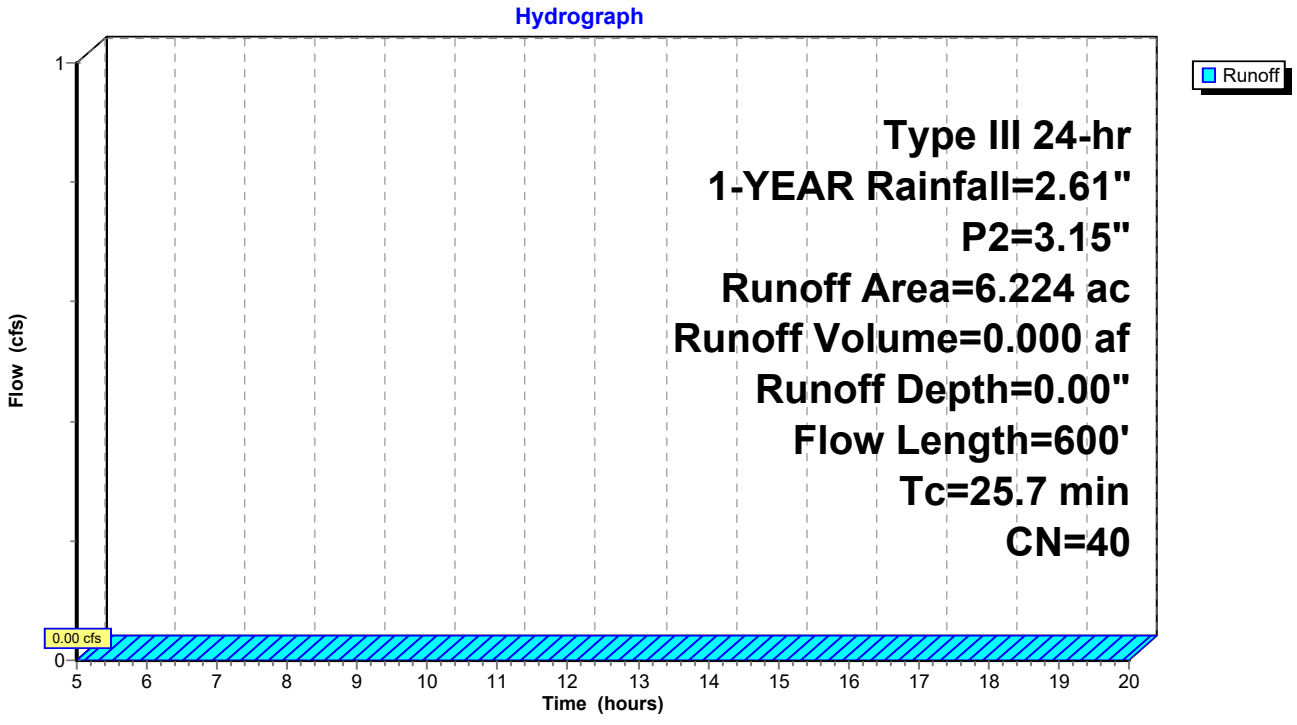
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

Area (ac)	CN	Description
5.204	32	Woods/grass comb., Good, HSG A
1.020	79	Woods/grass comb., Good, HSG D
6.224	40	Weighted Average
6.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0950	0.14		**Sheet Flow, SHEET 1** Woods: Light underbrush n= 0.400 P2= 3.15"
14.1	500	0.0140	0.59		**Shallow Concentrated Flow, Woods/brush** Woodland Kv= 5.0 fps
25.7	600	Total			

Subcatchment E-02: EDA-02



Summary for Subcatchment E-03: EDA-03

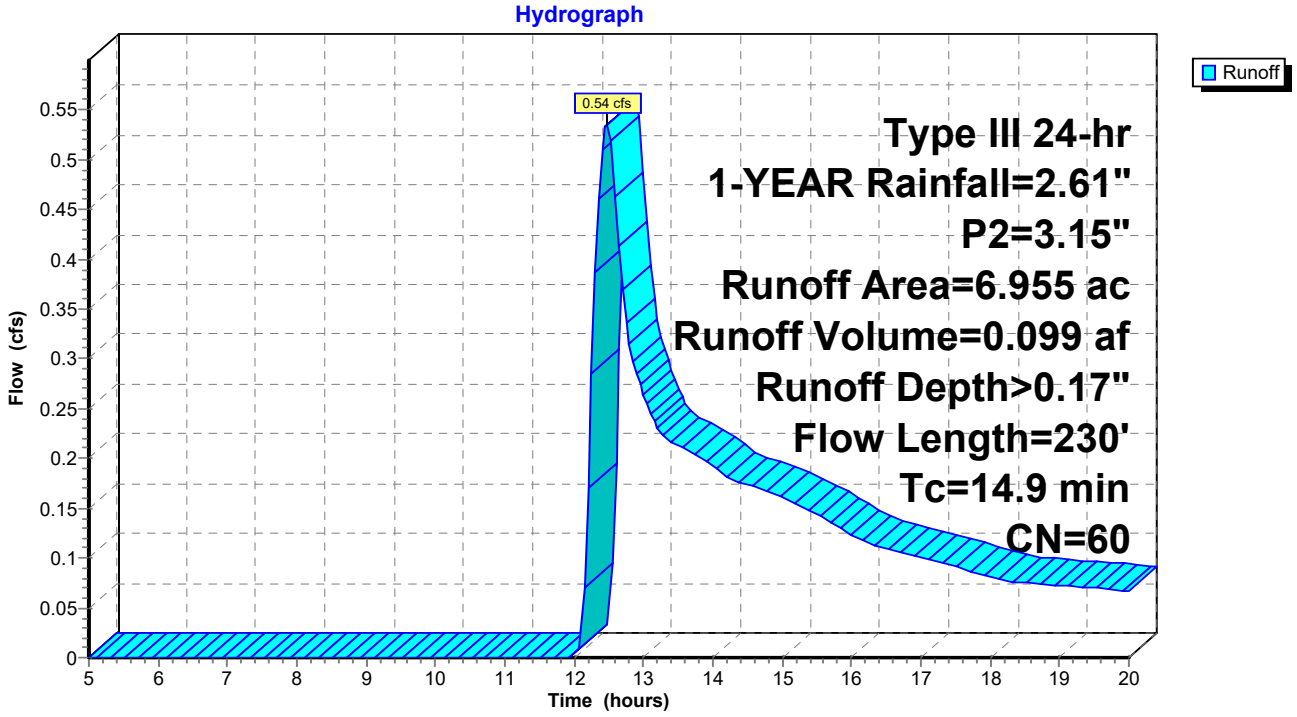
Runoff = 0.54 cfs @ 12.47 hrs, Volume= 0.099 af, Depth> 0.17"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
*	4.980	49	SOIL A
*	0.885	98	IMP A
*	0.530	69	SOIL B
*	0.560	84	SOIL D
	6.955	60	Weighted Average
	6.070		87.28% Pervious Area
	0.885		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
1.9	130	0.0546	1.17		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
14.9	230	Total			

Subcatchment E-03: EDA-03



Summary for Subcatchment E-04: EDA-04

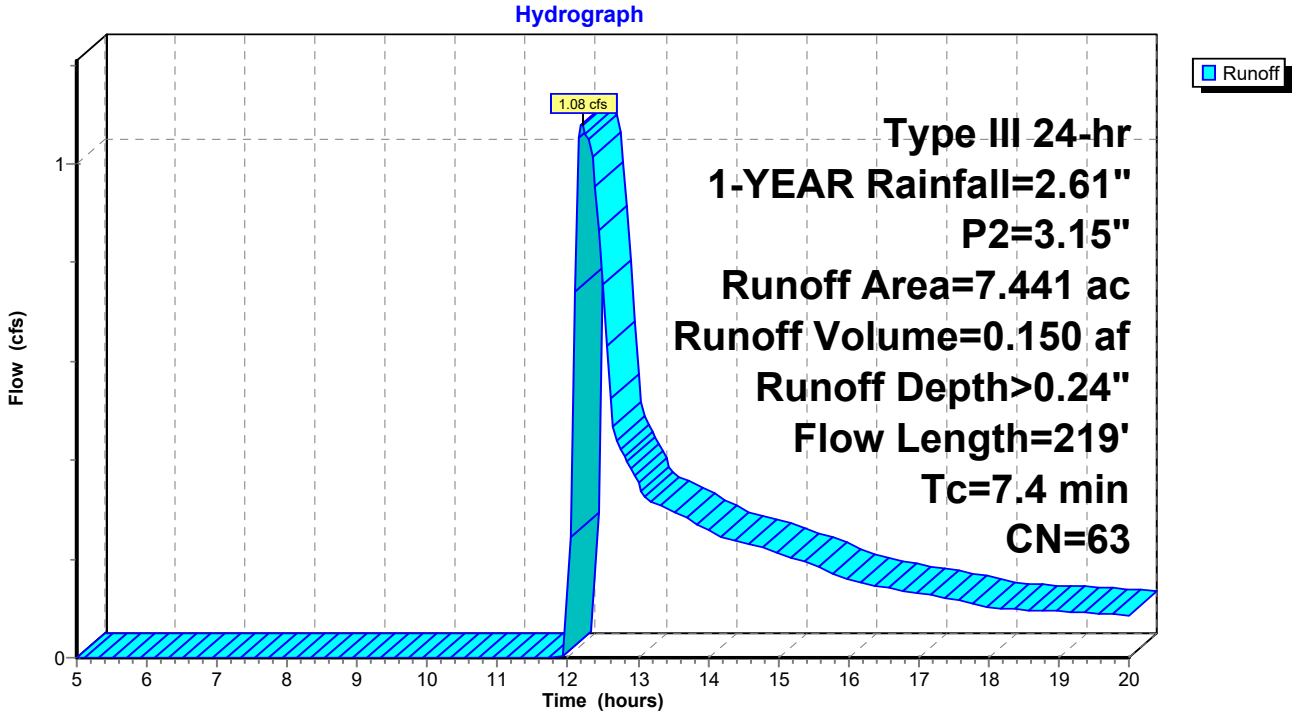
Runoff = 1.08 cfs @ 12.20 hrs, Volume= 0.150 af, Depth> 0.24"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	2.731	39	>75% Grass cover, Good, HSG A
*	0.850	98	IMP A
	1.880	61	>75% Grass cover, Good, HSG B
*	0.050	98	IMP B
	1.830	80	>75% Grass cover, Good, HSG D
*	0.100	98	IMP D
	7.441	63	Weighted Average
	6.441		86.56% Pervious Area
	1.000		13.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0550	0.25		**Sheet Flow, SHEET 1** Grass: Short n= 0.150 P2= 3.15"
0.8	119	0.0252	2.56		**Shallow Concentrated Flow, SC Flow** Unpaved Kv= 16.1 fps
7.4	219	Total			

Subcatchment E-04: EDA-04



Summary for Subcatchment E-05: EDA-05

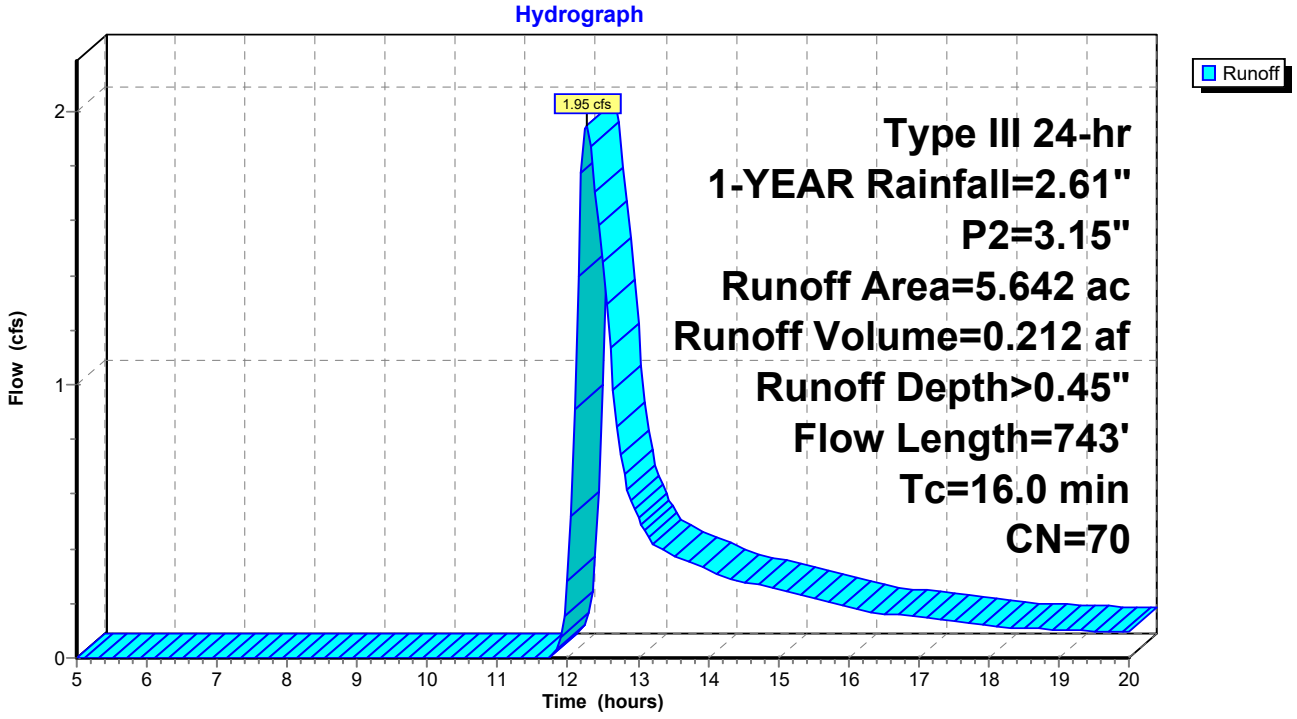
Runoff = 1.95 cfs @ 12.27 hrs, Volume= 0.212 af, Depth> 0.45"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

Area (ac)	CN	Description
0.280	32	Woods/grass comb., Good, HSG A
0.580	58	Woods/grass comb., Good, HSG B
3.790	72	Woods/grass comb., Good, HSG C
0.992	79	Woods/grass comb., Good, HSG D
5.642	70	Weighted Average
5.642		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.15"
5.4	643	0.1600	2.00		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
16.0	743	Total			

Subcatchment E-05: EDA-05



Summary for Subcatchment E-06: EDA-06

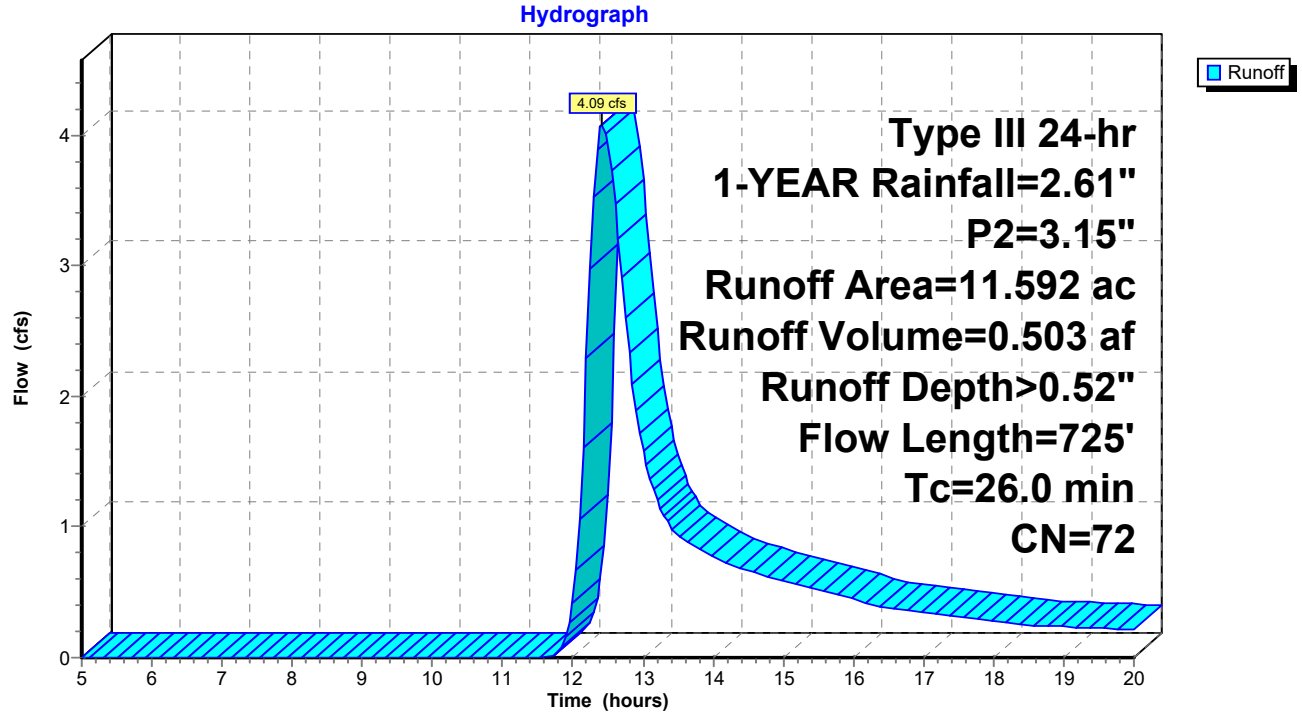
Runoff = 4.09 cfs @ 12.43 hrs, Volume= 0.503 af, Depth> 0.52"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	0.993	58	Woods/grass comb., Good, HSG B
	8.829	72	Woods/grass comb., Good, HSG C
*	0.330	98	IMP C
	1.440	79	Woods/grass comb., Good, HSG D
	11.592	72	Weighted Average
	11.262		97.15% Pervious Area
	0.330		2.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	100	0.0250	0.08		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
6.2	625	0.1120	1.67		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
26.0	725	Total			

Subcatchment E-06: EDA-06



Summary for Subcatchment E-07: EDA-07

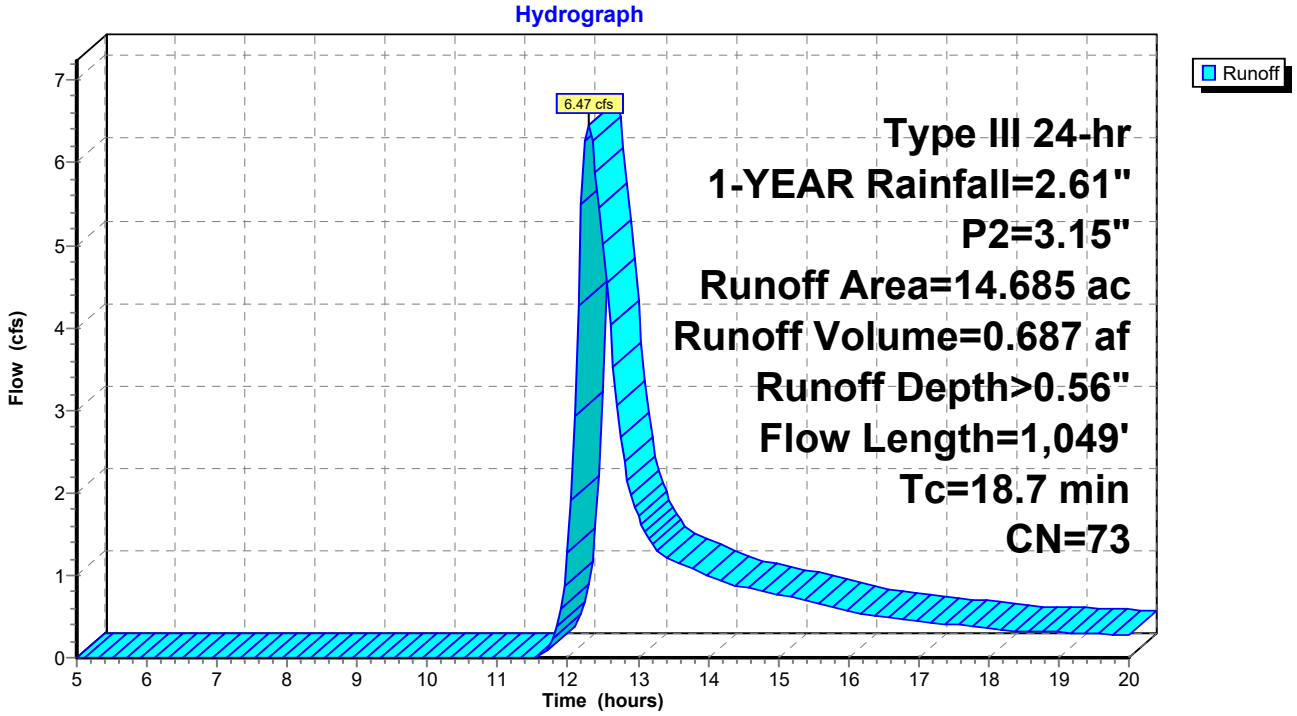
Runoff = 6.47 cfs @ 12.30 hrs, Volume= 0.687 af, Depth> 0.56"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	1.869	58	Woods/grass comb., Good, HSG B
*	0.096	98	IMP B
	7.864	72	Woods/grass comb., Good, HSG C
*	0.212	98	IMP C
	4.594	79	Woods/grass comb., Good, HSG D
*	0.050	98	IMP D
	14.685	73	Weighted Average
	14.327		97.56% Pervious Area
	0.358		2.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1400	0.17		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
8.8	949	0.1300	1.80		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
18.7	1,049	Total			

Subcatchment E-07: EDA-07



Summary for Subcatchment E-08: EDA-08

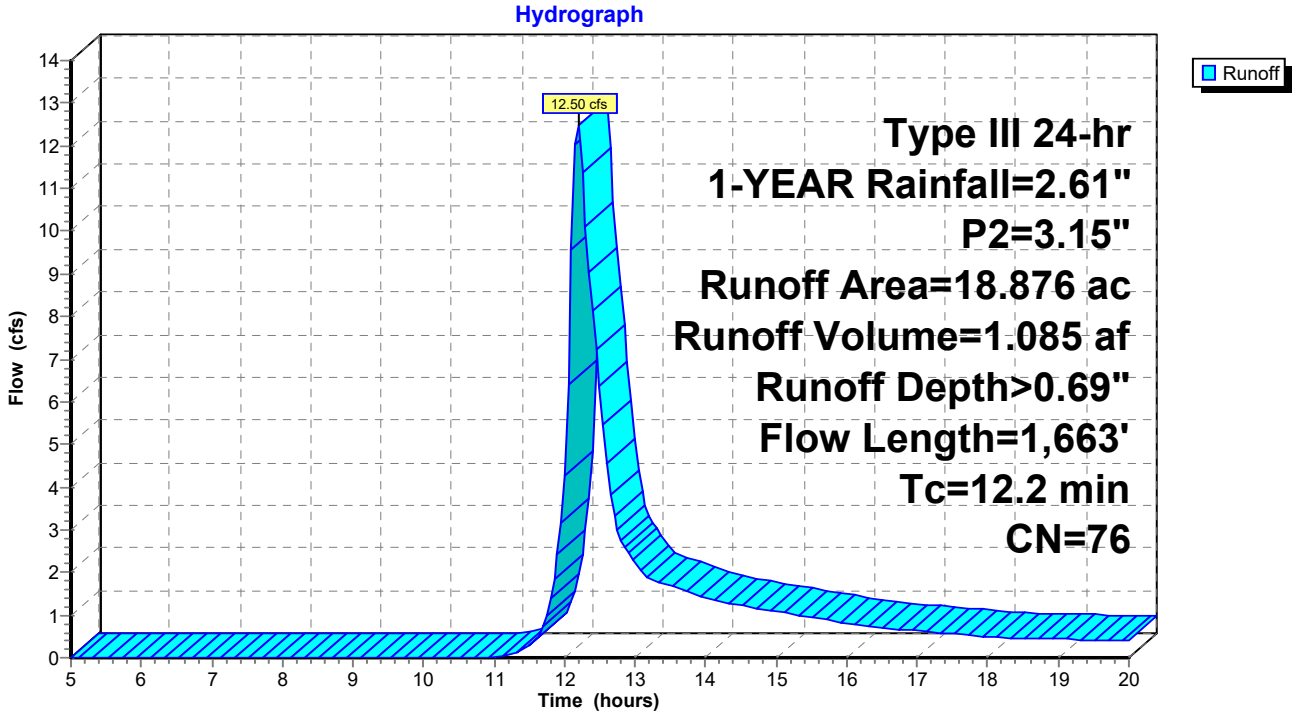
Runoff = 12.50 cfs @ 12.19 hrs, Volume= 1.085 af, Depth> 0.69"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	15.270	74	>75% Grass cover, Good, HSG C
*	0.510	98	IMP C
	2.860	80	>75% Grass cover, Good, HSG D
*	0.236	98	IMP D
	18.876	76	Weighted Average
	18.130		96.05% Pervious Area
	0.746		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0750	0.29		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	918	0.1700	2.89		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
1.1	645	0.0590	10.03	140.44	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=3.00' D=2.00' Z= 2.0 '/' Top.W=11.00' n= 0.040 Earth, cobble bottom, clean sides
12.2	1,663	Total			

Subcatchment E-08: EDA-08



Summary for Subcatchment E-09: EDA-09

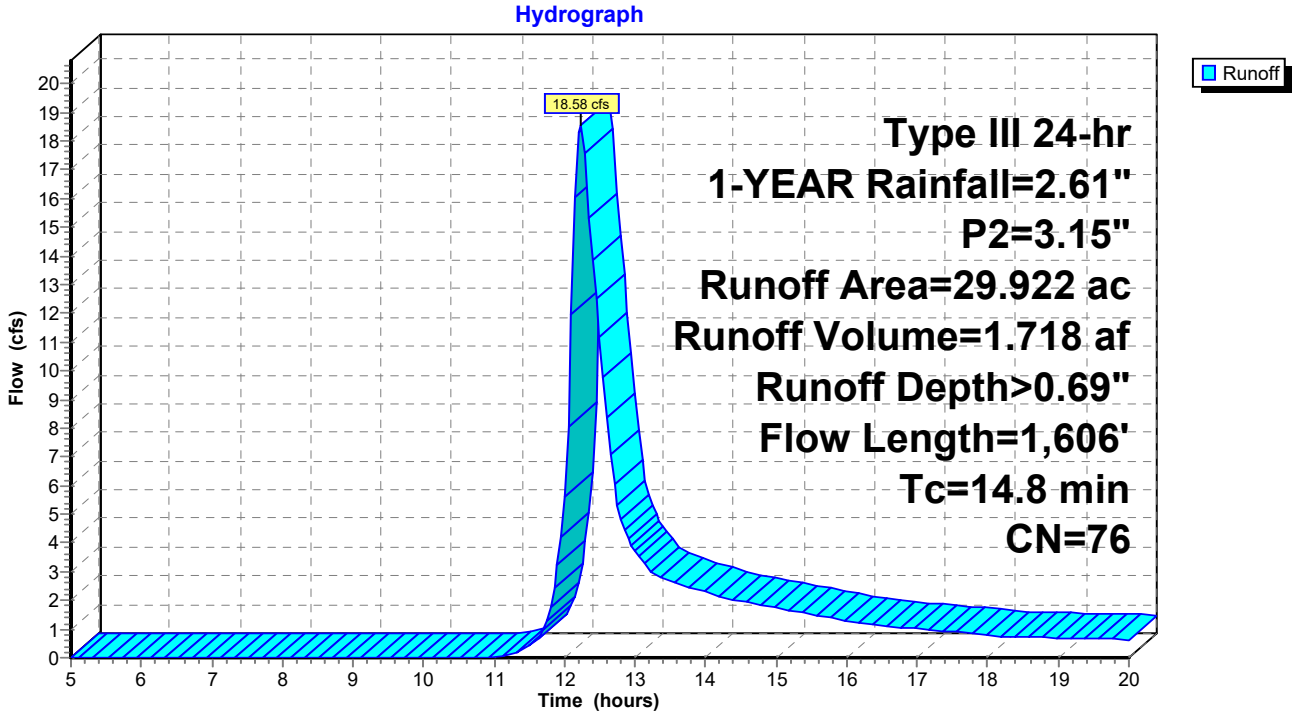
Runoff = 18.58 cfs @ 12.22 hrs, Volume= 1.718 af, Depth> 0.69"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	14.366	74	>75% Grass cover, Good, HSG C
	4.463	70	Woods, Good, HSG C
*	0.563	98	IMP C
	10.360	80	>75% Grass cover, Good, HSG D
*	0.170	98	IMP D
	29.922	76	Weighted Average
	29.189		97.55% Pervious Area
	0.733		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0900	0.31		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
8.3	928	0.1380	1.86		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
1.1	578	0.0600	8.45	67.58	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.040 Winding stream, pools & shoals
14.8	1,606	Total			

Subcatchment E-09: EDA-09



Summary for Subcatchment E-10: EDA-10

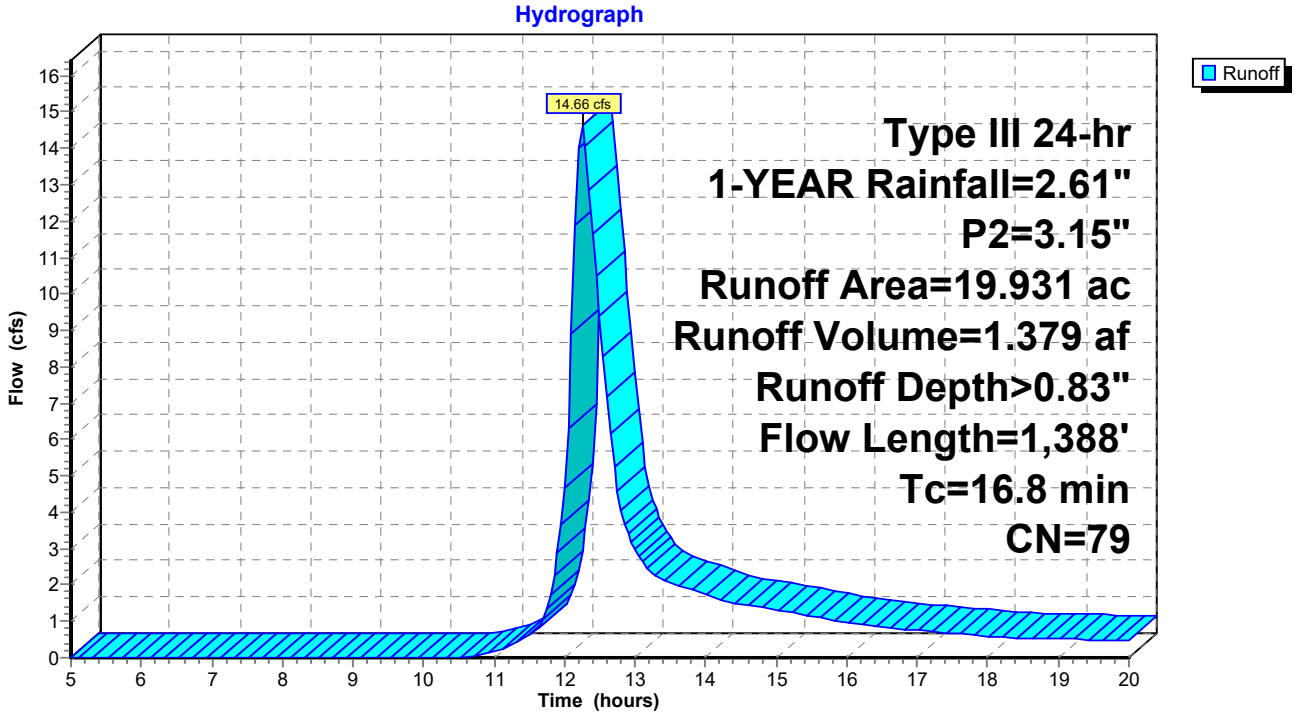
Runoff = 14.66 cfs @ 12.25 hrs, Volume= 1.379 af, Depth> 0.83"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	7.130	74	>75% Grass cover, Good, HSG C
*	0.340	98	IMP C
	12.081	80	>75% Grass cover, Good, HSG D
*	0.380	98	IMP D
	19.931	79	Weighted Average
	19.211		96.39% Pervious Area
	0.720		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
11.8	1,271	0.0660	1.80		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
0.0	17	0.0353	14.66	46.05	**Pipe Channel, CPP PIPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
16.8	1,388	Total			

Subcatchment E-10: EDA-10



Summary for Subcatchment E-11: EDA-11

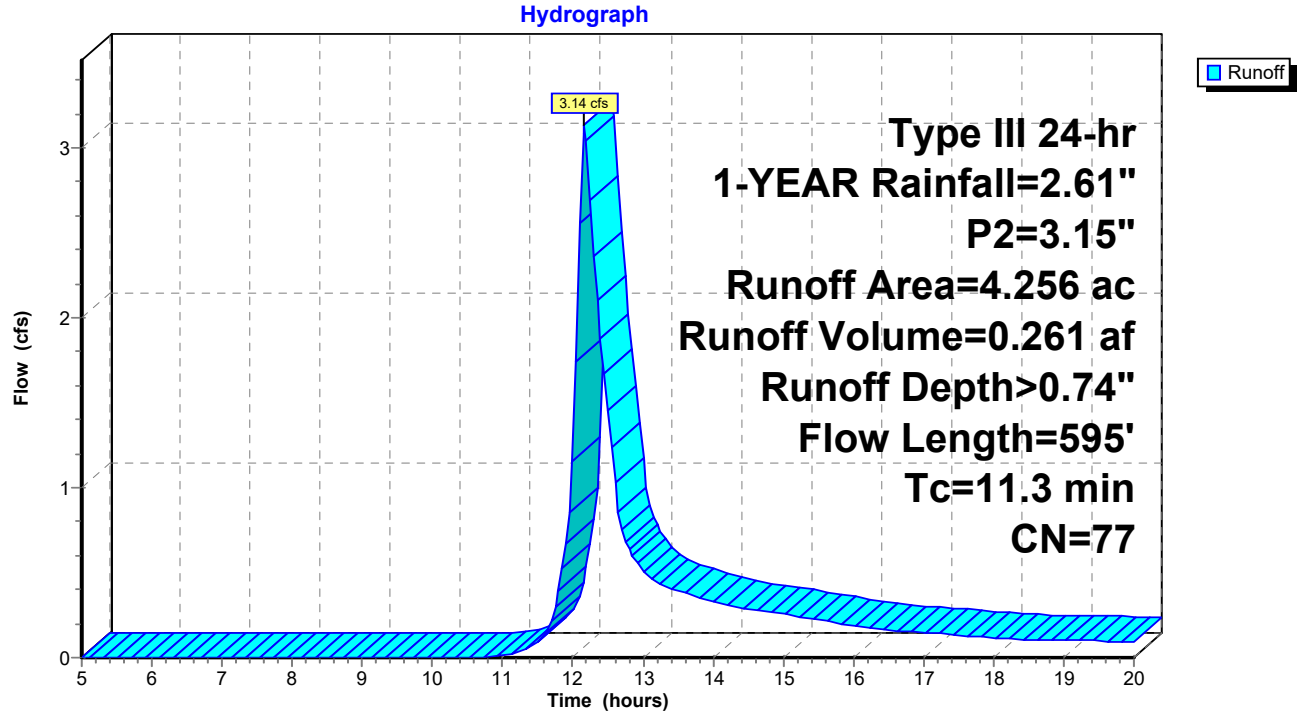
Runoff = 3.14 cfs @ 12.17 hrs, Volume= 0.261 af, Depth> 0.74"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	2.710	74	>75% Grass cover, Good, HSG C
*	0.010	98	IMP C
	1.390	80	>75% Grass cover, Good, HSG D
*	0.146	98	IMP D
	4.256	77	Weighted Average
	4.100		96.33% Pervious Area
	0.156		3.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, Orchard** Grass: Short n= 0.150 P2= 3.15"
3.4	495	0.1200	2.42		**Shallow Concentrated Flow, Orchard** Short Grass Pasture Kv= 7.0 fps
11.3	595	Total			

Subcatchment E-11: EDA-11



Summary for Subcatchment E-12: EDA-12

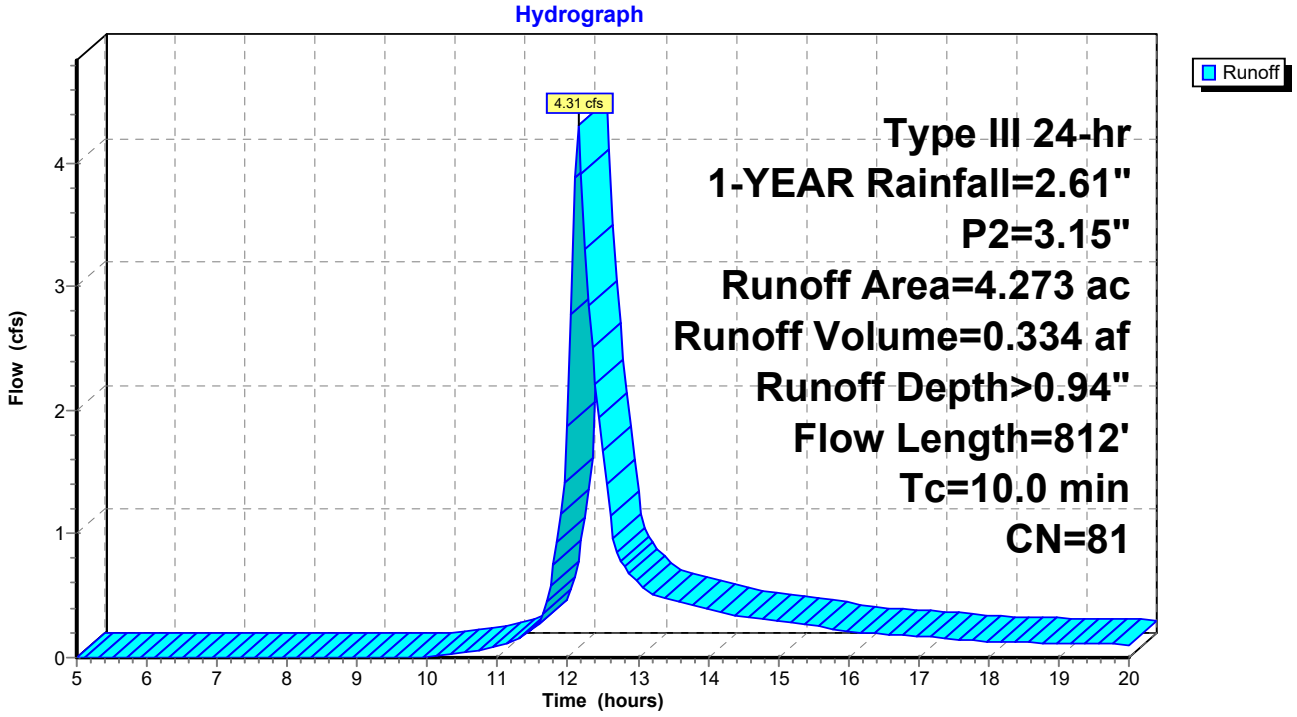
Runoff = 4.31 cfs @ 12.15 hrs, Volume= 0.334 af, Depth> 0.94"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
*	3.750	79	SOIL C
*	0.220	98	IMP C
*	0.250	84	SOIL D
*	0.053	98	IMP D
	4.273	81	Weighted Average
	4.000		93.61% Pervious Area
	0.273		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	712	0.1010	2.22		**Shallow Concentrated Flow, SHALLOW** Short Grass Pasture Kv= 7.0 fps
10.0	812	Total			

Subcatchment E-12: EDA-12

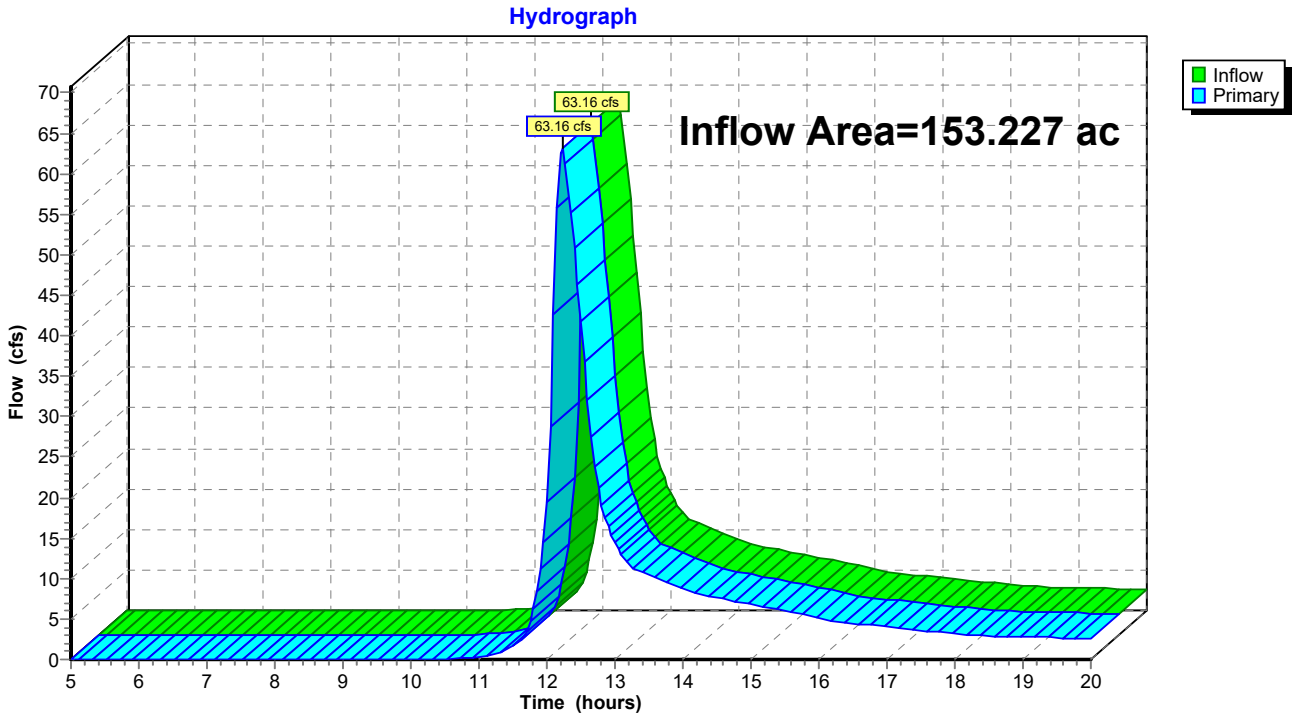


Summary for Link 1: AP-01-TOTAL Q

Inflow Area = 153.227 ac, 3.72% Impervious, Inflow Depth > 0.51" for 1-YEAR event
Inflow = 63.16 cfs @ 12.23 hrs, Volume= 6.507 af
Primary = 63.16 cfs @ 12.23 hrs, Volume= 6.507 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01-TOTAL Q

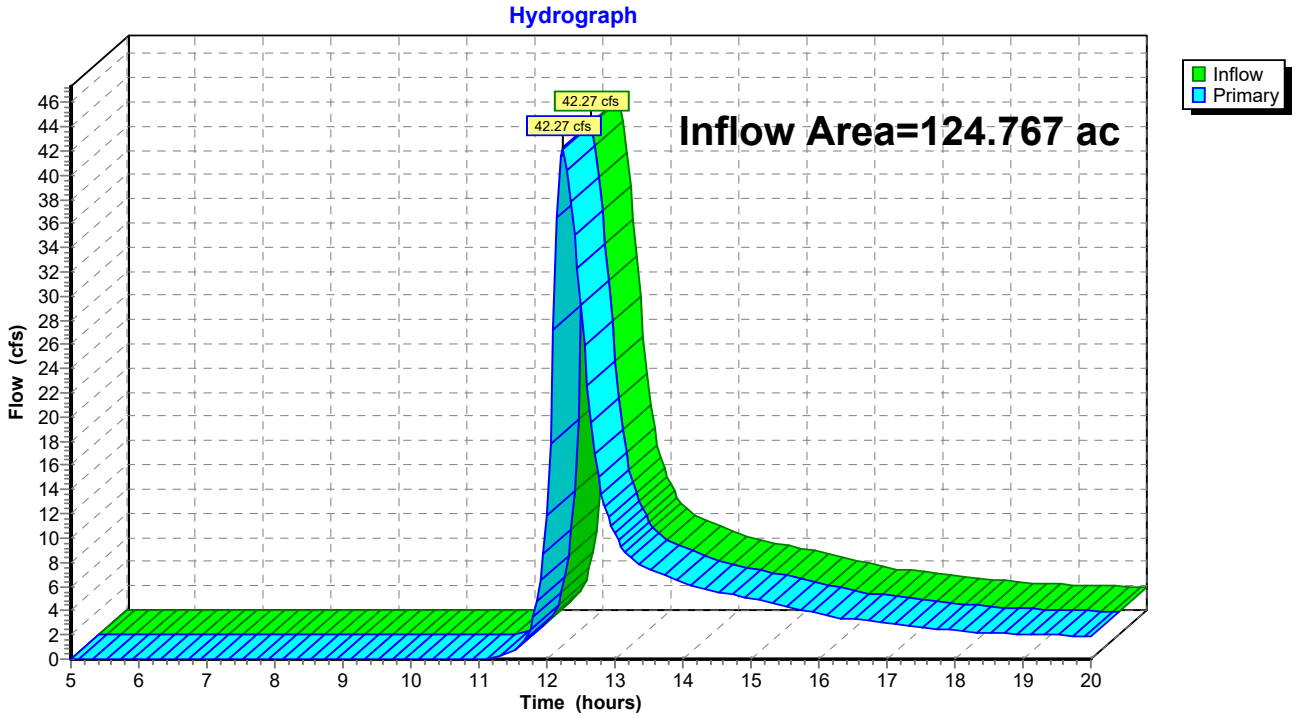


Summary for Link 2: AP-02

Inflow Area = 124.767 ac, 3.65% Impervious, Inflow Depth > 0.44" for 1-YEAR event
Inflow = 42.27 cfs @ 12.24 hrs, Volume= 4.532 af
Primary = 42.27 cfs @ 12.24 hrs, Volume= 4.532 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

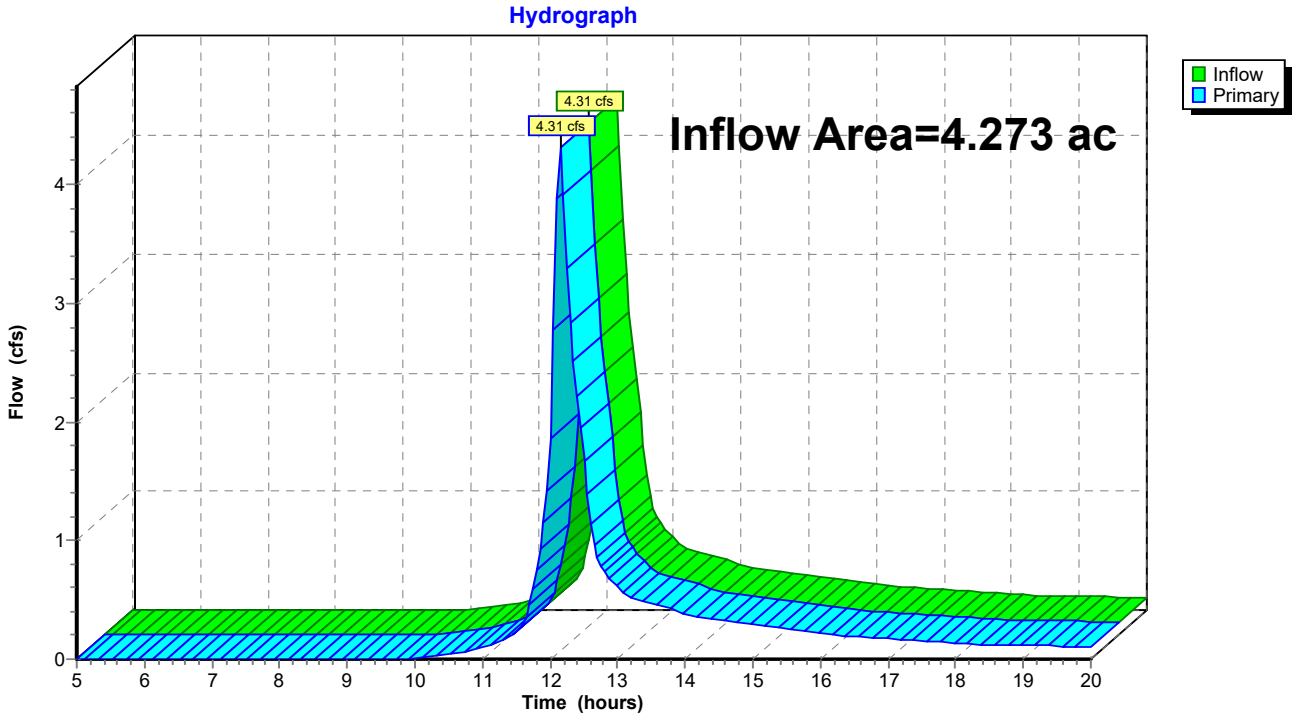


Summary for Link 3: AP-3

Inflow Area = 4.273 ac, 6.39% Impervious, Inflow Depth > 0.94" for 1-YEAR event
Inflow = 4.31 cfs @ 12.15 hrs, Volume= 0.334 af
Primary = 4.31 cfs @ 12.15 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-01: EDA-01 Runoff Area=23.430 ac 2.13% Impervious Runoff Depth>0.56"
Flow Length=845' Tc=44.5 min CN=52 Runoff=5.76 cfs 1.087 af

SubcatchmentE-02: EDA-02 Runoff Area=6.224 ac 0.00% Impervious Runoff Depth>0.12"
Flow Length=600' Tc=25.7 min CN=40 Runoff=0.14 cfs 0.064 af

SubcatchmentE-03: EDA-03 Runoff Area=6.955 ac 12.72% Impervious Runoff Depth>0.99"
Flow Length=230' Tc=14.9 min CN=60 Runoff=5.80 cfs 0.572 af

SubcatchmentE-04: EDA-04 Runoff Area=7.441 ac 13.44% Impervious Runoff Depth>1.17"
Flow Length=219' Tc=7.4 min CN=63 Runoff=9.66 cfs 0.725 af

SubcatchmentE-05: EDA-05 Runoff Area=5.642 ac 0.00% Impervious Runoff Depth>1.63"
Flow Length=743' Tc=16.0 min CN=70 Runoff=8.36 cfs 0.766 af

SubcatchmentE-06: EDA-06 Runoff Area=11.592 ac 2.85% Impervious Runoff Depth>1.77"
Flow Length=725' Tc=26.0 min CN=72 Runoff=15.49 cfs 1.706 af

SubcatchmentE-07: EDA-07 Runoff Area=14.685 ac 2.44% Impervious Runoff Depth>1.85"
Flow Length=1,049' Tc=18.7 min CN=73 Runoff=23.55 cfs 2.259 af

SubcatchmentE-08: EDA-08 Runoff Area=18.876 ac 3.95% Impervious Runoff Depth>2.08"
Flow Length=1,663' Tc=12.2 min CN=76 Runoff=40.21 cfs 3.275 af

SubcatchmentE-09: EDA-09 Runoff Area=29.922 ac 2.45% Impervious Runoff Depth>2.08"
Flow Length=1,606' Tc=14.8 min CN=76 Runoff=59.47 cfs 5.187 af

SubcatchmentE-10: EDA-10 Runoff Area=19.931 ac 3.61% Impervious Runoff Depth>2.32"
Flow Length=1,388' Tc=16.8 min CN=79 Runoff=42.07 cfs 3.858 af

SubcatchmentE-11: EDA-11 Runoff Area=4.256 ac 3.67% Impervious Runoff Depth>2.16"
Flow Length=595' Tc=11.3 min CN=77 Runoff=9.68 cfs 0.767 af

SubcatchmentE-12: EDA-12 Runoff Area=4.273 ac 6.39% Impervious Runoff Depth>2.50"
Flow Length=812' Tc=10.0 min CN=81 Runoff=11.58 cfs 0.890 af

Link 1: AP-01-TOTALQ Inflow=214.30 cfs 21.155 af
Primary=214.30 cfs 21.155 af

Link 2: AP-02 Inflow=153.75 cfs 15.641 af
Primary=153.75 cfs 15.641 af

Link 3: AP-3 Inflow=11.58 cfs 0.890 af
Primary=11.58 cfs 0.890 af

Total Runoff Area = 153.227 ac Runoff Volume = 21.155 af Average Runoff Depth = 1.66"
96.28% Pervious = 147.526 ac 3.72% Impervious = 5.701 ac

Summary for Subcatchment E-01: EDA-01

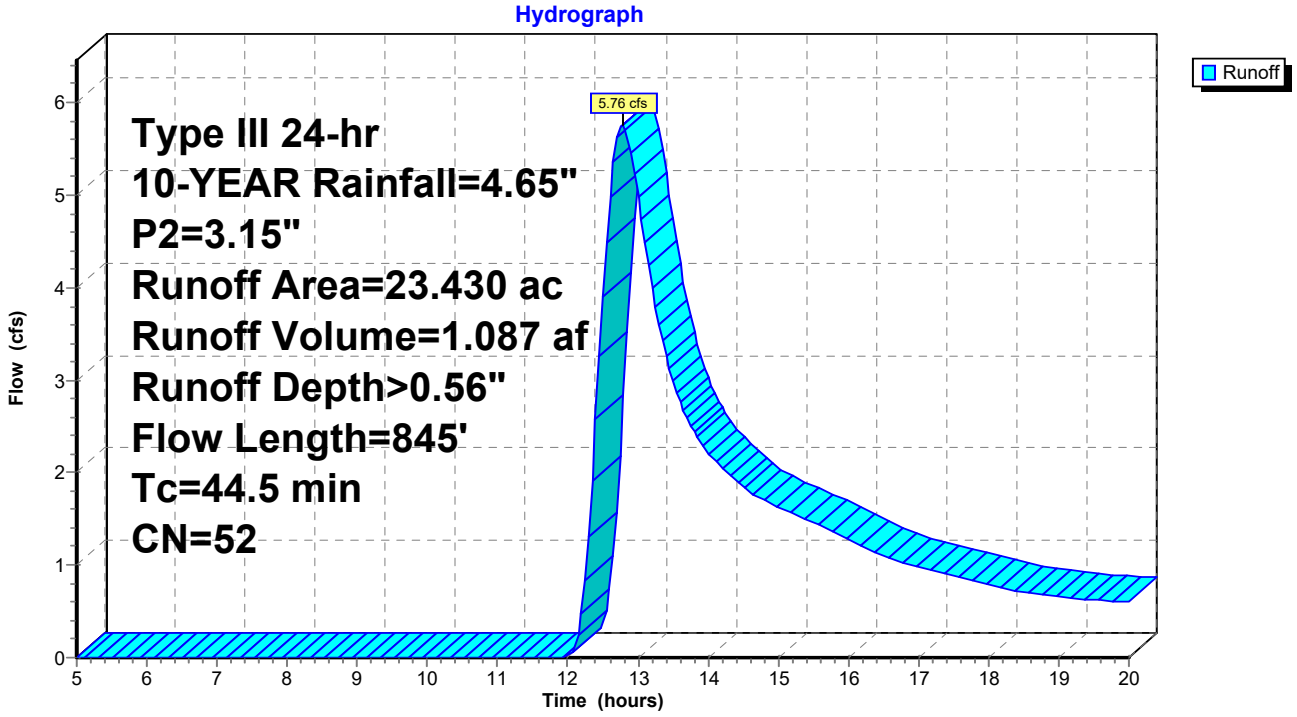
Runoff = 5.76 cfs @ 12.78 hrs, Volume= 1.087 af, Depth> 0.56"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

Area (ac)	CN	Description
12.890	32	Woods/grass comb., Good, HSG A
0.500	98	Paved parking, HSG A
1.700	58	Woods/grass comb., Good, HSG B
8.340	79	Woods/grass comb., Good, HSG D
23.430	52	Weighted Average
22.930		97.87% Pervious Area
0.500		2.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment E-01: EDA-01



Summary for Subcatchment E-02: EDA-02

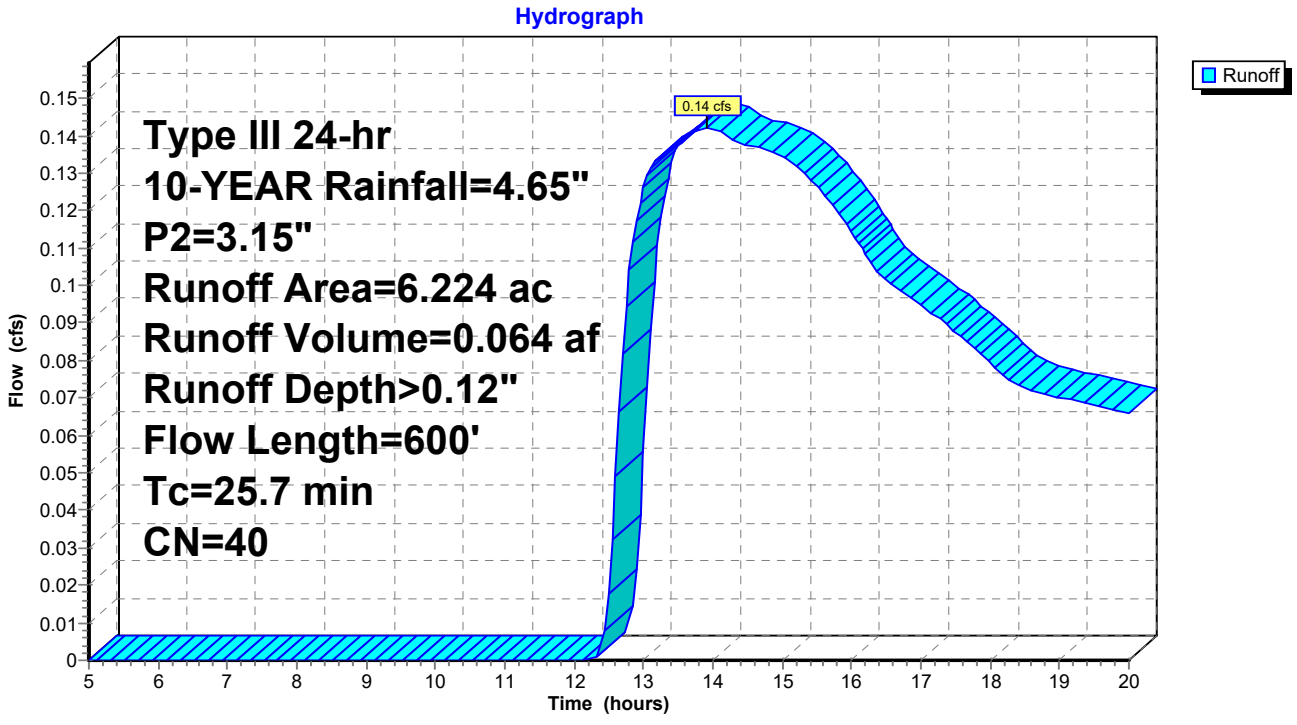
Runoff = 0.14 cfs @ 13.92 hrs, Volume= 0.064 af, Depth> 0.12"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

Area (ac)	CN	Description
5.204	32	Woods/grass comb., Good, HSG A
1.020	79	Woods/grass comb., Good, HSG D
6.224	40	Weighted Average
6.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0950	0.14		**Sheet Flow, SHEET 1** Woods: Light underbrush n= 0.400 P2= 3.15"
14.1	500	0.0140	0.59		**Shallow Concentrated Flow, Woods/brush** Woodland Kv= 5.0 fps
25.7	600	Total			

Subcatchment E-02: EDA-02



Summary for Subcatchment E-03: EDA-03

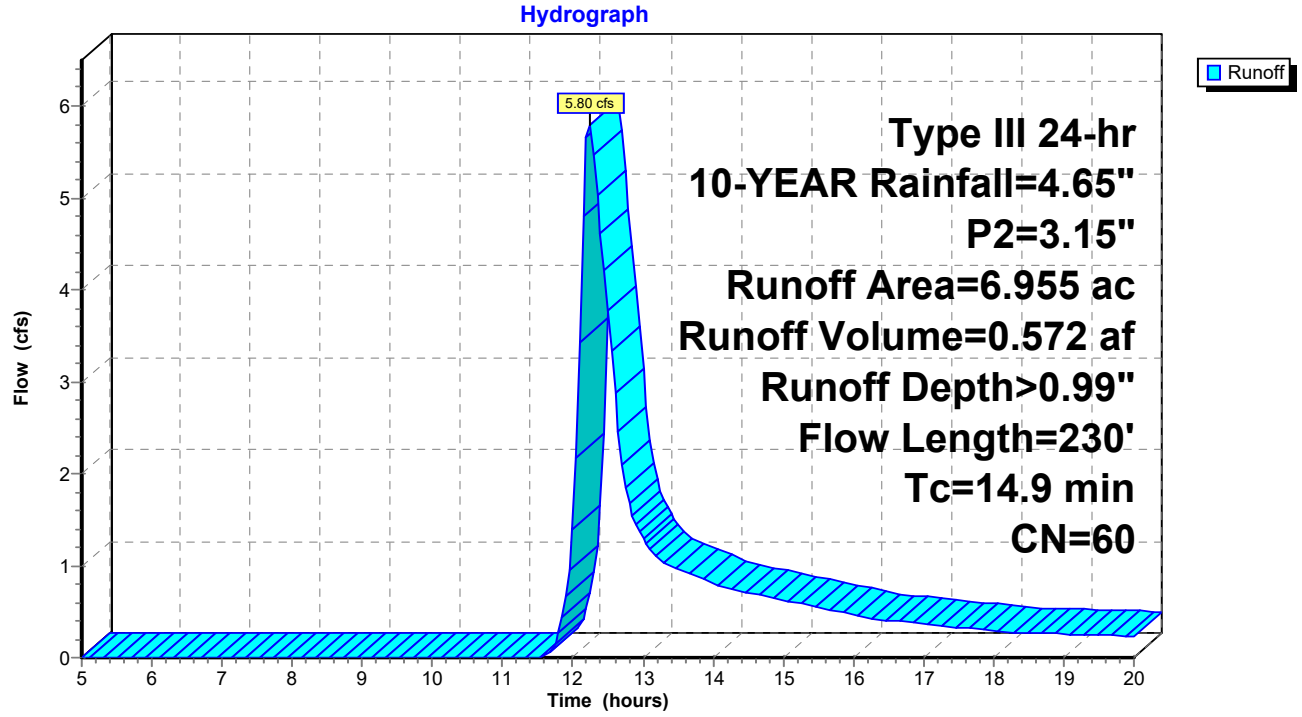
Runoff = 5.80 cfs @ 12.24 hrs, Volume= 0.572 af, Depth> 0.99"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
*	4.980	49	SOIL A
*	0.885	98	IMP A
*	0.530	69	SOIL B
*	0.560	84	SOIL D
	6.955	60	Weighted Average
	6.070		87.28% Pervious Area
	0.885		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
1.9	130	0.0546	1.17		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
14.9	230	Total			

Subcatchment E-03: EDA-03



Summary for Subcatchment E-04: EDA-04

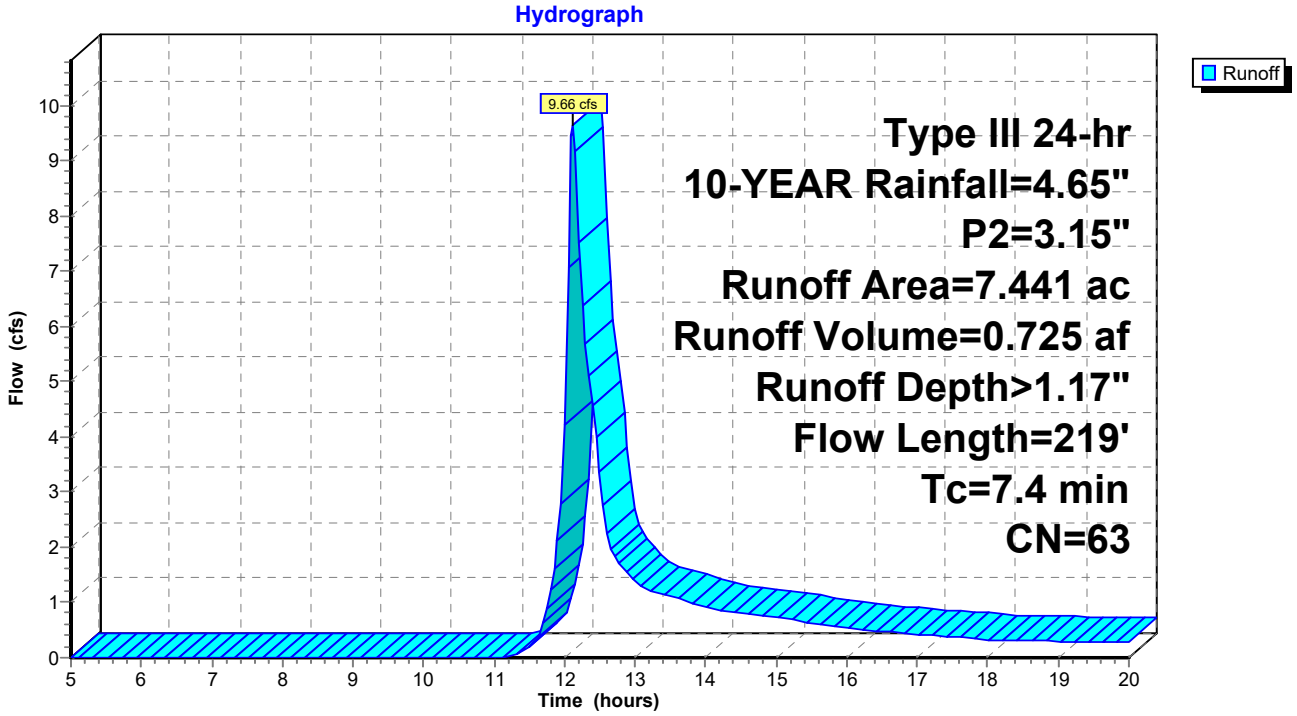
Runoff = 9.66 cfs @ 12.12 hrs, Volume= 0.725 af, Depth> 1.17"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	2.731	39	>75% Grass cover, Good, HSG A
*	0.850	98	IMP A
	1.880	61	>75% Grass cover, Good, HSG B
*	0.050	98	IMP B
	1.830	80	>75% Grass cover, Good, HSG D
*	0.100	98	IMP D
	7.441	63	Weighted Average
	6.441		86.56% Pervious Area
	1.000		13.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0550	0.25		**Sheet Flow, SHEET 1** Grass: Short n= 0.150 P2= 3.15"
0.8	119	0.0252	2.56		**Shallow Concentrated Flow, SC Flow** Unpaved Kv= 16.1 fps
7.4	219	Total			

Subcatchment E-04: EDA-04



Summary for Subcatchment E-05: EDA-05

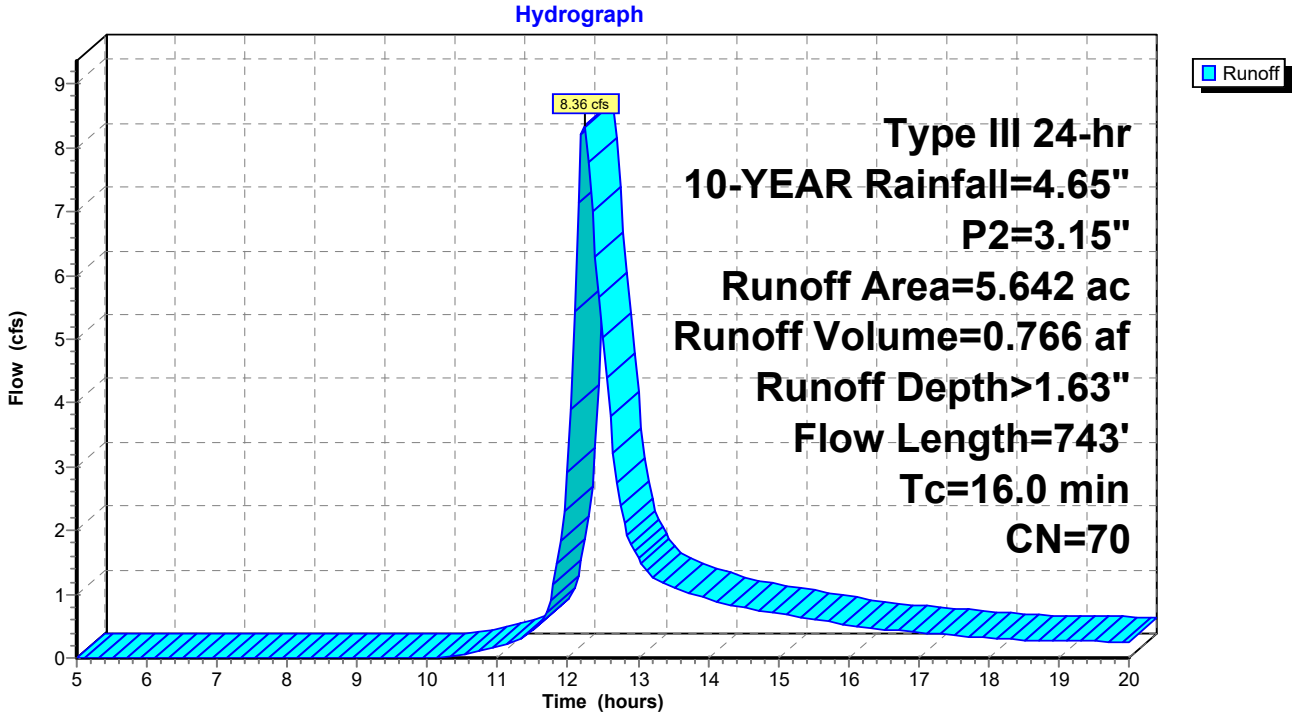
Runoff = 8.36 cfs @ 12.23 hrs, Volume= 0.766 af, Depth> 1.63"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

Area (ac)	CN	Description
0.280	32	Woods/grass comb., Good, HSG A
0.580	58	Woods/grass comb., Good, HSG B
3.790	72	Woods/grass comb., Good, HSG C
0.992	79	Woods/grass comb., Good, HSG D
5.642	70	Weighted Average
5.642		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.15"
5.4	643	0.1600	2.00		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
16.0	743	Total			

Subcatchment E-05: EDA-05



Summary for Subcatchment E-06: EDA-06

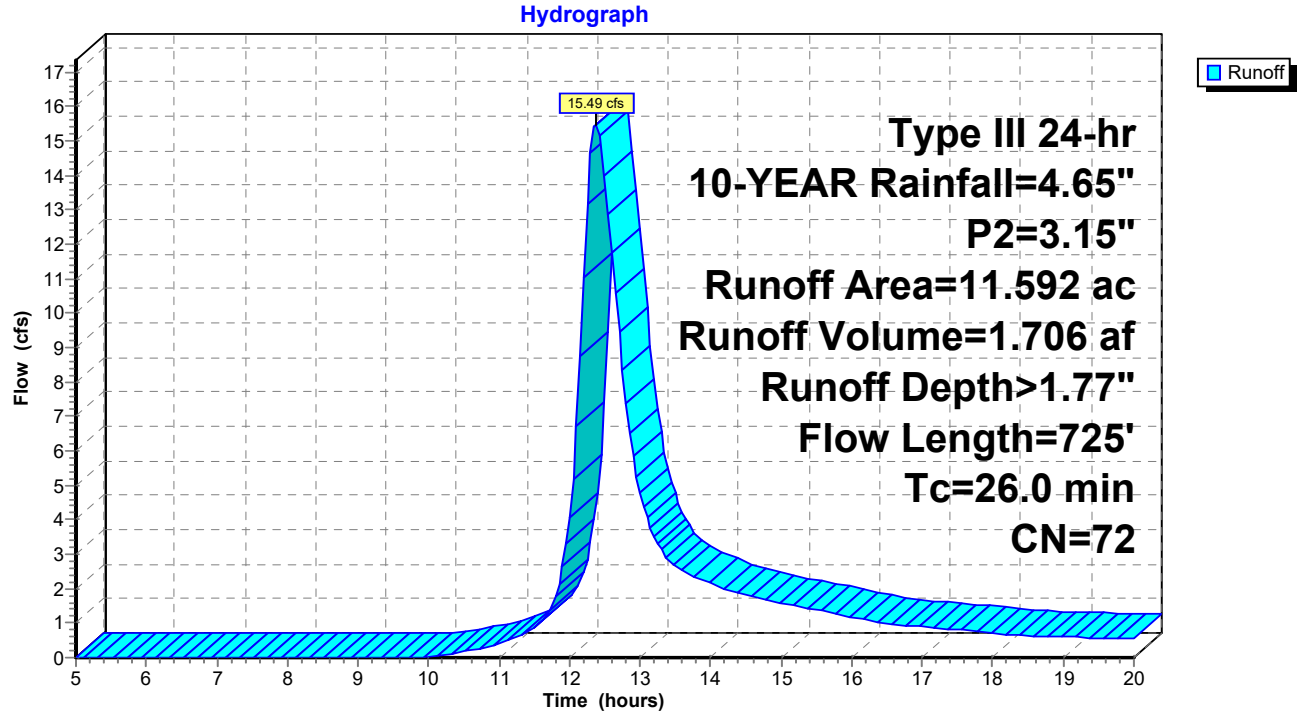
Runoff = 15.49 cfs @ 12.38 hrs, Volume= 1.706 af, Depth> 1.77"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	0.993	58	Woods/grass comb., Good, HSG B
	8.829	72	Woods/grass comb., Good, HSG C
*	0.330	98	IMP C
	1.440	79	Woods/grass comb., Good, HSG D
	11.592	72	Weighted Average
	11.262		97.15% Pervious Area
	0.330		2.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	100	0.0250	0.08		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
6.2	625	0.1120	1.67		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
26.0	725	Total			

Subcatchment E-06: EDA-06



Summary for Subcatchment E-07: EDA-07

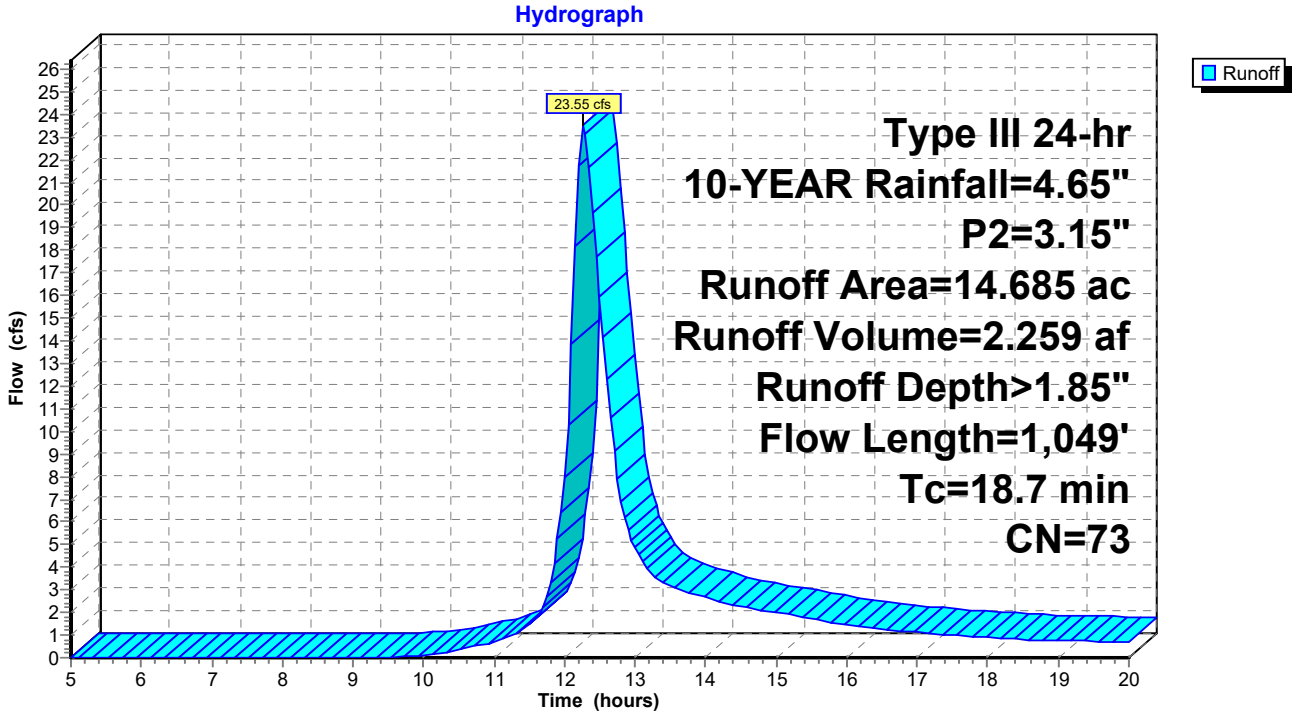
Runoff = 23.55 cfs @ 12.27 hrs, Volume= 2.259 af, Depth> 1.85"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	1.869	58	Woods/grass comb., Good, HSG B
*	0.096	98	IMP B
	7.864	72	Woods/grass comb., Good, HSG C
*	0.212	98	IMP C
	4.594	79	Woods/grass comb., Good, HSG D
*	0.050	98	IMP D
	14.685	73	Weighted Average
	14.327		97.56% Pervious Area
	0.358		2.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1400	0.17		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
8.8	949	0.1300	1.80		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
18.7	1,049	Total			

Subcatchment E-07: EDA-07



Summary for Subcatchment E-08: EDA-08

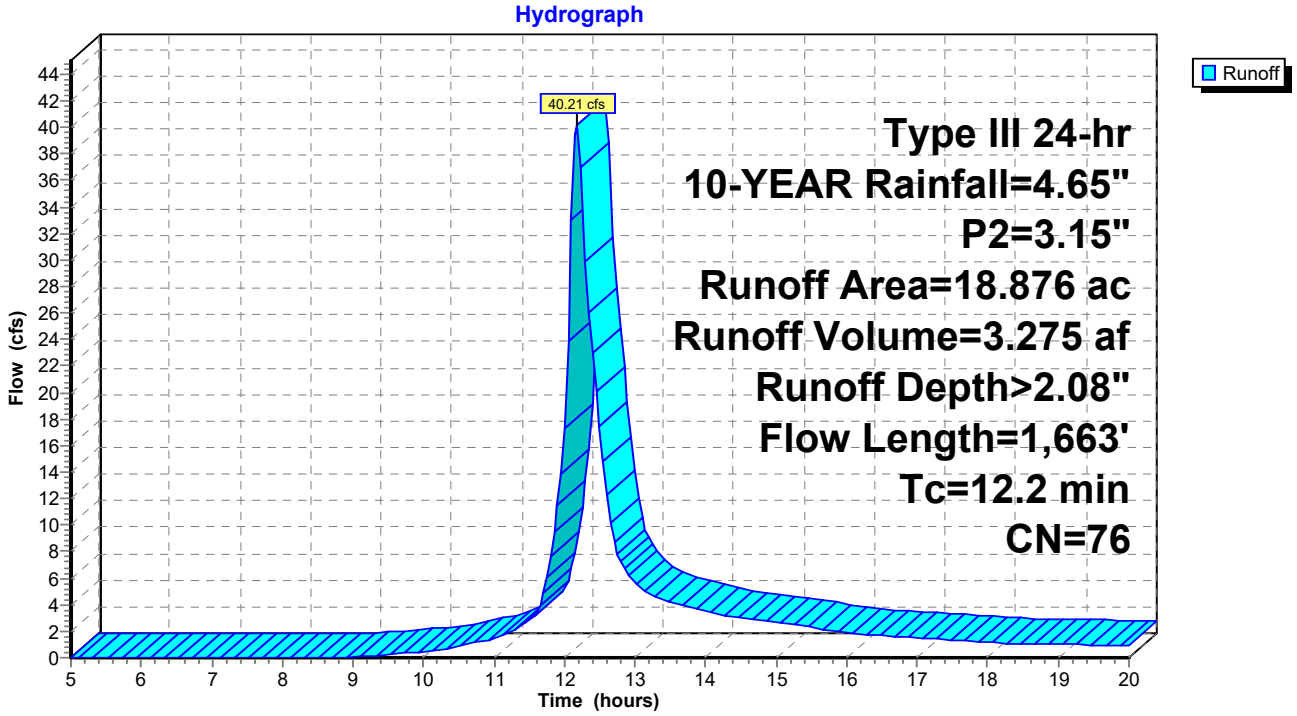
Runoff = 40.21 cfs @ 12.17 hrs, Volume= 3.275 af, Depth> 2.08"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	15.270	74	>75% Grass cover, Good, HSG C
*	0.510	98	IMP C
	2.860	80	>75% Grass cover, Good, HSG D
*	0.236	98	IMP D
	18.876	76	Weighted Average
	18.130		96.05% Pervious Area
	0.746		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0750	0.29		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	918	0.1700	2.89		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
1.1	645	0.0590	10.03	140.44	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=3.00' D=2.00' Z= 2.0 '/' Top.W=11.00' n= 0.040 Earth, cobble bottom, clean sides
12.2	1,663	Total			

Subcatchment E-08: EDA-08



Summary for Subcatchment E-09: EDA-09

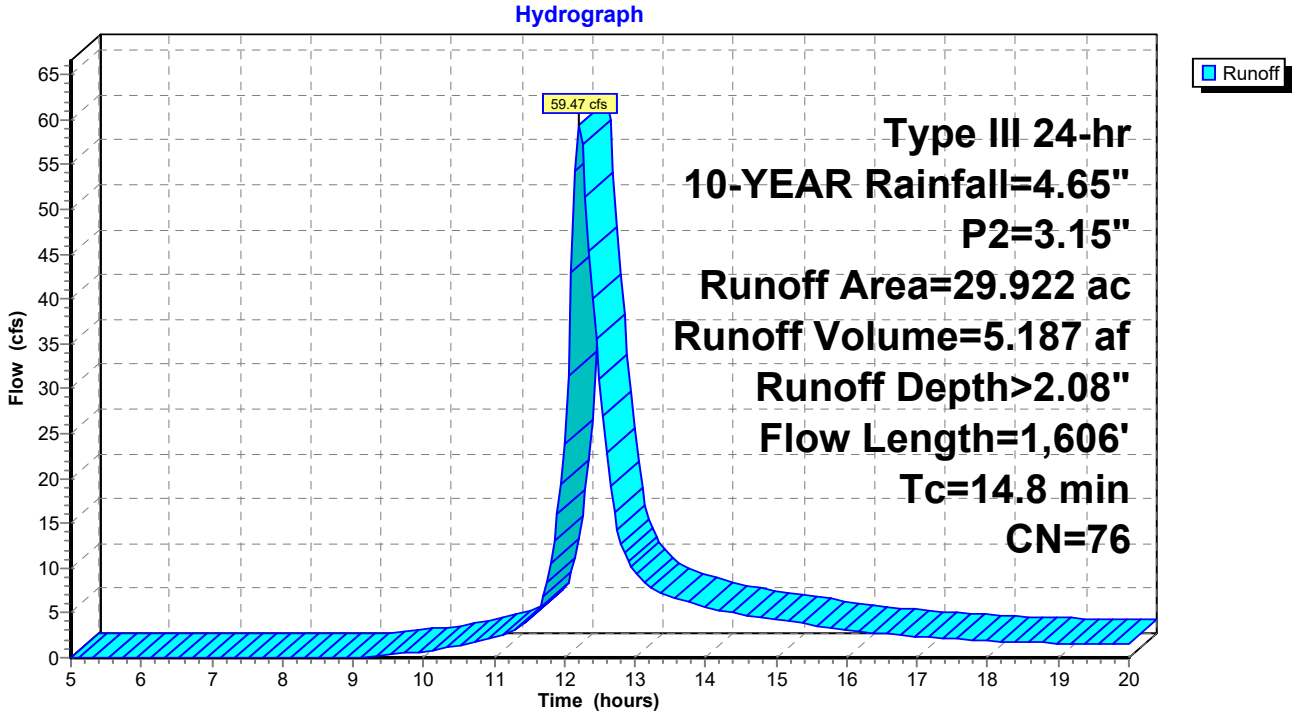
Runoff = 59.47 cfs @ 12.21 hrs, Volume= 5.187 af, Depth> 2.08"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	14.366	74	>75% Grass cover, Good, HSG C
	4.463	70	Woods, Good, HSG C
*	0.563	98	IMP C
	10.360	80	>75% Grass cover, Good, HSG D
*	0.170	98	IMP D
	29.922	76	Weighted Average
	29.189		97.55% Pervious Area
	0.733		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0900	0.31		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
8.3	928	0.1380	1.86		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
1.1	578	0.0600	8.45	67.58	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.040 Winding stream, pools & shoals
14.8	1,606	Total			

Subcatchment E-09: EDA-09



Summary for Subcatchment E-10: EDA-10

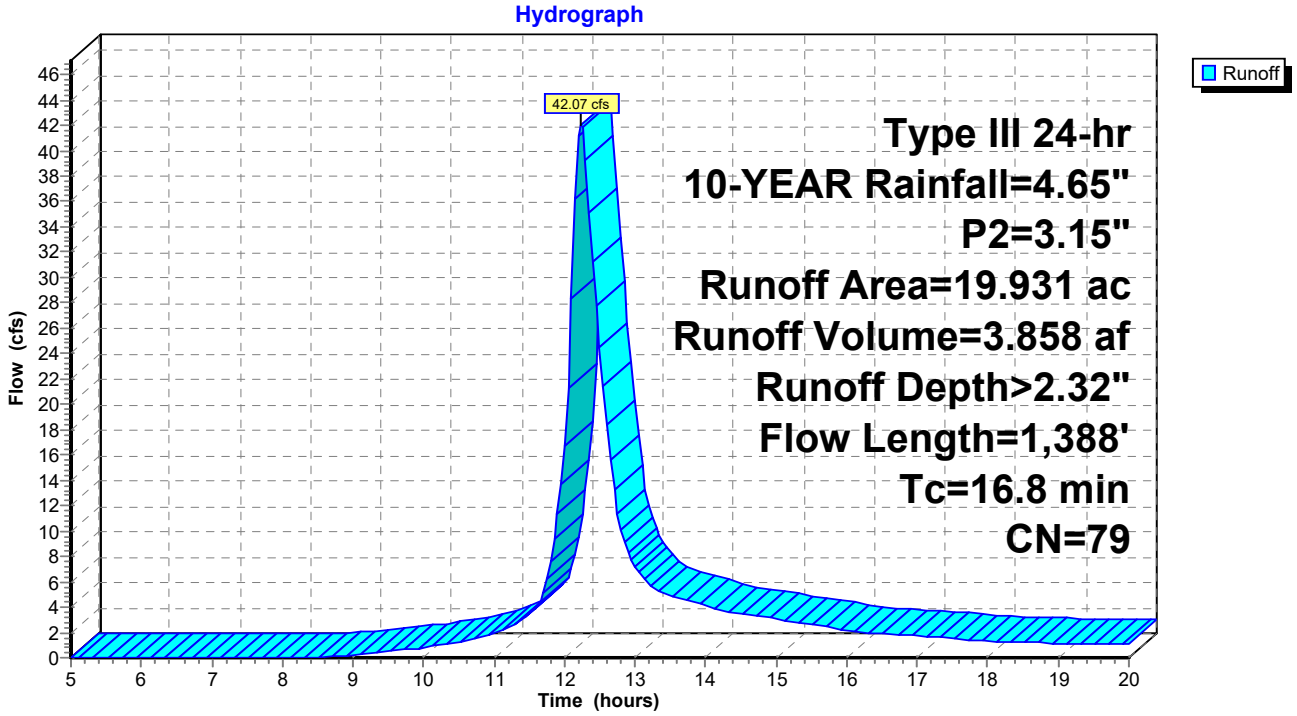
Runoff = 42.07 cfs @ 12.24 hrs, Volume= 3.858 af, Depth> 2.32"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	7.130	74	>75% Grass cover, Good, HSG C
*	0.340	98	IMP C
	12.081	80	>75% Grass cover, Good, HSG D
*	0.380	98	IMP D
	19.931	79	Weighted Average
	19.211		96.39% Pervious Area
	0.720		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
11.8	1,271	0.0660	1.80		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
0.0	17	0.0353	14.66	46.05	**Pipe Channel, CPP PIPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
16.8	1,388	Total			

Subcatchment E-10: EDA-10



Summary for Subcatchment E-11: EDA-11

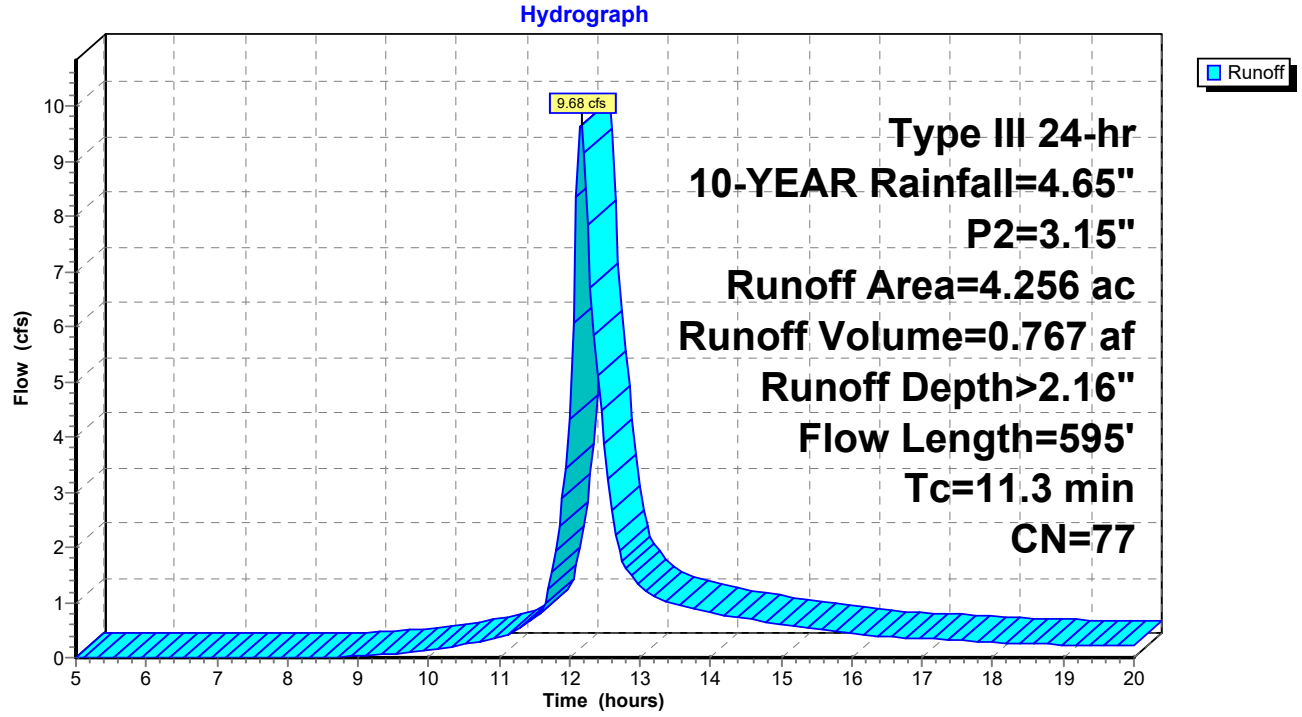
Runoff = 9.68 cfs @ 12.16 hrs, Volume= 0.767 af, Depth> 2.16"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	2.710	74	>75% Grass cover, Good, HSG C
*	0.010	98	IMP C
	1.390	80	>75% Grass cover, Good, HSG D
*	0.146	98	IMP D
	4.256	77	Weighted Average
	4.100		96.33% Pervious Area
	0.156		3.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, Orchard** Grass: Short n= 0.150 P2= 3.15"
3.4	495	0.1200	2.42		**Shallow Concentrated Flow, Orchard** Short Grass Pasture Kv= 7.0 fps
11.3	595	Total			

Subcatchment E-11: EDA-11



Summary for Subcatchment E-12: EDA-12

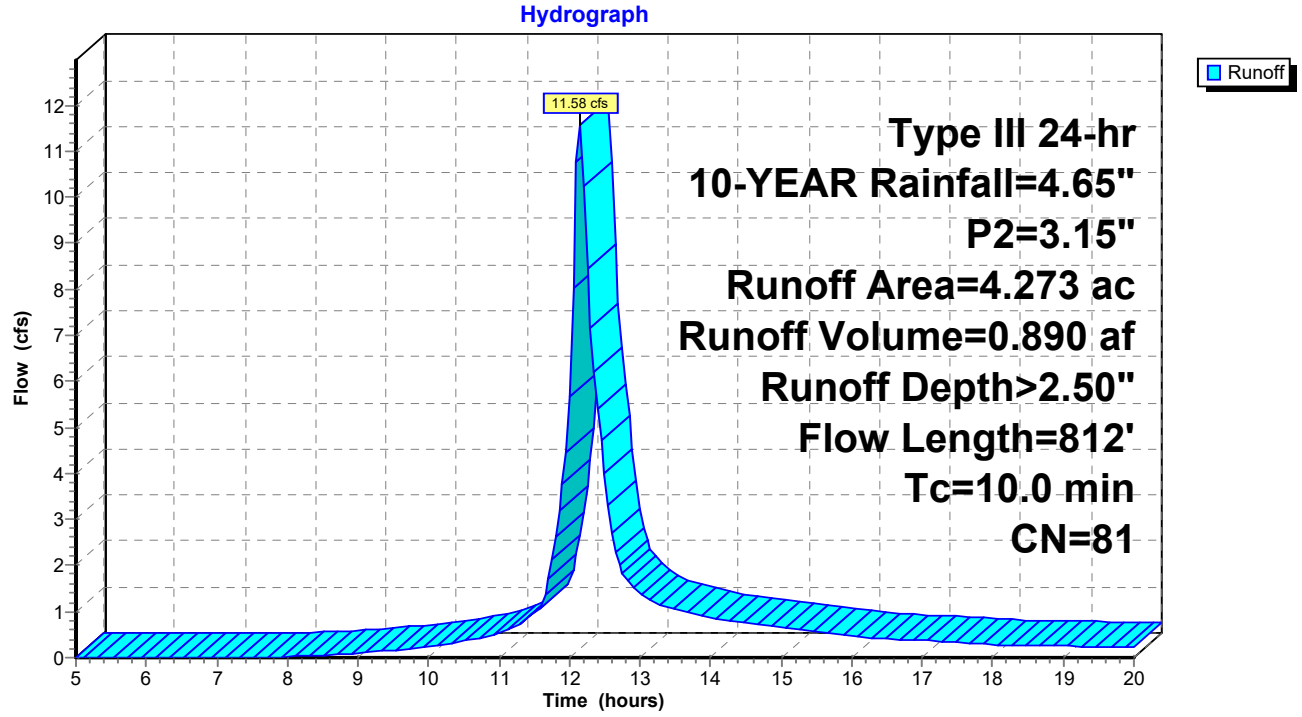
Runoff = 11.58 cfs @ 12.14 hrs, Volume= 0.890 af, Depth> 2.50"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
*	3.750	79	SOIL C
*	0.220	98	IMP C
*	0.250	84	SOIL D
*	0.053	98	IMP D
	4.273	81	Weighted Average
	4.000		93.61% Pervious Area
	0.273		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	712	0.1010	2.22		**Shallow Concentrated Flow, SHALLOW** Short Grass Pasture Kv= 7.0 fps
10.0	812	Total			

Subcatchment E-12: EDA-12

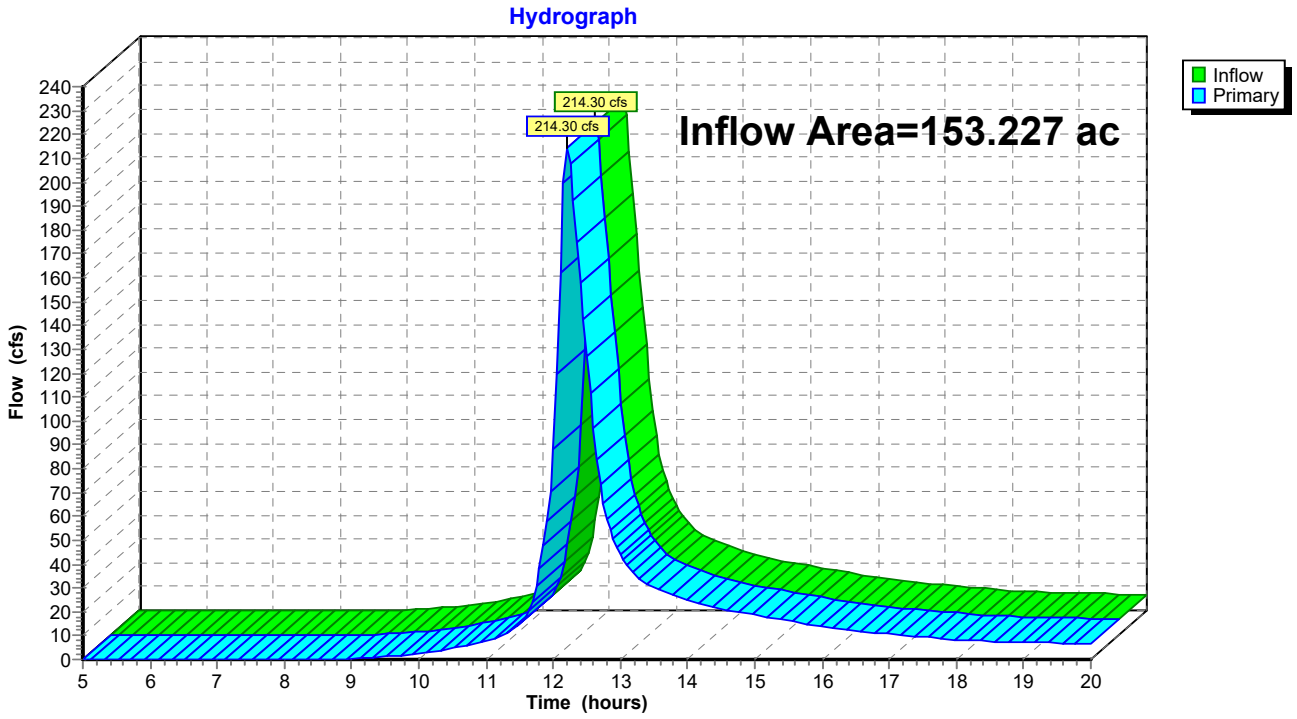


Summary for Link 1: AP-01-TOTAL Q

Inflow Area = 153.227 ac, 3.72% Impervious, Inflow Depth > 1.66" for 10-YEAR event
Inflow = 214.30 cfs @ 12.21 hrs, Volume= 21.155 af
Primary = 214.30 cfs @ 12.21 hrs, Volume= 21.155 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01-TOTAL Q

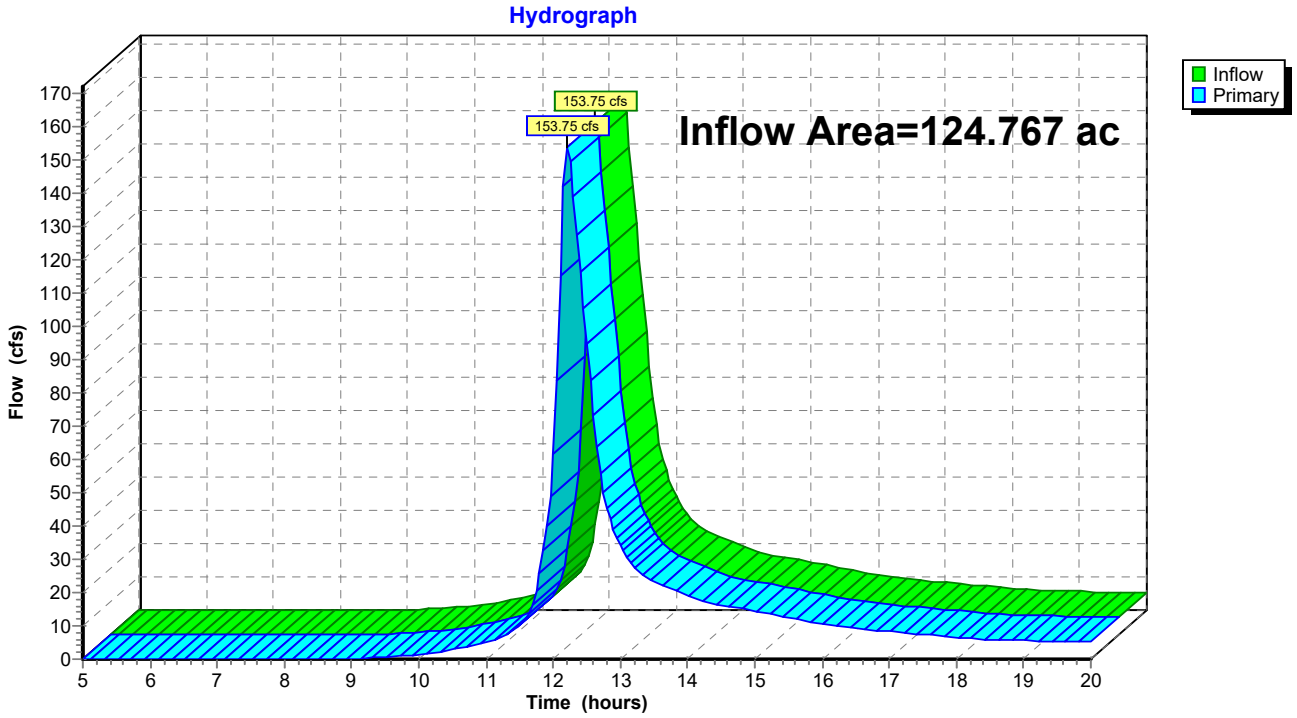


Summary for Link 2: AP-02

Inflow Area = 124.767 ac, 3.65% Impervious, Inflow Depth > 1.50" for 10-YEAR event
Inflow = 153.75 cfs @ 12.21 hrs, Volume= 15.641 af
Primary = 153.75 cfs @ 12.21 hrs, Volume= 15.641 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

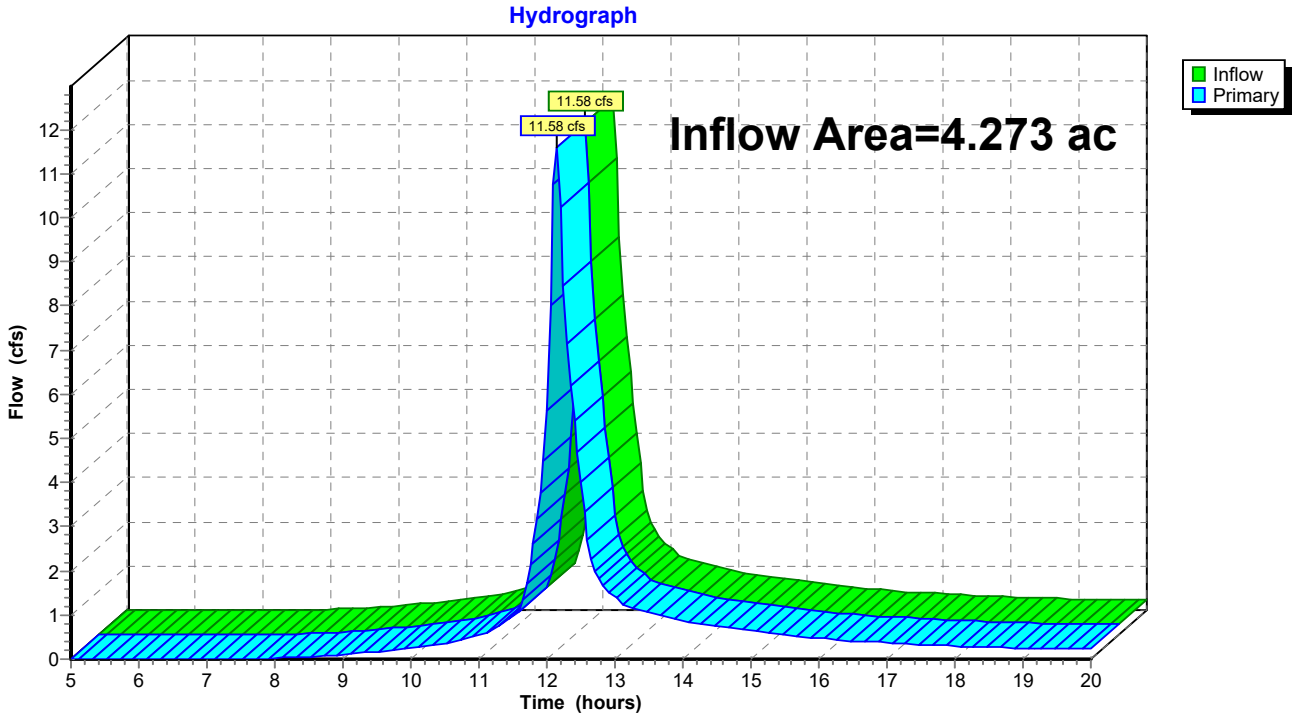


Summary for Link 3: AP-3

Inflow Area = 4.273 ac, 6.39% Impervious, Inflow Depth > 2.50" for 10-YEAR event
Inflow = 11.58 cfs @ 12.14 hrs, Volume= 0.890 af
Primary = 11.58 cfs @ 12.14 hrs, Volume= 0.890 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-01: EDA-01 Runoff Area=23.430 ac 2.13% Impervious Runoff Depth>1.30"
Flow Length=845' Tc=44.5 min CN=52 Runoff=16.39 cfs 2.547 af

SubcatchmentE-02: EDA-02 Runoff Area=6.224 ac 0.00% Impervious Runoff Depth>0.52"
Flow Length=600' Tc=25.7 min CN=40 Runoff=1.44 cfs 0.268 af

SubcatchmentE-03: EDA-03 Runoff Area=6.955 ac 12.72% Impervious Runoff Depth>1.97"
Flow Length=230' Tc=14.9 min CN=60 Runoff=12.65 cfs 1.140 af

SubcatchmentE-04: EDA-04 Runoff Area=7.441 ac 13.44% Impervious Runoff Depth>2.23"
Flow Length=219' Tc=7.4 min CN=63 Runoff=19.42 cfs 1.384 af

SubcatchmentE-05: EDA-05 Runoff Area=5.642 ac 0.00% Impervious Runoff Depth>2.86"
Flow Length=743' Tc=16.0 min CN=70 Runoff=14.97 cfs 1.344 af

SubcatchmentE-06: EDA-06 Runoff Area=11.592 ac 2.85% Impervious Runoff Depth>3.04"
Flow Length=725' Tc=26.0 min CN=72 Runoff=26.86 cfs 2.935 af

SubcatchmentE-07: EDA-07 Runoff Area=14.685 ac 2.44% Impervious Runoff Depth>3.14"
Flow Length=1,049' Tc=18.7 min CN=73 Runoff=40.31 cfs 3.845 af

SubcatchmentE-08: EDA-08 Runoff Area=18.876 ac 3.95% Impervious Runoff Depth>3.44"
Flow Length=1,663' Tc=12.2 min CN=76 Runoff=66.35 cfs 5.416 af

SubcatchmentE-09: EDA-09 Runoff Area=29.922 ac 2.45% Impervious Runoff Depth>3.44"
Flow Length=1,606' Tc=14.8 min CN=76 Runoff=98.12 cfs 8.578 af

SubcatchmentE-10: EDA-10 Runoff Area=19.931 ac 3.61% Impervious Runoff Depth>3.74"
Flow Length=1,388' Tc=16.8 min CN=79 Runoff=67.16 cfs 6.211 af

SubcatchmentE-11: EDA-11 Runoff Area=4.256 ac 3.67% Impervious Runoff Depth>3.54"
Flow Length=595' Tc=11.3 min CN=77 Runoff=15.77 cfs 1.257 af

SubcatchmentE-12: EDA-12 Runoff Area=4.273 ac 6.39% Impervious Runoff Depth>3.95"
Flow Length=812' Tc=10.0 min CN=81 Runoff=18.08 cfs 1.408 af

Link 1: AP-01-TOTALQ Inflow=362.84 cfs 36.332 af
Primary=362.84 cfs 36.332 af

Link 2: AP-02 Inflow=266.16 cfs 27.457 af
Primary=266.16 cfs 27.457 af

Link 3: AP-3 Inflow=18.08 cfs 1.408 af
Primary=18.08 cfs 1.408 af

Total Runoff Area = 153.227 ac Runoff Volume = 36.332 af Average Runoff Depth = 2.85"
96.28% Pervious = 147.526 ac 3.72% Impervious = 5.701 ac

Summary for Subcatchment E-01: EDA-01

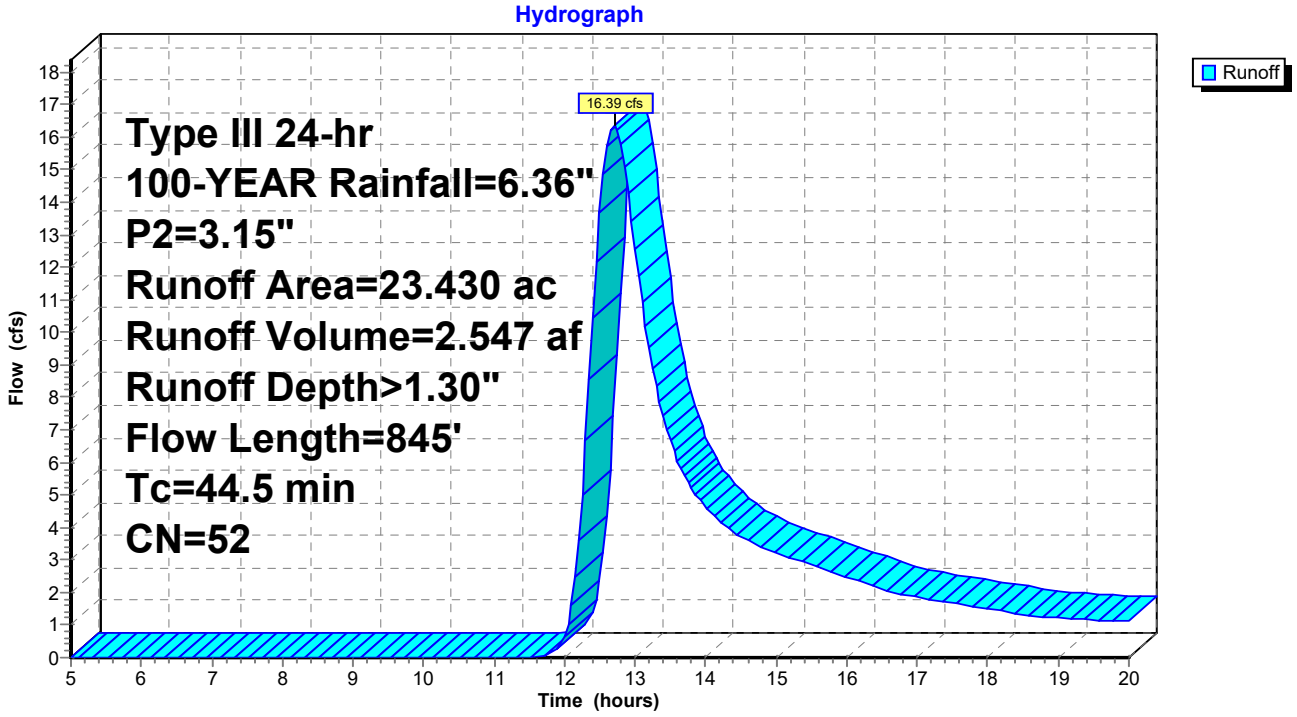
Runoff = 16.39 cfs @ 12.70 hrs, Volume= 2.547 af, Depth> 1.30"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

Area (ac)	CN	Description
12.890	32	Woods/grass comb., Good, HSG A
0.500	98	Paved parking, HSG A
1.700	58	Woods/grass comb., Good, HSG B
8.340	79	Woods/grass comb., Good, HSG D
23.430	52	Weighted Average
22.930		97.87% Pervious Area
0.500		2.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment E-01: EDA-01



Summary for Subcatchment E-02: EDA-02

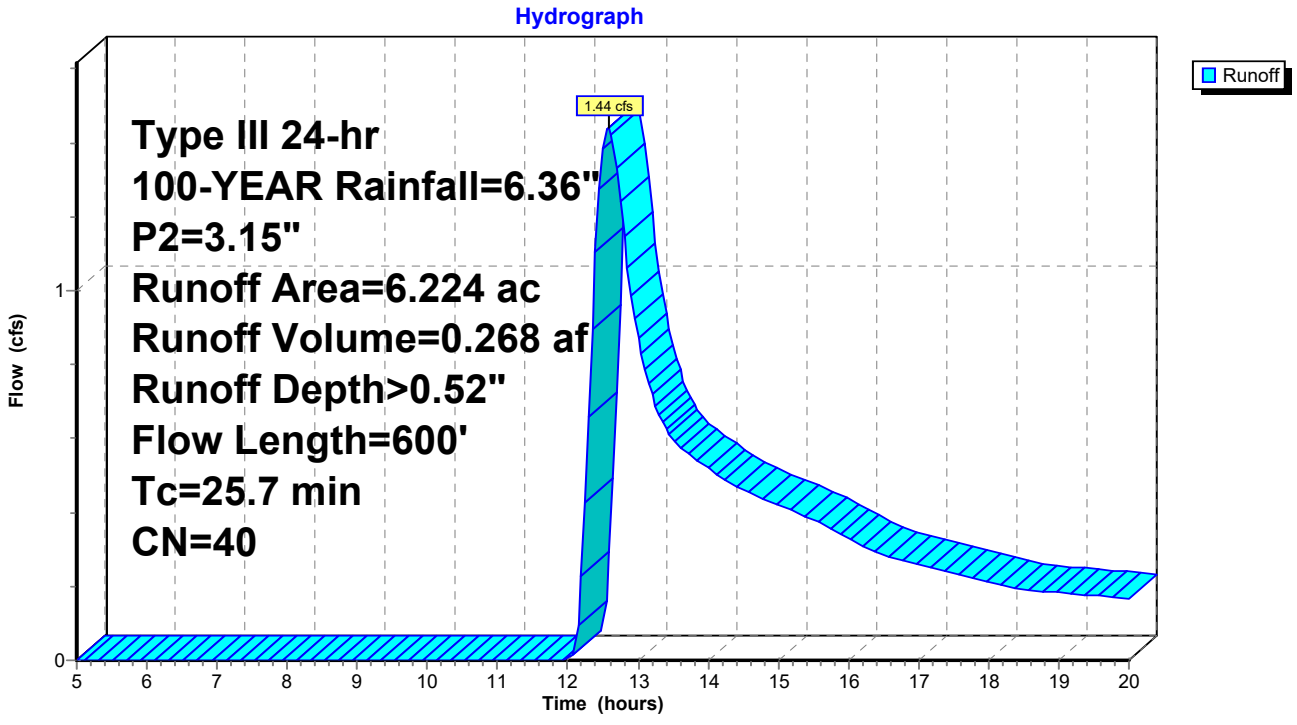
Runoff = 1.44 cfs @ 12.58 hrs, Volume= 0.268 af, Depth> 0.52"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

Area (ac)	CN	Description
5.204	32	Woods/grass comb., Good, HSG A
1.020	79	Woods/grass comb., Good, HSG D
6.224	40	Weighted Average
6.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0950	0.14		**Sheet Flow, SHEET 1** Woods: Light underbrush n= 0.400 P2= 3.15"
14.1	500	0.0140	0.59		**Shallow Concentrated Flow, Woods/brush** Woodland Kv= 5.0 fps
25.7	600	Total			

Subcatchment E-02: EDA-02



Summary for Subcatchment E-03: EDA-03

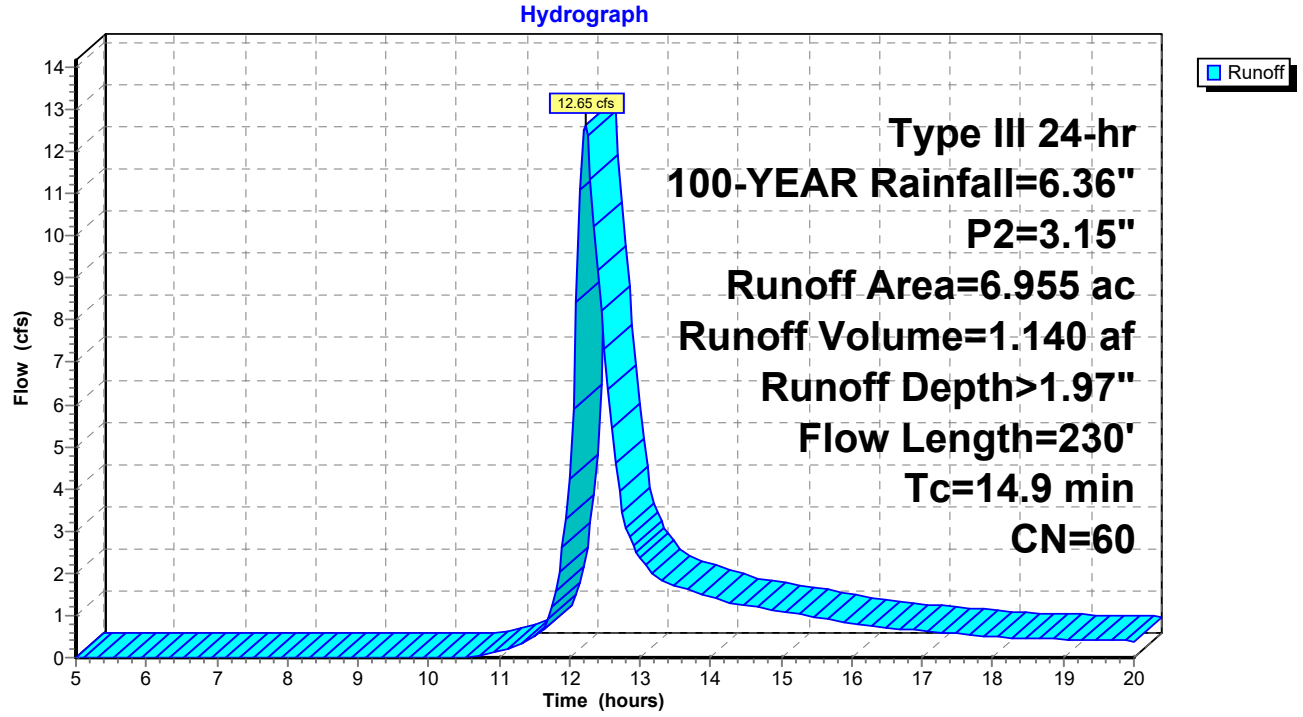
Runoff = 12.65 cfs @ 12.22 hrs, Volume= 1.140 af, Depth> 1.97"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
*	4.980	49	SOIL A
*	0.885	98	IMP A
*	0.530	69	SOIL B
*	0.560	84	SOIL D
	6.955	60	Weighted Average
	6.070		87.28% Pervious Area
	0.885		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
1.9	130	0.0546	1.17		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
14.9	230	Total			

Subcatchment E-03: EDA-03



Summary for Subcatchment E-04: EDA-04

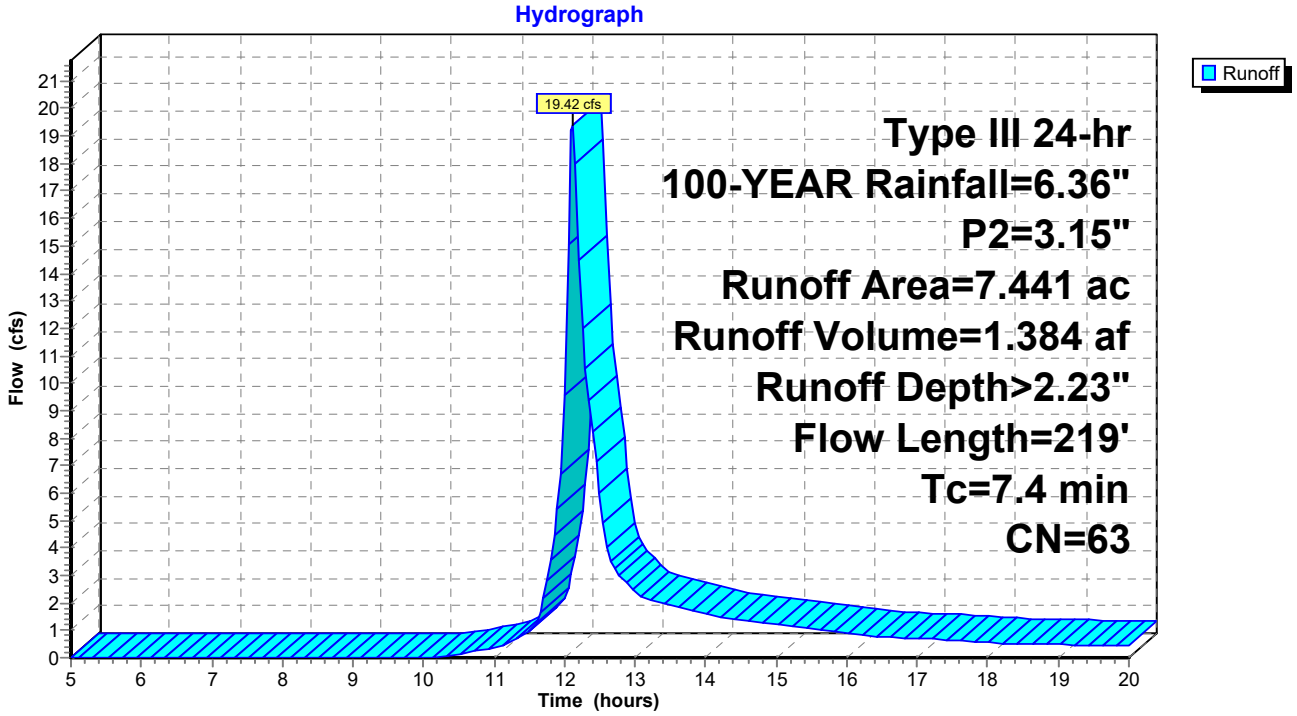
Runoff = 19.42 cfs @ 12.11 hrs, Volume= 1.384 af, Depth> 2.23"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	2.731	39	>75% Grass cover, Good, HSG A
*	0.850	98	IMP A
	1.880	61	>75% Grass cover, Good, HSG B
*	0.050	98	IMP B
	1.830	80	>75% Grass cover, Good, HSG D
*	0.100	98	IMP D
	7.441	63	Weighted Average
	6.441		86.56% Pervious Area
	1.000		13.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0550	0.25		**Sheet Flow, SHEET 1** Grass: Short n= 0.150 P2= 3.15"
0.8	119	0.0252	2.56		**Shallow Concentrated Flow, SC Flow** Unpaved Kv= 16.1 fps
7.4	219	Total			

Subcatchment E-04: EDA-04



Summary for Subcatchment E-05: EDA-05

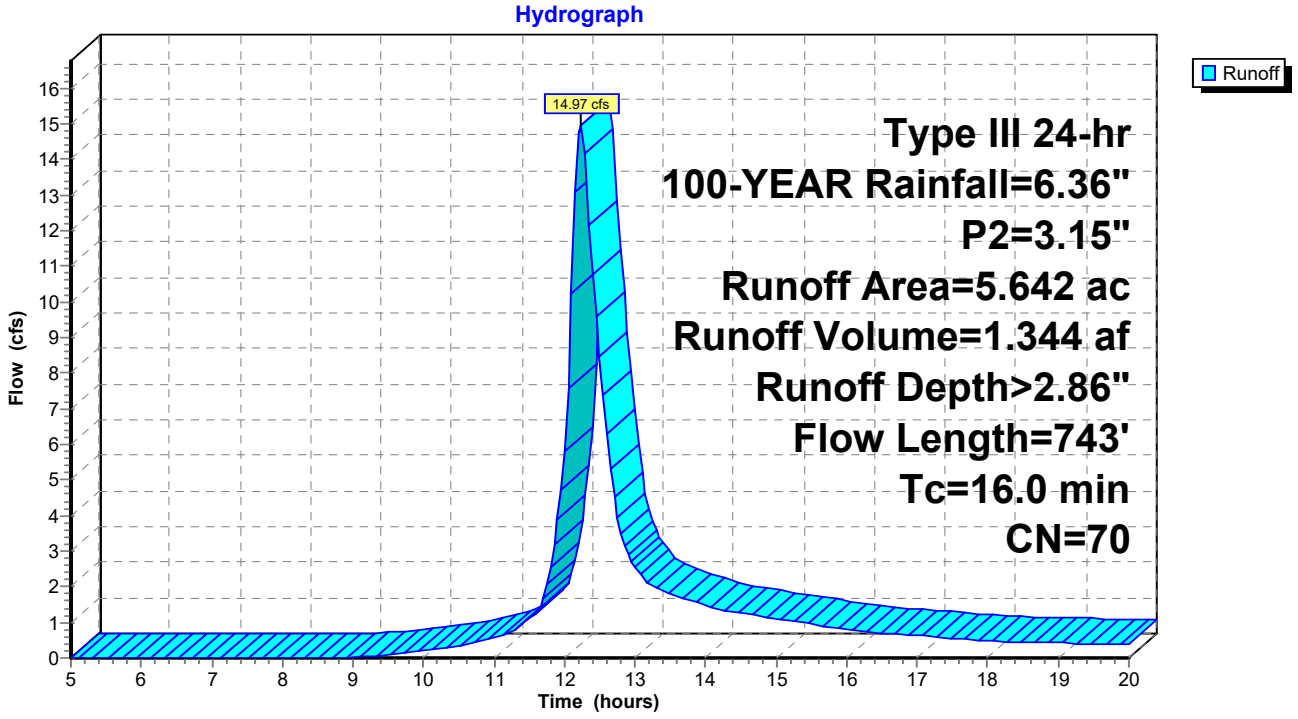
Runoff = 14.97 cfs @ 12.22 hrs, Volume= 1.344 af, Depth> 2.86"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

Area (ac)	CN	Description
0.280	32	Woods/grass comb., Good, HSG A
0.580	58	Woods/grass comb., Good, HSG B
3.790	72	Woods/grass comb., Good, HSG C
0.992	79	Woods/grass comb., Good, HSG D
5.642	70	Weighted Average
5.642		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.15"
5.4	643	0.1600	2.00		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
16.0	743	Total			

Subcatchment E-05: EDA-05



Summary for Subcatchment E-06: EDA-06

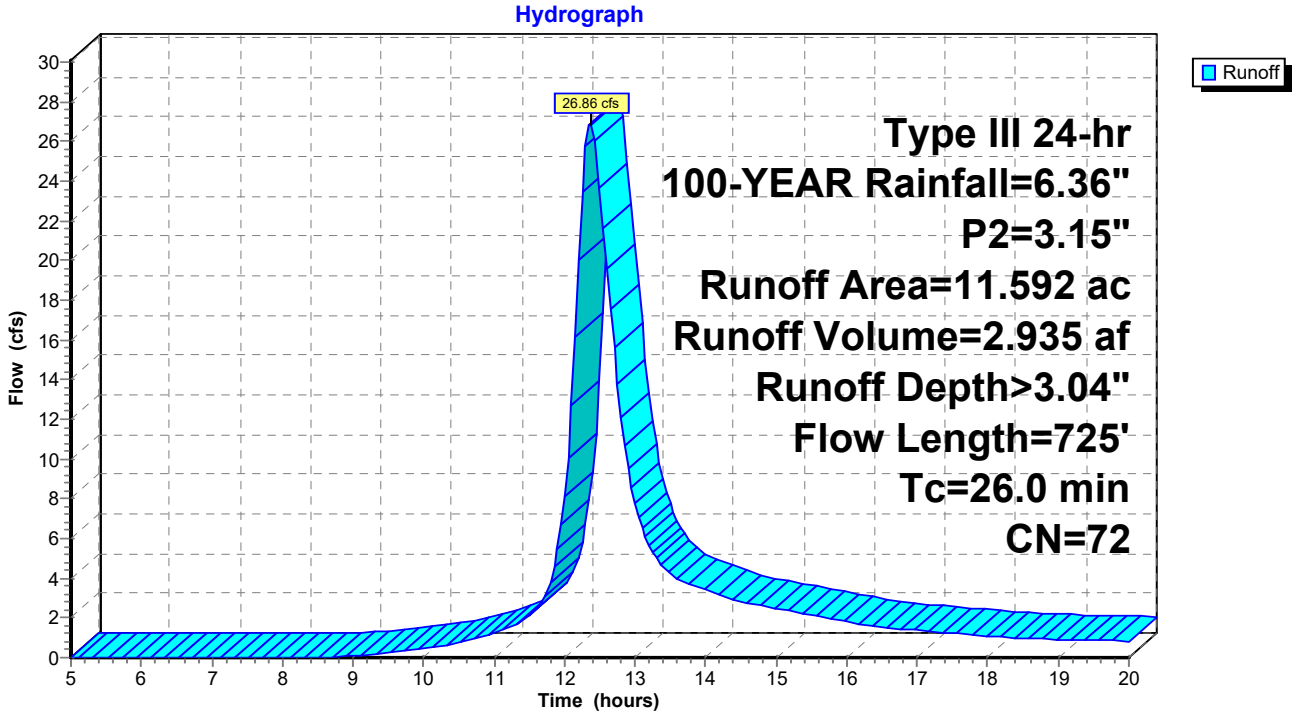
Runoff = 26.86 cfs @ 12.37 hrs, Volume= 2.935 af, Depth> 3.04"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	0.993	58	Woods/grass comb., Good, HSG B
	8.829	72	Woods/grass comb., Good, HSG C
*	0.330	98	IMP C
	1.440	79	Woods/grass comb., Good, HSG D
	11.592	72	Weighted Average
	11.262		97.15% Pervious Area
	0.330		2.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	100	0.0250	0.08		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
6.2	625	0.1120	1.67		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
26.0	725	Total			

Subcatchment E-06: EDA-06



Summary for Subcatchment E-07: EDA-07

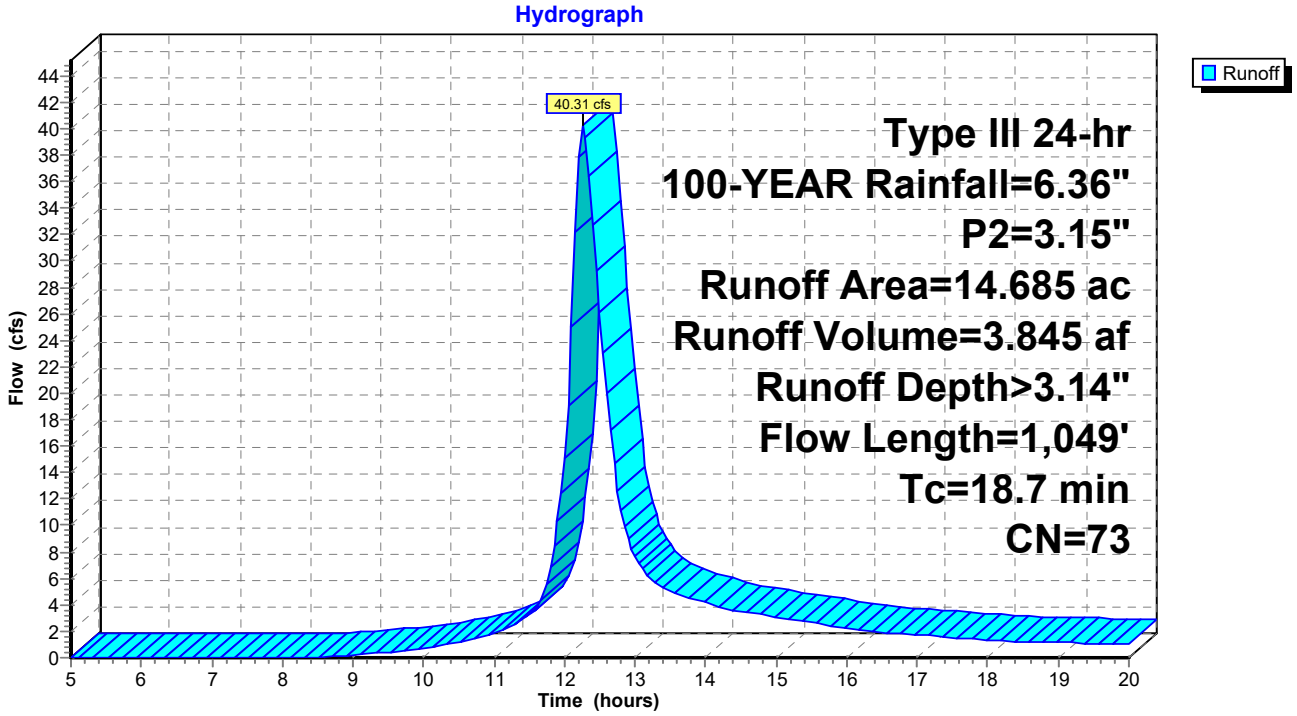
Runoff = 40.31 cfs @ 12.26 hrs, Volume= 3.845 af, Depth> 3.14"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	1.869	58	Woods/grass comb., Good, HSG B
*	0.096	98	IMP B
	7.864	72	Woods/grass comb., Good, HSG C
*	0.212	98	IMP C
	4.594	79	Woods/grass comb., Good, HSG D
*	0.050	98	IMP D
	14.685	73	Weighted Average
	14.327		97.56% Pervious Area
	0.358		2.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1400	0.17		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
8.8	949	0.1300	1.80		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
18.7	1,049	Total			

Subcatchment E-07: EDA-07



Summary for Subcatchment E-08: EDA-08

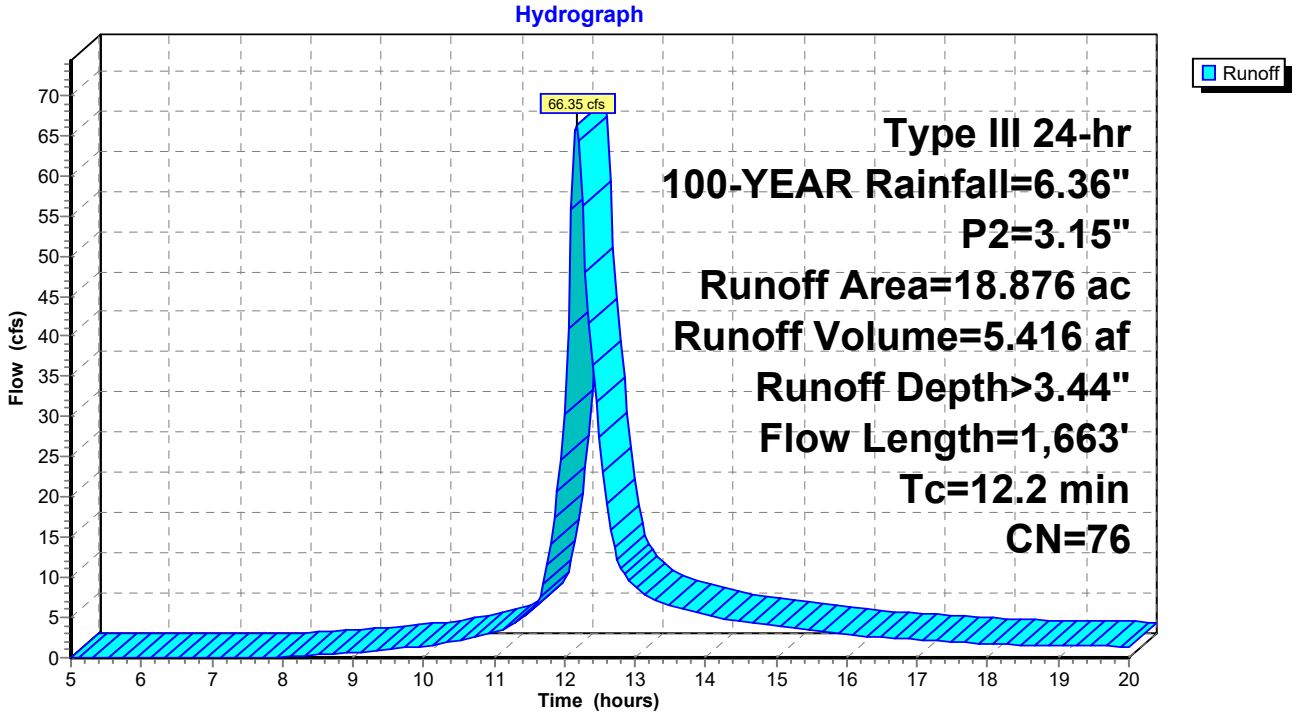
Runoff = 66.35 cfs @ 12.17 hrs, Volume= 5.416 af, Depth> 3.44"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	15.270	74	>75% Grass cover, Good, HSG C
*	0.510	98	IMP C
	2.860	80	>75% Grass cover, Good, HSG D
*	0.236	98	IMP D
	18.876	76	Weighted Average
	18.130		96.05% Pervious Area
	0.746		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0750	0.29		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	918	0.1700	2.89		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
1.1	645	0.0590	10.03	140.44	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=3.00' D=2.00' Z= 2.0 '/' Top.W=11.00' n= 0.040 Earth, cobble bottom, clean sides
12.2	1,663	Total			

Subcatchment E-08: EDA-08



Summary for Subcatchment E-09: EDA-09

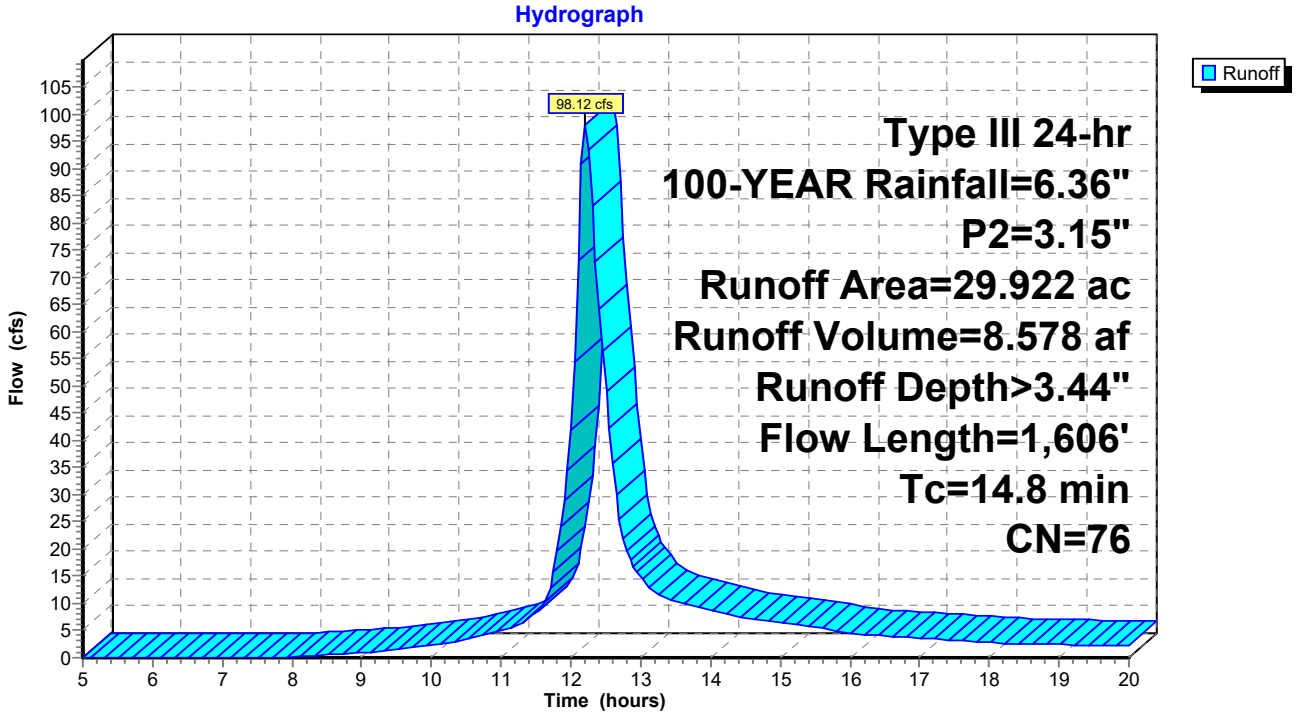
Runoff = 98.12 cfs @ 12.21 hrs, Volume= 8.578 af, Depth> 3.44"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	14.366	74	>75% Grass cover, Good, HSG C
	4.463	70	Woods, Good, HSG C
*	0.563	98	IMP C
	10.360	80	>75% Grass cover, Good, HSG D
*	0.170	98	IMP D
	29.922	76	Weighted Average
	29.189		97.55% Pervious Area
	0.733		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0900	0.31		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
8.3	928	0.1380	1.86		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
1.1	578	0.0600	8.45	67.58	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.040 Winding stream, pools & shoals
14.8	1,606	Total			

Subcatchment E-09: EDA-09



Summary for Subcatchment E-10: EDA-10

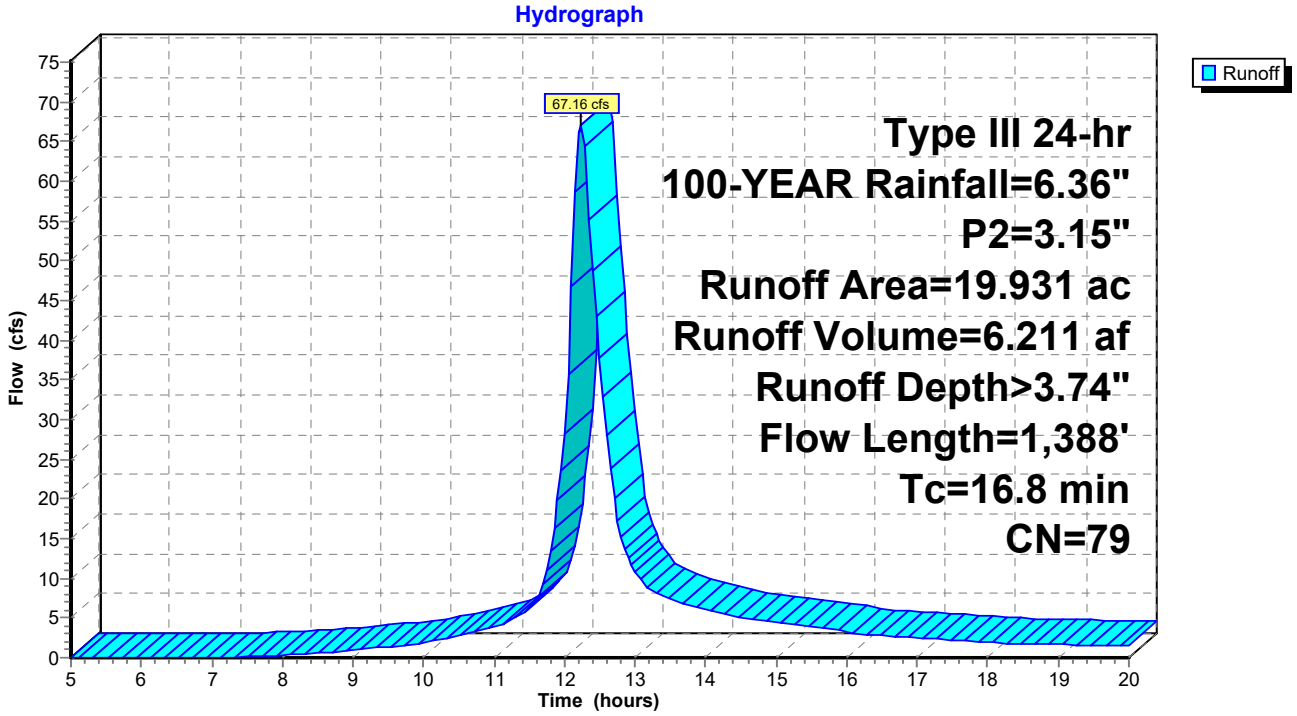
Runoff = 67.16 cfs @ 12.23 hrs, Volume= 6.211 af, Depth> 3.74"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	7.130	74	>75% Grass cover, Good, HSG C
*	0.340	98	IMP C
	12.081	80	>75% Grass cover, Good, HSG D
*	0.380	98	IMP D
	19.931	79	Weighted Average
	19.211		96.39% Pervious Area
	0.720		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
11.8	1,271	0.0660	1.80		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
0.0	17	0.0353	14.66	46.05	**Pipe Channel, CPP PIPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
16.8	1,388	Total			

Subcatchment E-10: EDA-10



Summary for Subcatchment E-11: EDA-11

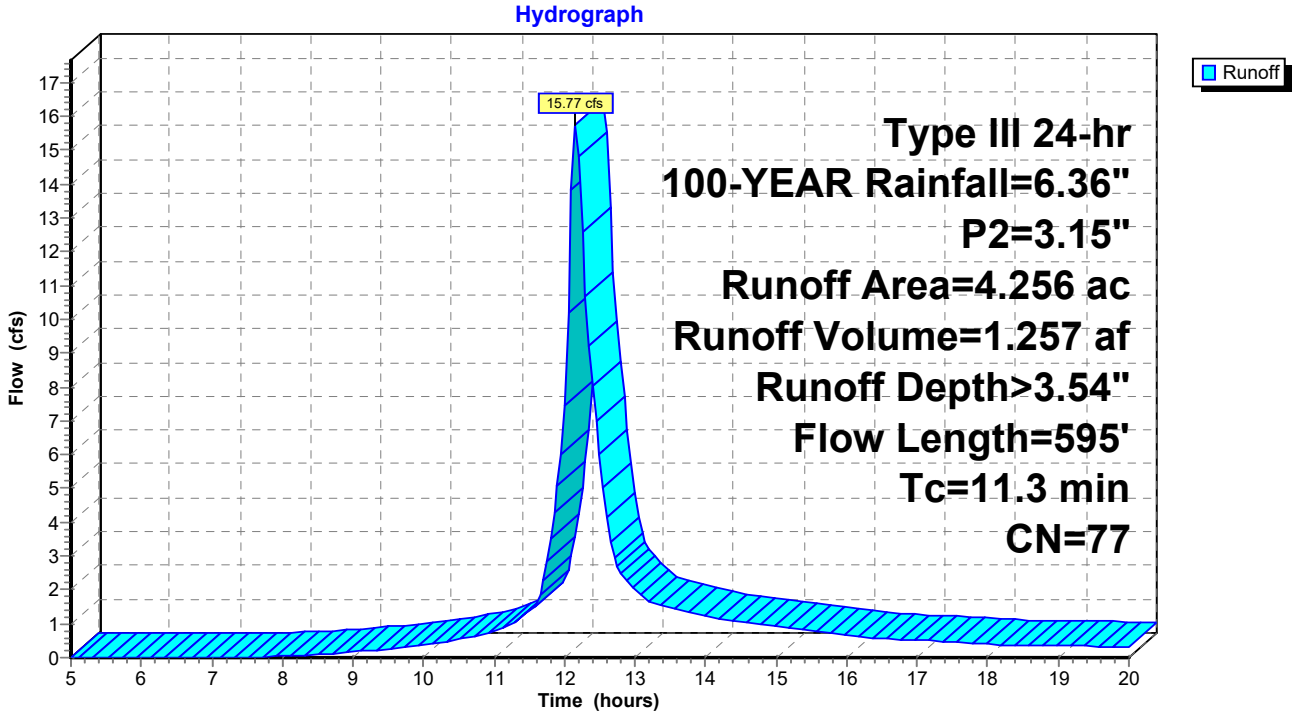
Runoff = 15.77 cfs @ 12.16 hrs, Volume= 1.257 af, Depth> 3.54"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	2.710	74	>75% Grass cover, Good, HSG C
*	0.010	98	IMP C
	1.390	80	>75% Grass cover, Good, HSG D
*	0.146	98	IMP D
	4.256	77	Weighted Average
	4.100		96.33% Pervious Area
	0.156		3.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, Orchard** Grass: Short n= 0.150 P2= 3.15"
3.4	495	0.1200	2.42		**Shallow Concentrated Flow, Orchard** Short Grass Pasture Kv= 7.0 fps
11.3	595	Total			

Subcatchment E-11: EDA-11



Summary for Subcatchment E-12: EDA-12

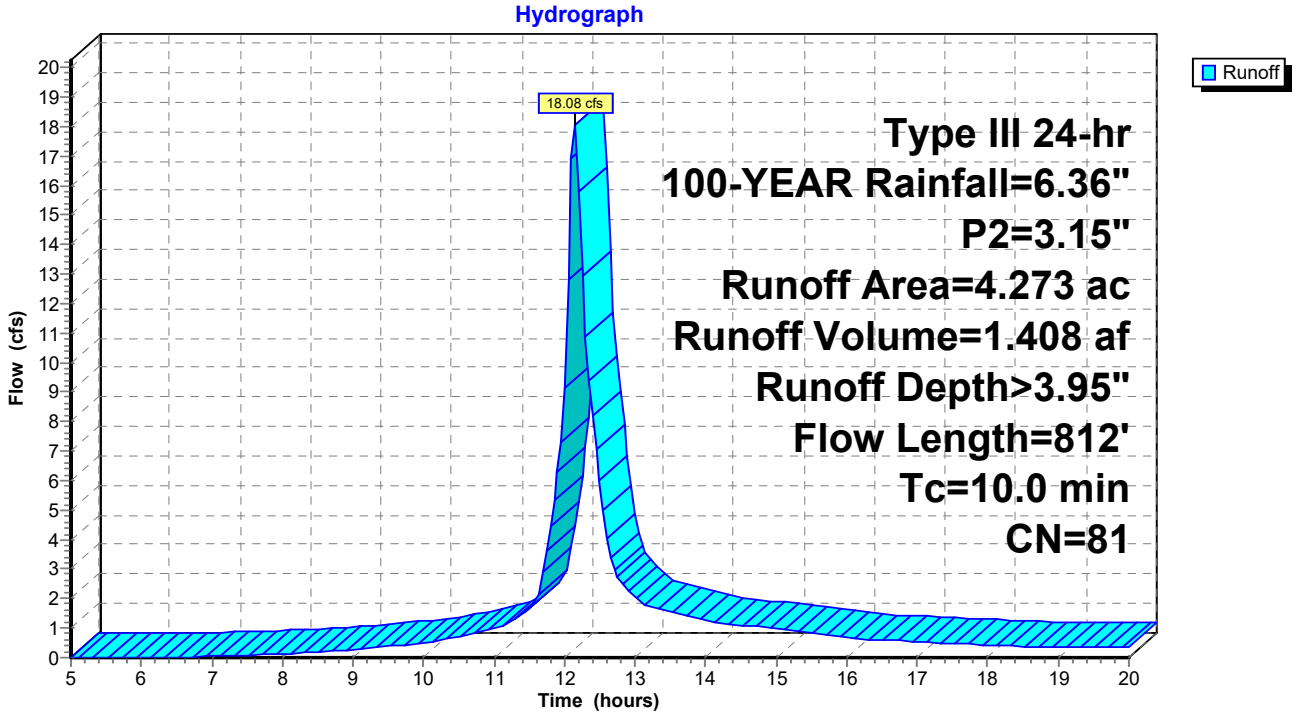
Runoff = 18.08 cfs @ 12.14 hrs, Volume= 1.408 af, Depth> 3.95"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
*	3.750	79	SOIL C
*	0.220	98	IMP C
*	0.250	84	SOIL D
*	0.053	98	IMP D
	4.273	81	Weighted Average
	4.000		93.61% Pervious Area
	0.273		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	712	0.1010	2.22		**Shallow Concentrated Flow, SHALLOW** Short Grass Pasture Kv= 7.0 fps
10.0	812	Total			

Subcatchment E-12: EDA-12

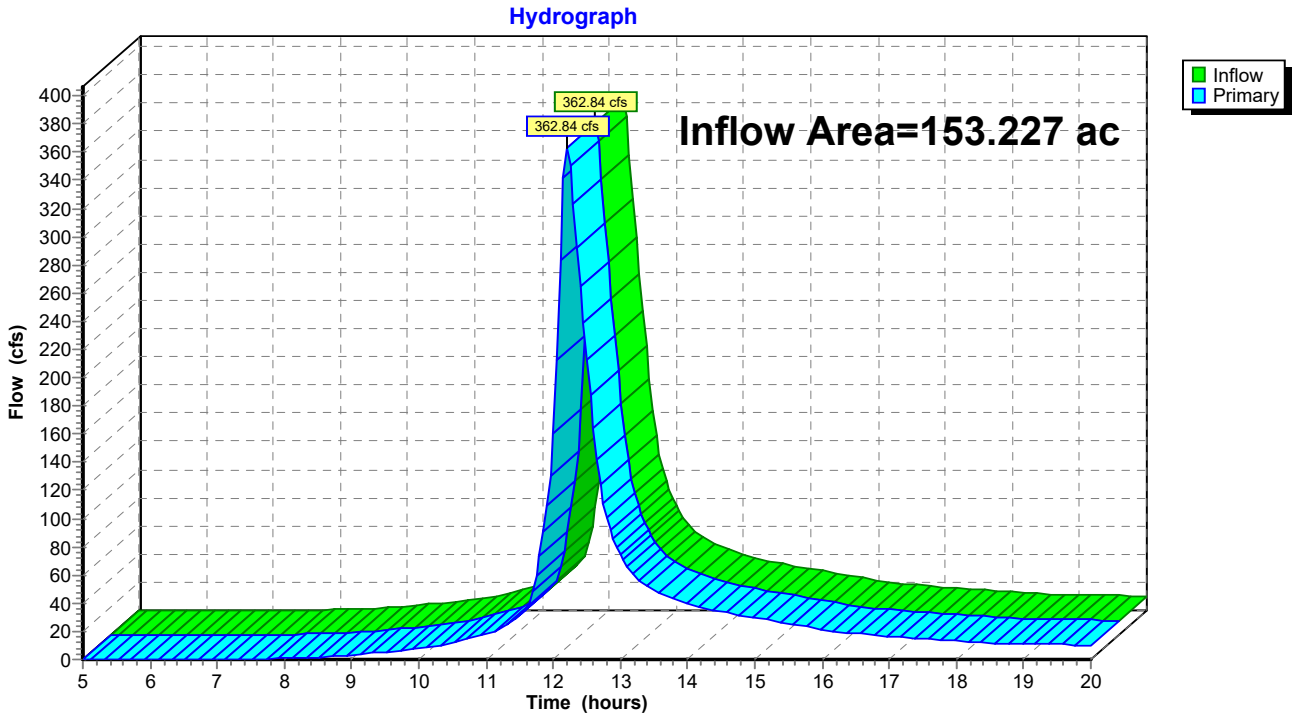


Summary for Link 1: AP-01-TOTAL Q

Inflow Area = 153.227 ac, 3.72% Impervious, Inflow Depth > 2.85" for 100-YEAR event
Inflow = 362.84 cfs @ 12.21 hrs, Volume= 36.332 af
Primary = 362.84 cfs @ 12.21 hrs, Volume= 36.332 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01-TOTAL Q

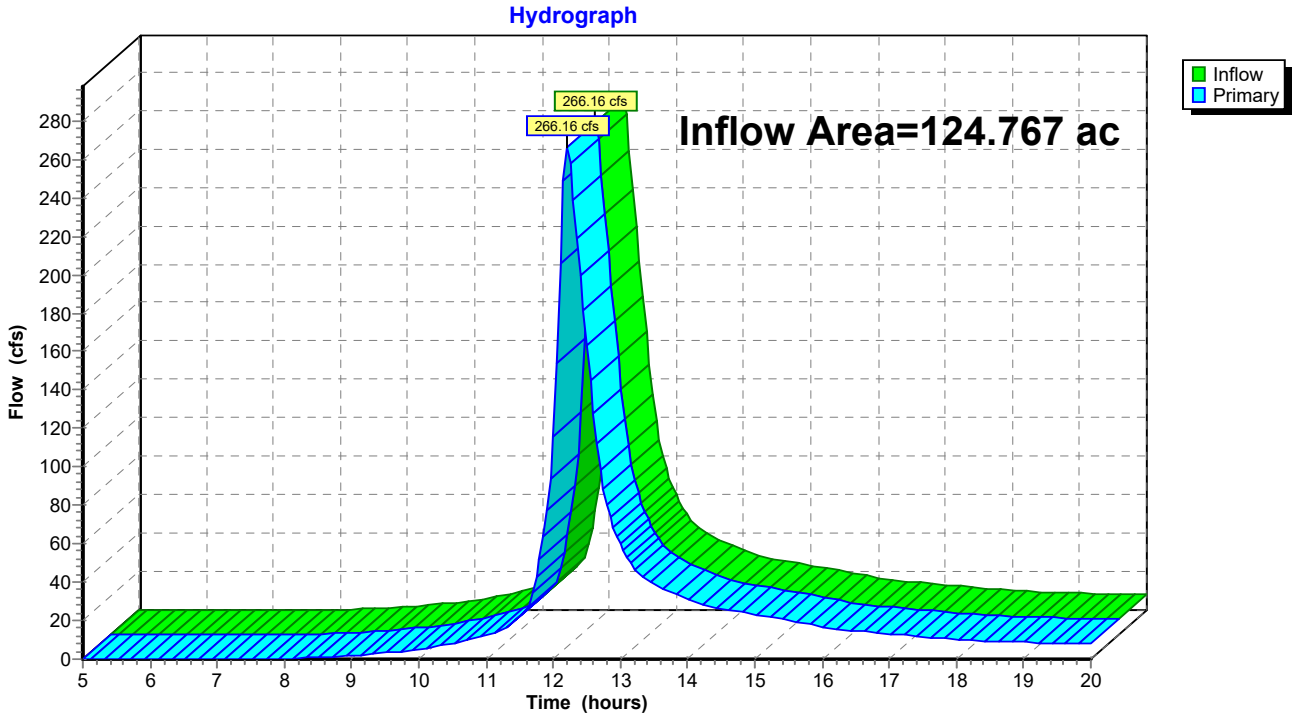


Summary for Link 2: AP-02

Inflow Area = 124.767 ac, 3.65% Impervious, Inflow Depth > 2.64" for 100-YEAR event
Inflow = 266.16 cfs @ 12.21 hrs, Volume= 27.457 af
Primary = 266.16 cfs @ 12.21 hrs, Volume= 27.457 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

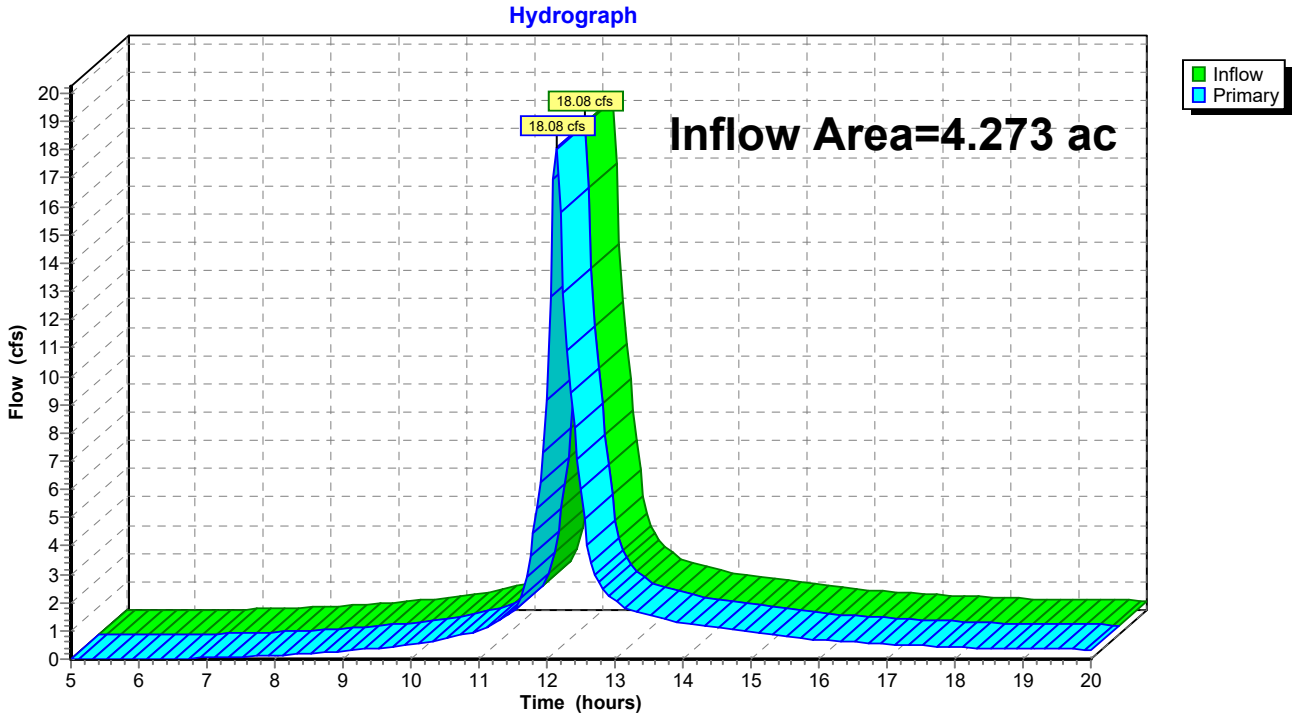


Summary for Link 3: AP-3

Inflow Area = 4.273 ac, 6.39% Impervious, Inflow Depth > 3.95" for 100-YEAR event
Inflow = 18.08 cfs @ 12.14 hrs, Volume= 1.408 af
Primary = 18.08 cfs @ 12.14 hrs, Volume= 1.408 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-01: EDA-01 Runoff Area=23.430 ac 2.13% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=44.5 min CN=52 Runoff=0.00 cfs 0.000 af

Subcatchment E-02: EDA-02 Runoff Area=6.224 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=600' Tc=25.7 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment E-03: EDA-03 Runoff Area=6.955 ac 12.72% Impervious Runoff Depth>0.00"
Flow Length=230' Tc=14.9 min CN=60 Runoff=0.00 cfs 0.000 af

Subcatchment E-04: EDA-04 Runoff Area=7.441 ac 13.44% Impervious Runoff Depth>0.00"
Flow Length=219' Tc=7.4 min CN=63 Runoff=0.01 cfs 0.003 af

Subcatchment E-05: EDA-05 Runoff Area=5.642 ac 0.00% Impervious Runoff Depth>0.05"
Flow Length=743' Tc=16.0 min CN=70 Runoff=0.06 cfs 0.023 af

Subcatchment E-06: EDA-06 Runoff Area=11.592 ac 2.85% Impervious Runoff Depth>0.07"
Flow Length=725' Tc=26.0 min CN=72 Runoff=0.25 cfs 0.067 af

Subcatchment E-07: EDA-07 Runoff Area=14.685 ac 2.44% Impervious Runoff Depth>0.08"
Flow Length=1,049' Tc=18.7 min CN=73 Runoff=0.48 cfs 0.101 af

Subcatchment E-08: EDA-08 Runoff Area=18.876 ac 3.95% Impervious Runoff Depth>0.13"
Flow Length=1,663' Tc=12.2 min CN=76 Runoff=1.37 cfs 0.203 af

Subcatchment E-09: EDA-09 Runoff Area=29.922 ac 2.45% Impervious Runoff Depth>0.13"
Flow Length=1,606' Tc=14.8 min CN=76 Runoff=2.11 cfs 0.320 af

Subcatchment E-10: EDA-10 Runoff Area=19.931 ac 3.61% Impervious Runoff Depth>0.19"
Flow Length=1,388' Tc=16.8 min CN=79 Runoff=2.47 cfs 0.310 af

Subcatchment E-11: EDA-11 Runoff Area=4.256 ac 3.67% Impervious Runoff Depth>0.15"
Flow Length=595' Tc=11.3 min CN=77 Runoff=0.39 cfs 0.052 af

Subcatchment E-12: EDA-12 Runoff Area=4.273 ac 6.39% Impervious Runoff Depth>0.23"
Flow Length=812' Tc=10.0 min CN=81 Runoff=0.89 cfs 0.084 af

Link 1: AP-01-TOTALQ Inflow=7.31 cfs 1.162 af
Primary=7.31 cfs 1.162 af

Link 2: AP-02 Inflow=3.98 cfs 0.716 af
Primary=3.98 cfs 0.716 af

Link 3: AP-3 Inflow=0.89 cfs 0.084 af
Primary=0.89 cfs 0.084 af

Total Runoff Area = 153.227 ac Runoff Volume = 1.162 af Average Runoff Depth = 0.09"
96.28% Pervious = 147.526 ac 3.72% Impervious = 5.701 ac

Summary for Subcatchment E-01: EDA-01

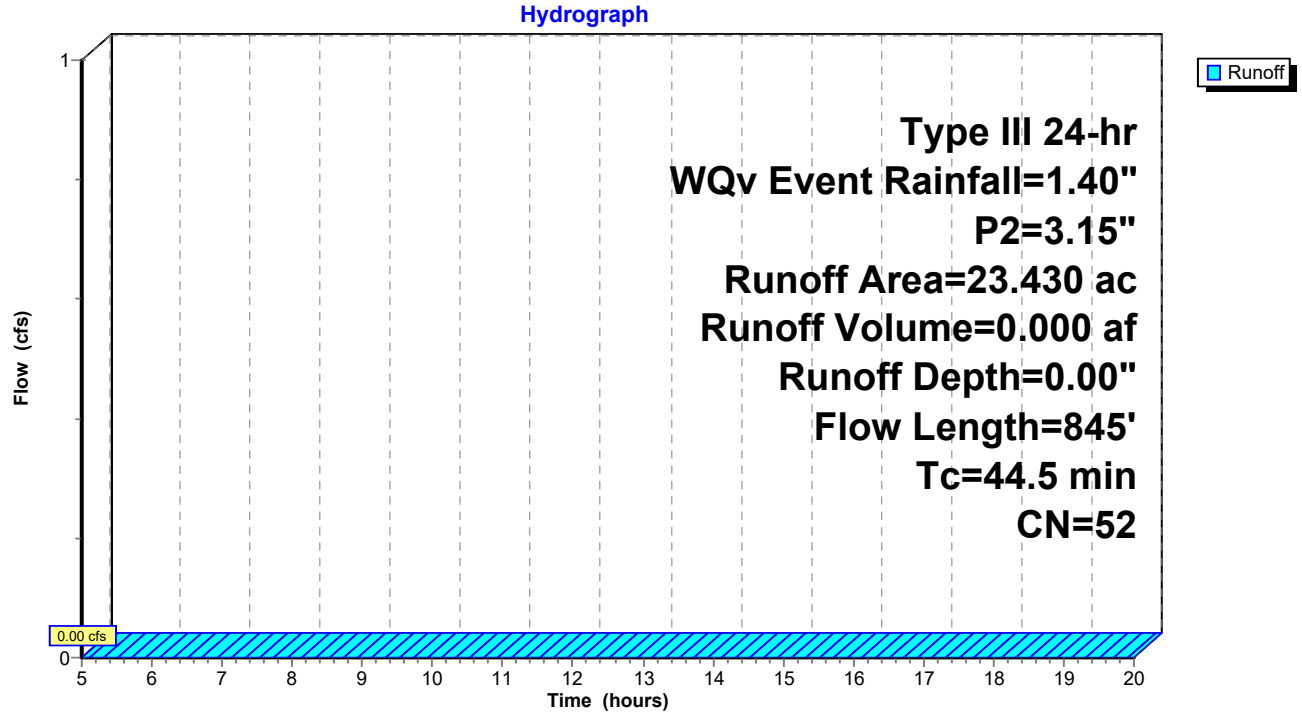
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

Area (ac)	CN	Description
12.890	32	Woods/grass comb., Good, HSG A
0.500	98	Paved parking, HSG A
1.700	58	Woods/grass comb., Good, HSG B
8.340	79	Woods/grass comb., Good, HSG D
23.430	52	Weighted Average
22.930		97.87% Pervious Area
0.500		2.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment E-01: EDA-01



Summary for Subcatchment E-02: EDA-02

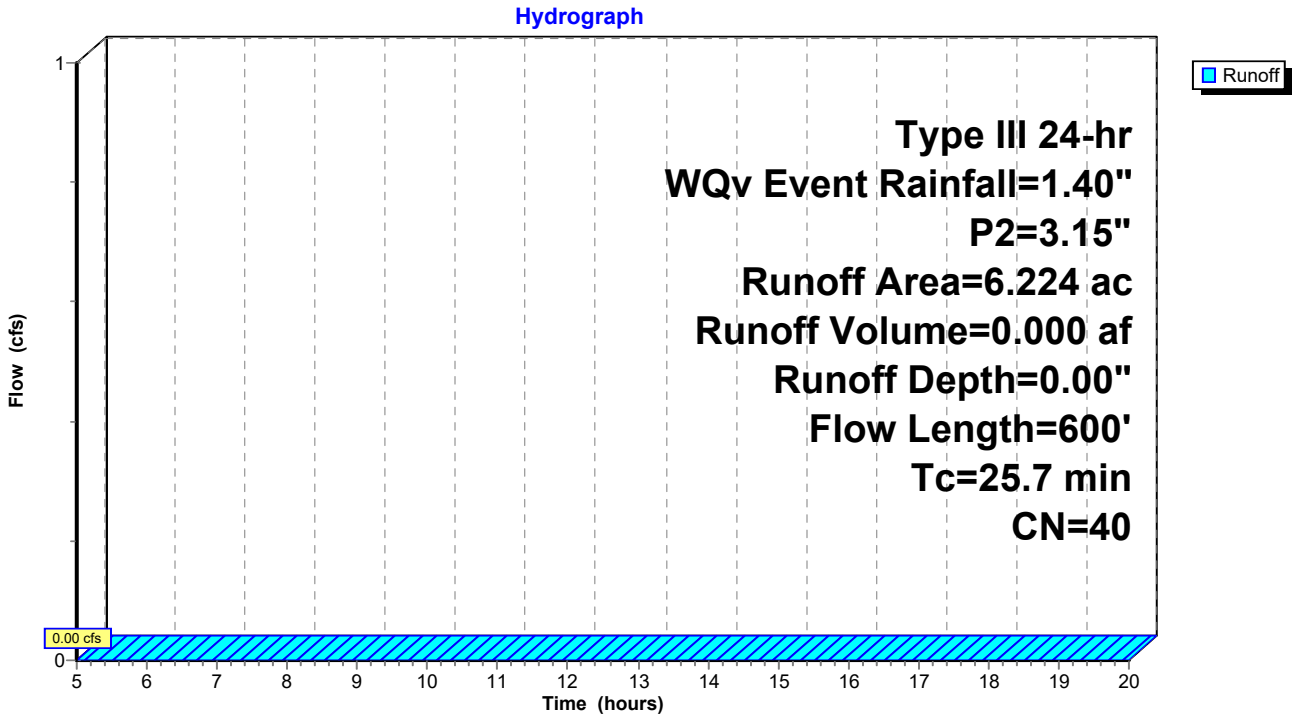
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

Area (ac)	CN	Description
5.204	32	Woods/grass comb., Good, HSG A
1.020	79	Woods/grass comb., Good, HSG D
6.224	40	Weighted Average
6.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0950	0.14		**Sheet Flow, SHEET 1** Woods: Light underbrush n= 0.400 P2= 3.15"
14.1	500	0.0140	0.59		**Shallow Concentrated Flow, Woods/brush** Woodland Kv= 5.0 fps
25.7	600	Total			

Subcatchment E-02: EDA-02



Summary for Subcatchment E-03: EDA-03

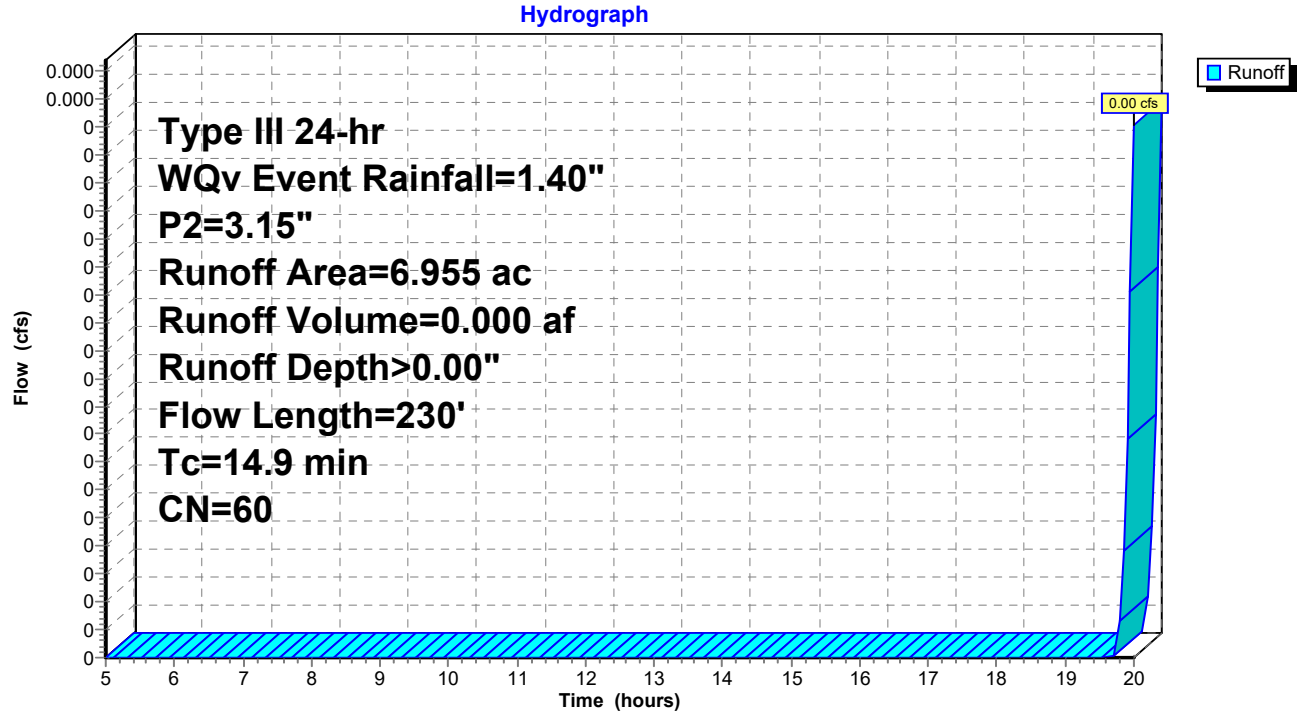
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
*	4.980	49	SOIL A
*	0.885	98	IMP A
*	0.530	69	SOIL B
*	0.560	84	SOIL D
	6.955	60	Weighted Average
	6.070		87.28% Pervious Area
	0.885		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
1.9	130	0.0546	1.17		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
14.9	230	Total			

Subcatchment E-03: EDA-03



Summary for Subcatchment E-04: EDA-04

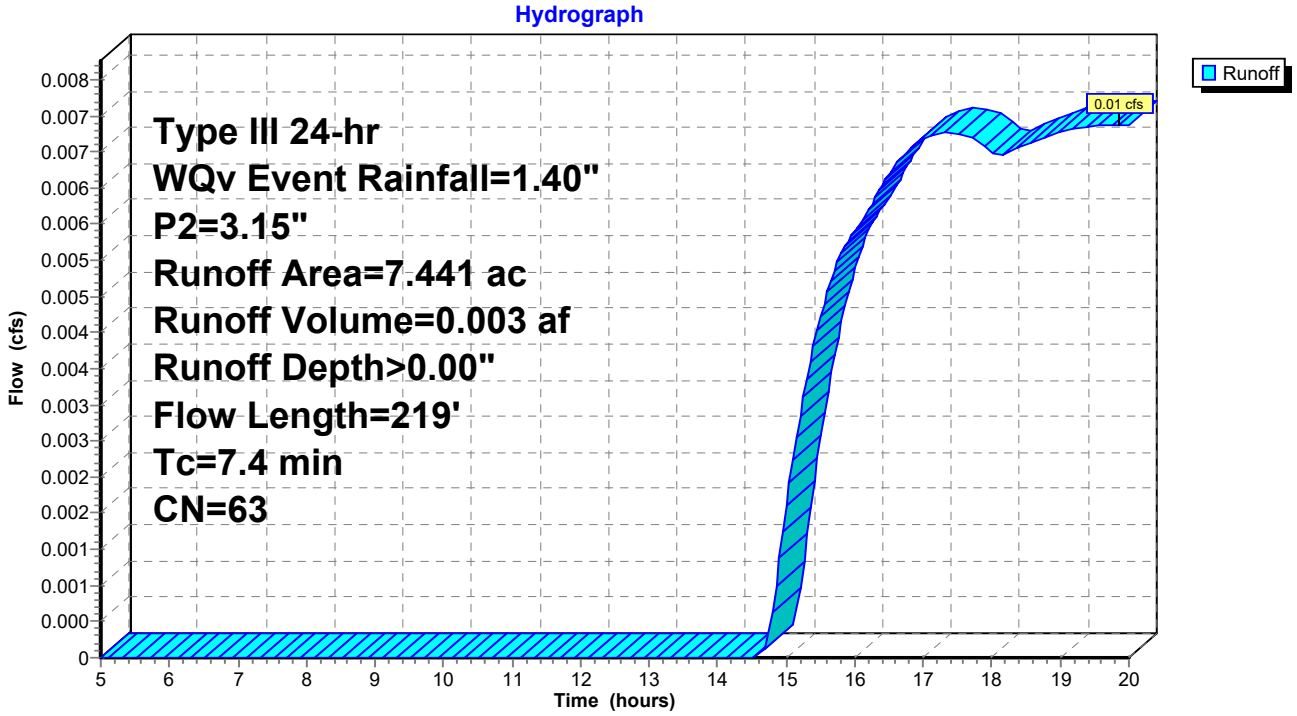
Runoff = 0.01 cfs @ 19.86 hrs, Volume= 0.003 af, Depth> 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	2.731	39	>75% Grass cover, Good, HSG A
*	0.850	98	IMP A
	1.880	61	>75% Grass cover, Good, HSG B
*	0.050	98	IMP B
	1.830	80	>75% Grass cover, Good, HSG D
*	0.100	98	IMP D
	7.441	63	Weighted Average
	6.441		86.56% Pervious Area
	1.000		13.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0550	0.25		**Sheet Flow, SHEET 1** Grass: Short n= 0.150 P2= 3.15"
0.8	119	0.0252	2.56		**Shallow Concentrated Flow, SC Flow** Unpaved Kv= 16.1 fps
7.4	219	Total			

Subcatchment E-04: EDA-04



Summary for Subcatchment E-05: EDA-05

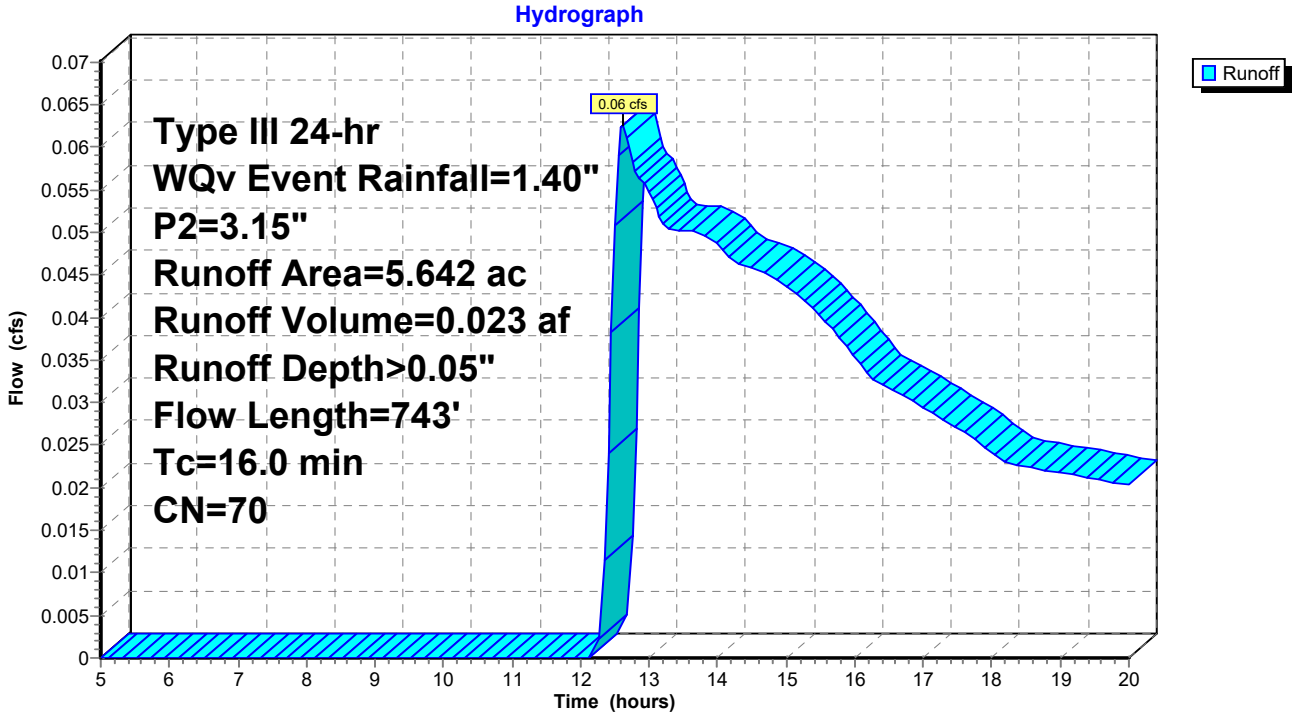
Runoff = 0.06 cfs @ 12.62 hrs, Volume= 0.023 af, Depth> 0.05"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

Area (ac)	CN	Description
0.280	32	Woods/grass comb., Good, HSG A
0.580	58	Woods/grass comb., Good, HSG B
3.790	72	Woods/grass comb., Good, HSG C
0.992	79	Woods/grass comb., Good, HSG D
5.642	70	Weighted Average
5.642		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.15"
5.4	643	0.1600	2.00		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
16.0	743	Total			

Subcatchment E-05: EDA-05



Summary for Subcatchment E-06: EDA-06

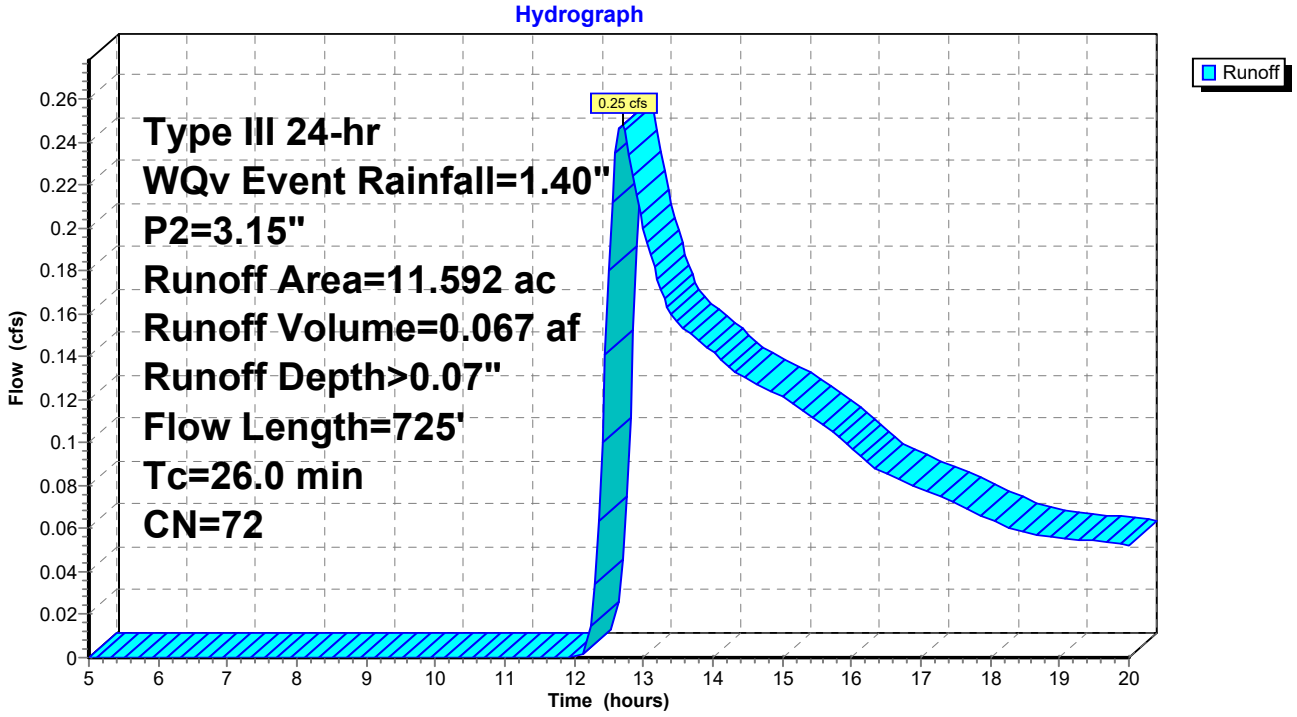
Runoff = 0.25 cfs @ 12.69 hrs, Volume= 0.067 af, Depth> 0.07"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	0.993	58	Woods/grass comb., Good, HSG B
	8.829	72	Woods/grass comb., Good, HSG C
*	0.330	98	IMP C
	1.440	79	Woods/grass comb., Good, HSG D
	11.592	72	Weighted Average
	11.262		97.15% Pervious Area
	0.330		2.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	100	0.0250	0.08		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
6.2	625	0.1120	1.67		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
26.0	725	Total			

Subcatchment E-06: EDA-06



Summary for Subcatchment E-07: EDA-07

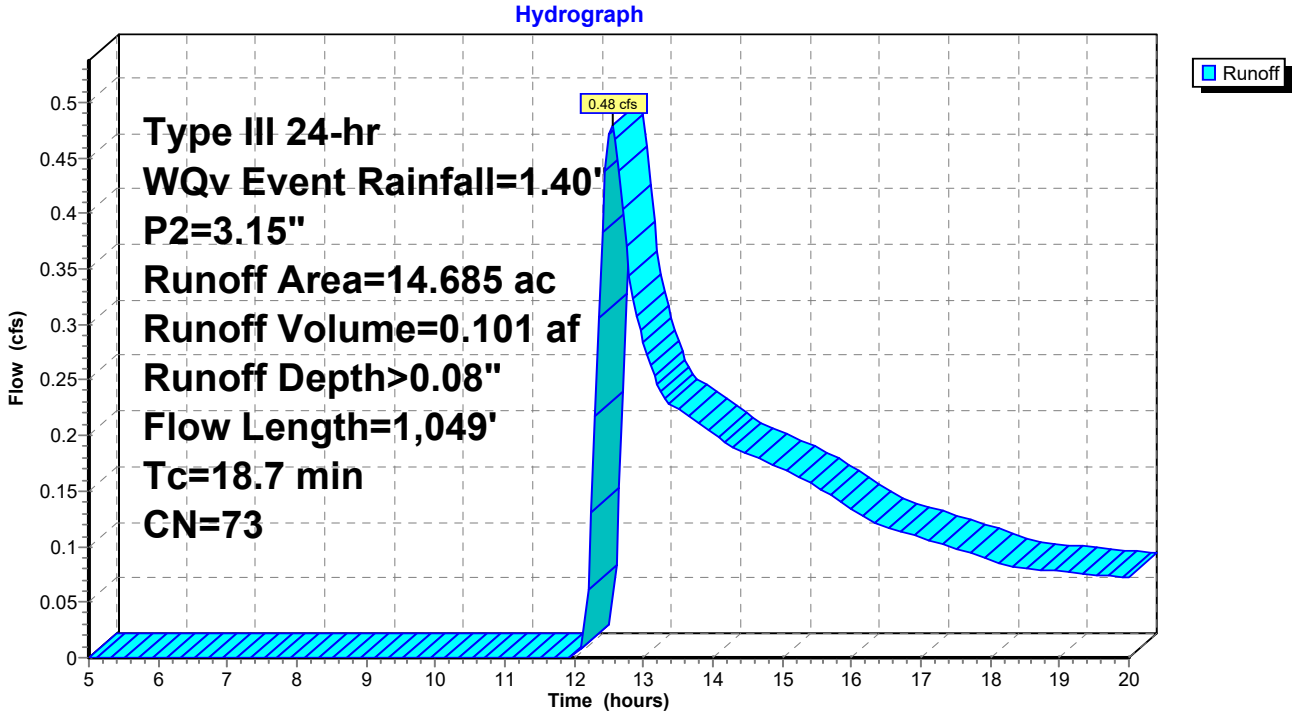
Runoff = 0.48 cfs @ 12.54 hrs, Volume= 0.101 af, Depth> 0.08"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	1.869	58	Woods/grass comb., Good, HSG B
*	0.096	98	IMP B
	7.864	72	Woods/grass comb., Good, HSG C
*	0.212	98	IMP C
	4.594	79	Woods/grass comb., Good, HSG D
*	0.050	98	IMP D
	14.685	73	Weighted Average
	14.327		97.56% Pervious Area
	0.358		2.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1400	0.17		**Sheet Flow, SHEET** Woods: Light underbrush n= 0.400 P2= 3.15"
8.8	949	0.1300	1.80		**Shallow Concentrated Flow, SHALLOW** Woodland Kv= 5.0 fps
18.7	1,049	Total			

Subcatchment E-07: EDA-07



Summary for Subcatchment E-08: EDA-08

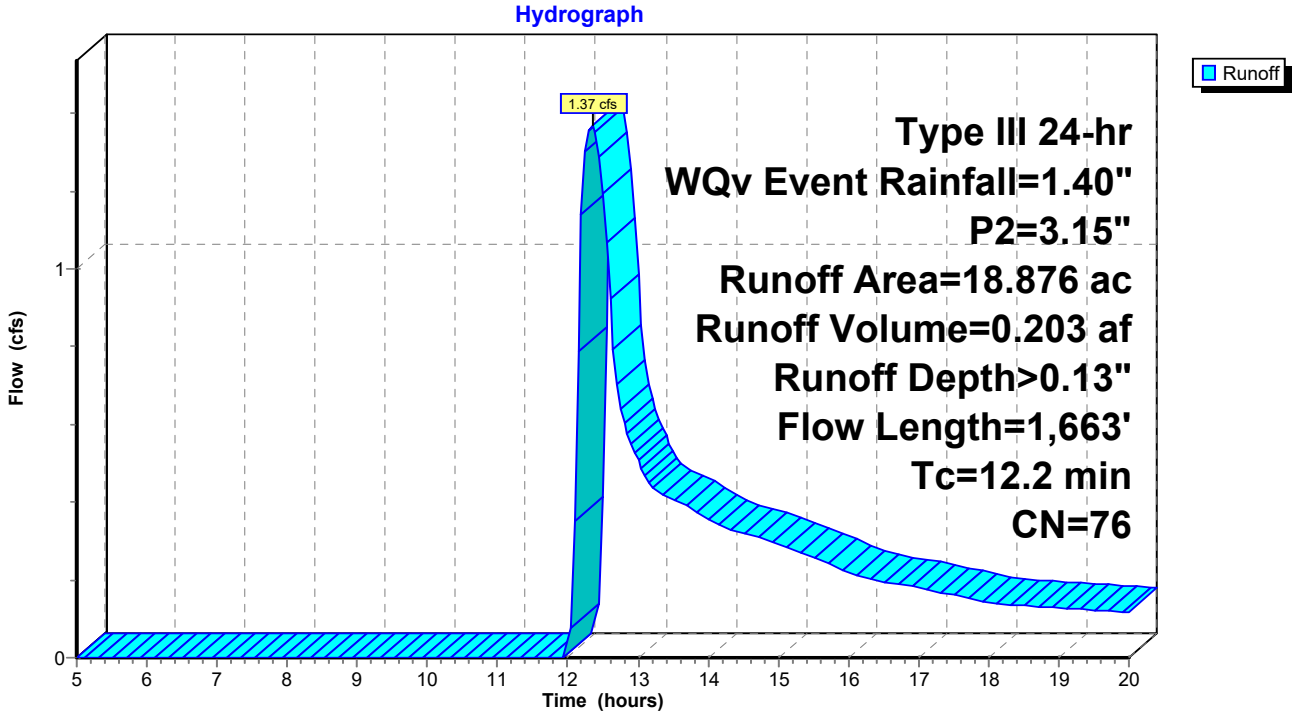
Runoff = 1.37 cfs @ 12.35 hrs, Volume= 0.203 af, Depth> 0.13"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	15.270	74	>75% Grass cover, Good, HSG C
*	0.510	98	IMP C
	2.860	80	>75% Grass cover, Good, HSG D
*	0.236	98	IMP D
	18.876	76	Weighted Average
	18.130		96.05% Pervious Area
	0.746		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0750	0.29		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	918	0.1700	2.89		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
1.1	645	0.0590	10.03	140.44	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=3.00' D=2.00' Z= 2.0 '/' Top.W=11.00' n= 0.040 Earth, cobble bottom, clean sides
12.2	1,663	Total			

Subcatchment E-08: EDA-08



Summary for Subcatchment E-09: EDA-09

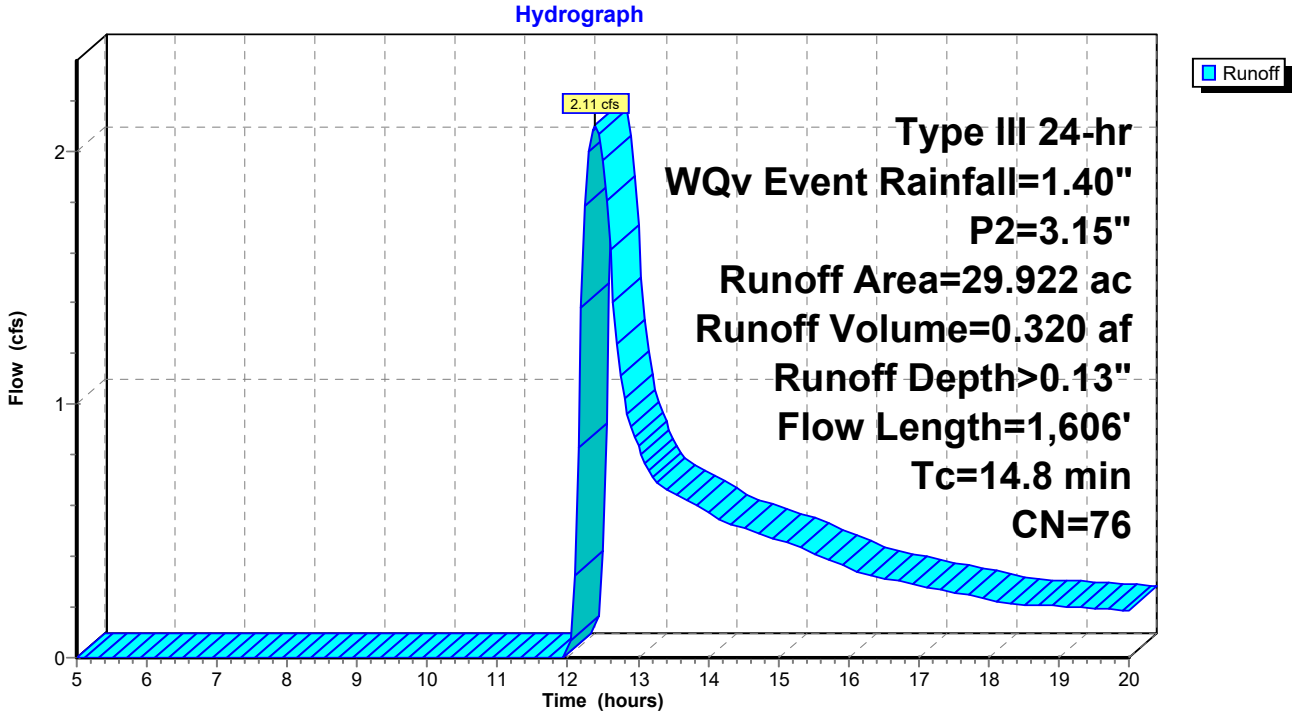
Runoff = 2.11 cfs @ 12.39 hrs, Volume= 0.320 af, Depth> 0.13"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	14.366	74	>75% Grass cover, Good, HSG C
	4.463	70	Woods, Good, HSG C
*	0.563	98	IMP C
	10.360	80	>75% Grass cover, Good, HSG D
*	0.170	98	IMP D
	29.922	76	Weighted Average
	29.189		97.55% Pervious Area
	0.733		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0900	0.31		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
8.3	928	0.1380	1.86		**Shallow Concentrated Flow, SHALLOW 1** Woodland Kv= 5.0 fps
1.1	578	0.0600	8.45	67.58	**Trap/Vee/Rect Channel Flow, Channel** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.040 Winding stream, pools & shoals
14.8	1,606	Total			

Subcatchment E-09: EDA-09



Summary for Subcatchment E-10: EDA-10

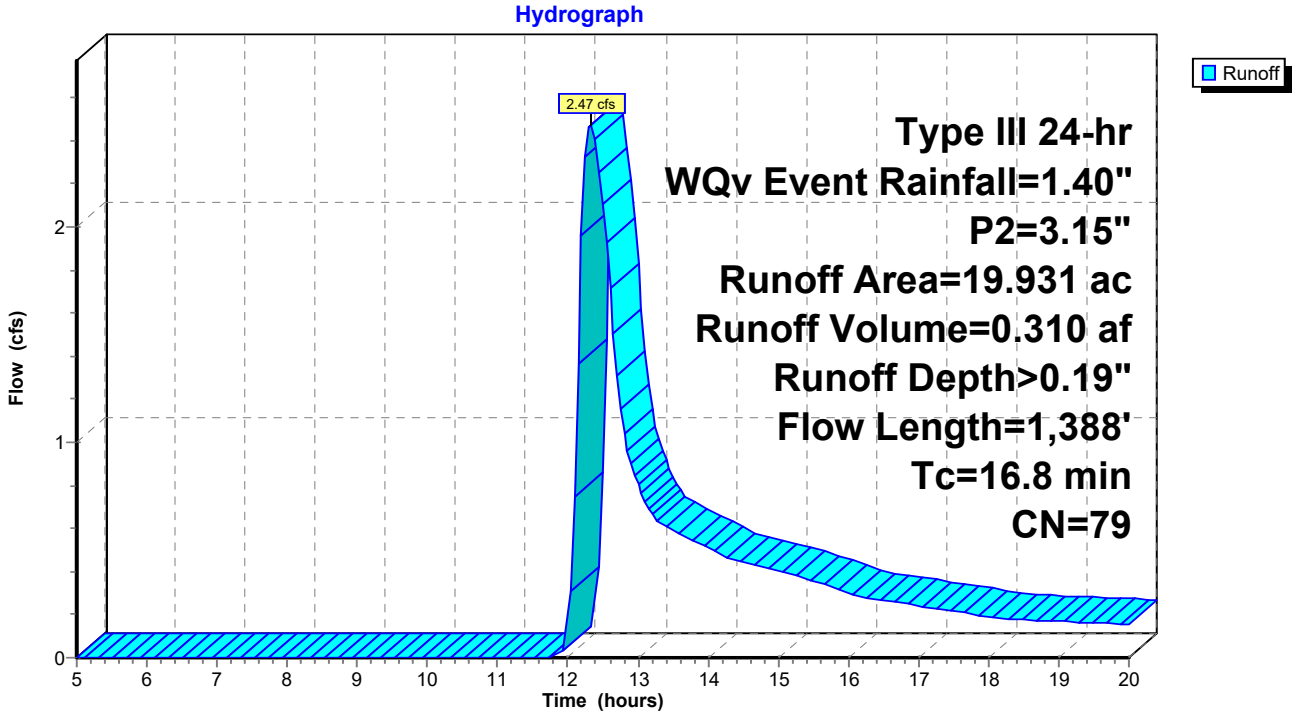
Runoff = 2.47 cfs @ 12.32 hrs, Volume= 0.310 af, Depth> 0.19"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	7.130	74	>75% Grass cover, Good, HSG C
*	0.340	98	IMP C
	12.081	80	>75% Grass cover, Good, HSG D
*	0.380	98	IMP D
	19.931	79	Weighted Average
	19.211		96.39% Pervious Area
	0.720		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
11.8	1,271	0.0660	1.80		**Shallow Concentrated Flow, SHALLOW 1** Short Grass Pasture Kv= 7.0 fps
0.0	17	0.0353	14.66	46.05	**Pipe Channel, CPP PIPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
16.8	1,388	Total			

Subcatchment E-10: EDA-10



Summary for Subcatchment E-11: EDA-11

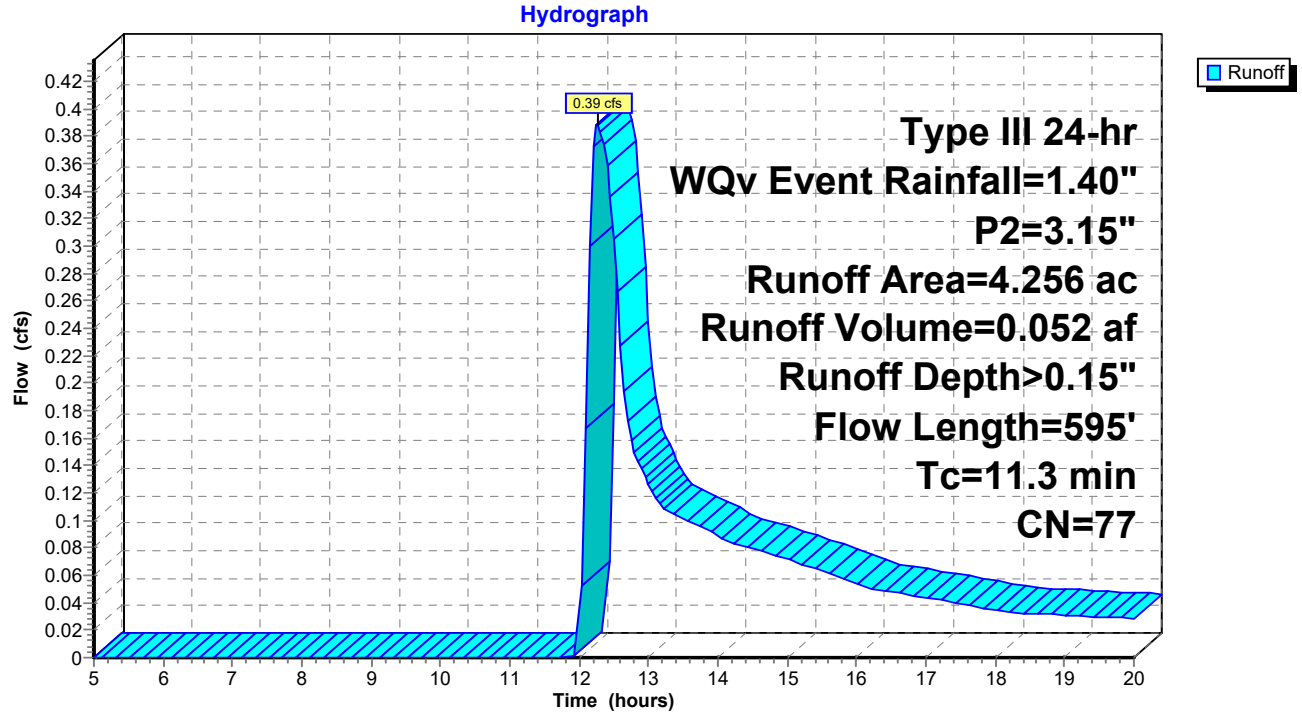
Runoff = 0.39 cfs @ 12.26 hrs, Volume= 0.052 af, Depth> 0.15"
Routed to Link 1 : AP-01-TOTAL Q

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	2.710	74	>75% Grass cover, Good, HSG C
*	0.010	98	IMP C
	1.390	80	>75% Grass cover, Good, HSG D
*	0.146	98	IMP D
	4.256	77	Weighted Average
	4.100		96.33% Pervious Area
	0.156		3.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, Orchard** Grass: Short n= 0.150 P2= 3.15"
3.4	495	0.1200	2.42		**Shallow Concentrated Flow, Orchard** Short Grass Pasture Kv= 7.0 fps
11.3	595	Total			

Subcatchment E-11: EDA-11



Summary for Subcatchment E-12: EDA-12

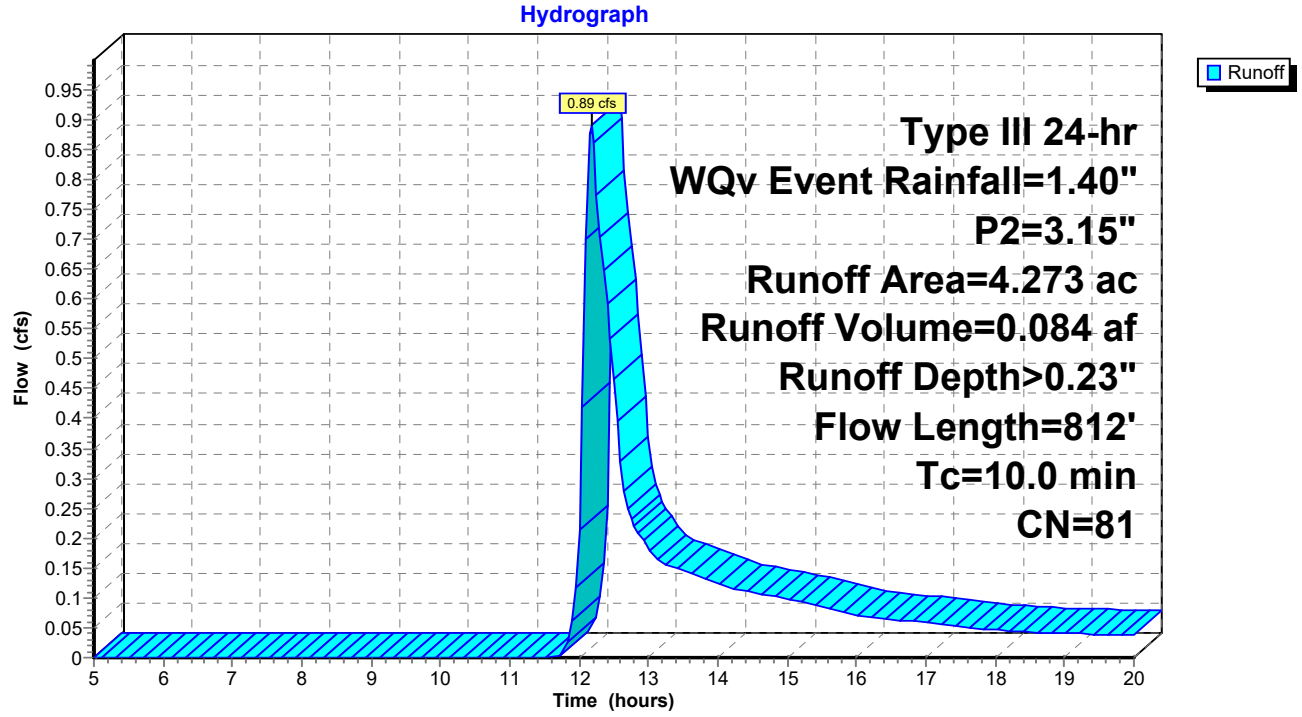
Runoff = 0.89 cfs @ 12.17 hrs, Volume= 0.084 af, Depth> 0.23"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Event Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
*	3.750	79	SOIL C
*	0.220	98	IMP C
*	0.250	84	SOIL D
*	0.053	98	IMP D
	4.273	81	Weighted Average
	4.000		93.61% Pervious Area
	0.273		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, SHEET** Grass: Short n= 0.150 P2= 3.15"
5.3	712	0.1010	2.22		**Shallow Concentrated Flow, SHALLOW** Short Grass Pasture Kv= 7.0 fps
10.0	812	Total			

Subcatchment E-12: EDA-12

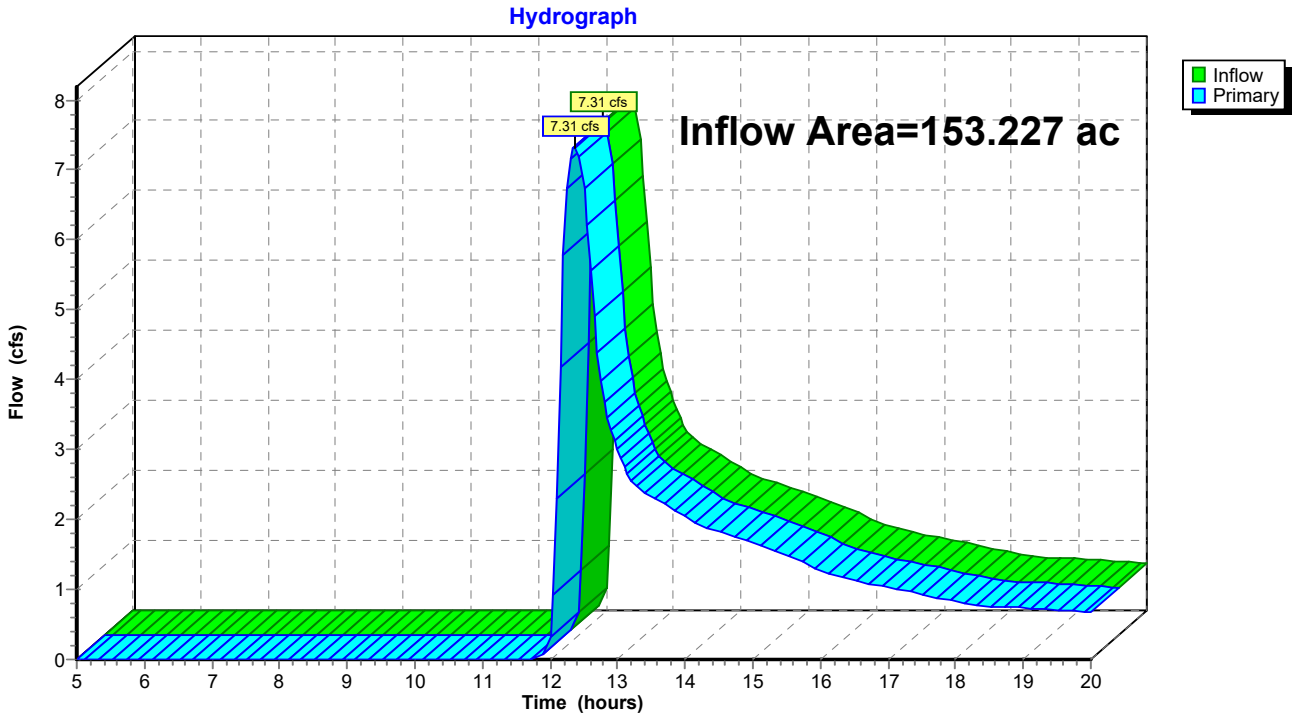


Summary for Link 1: AP-01-TOTAL Q

Inflow Area = 153.227 ac, 3.72% Impervious, Inflow Depth > 0.09" for WQv Event event
Inflow = 7.31 cfs @ 12.37 hrs, Volume= 1.162 af
Primary = 7.31 cfs @ 12.37 hrs, Volume= 1.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01-TOTAL Q

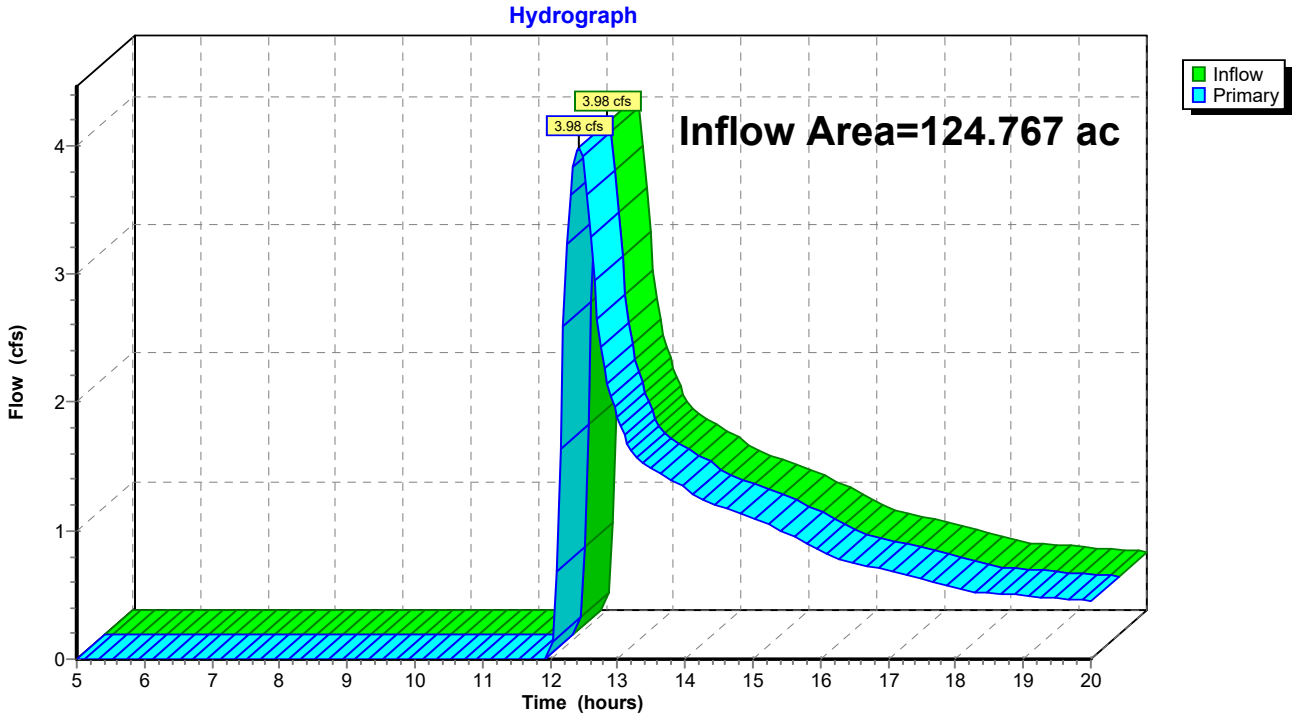


Summary for Link 2: AP-02

Inflow Area = 124.767 ac, 3.65% Impervious, Inflow Depth > 0.07" for WQv Event event
Inflow = 3.98 cfs @ 12.43 hrs, Volume= 0.716 af
Primary = 3.98 cfs @ 12.43 hrs, Volume= 0.716 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

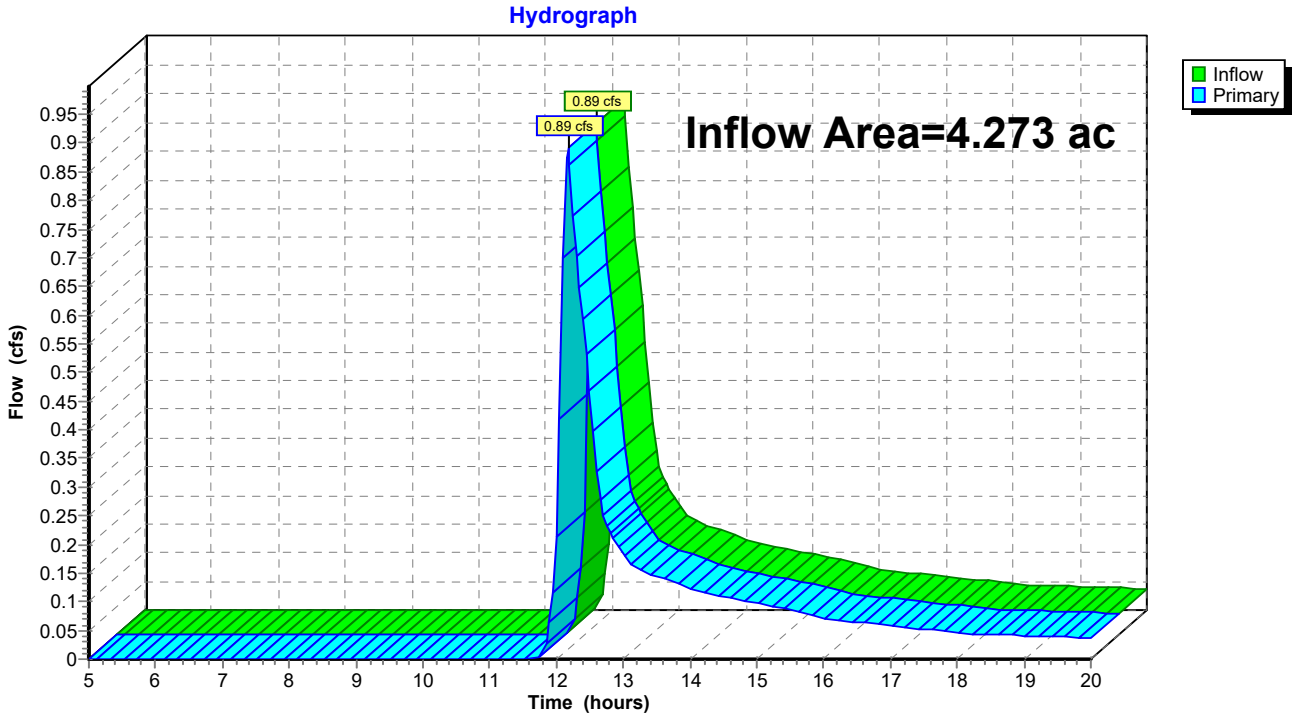


Summary for Link 3: AP-3

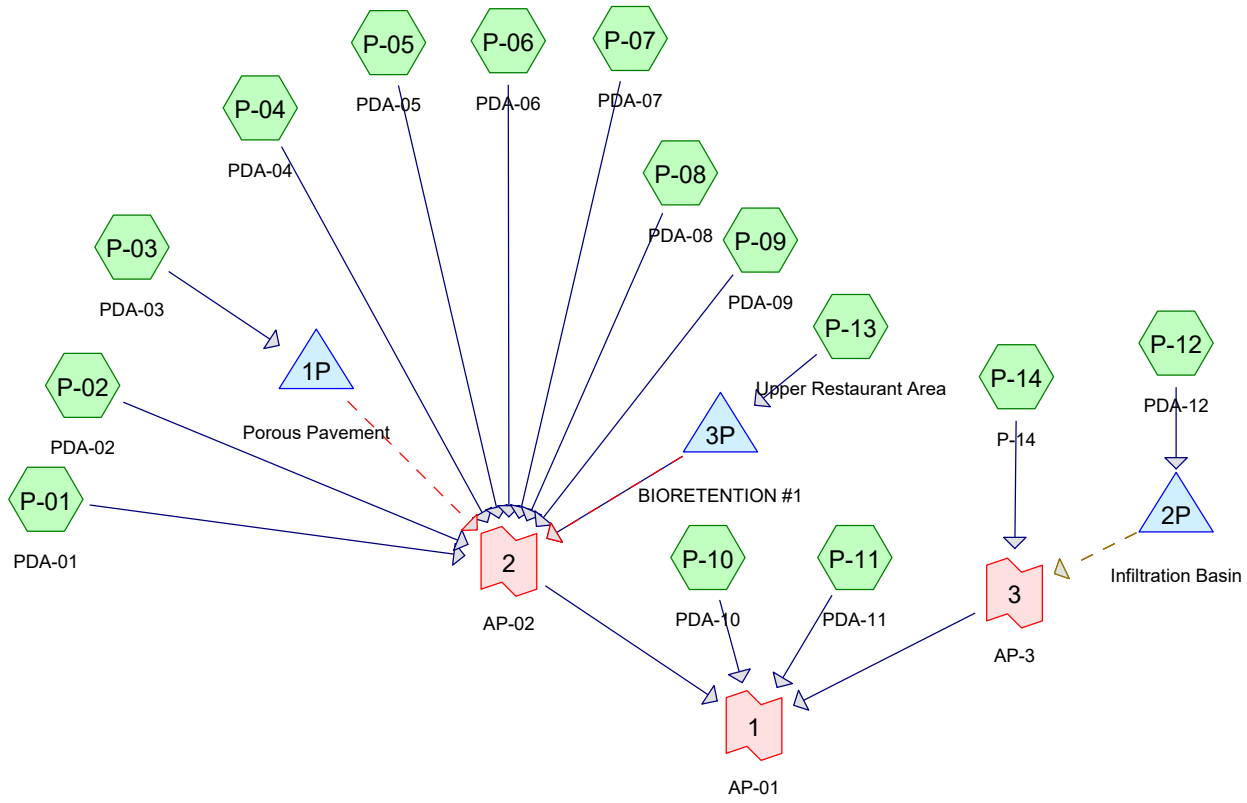
Inflow Area = 4.273 ac, 6.39% Impervious, Inflow Depth > 0.23" for WQv Event event
Inflow = 0.89 cfs @ 12.17 hrs, Volume= 0.084 af
Primary = 0.89 cfs @ 12.17 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01-TOTAL Q

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



APPENDIX I: PROPOSED CONDITIONS HYDROCAD



Routing Diagram for PROPOSED - MARLBOROUGH RESORT
Prepared by Passero Associates, Printed 10/24/2024
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PROPOSED - MARLBOROUGH RESORT

Prepared by Passero Associates

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	1-YEAR	Type III 24-hr		Default	24.00	1	2.61	2	3.15
2	10-YEAR	Type III 24-hr		Default	24.00	1	4.65	2	3.15
3	100-YEAR	Type III 24-hr		Default	24.00	1	6.36	2	3.15
4	WQv eVENT	Type III 24-hr		Default	24.00	1	1.40	2	3.15

PROPOSED - MARLBOROUGH RESORT

Prepared by Passero Associates

Printed 10/24/2024

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.400	39	>75% Grass cover, Good, HSG A (P-03, P-04)
2.420	61	>75% Grass cover, Good, HSG B (P-03, P-04)
41.701	74	>75% Grass cover, Good, HSG C (P-08, P-09, P-10, P-11, P-12, P-13)
26.171	80	>75% Grass cover, Good, HSG D (P-03, P-04, P-08, P-09, P-10, P-11, P-12, P-14)
5.100	98	IMP A (P-02, P-03, P-04)
0.170	98	IMP B (P-03, P-04, P-05, P-07)
7.841	98	IMP C (P-05, P-06, P-07, P-08, P-09, P-10, P-12, P-13)
2.181	98	IMP D (P-03, P-04, P-05, P-07, P-08, P-09, P-10, P-11, P-12, P-14)
0.198	98	Paved parking, HSG A (P-01)
8.240	79	Woods, Fair, HSG D (P-05, P-06)
13.094	30	Woods, Good, HSG A (P-01, P-05)
7.010	55	Woods, Good, HSG B (P-01, P-05, P-06, P-07)
19.469	70	Woods, Good, HSG C (P-05, P-06, P-07)
11.000	77	Woods, Good, HSG D (P-01, P-07)
4.980	32	Woods/grass comb., Good, HSG A (P-02)
1.199	79	Woods/grass comb., Good, HSG D (P-02)
155.174	**70**	**TOTAL AREA**

PROPOSED - MARLBOROUGH RESORT

Prepared by Passero Associates

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
4.400	2.420	41.701	26.171	0.000	74.692	>75% Grass cover, Good	P-03, P-04, P-08, P-09, P-10, P-11, P-12, P-13, P-14
0.000	0.000	0.000	0.000	5.100	5.100	IMP A	P-02, P-03, P-04
0.000	0.000	0.000	0.000	0.170	0.170	IMP B	P-03, P-04, P-05, P-07
0.000	0.000	0.000	0.000	7.841	7.841	IMP C	P-05, P-06, P-07, P-08, P-09, P-10, P-12, P-13
0.000	0.000	0.000	0.000	2.181	2.181	IMP D	P-03, P-04, P-05, P-07, P-08, P-09, P-10, P-11, P-12, P-14
0.198	0.000	0.000	0.000	0.000	0.198	Paved parking	P-01
0.000	0.000	0.000	8.240	0.000	8.240	Woods, Fair	P-05, P-06
13.094	7.010	19.469	11.000	0.000	50.573	Woods, Good	P-01, P-05, P-06, P-07

PROPOSED - MARLBOROUGH RESORT

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Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
4.980	0.000	0.000	1.199	0.000	6.179	Woods/grass comb., Good	P-02
22.672	**9.430**	**61.170**	**46.610**	**15.292**	**155.174**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-01: PDA-01 Runoff Area=23.452 ac 0.84% Impervious Runoff Depth>0.02"
Flow Length=845' Tc=44.5 min CN=50 Runoff=0.10 cfs 0.042 af

Subcatchment P-02: PDA-02 Runoff Area=6.449 ac 4.19% Impervious Runoff Depth=0.00"
Flow Length=615' Tc=26.4 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment P-03: PDA-03 Runoff Area=7.441 ac 43.81% Impervious Runoff Depth>0.49"
Tc=6.0 min CN=71 Runoff=3.89 cfs 0.303 af

Subcatchment P-04: PDA-04 Runoff Area=6.960 ac 24.57% Impervious Runoff Depth>0.45"
Flow Length=260' Tc=13.8 min CN=70 Runoff=2.52 cfs 0.262 af

Subcatchment P-05: PDA-05 Runoff Area=21.410 ac 2.38% Impervious Runoff Depth>0.52"
Flow Length=1,066' Tc=20.1 min CN=72 Runoff=8.34 cfs 0.932 af

Subcatchment P-06: PDA-06 Runoff Area=5.701 ac 7.40% Impervious Runoff Depth>0.35"
Flow Length=1,015' Tc=26.3 min CN=67 Runoff=1.16 cfs 0.166 af

Subcatchment P-07: PDA-07 Runoff Area=11.289 ac 16.91% Impervious Runoff Depth>0.64"
Flow Length=823' Tc=26.0 min CN=75 Runoff=5.17 cfs 0.604 af

Subcatchment P-08: PDA-08 Runoff Area=17.483 ac 8.85% Impervious Runoff Depth>0.73"
Flow Length=958' Tc=21.5 min CN=77 Runoff=10.09 cfs 1.067 af

Subcatchment P-09: PDA-09 Runoff Area=30.530 ac 8.94% Impervious Runoff Depth>0.78"
Flow Length=128' Tc=10.2 min CN=78 Runoff=25.08 cfs 1.993 af

Subcatchment P-10: PDA-10 Runoff Area=16.521 ac 5.14% Impervious Runoff Depth>0.81"
Flow Length=916' Tc=58.0 min CN=79 Runoff=6.76 cfs 1.122 af

Subcatchment P-11: PDA-11 Runoff Area=2.126 ac 3.76% Impervious Runoff Depth>0.74"
Flow Length=685' Tc=10.1 min CN=77 Runoff=1.63 cfs 0.130 af

Subcatchment P-12: PDA-12 Runoff Area=3.855 ac 30.09% Impervious Runoff Depth>0.94"
Flow Length=812' Tc=7.2 min CN=81 Runoff=4.27 cfs 0.302 af

Subcatchment P-13: Upper Restaurant Area Runoff Area=1.571 ac 49.46% Impervious Runoff Depth>1.24"
Tc=6.0 min CN=86 Runoff=2.41 cfs 0.162 af

Subcatchment P-14: P-14 Runoff Area=0.386 ac 17.36% Impervious Runoff Depth>1.05"
Tc=6.0 min CN=83 Runoff=0.50 cfs 0.034 af

Pond 1P: Porous Pavement Peak Elev=404.00' Storage=61 cf Inflow=3.89 cfs 0.303 af
Discarded=3.89 cfs 0.303 af Secondary=0.00 cfs 0.000 af Outflow=3.89 cfs 0.303 af

Pond 2P: Infiltration Basin Peak Elev=468.60' Storage=3,902 cf Inflow=4.27 cfs 0.302 af
Discarded=1.09 cfs 0.301 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=1.09 cfs 0.301 af

Pond 3P: BIORETENTION#1 Peak Elev=576.49' Storage=2,953 cf Inflow=2.41 cfs 0.162 af
Primary=0.35 cfs 0.155 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.155 af

Link 1: AP-01 Inflow=48.03 cfs 6.507 af
Primary=48.03 cfs 6.507 af

Link 2: AP-02 Inflow=44.58 cfs 5.221 af
Primary=44.58 cfs 5.221 af

Link 3: AP-3 Inflow=0.50 cfs 0.034 af
Primary=0.50 cfs 0.034 af

Total Runoff Area = 155.174 ac Runoff Volume = 7.119 af Average Runoff Depth = 0.55"
90.02% Pervious = 139.684 ac 9.98% Impervious = 15.490 ac

Summary for Subcatchment P-01: PDA-01

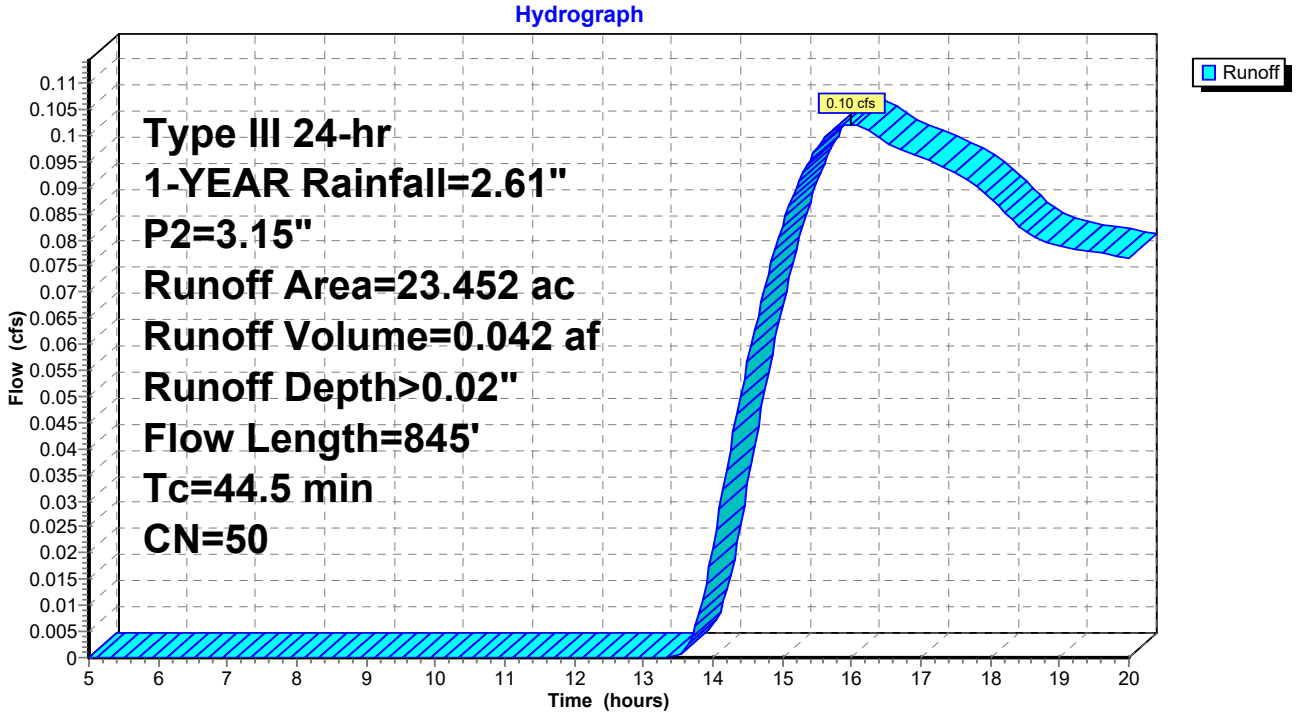
Runoff = 0.10 cfs @ 15.98 hrs, Volume= 0.042 af, Depth> 0.02"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

Area (ac)	CN	Description
12.804	30	Woods, Good, HSG A
0.198	98	Paved parking, HSG A
1.840	55	Woods, Good, HSG B
8.610	77	Woods, Good, HSG D
23.452	50	Weighted Average
23.254		99.16% Pervious Area
0.198		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment P-01: PDA-01



Summary for Subcatchment P-02: PDA-02

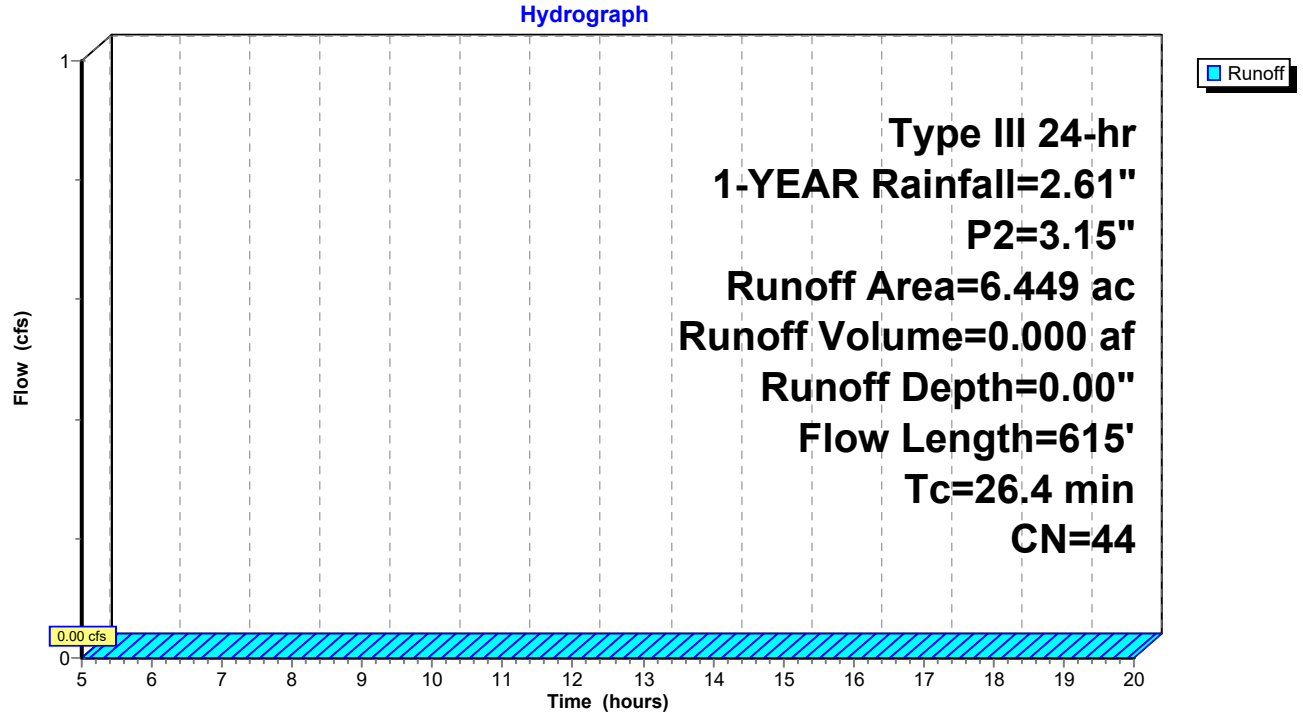
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	4.980	32	Woods/grass comb., Good, HSG A
*	0.270	98	IMP A
	1.199	79	Woods/grass comb., Good, HSG D
	6.449	44	Weighted Average
	6.179		95.81% Pervious Area
	0.270		4.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0900	0.14		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.15"
14.5	515	0.0140	0.59		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.4	615	Total			

Subcatchment P-02: PDA-02



Summary for Subcatchment P-03: PDA-03

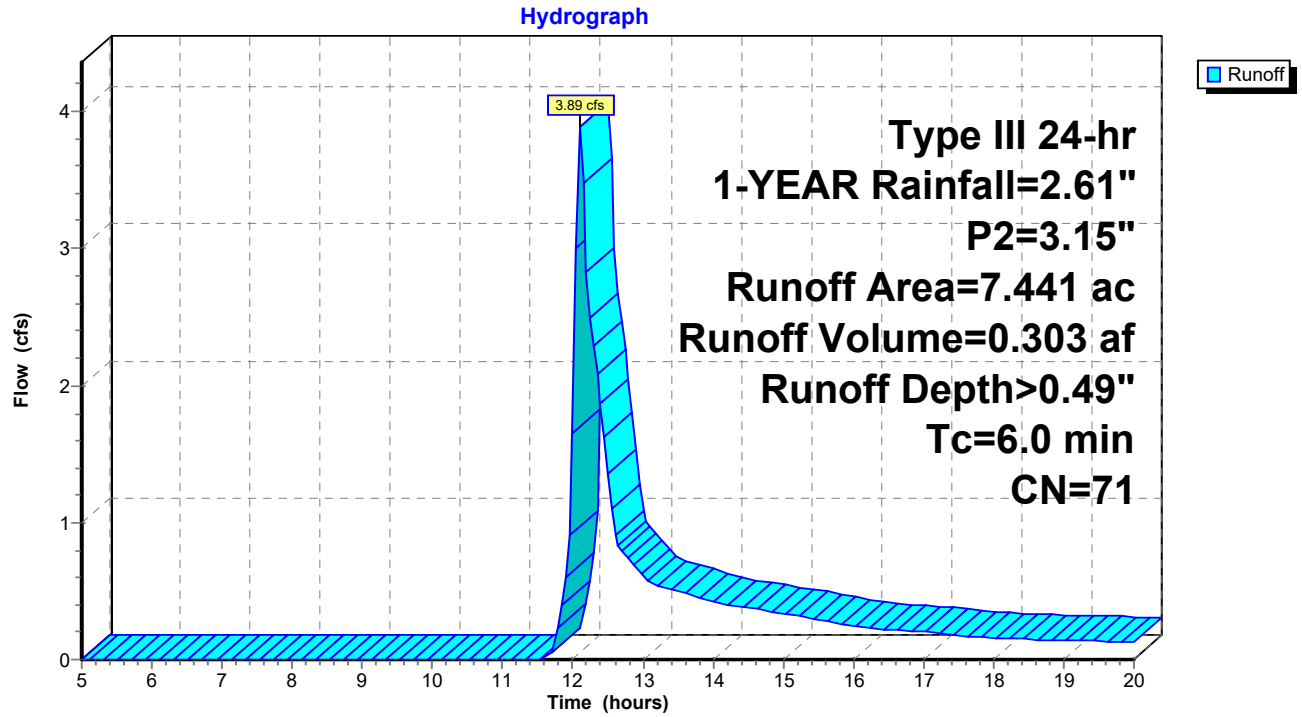
Runoff = 3.89 cfs @ 12.11 hrs, Volume= 0.303 af, Depth> 0.49"
Routed to Pond 1P : Porous Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	2.800	39	>75% Grass cover, Good, HSG A
*	3.240	98	IMP A
	0.590	61	>75% Grass cover, Good, HSG B
*	0.010	98	IMP B
	0.791	80	>75% Grass cover, Good, HSG D
*	0.010	98	IMP D
	7.441	71	Weighted Average
	4.181		56.19% Pervious Area
	3.260		43.81% Impervious Area

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

Subcatchment P-03: PDA-03



Summary for Subcatchment P-04: PDA-04

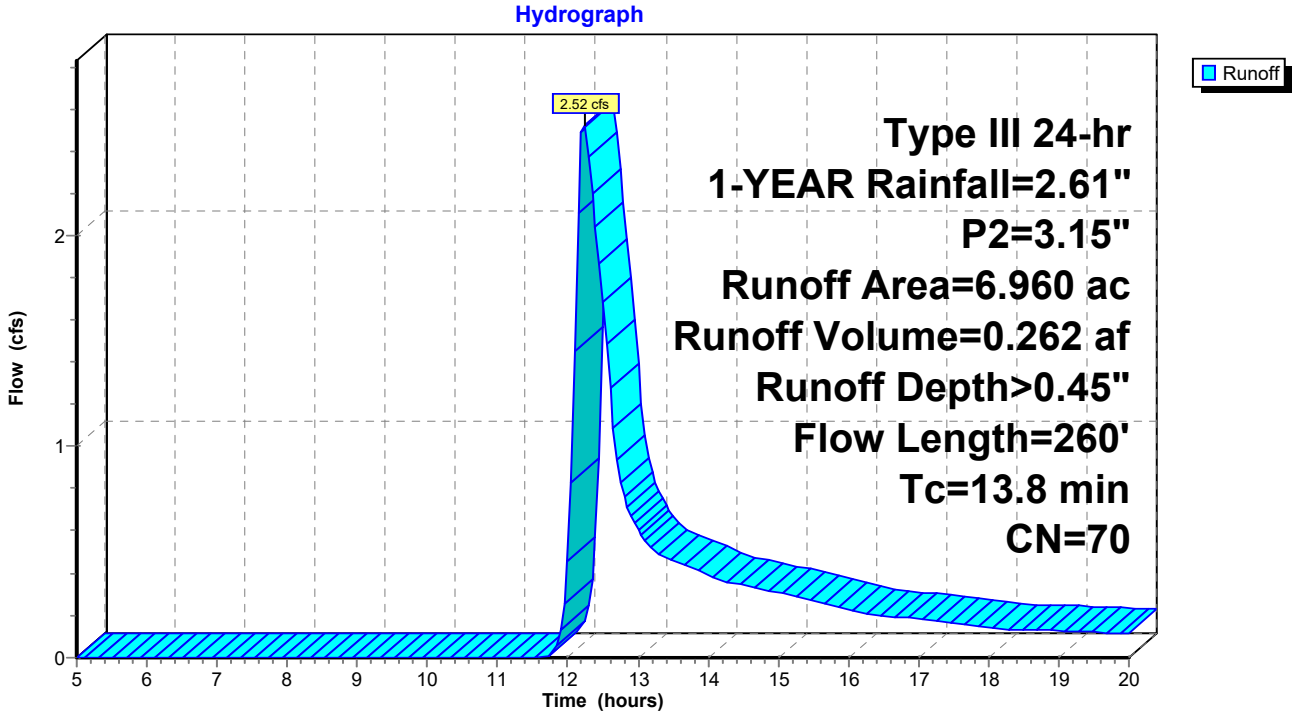
Runoff = 2.52 cfs @ 12.23 hrs, Volume= 0.262 af, Depth> 0.45"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	1.600	39	>75% Grass cover, Good, HSG A
*	1.590	98	IMP A
	1.830	61	>75% Grass cover, Good, HSG B
*	0.060	98	IMP B
	1.820	80	>75% Grass cover, Good, HSG D
*	0.060	98	IMP D
	6.960	70	Weighted Average
	5.250		75.43% Pervious Area
	1.710		24.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.8	160	0.0438	3.14		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
13.8	260	Total			

Subcatchment P-04: PDA-04



Summary for Subcatchment P-05: PDA-05

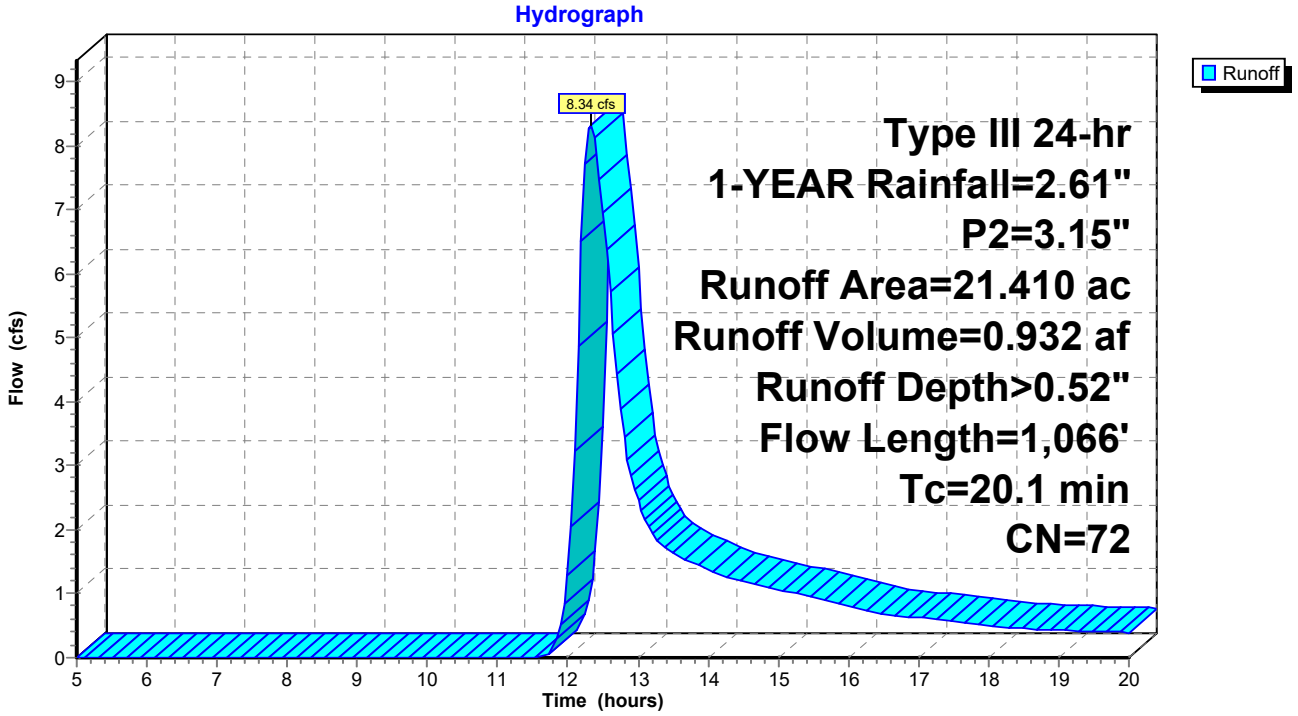
Runoff = 8.34 cfs @ 12.33 hrs, Volume= 0.932 af, Depth> 0.52"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	0.290	30	Woods, Good, HSG A
	1.630	55	Woods, Good, HSG B
*	0.030	98	IMP B
	11.470	70	Woods, Good, HSG C
*	0.270	98	IMP C
	7.510	79	Woods, Fair, HSG D
*	0.210	98	IMP D
	21.410	72	Weighted Average
	20.900		97.62% Pervious Area
	0.510		2.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.5	966	0.1160	1.70		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
20.1	1,066	Total			

Subcatchment P-05: PDA-05



Summary for Subcatchment P-06: PDA-06

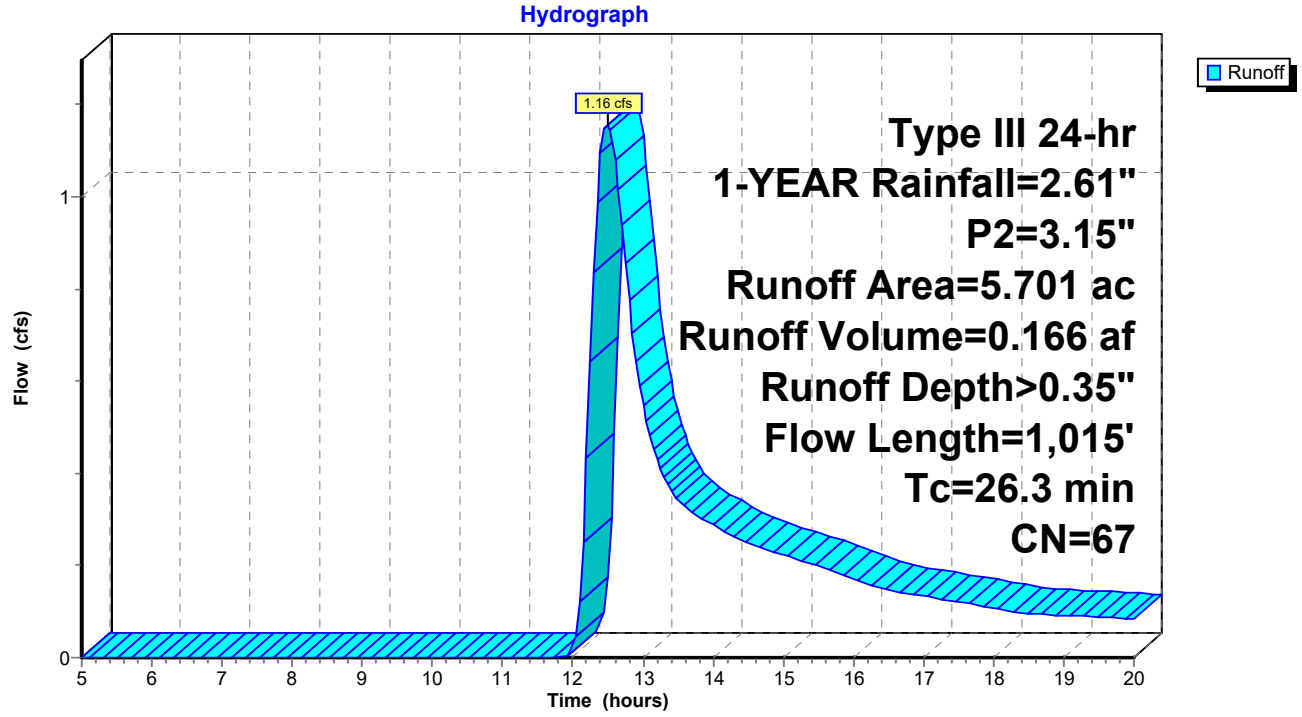
Runoff = 1.16 cfs @ 12.49 hrs, Volume= 0.166 af, Depth> 0.35"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	2.370	55	Woods, Good, HSG B
	2.179	70	Woods, Good, HSG C
*	0.422	98	IMP C
	0.730	79	Woods, Fair, HSG D
	5.701	67	Weighted Average
	5.279		92.60% Pervious Area
	0.422		7.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	100	0.0400	0.10		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.9	915	0.0950	1.54		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
26.3	1,015	Total			

Subcatchment P-06: PDA-06



Summary for Subcatchment P-07: PDA-07

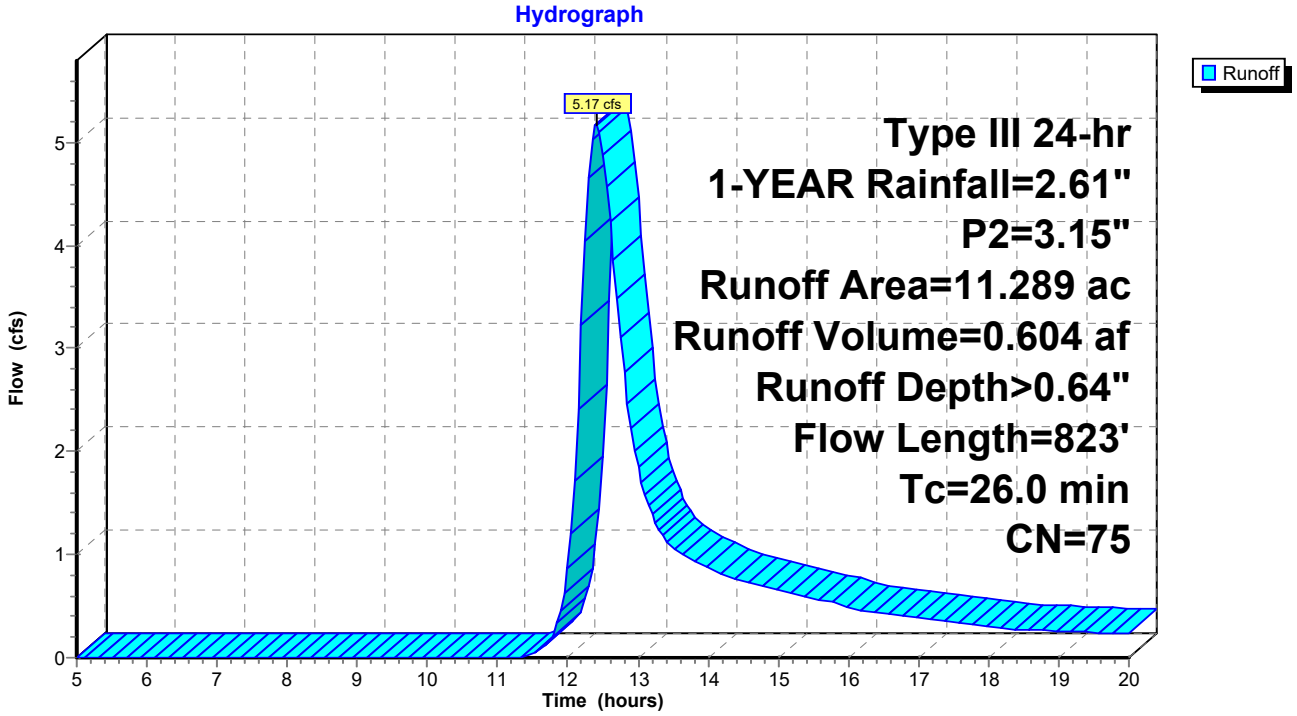
Runoff = 5.17 cfs @ 12.41 hrs, Volume= 0.604 af, Depth> 0.64"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	1.170	55	Woods, Good, HSG B
*	0.070	98	IMP B
	5.820	70	Woods, Good, HSG C
*	1.475	98	IMP C
	2.390	77	Woods, Good, HSG D
*	0.364	98	IMP D
	11.289	75	Weighted Average
	9.380		83.09% Pervious Area
	1.909		16.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	100	0.0300	0.09		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	723	0.1000	1.58		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.0	823	Total			

Subcatchment P-07: PDA-07



Summary for Subcatchment P-08: PDA-08

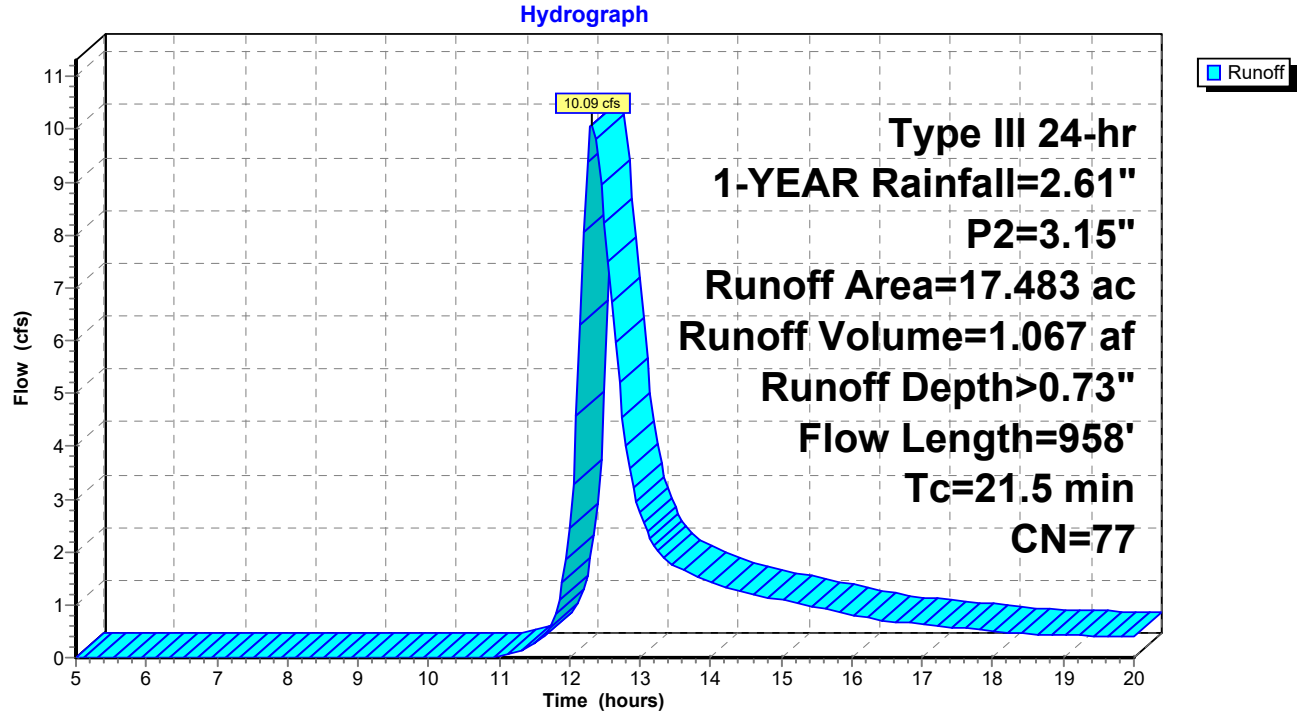
Runoff = 10.09 cfs @ 12.33 hrs, Volume= 1.067 af, Depth> 0.73"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	14.026	74	>75% Grass cover, Good, HSG C
*	1.347	98	IMP C
	1.910	80	>75% Grass cover, Good, HSG D
*	0.200	98	IMP D
	17.483	77	Weighted Average
	15.936		91.15% Pervious Area
	1.547		8.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0600	0.12		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	858	0.1420	1.88		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
21.5	958	Total			

Subcatchment P-08: PDA-08



Summary for Subcatchment P-09: PDA-09

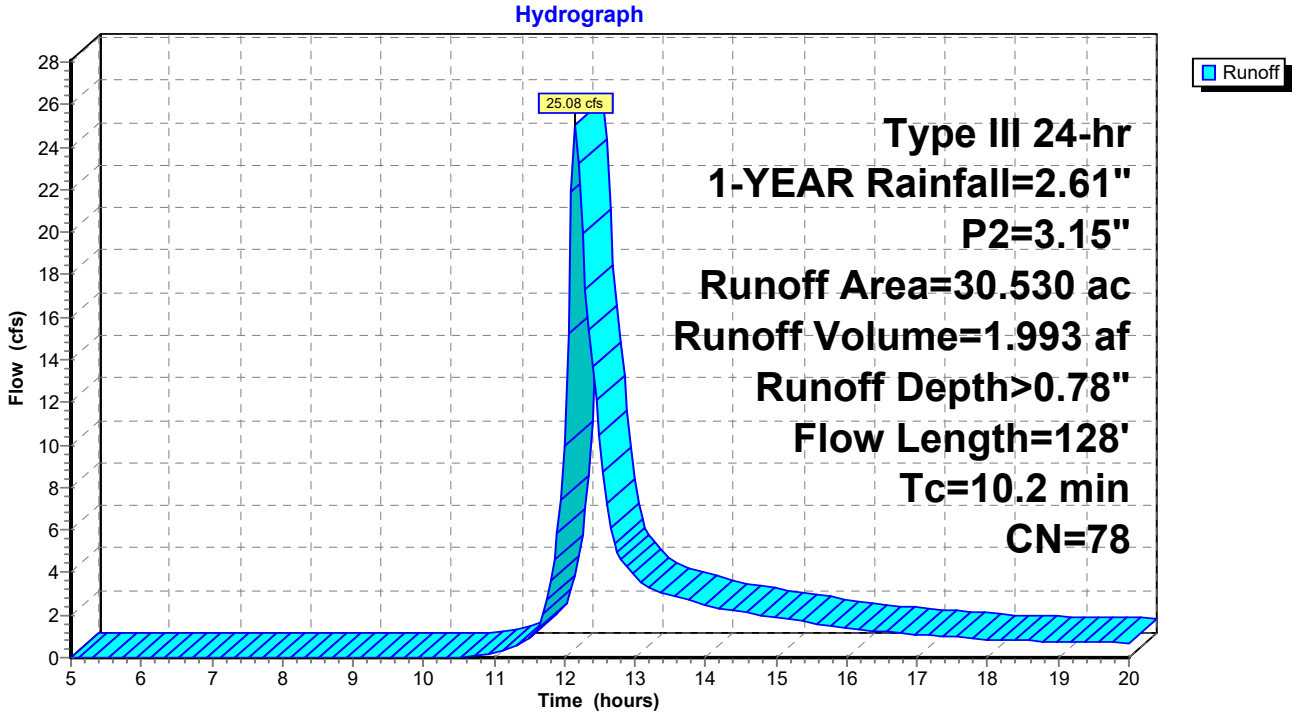
Runoff = 25.08 cfs @ 12.16 hrs, Volume= 1.993 af, Depth> 0.78"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	18.399	74	>75% Grass cover, Good, HSG C
*	2.190	98	IMP C
	9.401	80	>75% Grass cover, Good, HSG D
*	0.540	98	IMP D
	30.530	78	Weighted Average
	27.800		91.06% Pervious Area
	2.730		8.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0200	0.17		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.3	28	0.0482	1.50		**Sheet Flow, FLOW 2** Smooth surfaces n= 0.011 P2= 3.15"
10.2	128	Total			

Subcatchment P-09: PDA-09



Summary for Subcatchment P-10: PDA-10

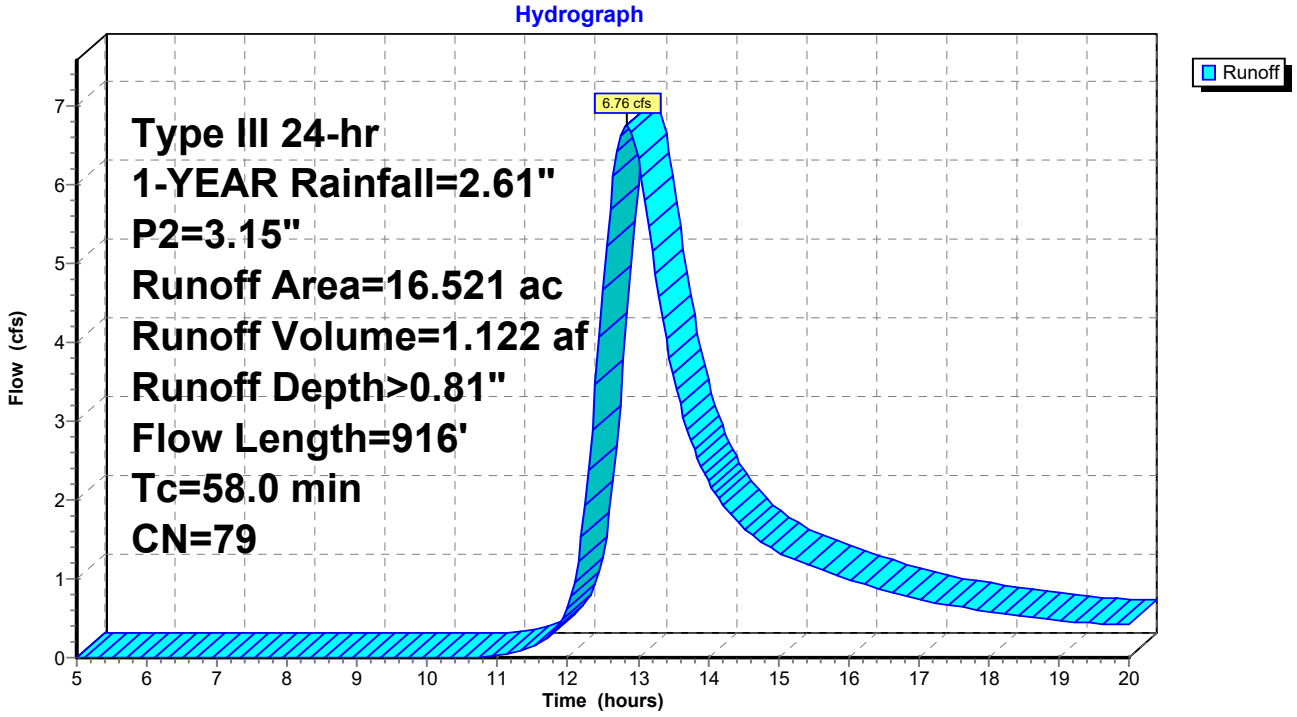
Runoff = 6.76 cfs @ 12.84 hrs, Volume= 1.122 af, Depth> 0.81"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	4.651	74	>75% Grass cover, Good, HSG C
*	0.280	98	IMP C
	11.020	80	>75% Grass cover, Good, HSG D
*	0.570	98	IMP D
	16.521	79	Weighted Average
	15.671		94.86% Pervious Area
	0.850		5.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
45.0	816	0.0300	0.30		**Sheet Flow, FLOW 2** Grass: Short n= 0.150 P2= 3.15"
58.0	916	Total			

Subcatchment P-10: PDA-10



Summary for Subcatchment P-11: PDA-11

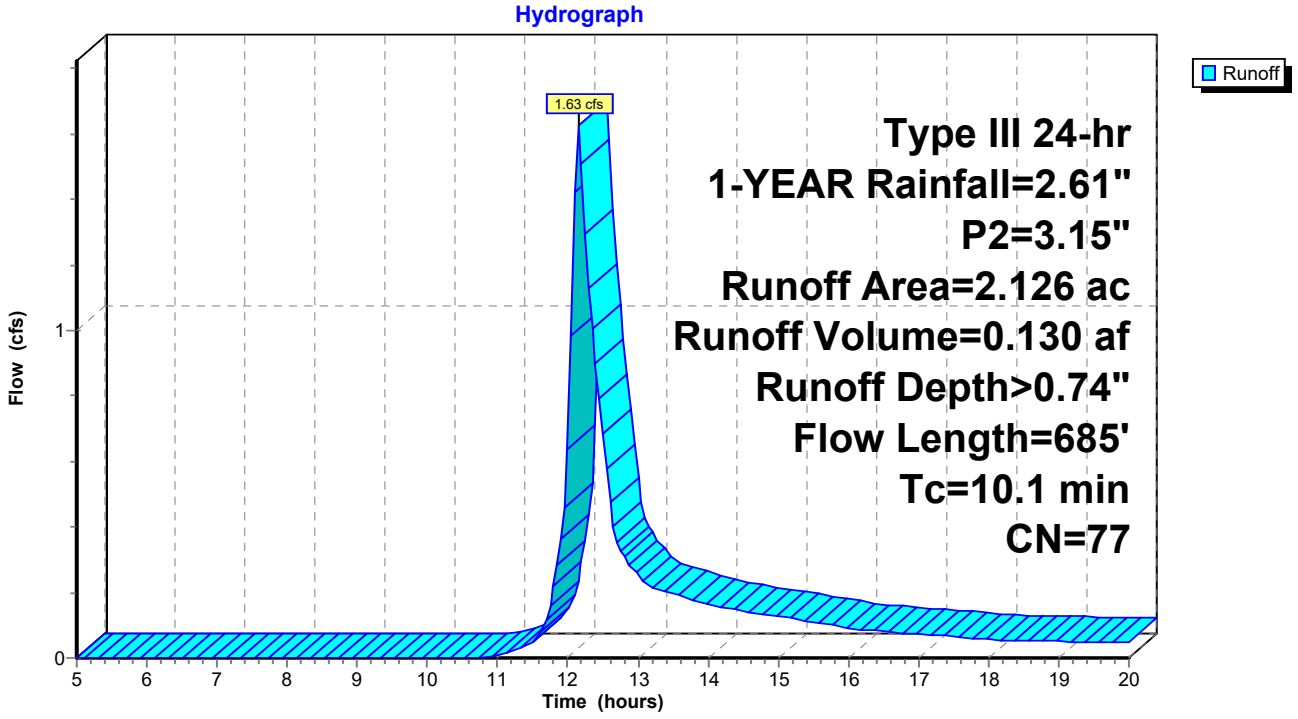
Runoff = 1.63 cfs @ 12.16 hrs, Volume= 0.130 af, Depth> 0.74"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	1.306	74	>75% Grass cover, Good, HSG C
	0.740	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	2.126	77	Weighted Average
	2.046		96.24% Pervious Area
	0.080		3.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.2	585	0.0900	4.50		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
10.1	685	Total			

Subcatchment P-11: PDA-11



Summary for Subcatchment P-12: PDA-12

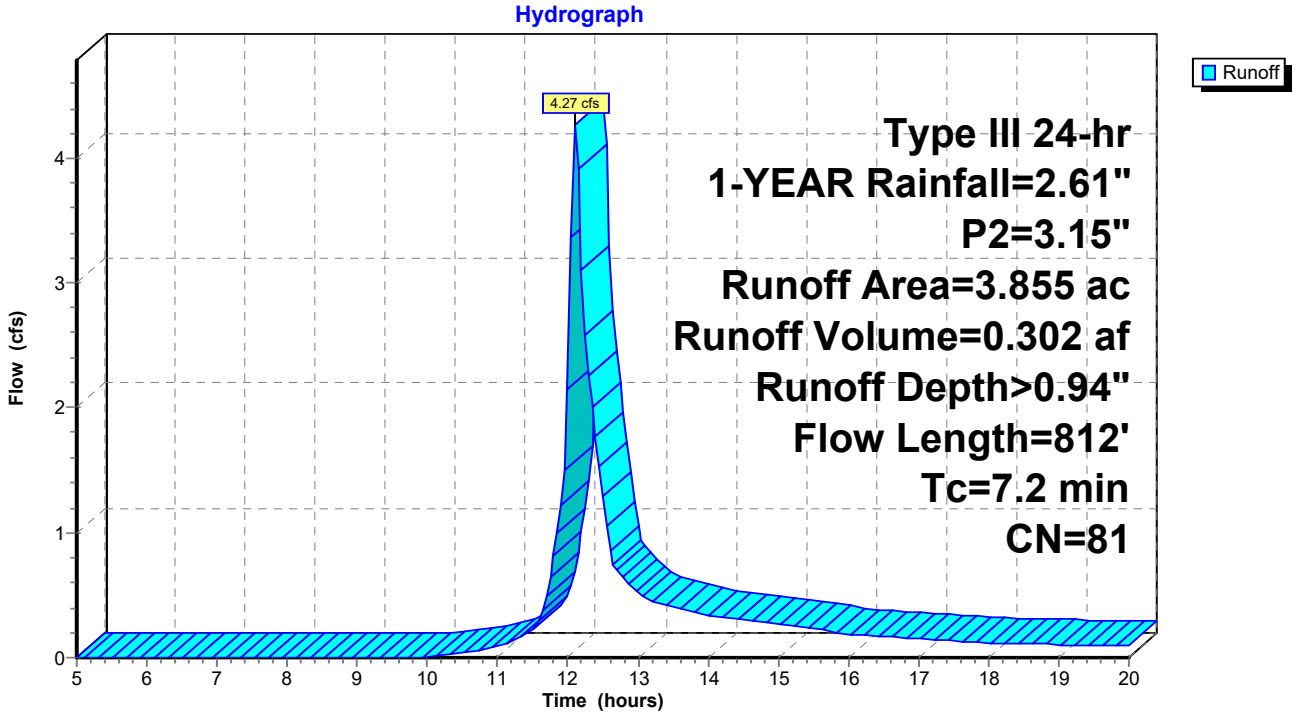
Runoff = 4.27 cfs @ 12.11 hrs, Volume= 0.302 af, Depth> 0.94"
Routed to Pond 2P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	2.525	74	>75% Grass cover, Good, HSG C
*	1.080	98	IMP C
	0.170	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	3.855	81	Weighted Average
	2.695		69.91% Pervious Area
	1.160		30.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.5	712	0.1010	4.77		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
7.2	812	Total			

Subcatchment P-12: PDA-12



Summary for Subcatchment P-13: Upper Restaurant Area

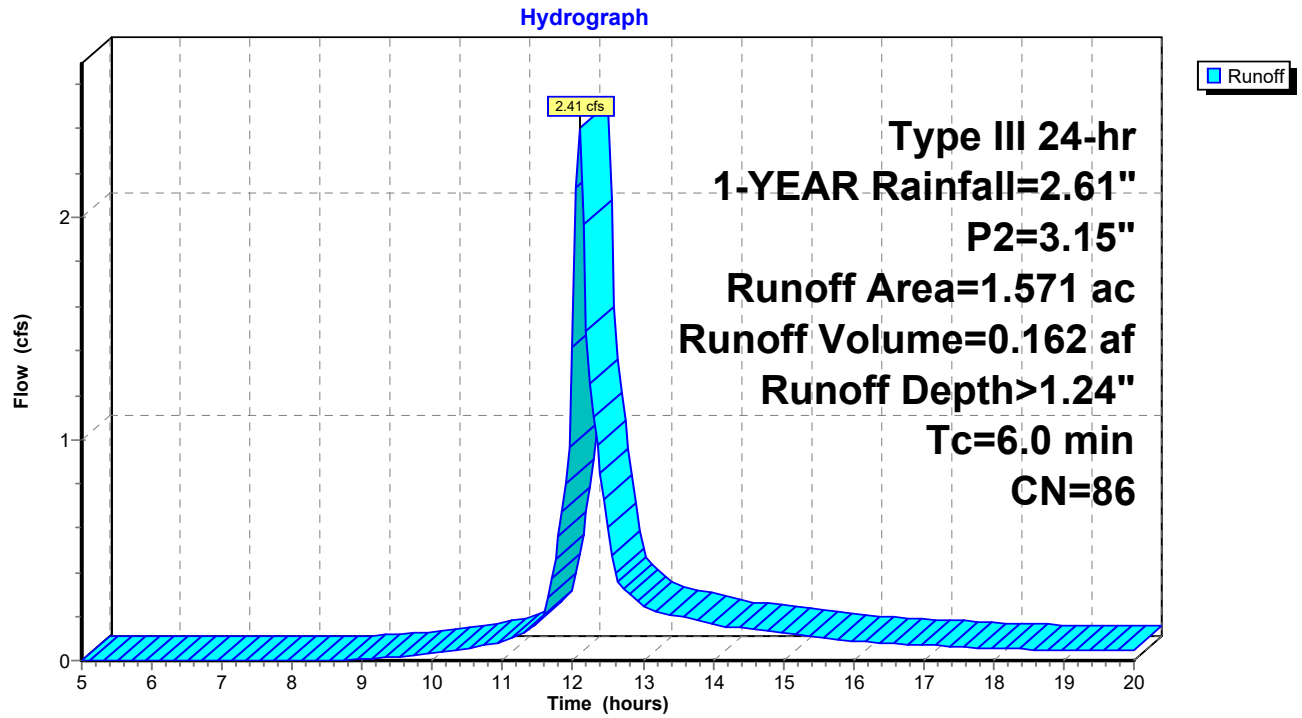
Runoff = 2.41 cfs @ 12.09 hrs, Volume= 0.162 af, Depth> 1.24"
Routed to Pond 3P : BIORETENTION #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	0.794	74	>75% Grass cover, Good, HSG C
*	0.777	98	IMP C
	1.571	86	Weighted Average
	0.794		50.54% Pervious Area
	0.777		49.46% Impervious Area

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

Subcatchment P-13: Upper Restaurant Area



Summary for Subcatchment P-14: P-14

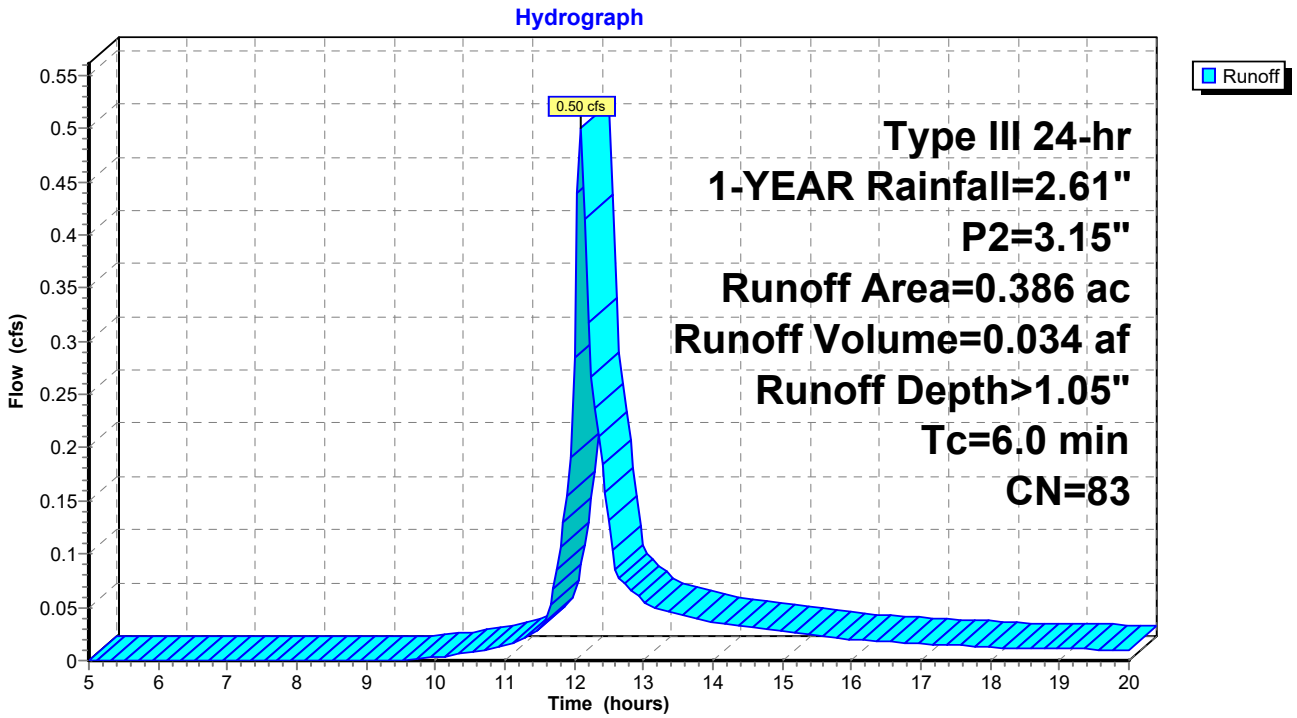
Runoff = 0.50 cfs @ 12.10 hrs, Volume= 0.034 af, Depth> 1.05"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YEAR Rainfall=2.61", P2=3.15"

	Area (ac)	CN	Description
	0.319	80	>75% Grass cover, Good, HSG D
*	0.067	98	IMP D
	0.386	83	Weighted Average
	0.319		82.64% Pervious Area
	0.067		17.36% Impervious Area

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

Subcatchment P-14: P-14



Summary for Pond 1P: Porous Pavement

Inflow Area = 7.441 ac, 43.81% Impervious, Inflow Depth > 0.49" for 1-YEAR event
Inflow = 3.89 cfs @ 12.11 hrs, Volume= 0.303 af
Outflow = 3.89 cfs @ 12.11 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.3 min
Discarded = 3.89 cfs @ 12.11 hrs, Volume= 0.303 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 404.00' @ 12.11 hrs Surf.Area= 43,838 sf Storage= 61 cf

Plug-Flow detention time= 0.3 min calculated for 0.303 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (837.9 - 837.7)

Volume	Invert	Avail.Storage	Storage Description
#1	404.00'	17,535 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 43,838 cf Overall x 40.0% Voids

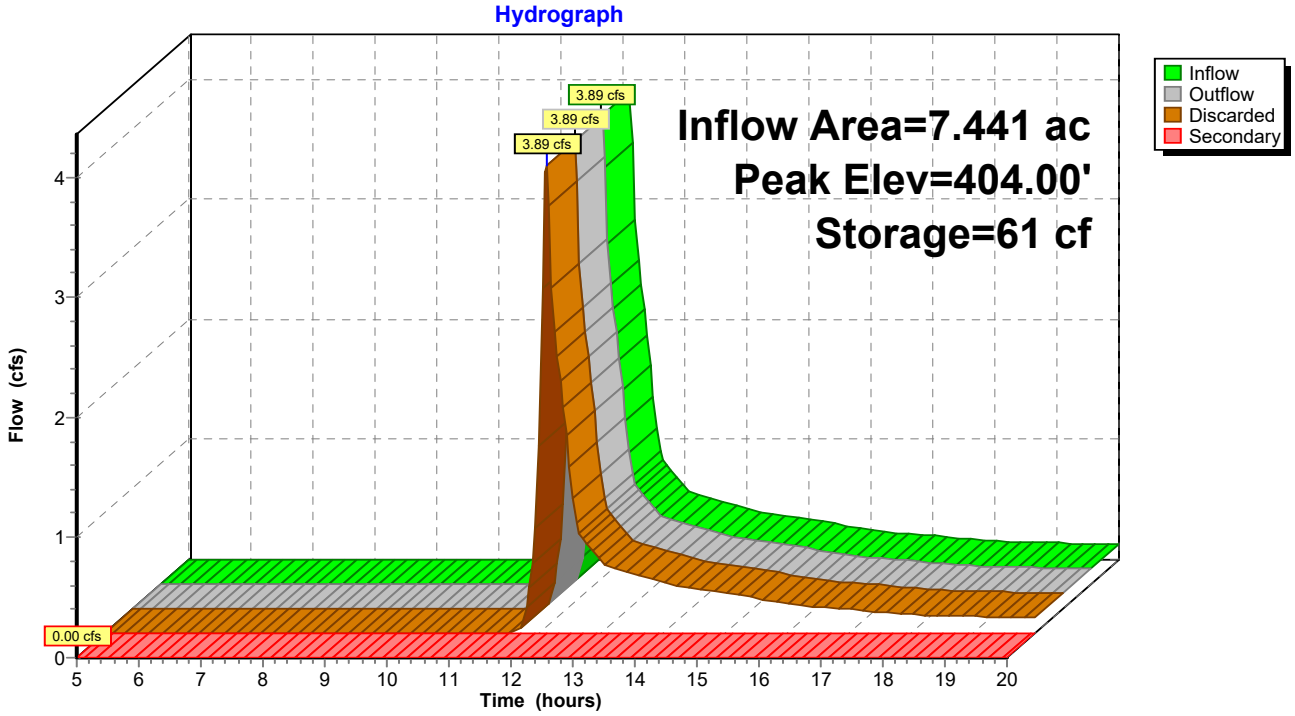
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.00	43,838	0	0
405.00	43,838	43,838	43,838

Device	Routing	Invert	Outlet Devices
#1	Discarded	404.00'	**15.000 in/hr Exfiltration over Surface area**
#2	Secondary	404.35'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 404.35' / 403.85' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=15.22 cfs @ 12.11 hrs HW=404.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 15.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=404.00' (Free Discharge)
↑**2=Culvert** (Controls 0.00 cfs)

Pond 1P: Porous Pavement



Summary for Pond 2P: Infiltration Basin

Inflow Area = 3.855 ac, 30.09% Impervious, Inflow Depth > 0.94" for 1-YEAR event
Inflow = 4.27 cfs @ 12.11 hrs, Volume= 0.302 af
Outflow = 1.09 cfs @ 12.54 hrs, Volume= 0.301 af, Atten= 74%, Lag= 25.9 min
Discarded = 1.09 cfs @ 12.54 hrs, Volume= 0.301 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3
Tertiary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 468.60' @ 12.54 hrs Surf.Area= 2,356 sf Storage= 3,902 cf

Plug-Flow detention time= 32.6 min calculated for 0.301 af (100% of inflow)
Center-of-Mass det. time= 32.2 min (842.6 - 810.4)

Volume	Invert	Avail.Storage	Storage Description
#1	466.00'	16,515 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)
466.00	746	213.0	0	0	746
468.00	1,960	264.0	2,610	2,610	2,740
470.00	3,425	318.0	5,317	7,927	5,308
472.00	5,226	391.0	8,588	16,515	9,487

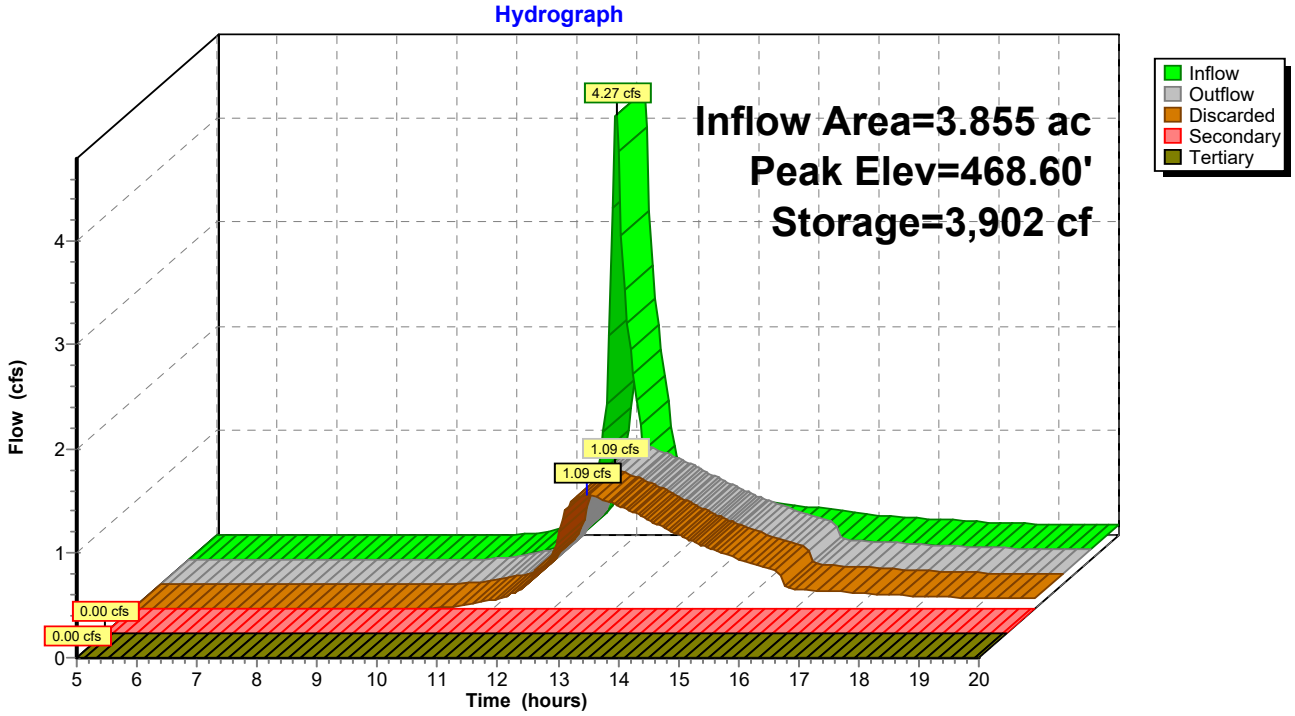
Device	Routing	Invert	Outlet Devices
#1	Discarded	466.00'	**20.000 in/hr Exfiltration over Surface area**
#2	Secondary	469.60'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.60' / 469.00' S= 0.0240 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#3	Tertiary	471.75'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=1.09 cfs @ 12.54 hrs HW=468.60' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.09 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin



Summary for Pond 3P: BIORETENTION #1

Inflow Area = 1.571 ac, 49.46% Impervious, Inflow Depth > 1.24" for 1-YEAR event
Inflow = 2.41 cfs @ 12.09 hrs, Volume= 0.162 af
Outflow = 0.35 cfs @ 12.00 hrs, Volume= 0.155 af, Atten= 86%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.00 hrs, Volume= 0.155 af
Routed to Link 2 : AP-02
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 576.49' @ 12.67 hrs Surf.Area= 7,486 sf Storage= 2,953 cf

Plug-Flow detention time= 92.9 min calculated for 0.155 af (95% of inflow)
Center-of-Mass det. time= 76.8 min (871.8 - 795.0)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	8,334 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	575.50'	10,480 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 26,201 cf Overall x 40.0% Voids
		18,814 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
579.00	7,486	561.0	0	0	7,486
580.00	9,212	587.0	8,334	8,334	9,930

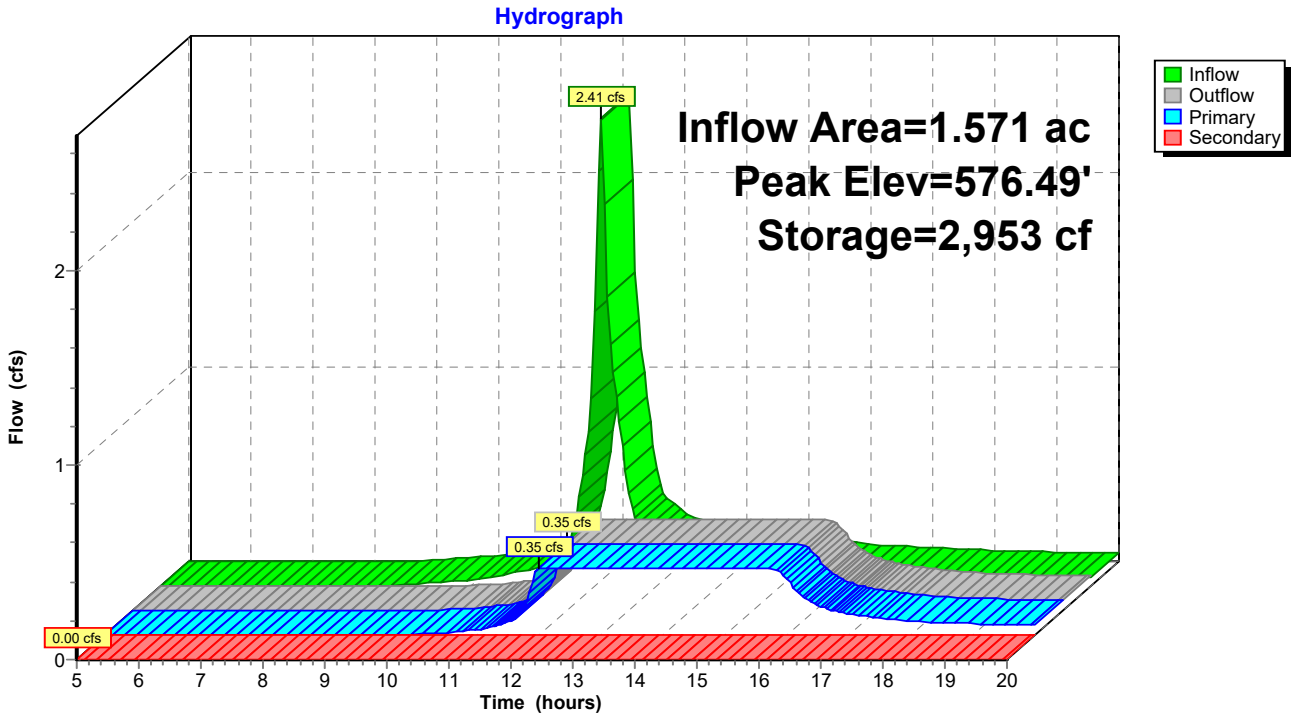
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
575.50	7,486	561.0	0	0	7,486
579.00	7,486	561.0	26,201	26,201	9,450

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.50'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	575.50'	**12.0" Round Culvert** L= 25.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.50' / 575.00' S= 0.0200 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	579.20'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	579.80'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.35 cfs @ 12.00 hrs HW=575.84' (Free Discharge)
└**2=Culvert** (Passes 0.35 cfs of 0.47 cfs potential flow)
  └**1=Exfiltration** (Exfiltration Controls 0.35 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=575.50' (Free Discharge)
└**4=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 3P: BIORETENTION #1

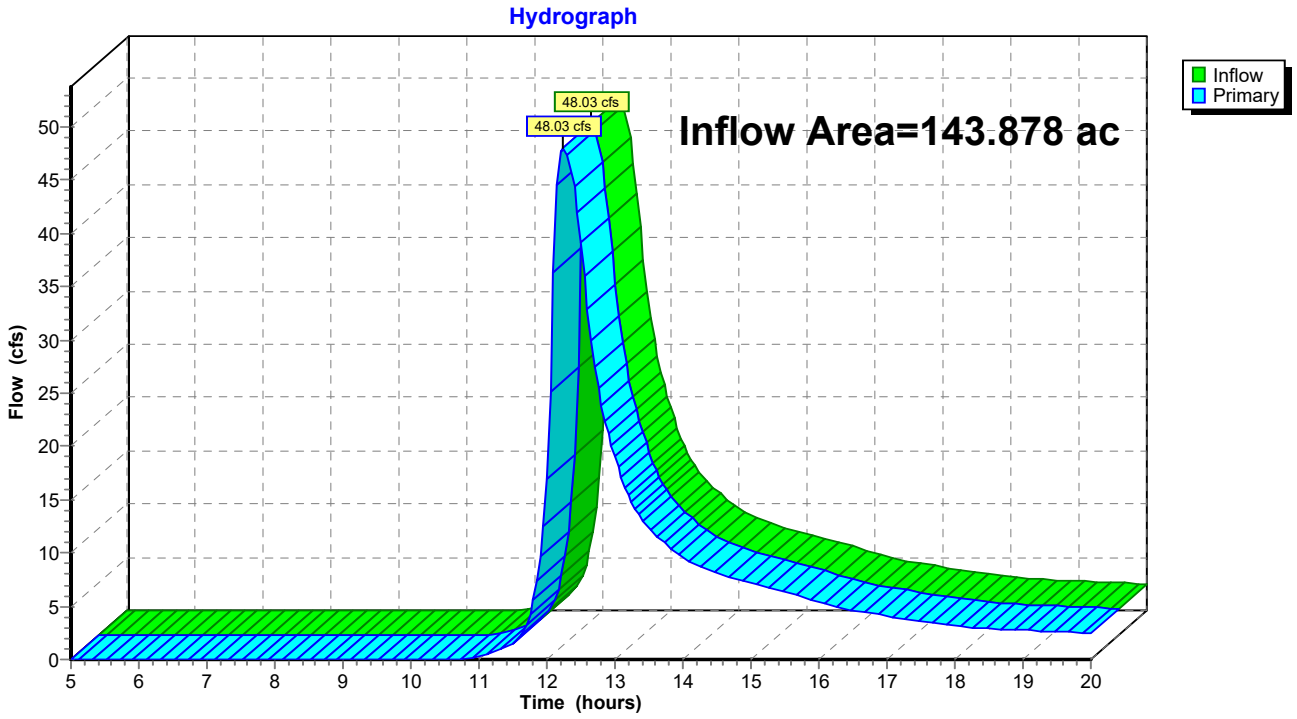


Summary for Link 1: AP-01

Inflow Area = 143.878 ac, 7.69% Impervious, Inflow Depth > 0.54" for 1-YEAR event
Inflow = 48.03 cfs @ 12.25 hrs, Volume= 6.507 af
Primary = 48.03 cfs @ 12.25 hrs, Volume= 6.507 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01

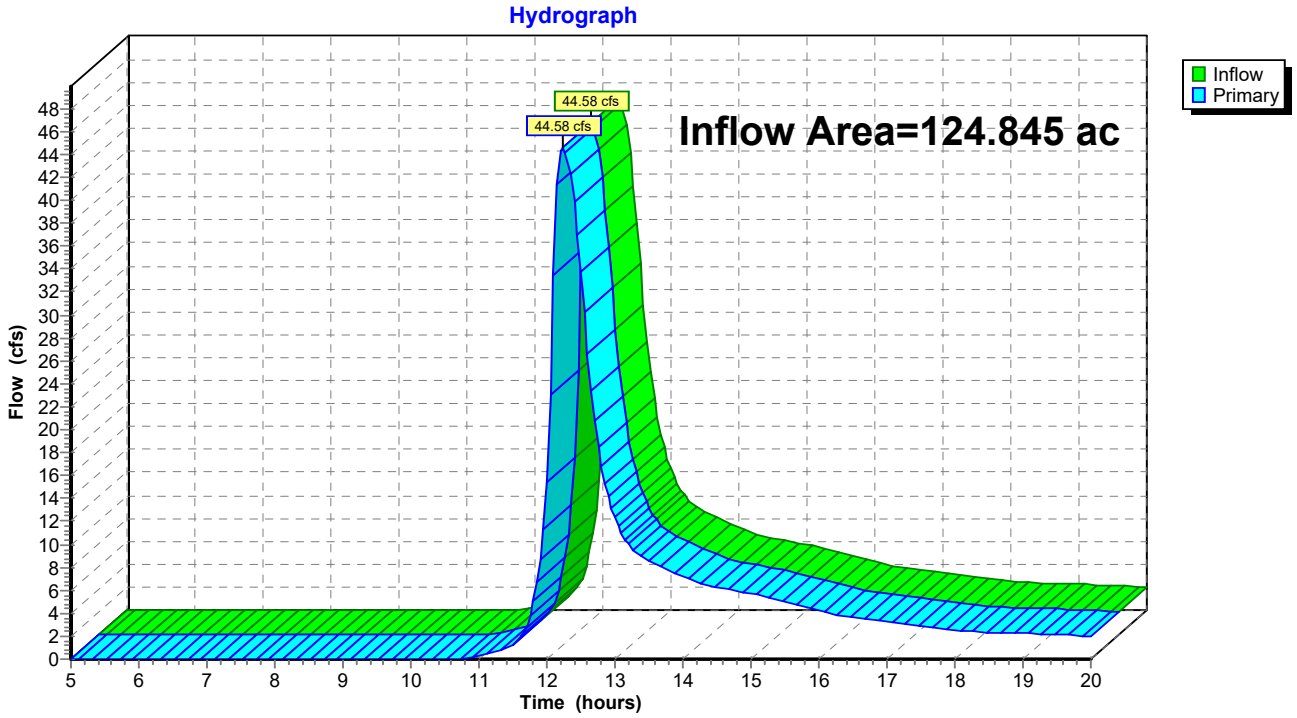


Summary for Link 2: AP-02

Inflow Area = 124.845 ac, 8.07% Impervious, Inflow Depth > 0.50" for 1-YEAR event
Inflow = 44.58 cfs @ 12.24 hrs, Volume= 5.221 af
Primary = 44.58 cfs @ 12.24 hrs, Volume= 5.221 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

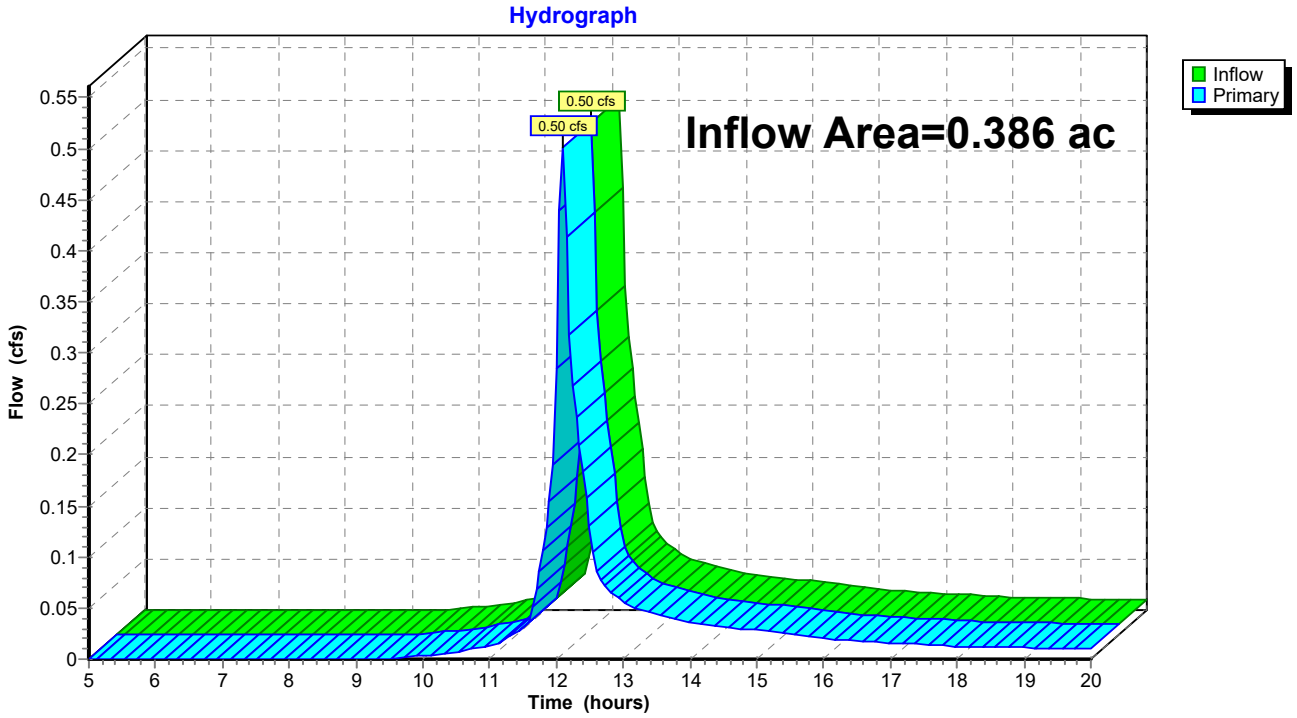


Summary for Link 3: AP-3

Inflow Area = 0.386 ac, 17.36% Impervious, Inflow Depth > 1.05" for 1-YEAR event
Inflow = 0.50 cfs @ 12.10 hrs, Volume= 0.034 af
Primary = 0.50 cfs @ 12.10 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



PROPOSED - MARLBOROUGH RESORT *Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"*

Prepared by Passero Associates Printed 10/24/2024

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-01: PDA-01 Runoff Area=23.452 ac 0.84% Impervious Runoff Depth>0.47"
Flow Length=845' Tc=44.5 min CN=50 Runoff=4.45 cfs 0.913 af

Subcatchment P-02: PDA-02 Runoff Area=6.449 ac 4.19% Impervious Runoff Depth>0.24"
Flow Length=615' Tc=26.4 min CN=44 Runoff=0.50 cfs 0.130 af

Subcatchment P-03: PDA-03 Runoff Area=7.441 ac 43.81% Impervious Runoff Depth>1.71"
Tc=6.0 min CN=71 Runoff=15.59 cfs 1.059 af

Subcatchment P-04: PDA-04 Runoff Area=6.960 ac 24.57% Impervious Runoff Depth>1.63"
Flow Length=260' Tc=13.8 min CN=70 Runoff=10.94 cfs 0.946 af

Subcatchment P-05: PDA-05 Runoff Area=21.410 ac 2.38% Impervious Runoff Depth>1.77"
Flow Length=1,066' Tc=20.1 min CN=72 Runoff=31.85 cfs 3.159 af

Subcatchment P-06: PDA-06 Runoff Area=5.701 ac 7.40% Impervious Runoff Depth>1.42"
Flow Length=1,015' Tc=26.3 min CN=67 Runoff=5.95 cfs 0.672 af

Subcatchment P-07: PDA-07 Runoff Area=11.289 ac 16.91% Impervious Runoff Depth>1.99"
Flow Length=823' Tc=26.0 min CN=75 Runoff=17.14 cfs 1.875 af

Subcatchment P-08: PDA-08 Runoff Area=17.483 ac 8.85% Impervious Runoff Depth>2.15"
Flow Length=958' Tc=21.5 min CN=77 Runoff=31.10 cfs 3.139 af

Subcatchment P-09: PDA-09 Runoff Area=30.530 ac 8.94% Impervious Runoff Depth>2.24"
Flow Length=128' Tc=10.2 min CN=78 Runoff=74.26 cfs 5.712 af

Subcatchment P-10: PDA-10 Runoff Area=16.521 ac 5.14% Impervious Runoff Depth>2.29"
Flow Length=916' Tc=58.0 min CN=79 Runoff=19.42 cfs 3.150 af

Subcatchment P-11: PDA-11 Runoff Area=2.126 ac 3.76% Impervious Runoff Depth>2.16"
Flow Length=685' Tc=10.1 min CN=77 Runoff=5.00 cfs 0.383 af

Subcatchment P-12: PDA-12 Runoff Area=3.855 ac 30.09% Impervious Runoff Depth>2.50"
Flow Length=812' Tc=7.2 min CN=81 Runoff=11.47 cfs 0.803 af

Subcatchment P-13: Upper Restaurant Area Runoff Area=1.571 ac 49.46% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=86 Runoff=5.60 cfs 0.387 af

Subcatchment P-14: P-14 Runoff Area=0.386 ac 17.36% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=83 Runoff=1.26 cfs 0.086 af

Pond 1P: Porous Pavement Peak Elev=404.02' Storage=278 cf Inflow=15.59 cfs 1.059 af
Discarded=15.26 cfs 1.059 af Secondary=0.00 cfs 0.000 af Outflow=15.26 cfs 1.059 af

Pond 2P: Infiltration Basin Peak Elev=470.52' Storage=9,828 cf Inflow=11.47 cfs 0.803 af
Discarded=1.79 cfs 0.658 af Secondary=3.73 cfs 0.145 af Tertiary=0.00 cfs 0.000 af Outflow=5.51 cfs 0.803 af

Pond 3P: BIORETENTION#1 Peak Elev=578.44' Storage=8,789 cf Inflow=5.60 cfs 0.387 af
Primary=0.35 cfs 0.275 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.275 af

Link 1: AP-01 Inflow=164.52 cfs 20.585 af
Primary=164.52 cfs 20.585 af

Link 2: AP-02 Inflow=149.94 cfs 16.821 af
Primary=149.94 cfs 16.821 af

Link 3: AP-3 Inflow=4.27 cfs 0.231 af
Primary=4.27 cfs 0.231 af

Total Runoff Area = 155.174 ac Runoff Volume = 22.414 af Average Runoff Depth = 1.73"
90.02% Pervious = 139.684 ac 9.98% Impervious = 15.490 ac

Summary for Subcatchment P-01: PDA-01

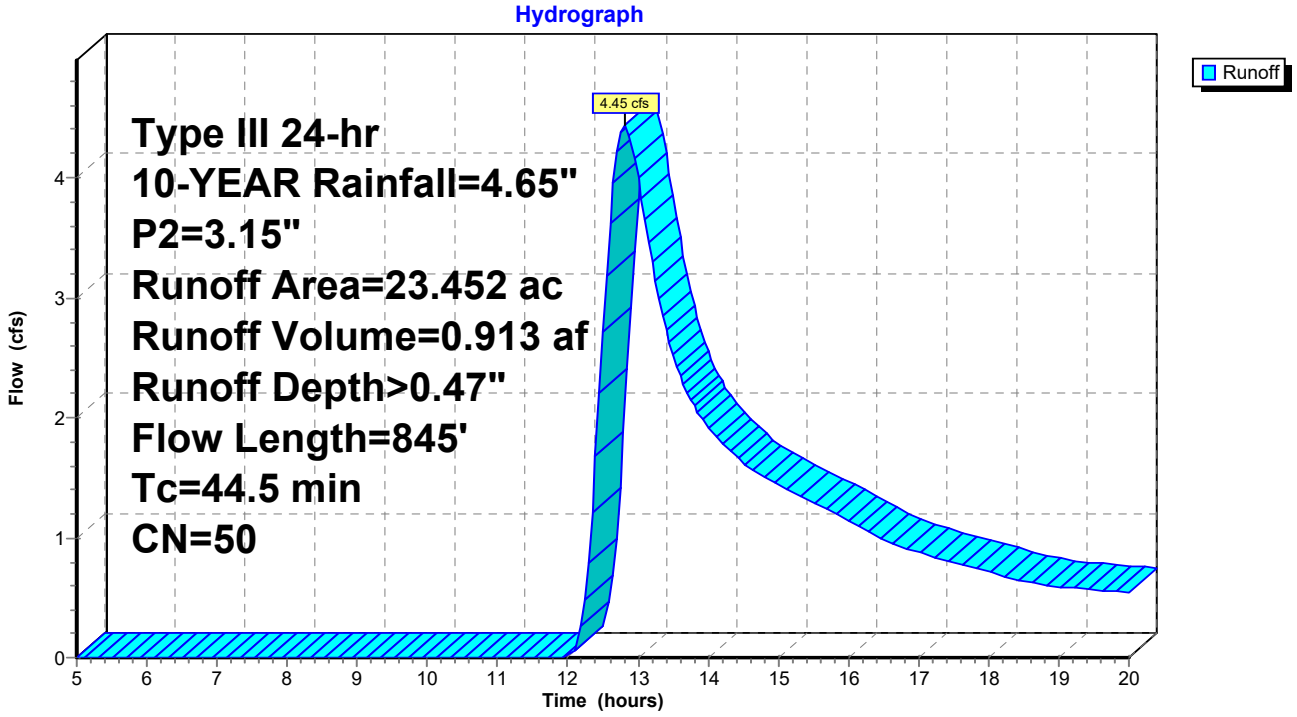
Runoff = 4.45 cfs @ 12.81 hrs, Volume= 0.913 af, Depth> 0.47"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

Area (ac)	CN	Description
12.804	30	Woods, Good, HSG A
0.198	98	Paved parking, HSG A
1.840	55	Woods, Good, HSG B
8.610	77	Woods, Good, HSG D
23.452	50	Weighted Average
23.254		99.16% Pervious Area
0.198		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment P-01: PDA-01



Summary for Subcatchment P-02: PDA-02

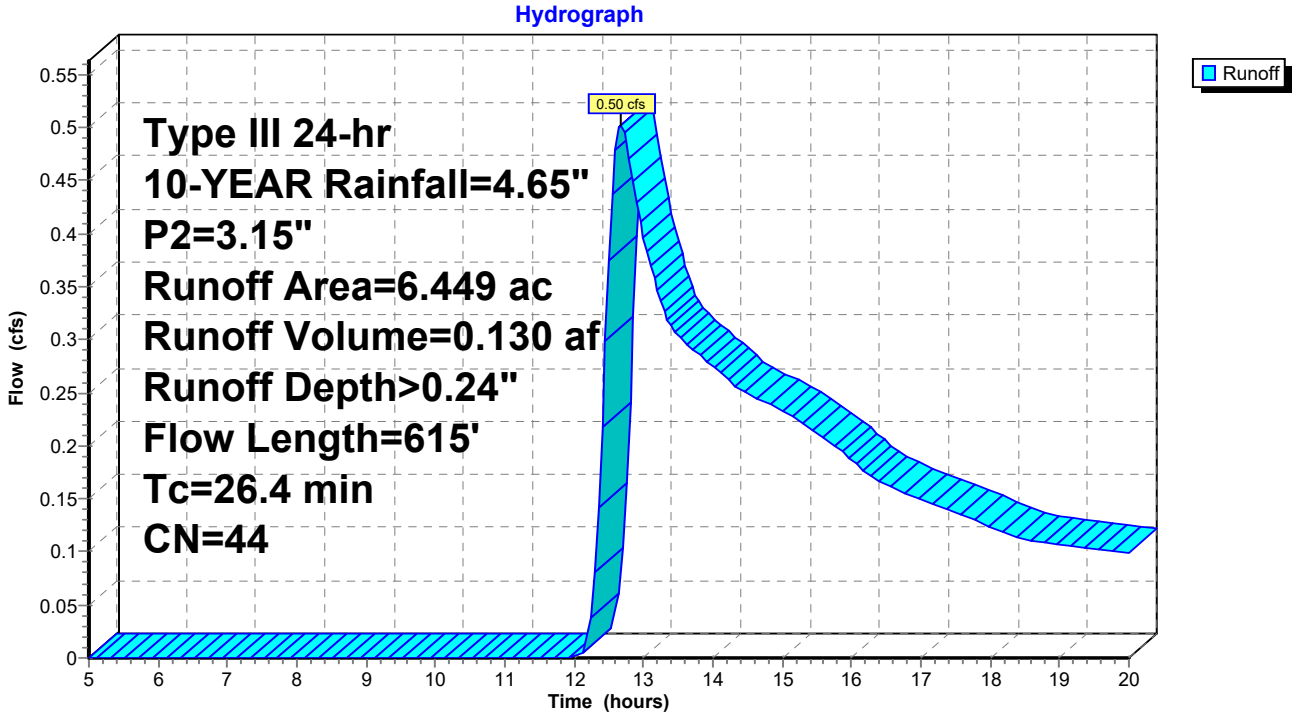
Runoff = 0.50 cfs @ 12.68 hrs, Volume= 0.130 af, Depth> 0.24"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	4.980	32	Woods/grass comb., Good, HSG A
*	0.270	98	IMP A
	1.199	79	Woods/grass comb., Good, HSG D
	6.449	44	Weighted Average
	6.179		95.81% Pervious Area
	0.270		4.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0900	0.14		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.15"
14.5	515	0.0140	0.59		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.4	615	Total			

Subcatchment P-02: PDA-02



Summary for Subcatchment P-03: PDA-03

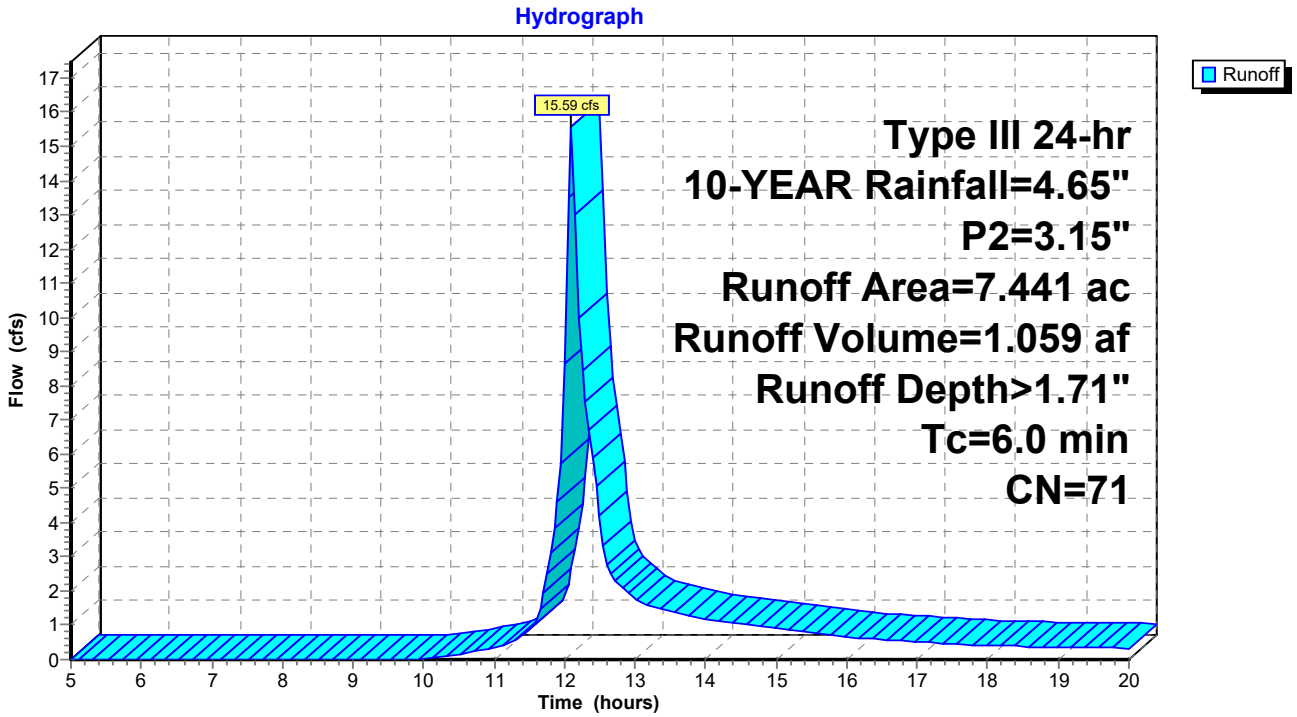
Runoff = 15.59 cfs @ 12.10 hrs, Volume= 1.059 af, Depth> 1.71"
Routed to Pond 1P : Porous Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	2.800	39	>75% Grass cover, Good, HSG A
*	3.240	98	IMP A
	0.590	61	>75% Grass cover, Good, HSG B
*	0.010	98	IMP B
	0.791	80	>75% Grass cover, Good, HSG D
*	0.010	98	IMP D
	7.441	71	Weighted Average
	4.181		56.19% Pervious Area
	3.260		43.81% Impervious Area

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

Subcatchment P-03: PDA-03



Summary for Subcatchment P-04: PDA-04

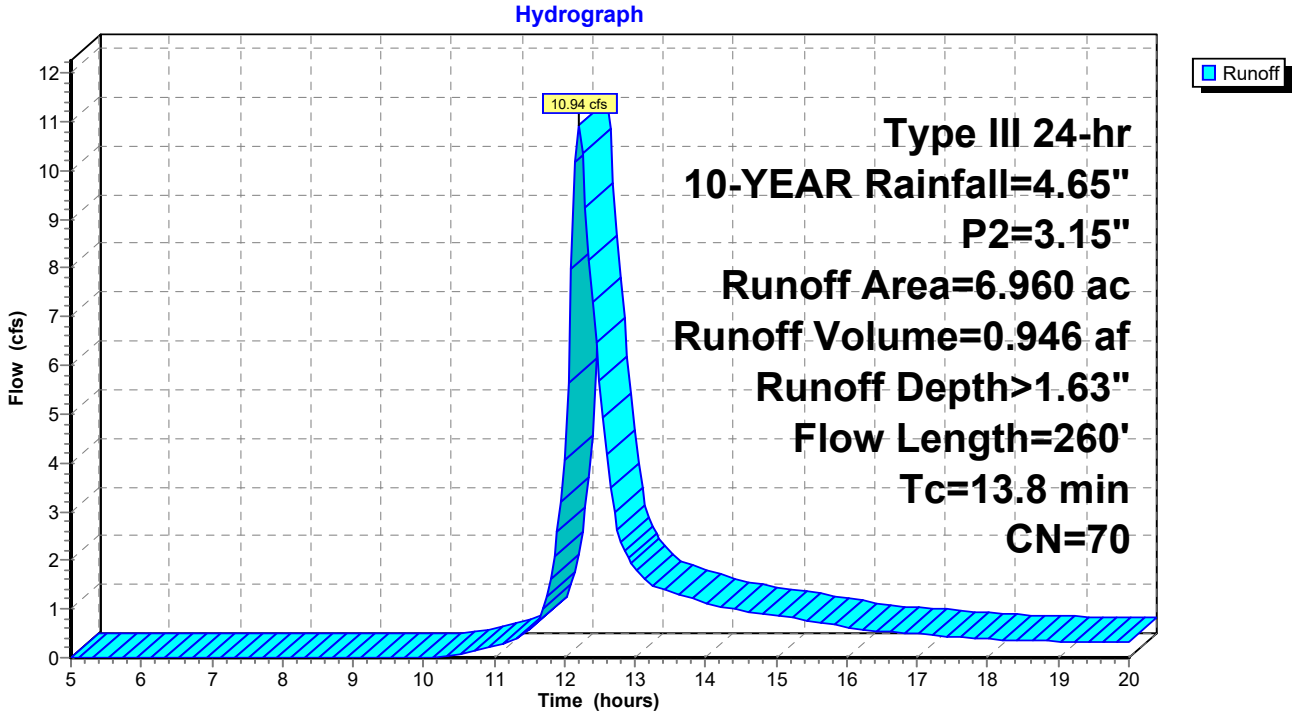
Runoff = 10.94 cfs @ 12.20 hrs, Volume= 0.946 af, Depth> 1.63"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	1.600	39	>75% Grass cover, Good, HSG A
*	1.590	98	IMP A
	1.830	61	>75% Grass cover, Good, HSG B
*	0.060	98	IMP B
	1.820	80	>75% Grass cover, Good, HSG D
*	0.060	98	IMP D
	6.960	70	Weighted Average
	5.250		75.43% Pervious Area
	1.710		24.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.8	160	0.0438	3.14		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
13.8	260	Total			

Subcatchment P-04: PDA-04



Summary for Subcatchment P-05: PDA-05

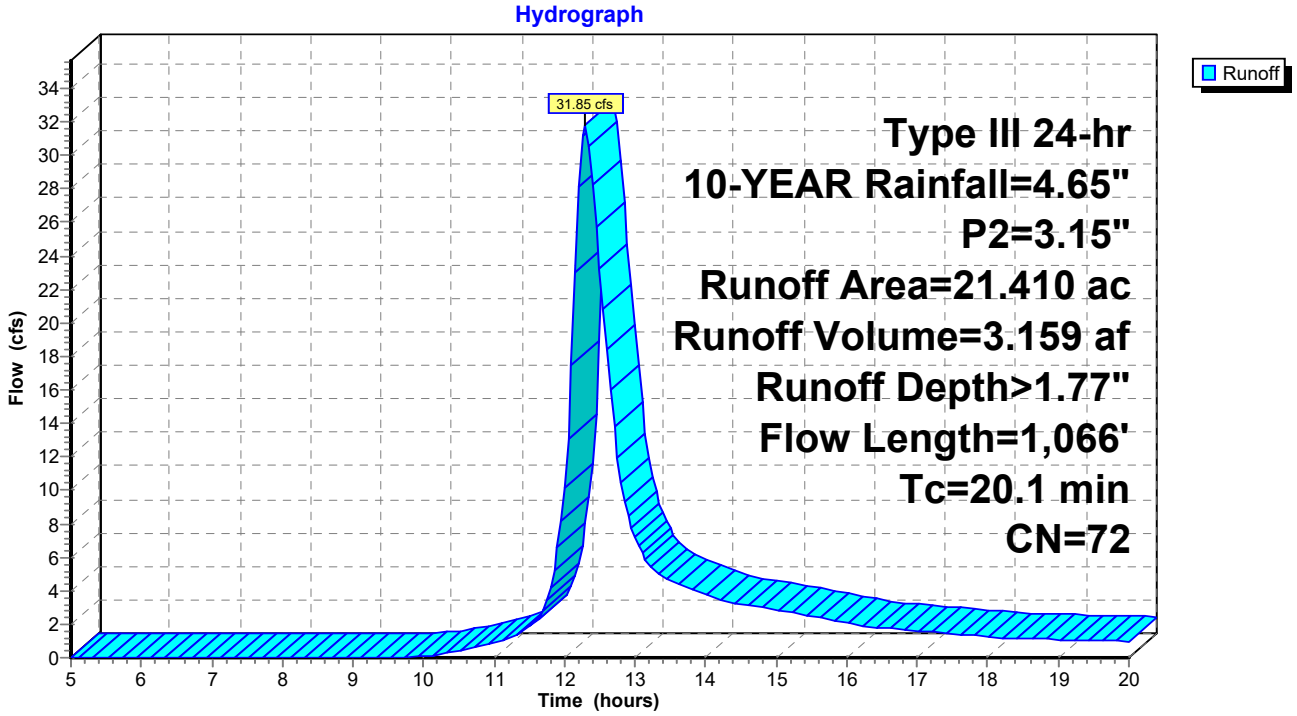
Runoff = 31.85 cfs @ 12.29 hrs, Volume= 3.159 af, Depth> 1.77"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	0.290	30	Woods, Good, HSG A
	1.630	55	Woods, Good, HSG B
*	0.030	98	IMP B
	11.470	70	Woods, Good, HSG C
*	0.270	98	IMP C
	7.510	79	Woods, Fair, HSG D
*	0.210	98	IMP D
	21.410	72	Weighted Average
	20.900		97.62% Pervious Area
	0.510		2.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.5	966	0.1160	1.70		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
20.1	1,066	Total			

Subcatchment P-05: PDA-05



Summary for Subcatchment P-06: PDA-06

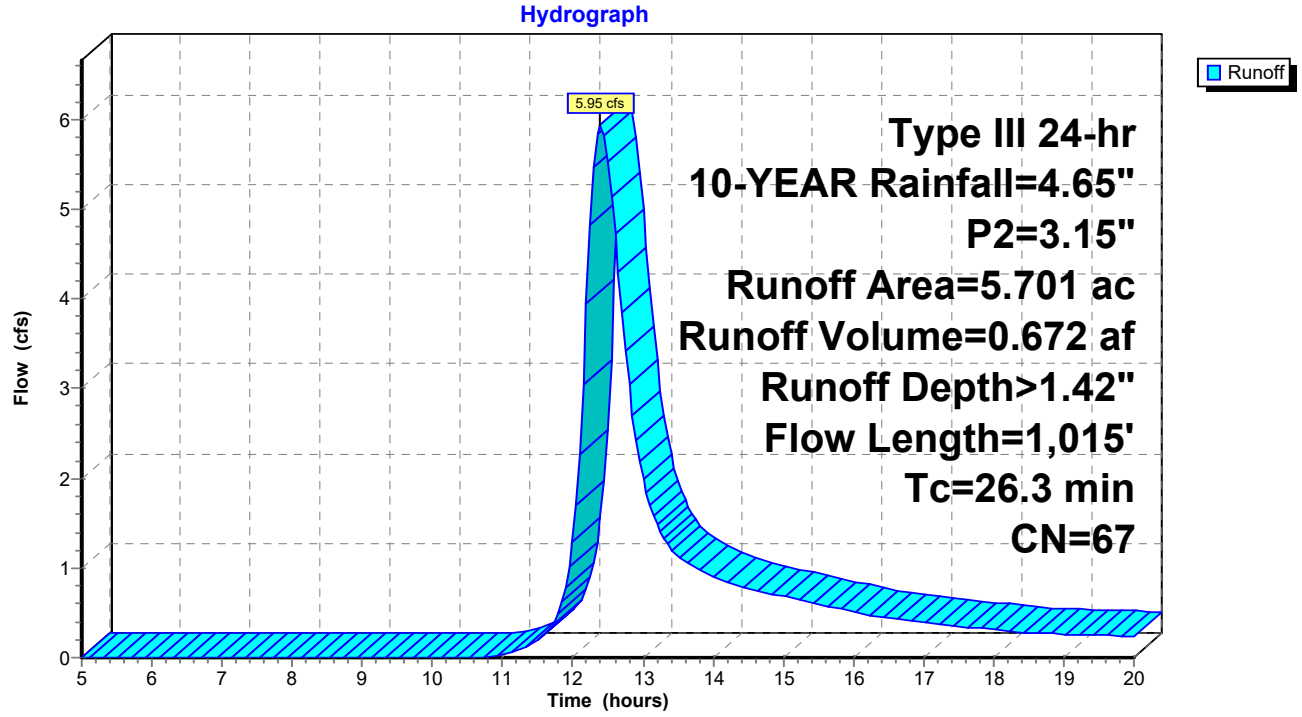
Runoff = 5.95 cfs @ 12.40 hrs, Volume= 0.672 af, Depth> 1.42"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	2.370	55	Woods, Good, HSG B
	2.179	70	Woods, Good, HSG C
*	0.422	98	IMP C
	0.730	79	Woods, Fair, HSG D
	5.701	67	Weighted Average
	5.279		92.60% Pervious Area
	0.422		7.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	100	0.0400	0.10		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.9	915	0.0950	1.54		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
26.3	1,015	Total			

Subcatchment P-06: PDA-06



Summary for Subcatchment P-07: PDA-07

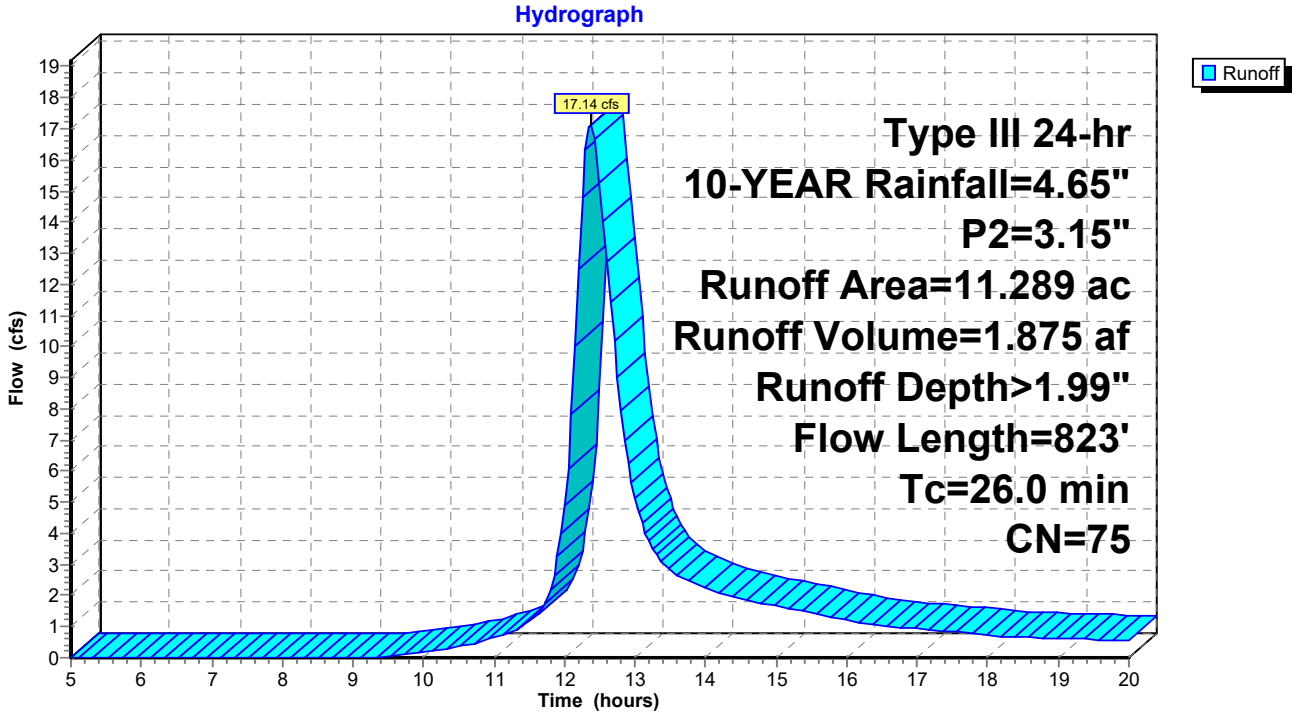
Runoff = 17.14 cfs @ 12.37 hrs, Volume= 1.875 af, Depth> 1.99"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	1.170	55	Woods, Good, HSG B
*	0.070	98	IMP B
	5.820	70	Woods, Good, HSG C
*	1.475	98	IMP C
	2.390	77	Woods, Good, HSG D
*	0.364	98	IMP D
	11.289	75	Weighted Average
	9.380		83.09% Pervious Area
	1.909		16.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	100	0.0300	0.09		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	723	0.1000	1.58		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.0	823	Total			

Subcatchment P-07: PDA-07



Summary for Subcatchment P-08: PDA-08

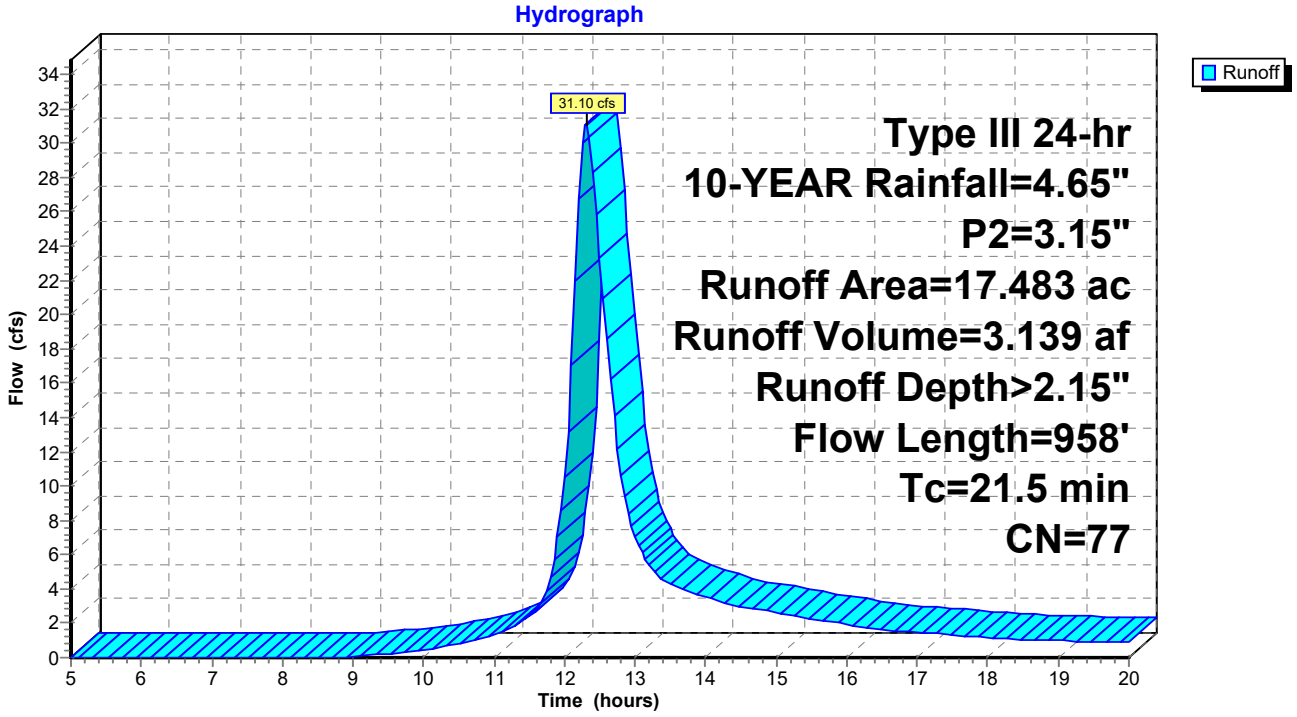
Runoff = 31.10 cfs @ 12.30 hrs, Volume= 3.139 af, Depth> 2.15"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	14.026	74	>75% Grass cover, Good, HSG C
*	1.347	98	IMP C
	1.910	80	>75% Grass cover, Good, HSG D
*	0.200	98	IMP D
	17.483	77	Weighted Average
	15.936		91.15% Pervious Area
	1.547		8.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0600	0.12		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	858	0.1420	1.88		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
21.5	958	Total			

Subcatchment P-08: PDA-08



Summary for Subcatchment P-09: PDA-09

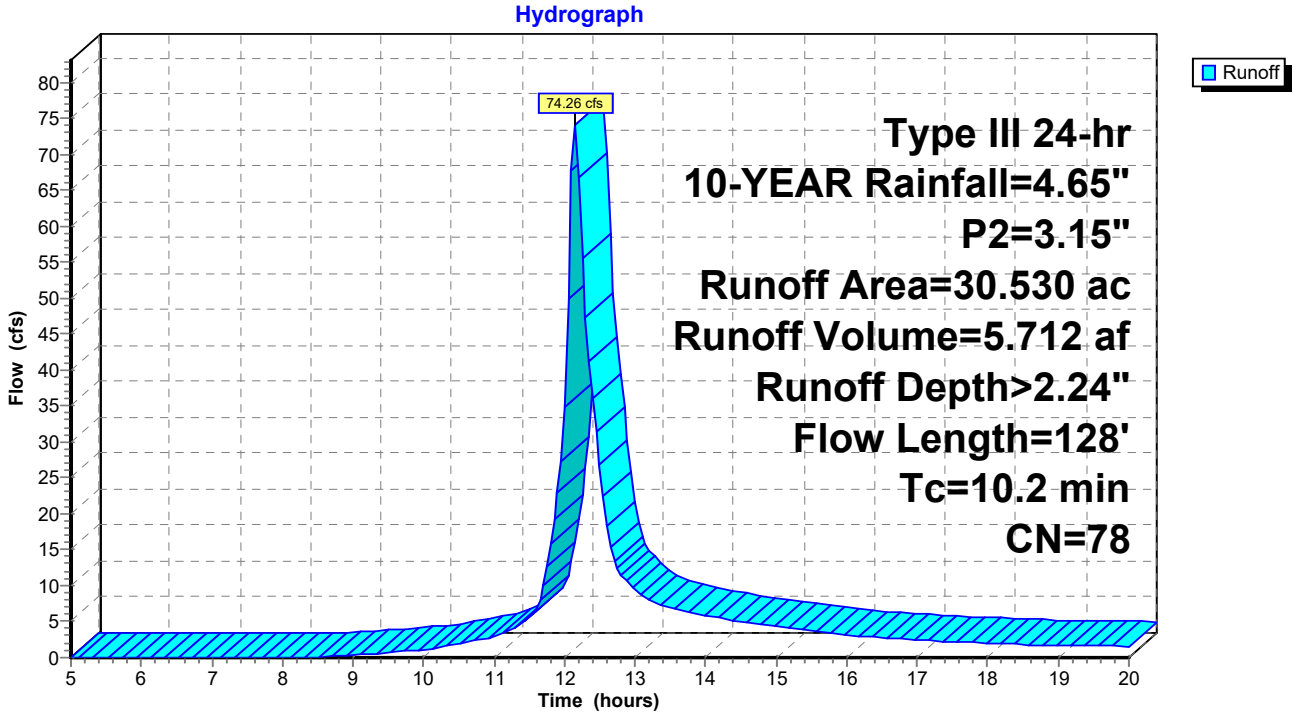
Runoff = 74.26 cfs @ 12.15 hrs, Volume= 5.712 af, Depth> 2.24"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	18.399	74	>75% Grass cover, Good, HSG C
*	2.190	98	IMP C
	9.401	80	>75% Grass cover, Good, HSG D
*	0.540	98	IMP D
	30.530	78	Weighted Average
	27.800		91.06% Pervious Area
	2.730		8.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0200	0.17		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.3	28	0.0482	1.50		**Sheet Flow, FLOW 2** Smooth surfaces n= 0.011 P2= 3.15"
10.2	128	Total			

Subcatchment P-09: PDA-09



Summary for Subcatchment P-10: PDA-10

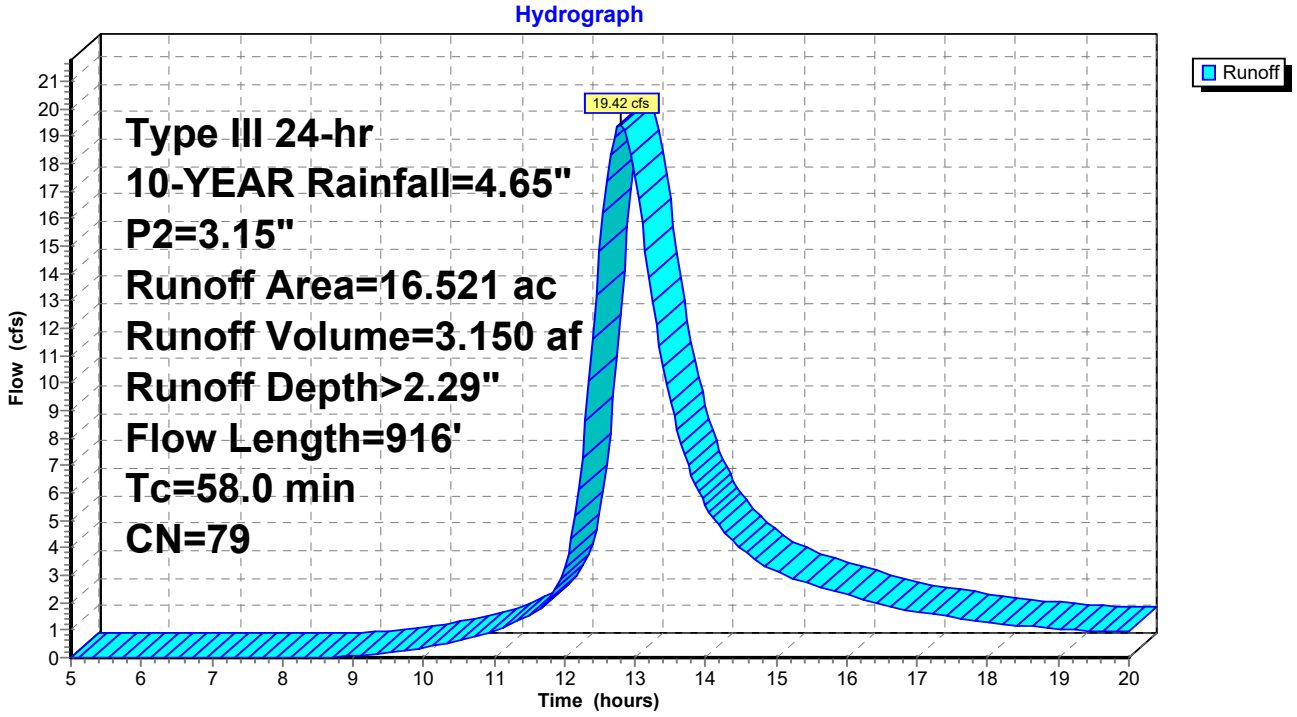
Runoff = 19.42 cfs @ 12.80 hrs, Volume= 3.150 af, Depth> 2.29"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	4.651	74	>75% Grass cover, Good, HSG C
*	0.280	98	IMP C
	11.020	80	>75% Grass cover, Good, HSG D
*	0.570	98	IMP D
	16.521	79	Weighted Average
	15.671		94.86% Pervious Area
	0.850		5.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
45.0	816	0.0300	0.30		**Sheet Flow, FLOW 2** Grass: Short n= 0.150 P2= 3.15"
58.0	916	Total			

Subcatchment P-10: PDA-10



Summary for Subcatchment P-11: PDA-11

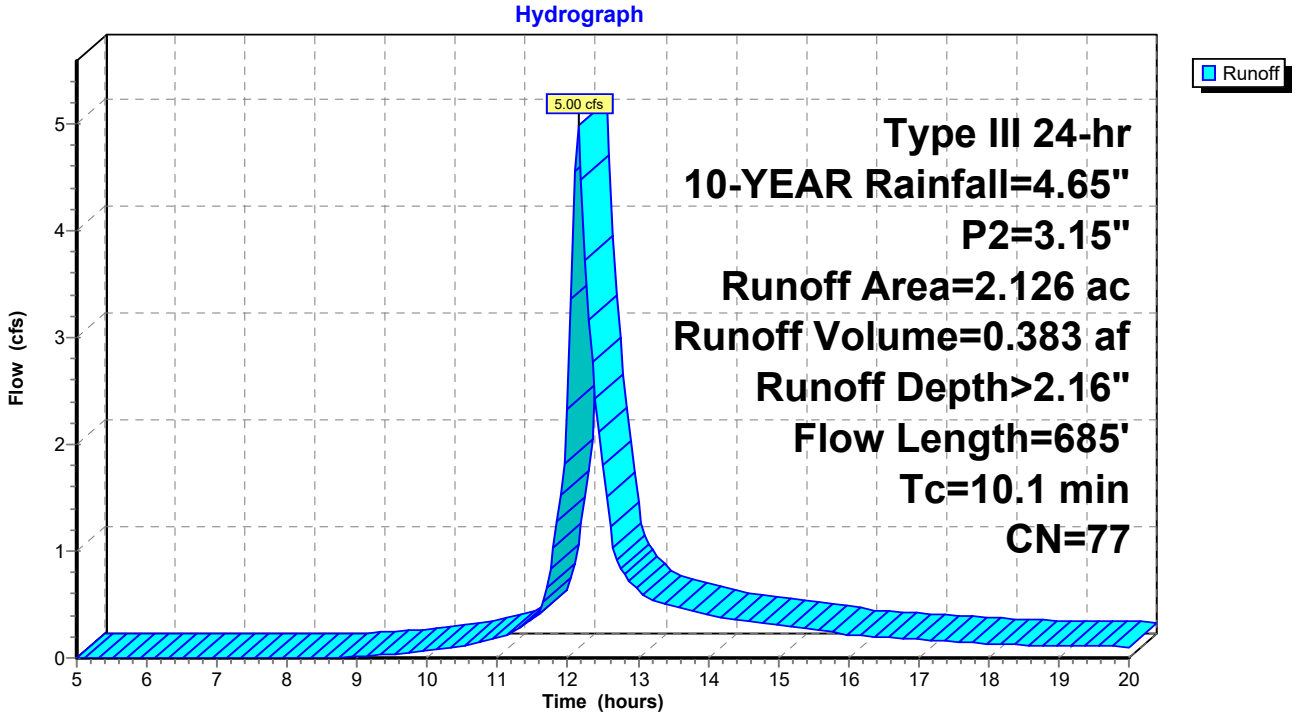
Runoff = 5.00 cfs @ 12.15 hrs, Volume= 0.383 af, Depth> 2.16"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	1.306	74	>75% Grass cover, Good, HSG C
	0.740	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	2.126	77	Weighted Average
	2.046		96.24% Pervious Area
	0.080		3.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.2	585	0.0900	4.50		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
10.1	685	Total			

Subcatchment P-11: PDA-11



Summary for Subcatchment P-12: PDA-12

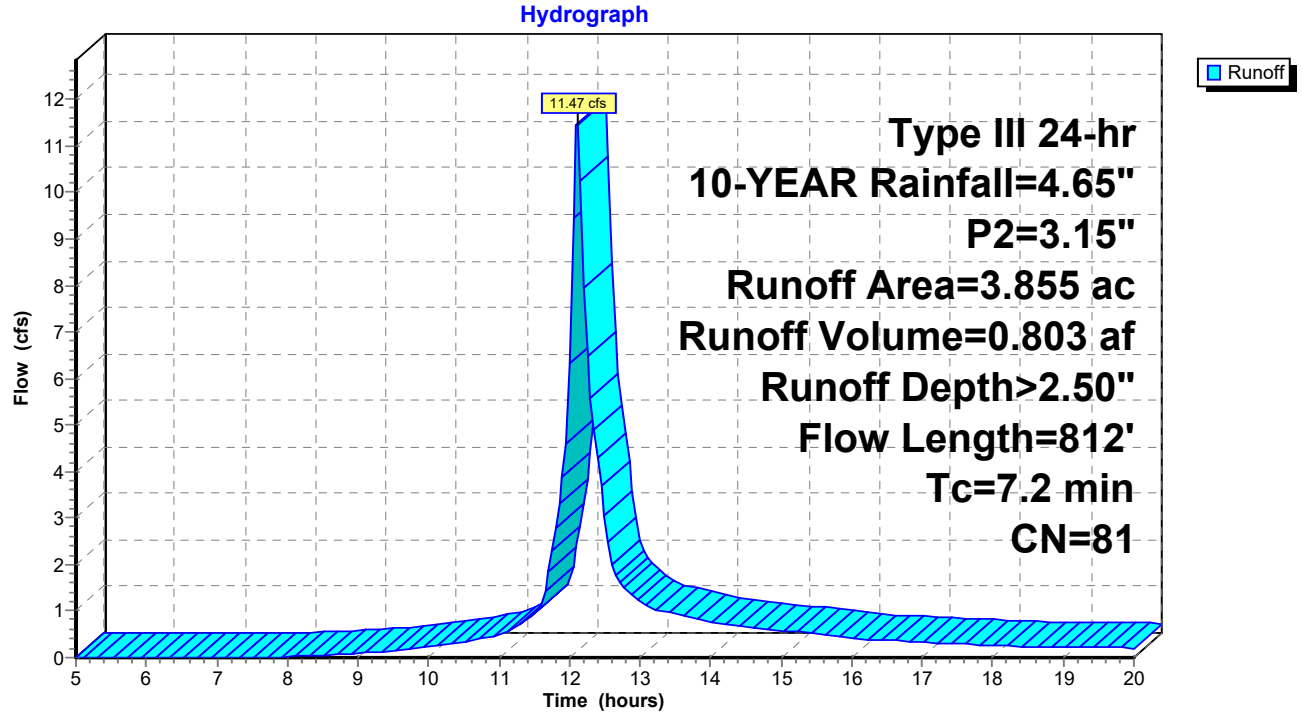
Runoff = 11.47 cfs @ 12.11 hrs, Volume= 0.803 af, Depth> 2.50"
Routed to Pond 2P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	2.525	74	>75% Grass cover, Good, HSG C
*	1.080	98	IMP C
	0.170	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	3.855	81	Weighted Average
	2.695		69.91% Pervious Area
	1.160		30.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.5	712	0.1010	4.77		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
7.2	812	Total			

Subcatchment P-12: PDA-12



Summary for Subcatchment P-13: Upper Restaurant Area

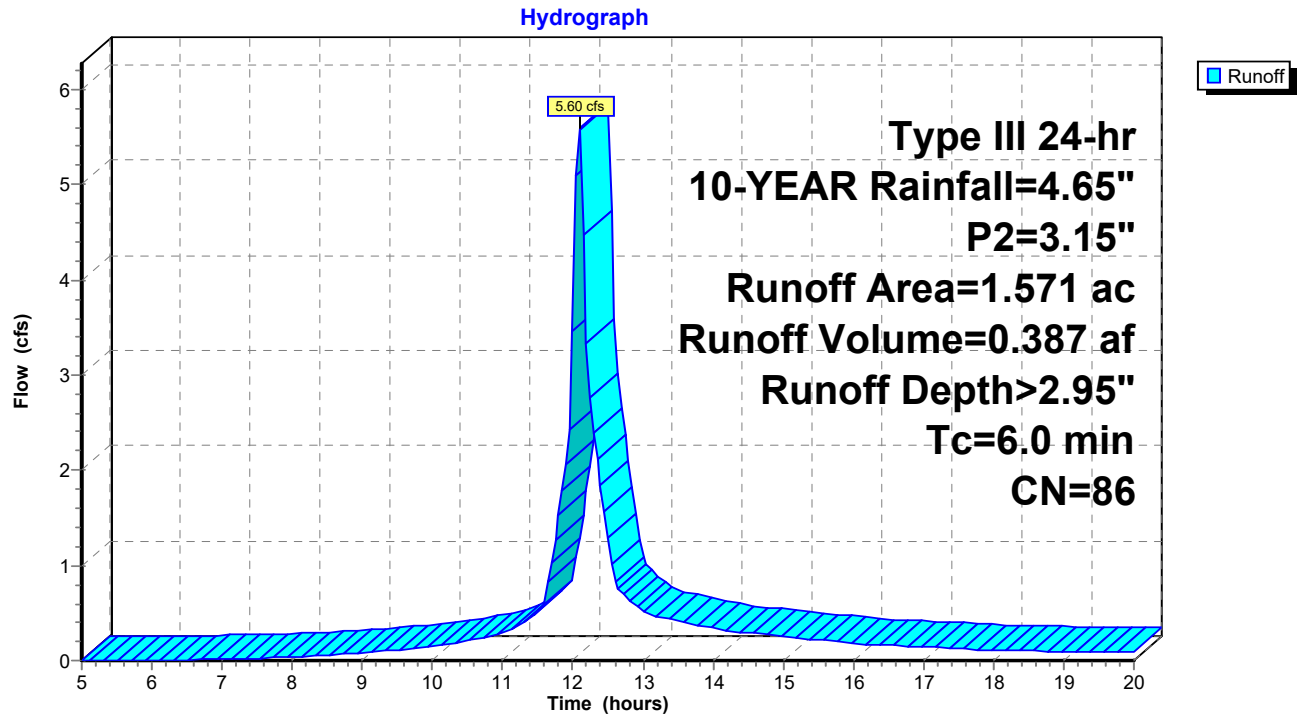
Runoff = 5.60 cfs @ 12.09 hrs, Volume= 0.387 af, Depth> 2.95"
Routed to Pond 3P : BIORETENTION #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	0.794	74	>75% Grass cover, Good, HSG C
*	0.777	98	IMP C
	1.571	86	Weighted Average
	0.794		50.54% Pervious Area
	0.777		49.46% Impervious Area

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

Subcatchment P-13: Upper Restaurant Area



Summary for Subcatchment P-14: P-14

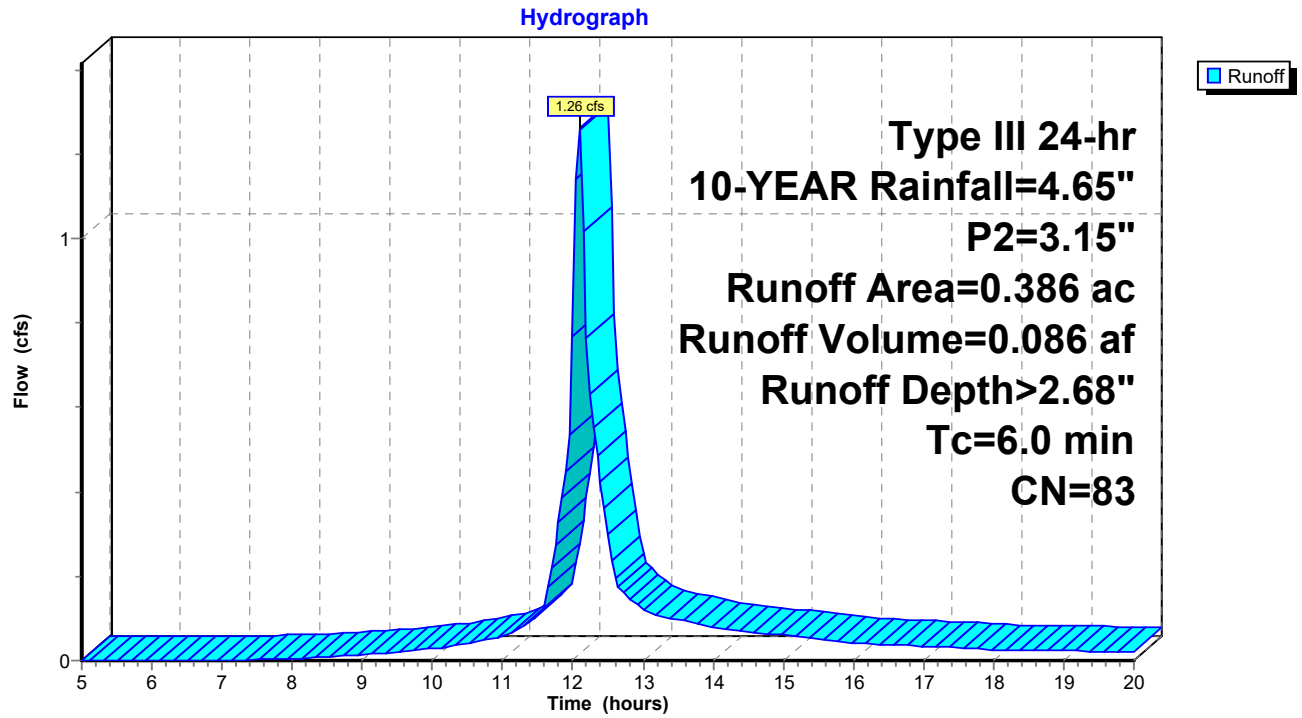
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 0.086 af, Depth> 2.68"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.65", P2=3.15"

	Area (ac)	CN	Description
	0.319	80	>75% Grass cover, Good, HSG D
*	0.067	98	IMP D
	0.386	83	Weighted Average
	0.319		82.64% Pervious Area
	0.067		17.36% Impervious Area

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

Subcatchment P-14: P-14



Summary for Pond 1P: Porous Pavement

Inflow Area = 7.441 ac, 43.81% Impervious, Inflow Depth > 1.71" for 10-YEAR event
Inflow = 15.59 cfs @ 12.10 hrs, Volume= 1.059 af
Outflow = 15.26 cfs @ 12.11 hrs, Volume= 1.059 af, Atten= 2%, Lag= 0.6 min
Discarded = 15.26 cfs @ 12.11 hrs, Volume= 1.059 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 404.02' @ 12.10 hrs Surf.Area= 43,838 sf Storage= 278 cf

Plug-Flow detention time= 0.3 min calculated for 1.055 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (808.7 - 808.5)

Volume	Invert	Avail.Storage	Storage Description
#1	404.00'	17,535 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 43,838 cf Overall x 40.0% Voids

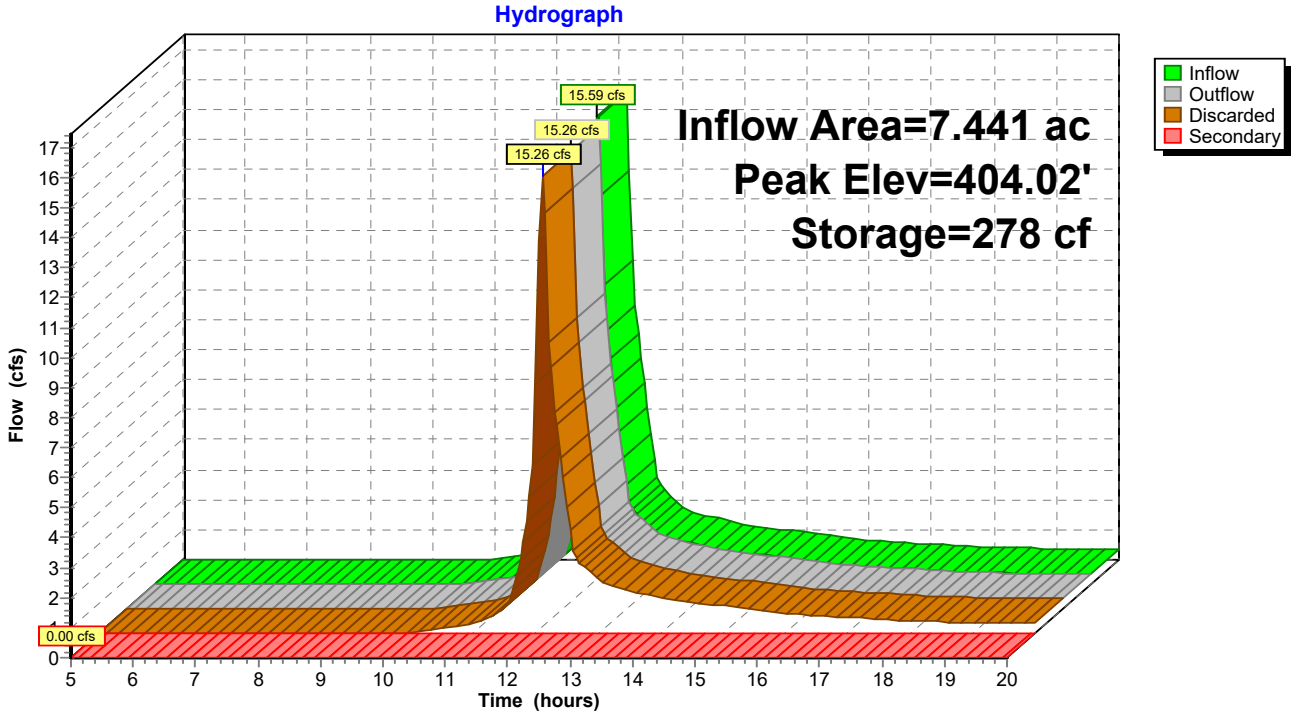
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.00	43,838	0	0
405.00	43,838	43,838	43,838

Device	Routing	Invert	Outlet Devices
#1	Discarded	404.00'	**15.000 in/hr Exfiltration over Surface area**
#2	Secondary	404.35'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 404.35' / 403.85' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=15.22 cfs @ 12.11 hrs HW=404.02' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 15.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=404.00' (Free Discharge)
↑**2=Culvert** (Controls 0.00 cfs)

Pond 1P: Porous Pavement



Summary for Pond 2P: Infiltration Basin

Inflow Area = 3.855 ac, 30.09% Impervious, Inflow Depth > 2.50" for 10-YEAR event
Inflow = 11.47 cfs @ 12.11 hrs, Volume= 0.803 af
Outflow = 5.51 cfs @ 12.31 hrs, Volume= 0.803 af, Atten= 52%, Lag= 12.3 min
Discarded = 1.79 cfs @ 12.31 hrs, Volume= 0.658 af
Secondary = 3.73 cfs @ 12.31 hrs, Volume= 0.145 af
Routed to Link 3 : AP-3
Tertiary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 470.52' @ 12.31 hrs Surf.Area= 3,859 sf Storage= 9,828 cf

Plug-Flow detention time= 43.7 min calculated for 0.803 af (100% of inflow)
Center-of-Mass det. time= 43.4 min (831.6 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	466.00'	16,515 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)
466.00	746	213.0	0	0	746
468.00	1,960	264.0	2,610	2,610	2,740
470.00	3,425	318.0	5,317	7,927	5,308
472.00	5,226	391.0	8,588	16,515	9,487

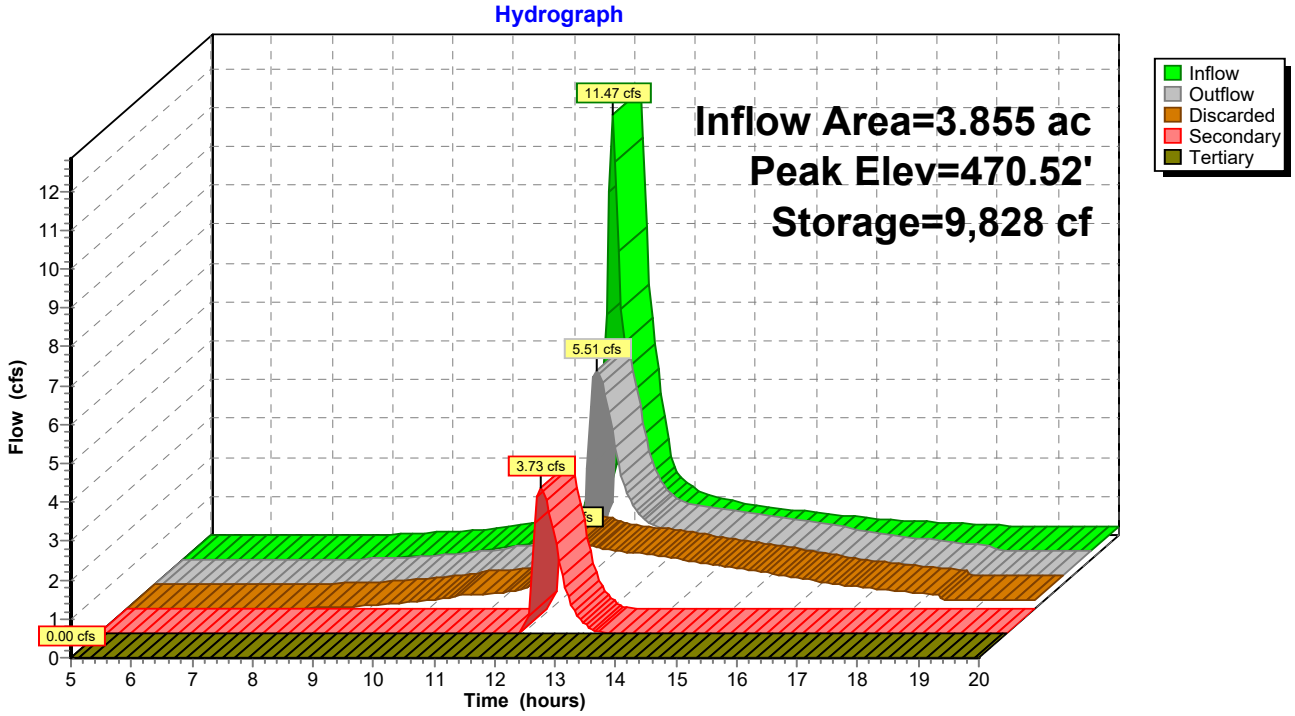
Device	Routing	Invert	Outlet Devices
#1	Discarded	466.00'	**20.000 in/hr Exfiltration over Surface area**
#2	Secondary	469.60'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.60' / 469.00' S= 0.0240 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#3	Tertiary	471.75'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=1.79 cfs @ 12.31 hrs HW=470.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.79 cfs)

Secondary OutFlow Max=3.70 cfs @ 12.31 hrs HW=470.52' (Free Discharge)
└**2=Culvert** (Inlet Controls 3.70 cfs @ 3.26 fps)

Tertiary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin



Summary for Pond 3P: BIORETENTION #1

Inflow Area = 1.571 ac, 49.46% Impervious, Inflow Depth > 2.95" for 10-YEAR event
Inflow = 5.60 cfs @ 12.09 hrs, Volume= 0.387 af
Outflow = 0.35 cfs @ 11.60 hrs, Volume= 0.275 af, Atten= 94%, Lag= 0.0 min
Primary = 0.35 cfs @ 11.60 hrs, Volume= 0.275 af
Routed to Link 2 : AP-02
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 578.44' @ 13.95 hrs Surf.Area= 7,486 sf Storage= 8,789 cf

Plug-Flow detention time= 200.6 min calculated for 0.274 af (71% of inflow)
Center-of-Mass det. time= 136.1 min (910.9 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	8,334 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	575.50'	10,480 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 26,201 cf Overall x 40.0% Voids
		18,814 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
579.00	7,486	561.0	0	0	7,486
580.00	9,212	587.0	8,334	8,334	9,930

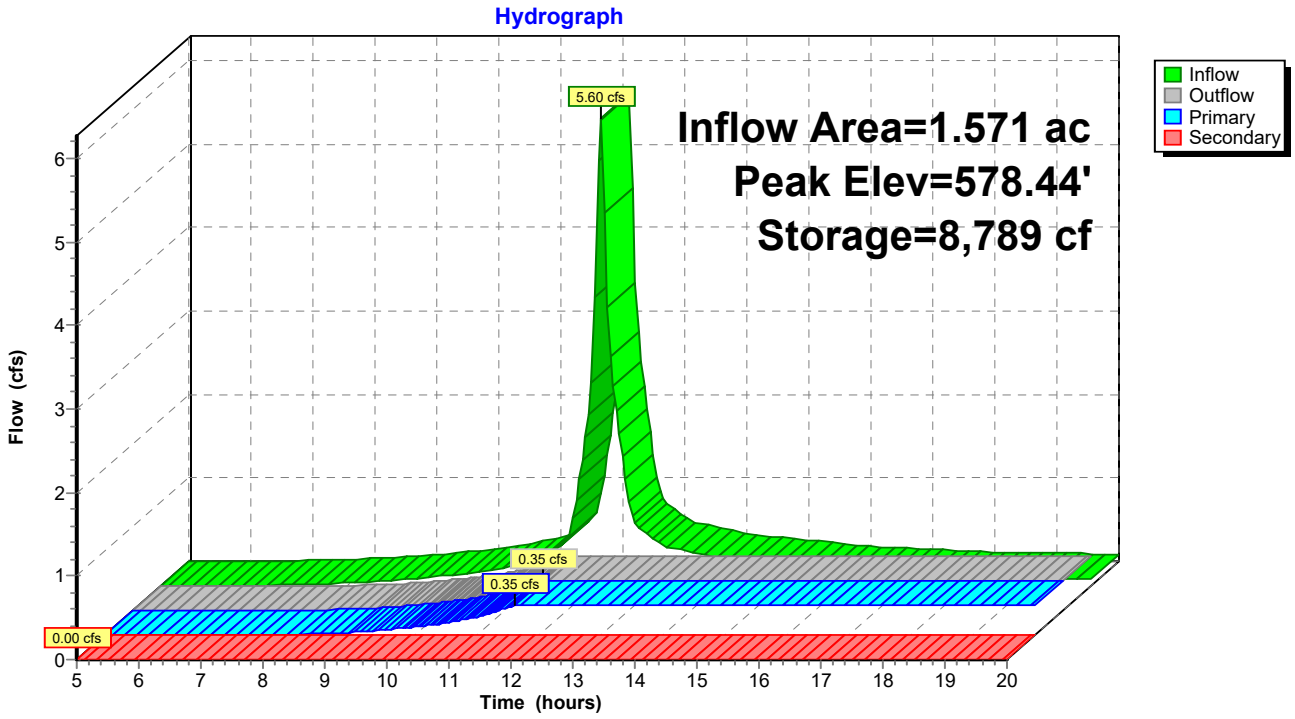
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
575.50	7,486	561.0	0	0	7,486
579.00	7,486	561.0	26,201	26,201	9,450

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.50'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	575.50'	**12.0" Round Culvert** L= 25.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.50' / 575.00' S= 0.0200 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	579.20'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	579.80'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.35 cfs @ 11.60 hrs HW=575.82' (Free Discharge)
└─**2=Culvert** (Passes 0.35 cfs of 0.42 cfs potential flow)
  └─**1=Exfiltration** (Exfiltration Controls 0.35 cfs)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=575.50' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 3P: BIORETENTION #1

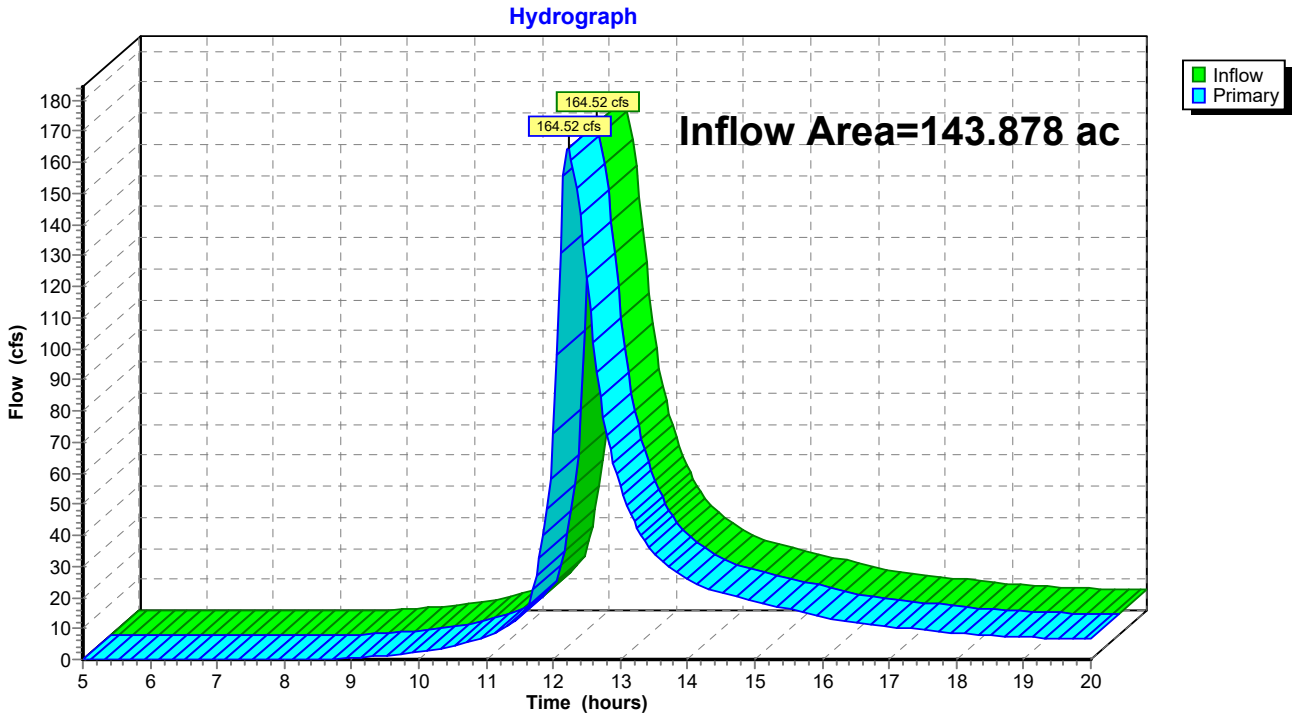


Summary for Link 1: AP-01

Inflow Area = 143.878 ac, 7.69% Impervious, Inflow Depth > 1.72" for 10-YEAR event
Inflow = 164.52 cfs @ 12.22 hrs, Volume= 20.585 af
Primary = 164.52 cfs @ 12.22 hrs, Volume= 20.585 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01

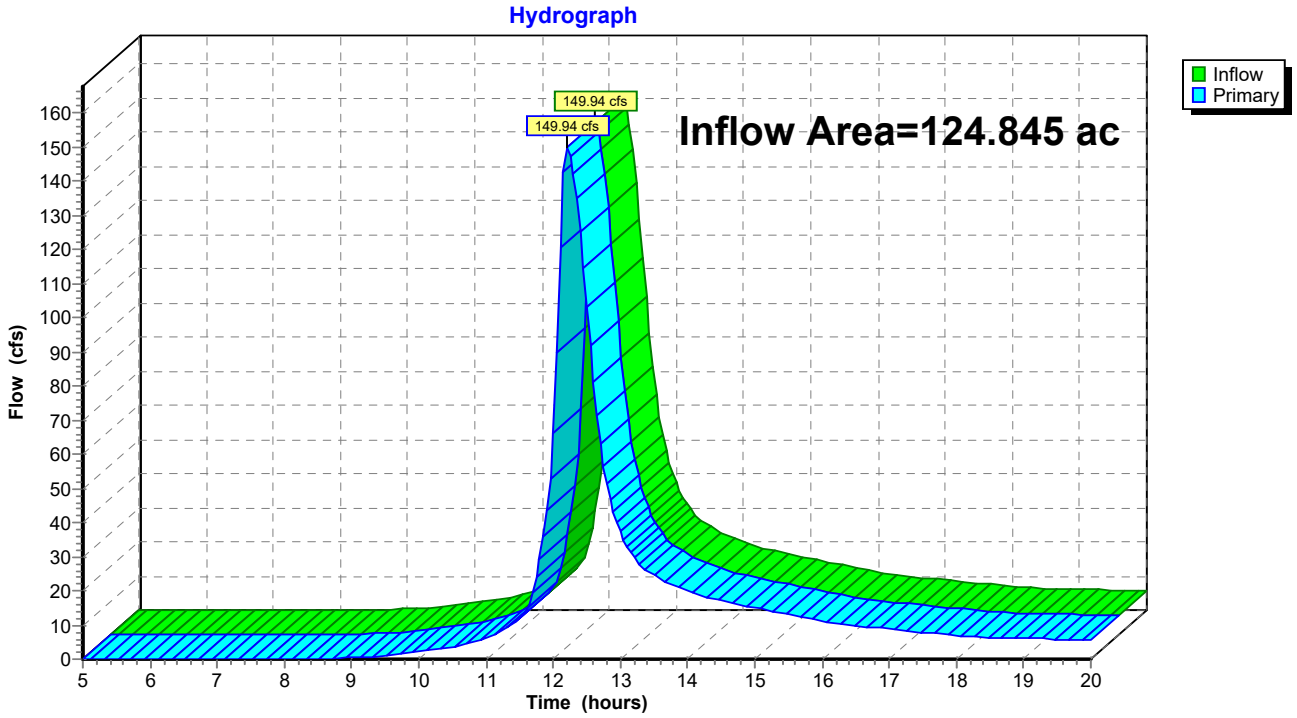


Summary for Link 2: AP-02

Inflow Area = 124.845 ac, 8.07% Impervious, Inflow Depth > 1.62" for 10-YEAR event
Inflow = 149.94 cfs @ 12.21 hrs, Volume= 16.821 af
Primary = 149.94 cfs @ 12.21 hrs, Volume= 16.821 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

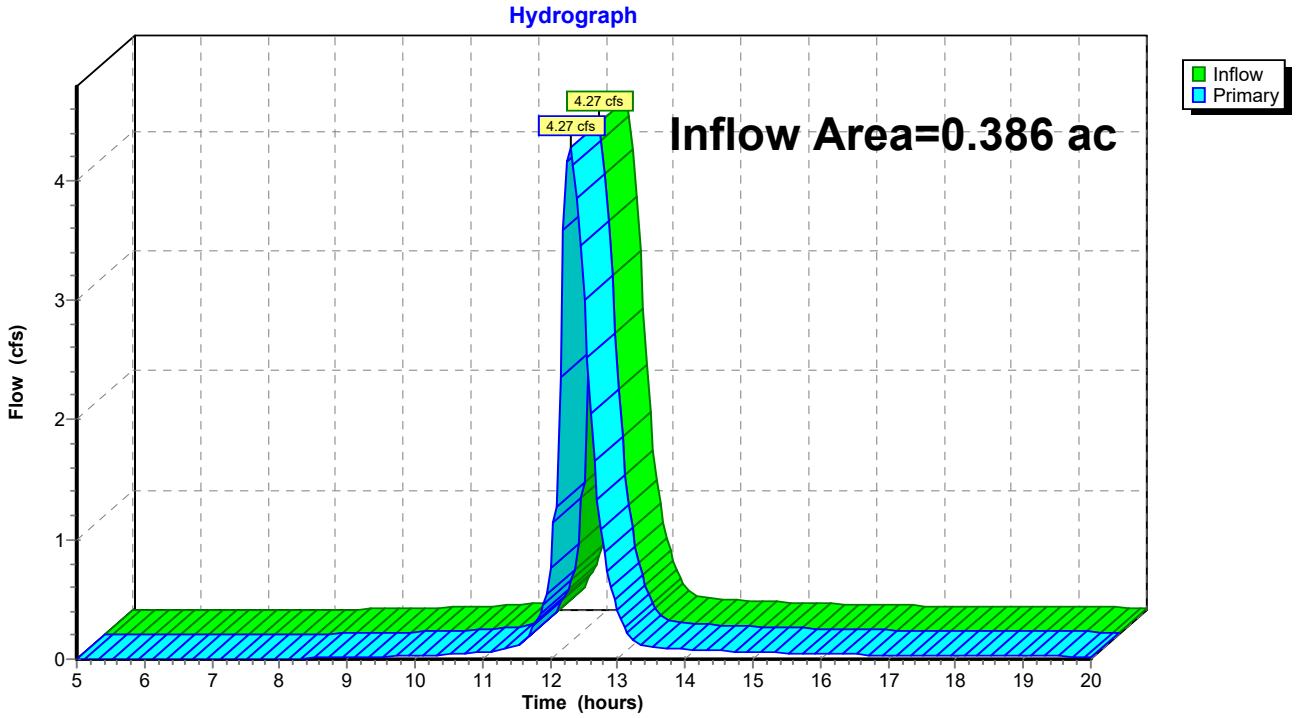


Summary for Link 3: AP-3

Inflow Area = 0.386 ac, 17.36% Impervious, Inflow Depth > 7.19" for 10-YEAR event
Inflow = 4.27 cfs @ 12.30 hrs, Volume= 0.231 af
Primary = 4.27 cfs @ 12.30 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



PROPOSED - MARLBOROUGH RESORT *Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"*

Prepared by Passero Associates

Printed 10/24/2024

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-01: PDA-01 Runoff Area=23.452 ac 0.84% Impervious Runoff Depth>1.16"
Flow Length=845' Tc=44.5 min CN=50 Runoff=14.07 cfs 2.262 af

Subcatchment P-02: PDA-02 Runoff Area=6.449 ac 4.19% Impervious Runoff Depth>0.76"
Flow Length=615' Tc=26.4 min CN=44 Runoff=2.68 cfs 0.407 af

Subcatchment P-03: PDA-03 Runoff Area=7.441 ac 43.81% Impervious Runoff Depth>2.96"
Tc=6.0 min CN=71 Runoff=27.27 cfs 1.838 af

Subcatchment P-04: PDA-04 Runoff Area=6.960 ac 24.57% Impervious Runoff Depth>2.86"
Flow Length=260' Tc=13.8 min CN=70 Runoff=19.49 cfs 1.660 af

Subcatchment P-05: PDA-05 Runoff Area=21.410 ac 2.38% Impervious Runoff Depth>3.04"
Flow Length=1,066' Tc=20.1 min CN=72 Runoff=55.21 cfs 5.432 af

Subcatchment P-06: PDA-06 Runoff Area=5.701 ac 7.40% Impervious Runoff Depth>2.57"
Flow Length=1,015' Tc=26.3 min CN=67 Runoff=11.08 cfs 1.221 af

Subcatchment P-07: PDA-07 Runoff Area=11.289 ac 16.91% Impervious Runoff Depth>3.33"
Flow Length=823' Tc=26.0 min CN=75 Runoff=28.61 cfs 3.131 af

Subcatchment P-08: PDA-08 Runoff Area=17.483 ac 8.85% Impervious Runoff Depth>3.53"
Flow Length=958' Tc=21.5 min CN=77 Runoff=50.75 cfs 5.146 af

Subcatchment P-09: PDA-09 Runoff Area=30.530 ac 8.94% Impervious Runoff Depth>3.65"
Flow Length=128' Tc=10.2 min CN=78 Runoff=119.62 cfs 9.275 af

Subcatchment P-10: PDA-10 Runoff Area=16.521 ac 5.14% Impervious Runoff Depth>3.69"
Flow Length=916' Tc=58.0 min CN=79 Runoff=31.07 cfs 5.078 af

Subcatchment P-11: PDA-11 Runoff Area=2.126 ac 3.76% Impervious Runoff Depth>3.55"
Flow Length=685' Tc=10.1 min CN=77 Runoff=8.14 cfs 0.628 af

Subcatchment P-12: PDA-12 Runoff Area=3.855 ac 30.09% Impervious Runoff Depth>3.96"
Flow Length=812' Tc=7.2 min CN=81 Runoff=17.89 cfs 1.271 af

Subcatchment P-13: Upper Restaurant Area Runoff Area=1.571 ac 49.46% Impervious Runoff Depth>4.49"
Tc=6.0 min CN=86 Runoff=8.33 cfs 0.587 af

Subcatchment P-14: P-14 Runoff Area=0.386 ac 17.36% Impervious Runoff Depth>4.17"
Tc=6.0 min CN=83 Runoff=1.93 cfs 0.134 af

Pond 1P: Porous Pavement Peak Elev=404.32' Storage=5,589 cf Inflow=27.27 cfs 1.838 af
Discarded=15.22 cfs 1.838 af Secondary=0.00 cfs 0.000 af Outflow=15.22 cfs 1.838 af

Pond 2P: Infiltration Basin Peak Elev=471.36' Storage=13,362 cf Inflow=17.89 cfs 1.271 af
Discarded=2.13 cfs 0.864 af Secondary=8.54 cfs 0.405 af Tertiary=0.00 cfs 0.000 af Outflow=10.68 cfs 1.269 af

Pond 3P: BIORETENTION#1 Peak Elev=579.25' Storage=12,436 cf Inflow=8.33 cfs 0.587 af
Primary=1.06 cfs 0.410 af Secondary=0.00 cfs 0.000 af Outflow=1.06 cfs 0.410 af

Link 1: AP-01 Inflow=281.66 cfs 35.189 af
Primary=281.66 cfs 35.189 af

Link 2: AP-02 Inflow=253.98 cfs 28.944 af
Primary=253.98 cfs 28.944 af

Link 3: AP-3 Inflow=9.62 cfs 0.539 af
Primary=9.62 cfs 0.539 af

Total Runoff Area = 155.174 ac Runoff Volume = 38.070 af Average Runoff Depth = 2.94"
90.02% Pervious = 139.684 ac 9.98% Impervious = 15.490 ac

Summary for Subcatchment P-01: PDA-01

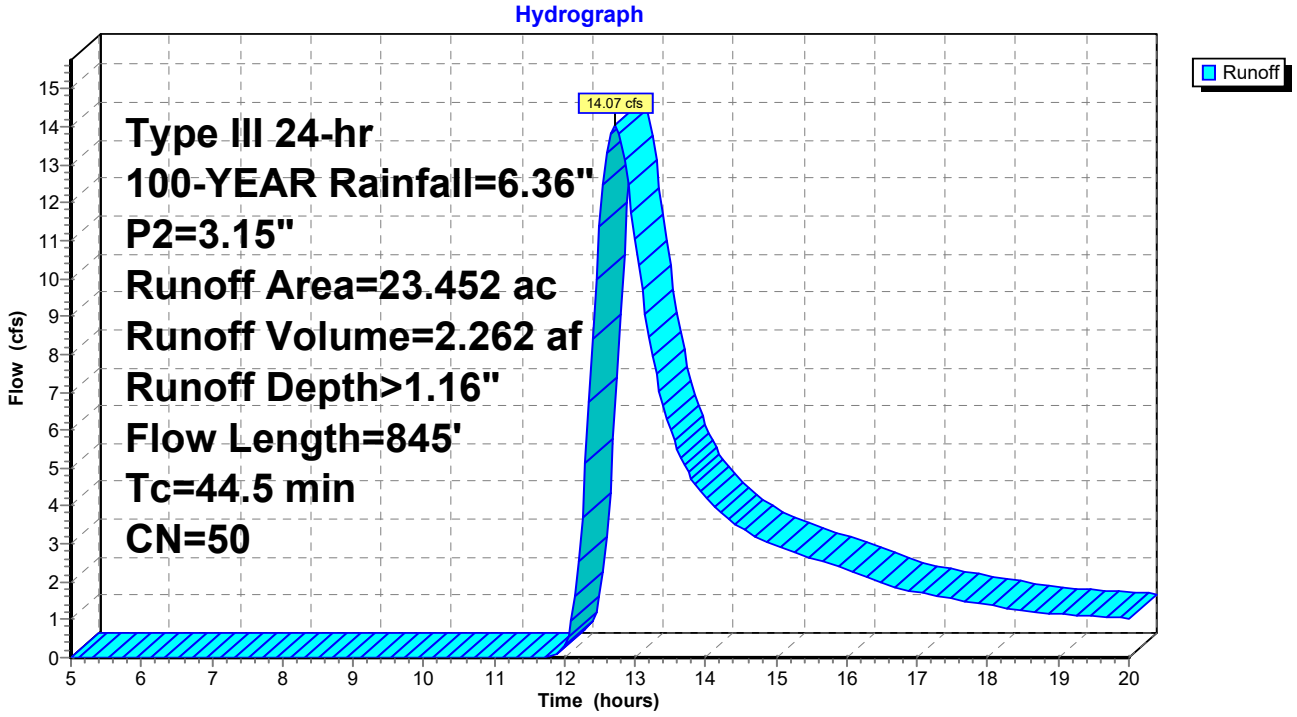
Runoff = 14.07 cfs @ 12.71 hrs, Volume= 2.262 af, Depth> 1.16"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

Area (ac)	CN	Description
12.804	30	Woods, Good, HSG A
0.198	98	Paved parking, HSG A
1.840	55	Woods, Good, HSG B
8.610	77	Woods, Good, HSG D
23.452	50	Weighted Average
23.254		99.16% Pervious Area
0.198		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment P-01: PDA-01



Summary for Subcatchment P-02: PDA-02

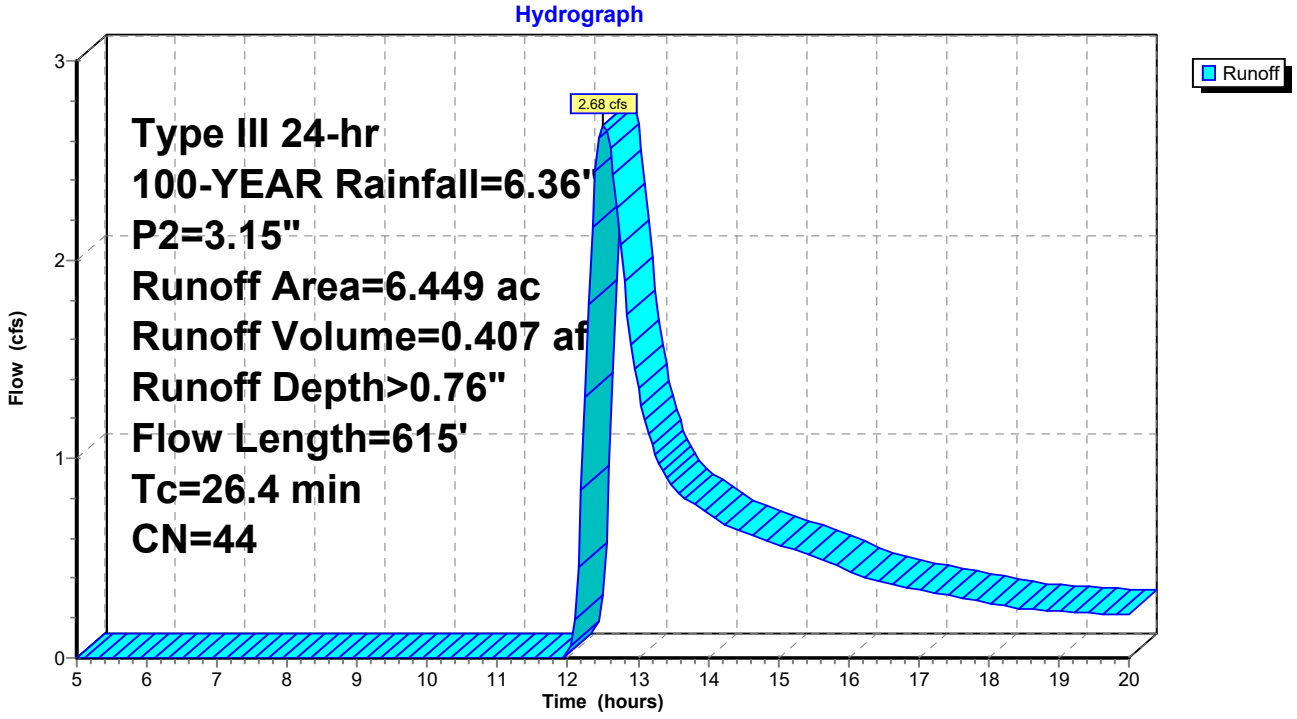
Runoff = 2.68 cfs @ 12.51 hrs, Volume= 0.407 af, Depth> 0.76"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	4.980	32	Woods/grass comb., Good, HSG A
*	0.270	98	IMP A
	1.199	79	Woods/grass comb., Good, HSG D
	6.449	44	Weighted Average
	6.179		95.81% Pervious Area
	0.270		4.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0900	0.14		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.15"
14.5	515	0.0140	0.59		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.4	615	Total			

Subcatchment P-02: PDA-02



Summary for Subcatchment P-03: PDA-03

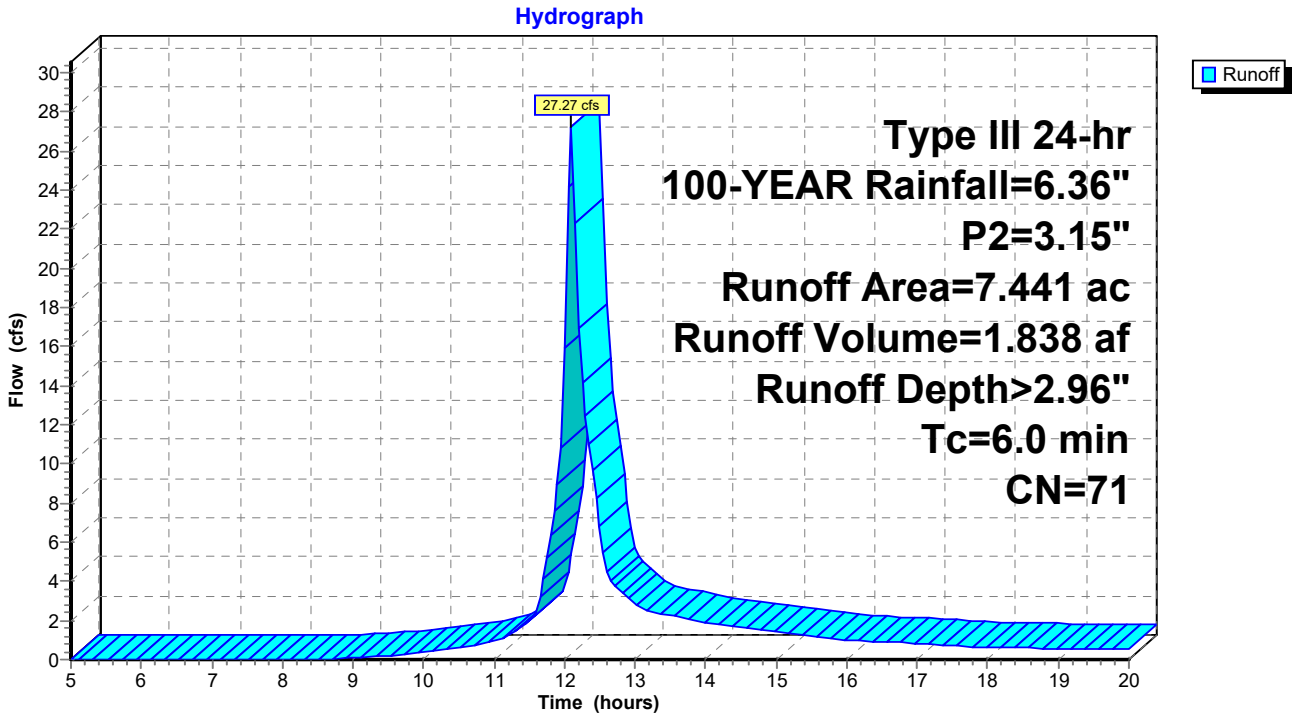
Runoff = 27.27 cfs @ 12.09 hrs, Volume= 1.838 af, Depth> 2.96"
Routed to Pond 1P : Porous Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	2.800	39	>75% Grass cover, Good, HSG A
*	3.240	98	IMP A
	0.590	61	>75% Grass cover, Good, HSG B
*	0.010	98	IMP B
	0.791	80	>75% Grass cover, Good, HSG D
*	0.010	98	IMP D
	7.441	71	Weighted Average
	4.181		56.19% Pervious Area
	3.260		43.81% Impervious Area

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

Subcatchment P-03: PDA-03



Summary for Subcatchment P-04: PDA-04

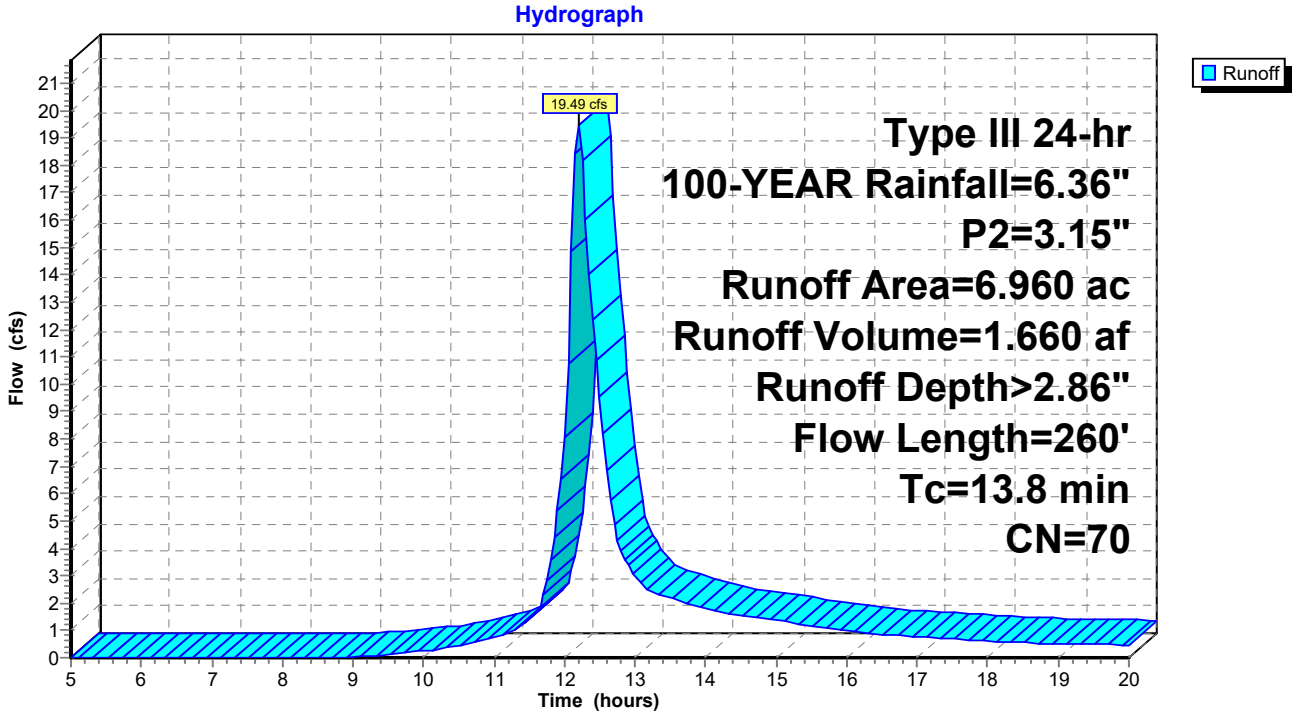
Runoff = 19.49 cfs @ 12.20 hrs, Volume= 1.660 af, Depth> 2.86"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	1.600	39	>75% Grass cover, Good, HSG A
*	1.590	98	IMP A
	1.830	61	>75% Grass cover, Good, HSG B
*	0.060	98	IMP B
	1.820	80	>75% Grass cover, Good, HSG D
*	0.060	98	IMP D
	6.960	70	Weighted Average
	5.250		75.43% Pervious Area
	1.710		24.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.8	160	0.0438	3.14		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
13.8	260	Total			

Subcatchment P-04: PDA-04



Summary for Subcatchment P-05: PDA-05

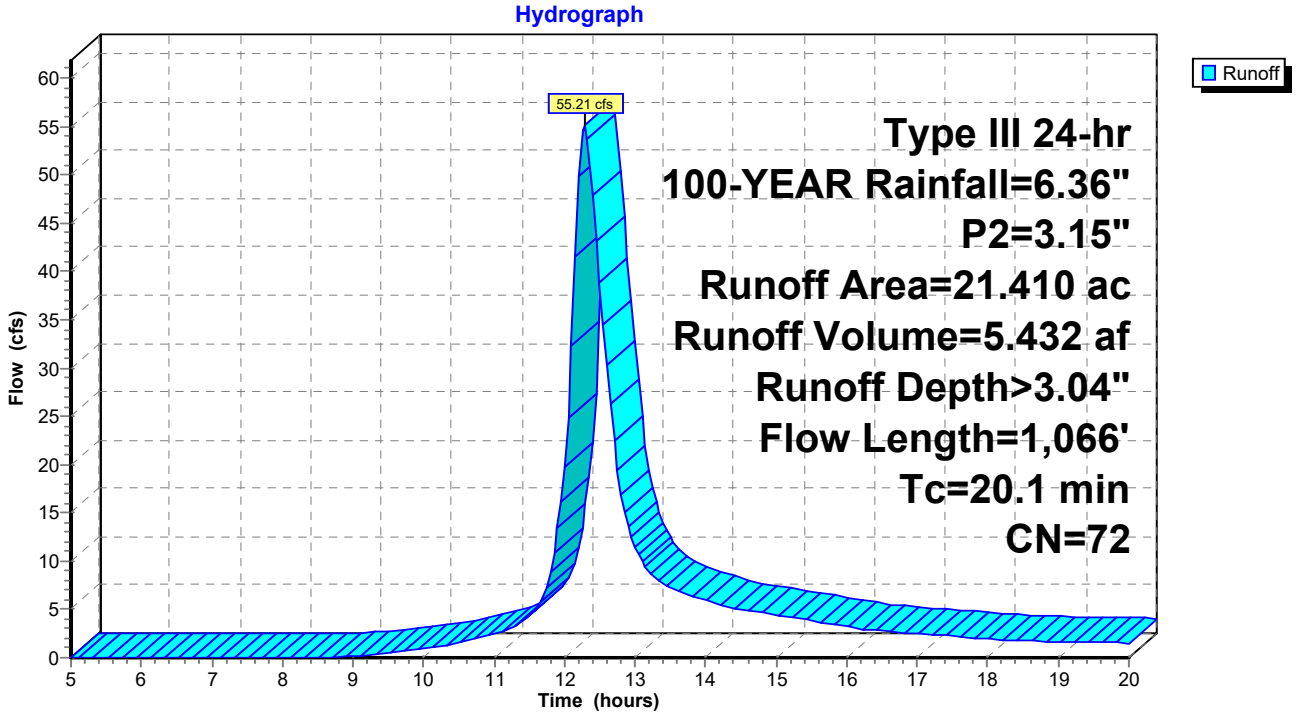
Runoff = 55.21 cfs @ 12.28 hrs, Volume= 5.432 af, Depth> 3.04"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	0.290	30	Woods, Good, HSG A
	1.630	55	Woods, Good, HSG B
*	0.030	98	IMP B
	11.470	70	Woods, Good, HSG C
*	0.270	98	IMP C
	7.510	79	Woods, Fair, HSG D
*	0.210	98	IMP D
	21.410	72	Weighted Average
	20.900		97.62% Pervious Area
	0.510		2.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.5	966	0.1160	1.70		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
20.1	1,066	Total			

Subcatchment P-05: PDA-05



Summary for Subcatchment P-06: PDA-06

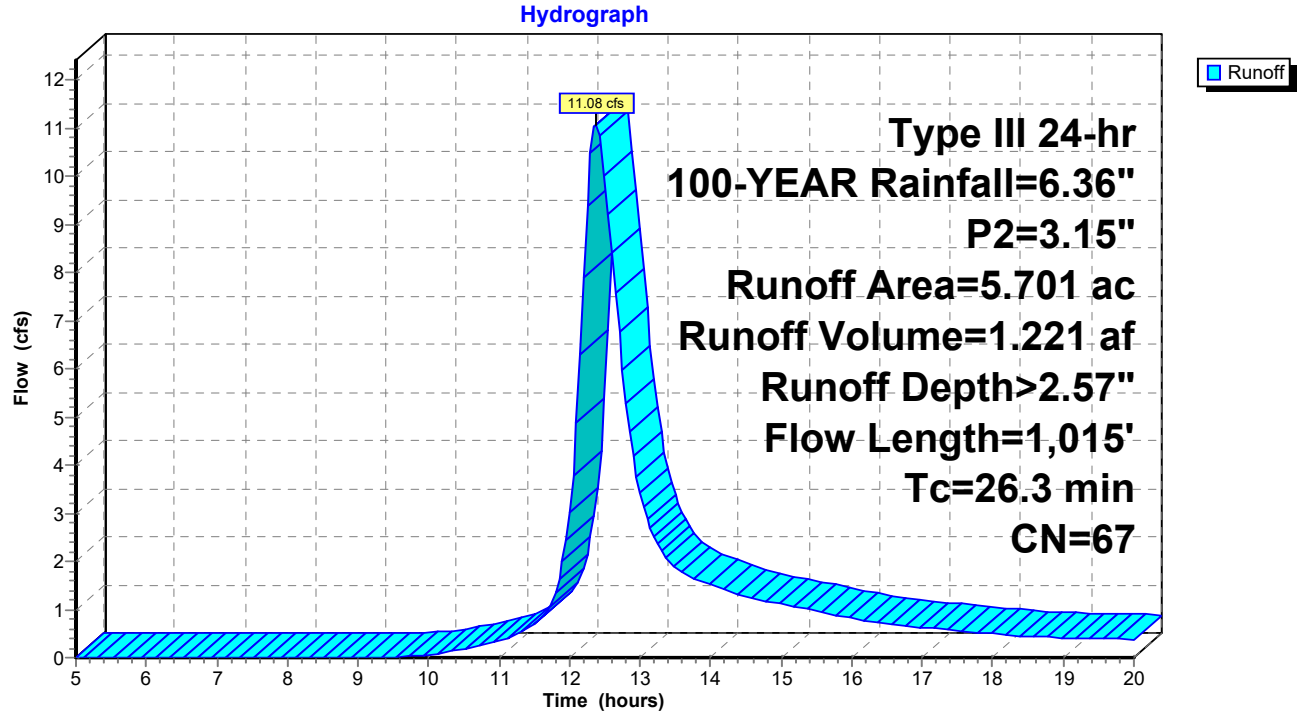
Runoff = 11.08 cfs @ 12.38 hrs, Volume= 1.221 af, Depth> 2.57"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	2.370	55	Woods, Good, HSG B
	2.179	70	Woods, Good, HSG C
*	0.422	98	IMP C
	0.730	79	Woods, Fair, HSG D
	5.701	67	Weighted Average
	5.279		92.60% Pervious Area
	0.422		7.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	100	0.0400	0.10		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.9	915	0.0950	1.54		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
26.3	1,015	Total			

Subcatchment P-06: PDA-06



Summary for Subcatchment P-07: PDA-07

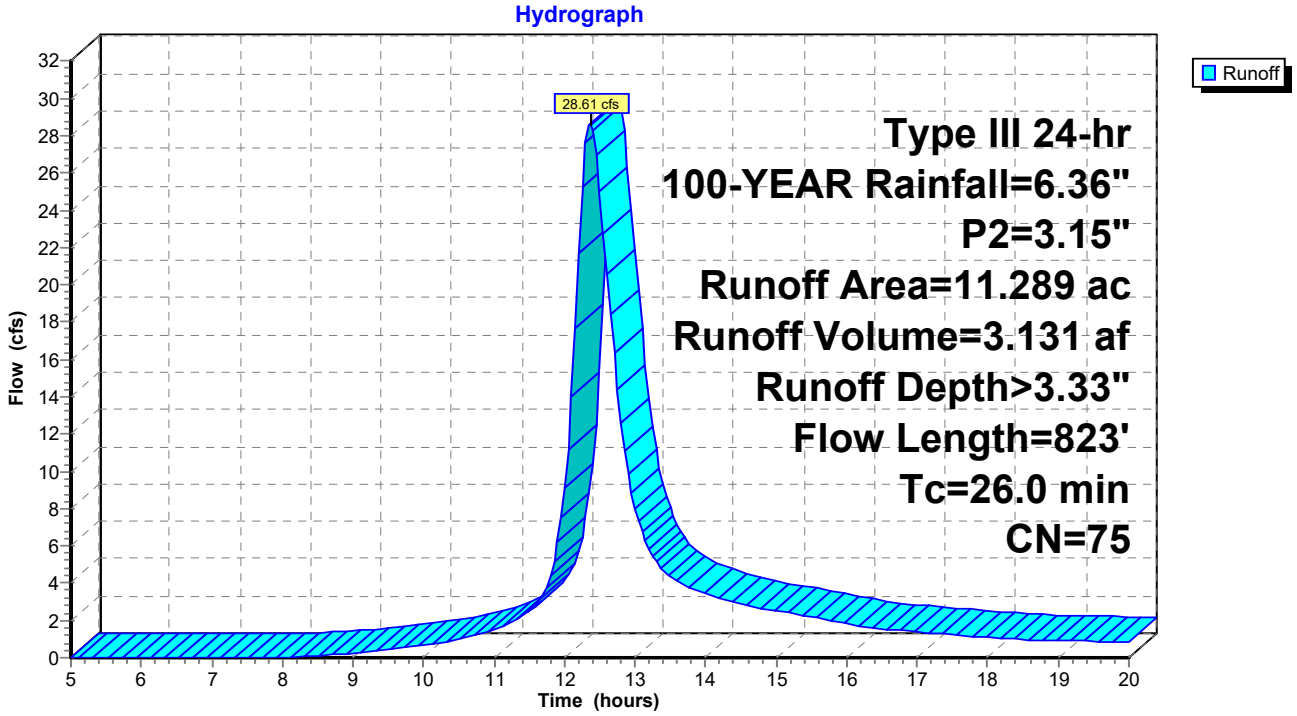
Runoff = 28.61 cfs @ 12.36 hrs, Volume= 3.131 af, Depth> 3.33"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	1.170	55	Woods, Good, HSG B
*	0.070	98	IMP B
	5.820	70	Woods, Good, HSG C
*	1.475	98	IMP C
	2.390	77	Woods, Good, HSG D
*	0.364	98	IMP D
	11.289	75	Weighted Average
	9.380		83.09% Pervious Area
	1.909		16.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	100	0.0300	0.09		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	723	0.1000	1.58		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.0	823	Total			

Subcatchment P-07: PDA-07



Summary for Subcatchment P-08: PDA-08

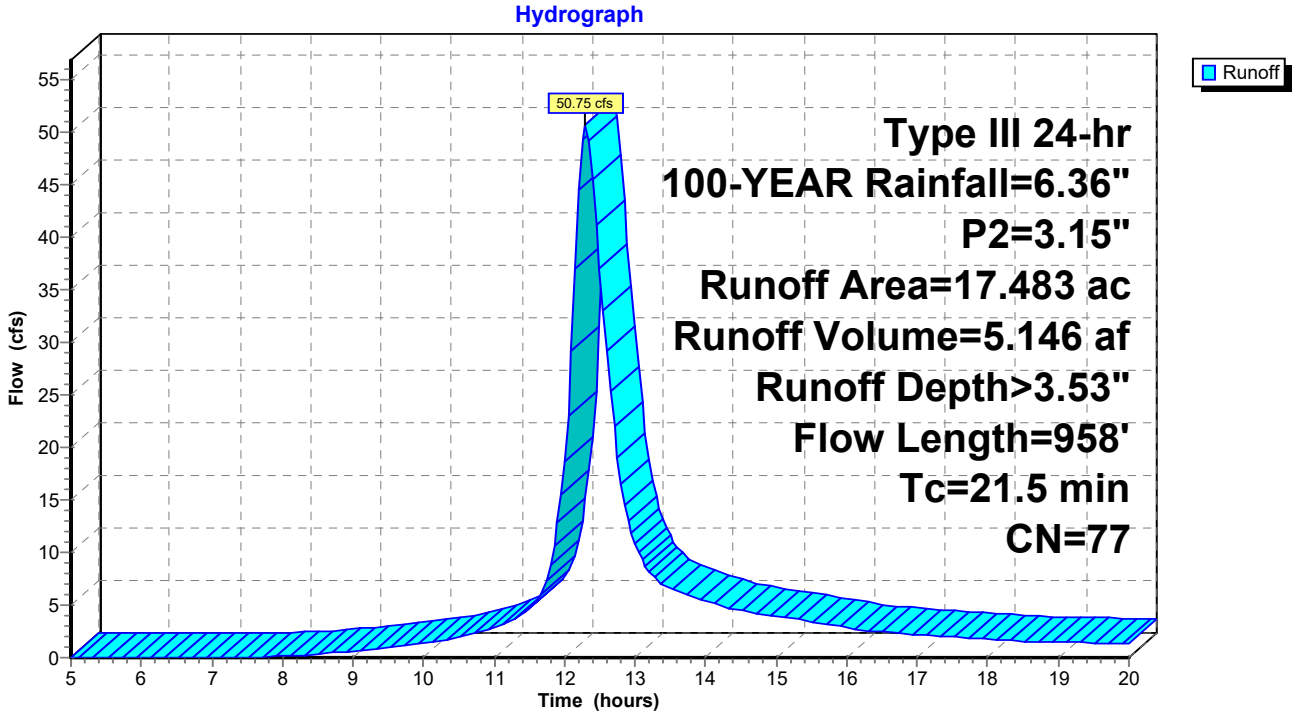
Runoff = 50.75 cfs @ 12.30 hrs, Volume= 5.146 af, Depth> 3.53"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	14.026	74	>75% Grass cover, Good, HSG C
*	1.347	98	IMP C
	1.910	80	>75% Grass cover, Good, HSG D
*	0.200	98	IMP D
	17.483	77	Weighted Average
	15.936		91.15% Pervious Area
	1.547		8.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0600	0.12		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	858	0.1420	1.88		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
21.5	958	Total			

Subcatchment P-08: PDA-08



Summary for Subcatchment P-09: PDA-09

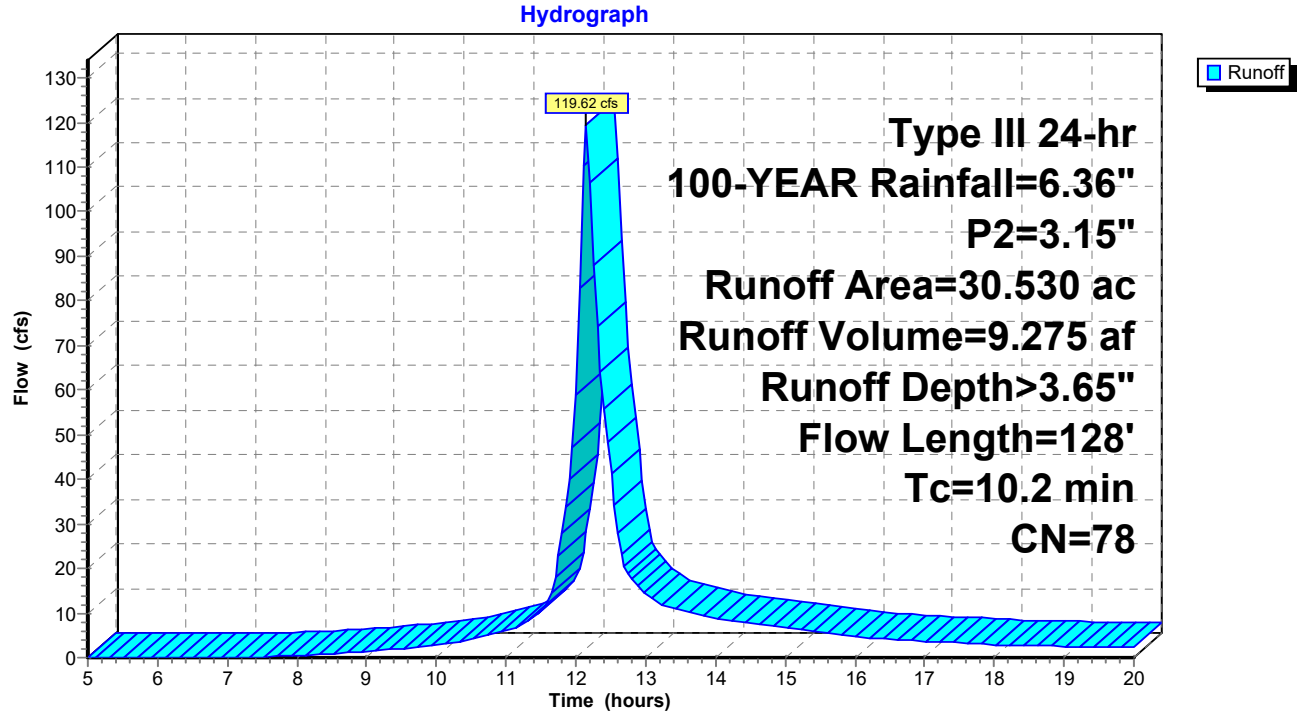
Runoff = 119.62 cfs @ 12.15 hrs, Volume= 9.275 af, Depth> 3.65"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	18.399	74	>75% Grass cover, Good, HSG C
*	2.190	98	IMP C
	9.401	80	>75% Grass cover, Good, HSG D
*	0.540	98	IMP D
	30.530	78	Weighted Average
	27.800		91.06% Pervious Area
	2.730		8.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0200	0.17		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.3	28	0.0482	1.50		**Sheet Flow, FLOW 2** Smooth surfaces n= 0.011 P2= 3.15"
10.2	128	Total			

Subcatchment P-09: PDA-09



Summary for Subcatchment P-10: PDA-10

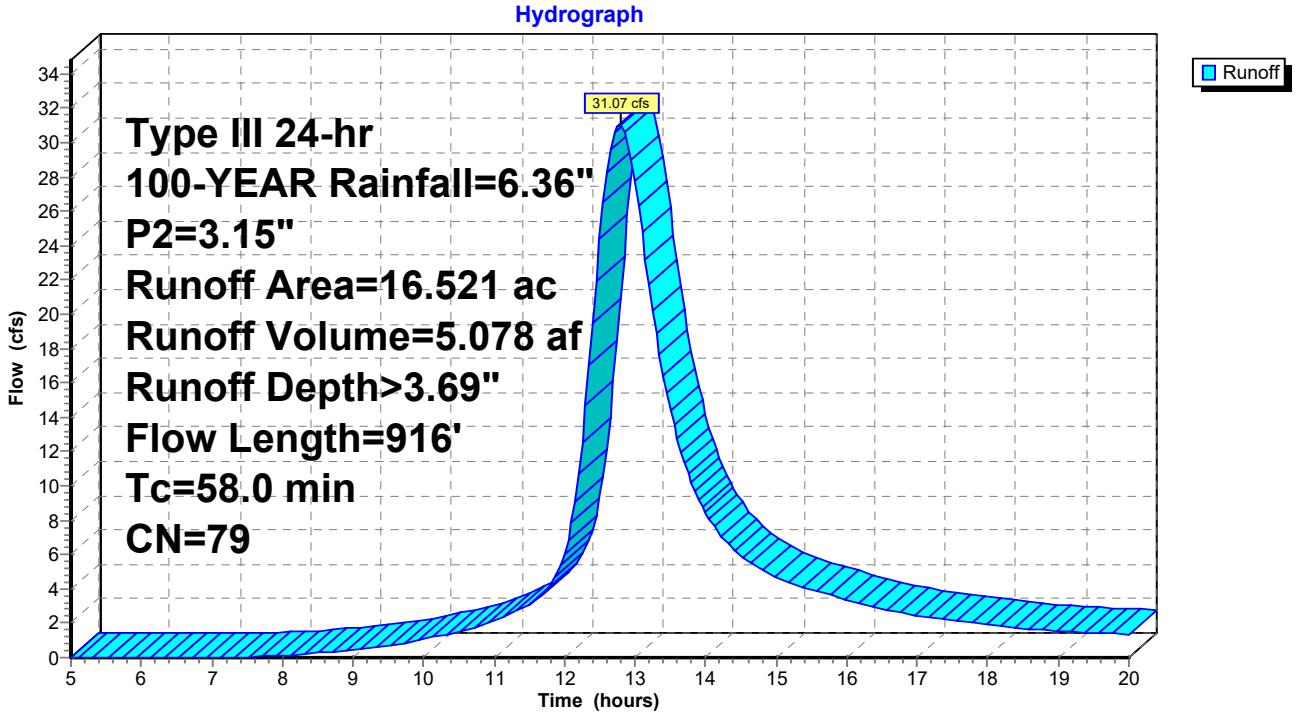
Runoff = 31.07 cfs @ 12.78 hrs, Volume= 5.078 af, Depth> 3.69"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	4.651	74	>75% Grass cover, Good, HSG C
*	0.280	98	IMP C
	11.020	80	>75% Grass cover, Good, HSG D
*	0.570	98	IMP D
	16.521	79	Weighted Average
	15.671		94.86% Pervious Area
	0.850		5.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
45.0	816	0.0300	0.30		**Sheet Flow, FLOW 2** Grass: Short n= 0.150 P2= 3.15"
58.0	916	Total			

Subcatchment P-10: PDA-10



Summary for Subcatchment P-11: PDA-11

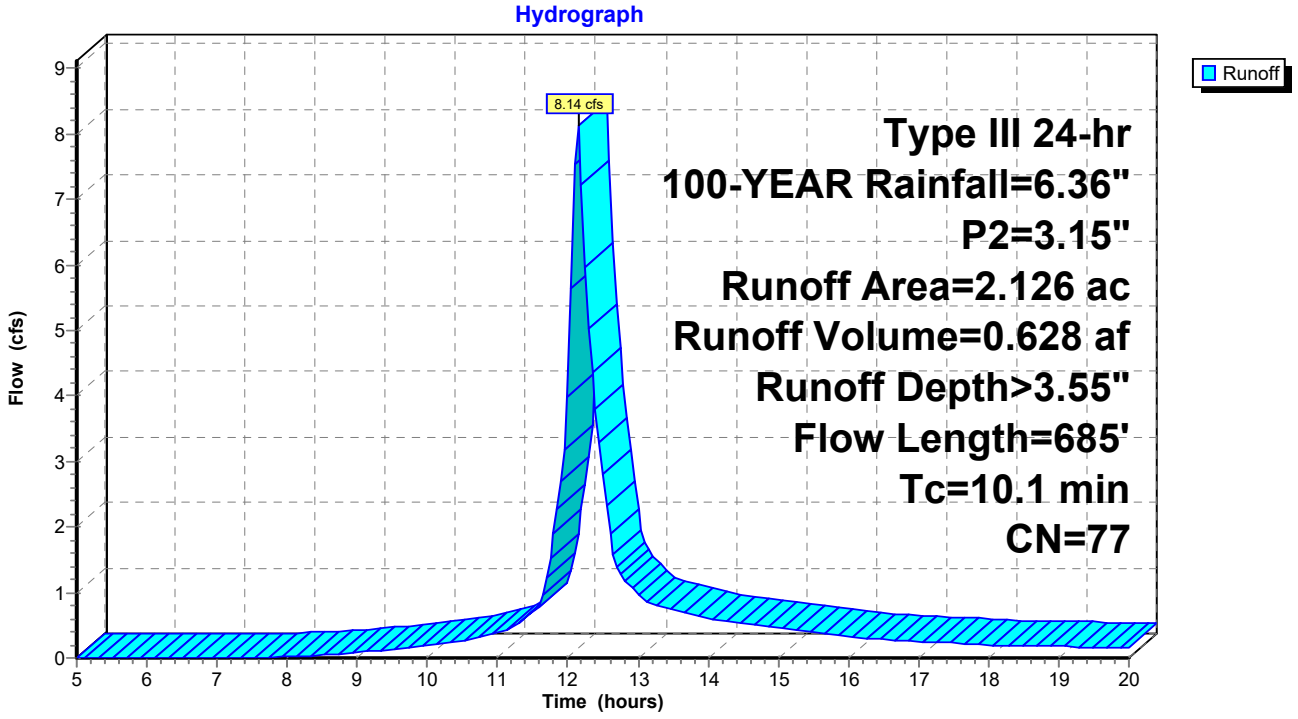
Runoff = 8.14 cfs @ 12.14 hrs, Volume= 0.628 af, Depth> 3.55"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	1.306	74	>75% Grass cover, Good, HSG C
	0.740	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	2.126	77	Weighted Average
	2.046		96.24% Pervious Area
	0.080		3.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.2	585	0.0900	4.50		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
10.1	685	Total			

Subcatchment P-11: PDA-11



Summary for Subcatchment P-12: PDA-12

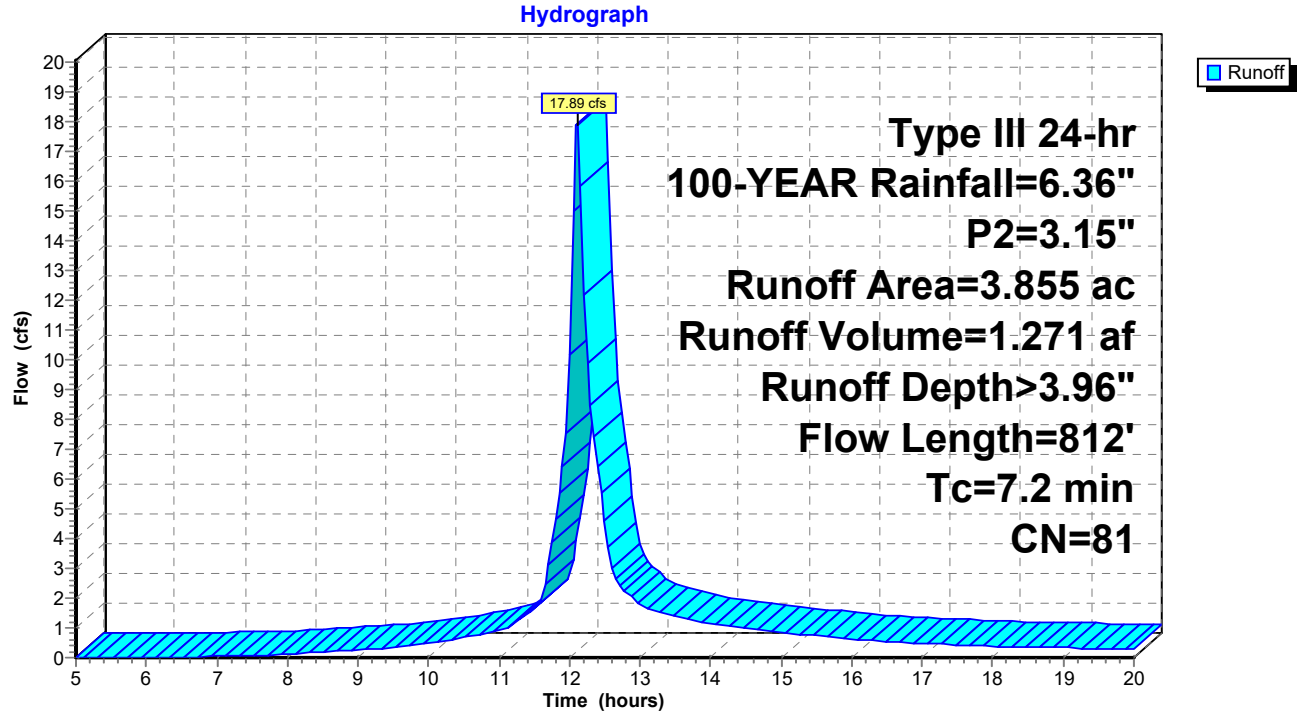
Runoff = 17.89 cfs @ 12.10 hrs, Volume= 1.271 af, Depth> 3.96"
Routed to Pond 2P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	2.525	74	>75% Grass cover, Good, HSG C
*	1.080	98	IMP C
	0.170	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	3.855	81	Weighted Average
	2.695		69.91% Pervious Area
	1.160		30.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.5	712	0.1010	4.77		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
7.2	812	Total			

Subcatchment P-12: PDA-12



Summary for Subcatchment P-13: Upper Restaurant Area

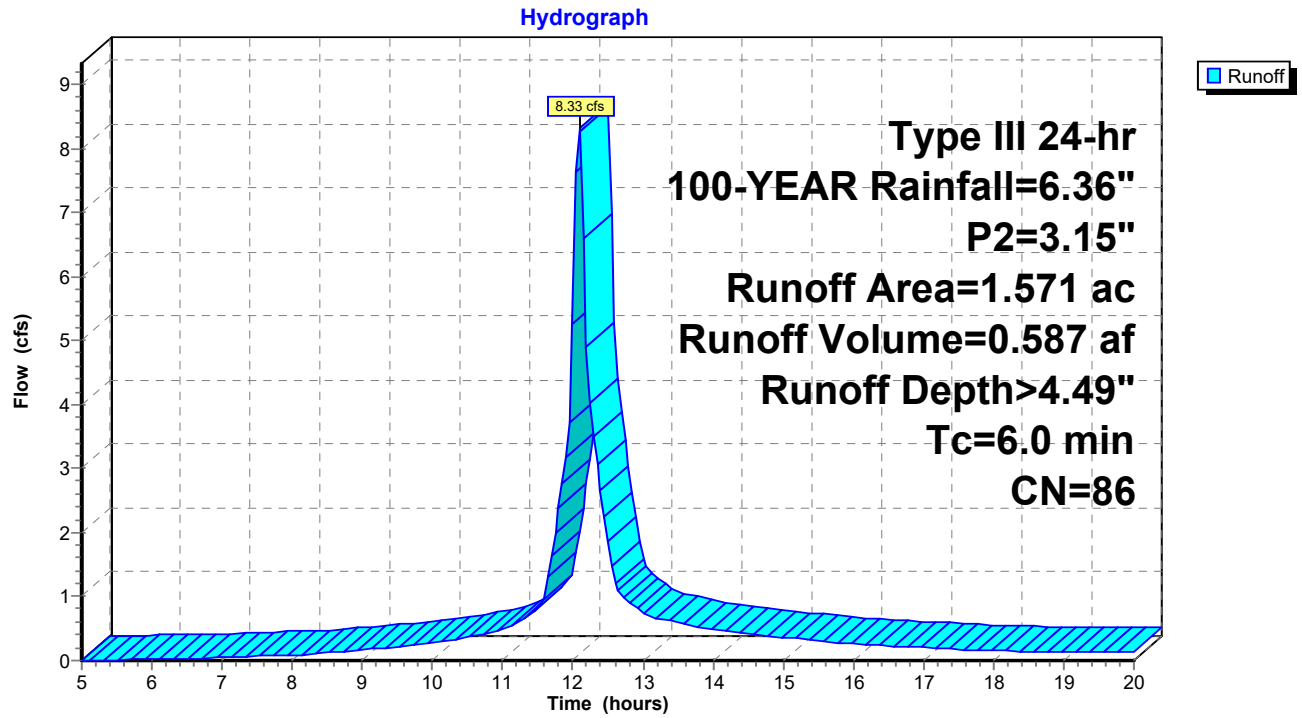
Runoff = 8.33 cfs @ 12.09 hrs, Volume= 0.587 af, Depth> 4.49"
Routed to Pond 3P : BIORETENTION #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	0.794	74	>75% Grass cover, Good, HSG C
*	0.777	98	IMP C
	1.571	86	Weighted Average
	0.794		50.54% Pervious Area
	0.777		49.46% Impervious Area

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

Subcatchment P-13: Upper Restaurant Area



Summary for Subcatchment P-14: P-14

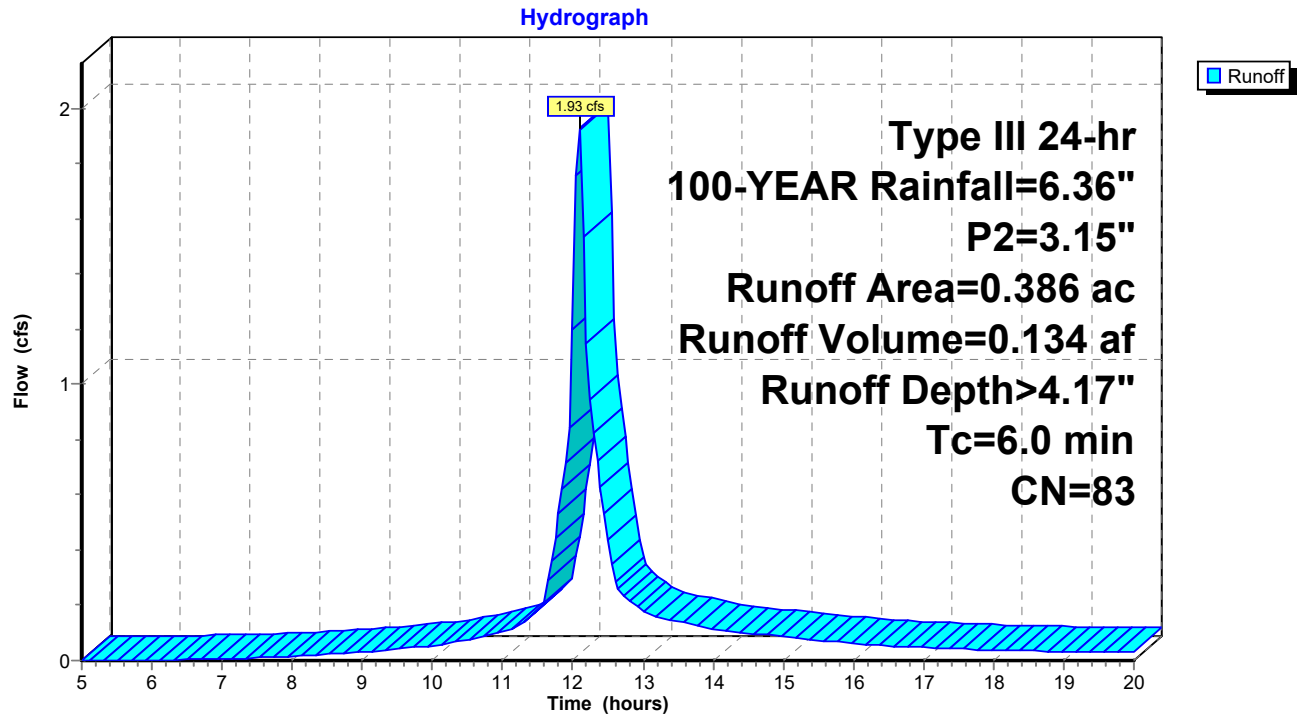
Runoff = 1.93 cfs @ 12.09 hrs, Volume= 0.134 af, Depth> 4.17"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.36", P2=3.15"

	Area (ac)	CN	Description
	0.319	80	>75% Grass cover, Good, HSG D
*	0.067	98	IMP D
	0.386	83	Weighted Average
	0.319		82.64% Pervious Area
	0.067		17.36% Impervious Area

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

Subcatchment P-14: P-14



Summary for Pond 1P: Porous Pavement

Inflow Area = 7.441 ac, 43.81% Impervious, Inflow Depth > 2.96" for 100-YEAR event
Inflow = 27.27 cfs @ 12.09 hrs, Volume= 1.838 af
Outflow = 15.22 cfs @ 12.00 hrs, Volume= 1.838 af, Atten= 44%, Lag= 0.0 min
Discarded = 15.22 cfs @ 12.00 hrs, Volume= 1.838 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 404.32' @ 12.23 hrs Surf.Area= 43,838 sf Storage= 5,589 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.5 min (797.6 - 796.1)

Volume	Invert	Avail.Storage	Storage Description
#1	404.00'	17,535 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 43,838 cf Overall x 40.0% Voids

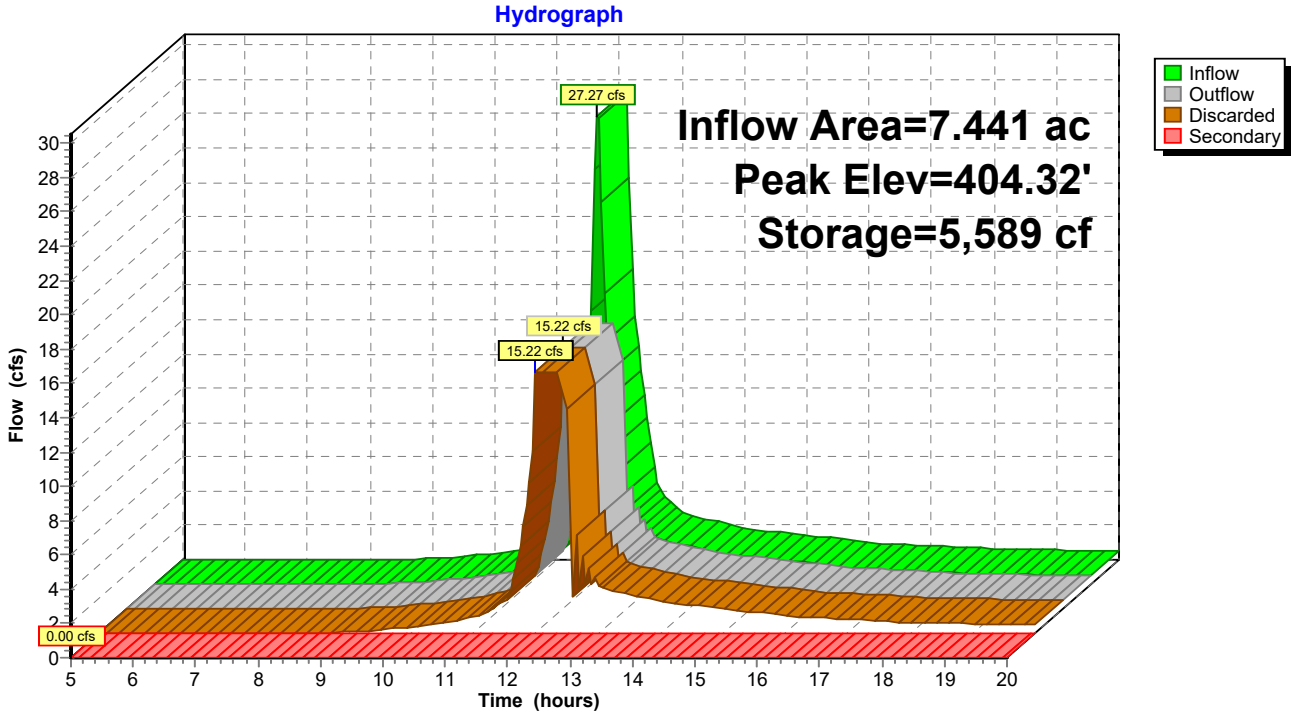
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.00	43,838	0	0
405.00	43,838	43,838	43,838

Device	Routing	Invert	Outlet Devices
#1	Discarded	404.00'	**15.000 in/hr Exfiltration over Surface area**
#2	Secondary	404.35'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 404.35' / 403.85' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=15.22 cfs @ 12.00 hrs HW=404.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 15.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=404.00' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Pond 1P: Porous Pavement



Summary for Pond 2P: Infiltration Basin

Inflow Area = 3.855 ac, 30.09% Impervious, Inflow Depth > 3.96" for 100-YEAR event
Inflow = 17.89 cfs @ 12.10 hrs, Volume= 1.271 af
Outflow = 10.68 cfs @ 12.24 hrs, Volume= 1.269 af, Atten= 40%, Lag= 7.9 min
Discarded = 2.13 cfs @ 12.24 hrs, Volume= 0.864 af
Secondary = 8.54 cfs @ 12.24 hrs, Volume= 0.405 af
Routed to Link 3 : AP-3
Tertiary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 471.36' @ 12.24 hrs Surf.Area= 4,607 sf Storage= 13,362 cf

Plug-Flow detention time= 40.3 min calculated for 1.265 af (100% of inflow)
Center-of-Mass det. time= 39.5 min (817.1 - 777.5)

Volume	Invert	Avail.Storage	Storage Description
#1	466.00'	16,515 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)
466.00	746	213.0	0	0	746
468.00	1,960	264.0	2,610	2,610	2,740
470.00	3,425	318.0	5,317	7,927	5,308
472.00	5,226	391.0	8,588	16,515	9,487

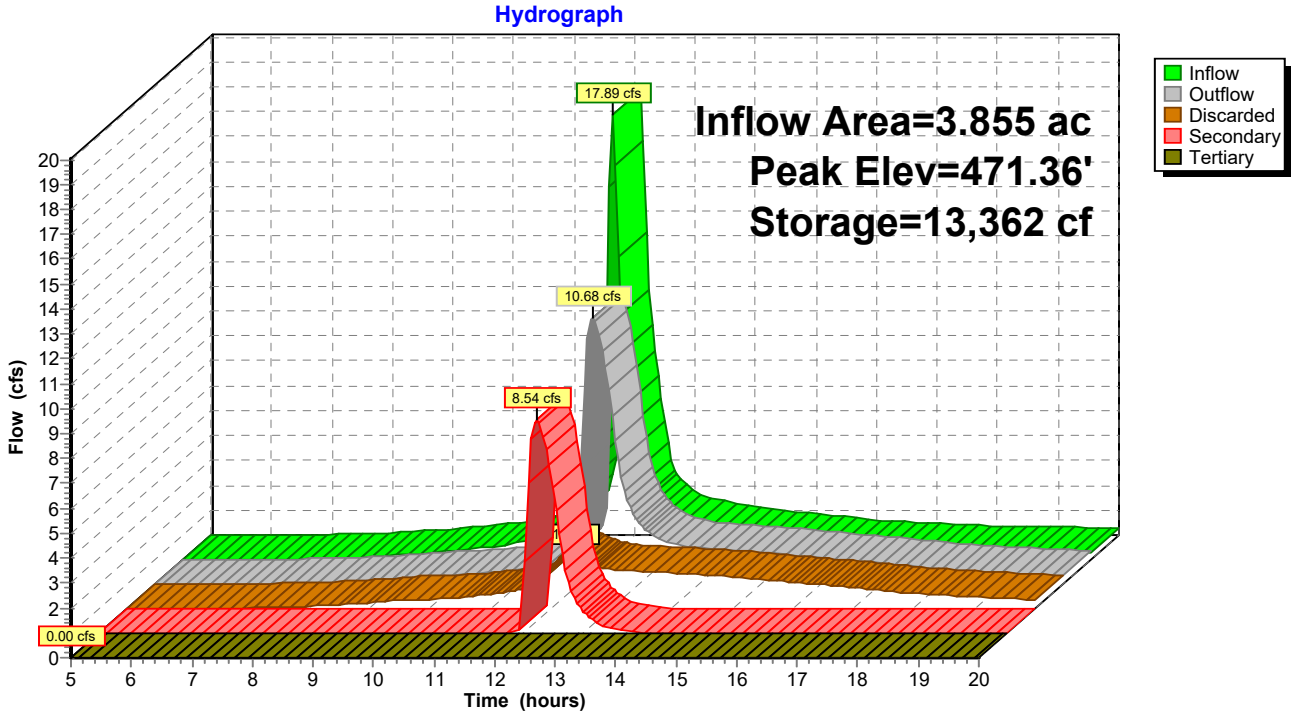
Device	Routing	Invert	Outlet Devices
#1	Discarded	466.00'	**20.000 in/hr Exfiltration over Surface area**
#2	Secondary	469.60'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.60' / 469.00' S= 0.0240 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#3	Tertiary	471.75'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=2.13 cfs @ 12.24 hrs HW=471.35' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 2.13 cfs)

Secondary OutFlow Max=8.51 cfs @ 12.24 hrs HW=471.35' (Free Discharge)
└**2=Culvert** (Inlet Controls 8.51 cfs @ 4.82 fps)

Tertiary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin



Summary for Pond 3P: BIORETENTION #1

Inflow Area = 1.571 ac, 49.46% Impervious, Inflow Depth > 4.49" for 100-YEAR event
Inflow = 8.33 cfs @ 12.09 hrs, Volume= 0.587 af
Outflow = 1.06 cfs @ 12.67 hrs, Volume= 0.410 af, Atten= 87%, Lag= 35.0 min
Primary = 1.06 cfs @ 12.67 hrs, Volume= 0.410 af
Routed to Link 2 : AP-02
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 579.25' @ 12.67 hrs Surf.Area= 15,394 sf Storage= 12,436 cf

Plug-Flow detention time= 164.7 min calculated for 0.410 af (70% of inflow)
Center-of-Mass det. time= 98.1 min (863.0 - 764.9)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	8,334 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	575.50'	10,480 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 26,201 cf Overall x 40.0% Voids
		18,814 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
579.00	7,486	561.0	0	0	7,486
580.00	9,212	587.0	8,334	8,334	9,930

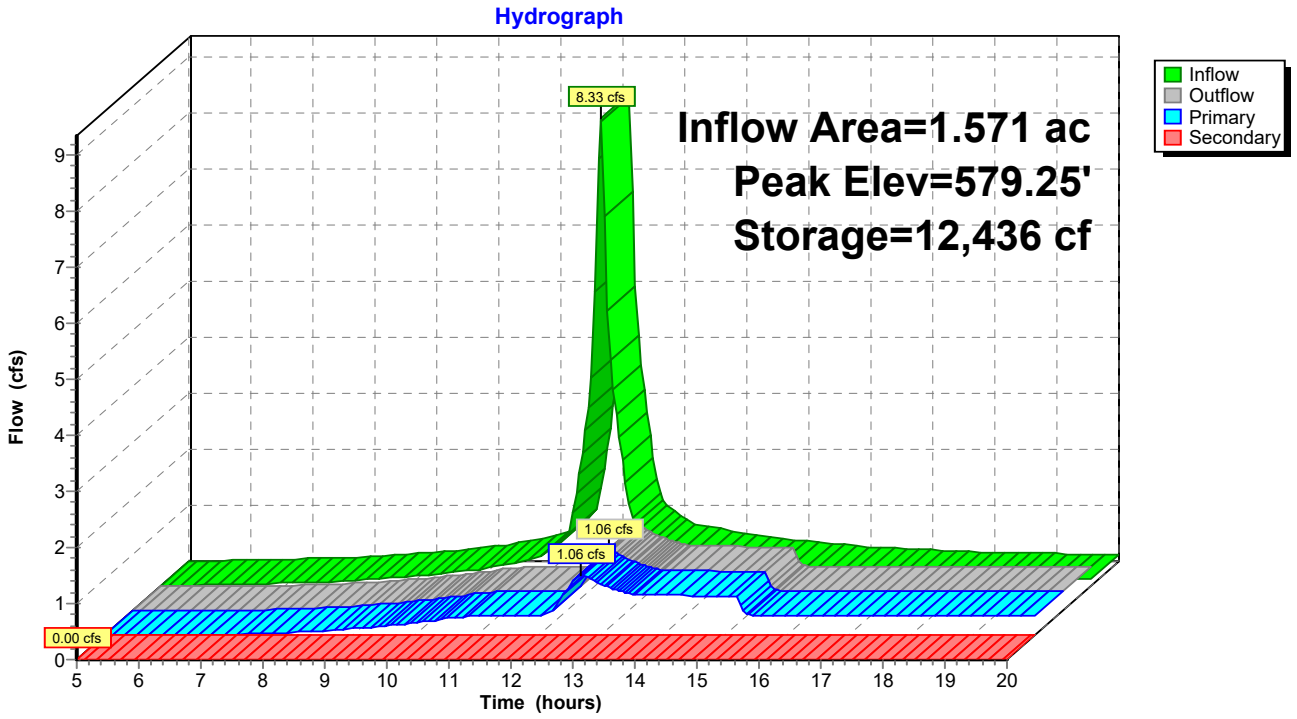
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
575.50	7,486	561.0	0	0	7,486
579.00	7,486	561.0	26,201	26,201	9,450

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.50'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	575.50'	**12.0" Round Culvert** L= 25.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.50' / 575.00' S= 0.0200 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	579.20'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	579.80'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.04 cfs @ 12.67 hrs HW=579.25' (Free Discharge)
└─**2=Culvert** (Passes 1.04 cfs of 6.82 cfs potential flow)
  ├─**1=Exfiltration** (Exfiltration Controls 0.71 cfs)
  └─**3=Orifice/Grate** (Weir Controls 0.33 cfs @ 0.76 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=575.50' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 3P: BIORETENTION #1

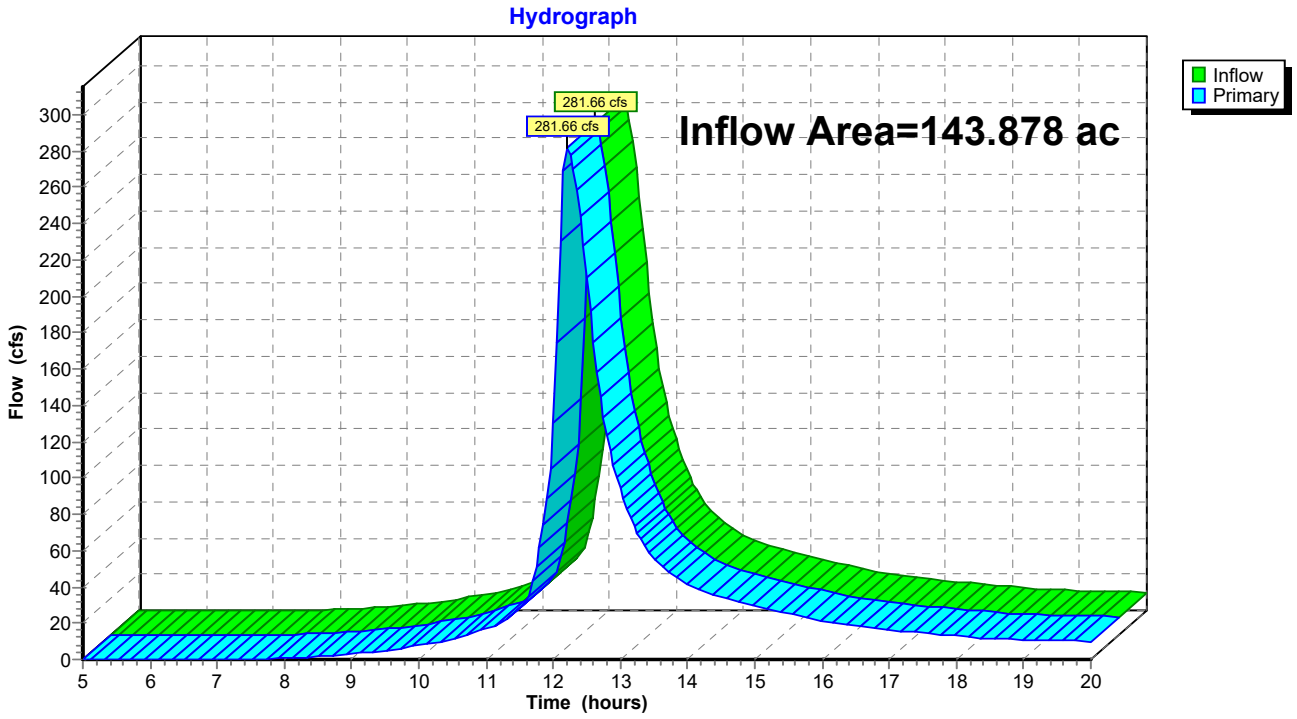


Summary for Link 1: AP-01

Inflow Area = 143.878 ac, 7.69% Impervious, Inflow Depth > 2.93" for 100-YEAR event
Inflow = 281.66 cfs @ 12.21 hrs, Volume= 35.189 af
Primary = 281.66 cfs @ 12.21 hrs, Volume= 35.189 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01

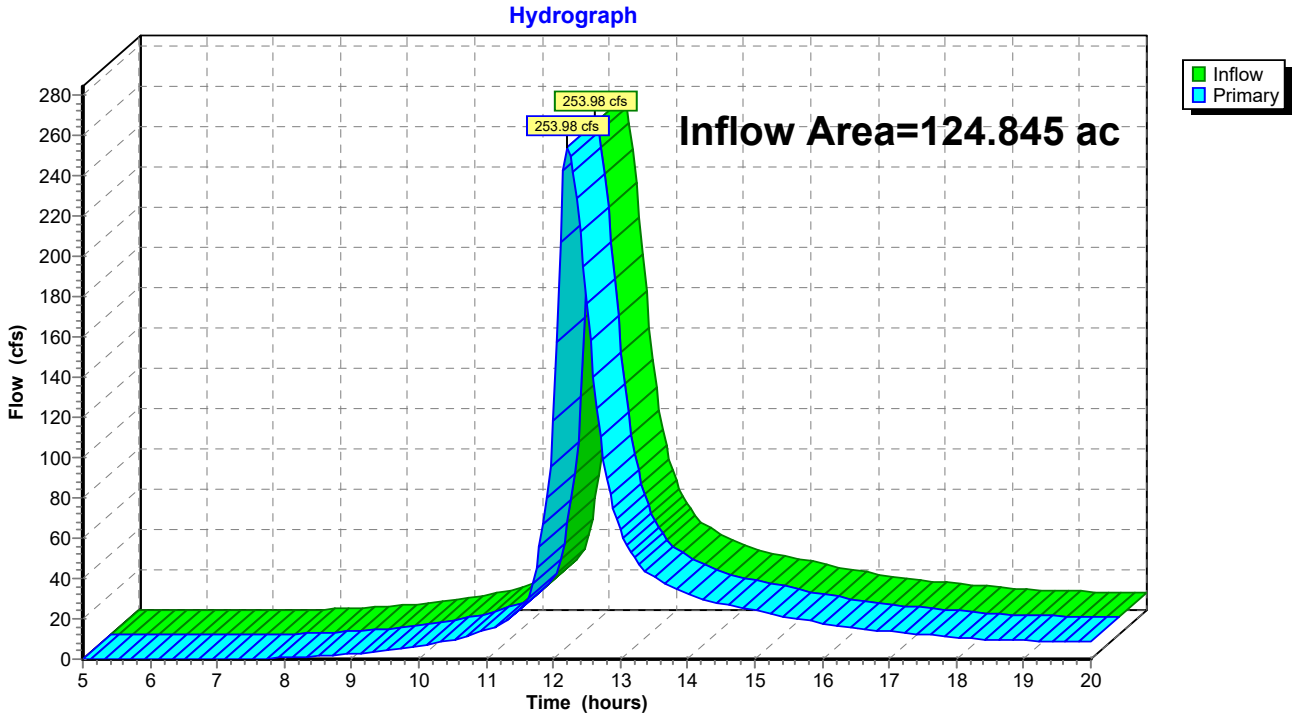


Summary for Link 2: AP-02

Inflow Area = 124.845 ac, 8.07% Impervious, Inflow Depth > 2.78" for 100-YEAR event
Inflow = 253.98 cfs @ 12.21 hrs, Volume= 28.944 af
Primary = 253.98 cfs @ 12.21 hrs, Volume= 28.944 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

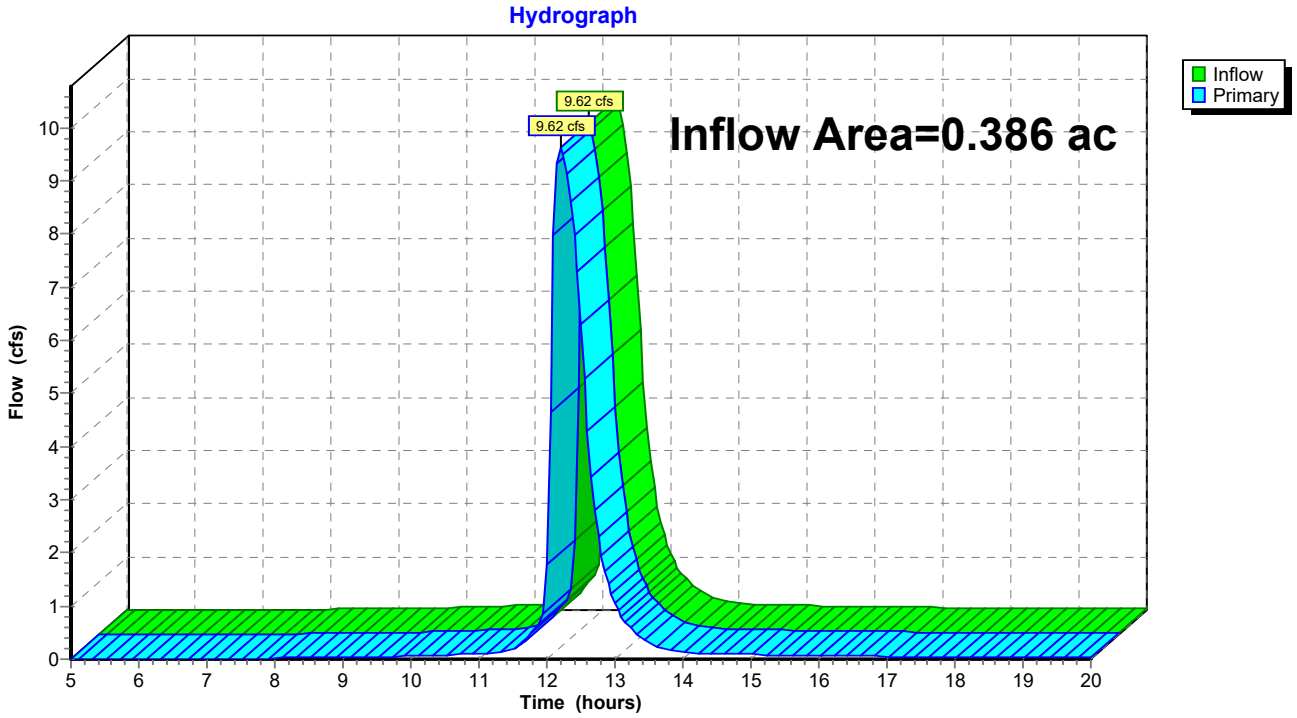


Summary for Link 3: AP-3

Inflow Area = 0.386 ac, 17.36% Impervious, Inflow Depth > 16.76" for 100-YEAR event
Inflow = 9.62 cfs @ 12.21 hrs, Volume= 0.539 af
Primary = 9.62 cfs @ 12.21 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-01: PDA-01 Runoff Area=23.452 ac 0.84% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=44.5 min CN=50 Runoff=0.00 cfs 0.000 af

Subcatchment P-02: PDA-02 Runoff Area=6.449 ac 4.19% Impervious Runoff Depth=0.00"
Flow Length=615' Tc=26.4 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment P-03: PDA-03 Runoff Area=7.441 ac 43.81% Impervious Runoff Depth>0.06"
Tc=6.0 min CN=71 Runoff=0.15 cfs 0.037 af

Subcatchment P-04: PDA-04 Runoff Area=6.960 ac 24.57% Impervious Runoff Depth>0.05"
Flow Length=260' Tc=13.8 min CN=70 Runoff=0.08 cfs 0.028 af

Subcatchment P-05: PDA-05 Runoff Area=21.410 ac 2.38% Impervious Runoff Depth>0.07"
Flow Length=1,066' Tc=20.1 min CN=72 Runoff=0.50 cfs 0.124 af

Subcatchment P-06: PDA-06 Runoff Area=5.701 ac 7.40% Impervious Runoff Depth>0.02"
Flow Length=1,015' Tc=26.3 min CN=67 Runoff=0.02 cfs 0.011 af

Subcatchment P-07: PDA-07 Runoff Area=11.289 ac 16.91% Impervious Runoff Depth>0.11"
Flow Length=823' Tc=26.0 min CN=75 Runoff=0.55 cfs 0.104 af

Subcatchment P-08: PDA-08 Runoff Area=17.483 ac 8.85% Impervious Runoff Depth>0.15"
Flow Length=958' Tc=21.5 min CN=77 Runoff=1.38 cfs 0.212 af

Subcatchment P-09: PDA-09 Runoff Area=30.530 ac 8.94% Impervious Runoff Depth>0.17"
Flow Length=128' Tc=10.2 min CN=78 Runoff=3.59 cfs 0.423 af

Subcatchment P-10: PDA-10 Runoff Area=16.521 ac 5.14% Impervious Runoff Depth>0.18"
Flow Length=916' Tc=58.0 min CN=79 Runoff=1.20 cfs 0.250 af

Subcatchment P-11: PDA-11 Runoff Area=2.126 ac 3.76% Impervious Runoff Depth>0.15"
Flow Length=685' Tc=10.1 min CN=77 Runoff=0.20 cfs 0.026 af

Subcatchment P-12: PDA-12 Runoff Area=3.855 ac 30.09% Impervious Runoff Depth>0.23"
Flow Length=812' Tc=7.2 min CN=81 Runoff=0.87 cfs 0.075 af

Subcatchment P-13: Upper Restaurant Area Runoff Area=1.571 ac 49.46% Impervious Runoff Depth>0.39"
Tc=6.0 min CN=86 Runoff=0.72 cfs 0.051 af

Subcatchment P-14: P-14 Runoff Area=0.386 ac 17.36% Impervious Runoff Depth>0.29"
Tc=6.0 min CN=83 Runoff=0.12 cfs 0.009 af

Pond 1P: Porous Pavement Peak Elev=404.00' Storage=2 cf Inflow=0.15 cfs 0.037 af
Discarded=0.15 cfs 0.037 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.037 af

Pond 2P: Infiltration Basin Peak Elev=466.45' Storage=383 cf Inflow=0.87 cfs 0.075 af
Discarded=0.45 cfs 0.075 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=0.45 cfs 0.075 af

Pond 3P: BIORETENTION#1 Peak Elev=575.74' Storage=713 cf Inflow=0.72 cfs 0.051 af
Primary=0.24 cfs 0.046 af Secondary=0.00 cfs 0.000 af Outflow=0.24 cfs 0.046 af

Link 1: AP-01 Inflow=5.88 cfs 1.235 af
Primary=5.88 cfs 1.235 af

Link 2: AP-02 Inflow=5.29 cfs 0.949 af
Primary=5.29 cfs 0.949 af

Link 3: AP-3 Inflow=0.12 cfs 0.009 af
Primary=0.12 cfs 0.009 af

Total Runoff Area = 155.174 ac Runoff Volume = 1.351 af Average Runoff Depth = 0.10"
90.02% Pervious = 139.684 ac 9.98% Impervious = 15.490 ac

Summary for Subcatchment P-01: PDA-01

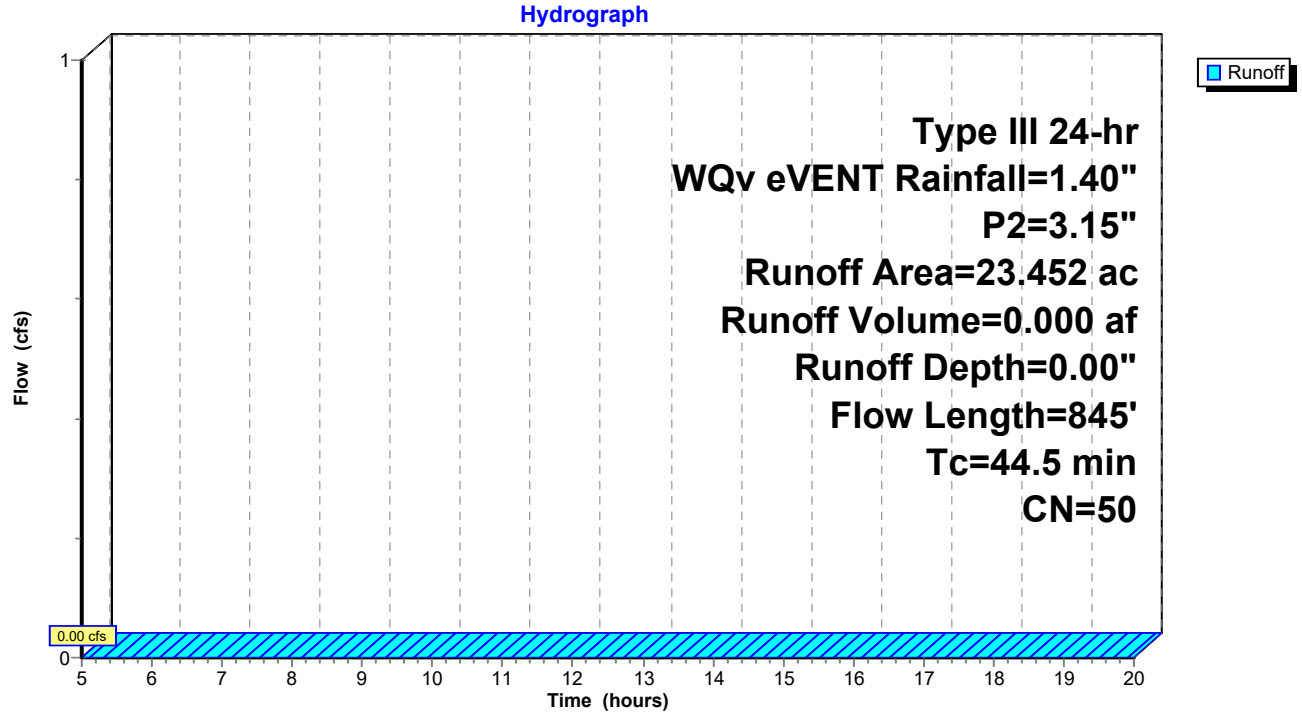
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

Area (ac)	CN	Description
12.804	30	Woods, Good, HSG A
0.198	98	Paved parking, HSG A
1.840	55	Woods, Good, HSG B
8.610	77	Woods, Good, HSG D
23.452	50	Weighted Average
23.254		99.16% Pervious Area
0.198		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1600	0.18		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
35.1	745	0.0050	0.35		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
44.5	845	Total			

Subcatchment P-01: PDA-01



Summary for Subcatchment P-02: PDA-02

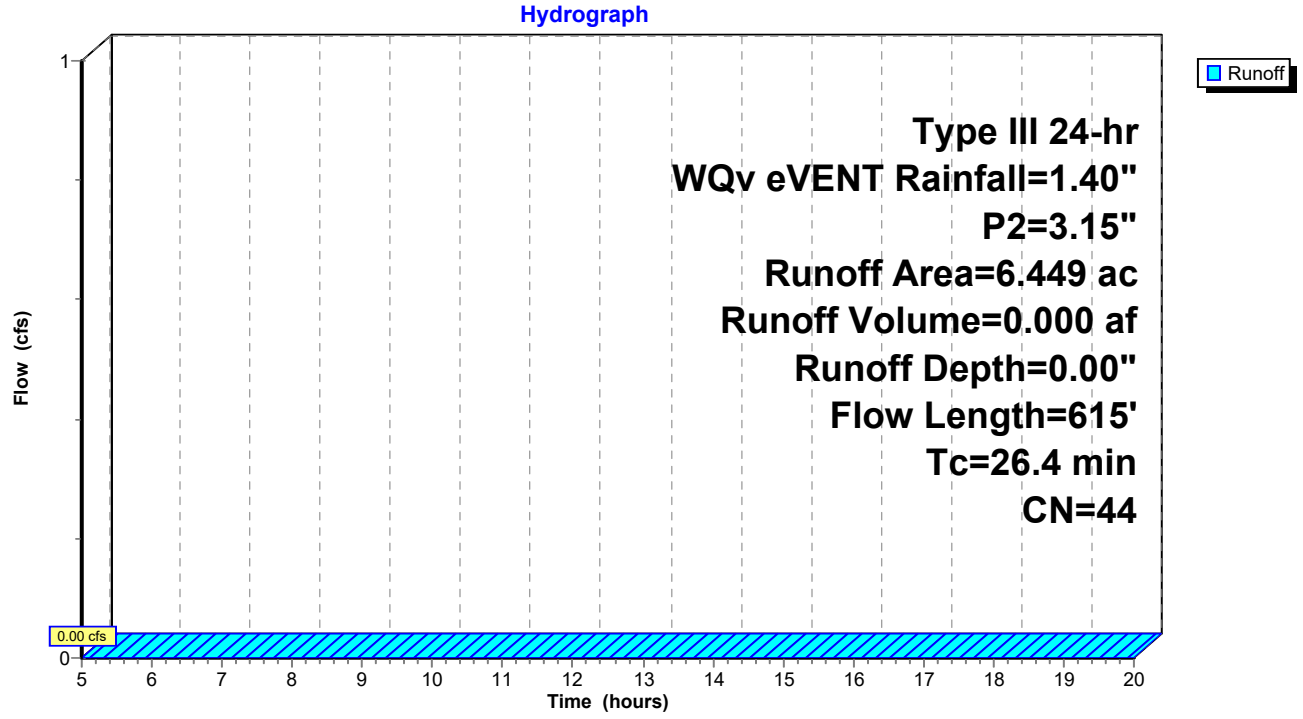
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	4.980	32	Woods/grass comb., Good, HSG A
*	0.270	98	IMP A
	1.199	79	Woods/grass comb., Good, HSG D
	6.449	44	Weighted Average
	6.179		95.81% Pervious Area
	0.270		4.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0900	0.14		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.15"
14.5	515	0.0140	0.59		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.4	615	Total			

Subcatchment P-02: PDA-02



Summary for Subcatchment P-03: PDA-03

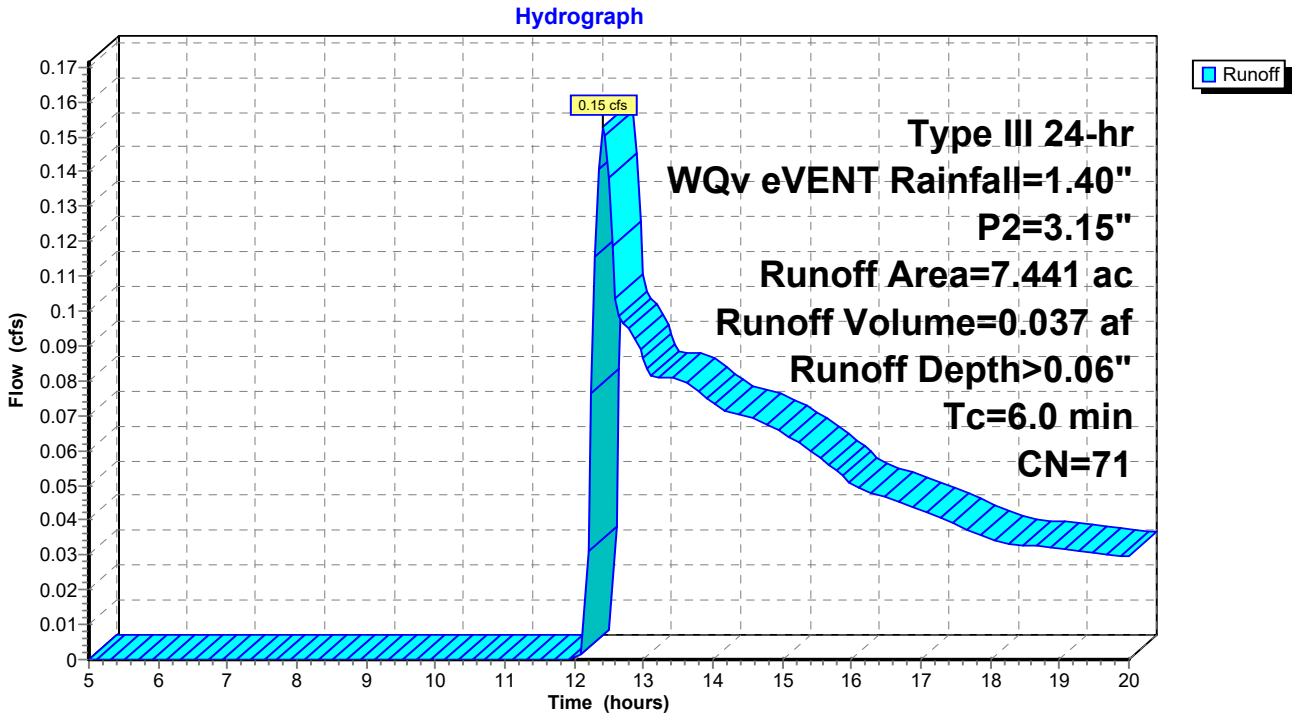
Runoff = 0.15 cfs @ 12.42 hrs, Volume= 0.037 af, Depth> 0.06"
Routed to Pond 1P : Porous Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	2.800	39	>75% Grass cover, Good, HSG A
*	3.240	98	IMP A
	0.590	61	>75% Grass cover, Good, HSG B
*	0.010	98	IMP B
	0.791	80	>75% Grass cover, Good, HSG D
*	0.010	98	IMP D
	7.441	71	Weighted Average
	4.181		56.19% Pervious Area
	3.260		43.81% Impervious Area

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

Subcatchment P-03: PDA-03



Summary for Subcatchment P-04: PDA-04

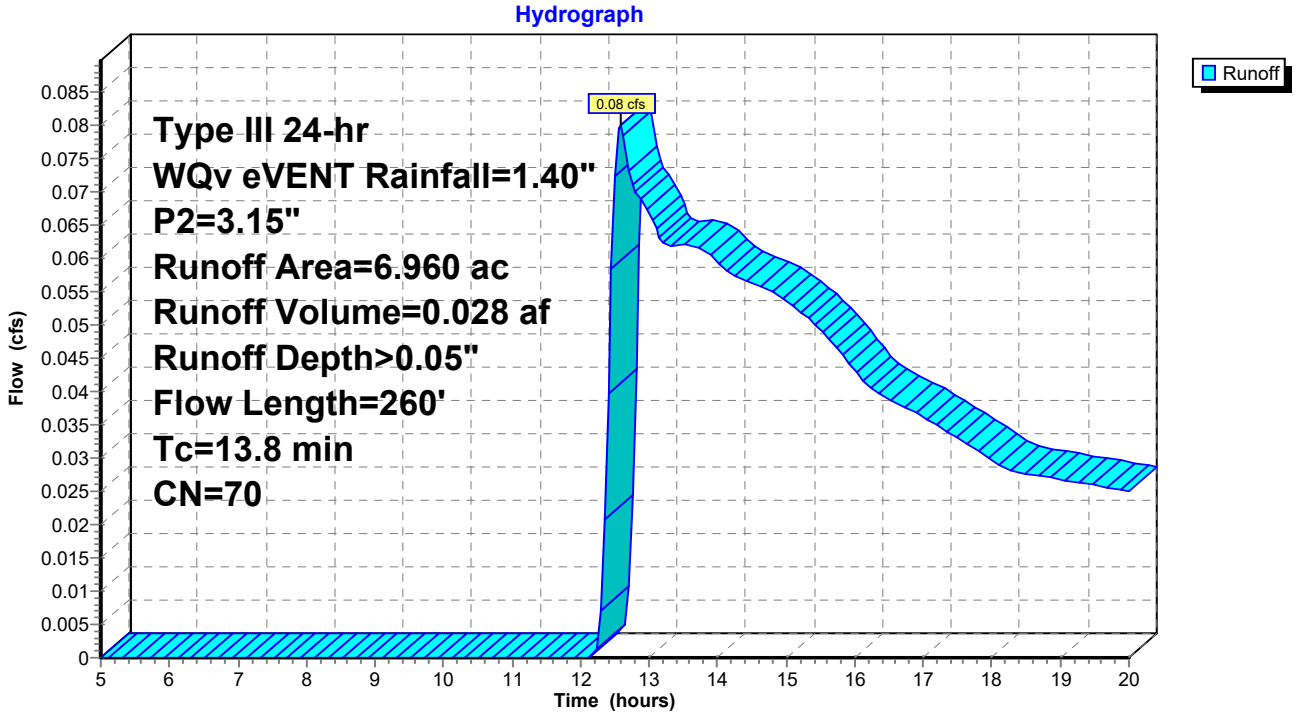
Runoff = 0.08 cfs @ 12.58 hrs, Volume= 0.028 af, Depth> 0.05"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	1.600	39	>75% Grass cover, Good, HSG A
*	1.590	98	IMP A
	1.830	61	>75% Grass cover, Good, HSG B
*	0.060	98	IMP B
	1.820	80	>75% Grass cover, Good, HSG D
*	0.060	98	IMP D
	6.960	70	Weighted Average
	5.250		75.43% Pervious Area
	1.710		24.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.8	160	0.0438	3.14		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
13.8	260	Total			

Subcatchment P-04: PDA-04



Summary for Subcatchment P-05: PDA-05

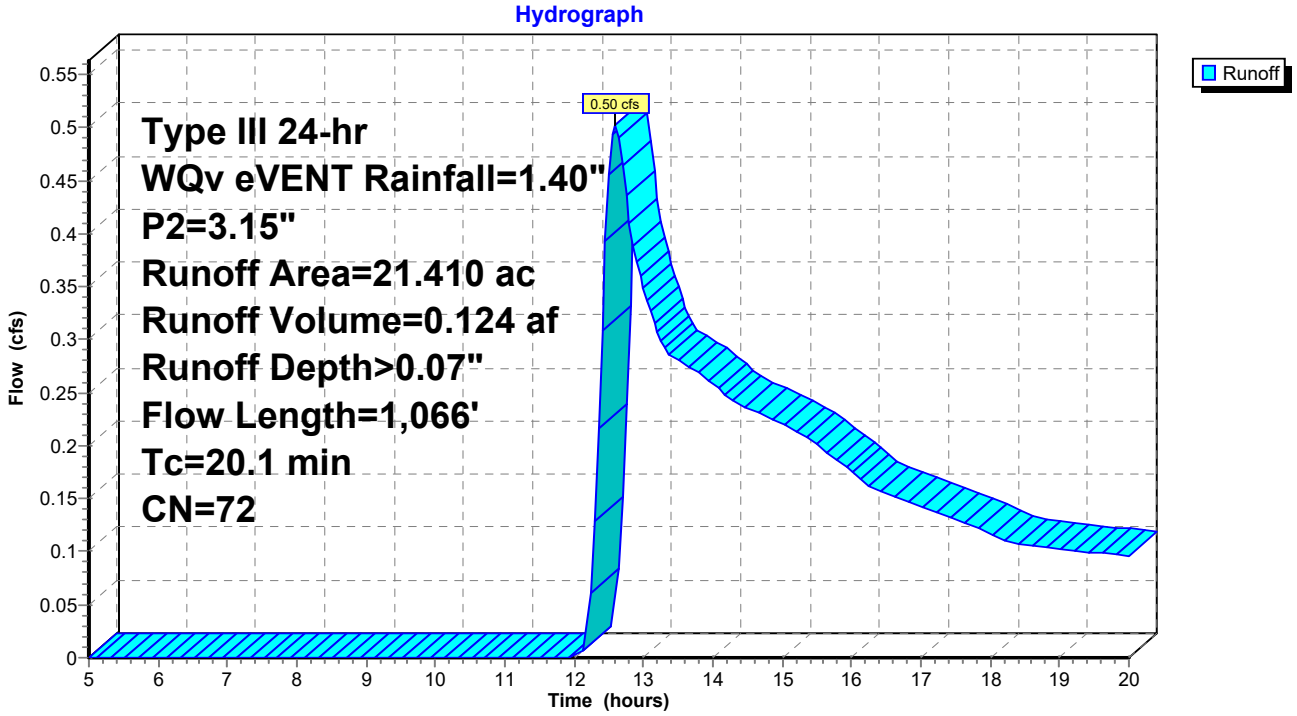
Runoff = 0.50 cfs @ 12.60 hrs, Volume= 0.124 af, Depth> 0.07"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	0.290	30	Woods, Good, HSG A
	1.630	55	Woods, Good, HSG B
*	0.030	98	IMP B
	11.470	70	Woods, Good, HSG C
*	0.270	98	IMP C
	7.510	79	Woods, Fair, HSG D
*	0.210	98	IMP D
	21.410	72	Weighted Average
	20.900		97.62% Pervious Area
	0.510		2.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1200	0.16		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.5	966	0.1160	1.70		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
20.1	1,066	Total			

Subcatchment P-05: PDA-05



Summary for Subcatchment P-06: PDA-06

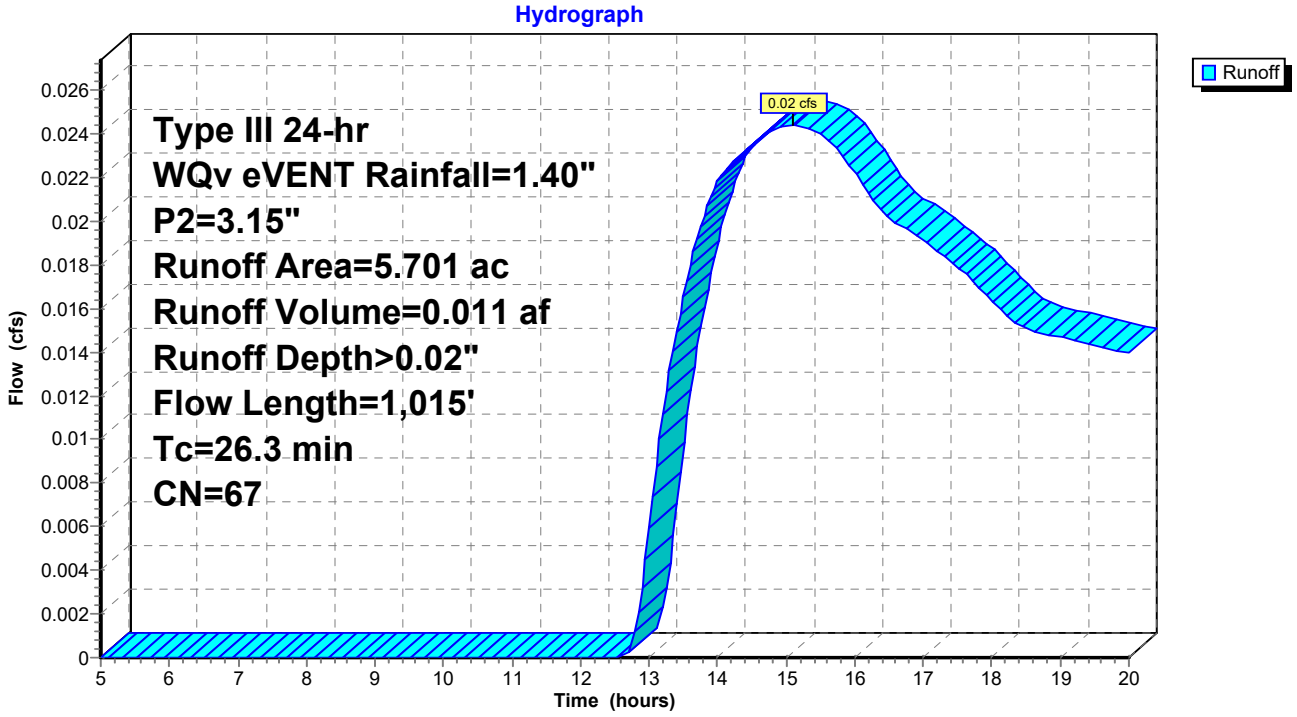
Runoff = 0.02 cfs @ 15.09 hrs, Volume= 0.011 af, Depth> 0.02"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	2.370	55	Woods, Good, HSG B
	2.179	70	Woods, Good, HSG C
*	0.422	98	IMP C
	0.730	79	Woods, Fair, HSG D
	5.701	67	Weighted Average
	5.279		92.60% Pervious Area
	0.422		7.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	100	0.0400	0.10		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
9.9	915	0.0950	1.54		**Shallow Concentrated Flow, FLOW 2** Woodland Kv= 5.0 fps
26.3	1,015	Total			

Subcatchment P-06: PDA-06



Summary for Subcatchment P-07: PDA-07

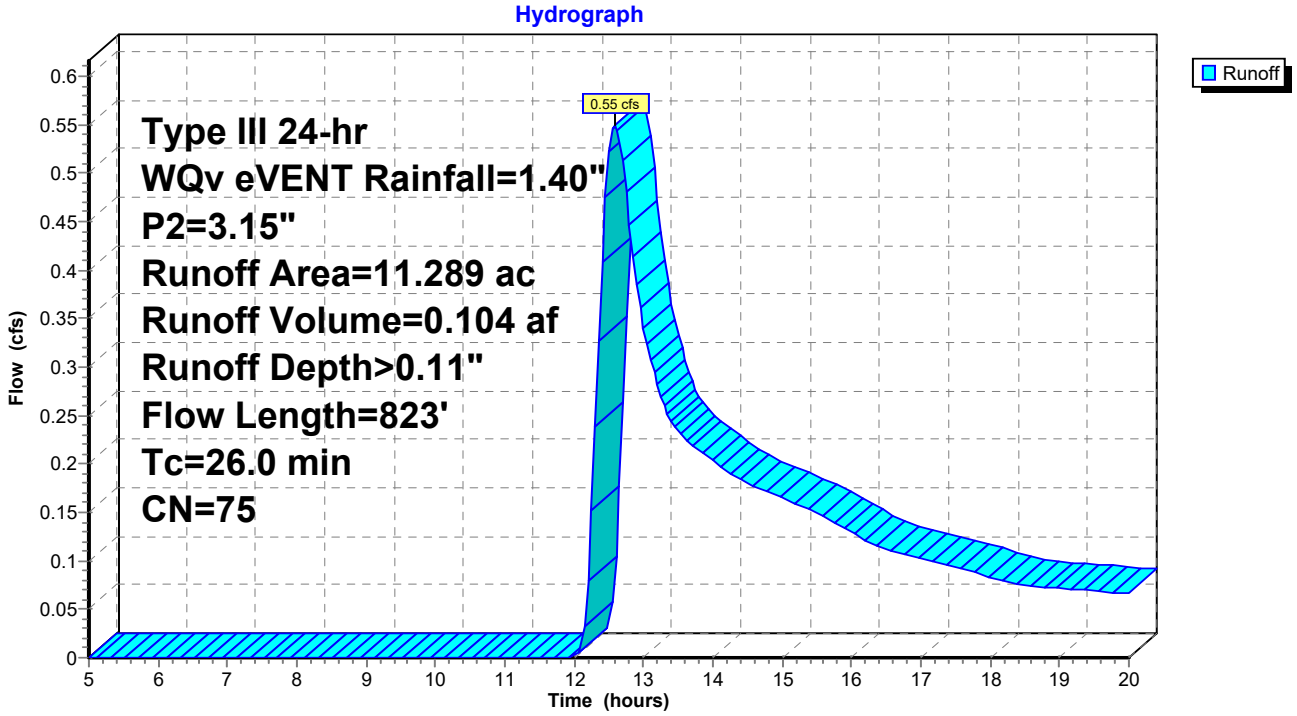
Runoff = 0.55 cfs @ 12.59 hrs, Volume= 0.104 af, Depth> 0.11"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	1.170	55	Woods, Good, HSG B
*	0.070	98	IMP B
	5.820	70	Woods, Good, HSG C
*	1.475	98	IMP C
	2.390	77	Woods, Good, HSG D
*	0.364	98	IMP D
	11.289	75	Weighted Average
	9.380		83.09% Pervious Area
	1.909		16.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	100	0.0300	0.09		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	723	0.1000	1.58		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.0	823	Total			

Subcatchment P-07: PDA-07



Summary for Subcatchment P-08: PDA-08

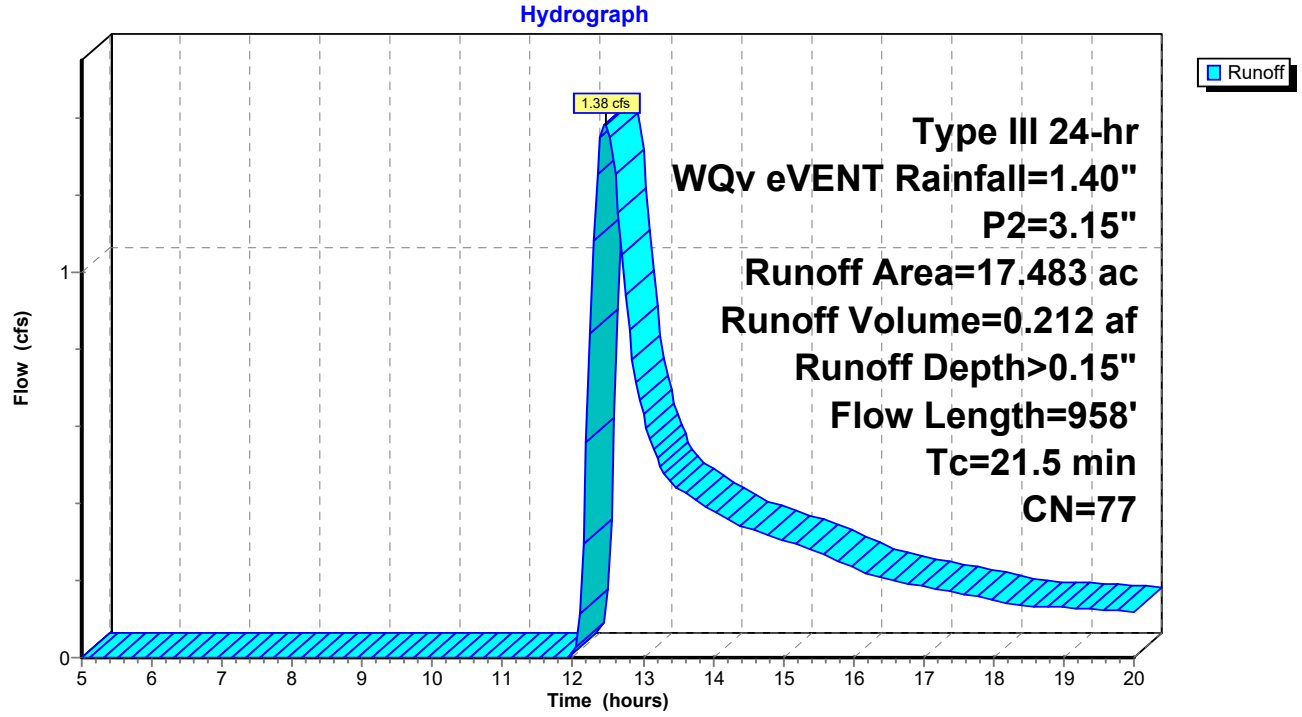
Runoff = 1.38 cfs @ 12.46 hrs, Volume= 0.212 af, Depth> 0.15"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	14.026	74	>75% Grass cover, Good, HSG C
*	1.347	98	IMP C
	1.910	80	>75% Grass cover, Good, HSG D
*	0.200	98	IMP D
	17.483	77	Weighted Average
	15.936		91.15% Pervious Area
	1.547		8.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0600	0.12		**Sheet Flow, FLOW 1** Woods: Light underbrush n= 0.400 P2= 3.15"
7.6	858	0.1420	1.88		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
21.5	958	Total			

Subcatchment P-08: PDA-08



Summary for Subcatchment P-09: PDA-09

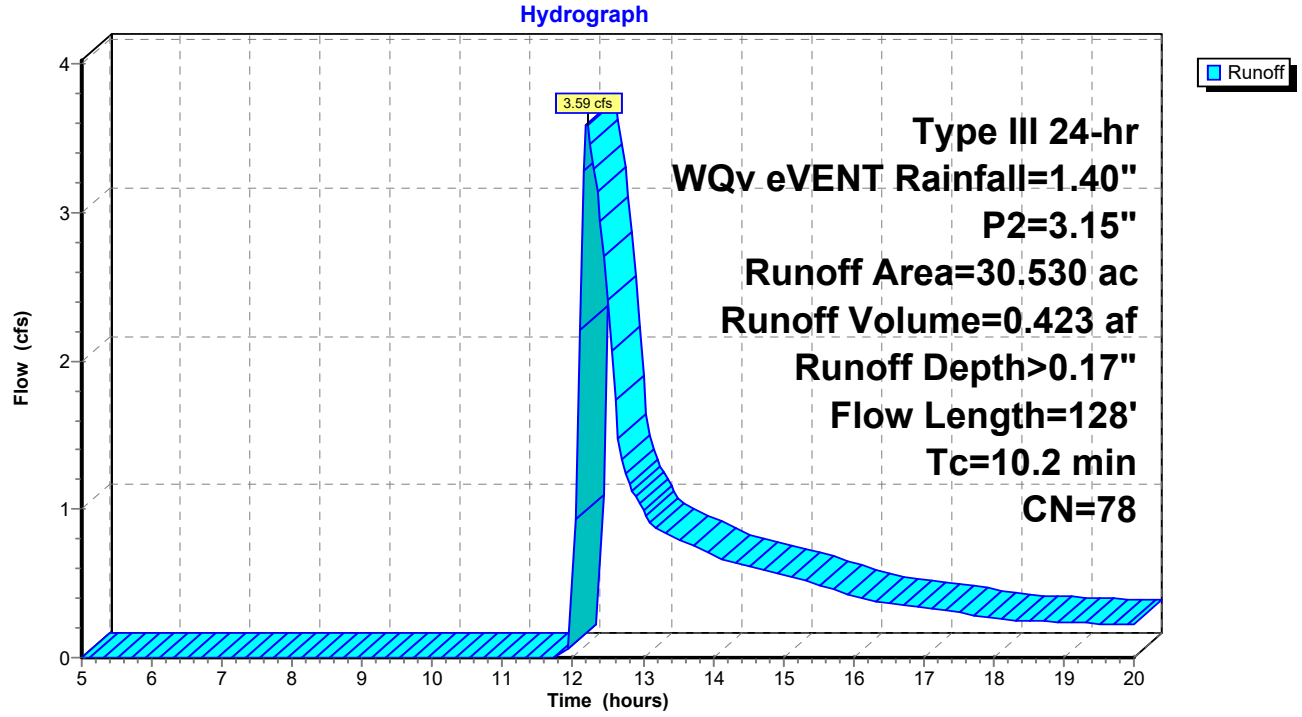
Runoff = 3.59 cfs @ 12.21 hrs, Volume= 0.423 af, Depth> 0.17"
Routed to Link 2 : AP-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	18.399	74	>75% Grass cover, Good, HSG C
*	2.190	98	IMP C
	9.401	80	>75% Grass cover, Good, HSG D
*	0.540	98	IMP D
	30.530	78	Weighted Average
	27.800		91.06% Pervious Area
	2.730		8.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0200	0.17		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
0.3	28	0.0482	1.50		**Sheet Flow, FLOW 2** Smooth surfaces n= 0.011 P2= 3.15"
10.2	128	Total			

Subcatchment P-09: PDA-09



Summary for Subcatchment P-10: PDA-10

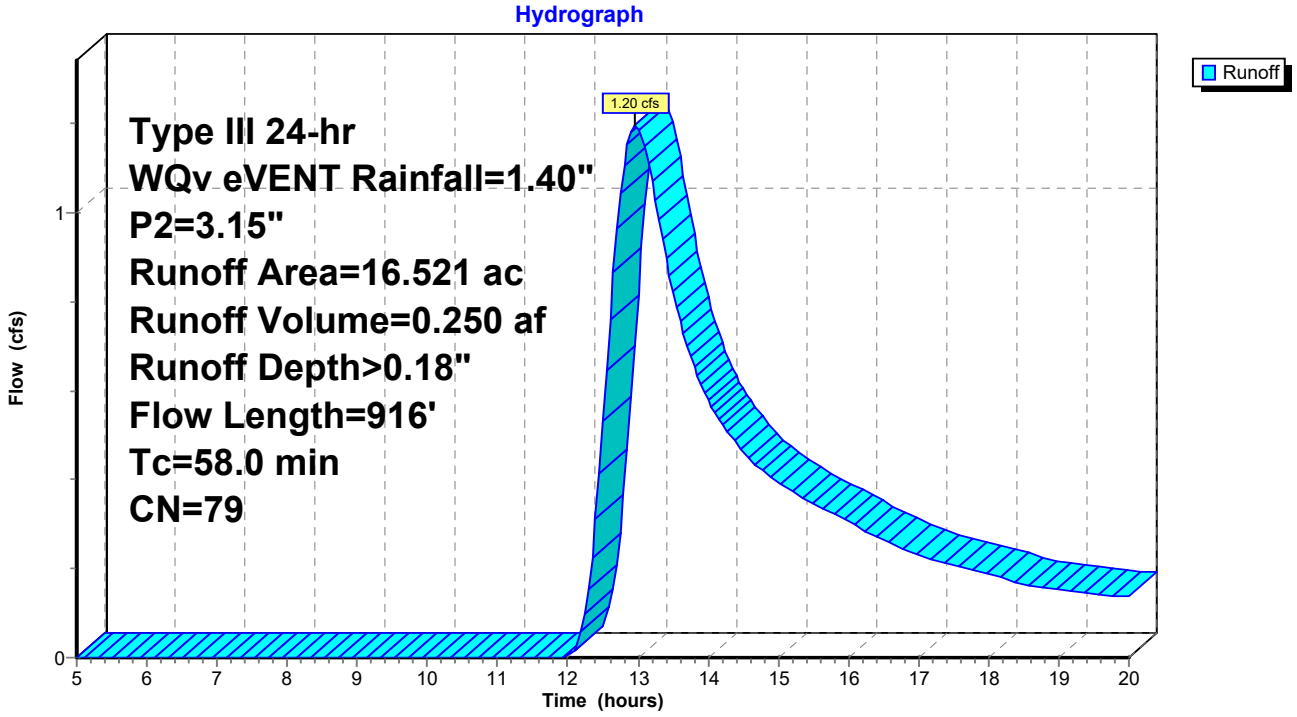
Runoff = 1.20 cfs @ 12.96 hrs, Volume= 0.250 af, Depth> 0.18"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	4.651	74	>75% Grass cover, Good, HSG C
*	0.280	98	IMP C
	11.020	80	>75% Grass cover, Good, HSG D
*	0.570	98	IMP D
	16.521	79	Weighted Average
	15.671		94.86% Pervious Area
	0.850		5.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0100	0.13		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
45.0	816	0.0300	0.30		**Sheet Flow, FLOW 2** Grass: Short n= 0.150 P2= 3.15"
58.0	916	Total			

Subcatchment P-10: PDA-10



Summary for Subcatchment P-11: PDA-11

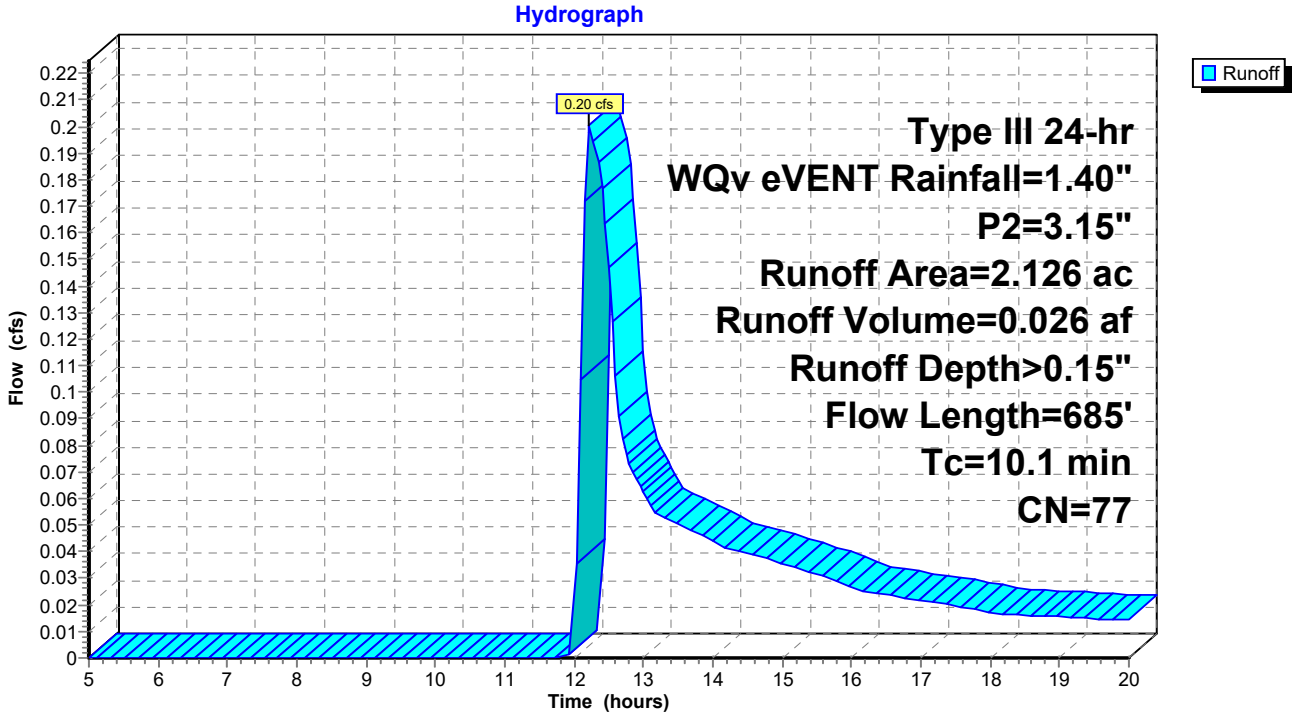
Runoff = 0.20 cfs @ 12.22 hrs, Volume= 0.026 af, Depth> 0.15"
Routed to Link 1 : AP-01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	1.306	74	>75% Grass cover, Good, HSG C
	0.740	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	2.126	77	Weighted Average
	2.046		96.24% Pervious Area
	0.080		3.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0350	0.21		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.2	585	0.0900	4.50		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
10.1	685	Total			

Subcatchment P-11: PDA-11



Summary for Subcatchment P-12: PDA-12

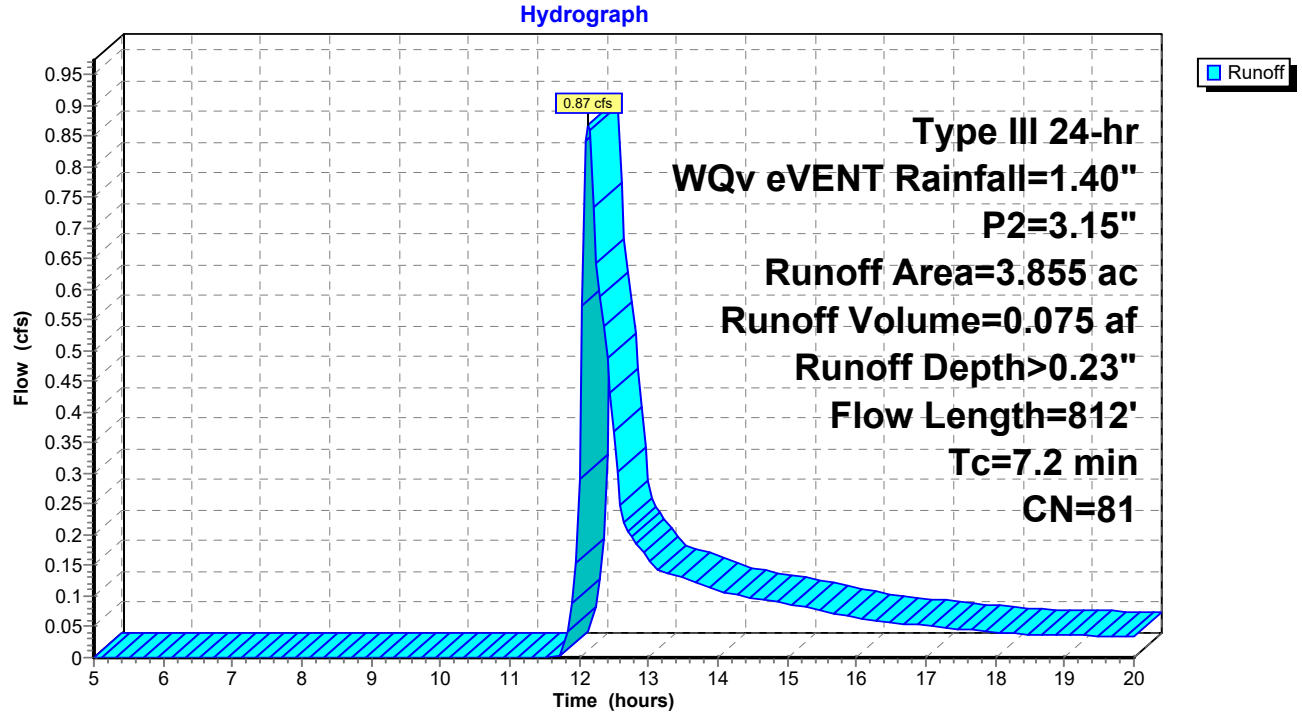
Runoff = 0.87 cfs @ 12.13 hrs, Volume= 0.075 af, Depth> 0.23"
Routed to Pond 2P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	2.525	74	>75% Grass cover, Good, HSG C
*	1.080	98	IMP C
	0.170	80	>75% Grass cover, Good, HSG D
*	0.080	98	IMP D
	3.855	81	Weighted Average
	2.695		69.91% Pervious Area
	1.160		30.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		**Sheet Flow, FLOW 1** Grass: Short n= 0.150 P2= 3.15"
2.5	712	0.1010	4.77		**Shallow Concentrated Flow, FLOW 2** Grassed Waterway Kv= 15.0 fps
7.2	812	Total			

Subcatchment P-12: PDA-12



Summary for Subcatchment P-13: Upper Restaurant Area

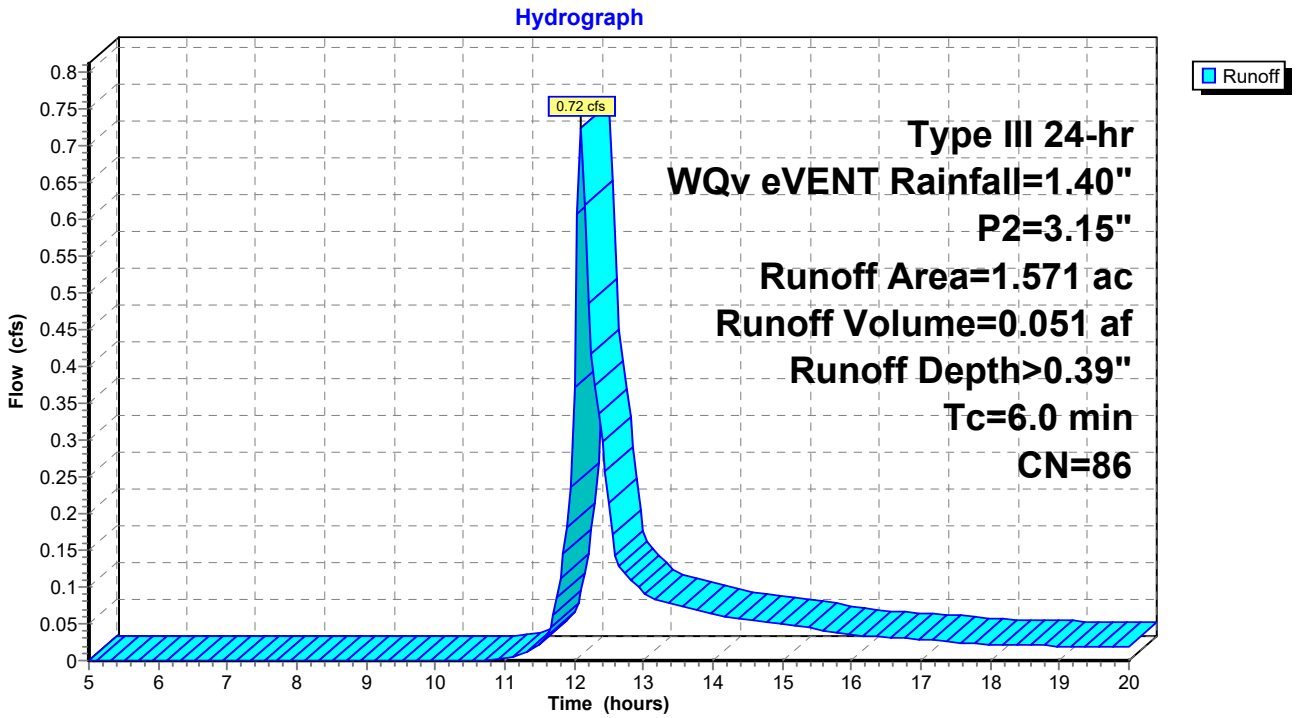
Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.051 af, Depth> 0.39"
Routed to Pond 3P : BIORETENTION #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	0.794	74	>75% Grass cover, Good, HSG C
*	0.777	98	IMP C
	1.571	86	Weighted Average
	0.794		50.54% Pervious Area
	0.777		49.46% Impervious Area

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

Subcatchment P-13: Upper Restaurant Area



Summary for Subcatchment P-14: P-14

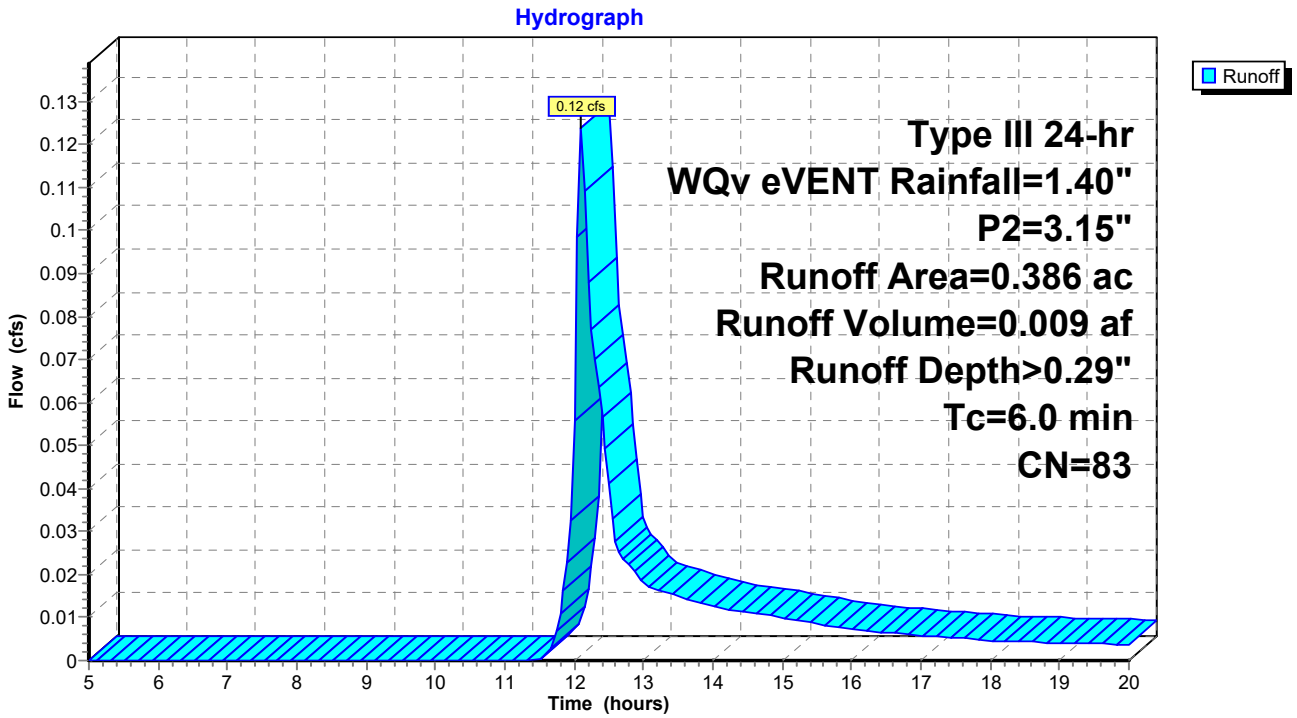
Runoff = 0.12 cfs @ 12.11 hrs, Volume= 0.009 af, Depth> 0.29"
Routed to Link 3 : AP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv eVENT Rainfall=1.40", P2=3.15"

	Area (ac)	CN	Description
	0.319	80	>75% Grass cover, Good, HSG D
*	0.067	98	IMP D
	0.386	83	Weighted Average
	0.319		82.64% Pervious Area
	0.067		17.36% Impervious Area

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

Subcatchment P-14: P-14



Summary for Pond 1P: Porous Pavement

Inflow Area = 7.441 ac, 43.81% Impervious, Inflow Depth > 0.06" for WQv eVENT event
Inflow = 0.15 cfs @ 12.42 hrs, Volume= 0.037 af
Outflow = 0.15 cfs @ 12.42 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.2 min
Discarded = 0.15 cfs @ 12.42 hrs, Volume= 0.037 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 404.00' @ 12.42 hrs Surf.Area= 43,838 sf Storage= 2 cf

Plug-Flow detention time= 0.3 min calculated for 0.037 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (911.6 - 911.4)

Volume	Invert	Avail.Storage	Storage Description
#1	404.00'	17,535 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 43,838 cf Overall x 40.0% Voids

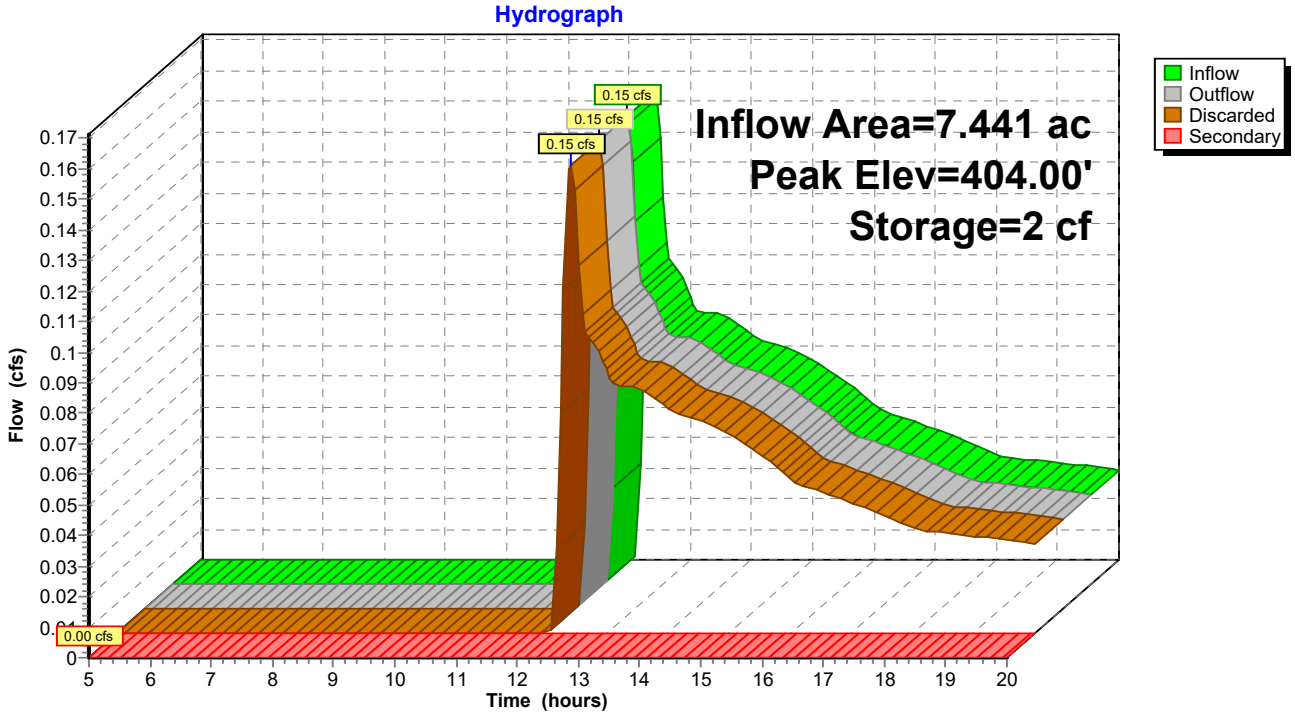
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.00	43,838	0	0
405.00	43,838	43,838	43,838

Device	Routing	Invert	Outlet Devices
#1	Discarded	404.00'	**15.000 in/hr Exfiltration over Surface area**
#2	Secondary	404.35'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 404.35' / 403.85' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=15.22 cfs @ 12.42 hrs HW=404.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 15.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=404.00' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Pond 1P: Porous Pavement



Summary for Pond 2P: Infiltration Basin

Inflow Area = 3.855 ac, 30.09% Impervious, Inflow Depth > 0.23" for WQv eVENT event
Inflow = 0.87 cfs @ 12.13 hrs, Volume= 0.075 af
Outflow = 0.45 cfs @ 12.43 hrs, Volume= 0.075 af, Atten= 48%, Lag= 18.3 min
Discarded = 0.45 cfs @ 12.43 hrs, Volume= 0.075 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3
Tertiary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 3 : AP-3

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 466.45' @ 12.43 hrs Surf.Area= 968 sf Storage= 383 cf

Plug-Flow detention time= 5.5 min calculated for 0.075 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (848.3 - 843.3)

Volume	Invert	Avail.Storage	Storage Description
#1	466.00'	16,515 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)
466.00	746	213.0	0	0	746
468.00	1,960	264.0	2,610	2,610	2,740
470.00	3,425	318.0	5,317	7,927	5,308
472.00	5,226	391.0	8,588	16,515	9,487

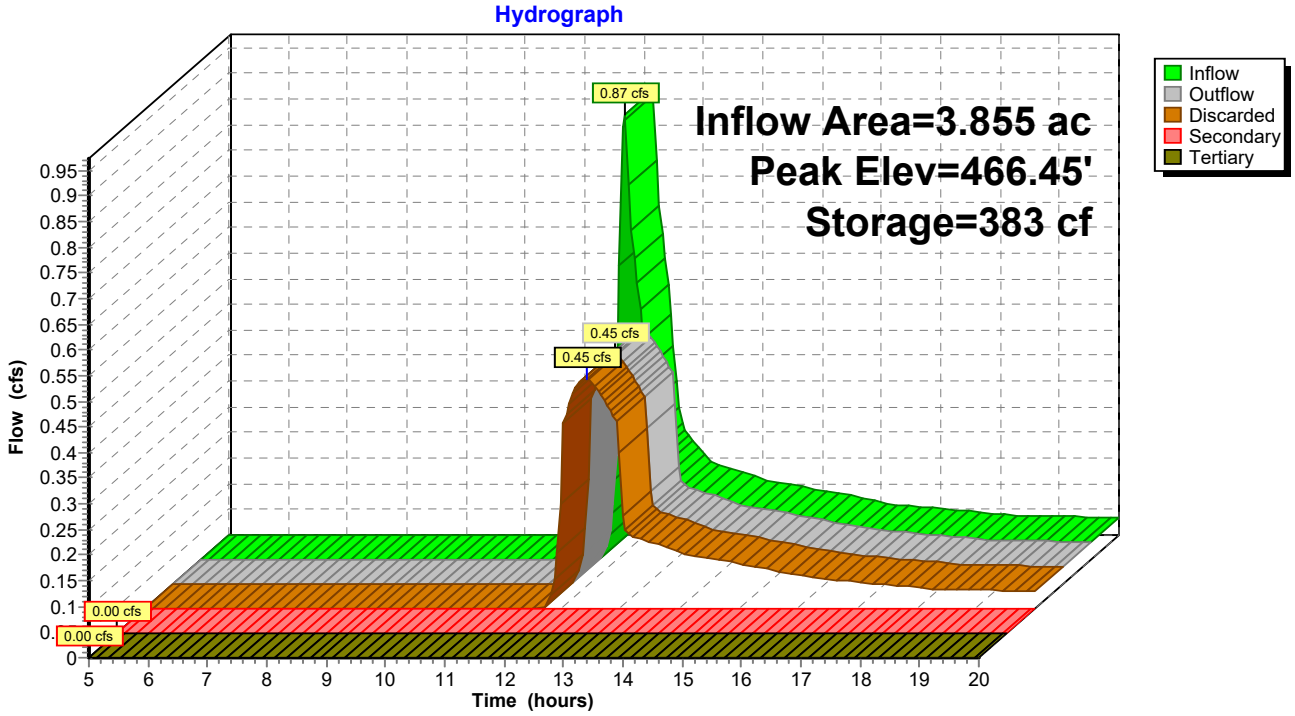
Device	Routing	Invert	Outlet Devices
#1	Discarded	466.00'	**20.000 in/hr Exfiltration over Surface area**
#2	Secondary	469.60'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.60' / 469.00' S= 0.0240 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#3	Tertiary	471.75'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.45 cfs @ 12.43 hrs HW=466.45' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.45 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 5.00 hrs HW=466.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin



Summary for Pond 3P: BIORETENTION #1

Inflow Area = 1.571 ac, 49.46% Impervious, Inflow Depth > 0.39" for WQv eVENT event
Inflow = 0.72 cfs @ 12.10 hrs, Volume= 0.051 af
Outflow = 0.24 cfs @ 12.47 hrs, Volume= 0.046 af, Atten= 67%, Lag= 22.2 min
Primary = 0.24 cfs @ 12.47 hrs, Volume= 0.046 af
Routed to Link 2 : AP-02
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Link 2 : AP-02

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 575.74' @ 12.47 hrs Surf.Area= 7,486 sf Storage= 713 cf

Plug-Flow detention time= 76.0 min calculated for 0.046 af (91% of inflow)
Center-of-Mass det. time= 46.9 min (868.0 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	8,334 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	575.50'	10,480 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 26,201 cf Overall x 40.0% Voids
		18,814 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
579.00	7,486	561.0	0	0	7,486
580.00	9,212	587.0	8,334	8,334	9,930

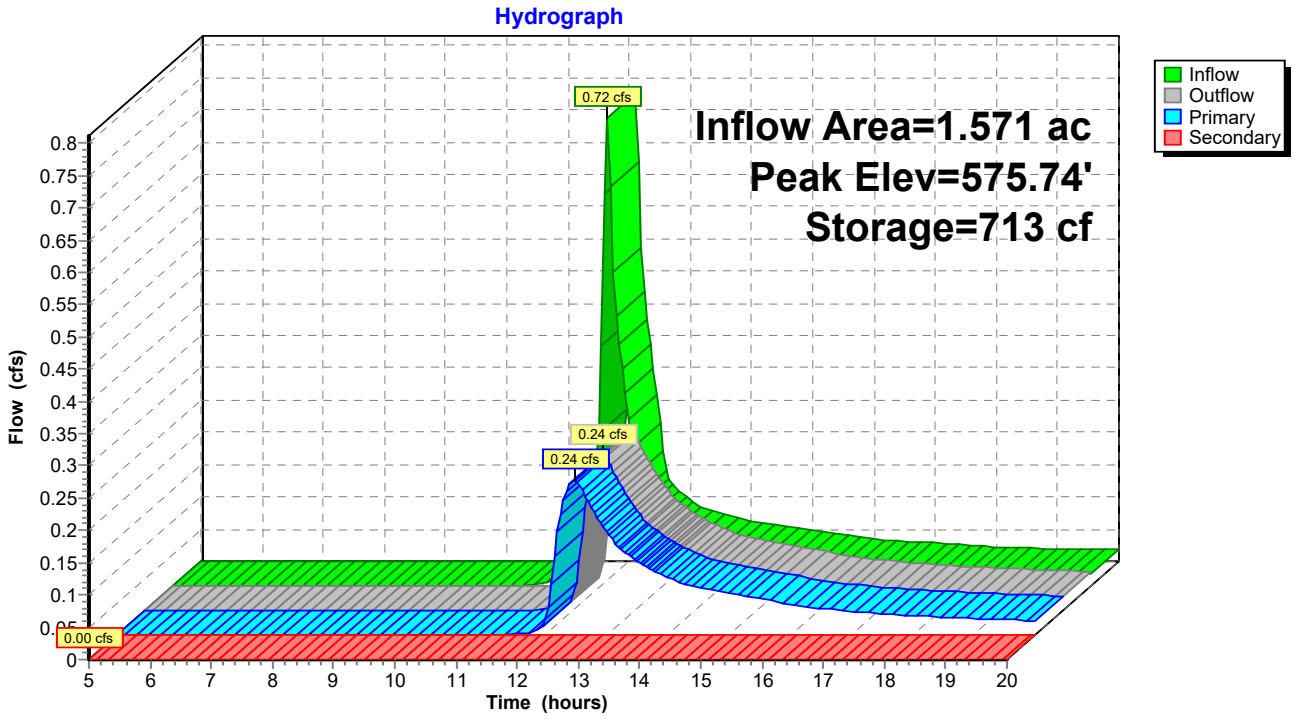
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
575.50	7,486	561.0	0	0	7,486
579.00	7,486	561.0	26,201	26,201	9,450

Device	Routing	Invert	Outlet Devices
#1	Device 2	575.50'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	575.50'	**12.0" Round Culvert** L= 25.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.50' / 575.00' S= 0.0200 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	579.20'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	579.80'	**4.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.24 cfs @ 12.47 hrs HW=575.74' (Free Discharge)
└**2=Culvert** (Inlet Controls 0.24 cfs @ 1.66 fps)
  └**1=Exfiltration** (Passes 0.24 cfs of 0.35 cfs potential flow)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=575.50' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: BIORETENTION #1

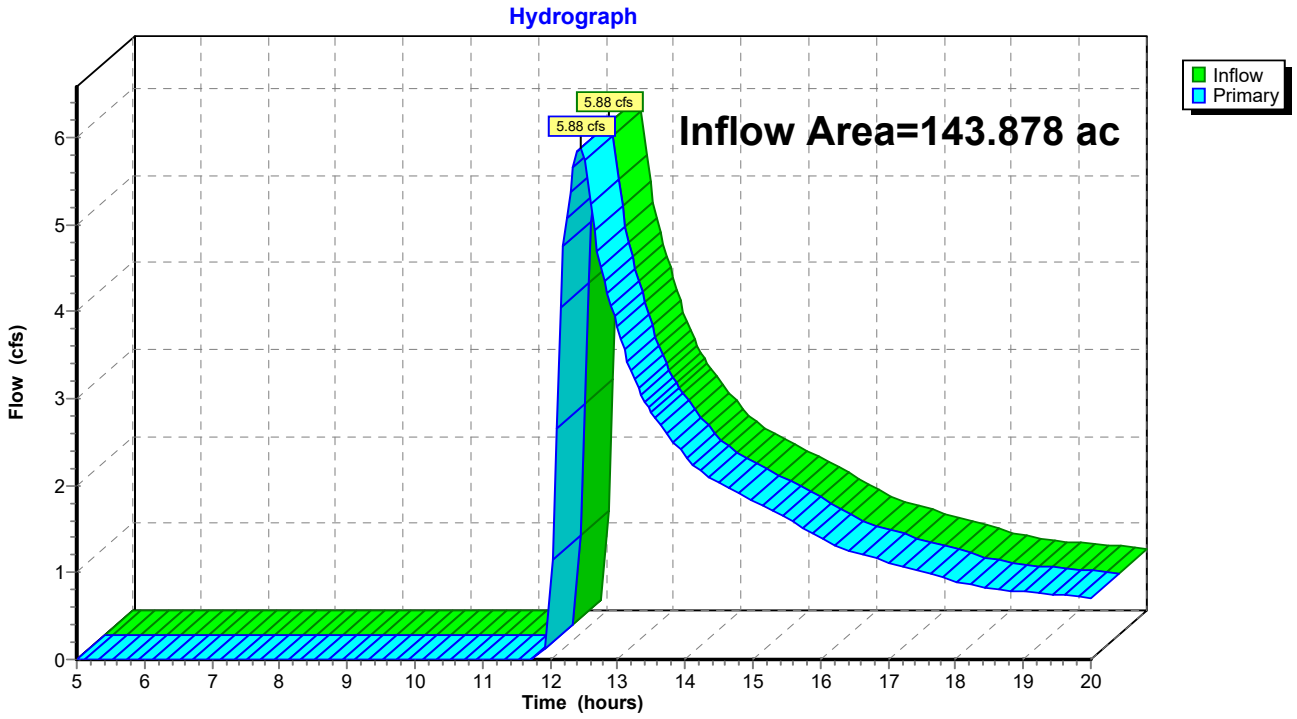


Summary for Link 1: AP-01

Inflow Area = 143.878 ac, 7.69% Impervious, Inflow Depth > 0.10" for WQv eVENT event
Inflow = 5.88 cfs @ 12.44 hrs, Volume= 1.235 af
Primary = 5.88 cfs @ 12.44 hrs, Volume= 1.235 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1: AP-01

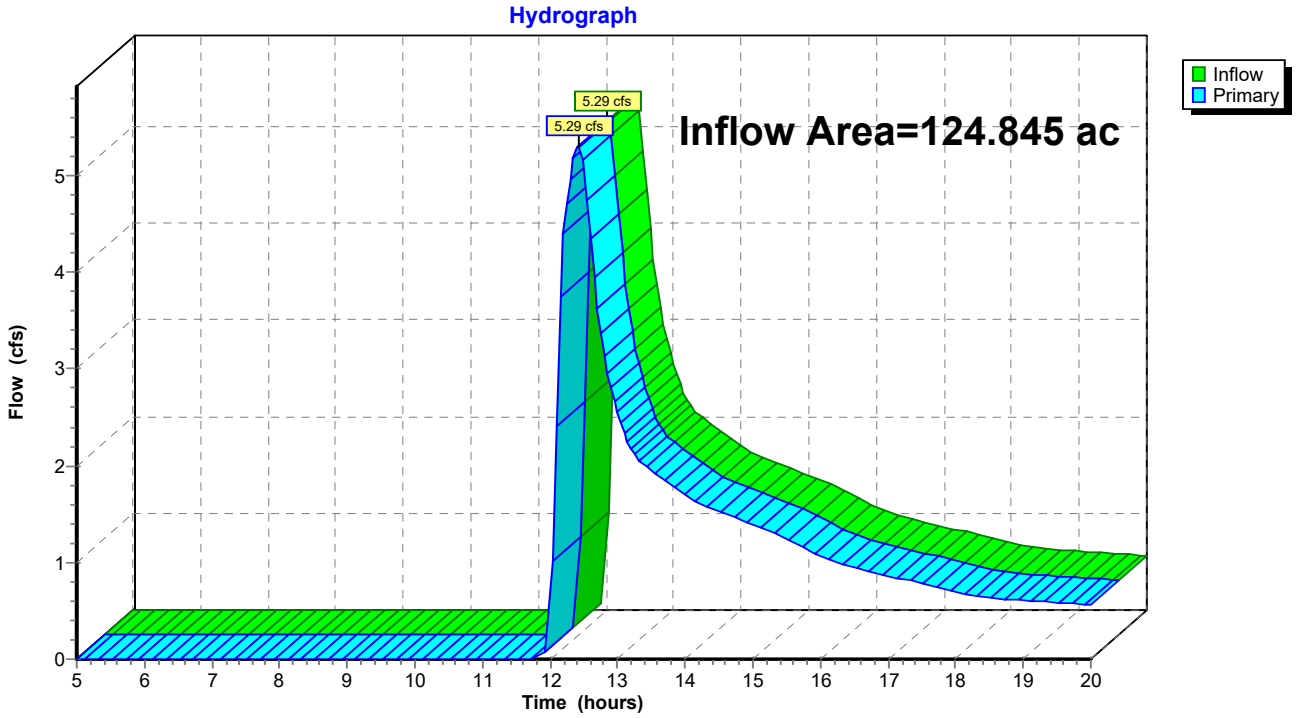


Summary for Link 2: AP-02

Inflow Area = 124.845 ac, 8.07% Impervious, Inflow Depth > 0.09" for WQv eVENT event
Inflow = 5.29 cfs @ 12.41 hrs, Volume= 0.949 af
Primary = 5.29 cfs @ 12.41 hrs, Volume= 0.949 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2: AP-02

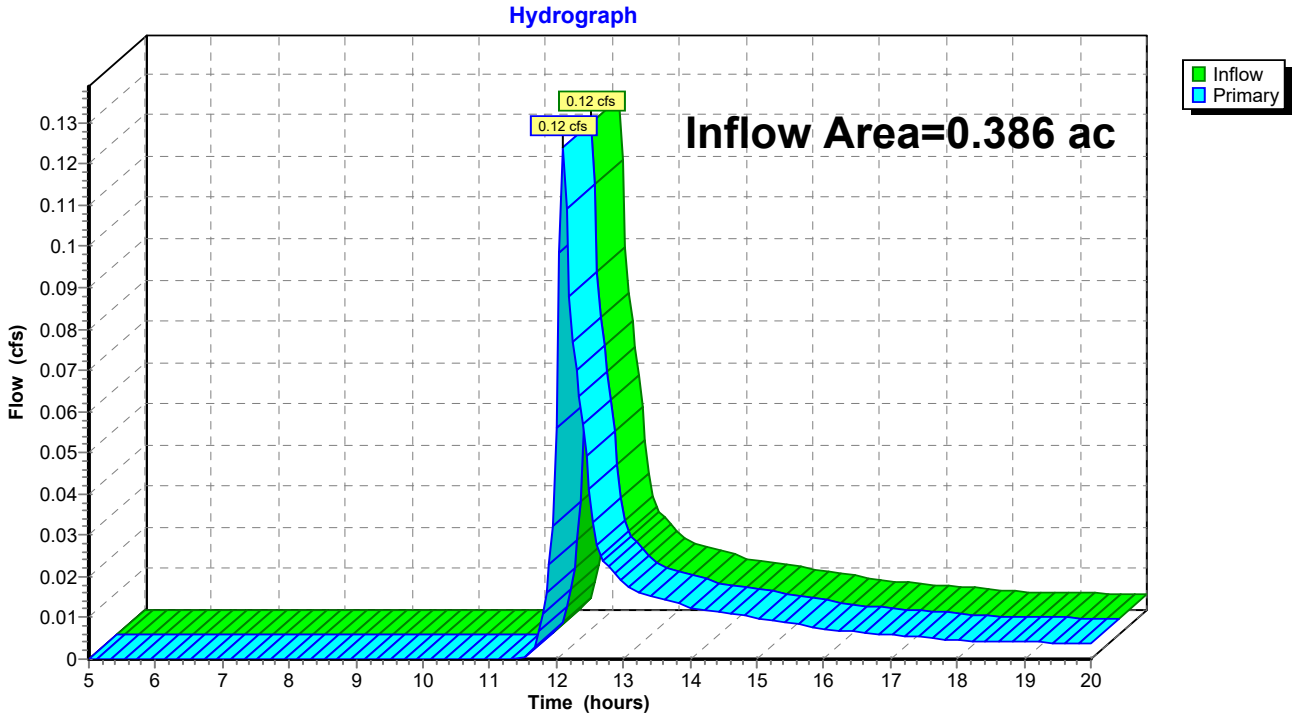


Summary for Link 3: AP-3

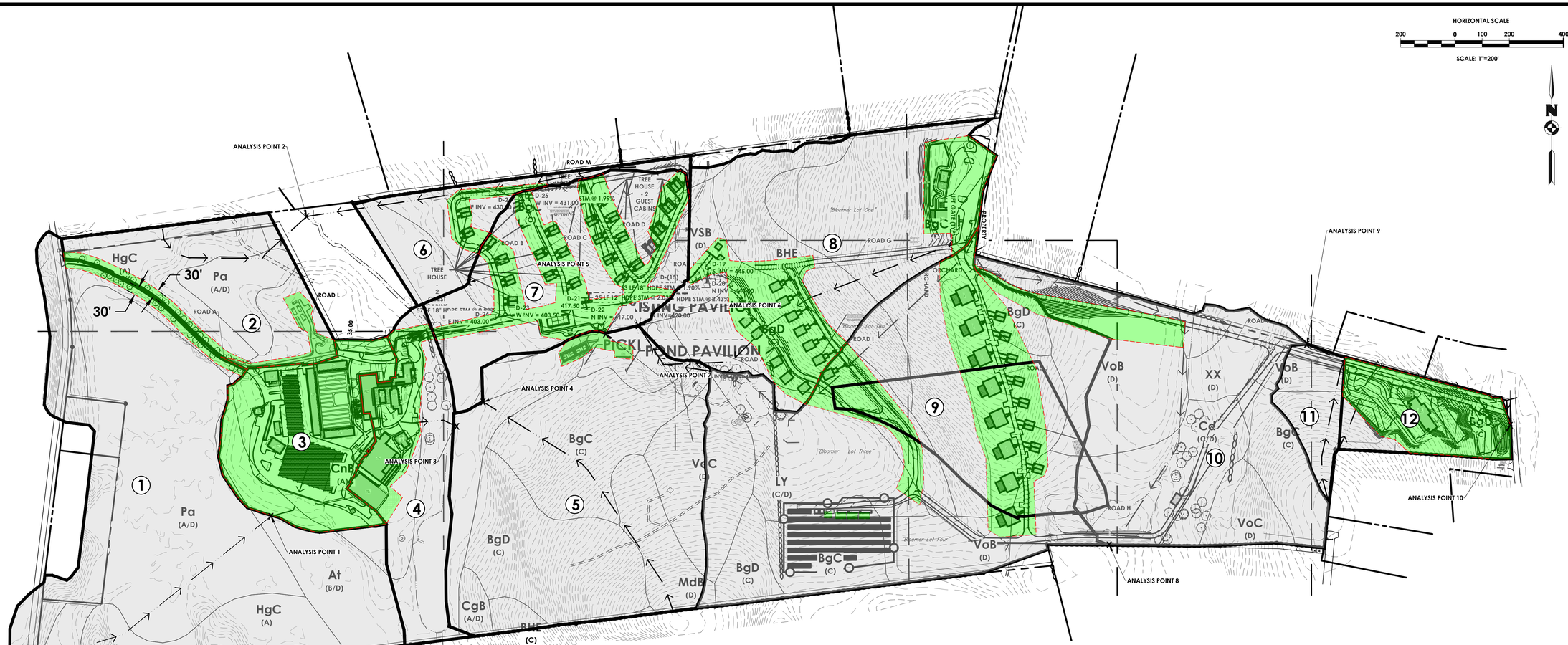
Inflow Area = 0.386 ac, 17.36% Impervious, Inflow Depth > 0.29" for WQv eVENT event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 0.009 af
Primary = 0.12 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1 : AP-01

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 3: AP-3



APPENDIX J: DRAINAGE MAPS



	AREA WITH RRV TREATMENT
	AREA WITHOUT RRV TREATMENT
→	Tc PATH
	SOIL BOUNDARY
	PROPERTY LINE
CIB	SOIL ABBREVIATION
(C/D)	SOIL RATING

CATCHMENT AREA 1		GREEN INFRASTRUCTURE
AREA (acre)	28.35	Vegetated Buffer
IMPERVIOUS AREA (acre)	0.11	
WQV (cuft	5,505	
RRV (cuft)	0.05	

CATCHMENT AREA 2		GREEN INFRASTRUCTURE
AREA (acre)	7.33	Vegetated Buffer
IMPERVIOUS AREA (acre)	0.27	
WQV (cuft	2,212	
RRV (cuft)	0.08	

CATCHMENT AREA 3		GREEN INFRASTRUCTURE
AREA (acre)	7.30	Porous Pavement
IMPERVIOUS AREA (acre)	3.26	
WQV (cuft	11,975	
RRV (cuft)	0.45	

CATCHMENT AREA 4		GREEN INFRASTRUCTURE
AREA (acre)	6.97	Infiltration Basin
IMPERVIOUS AREA (acre)	1.71	
WQV (cuft	6,852	
RRV (cuft)	0.27	

CATCHMENT AREA 5		GREEN INFRASTRUCTURE
AREA (acre)	21.41	Rooftop Disconnection
IMPERVIOUS AREA (acre)	0.52	
WQV (cuft	5,585	
RRV (cuft)	0.07	

CATCHMENT AREA 6		GREEN INFRASTRUCTURE
AREA (acre)	4.15	Rooftop Disconnection
IMPERVIOUS AREA (acre)	0.33	
WQV (cuft	1,831	
RRV (cuft)	0.12	

CATCHMENT AREA 7		GREEN INFRASTRUCTURE
AREA (acre)	11.36	Rooftop Disconnection
IMPERVIOUS AREA (acre)	1.97	
WQV (cuft	8,498	
RRV (cuft)	0.21	

CATCHMENT AREA 8		GREEN INFRASTRUCTURE
AREA (acre)	18.30	Rooftop Disconnection/ Bioretention
IMPERVIOUS AREA (acre)	2.23	
WQV (cuft	10,607	
RRV (cuft)	0.16	

CATCHMENT AREA 9		GREEN INFRASTRUCTURE
AREA (acre)	30.53	Rooftop Disconnection
IMPERVIOUS AREA (acre)	3.48	
WQV (cuft	16,910	
RRV (cuft)	0.15	

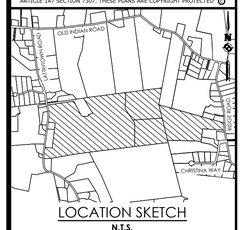
CATCHMENT AREA 10		GREEN INFRASTRUCTURE
AREA (acre)	16.82	N/A
IMPERVIOUS AREA (acre)	0.85	
WQV (cuft	5,830	
RRV (cuft)	0.10	

CATCHMENT AREA 11		GREEN INFRASTRUCTURE
AREA (acre)	2.08	N/A
IMPERVIOUS AREA (acre)	0.08	
WQV (cuft	639	
RRV (cuft)	0.08	

CATCHMENT AREA 12		GREEN INFRASTRUCTURE
AREA (acre)	3.95	Infiltration Basin
IMPERVIOUS AREA (acre)	1.16	
WQV (cuft	4,507	
RRV (cuft)	0	

PASSERO
engineering architecture

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LOCATION SKETCH
N.T.S.

Client:
Marlborough Resort, LLC
100 Ring Rd West
Garden City, NY 11530
SUITE 101

PASSERO ASSOCIATES
4 Front St., 2nd Floor
Newburgh, New York 12550
(585) 325-1000
Fax: (585) 325-1691
Principal-in-Charge Jess D. Sudol, P.E.
Project Manager Chris LaPorta, P.E.
Designed by Marvin Pinkrah

STATE OF NEW YORK
CHRISTOPHER J. LAPORTA
LICENSED PROFESSIONAL ENGINEER
102592

Revisions

No.	Date	By	Description
1	08/14/24		REVISED FOR PB SUBMISSION
2	10/11/24	DJG	REVISED BUILDING FOOTPRINTS
3	10/25/24		REVISED PER TOWN COMMENTS

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GREEN INFRASTRUCTURE MAP

MARLBOROUGH RESORT

Municipality: MARLBOROUGH
County: ULSTER State: NY

Project No.
20233707.0001

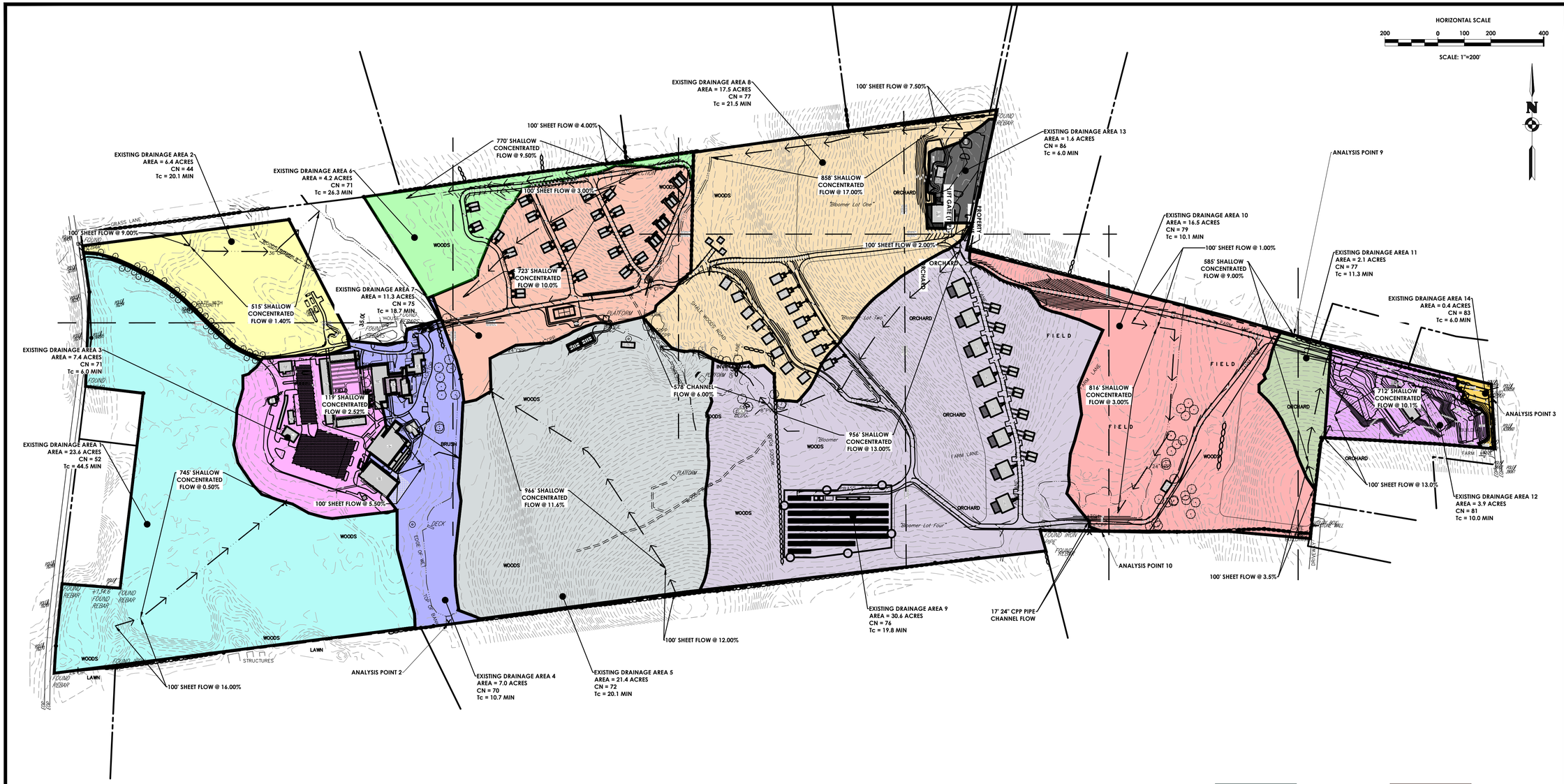
Drawing No.
C 192

Scale:
1" = 200'

Date
AUGUST 16, 2024

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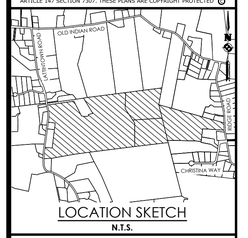


PRDA #1
PRDA #2
PRDA #3
PRDA #4
PRDA #5
PRDA #6
PRDA #7
PRDA #8
PRDA #9
PRDA #10
PRDA #11
PRDA #12

Tc PATH
SOIL BOUNDARY
PROPERTY LINE
CIB — SOIL ABBREVIATION
(C/D) — SOIL RATING

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LOCATION SKETCH
N.T.S.

Client:
Marlborough Resort, LLC
100 Ring Rd West
Garden City, NY 11530
SUITE 101

PASSERO ASSOCIATES
6 Front St., 2nd Floor
Newburgh, New York 12550
(585) 325-1000
Fax: (585) 325-1691
Principal-in-Charge — Jess D. Sudol, P.E.
Project Manager — Chris LaPorta, P.E.
Designed by — Marvin Pinkrah

STATE OF NEW YORK
CHRISTOPHER J. LAPORTA
102592
LICENSED PROFESSIONAL ENGINEER

Revisions

No.	Date	By	Description
1	08/14/24		REVISED FOR PB SUBMISSION
2	10/11/24	DJG	REVISED BUILDING FOOTPRINTS
3	10/25/24		REVISED PER TOWN COMMENTS

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PROPOSED DRAINAGE MAP

MARLBOROUGH RESORT

Municipality: MARLBOROUGH
County: ULSTER State: NY

Project No.
20233707.0001

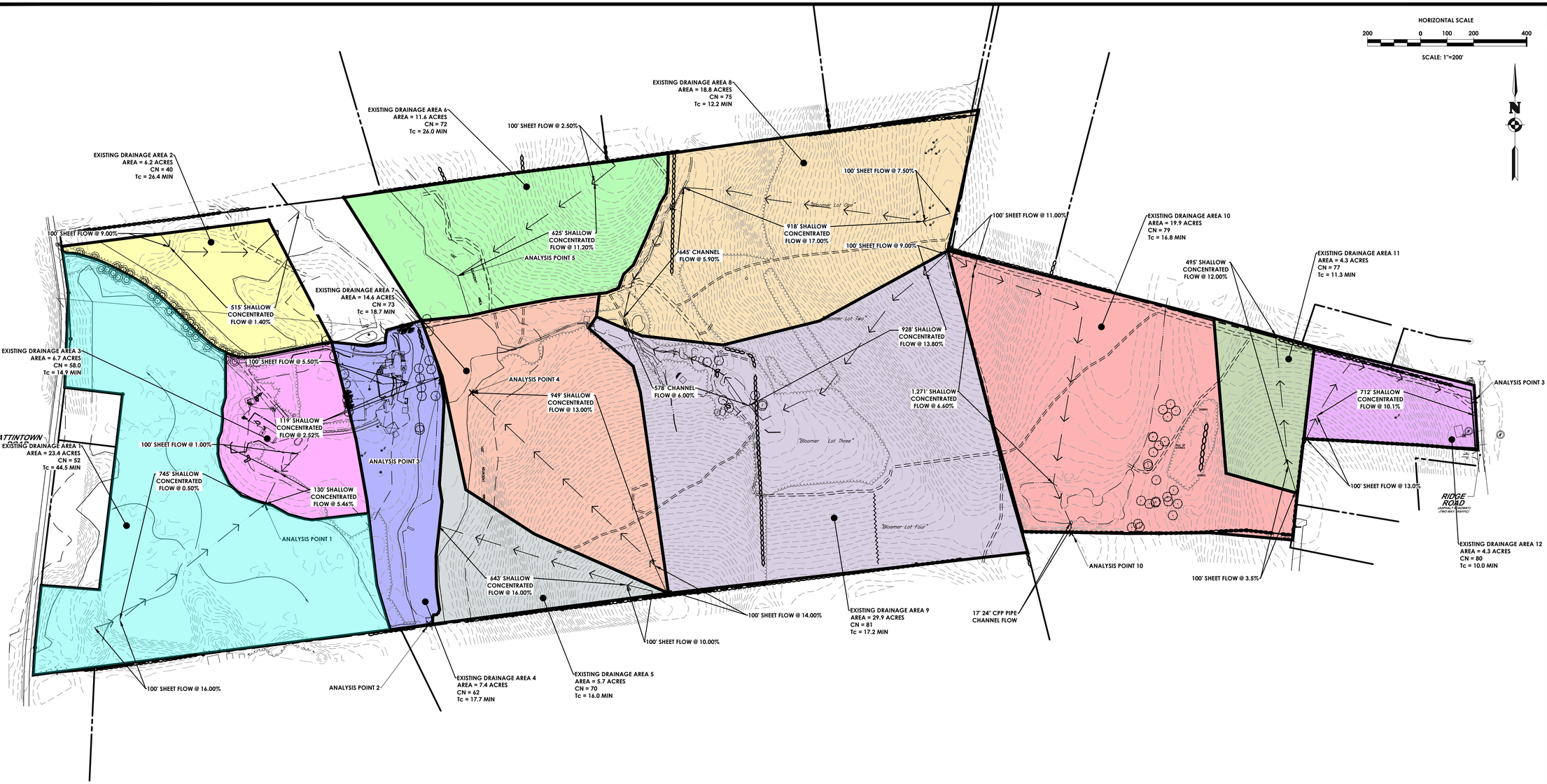
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Scale:
1" = 200'

Date
AUGUST 16, 2024

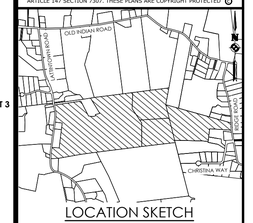
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STATE OF NEW YORK
CHRISTOPHER J. LAPORTA
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Revisions

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EXISITING DRAINAGE MAP

MARLBOROUGH RESORT

Municipality: MARLBOROUGH
County: ULSTER State: NY

Project No.
20233707.0001

Drawing No.

Scale:
1" = 200'

Date
AUGUST 16, 2024

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APPENDIX K: WQV & RUNOFF REDUCTION CALCULATIONS

PASSERO

JOB	Marlborough Resort RRV		
SHEET NO.	1	OF	4
CALCULATED BY	PM	DATE	8/18/2024
CHECKED BY	xx	DATE	xx
SCALE	N.T.S.		

Runoff Reduction Volume-For added impervious area

DA 155.172 acres **HSG** C **90% RAIN** 1.4 inch

1. **Planning (check all that apply)**

x	Preserve undisturbed areas, natural buffer, and critical environmental areas
x	Employ open space, conservation, clustering site design techniques
x	Avoid developing in environmentally sensitive areas
x	Minimize impervious surfaces, building footprints, parking, roads, walks and drives
x	Minimize clearing and grading

PASSERO

2. **Water Quality Volume (before runoff reduction)** WQv=P*A*Rv/12 **WQv=** 1.915 af
   83401.718 cf

DA 155.172 acres **Impervious Area** 9.614 **Rv=** 0.106

3. **Minimum RRv Requirements** RRv=P*.95*S*AI/12

P= 1.4 inch **S=** 0.3 **AI=** 9.614 **RRv=** 0.320 af
13924.63 cf

4. **Area Reduction Practices (check all that apply)**

x	Conservation of natural areas	contributing AI=	0.967	Area=	3.654 ac
x	Riparian Buffers/filter strips	contributing AI=	3.65	Area=	138.657 ac
x	Tree Planting/Tree preservation	contributing AI=		Area=	ac
x	Total Area Reduction				142.311 ac
x	Total Impervious area within area reduction				4.617 ac

5. **Subtract total area reduction from DA**

Remaining drainage area: (#2-#4) 12.861 ac
Remaining impervious area: (#2 AI-#4 AI) 4.997 ac

6. **Recalculate WQv for site area remaining after area reductions:**

Remaining DA= 12.861
Remaining AI= 4.997
Rv= 0.400

Area reduced WQv= 0.600 af

7. **Runoff reduction volume (RRv) from #2: (#2 WQv-#6 WQv)=** **RRv=** 1.315 af

PASSERO

JOB	Marlborough Resort RRV		
SHEET NO.	2		4
CALCULATED BY	PM	DATE	8/18/2024
CHECKED BY	xx	DATE	xx
SCALE	N.T.S.		

Rooftop Disconnect

8. **Incorporate rooftop area disconnection:**

Total disconnected rooftop area (now considered pervious for Rv calculation — Area= 0.874 ac

9. **Recalculate WQv with Rv modified for impervious disconnect:**

DA from (#5) 12.861 **Remaining AI=** 4.123 **Rv=** 0.339 Rv reduced WQv= 0.508 af

10. **Runoff reduction volume: #6 (area reduced WQv) - #9 (Rv reduced WQv)=** RRv= 0.092 af
3997.5012 cf

Source Control WQv Treatment Practices (from attached worksheet)

11a. **Subtotal DA tributary to Source Control treatment practices=** 12.867 acres
11b. **Subtotal Source Control WQv Treatment Volume=** 0.566 af
11c. **Subtotal Runoff Reduction Volume (RRv)=** 1.973 af

TOTAL Runoff Reduction Volume (RRv)

12. **Total RRv provided (#7 + #10 + 11c) =** Total RRv= 3.380 af

13. **Is RRv (#12) ≥ original WQv (#2)** YES NO If yes, skip to #18

14. **Is RRv (#12) ≥ minimum WQv (#3)** YES NO If no, provide add'l RRV and recalculate

15. **Total drainage area treated with runoff reduction/source control practices=** 155.178 ac
(Area reduction from #4 + total DA tributary to source control #11a.)

16. **Is all of the watershed DA treated by either area reduction or source control practices?**
YES NO If yes, skip to #18

Standard WQv Treatment

17. **Provide treatment for any remaining untreated watershed DA with standard practices**

Remaining untreated DA=DA (#2)	155.172 ac	- treated DA (#15)	155.178	ac	=	-0.006 ac
Remaining impervious=AI (#2)	9.614 ac	- treated AI (#11, #8, #4)	10.688	ac	=	-1.074 ac
Remaining DA =	-0.006 ac					
Remaining AI=	-1.074 ac					
Rv=	-0.025					
WQv=	-0.038 af					

PASSERO

JOB	Marlborough Resort RRV		
SHEET NO.	3	OF	4
CALCULATED BY	PM	DATE	8/18/2024
CHECKED BY	xx	DATE	xx
SCALE	N.T.S.		

Standard WQv Treatment (Continued)

Ponds	WQv Provided	_____	af	*Minimum Rv= 0.20
Wetlands	WQv Provided	_____	af	
Infiltration	WQv Provided	_____	af	
Filters	WQv Provided	_____	af	
Open Channels	WQv Provided	_____	af	

Peak Flow Attenuation

18. **Calculate peak runoff rates for pre-development site conditions**

DA= 0 ac RCN= 0 Tc (hours) 0.00

Q1= 0.00
Q10= 0.00
Q100= 0.00

19. **Calculate peak runoff rates for post-development site conditions with RRv (method used "HydroCAD")**

DA= 0 ac RCN= 0 Tc (hours) 0.000

Q1= 0.00
Q10= 0.00
Q100= 0.00

20. **Provide necessary stormwater volume detention for channel protection, overbank and extreme storm runoff to mitigate any increase in post-developed runoff from pre-developed conditions using:**

Ponds	CP vol	_____	cf	OB vol	_____	cf	ES vol	_____ cf
Wetlands	CP vol	_____	cf	OB vol	_____	cf	ES vol	_____ cf
Dry Detention	CP vol		cf	OB vol		cf	ES vol	cf
Underground storage	CP vol	_____	cf	OB vol	_____	cf	ES vol	_____ cf
Blue roofs	CP vol	_____	cf	OB vol	_____	cf	ES vol	_____ cf

PASSERO

JOB	Marlborough Resort RRV		
SHEET NO.	4	OF	4
CALCULATED BY	PM	DATE	8/18/2024
CHECKED BY	xx	DATE	xx
SCALE	N.T.S.		

11. **SOURCE CONTROL WQv TREATMENT PRACTICES WORKSHEET**

X	Infiltration					**Allowable Reduction**	
	DA(ac)=	3.855	Rv=	0.321		100% of WQv=	0.144
	AI (ac)=	1.16	WQv=	0.144			
X	Bioretention					**Allowable Reduction**	
	DA(ac)=	1.571	Rv=	0.495	A/B soils	80% of WQv=	0.000
	AI (ac)=	0.777	WQv=	0.091	C/D soils	40% of WQv=	0.036
	Dry Swale					**Allowable Reduction**	
	DA(ac)=	0	Rv=	0.000	A/B soils	40% of WQv=	0.000
	AI (ac)=	0	WQv=	0.000	C/D soils	20% of WQv=	0.000
	Vegetated Swale					**Allowable Reduction**	
	DA(ac)=	0	Rv=	0.000	A/B soils	20% of WQv=	0.000
	AI (ac)=	0	WQv=	0.000	C/D soils	10% of WQv=	0.000
	Green Roof					**Allowable Reduction**	
	Roof=	0	Rv=	0.000		100% of WQv=	0.000
			WQv=	0.000			
	Rain Garden					**Allowable Reduction**	
	Roof=	0	Rv=	0.000	A/B soils	100% of WQv=	0.000
			WQv=	0.000	C/D soils	40% of WQv=	0.000
	Cisterns/Rain Barrels					**Allowable Reduction**	
	Roof=	0	Rv=	0.000	A/B soils	100% of WQv=	0.000
			WQv=	0.000	C/D soils	40% of WQv=	0.000
	Stormwater Planters					**Allowable Reduction**	
	DA(ac)=	0	Rv=	0.000		100% of WQv=	0.000
	AI (ac)=	0	WQv=	0.000			
X	Porous Pavement					**Allowable Reduction**	
	DA(ac)=	7.441	Rv=	0.444		100% of WQv=	0.386
	AI (ac)=	3.26	WQv=	0.386			

11a.	**Subtotal DA tributary to Source Control WQv Treatment=**	12.867	ac	
11b.	**Subtotal Source Control WQv Treatment Volume=**	0.566	af	
11c.	**Subtotal of All Runoff Reduction Volume (RRv)=**		Subtotal RRv=	**1.973**

PASSERO

JOB	Marlborough Resort 20233707.0001		
SHEET NO.	1	OF	1
CALCULATED BY	PM	DATE	8/18/2024
CHECKED BY		DATE	
SCALE	Water Quality Volume		

Initial Water Quality Volume

WQv = [(P)(Rv)(A)]/12

Where:

Rv = 0.05 + 0.009(I)

I = impervious cover in percent

P = 90% rainfall (see Figure 4.1)

A = site area in acres

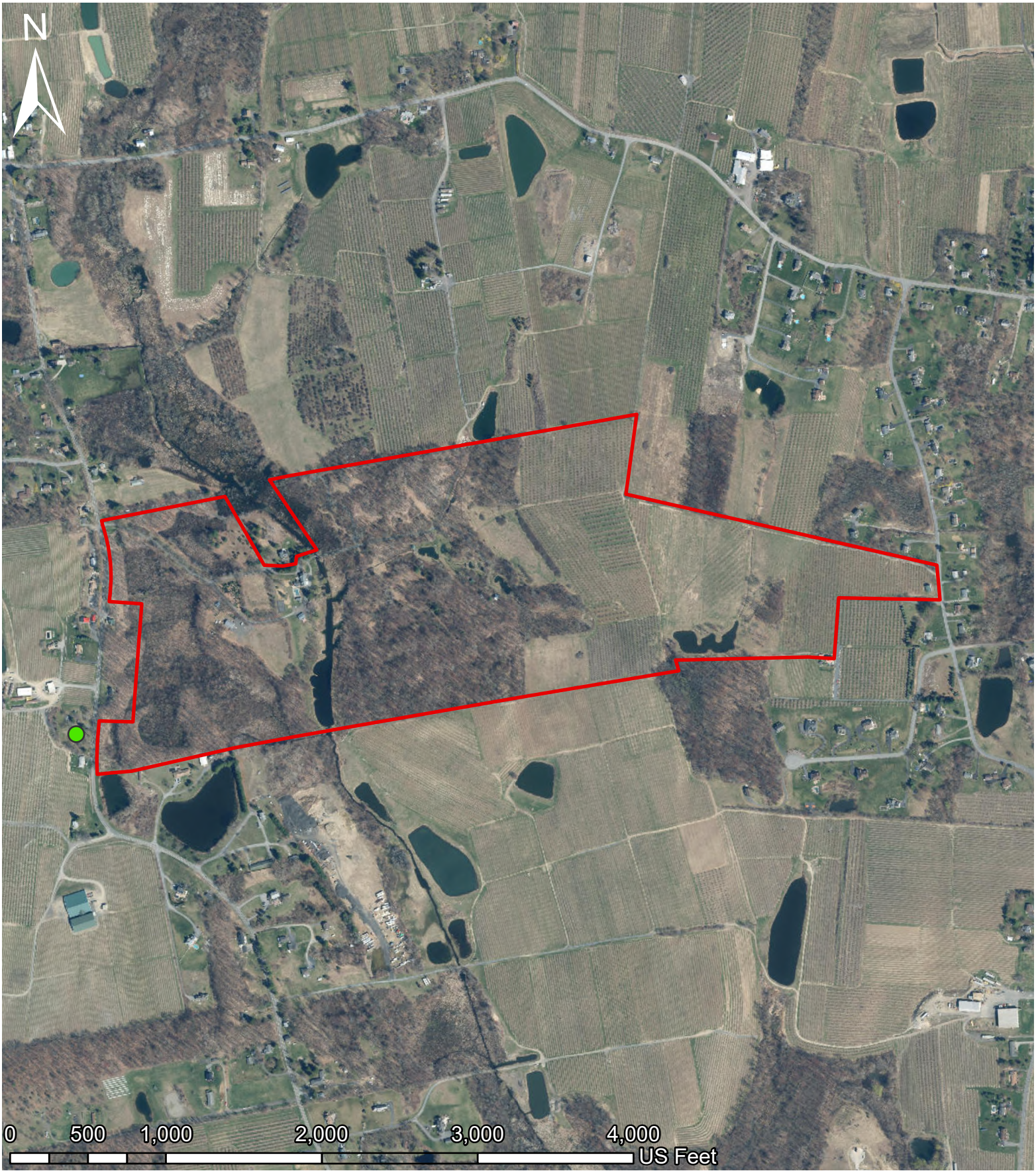
Location	Site Area (ac)	New Impervious Area (ac)	Replaced Impervious Area (ac)	% Impervious	Rv	Rainfall (P) (inches)	WQv (ac-ft)		cf
P-03	7.441	2.375	0.885	43.8%	0.44	1.40	0.386	0.307	16801
P-12	3.855	0.887	0.273	30.1%	0.32	1.40	0.144	0.119	6285.2
P-13	1.571	0.777	0.000	49.5%	0.50	1.40	0.091	0.091	3953
	12.867	4.039	1.158	40.4%	0.41	1.35	0.599		26074

RRV Provided= Subcatchments 3, 12 @ 100%, Subcatchments 13 @ 40% 0.566

Remaining WQv treated in same bioretention as "standard practice" 0.033

Location	Site Area (ac)	New pervious Are (ac)	Replaced pervious Are (ac)	% Impervious	Rv	Rainfall (P) (inches)	WQv (ac-ft)	
P-01	23.450	0.000		0.0%	0.05	1.40	0.137	#DIV/0!
P-02	6.449	0.000	0.270	4.2%	0.09	1.40	0.066	0.016
P-03	7.441	2.375	0.885	43.8%	0.44	1.40	0.386	0.307
P-04	6.960	0.710	1.000	24.6%	0.27	1.40	0.220	0.124
P-05	21.410	0.510		2.4%	0.07	1.40	0.178	0.178
P-06	5.701	0.089	0.333	7.4%	0.12	1.40	0.078	0.032
P-07	11.289	1.551	0.358	16.9%	0.20	1.40	0.266	0.229
P-08	17.483	0.801	0.746	8.8%	0.13	1.40	0.264	0.169
P-09	30.530	1.984	0.746	8.9%	0.13	1.40	0.465	0.369
P-10	16.521	0.130	0.720	5.1%	0.10	1.40	0.186	0.068
P-11	2.126		0.156	7.3%	0.12	1.40	0.029	0.007
P-12	3.855	0.887	0.273	30.1%	0.32	1.40	0.144	0.119
P-13	1.571	0.777		49.5%	0.50	1.40	0.091	0.091
P-14	0.386		0.067	17.4%	0.21	1.40	0.009	0.002
	155.172	9.814	5.554	9.9%	0.14	1.40	2.519	1.836

APPENDIX L: ARCHEOLOGICAL SENSITIVE AREA MAP



Legend

- Project Area
- Historic Sites

Eligible Historic Sites

- Eligible
- Listed

Archeological Sensitive Areas

Maps created by: Passero Associates GIS
CRS: NAD83 State Plane New York East
Municipality: Hamlet of Marlborough
Source: Cultural Resource Information System

PASSERO
architecture engineering

Service Credits:
New York State, Maxar

Date: 4/25/2024

APPENDIX M: INSPECTION FORMS

HORIZONTAL SCALE
200 0 100 200 400
SCALE: 1"=200'

N

PHASE X=4.6 ACRES
PHASE X=2.6 ACRES
PHASE X=4.5 ACRES
PHASE X=2.4 ACRES
PHASE X= 0.7 ACRES
PHASE X= 4.6 ACRES
PHASE X= 0.8 ACRES
PHASE X= 4.7 ACRES
PHASE X=3.3 ACRES
PHASE X=2.3 ACRES
PHASE X=3.1 ACRES

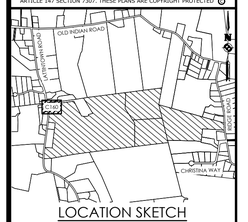
"Bloomer Lot One"
"Bloomer Lot Two"
"Bloomer Lot Three"
"Bloomer Lot Four"

LATTINTOWN ROAD (ASPHALT PAVEMENT) (TWO WAY TRAFFIC)
RIDGE ROAD (ASPHALT PAVEMENT) (TWO WAY TRAFFIC)
OLD INDIAN ROAD
CHRISHNA WAY
POLICE ACADEMY
POLICE ACADEMY

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PHASING PLAN

MARLBOROUGH RESORT

Municipality: MARLBOROUGH
County: ULSTER State: NY

Project No.
20233707.0001

Drawing No.
C 169

Scale:
1" = 200'

Date
AUGUST 16, 2024

NOT FOR CONSTRUCTION

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

Standardized Qualified Inspector Form

Project Name and Location of Project: _____ _____ _____ Municipality:_____ County: _____ Qualified Inspector: _____ Qualified Inspector Title:_____	Date:	Weather:
	Permit #: **NYR10**	
	Entry Time:	Exit Time:
5 Acre Waiver: □ Yes □ No Name of SPDES Permittee:_____ Phone: _____Fax:_____ Name of Representative on Site: _____		

Qualified Inspector's Credentials & Certification

Qualified Inspector (QI) means a person that is knowledgeable in the principles and practices of erosion and sediment control (ESC). A person is considered qualified under the following conditions:

1. A licensed Professional Engineer; licensed Landscape Architect with documented training and education in the principles and practices of ESC;
2. An individual certified in ESC by CPESC, Incorporated or any other agency endorsed by the NYS Department of Environmental Conservation Office of Water Resources;
3. An individual working under the direct supervision of a qualified licensed Professional Engineer or qualified licensed Landscape Architect with documented training and education in the principles and practices of ESC **and has** completed the four (4) hour training program in the principles and practices of erosion and sediment control from either a Soil and Water Conservation District, CPESC or any other agency endorsed by the NYS Department of Environmental Conservation Office of Water Resources. This initial training must be completed no later than May 1, 2010. After receiving the initial training, an individual working under the direct supervision of a qualified licensed Professional Engineer or qualified licensed Landscape Architect must complete four (4) hours of training every three (3) years.
4. Any other individual endorsed by the NYS Department of Environmental Conservation by written documentation.
5. Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.1

Part I. CONSTRUCTION DURATION INSPECTIONS **Page 2 of _____**

a. SITE PLAN/SKETCH OF AREAS DISTURBED AT TIME OF INSPECTION AND AREAS THAT HAVE BEEN STABILIZED (TEMPORARY OR FINAL) SINCE LAST INSPECTION:

b. Other Permit Required Reporting

Maintaining Water Quality - *Attach Color Photographs of the site documenting discharge points and site conditions.*
Describe the condition of runoff at all points of discharge.
Is there an increase in turbidity causing a substantial visible contrast to natural conditions? _____
Is there residue from oil and floating substances, visible oil film, or globules or grease? _____
Is there evidence of silt deposition from project in a stream, wetland, or other water body? _____
If yes, where? _____remedial measure needed? _____
Provide a description of the conditions of all natural water bodies within or immediately adjacent to the project. _____

Area of Disturbance
Total area of disturbance (as shown on sketch plan and not including areas that have temporary or permanent stabilization measures applied) _____
Are all disturbances within the limits of the SWPPP? _____

Weather Conditions
A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;
_____
_____

General Housekeeping
Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?_____
Is construction impacting the adjacent property? _____
Is dust adequately controlled?_____
Describe corrective action(s): _____
Date correction needed: _____

c. Runoff Controls *Direct runoff away from exposed soil surfaces and control water that falls onto the site*

Runoff conveyance systems ☐ N A
Are all runoff conveyance systems called for in the SWPPP installed, stabilized and working? _____
If not, what specific areas need detailing?_____
With minimum side slopes 2H:1V or flatter? _____ Stabilized by geotextile fabric, seed, or mulch with no erosion occurring? _____Sediment-laden runoff directed to sediment trapping structure? _____
Describe corrective action(s): _____
Date correction needed: _____

Runoff Control Structures ☐ N A
Have all required runoff control structures (rock outlets and aprons) been installed and constructed per plan and according to the Blue Book?_____ Installed concurrently with pipe installation? _____
Describe corrective action(s): _____
Date correction needed: _____

Temporary Stream or Channel Crossing □ N A
Have construction crossings at concentrated flow areas been culverted?_____
Describe corrective action(s): _____
Date correction needed: _____

Stone Check Dam □ N A
Installed per standards? _____ channel stable (flow is not eroding soil underneath or around the structure). _____does sediment need to be removed? _____
Describe corrective action(s): _____
Date correction needed: _____

Excavation Dewatering □ N A
1. Flowing water □ N A – Upstream berm (sandbags, inflatable dams, etc. with one-foot minimum freeboard) and downstream berms are installed per plan? _____and functioning? (clean water from upstream pool is being pumped to the downstream pool)?
_____
2. Sediment laden water from work area □ N A - Is being discharged to a silt-trapping device? _____
3. Groundwater from excavations □ N A - is being managed properly (sumps and sediment control)? _____
Describe corrective action(s): _____
Date correction needed: _____

d. Soil Stabilization *Basic erosion control is achieved by covering all bare ground areas.*

Topsoil and Spoil Stockpiles □ N A
Stabilized - sediment controls at downhill slope? _____
Describe corrective action(s): _____
Date correction needed: _____

Revegetation/Stabilization □ N A
Has temporary or permanent seeding *and* mulch (as shown on site sketch plan) been applied to areas that have been inactive for 14 days or less (or, inactive for 7 days if over 5 acres disturbed)?_____
Has soil preparation been applied as specified in the SWPPP and in accordance with the Blue Book (Assure that all the necessary soil testing/fertilizer/lime, topsoil, decompaction has been applied)?
_____
Have rolled erosion control products specified for steep slopes or channels been installed? _____
Describe corrective action(s): _____
Date correction needed: _____

e. Sediment Controls

Stabilized Construction Entrance □ N A
Stone is clean and all access areas covered (entrances, construction routes, materials storage areas, equipment parking)?_____ Tracking onto public streets is minimized and cleaned daily? _____
Describe:_____
Date correction needed: _____

Silt Fence □ N A

Installed on contour? not across conveyance channels?_____ At least 10 feet from toe of slope?_____At appropriate spacing intervals based on slope?_____Wrapped ends for continuous support?_____Fabric is tight, without rips or frayed areas?_____Posts are stable?_____ buried 6 inches minimum?_____Any "bulges"?_____
Describe:_____
_____
Date correction needed: _____

Temporary Sediment Trap □ N A

Is outlet structure constructed properly?_____geotextile fabric has been placed beneath rock fill?_____Maintenance – depth of sediment in basin? _____ 50% capacity?
_____
Describe:_____
_____
Date correction needed: _____

Temporary Sediment Basin □ N A

Is basin and outlet structure constructed per the approved plan? _____
Are basin side slopes stabilized with seed/mulch?
_____
Maintenance – depth of sediment in basin? _____ 50% capacity?
_____
Describe:_____
_____
Date correction needed: _____

Drop Inlet Protection □ N A

Type(s) of inlet control? _____
Installed per Blue Book specifications: drainage area (typically 1 acre)? _____
Appropriate for location? _____
Describe:_____
_____
Date correction needed: _____

f. Digital Color Photographs of Deficient BMPs

The *qualified inspector* shall attach paper color copies of the digital photographs to this inspection report of deficient BMPs with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions.

g. Digital Color Photographs of BMPs that have been Corrected

The *qualified inspector* shall attach paper color copies of the digital photographs to this inspection report of corrected BMPs with date stamp, that clearly show the condition of the practice(s) after the corrective actions has been completed.

h. Post-Construction Stormwater Management

Report of any corrective action(s) that must be taken to install, correct, repair, replace or maintain any deficiencies identified with the construction of the post-construction stormwater management practice(s).
Report the current phase of construction of all post-construction stormwater management practice(s) and whether the installation appears to be geometrically consistent with the approved hydraulic design (e.g. the pond, the outlet structure, orifice, pipe sizing and slope is geometrically consistent with the SWPPP):_____

_____
_____
_____

i. Revisions to SWPPP

When the owner or operator becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any other report, or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or impervious area) which were not reflected in the original NOI submitted to the Department and/or the MS4, they shall promptly submit such facts or information. Failure of the owner or operator to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a permit violation (GP-0-10-001 PartVII.G)

_____
_____
_____
_____

j. Inspection Notes and Signature

Inspection Notes:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Standardized Qualified Inspector Form

PART I. j. Signature

GP-0-10-001 Part VII.Q

Articles 175 and 210 of the New York State Penal Law provide for Criminal penalty of a fine and/or imprisonment for falsifying forms and reports required by this permit.

_____ _____

Qualified Inspector (print name) **Date of Inspection**

_____

Signature

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Title: _____ Address: _____

Phone: _____ Email: _____

CPESC#: _____

Stormwater Training Number for *Trained Individuals*: _____
P.E. or L.A. Supervisor Name for *Trained Individuals*:_____

Compliance certification:

Received and reviewed by_____Title:_____

The above signed acknowledges receipt of this inspection report

Chapter 12: Maintenance Guidance

SMPs will not function to protect water resources without proper attention to operation and maintenance (O&M). In order to ensure long-term performance, it's critical that O&M tasks and responsibilities are identified, clearly outlined in an inspection and maintenance plan, and assigned to various stakeholders. This Chapter was developed to address the need for maintenance guidance, and is structured in the following sections:

- **Section 12.1** introduces the 10 SMP groups used in this Chapter, establishes the 3 level hierarchy for inspection and maintenance responsibilities and procedures, and provides an overview of planning and budgeting for maintenance.
- **Section 12.2** outlines the key components to be inspected, the Level 1 inspection and maintenance procedures, and common triggers for Level 2 and Level 3 inspections, for each of the 10 SMP groups.
- **Section 12.3** includes diagnostic measures for specific problems, as well as guidance for performing repair activities.

Section 12.1 Introduction

12.1.1 Stormwater Management Practice (SMP) Groups

For the purpose of this Chapter, the standard SMPs and Runoff Reduction Techniques have been clustered into ten SMP groups (**Table 12.1**), containing practices that share common inspection components and maintenance concerns. This grouping has been applied to the detailed inspection guidance provided in **Section 12.2,** as well as the fillable **Level 1 and Level 2 Inspection Checklists** that are available for download on the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov). The checklists identify common problems with key components of the SMPs, recommend follow-up actions to correct them, and outline triggers for Level 2 and Level 3 inspections. These checklists have been developed as a guideline to assist responsible parties with efficient and thorough O&M.

Table 12.1 Practices Discussed in this Chapter, by Group

SMP Group	Practices Included	
1. Sheet Flow and Disconnection	• Sheet Flow to Filter Strip • Rooftop Disconnection	• Sheet Flow to Riparian Buffers
2. Tree Planting	• Tree Planting	
3. Swales	• Vegetated Swale	• Wet Swale
4. Bioretention	• Tree Pit • Tree Trench • Rain Garden • Stormwater Planter	• Infiltration Bioretention • Filtration Bioretention • Bioslope • Dry Swale
5. Rainwater Harvesting	• Rain Barrel	• Cistern
6. Porous Pavements	• Porous Asphalt • Porous Paver	• Porous Concrete • Stabilized Grid/Cell
7. Green Roofs	• Extensive Green Roof	• Intensive Green Roof
8. Ponds and Wetlands	• Stormwater Ponds	• Stormwater Wetlands
9. Infiltration	• Infiltration Trench • Infiltration Basin	• Dry Well • Underground Infiltration
10. Sand Filters	• Surface Sand Filters • Perimeter Sand Filters	• Underground Sand Filters

12.1.2 Maintenance Hierarchy

This Chapter is structured around a hierarchy concept, where the severity of the problem directly correlates to the level of experience needed to perform the inspection and identify corrective maintenance measures.

Many SMP maintenance problems start out as minor and can be easily identified by individuals with limited experience (**Level 1**). As long as these issues are detected early, through regular inspections, they can typically be addressed in an expedient and cost-effective manner.

However, in some cases, issues may arise that require additional technical knowledge or capabilities to diagnose the problem and identify the appropriate remedy (**Level 2**). At this point, assistance from an individual with training in SMP inspection, operation and maintenance, may be necessary.

Similarly, some problems escalate to the point where a Qualified Professional or specialized expert is needed to return the SMP to proper functioning condition (**Level 3**).

The step-wise approach of the Maintenance Hierarchy (**Figure 12.1**) was developed to ensure long-term performance of SMPS, through cost-effective implementation of inspection and maintenance.



Figure 12.1 The SMP Maintenance Hierarchy

Level 1: Individuals with Limited or No Training

Level 1 includes routine inspection and maintenance activities conducted by:

- Property owners, property managers, or HOA representatives, for privately owned SMPs.
- Municipal maintenance staff/interns or volunteers, for municipally owned SMPS.

These individuals typically have very limited training in stormwater operation, inspection, and maintenance, but can use available guidance to quickly identify and rectify common or minor issues with SMP performance. For most SMPs, the majority of inspection and maintenance activities can be conducted at this skill level, thus Level 1 forms the base of the Maintenance Hierarchy pyramid. Many well-functioning SMPs can be adequately maintained for long periods of time using Level 1 capabilities.

Some issues may arise that require a higher level of resources and expertise. Such issues are referred to in this Chapter and the Inspection Checklists as “kick-outs to Level 2.”

Level 2: Trained Individuals

Level 2 includes inspection and maintenance activities conducted by municipal employees or landscape contractors who have completed training on SMP operation, inspection, and maintenance. Level 2 inspections can occur in response to two circumstances:

1. As part of an ongoing, municipal inspection program whereby SMPs are visited on a rotating basis at a frequency of once every five years, or a frequency established by the local program; or
2. In response to a “kick-out” from a Level 1 Inspector.

Circumstance #2 requires coordination and communication between the Level 1 and Level 2 Inspectors, with documentation and background provided by the Level 1 Inspector. This is essential to make the hierarchy approach successful.

As with kick-outs from Level 1 to Level 2, the same can exist from Level 2 to Level 3. If the Level 2 Inspector encounters a problem where a Qualified Professional is needed to re-design certain components of the SMP, and/or a Qualified Contractor is needed to undertake a more serious repair, then Level 3 is activated.

Level 3: Qualified Professionals

Level 3 includes inspection and maintenance conducted by Qualified professionals, including professional engineers and landscape architects, that can revisit design issues associated with chronic or serious problems. For repair and maintenance of the SMPs at this level, individuals with specific skills and certifications, such as a certified plumber with experience working with rainwater harvesting systems or a horticulturalist with knowledge on proper plantings, may need to be called in by the Qualified Professional.

Table 12.2 describes how SMP inspection and maintenance activities differ at each level of the Maintenance Hierarchy.

Table 12.2 SMP Inspection and Maintenance Hierarchy Levels

	Level 1: Individuals with Limited or No Training	**Level 2: Trained Individuals**	**Level 3: Qualified Professionals**
Qualifications/ Training of Inspectors	No special training, but person is provided educational materials	On-the-job training and/or workshops	Professional License, such as a PE or RLA
Frequency of Inspection	At least annually	Routine as determined by the local program OR as kick-out from Level 1 inspection	Only as needed from Level 2 inspection
Inspection Guidance	Inspection guidance is included in **Section 12.2.** Refer to the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov) for **Level 1 Inspection Checklists**.	Refer to the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov) for **Level 2 Inspection Checklists**.	Guidance on diagnosing common problems is included in **Section 12.3.** Refer to the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov) for a **Level 3 Inspection Form**.
Typical Maintenance Activities	Routine mowing. Trash removal. Plant care and upkeep. Mulching as needed. Removal of small amounts of sediment from pretreatment areas of the practice.	Removal of larger amounts of sediment. Structural damage repair. Minor regrading and scarification of soil surface to restore permeability.	Redesign an improperly functioning practice, to include: regrading the contributing drainage area, replacing filter media or plantings, modifying conveyance structures, etc.
Triggers for Inspection or Maintenance by this Level	Regular inspection (no trigger)	Common triggers for Level 2 inspection are included in **Section 12.2.**	Common triggers for Level 3 inspection are included in **Section 12.2.**

12.1.3 Level 1, 2 and 3 Inspections

12.1.3.1 General Guidance for Level 1 Inspections

Read through this guidance before performing an inspection and use the specific guidance in **Section 12.2** for the SMP Group that includes the practice being inspected. Refer to **Chapter 11** for guidance on plant maintenance, as well as control of invasive species.

When to Conduct a Level 1 Inspection

Level 1 Inspections are the most common and are intended to identify minor maintenance issues early and keep up with routine maintenance tasks. They should be conducted *at least annually* for all practices and supplemented with additional visits after large storms, winter salting and sanding, or other seasonal changes. In addition, it is recommended that inspections take place more frequently during the first few years after installation of an SMP. Many issues can be identified and corrected during this early period, so that they do not lead to larger problems in subsequent years. Once the SMP is stable and seems to be functioning properly, the inspections can become less frequent.

What to Take into the Field

The Level 1 Inspection is simple, and it is assumed that very little measurement is needed. However, the Inspector should take pictures to document findings and keep a record of all inspections. The following items may be needed during a Level 1 Inspection:

1. Letter of permission to access property if the Inspector is from an outside agency
2. Clipboard and pencils (if using paper forms), or Tablet or smartphone (if using digital forms)
3. Level 1 Inspection Checklists (paper or digital copies)
4. Notes or records from past inspections
5. Approved Site Plan, Planting Plan (includes planting/seed mixes), and/or details for SMP's
6. Digital camera or smartphone
7. Engineer's scale
8. Flagging/stakes and waterproof marker (to mark problem areas that need to be revisited)
9. 25-ft Measuring Tape (optional, to measure pipe sizes and SMP dimensions)
10. Safety equipment: safety vest, steel-toe shoes, traffic cones, etc. (if SMP is located near traffic)
11. Bug spray (if needed)
12. Sun block (if needed)

Level 1 Checklists

The **Level 1 Inspection Checklists** are available for download on the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov). These checklists outline common problems with key components of the SMPs and describe follow-up actions for each observed condition. Refer to **Figure 12.2**, for an example checklist.

The Checklists are intended to be used as follows:

- Check the box in the LEFT column if the problem is present at the site.
- Check the appropriate follow-up action(s) in the RIGHT column, or add an action as needed to fix the problem.
- Record all your actions. Keep copies of the Level 1 Inspection Checklists, plus notes, photos, or other documentation of corrective measures to fix problems. Record dates of actions and any follow-up inspections. This will be important for communicating with Level 2 Inspectors and/or the local maintenance program.
- Activate a Level 2 Inspection using the blue cells to identify conditions when a more detailed inspection is necessary to further diagnose a problem. Refer to **Section 12.2** for common triggers of Level 2 Inspection for each of the SMP Groups. Consult the local stormwater program authority for the most appropriate Level 2 inspection option.

Porous Pavement 1. Drainage Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small bern or adding topsoil to area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.

Figure 12.2 Example Level 1 Inspection Checklist, with Follow-Up Actions. *Note "Kick-Out to Level 2" highlighted in light blue.*

12.1.3.2 General Guidance for Level 2 and 3 Inspections

Read through this guidance before performing an inspection, and use the specific guidance in **Section 12.2** for the SMP Group that includes the practice being inspected, or **Section 12.3** for the specific problem encountered.

When to Conduct a Level 2 Inspection

Level 2 Inspections occur as routine inspections for compliance with local stormwater regulations or when triggered by a Level 1 Inspector to address or diagnose specific problems. In this situation, the Level 2 Inspector should confer with the Level 1 Inspector about problems they have identified and then conduct a follow-up inspection that focuses on diagnosing the causes of the problems and possible solutions.

The frequency of Level 2 Inspections is typically defined by the municipality, but shall occur at least once every five years. As with Level 1 inspections, the frequency may change with the age of the SMP, with higher inspection frequency the first couple of years after installation.

Notifying the Owner/Operator

Consult the project files and maintenance agreement to ascertain the Owner/Operator. Confirm that there is right of access through the local code, signed maintenance agreement, or other means. Contact the Owner/Operator at least three business days in advance of the proposed inspection. If the Owner/Operator cannot be found or contacted, make a reasonable effort through file research to contact a property representative, and document those efforts in writing. If the inspection is in response to a Level 1 inspection and referral to your agency, speak with the person who conducted the Level 1 inspection and get any documentation they may have. For publicly owned and managed SMPs, the municipality or other regulated MS4 is responsible for long-term operation and maintenance.

What to Take in the Field

Level 2 inspections may require authorized access to private property. Therefore, additional identification shall be provided for these inspections. It is recommended that the following items be taken into the field during a Level 2 Inspection:

1. Letter on municipal letterhead granting access to property and/or agency photo badge
2. Clipboard and pencils (if using paper forms), or Tablet or smartphone (if using digital forms)
3. Level 2 Inspection Checklists (paper or digital copies)
4. Dry erase board and marker (optional) to include in photos to keep track of SMP tracking # in municipal database (see **Figure 12.3** as example)
5. Notes or records from past inspections
6. Approved Site Plan, Planting Plan (includes planting/seed mixes), and/or details for SMP's
7. SMP As-Built Plan (if available)
8. Digital camera or smartphone
9. Engineer's scale
10. Flagging/stakes and waterproof marker (to mark problem areas that need to be revisited)
11. 100-ft Measuring Tape
12. Hand level and pocket rod (if needed to measure relative elevations)
13. Pipe wrench (to open underdrain clean-out caps)
14. Flashlight (to look into underdrain cleanouts and/or manholes)
15. Manhole cover puller
16. Soil probe, auger, and/or shovel
17. Safety equipment: safety vest, steel-toe shoes, traffic cones, etc. (if SMP is located near traffic)
18. Bug spray (if needed)
19. Sun block (if needed)

Level 2 Checklists

The **Level 2 Inspection Checklists** are available for download on the NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov). These checklists outline recommended repairs for common problems with key SMP components, and common triggers for Level 3 Inspection.

Conducting the Inspection

In general, the inspection should follow a consistent, logical approach, such as outlined below.

- Conduct a quick tour of the practice to identify any obvious issues and important components: inlets (number, location), surface area, outlet structures, berms or impoundments, outfalls, downstream conveyance channels or receiving waters. Check these components against the approved design plan or as-built drawing (if available).



Figure 12.3 Use a white board and digital camera to note SMP tracking #, date of inspection, and other forms of documentation. Alternatively, tag photographs using a smartphone

- Starting at the upland area, use the Level 2 Checklist to evaluate the practice. The inspection will proceed from the upland drainage area to inlets, side slopes, berms, treatment area, and outlets/outfalls. Make sure to fill in key information on the inspection form, such as SMP identifier number, site name, Inspector name, date, and weather conditions.
- Take photos of key practice components or maintenance concerns. Mark photo locations and orientation on a sketch Site Plan.
- Review the Inspection Checklists before leaving the site to make sure that all necessary information has been collected.

Follow-Up Actions

Upon completion of an inspection, complete these follow-up actions as soon as possible:

- Enter the inspection information in the appropriate database or hard copy file
- Download and label photos
- Communicate problems and corrective measures to the Owner/Operator (private or public). This may involve the Level 2 Inspector making a judgement call as to whether observed problems warrant a Level 3 investigation, providing a timeframe for correcting simpler issues, and coordinating with the Owner/Operator to pursue such an investigation, if required. Many local programs have existing protocols for sending letters, activating a compliance procedure, or verifying that repairs and corrections are completed by the Owner/Operator.

The **Level 2 Inspection Checklists** summarize follow-up actions and recommended repairs associated with various observations of SMP condition (blue cells) and highlight specific conditions that would trigger Level 3 Inspection (grey cells).

Level 3 Inspection Guidance

Level 3 Inspections are conducted in response to more complex issues identified during a Level 2 inspection, with the goal of developing specific repairs to resolve the issues. Therefore, the inspection primarily focuses on the problematic components of the SMP, but it is good practice to perform a cursory review of all system components. **Section 12.3** identifies twelve problems that are typically addressed in Level 3 inspections and discusses how to diagnose the cause of each problem, as well as repairs needed to address them. It should be noted that the problems addressed in each subsection can occur in a variety of SMPs. As a result, each subsection identifies the SMPs where the problem most commonly occurs and, in some cases, an SMP-specific diagnosis procedure.

12.1.4 Planning for Stormwater Maintenance

This section outlines key elements of stormwater maintenance planning, including:

1. Program models for stormwater maintenance
2. Inspection and maintenance checklists
3. Planning for the costs of stormwater maintenance
4. Identifying the need for infrequent maintenance items

12.1.4.1 Program Models for Stormwater Maintenance

The Maintenance Hierarchy concept (See **Section 12.1.2**) is discussed throughout this Chapter, but the individuals who will conduct the Level 1, Level 2 and Level 3 inspections and maintenance will vary depending on how the local program is administered. While this Chapter does not focus on program elements, it is important to note that the local program requirements will influence who performs ongoing maintenance. A legally binding and enforceable maintenance agreement shall be established between the property owner and local reviewing authorities to assign maintenance responsibilities to the responsible parties. This will play an important role in how to develop a comprehensive maintenance plan. All required maintenance elements shall be included in the maintenance plan.

Stormwater maintenance plans can generally be designated in three categories: 1) Private; 2) Local Government; and 3) Hybrid Approach. Understanding the program and regulations in the local community will influence the best techniques for developing the maintenance plan (**Table 12.3**).

Option 1: Private Maintenance

In this option, maintenance is the responsibility of the private landowner. In regulated MS4s, however, the landowner will periodically report to the local government. In this model, it is important to ensure that the maintenance plan is very easy to understand.

Option 2: Local Government Maintenance

In this option, the local government takes over maintenance responsibility for all stormwater practices. While it is still important to develop a clear and simple plan, the designer can assume some level of training or supervision for the individuals conducting inspections and maintenance. Maintenance access should be made available to local government staff through official easements.

Option 3: Hybrid Approach

In the hybrid approach to stormwater maintenance, larger practices or practices on public land are maintained by the local government, and smaller practices on private property are maintained by the landowner. Alternatively, the local government may take responsibility for inspections, but leave the landowner responsible for maintenance items identified during the inspection.

Table 12.3 Maintenance Considerations for Three Program Options

Program Option	Inspection/Maintenance Performed By:	Key Considerations for the Designer
Option 1: Private	Level 1: Property owner or HOA Level 2: Trained Individual Level 3: Qualified Professional/Contractor	Make the plan very simple and graphic intensive. Make a landscape/seed plan very simple and graphic intensive Include a list of contractors if applicable. Provide links to educational materials.
Option 2: Local Government Program	Level 1: Interns or Untrained Staff Level 2: Trained Local Staff Level 3: City/Town/Village Engineer or other individual hired by the municipality	Learn about the resources the local program has at its disposal. If government staff are being trained, develop a maintenance plan that is consistent with their knowledge and understanding. Be aware of equipment and materials on hand in this community.
Option 3: Hybrid Approach	Inspection and maintenance responsibilities are divided between the local government and private landowner.	Understand how the responsibilities are divided and develop a plan that is consistent with this arrangement.

12.1.4.2 Inspection and Maintenance Checklists and Documentation

The NYSDEC Construction Stormwater Toolbox website (www.dec.ny.gov) includes inspection checklists specific to each level of the maintenance hierarchy. The maintenance plan should include the inspection checklists for each level for the SMP Group(s) being constructed. The checklists include blank sections under each of the practice key components, to input project specific information. All materials developed as a part of the maintenance plan should be provided to the practice owner and local government. (See **Table 12.4**)

Table 12.4 Customizing Checklists and Guidance

Level 1	**Section 12.2** includes guidance.	Attach photographs of the practice (once installed), and a simple aerial photograph of the site to locate the practice. Include key local government contacts and contractors along with the checklist. Modify to add other problems, as they are identified during inspections. Attach site specific photographs of each problem identified.
Level 2	**Section 12.2** includes triggers for Level 2 and Level 3 Inspection.	Modify to add other observed conditions and recommended repairs, as they are identified during inspections. Attach site specific photographs of each observed condition identified.
Level 3	**Section 12.2** and **Section 12.3** include guidance.	Attach site specific photographs of each observed condition identified. Develop plans, details, and/or written narrative of recommended.

12.1.4.3 Budgeting for Maintenance

A maintenance plan should include a budget for annual maintenance. In the Local Government Maintenance model, a single entity (the local government) will be responsible for maintenance of many practices, so the cost of maintenance for an individual practice may not be as important as estimating the average cost of maintenance across all practices. For privately maintained practices, on the other hand, it is very helpful to develop a cost estimate that is as accurate as possible for the specific location. As a result, two options for estimating costs are presented here, including:

- **Option 1**: Average or Unit Costs
  Generalized cost data are used to estimate an annual cost. This option may be used for a municipality or other institution that manages a large number of practices.
- **Option 2:** Detailed Individual Practice Budget
  Annual costs are estimated using more detailed practice information, as well as more detailed estimates of labor and material costs.

Option 1: Average or Unit Costs

In this option, annual maintenance costs are estimated on a per-acre basis or as a percentage of the total construction costs. These prices typically range from about 1% to 4% of the construction costs (King and Hagan, 2011; **Table 12.5** Typical Maintenance Costs**)**.

Table 12.5 Typical Maintenance Costs
(Source: King and Hagan, 2011; Adjusted to 2015 Costs)

Practice	Annual Maintenance Cost (% of Construction)	Annual Maintenance Cost ($/cf of water quality volume treated)
Buffers	4%	$0.25 - $0.35
Tree Planting	4%	$0.35
Ponds and Wetlands	4%	$0.22 - $0.35
Infiltration Trench/ Basin	2%	$0.25
Filtering Practices	4%	$0.41 - $0.47
Bioretention	4%	$0.44
Swales	3%	$0.18 - $0.26
Porous Pavement	1%	$0.64 - $0.89

While the costs in **Table 12.5** may be a reasonable starting point, it is important to note that the actual data will vary greatly, depending on labor rates and material costs. For example, the hourly "Open Shop" labor rate for rough grading is approximately $27/hour in Elmira and $38/hour in New York City (Means, 2015). In addition, costs for labor, materials and equipment will vary depending on the maintenance arrangement (**Table 12.6**).

Table 12.6 Variability in Maintenance Costs Based on Maintenance Arrangement

Maintenance Arrangement	Labor	Materials	Equipment
Public Maintenance (Municipality)	Level 1: Intern Wage Level 2: Staff Salary Level 3: Professional Staff or Contractor	Low: Materials bought in bulk.	Low: Typically owned by Public Works or similar department.
Private Maintenance (Homeowner)	Level 1: Homeowner (Free) or Contractor Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	High: Materials purchased in small quantities.	High: Specialized equipment needs to be rented if needed.
Private Maintenance (Commercial or HOA)	Level 1: Free (with HOA volunteers) or Contracted Labor Rate Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	Varies: Materials may be bought in bulk or on a small scale, depending on the size of the private entity.	High: Specialized equipment needs to be rented if needed.

Option 2: Site-Based Costs

Because the unit costs of labor and materials, and the average annual costs of maintenance can be highly variable, more detailed data will be needed to estimate costs at a particular site. One approach for estimating costs is to generate a list of routine maintenance items, along with associated unit costs for labor, materials, and equipment. This approach requires the user to enter basic design data for the practice, as well as information regarding local labor rates and other general costs. In the bioretention example below, unit costs are used to estimate routine maintenance costs, including regular inspections and maintenance.

Example Annual Cost Estimation: Bioretention

An example cost estimation for a bioretention filter follows below, which demonstrates how the unit cost and typical frequency data can be used to estimate average annual maintenance costs. **Table 12.7** summarizes the characteristics of the example bioretention practice, as well as the unit cost assumptions for typical inspection and maintenance activities. **Table 12.8** then summarizes routine inspection and maintenance activities, their frequency and extent, and associated labor costs.

Using the assumptions for this example, the annual costs for routine inspection and maintenance would be $1,828 ($1.15/cfof Water Quality Volume) in the first year, and $1,468 ($0.90/cf WQ_v) in subsequent years. These values are much higher than the $0.44/cf estimated using general cost data (**Table 12.5**). However, significant cost savings could be realized by using volunteer or intern-level labor for Level 1 inspections and routine maintenance.

Table 12.7 Bioretention Example: Assumed Practice Characteristics and Unit Costs			
Practice Design		**Unit Costs**	
Water Quality Volume (cf)	1,600	Level 1 Labor ($/hr)	$15
Forebay Volume (cf)	400	Level 2 Labor ($/hr)	$35
Total Practice Area (sf)	2,000	Mulch ($/cy)	$10
Filter Area (sf)	1,000	Plants ($/plant)	$1
Ponding Area (sf)	1,500	Trash Tipping Fee	$25
Slope Area (sf)	500	Seed/Mulch for a small area	$10
Turf Area (sf)	No Turf	Average Cost for a PVC Replacement Part (Planning Level)	$100
Inlets (#)	1		

Table 12.8 Bioretention Example: Routine Inspection and Maintenance Costs

Task	Frequency (x/year, Decimal)	Typical Extent	Extent	Hours (Unit)	Hours/yr	Level	Materials and Equipment	Annual Costs		
								Labor	Materials and Equipment	Total
Level 1 Inspection - 1 to 5-acre drainage	1	Practice	1	1 per inspection	1	1		$15		$15
Level 2 Inspection - 1 to 5-acre drainage	0.2	Practice	1	2 per inspection	0.4	2		$14		$14
Watering - grass and plants: Year 1	16	Weekly for first growing season, over filter surface area	1,000	0.5 per 400 sf area	24	1	Assume minimal cost for water	$360		$360
Trash and Debris Removal	4	Ponding area	1,500	1 per 400 sf practice surface area	15	1	Assume $25 Tipping Fee for Each Trip	$225	$100	$325
Weeding	2	Assume 50% of practice area	1,000	4 per 400 sf practice surface area	20	1		$300		$300
Mulching	1	Ponding area	1,500	4 per 400 sf area	15	1	Bark mulch; assume 15 cy/application	$225	$150	$375
Sediment Removal (minor, less than 2”)	1	Assume one small area per inlet	1	1 per small area	1	1		$15		$15
Erosion Repair (minor)	1	Inlets; assume 25 sf/practice	25	1 per 25 sf	1	1	Seed, mulch, and topsoil	$15	$10	$25
Erosion Repair (minor)	1	10% of slope area	50	1 per 25 sf	2	1	Seed, mulch, and topsoil	$30	$20	$40
Minor Regrading	0.5	1 spot per 400 sf of practice area	5	1 per repair	2.5	2	Assume done by hand	$88		$88
Planting (plants)	0.2	Assume 50% of practice area	1,000	8 per200 sf	8	1	Assume 500 plants/planting	$120	$100	$220
Minor PVC or Metal Repairs (observation well cap, PVC outlet control, grates)	0.2	1 per practice	1	1 per repair	0.2	2	Assume about a $100 piece of equipment	$7	$20	$27
Sediment Removal (small forebay)	0.2	per forebay	1	2 per forebay	0.4	2	Assume removal by hand	$14		$14
							Total Costs - Year 1	**$1,428**	**$400**	**$1,828**
							Total Costs - Subsequent Years	**$1,068**	**$400**	**$1,468**

12.1.4.4 Planning for “Non-Routine” Maintenance

If the guidance provided in this Chapter is followed and practices are designed properly, the routine maintenance (and budget guidance in **Section 12.1.4.3**) should be sufficient to keep a practice functioning indefinitely. However, planning is needed for infrequent maintenance items. In the initial maintenance plan, identify a few of the most likely infrequent items. If initial routine inspections start to identify a more serious problem, develop a plan and budget for performing the repairs. To be more conservative, another option is to provide a contingency budget to plan for non-routine repairs over the life of the practice.

Note: Maintenance and repairs that rise to a Level 3 inspection may require permits from the NYSDEC and/or US Army Corps of Engineers, if they are undertaken within or adjacent to regulated wetlands or other waters of the U.S.

Section 12.2 Inspections by SMP Group

12.2.1 Sheet Flow and Disconnection

Includes: Sheet Flow to Riparian Buffers/Filter Strips (RR-2) and Disconnection of Rooftop Runoff (RR-4)

Components

The intent of sheet Flow and disconnection is for runoff from small areas of impervious cover to spread out evenly and dissipate in a grassy, vegetated, riparian, or reforestation area. It is a low-technology practice intended to reduce runoff at its source. Key components to inspect for Sheet Flow and Disconnection include the following:

- **S&D-1 Drainage Area:** The drainage area consists of rooftops and/or impervious surfaces such as parking lots, driveways, or sidewalks. Pervious areas such as lawns or forests may also be part of the drainage area.
- **S&D-2 Level Spreader/Energy Dissipator:** Some sheet flow and disconnection practices have a mechanism in place to dissipate concentrated runoff and return it to sheet flow.
- **S&D-3 Treatment Area:** After runoff is dissipated as sheet flow, it enters the treatment area.

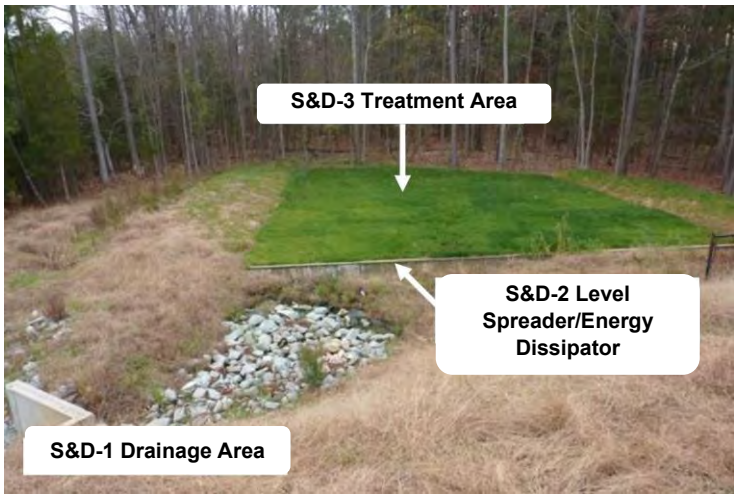


Figure 12.4 Key Areas for Level 1 Inspection of Sheet Flow and Disconnection with filter strip shown. (R. Winston, NCSU)

Level 1 Inspections

Frequency: *2 times per year in early spring and fall. Recommend an additional inspection during a storm to better see any active blockages, bypassing, or other problems.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of S&D practices are:

- Widespread sediment accumulation in paved tributary area
- Deterioration at pavement edge
- Deterioration of level spreader/energy dissipator
- Erosion in the treatment area

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of S&D practices are:

- Major sediment or erosion caused by uphill issue
- Significant damage to level spreader/energy dissipator

12.2.2 Tree Plantings

Includes: Tree Plantings (RR-3)

Components

Key components to inspect for tree planting include the following:

- **TP-1 Surface Area:** The tree planting surface area is the mulched area where water accumulates and is absorbed during a storm.
- **TP-2 Vegetation:** The vegetation of a tree planting is comprised of the tree itself. The health of the tree is one of the most critical maintenance items for tree plantings.

Note: This is a simple, "non-structural" practice and, as such, maintenance tasks are similar to any landscape maintenance. Tree planting can involve individual trees or multiple trees, such as reforesting a riparian buffer.

Level 1 Inspections

Frequency: *Annually in early spring. Recommend every 3 months, within 1 week of ice storms and within 1 week of high wind events (>20 mph) until the trees reach maturity.*



Figure 12.5 Key Areas for Level 1 Inspection of Tree Plantings

The Level 1 inspection goes hand in hand with active maintenance and includes inspection of the surface area (TP-1) and Vegetation (TP-2) of the tree planting. Watering, mulching, and pruning are common maintenance activities. During the first three years, mulching, watering, and protection of young trees may be necessary, see **Chapter 11** for additional maintenance guidance. Watering should occur during the growing season. Mulching and pruning occurs once a year in the spring and early spring, respectively.

At a minimum, inspections shall include an assessment of tree health and determination of survival rates. Any dead trees shall be replaced, and remaining trees shall be inspected for evidence of insect, disease, or other physical damage.

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of TP practices are:

- Appearance of fungus or pest damage to vegetation

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of TP practices are:

- Uncertainty about how to address the infestation or disease

12.2.3 Swales

Includes: Vegetated Swales (RR-5) and Wet Swales (O-2)

Components

Key components to inspect for swales include the following:

- **SW-1 Drainage Area:** The drainage area sends runoff to and is uphill from the swale. When it rains, water runs off and flows to and along the swale.
- **SW-2 Inlets:** The inlets to a swale are where water flows in. Depending on the design, water can flow in through: a ditch, pipe, or curb opening at top of swale or as sheet flow along the entire length of swale.
- **SW-3 Surface Area:** The swale surface area is the vegetated bottom area and side slopes where water flows during a storm. Depending on the design, the swale may also contain check dams, which are small dams of earth, stone, wood, or other materials that slow down and temporarily pond water as it flows down the swale.
- **SW-4 Vegetation:** The health of vegetation within the swale is perhaps the most critical maintenance item for the property owner or responsible party.
- **SW-5 Outlets:** These are where water leaves the swale when it fills up or where water reaches the downstream end of the swale. There may be a small stone apron or rock dam here or even an outlet grate.

Level 1 Inspections

Frequency: *Annually in early Spring. Recommend an additional inspection during the growing season or in the early fall to assess the health of vegetation.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of SW practices are:

- Water ponding on the surface for more than 72 hours following a storm event
- Vegetation being replaced by weeds and invasive species
- Erosion of check dams, inlets, swale surface area or side slopes
- Significant sediment accumulation

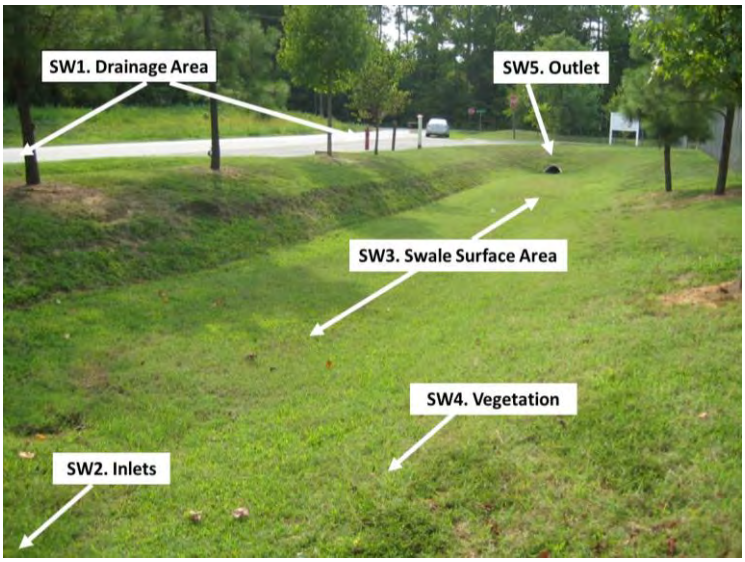


Figure 12.6 Key Areas for Level 1 Inspection of Swales

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of SW practices are:

- Standing water caused by over compacted or clogged soil media
- Severe erosion around or under check dams
- Large area of vegetation overrun with weeds and/or invasive species
- Problem requires practice redesign or modification to solve
- Severe sediment accumulation that appears to be getting worse over time

12.2.4 Bioretention

Includes: Tree Pits (RR-3), Tree Trench (RR-3), Rain Gardens (RR-6), Stormwater Planters (RR-7), Infiltration Bioretention (F-4), Filtration Bioretention (F-5), Bioslope (F-6), Dry Swales (O-1)

Note: For the purposes of this Chapter, the term "Bioretention" will be used to generally describe all of these practices.

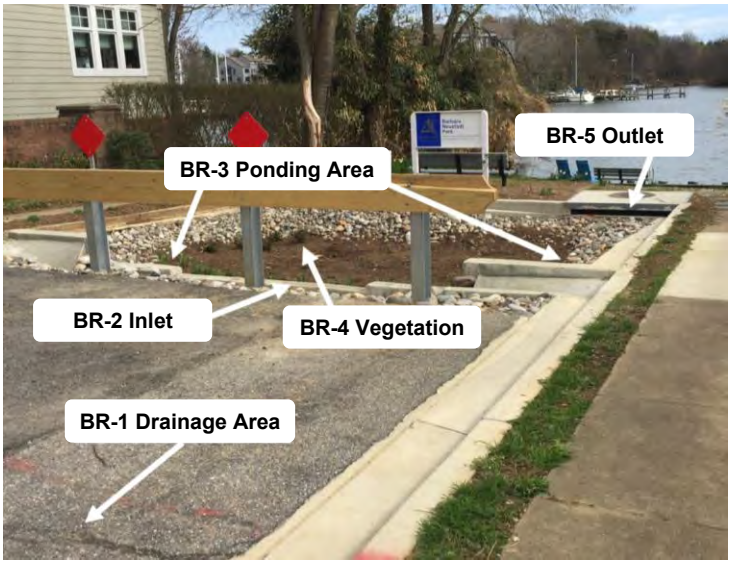


Figure 12.7 Key Areas for Level 1 Inspection of Bioretention

Components

Key components to inspect for Bioretention include the following:

- **BR-1 Drainage Area:** The drainage area sends runoff to and is uphill from the Bioretention. When it rains, water runs off and flows to the Bioretention and ponds within the filter temporarily (usually for no more than 48 hours). Sometimes, the runoff will contain dirt, grit, grass clippings, oil, or other substances that SHOULD NOT be directed to the practice.
- **BR-2 Inlets:** The inlets to a Bioretention are where water flows into the filter. Depending on the design, water can flow in through: curb cuts, pipes, ditches, or sheet flow.
- **BR-3 Ponding Area:** The ponding area fills up with water during a rainstorm. If you picture the Bioretention as a bathtub, there is the *bottom* (usually flat surface), *side slopes* (areas that slope down to the bottom from the surrounding ground), and *berms or structures that control the depth to which water ponds.*
- **BR-4 Vegetation:** The health of vegetation within the Bioretention is perhaps the most critical maintenance item for the Owner/Operator. Many Bioretention become overgrown, and "desirable" vegetation becomes choked out by weeds and invasive plants. Weeding and watering are essential the first year and can be minimized with the use of a weed-free mulch layer. It is important to know what the practice is supposed to look like, and what plants seem to be thriving or doing poorly.
- **BR-5 Outlets:** Outlets are where water leaves the Bioretention when stormwater exceeds the storage capacity.

Level 1 Inspections

Inspection Frequency: *4 times per year during the growing season. During the first 6 months of operation, it is recommended that bioretention practices be inspected at least twice, and after each storm event greater than 0.5".*

Maintenance Frequency: *At least 4 times during the growing season, bioretention should be pruned, weeded, and mowed around; have sediment, trash, and debris removed; and have dead and damaged plants replaced, as needed. In the spring and fall, the practices should have rills, gullies, dead or diseased trees and shrubs repaired or replaced; have bare areas reseeded if applicable; and have mulch replenished to required depth. In the winter months, planting material should be trimmed, and the practice should be inspected for snow accumulation. Once per year, soils should be tested for appropriate pH levels. Finally, every 2 to 3 years, damaged or compromised structures within the practice should be replaced, perennials should be trimmed and divided, and infiltration rates should be checked to ensure proper drainage.*

Maintenance Frequency (Design F-6): In addition to the above, Bioslopes should be inspected after snow events to ensure that the added weight from accumulated snow did not compact the filter media. On a monthly basis, stabilize eroded areas, ensure that flow is not bypassing the facility, and mow the slope using a retractable arm mower to a height of 6 to 15 inches. Recommend performing a flow test on the cleanouts annually to check for clogging, and to remove accumulated sediment that exceeds three inches in depth.



Curb Inlet #1: flow enters through curb channel.



Curb Inlet #2: flow enters through drop curb.



Pea Gravel Diaphragm: sheet flow enters and is evenly distributed along the practice length.



Grass filter strip: sheet flow enters and is evenly distributed along the practice length.

Figure 12.8 Bioretention Filter Inlets

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of BR practices are:

- Water ponding on surface of practice for more than 72 hours after a storm event
- Bioslope does not drain properly
- Sparse or out of control vegetation
- Practice deviates from original design
- Erosion of inlets, filter bed or outlets
- Significant sediment accumulation

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of BR practices are:

- Standing water caused by clogged or over compacted media
- Vegetation management needed
- Bioretention does not conform to original design plan in surface area or storage.
- Severe erosion especially when caused by subsurface defect
- Widespread significant and persistent sediment accumulation

12.2.5 Rainwater Harvesting

Includes: Rain Barrels and Cisterns (RR-8)

Components

Key components to inspect for Rainwater Harvesting systems include the following:

- **RWH-1 Conveyance System and Filter:** The conveyance system is all the components that collect and convey runoff from the roof toward the storage tank. This typically consists of gutters and downspouts, and sometimes additional drainage pipes. These components must be kept clear of debris in order to avoid blockages and spilling of runoff out of the gutters. The system should also be equipped with one or more ways of filtering water coming in from the conveyance system, such as screens, first-flush diverters, and/or vortex filters.

- **RWH-2 Storage Tank:** Many different types and sizes of tanks can be used for rainwater harvesting. They can be situated underground, above ground, or even partially buried. The tank body has an inlet (and/or cover) and one or more outlet points for water to leave the tank. Advanced rainwater harvesting systems usually also have a pump and a filter inside or outside the tank to further clean the stored water and pump it to the point of use.

- **RWH-3 Outlets:** An above-ground rainwater harvesting tank usually has at least two outlets—one at the top of the tank where water overflows when the tank is full, and one near the bottom of the tank for delivering the stored water by gravity feed. Many filters also have an outlet pipe to divert the first flush of roof runoff away from the tank.



Figure 12.9 Key Areas for Level 1 Inspection of Rainwater Harvesting Systems



Figure 12.10 Inspecting the conveyance system, vortex-style filter.



Figure 12.11 Inspecting the RWH system top access port.

Level 1 Inspections

Frequency: *2 times per year in early spring and fall prior to the tank being taken offline. Recommend two additional intermediate inspections per year, during or immediately following a storm.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of RWH practices are:

- Tank not filling properly or water level drops quickly
- Tank is sinking, leaking or at risk of collapse
- Severe erosion at outlet

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of RWH practices are:

- Structural or mechanical problems
- Problem requires practice redesign or modification
- Accumulation of debris in the tank that cannot be easily removed by hand
- Severe reoccurring erosion at the outlet or downstream drainage concerns

12.2.6 Porous Pavement

Includes: Porous Pavements (RR-9), which covers porous versions of asphalt, concrete, pavers, concrete block, stabilized grid/cell systems, etc.

Components

Key components to inspect for porous pavement include the following:

- **PP-1 Drainage Area:** The drainage area sends runoff to the Porous pavement area and is uphill from the Porous pavement.
- **PP-2 Surface:** The surface of the porous pavement should be relatively clean (not a lot of dirt and grit on the surface), free of cracks and broken pavement, and should NOT hold water after a rainstorm for more than a few hours.

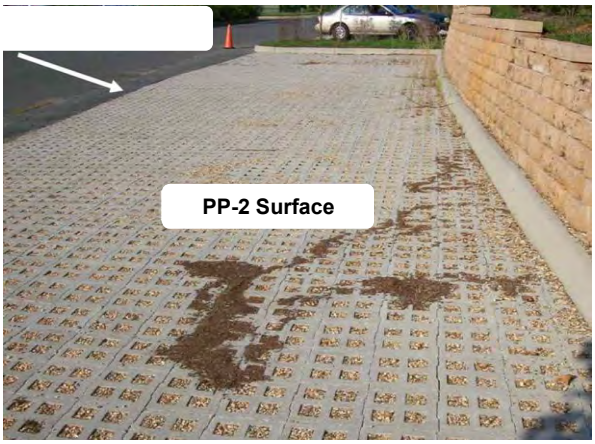


Figure 12.12 Key Areas for Level 1 Inspection of Porous Pavement

Level 1 Inspections

Frequency: *2 times per year in early spring and fall, to inspect for surface deterioration, spalling, etc. In addition, the surface should be inspected monthly to ensure that it is clear of debris and sediments and that it dewaters between storms (or after storms >0.5 inches).*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of PP practices are:

- Extensive bare soil and erosion in the drainage area
- Sediment accumulating on the surface
- Damage to the pavement surface
- Ponding water following storm events



Figure 12.13 Winter salting, sanding, plowing, and snow storage can cause problems for porous pavement surfaces, which may trigger a Level 3 Inspection.

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of PP practices are:

- Severe erosion in drainage area
- Subsurface water conveyance or soil stabilization issues
- Highly clogged pavement
- Solving the problem would require practice redesign or extensive regrading of the drainage area.



Figure 12.14 A Level 3 Inspection is warranted if more than 25% of the porous pavement surface appears to be clogged, joints are filled in, or vegetation is not growing (as shown in photo).

12.2.7 Green Roof

Includes: Green Roofs (RR-10), which covers extensive and intensive systems.

Note: Green Roofs are unique in that they are often covered by a professional ongoing maintenance contract, and their design is highly variable depending on the system specified.

Components

Key components to inspect for green roofs include the following:

- **GR-1 Vegetation and Surface:** The green roof vegetation usually consists of succulent plants, such as sedums, and should form a dense cover over the course of several growing seasons.

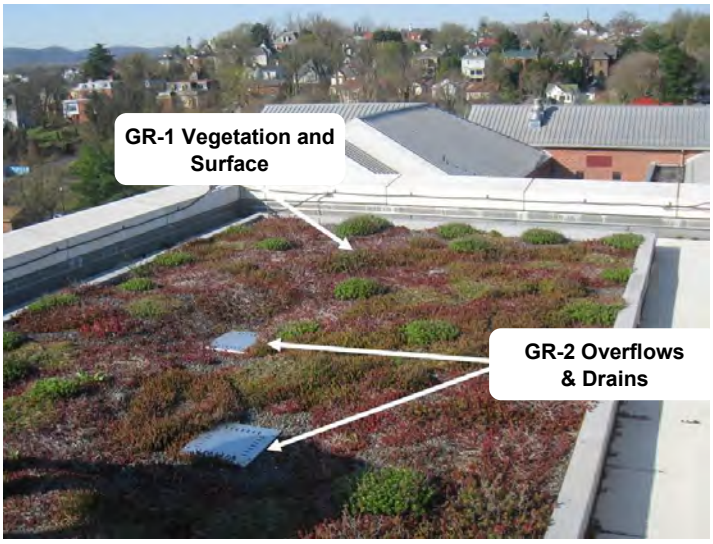


Figure 12.15 Key Areas for Level 1 Inspection of Green Roofs

- **GR-2 Overflows and Drains:** Green roofs typically drain through a network of underdrains to outlet at roof drainage infrastructure. These drainage structures need to be inspected and cleaned periodically to ensure that the media drains properly.

Level 1 Inspections

Inspection Frequency: *2 times per year in early spring and fall.*

Maintenance Frequency: *In the first 2 years of operation, green roofs shall receive routine maintenance on at least a monthly basis, to include watering, fertilizing, and weeding, see* ***Chapter 11*** *for additional maintenance guidance. Once plants have become established, maintenance can be reduced to a frequency necessary to weed, remove invasive species, replace dying vegetation and maintain system components. It is also recommended that inspections occur during periods of drought, to water and ensure that vegetation is surviving.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of GR practices are:

- Unhealthy or dying vegetation
- Ponding caused by clogged outflow pipes or underdrains
- Minor damage to overflows

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of GR practices are:

- Standing water caused by soil media or underdrain system
- Significant vegetation die-off requiring management
- Severe structural damage
- Roof is leaking

12.2.8 Ponds and Wetlands

Includes: Micropool Extended Detention (P-1), Wet Pond (P-2), Wet Extended Detention Pond (P-3), Multiple Pond Systems (P-4), Shallow Wetland (W-1), Extended Detention Wetland (W-2), Pond/Wetland System (W-3), Pocket Wetland (W-4), Gravel Wetland (W-5)

Note: It is strongly recommended to have as-built drawings and copies of previous inspections at hand, if available. Aerial photos may be needed to help direct the Inspector to the pond or wetland location if it is obscured by vegetation.

Components

Key components to inspect for ponds and wetlands include the following:

- **PW-1 Drainage Area:** The drainage area conveys runoff to and is uphill from the inlet. When it rains, water runs off through roof drains, yard drains, parking lots, roadways, and underdrains to the ponds. Flow is through underground piping systems, overland via swales, or across the ground as sheet flow.
- **PW-2 Inlets:** Free, unobstructed flow from the drainage area to stormwater ponds and wetlands is necessary to prevent shallow flooding and even structural damage from flooding. Inlets can consist of pipes, ditches, swales, or other means to convey stormwater to the pond or wetland.

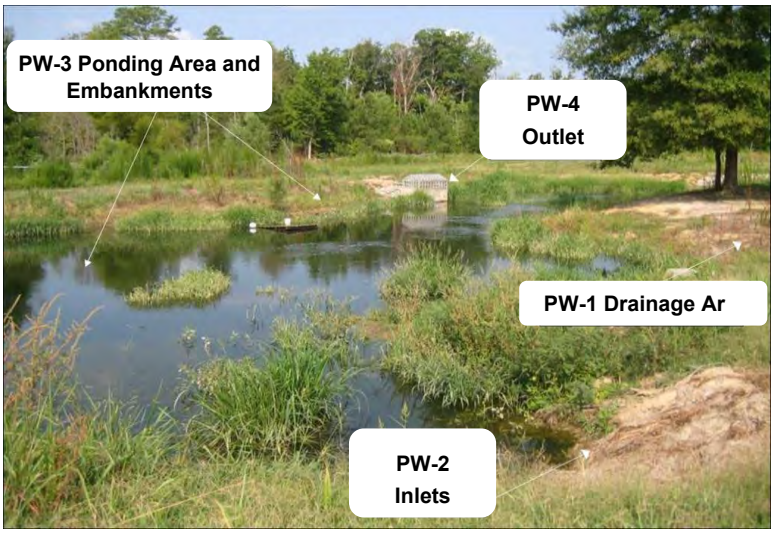


Figure 12.16 Key Areas for Level 1 Inspection of Ponds

- **PW-3 Ponding Area and Embankments:** The ponding area and embankment can consist of the following elements: forebays, safety/aquatic benches, side slopes and permanent pools of water.
- **PW-4 Outlets:** The outlet enables the ponded water to discharge to downstream drainage systems or stream channels. The outlet is often at the base of the dam/embankment on the downstream side.

Level 1 Inspections

Inspection Frequency: *1 time per year in early spring. Recommend additional inspections following major storm events. Inspect the permanent pool and safety elements during every inspection.*

Maintenance Frequency: *At least 2 times per year, the emergency spillway should be mowed and cleared of obstructions. Remove buildup of trash, vegetation, or sediment during every inspection.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of PW practices are:

- Extensive bare soil and erosion in the drainage area
- Manholes or inlet pipes buried or covered with vegetation
- Excessive sediment buildup or overgrown vegetation

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of PW practices are:

- Severe erosion of the drainage area
- Buried or submerged manholes, pipes or other structures need to be located
- Excessive algae or aquatic plants
- Pipe or headwall settlement, erosion, corrosion, or failure
- Major sediment buildup
- Solving the problem would require practice redesign or extensive regrading of the drainage area

12.2.9 Infiltration

Includes: Infiltration Trench (I-1), Infiltration Basin (I-2), Dry Well (I-3), Underground Infiltration System (I-4)

Components

Key components to inspect for Infiltration include the following:

- **IN-1 Drainage Area:** The drainage area conveys runoff to and is uphill from the infiltration cell. When it rains, water runs off and flows to the infiltration cell and soaks into its underlying layers.
- **IN-2 Inlets:** The inlets are where water flows into the practice. Depending on the design, inlets can include curb cuts, openings in a parking lot or roadway, downspouts, pipes, or ditches. Water can also enter the practice directly as sheet flow.

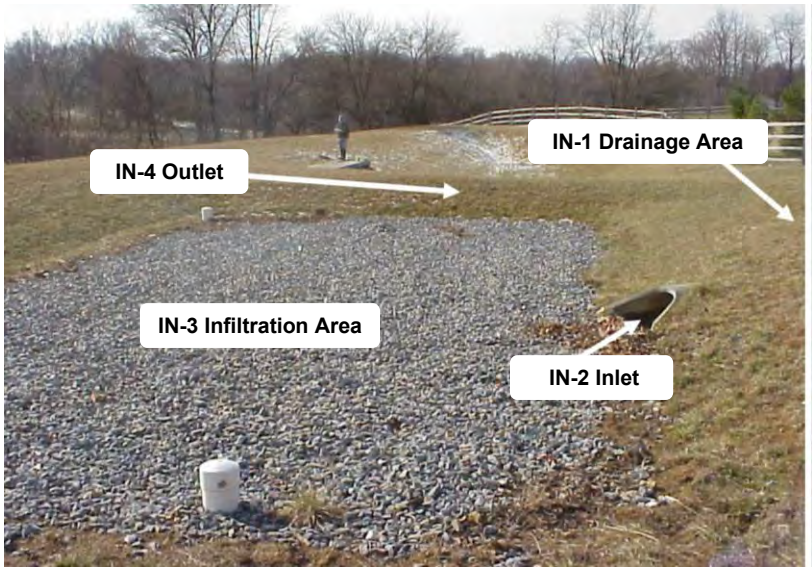


Figure 12.17 Key Areas for Level 1 Inspection of Infiltration Practices

- **IN-3 Infiltration Area:** The area that collects water and allows it to seep into the underlying soil.
- **IN-4 Outlets:** Outlets are where water exits the surface of the infiltration area during larger storms when the underground infiltration reservoir fills up and the excess water needs somewhere to go. Note that not all infiltration practices will have an identifiable outlet if the design is for all the water to infiltrate into the ground. Outlets may be a berm, stone weir, or pipe.

Level 1 Inspections

Frequency: *At least 2 times a year, especially in early spring, to ensure that the practice has survived the winter. Debris cleanout and dewatering inspection should occur monthly. Inspection of sediment traps, forebays, inlets and outlets should occur at least 1 time per year along with sediment cleanout and aggregate repairs.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of IN practices are:

- Water stands on the surface for more than 72 hours after a storm event
- Erosion of inlets, infiltration area or outlets
- Excessive sediment buildup

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of IN practices are:

- Standing water caused by clogged media
- Severe erosion of infiltration area, inlets, or around outlets
- Reoccurring significant sediment accumulation that is getting worse with time
- Solving the problem would require practice redesign or modification

12.2.10 Sand Filters

Includes: Surface Sand Filter (F-1), Underground Sand Filter

(F-2), Perimeter Sand Filter (F-3)

Components

Key areas to inspect for these types of practices include the following:

- **SF-1 Drainage Area:** The drainage area conveys runoff to and is uphill from the filter.
- **SF-2 Inlets:** Inlets to a filter are where water flows into the filter, such as curb cuts, downspouts, pipes, or ditches that carry water into the filter from the drainage area. Water can enter the practice directly through sheet flow.
- **SF-3 Filter Area:** The Filter Area is the area that collects water and allows it to seep into the filter media.



Figure 12.18 Key Areas for Level 1 Inspection of Sand Filters



Figure 12.19 Example Perimeter Sand Filter



Figure 12.20 Example Concrete Perimeter Sand Filter (photo shows the filter with the grate top off as the filter is being maintained. Sedimentation chamber filled with water is on the right, and the sand filter chamber is on the left.

Level 1 Inspections

Inspection Frequency: *All system components shall be inspected at least 1 time per year in early spring. Recommend an additional inspection in the fall to look for debris, vegetation, and water retention.*

Maintenance Frequency: *Any grass cover should be mowed a minimum of 3 times per growing season, to maintain a maximum grass height of 12 inches.*

Triggers for Level 2 Inspection

The most likely triggers for Level 2 Inspection of SF practices are:

- Ponding water more than 72 hours after storm event
- Erosion of inlets, filter bed or outlets
- Excessive sediment buildup

Triggers for Level 3 Inspection

The most likely triggers for Level 3 Inspection of SF practices are:

- Standing water caused by clogged filter media
- Need to pump out sedimentation chamber
- Severe erosion
- Severe sedimentation
- Response to fuel or other spills that make it into the filter
- Subsurface defects with underlying soil
- Solving the problem will require practice redesign or modification

Section 12.3 Diagnostics and Maintenance Measures

This Section summarizes the most common problems found in SMPs, as well as typical maintenance or repair solutions. The guidance provided in this section has some similarities to **Section 12.2**, but differs in the following ways:

1. The primary audience of this Section is the Level 3 Inspector, who is tasked with diagnosing and repairing SMPs that are not working properly. However, this information may also be useful for a Level 2 Inspector seeking to diagnose a particular problem.
2. The maintenance measures described in this Section are more detailed and focus on repairs to specific problems rather than on routine maintenance, such as weeding or minor sediment removal.
3. Because the problems described in this section can be applied to several different practices, this section is organized by the problem type rather than the practice type.

Common problems addressed during Level 3 inspection/maintenance are summarized in **Table 12.9**. This list is not exhaustive but does address SMP issues that require some advanced knowledge and skill to inspect and diagnose solutions. Each problem category is discussed in a separate subsection.

Table 12.9 Common Level 3 Inspection/Maintenance Issues

Subsection/Category	Description
12.3.1 Contributing Drainage Area – Pollutant Sources	Sediment or pollution sources in the Drainage Area
12.3.2 Physical Obstructions	Physical obstructions to maintenance access, overflow, or emergency spillway
12.3.3 Erosion	Erosion on side slopes, practice bottom, at inlet or outlets. Rills and gullies forming where there should be sheet flow
12.3.4 Departure from Design Dimensions	Practice dimensions have been altered, either due to filling with sediment, redesign or filling in, or improper implementation.
12.3.5 Improper Flow Paths	Flow is short-circuiting the practice, or drainage flow paths have been otherwise modified.
12.3.6 Sediment Buildup	Sediment has accumulated in a pool, practice bottom, pretreatment area, or vault.
12.3.7 Clogging	The filter media or other components are clogged, and there may be standing water for longer than intended.
12.3.8 Vegetation	Excessive, inadequate, and/or unhealthy vegetation to support a practice
12.3.9 Embankment and Overflow Condition	Issues with an embankment or overflow weir or channel
12.3.10 Structural Damage	SMP infrastructure, such as concrete or metal elements, have been damaged.
12.3.11 Pool Stability	Permanent pool of water is at the improper elevation.
12.3.12 Pool Quality	Permanent pool of water suffers from poor quality due to algal growth or other issues.

12.3.1 Contributing Drainage Area – Pollutant Sources

Applies Most Commonly To: Sheet Flow/Disconnection, Swales, Bioretention, Porous Pavement, Ponds/Wetlands, Infiltration, and Sand Filters.

Problem #1: Bare soil washing into SMP from drainage area

General Approach for All Practices:

- Identify the specific source(s) of sediment in the drainage area by tracking sediment flow during a rainfall or looking for a track of sediment staining during dry weather.
- For an active sedimentation event, attempt to filter incoming runoff if conditions allow (e.g., enough space upstream of the practice for temporary ponding). Consider installing a silt fence, silt socks (at curb inlets), staked straw bales, or other filtering material at the inlets of the SMP. This will keep at least some of the sediment from getting into the practice.
- Runoff from active construction should not enter the SMP; divert to a temporary and approved sediment control practice.
- For areas of bare soil *not* due to active construction **(bottom photo)**, prep the soil and re-seed/plant with grass species or other thick ground cover appropriate for the region. May also need starter fertilizer, topsoil, and/or compost.
- For steep slopes with bare soil, consider also installing erosion-control matting to hold soil, seed, and straw in place until the vegetation becomes well established.
- For fill and topsoil stockpiles in the drainage area, provide temporary or permanent cover as soon as possible. Alternatively, surround the base of the stockpile with silt fence, or equivalent, to prevent the transport of sediment-laden runoff.





Helpful Skills:

- Erosion and sediment control knowledge and skills
- Landscaping knowledge to understand appropriate ground cover species for re-vegetating bare areas

Equipment Typically Used for Fixing Sediment Sources:

- Silt fencing and other sediment barriers
- Erosion-control matting and/or straw
- Rakes and shovels
- Light excavation or grading equipment for larger jobs
- Equipment to deliver topsoil or compost as needed
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Starter fertilizer, topsoil, and/or compost

Problem #2: Other pollution sources in the drainage area

General Approach for All Practices:

- Pollutants may include: road salt, oils, fuels, food grease, wash water, paints and solvents, trash, and many others.
- Identify the source(s) of pollution.
- For pollutants spilled on the ground, remove by hand or use absorbents to soak up wet material. Absorbents and other waste materials shall be disposed of properly.
- For materials stored outside, move them to a covered area or build/add cover over the materials. Provide secondary containment, if possible.
- Make sure all waste containers have lids and fix any leaks (**see improper practice in photo at right**).
- For sites prone to frequent oil leaks and staining (e.g., vehicle maintenance yards), consider installing an oil/water separator to pre-treat runoff that enters the SMP.
- For routine dumping of wash water, grease, paints, or other pollutants, enforce behavior change and explain good housekeeping practices.
- Develop a pollution prevention plan for the site to ensure that hazardous materials and other potential pollutants are not stored where they are exposed to rainfall.
- For areas that receive a heavy salt and/or sand load during the winter, consider diverting upslope runoff, especially for practices such as porous pavement. Some monitoring of winter road or parking lot clearing activities may also be warranted.



Helpful Skills:

- Knowledge of good housekeeping and pollution prevention practices
- Good communication with employees and managers at site (e.g., for correcting bad site operations)

Equipment Typically Used for Correcting Other Pollutant Sources:

- Tarps to cover stockpiles
- Absorbents to soak up spills
- Secondary containment barriers that will hold back any liquids or solids that may leak out of their primary container
- Storage barns, sheds, pole barns and other permanent cover for potential pollutants

12.3.2 Physical Obstructions

Applies Most Commonly To: Sheet Flow/Disconnection, Swales, Bioretention, Rainwater Harvesting, Green Roofs, Ponds/Wetlands, Infiltration, and Sand Filters

Problem #1: Maintenance access is obstructed

Ground-Level SMPs:

- Where a path for vehicles and construction equipment to access the practice was established during construction but is now overgrown, remove woody vegetation and any other tall vegetation. This path should be bush hogged once or twice a year.
- If the SMP needs a large quantity of trash and/or sediment removed in areas where access is limited due to steep grades, overgrown vegetation, etc., it will be necessary to establish safe vehicular access by clearing and possibly re-grading the area. It is advisable to have a maintained, all-weather surface to critical parts of the SMP.
- It is most important to provide access nearest to parts of the practice where sediment and trash tend to accumulate the most: forebay and outlet control structure.
- For an SMP blocked by fences **(photo at right)**, install a gate that is wide enough for vehicles to enter for any current or future maintenance.
- Sometimes access is blocked by unauthorized structures, such as sheds, property fences, retaining walls, etc. Confer with the local stormwater authority on the presence of any maintenance easements and means to gain access to the practice.
- The solutions above should also provide for safe foot access for routine inspection and maintenance.



Rainwater Harvesting:

- Ensure that no structures are covering the filter or the tank's access/inspection port.

Green Roofs

- Ensure that individuals can safely reach the roof with tools in hand (e.g., buckets, pruners, hoses). If the roof cannot be accessed via a walk-through door, this may require installing a wide ladder or fire escape-style stairs on the inside or outside of the building.
- If there is a concern of getting too close to the roof's edge while doing maintenance, install a railing around the edge for safety. Alternatively, for sloped roofs, workers may need to use harnesses during maintenance activities.

Helpful Skills:

- Use of motorized landscaping equipment
- Chainsaw skills
- Use of grading equipment for larger jobs
- *Note*: OSHA safety requirements and certifications may apply to green roof maintenance.

Equipment Typically Used to Regain Proper Access:

- Mower, trimmer
- For very overgrown areas, chainsaw and/or bush hog
- For areas that need to be regraded, excavator, skid steer, or other grading equipment

Problem #2: Flow is obstructed in or out of the practice

General Approach for All Practices:

- Flow can bypass an SMP when there is too much sediment/debris buildup near the inlets or due to grading changes in the drainage area (e.g., repaving of parking lot). If the cause of blockage or bypass is not obvious, inspect the practice during rainfall to watch the flow paths. (See **Section 12.3.5** for additional guidance.)
- Obstruction of overflow or emergency spillway structures is most often due to buildup of debris, such as trees, sticks, trash. It is *very* important to keep these structures clear of such blockages in order to avoid flooding or a dam breach (**avoid conditions caused by beaver activity - top photo**).
- Where debris cannot easily be cleared by hand, special equipment and skills may be needed. An obstructed outlet control structure in a wet pond may need to be accessed by boat **(bottom photo)**. In cases where large sticks, tree branches, trash, or other debris obstruct the overflow or spillway, they may need to be cut up by chainsaw. Large debris will usually need to be hauled away with a truck.





Helpful Skills:

- Chainsaw skills
- Muscle strength to haul large debris
- Boating capabilities

Equipment Typically Used to Clear Obstructions:

- Gloves, shovels, pruners, rakes, and other hand tools
- Waders for wetlands
- Chainsaw for large sticks and branches
- Cable puller (come-along) to remove large branches that cannot be pulled out by hand
- Boat and personal floatation device for outlet control structures in wet ponds
- Truck to haul away debris

12.3.3 Erosion

Applies Most Commonly To: Sheet Flow/Disconnection, Swales, Bioretention, and Ponds/Wetlands

Problem: Erosion on practice surface, inlets, and/or outlets

General Approach for All Practices:

- See **Section 12.3.9** for how to repair erosion on side-slope embankments.
- Rill and gully erosion occur when runoff flow is concentrated. Deep rills and gully erosion on the practice surface **(top photo)** will require the surface to be regraded to make uniform again. Use the lightest equipment possible in order to minimize soil compaction during excavation.
- After excavation, reseed/plant the area with ground cover that is appropriate for the moisture conditions of the practice. Amend or enhance soil as needed according to a soil test; soil may need more organic material to support plants.
- To prevent further erosion on the surface of the practice, ensure that flow from the inlets can spread out adequately and has enhanced energy dissipation features. This may require installing or enhancing a stone apron outlet protection that flares out and down to the level of the practice to slow and spread out the flow. Other options include check dams, energy dissipation devices, or an armored low-flow channel. A stilling basin **(bottom photo)** can also dissipate flow as it comes out of an inlet or outlet pipe. Apply similar treatments to any outlets that are experiencing erosion.
- Any sloped soils that are disturbed during excavation will likely need erosion-control matting to hold it in place while vegetation becomes established.





Helpful Skills:

- Landscaping/Gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- Skills with excavation equipment
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Equipment Typically Used for Fixing Erosion:

- Rakes, shovels, wheelbarrows, and other “landscaping” equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move stone and other materials around
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out

12.3.4 Departure from Design Dimensions

Applies Most Commonly To: Swales, Bioretention, Ponds/Wetlands, Infiltration, and Sand Filters

Problem: Practice dimensions have been altered

General Approach for All Practices:

- Once constructed, the dimensions of an SMP may become altered from the original design for a variety of reasons. These reasons can include:
- The SMP was not constructed to the proper dimensions at initial installation.
- Sediment accumulation in the SMP reduces the intended storage volume of the practice **(top photo).**
- Redevelopment or regrading of the site encroaches into the footprint of the SMP.
- Dumping of leaves, trash, or other debris into the SMP reduces the intended storage volume of the practice.
- If it appears that the dimensions of an SMP have been altered, proceed as follows:
- Consult the original design or as-built plans and sizing computations for the SMP to identify the intended dimensions and storage volume of the practice. Measure the length, width, and depth of the practice to estimate the current storage volume. Calculate the difference in volume to determine whether it is significant enough to warrant restoring the practice to its original dimensions. If the loss in volume is greater than about 10%, this likely warrants action.
- If the SMP's original storage volume cannot practically be restored because of current site conditions, an additional SMP may need to be built elsewhere on the site in order to regain adequate storage and treatment volume for the site.
- For problems of dumping by individuals on or near the site, install "No Dumping" or similar signage to inform people that this is not an appropriate place to dispose of debris. Any debris that has already been dumped should be removed from the practice either by hand or with equipment.





Helpful Skills:

- Basic surveying
- Understanding stormwater design plans and sizing computations
- Stormwater management design
- Skills with excavation equipment and erosion and sediment control

Equipment Typically Used to Investigate and Fix Dimensions:

- Simple level or survey equipment, tape measure, and other tools to measure SMP dimensions
- Light excavation or grading equipment for larger jobs
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment for small jobs
- Soil stabilization materials

12.3.5 Improper Flow Paths

Applies Most Commonly To: Sheet Flow/Disconnection, Swales, Bioretention, Rainwater Harvesting, Infiltration, and Sand Filters

Problem #1: Flow intended to go into a practice is diverted by debris or grit buildup or capacity issues at inlets

Bioretention, Swales, Infiltration, Sand Filters:





- Grit, sediment, leaves, and other debris builds up at curb inlets or other inlets, sometimes to the point where flow is diverted completely around the practice (photos above). This is a common issue for practices that rely on curb cuts or other small inlet structures to get water into the practice for treatment. A minor amount of debris may be OK and not affect the ability of water to enter the practice. However, be aware of conditions where flow *that is supposed to be treated* is diverted to a downgradient storm drain or other structures in such a way that the stormwater treatment is entirely or partially bypassed.

- In many cases, correcting the problem may simply involve removing debris or unclogging the inlet.
- However, this problem can be chronic if the inlet design is susceptible to clogging. This can occur if the slope from the inlet into the practice is flat and/or there are controllable sources of sediment and debris in the drainage area.
- For chronic problems, consider redesigning inlets to be more clog proof. One solution is to build in a 2 to 3" drop from the curb inlet onto a gravel or stone diaphragm along the edge of the practice (see example in **photo at right**).
- Inlets that are undersized for the flow coming to them should be enlarged and armored with an appropriate erosion-resistant lining.



Rainwater Harvesting:

- Water intended to be collected in rainwater harvesting systems is sometimes not delivered to the tank or cistern if the system of gutters, downspouts, pipes, etc. is not sized properly or if the first-flush diverter or vortex filter is not functioning correctly and diverting too much water away from the tank.
- As with inlets, this may simply be a matter of routine cleaning of gutters, downspouts, vortex filters, etc.
- It may also be a design or capacity issue, in which case, installing larger gutters or a more robust piping system may be in order.



Source: Rainwater Management Solutions 1

Example of enhancing the gutter and piping system leading to a rainwater harvesting system

Helpful Skills:

- Basic surveying
- Typical landscaping skills using materials such as soil, rock/stone, edging material, mulch, etc.
- Light construction of gutters, downspouts, piping
- Some knowledge of first-flush diverter and vortex filter products

Problem #2: Flow is not uniformly accessing the entire treatment area

Bioretention, Swales, Infiltration, Sheet Flow and Disconnection, Sand Filters:

Improper flow path issues in this category include:

- Water forming channels or rills through the treatment bed of bioretention, swales, infiltration, or surface sand filters, and thus not spreading out across the treatment area surface
- Water ponding only at one end of the treatment area because the surface is not level
- Water piping through weak spots to an outlet or underdrain, such as where filter media meets a concrete structure
- See **Section 12.3.3** for issues of channeling or erosion on the treatment surface.
- For uneven treatment area and preferential ponding, assess the severity of the problem. Compare the relative elevations of the "high" part of the treatment area (the area where water does not seem to pond) and any overflow structure or weir where high water flows will leave the practice. If there is still some freeboard (such that the overflow structure is higher than all of the treatment bed surface), then there will still be some ponding for larger rainfall events. Try some minor raking or moving filter media and mulch around to even out the filter bed.
- However, the problem is more serious if parts of the treatment area are higher than the overflow structure. These areas will never be valuable for treatment purposes. The treatment area is supposed to fill up like a bathtub, so some regrading is needed to level out the treatment area.
- If water is piping or short-circuiting through the soil or filter media, forming sinkholes, or otherwise bypassing the intended treatment mechanism, it will be necessary to repair these spots. Around concrete or metal overflow structures, use soil material right around the structure that can be compacted (bioretention filter media tends to be light, sandy, and fluffy and won't compact very well). Another option is to "ramp up" the soil layer to the lip of the structure so that there won't be a hydraulic jump at this potentially weak point. See the figure below.

These three issues are illustrated below:



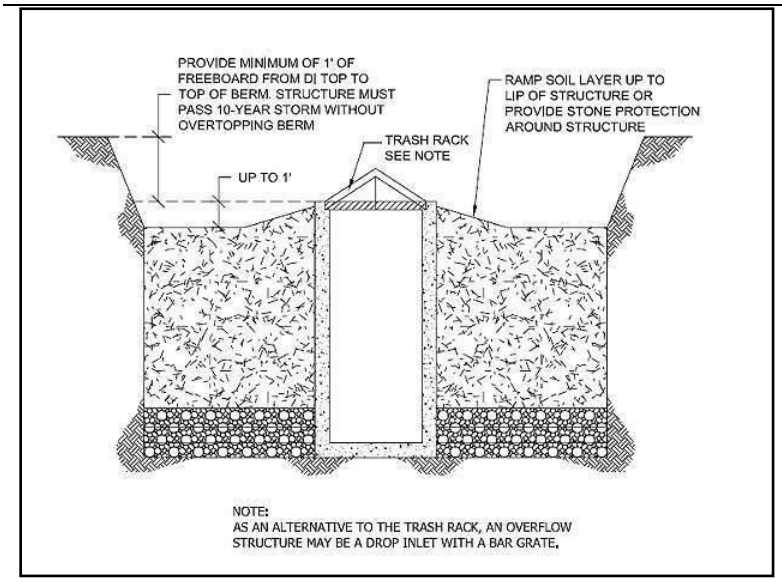
Water from the inlet at top of photo is channeling through the bioretention area.



Water is preferentially ponding only at one end of the bioretention because the surface is not flat.



Water is "piping" down to the underdrain at the weak spot where the filter media meets the concrete overflow structure.



Ramp up soil layer to the lip of the structure to address this being a weak interface where water can work down and create bypassing. (Source: Virginia 2013 Stormwater BMP Specifications, Specification #9, Bioretention, Figure 9.13.)

Impervious Disconnection:

The most likely flow path issues with Impervious Disconnection are: (1) owners intentionally diverting downspouts away from pervious area and onto impervious area **(left photo below),** and (2) slight grading issues diverting the water away from the intended pervious receiving area **(right photo below).**





Both issues are fairly straightforward to address but involve communicating and working with property owners to explain the purpose of disconnection and how to properly maintain it. The second issue may involve some minor regrading or building low-profile berms to get water to flow to the intended disconnection area.

Helpful Skills:

- Rudimentary surveying
- Typical landscaping skills—using materials such as soil, rock/stone, edging material, mulch, etc.

Equipment Typically Used for Inspecting and Fixing Flow Paths

- Surveying equipment (i.e. Site level or total station) to get relative elevations among different parts of treatment area, inlets, overflow structures, etc.
- Small, simple tools—flat shovels, wheelbarrows, rakes, other common landscape/gardening tools
- Large, more complicated equipment—small excavators to move material around or do regrading. Always work from the side of the practice and NOT within the practice itself.

12.3.6 Sediment Buildup

Applies Most Commonly To: Swales, Bioretention, Porous Pavement, Ponds/Wetlands, Infiltration, and Sand Filters

Problem: Sediment accumulation more than 2" thick covering 25% or more of the practice surface area

Bioretention, Swales:

- Determine the source(s) of sediment. The most likely sources are: (1) premature installation of the practice during the construction process and discharge of construction site sediment loads; (2) erosion in the contributing drainage area *after* construction is complete; and (3) erosion along the practice side slope or within the practice itself. If it is an ongoing source, it must be abated (see **Section 12.3.1**, and **Section 12.3.3).**
- Use a soil auger to auger holes in various places across the Bioretention or Swale surface area, especially in areas where sediment is accumulating. Determine how deep the sediment is penetrating into the filter media layer. Usually, it will be the top 2 to 3" that are most affected. Note that for swales *without* an engineered filter media, the sediment layer will likely be confined to the surface.
- Remove the "fouled" filter media to the affected depth (using flat shovels or small excavators and working from the side) and replace with clean material from an approved vendor (bioretention filter media or equivalent). If no vendors are available in your area, use the filter media specifications from the Design Manual to replicate the right mix of sand, topsoil, and composted organic material.
- Check to ensure that the practice is filtering at the proper rate after the next several storm events.

Infiltration:

- For infiltration practices excavated to a suitable infiltrating soil layer (e.g., not stone reservoir layer), use the same procedures as for Bioretention/Swales above.
- For infiltration trenches and basins that have a stone reservoir layer, use similar procedures, but use a shovel to dig into the stone layer to ascertain how deep the sediment incursion is into the stone. Remove down to this layer and replace with clean material.
- If the infiltration practice is clogged, see **Section 12.3.7.**
- As with Bioretention, check for controllable sources of sediment in the Drainage Area (**Section 12.3.1**).

Porous Pavement:

- NOTE: Routine sweeping with a regenerative air vacuum (max. power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. It is best to sweep the pavement surface in early spring after winter sanding/salting materials or snow piles have led to sediment or winter slag accumulation. If the area is surrounded by tree canopy, fall cleanup is essential, as vegetative debris is broken up by vehicle traffic and ground into the pavement surface.
- Observe the pavement surface during a storm event to see whether the sediment is clogging the pavement (i.e., standing water on the surface after the storm stops). If so, see **Section 12.3.7.**
- Remove several of the paver blocks in different parts of the structure to ascertain how deep the sediment is penetrating into the bedding and reservoir layers. Most of the time, sediment incursion will be limited to the top 1 or 2" of the pavement bedding layer (for porous interlocking concrete pavers and concrete grid pavers).
- Based on the above observations, it may be worthwhile to quantify the infiltration rate using ASTM C-1701 and ASTM C1781. This is most useful in conducting the test in the *same place within the pavement surface through the course of several years* to document reduction in infiltration rates. Repair or restorative sweeping is warranted when infiltration rates drop below around 10" per hour. NOTE: As stated above, this can likely be avoided if routine annual sweeping is conducted.
- If sediment covers more than 25% of the surface, is deeper than 2", or vegetation is starting to grow where sediment has accumulated, consult a street-sweeping vendor about *restorative* sweeping. In this case, it will be necessary to use a higher RPM sweeper or vacuum sweeper to suck out more of the bedding pea gravel that has been fouled, then replace with clean material.
- Vegetation growing in pavement joints should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). It is important to not let weeds proliferate in the pavement surface because pulling them out by the roots may damage the pavement structure. (Note: The application of herbicides within wetlands or other waters of the U.S. may require an Aquatic Pesticide Permit from the NYSDEC)



Infiltration test using ASTM C-1781



Pulling grass and weeds from the joints can damage parking surface if roots are firmly established in the bedding layer.

- Check the pavement surface after a storm event to ensure that it is draining properly.

The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011).*



Routine, air-vacuum sweeping in the early spring and fall is the best approach for porous pavement maintenance (Photo source: Toronto and Region Conservation)

Ponds and Wetlands:

- Sedimentation is an inevitable process in ponds and wetlands. NOTE that upstream erosion, especially along stream channels or ditches leading to the practice will accelerate the sedimentation process and lead to more frequent and costly sediment removal operations. Whenever possible, it is important to mitigate any upstream erosion issues.
- Forebays and/or pre-treatment areas should be cleaned out when they reach 50% of their design capacity. Once cleanout is complete, it will be worthwhile to install a graduated rod into the forebay with a clear marking of future sediment clean-out levels.
- The main body of a pond or wetland may need to be dredged on an infrequent basis or when sediment has replaced 50% of the design capacity. There are many dredging methods available. Excavators with long arms can handle most small or moderate-sized ponds. Other methods may be necessary for larger facilities. Dredging can be a complicated operation involving dewatering, storage of wet sediment, and possibly hauling to on-site or off-site disposal or refuse areas. Consult a qualified contractor to explore available methods and costs for the particular application. Once again, installation of a graduated rod can help mark future clean-out levels. Note: The dredging of accumulated sediment within regulated wetlands, ponds or at outlet structure may require permits from NYS DEC and/or USACE. In addition, removed sediment should be properly disposed of in a regulated solid waste management facility or in an upland area that is at least 100 ft from regulated wetlands or streams. Sediment managed in upland disposal areas shall be graded, seeded, and mulched.

Sand Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters. It is important to determine whether the drainage area is generating a controllable source of sediment that can be abated.
- Underground trench or vault filters will require routine maintenance to: (1) remove accumulated sediment, trash, and floatables from the sedimentation chamber, usually with a vac truck; and (2) remove sediment, grit, and sludge from the top layer of the filter media and replace with clean material. NOTE: Depending on the configuration of the underground filter, confined-space procedures may apply. For a normally operating practice, these maintenance tasks should be conducted every two to three years. If the filter is treating a stormwater hotspot or a particularly dirty drainage area (e.g., vehicle maintenance, washing, repair), the frequency may increase to annually or more often, as dictated by Level 2 inspections. Also, in these cases, it may be warranted to test the material to ensure proper disposal.
- Some proprietary filters require replacement of special cartridges or filter material. Consult the vendor or manufacturer for special maintenance procedures.



Routine cleaning of a perimeter or "Delaware" sand filter. This can be done from the surface, but deeper, vault-type filters will require confined-space entry procedures.

Helpful Skills:

- Most common contracting skills
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention filter media
- Soil testing in some cases where sediment is being removed from stormwater hotspots

Equipment Typically Used for Sediment Removal Activities:

- Small, simple tools—flat shovels, wheelbarrows, rakes, other common tools
- Larger jobs—small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment-control supplies.

12.3.7 Clogging

Applies Most Commonly To: Bioretention, Porous Pavement, Infiltration, and Sand Filters

Problem: Filter media clogged; water standing on practice surface for 48 to 72 hours or longer after a storm

Bioretention:

Standing water on the bioretention surface 48 to 72 hours after a storm event is a sure indication of clogging (top photo). Clogging of bioretention practices can be tricky to diagnose as there are several probable causes:

a. Clogged underdrain
b. Filter fabric between filter media and underdrain stone
c. Sediment/grit buildup at surface
d. Erosion of contributing drainage area
e. Improper filter media





The following procedure can be used to work through diagnosing the most common causes, beginning with the simplest and easiest to fix and progressing through more complex remedies:

1. Look for a thin, crusty layer of sediment that covers some or all of the filter media. It is often grayish in color. This thin layer can sometimes be enough to cause slow drainage. Scrape this crust off and ascertain sources of sediment in the drainage area (see **Section 12.3.1**). Often, this problem can be caused by the bioretention filter media being installed too early in the construction process, but other chronic sediment sources should also be checked.
2. Open the underdrain cleanout and pour water in to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see whether there is standing water all the way down through the soil. If there is standing water on the surface, *but not in the underdrain*, then there is clogging somewhere in the soil layer. If the underdrain and cleanout have standing water and there is not water coming out the other end (outlet) of the underdrain pipe, then the underdrain is clogged and will need to be rooted out.
3. Use a soil auger to auger several holes down through the filter media to the underdrain layer (if present) or underlying soil. Check to see whether there is a layer of filter fabric at the bottom of the soil layer. The auger will pierce through any filter fabric that is present, and pieces of fabric in the auger bucket should be removed. Notice if the fabric is “blinded” or clogged with sediment. This is a common issue with older bioretention practices. If the practice has a clogged the filter fabric layer, go to step #6, install wick drain.
4. While checking for filter fabric in auger holes, also note whether there is a layer of saturated filter media or bad filter media (e.g., too much clay content) that may be on top of a good media layer. This will be fairly obvious as the top 3 or 4” will be mucky and saturated, with dry and sandy media below. If this is the case, it will be necessary to remove the bad material and replace with good, clean bioretention filter media in accordance with the design specifications. Till or incorporate the good material into the underlying existing filter media to establish a good contact.
5. If the entire profile of filter media is bad, has too much clay content, or does not appear to meet the specifications for filter media, it will be worthwhile to test the soil and compare against the recommended specifications (e.g., clay content, particle sizes, etc.). If the soil does not meet specifications, see steps #6 and #9 below.

6. If the problem appears to be filter fabric or bad filter media (steps #3 or #5 above), there is a critical decision to be made. It is an expensive proposition to dig up the entire facility to either remove the filter fabric or replace the entire soil layer. If the clogging problem is not severe in nature, an intermediate (and much cheaper) option may be to install wick drains. Using a 6" auger bucket, auger numerous vertical holes around the practice surface area, making sure to auger all the way down to the underdrain stone or underlying soil (if there is no underdrain). Hammer 6" perforated PVC or other type of pipe into these holes. Perforations should be about 3/8" diameter. Fill the pipes with clean underdrain gravel (#57 stone) mixed in with coarse construction sand. These drains will serve to wick fines from the surrounding filter media and will provide alternative drainage. Check after the next several storm events to see whether the wick drains improve drainage.
7. Sometimes the cause of saturated filter media is springs or some type of baseflow coming into the practice. This is a more difficult problem as bioretention is not supposed to receive this type of constant flow. It will be necessary to identify and reroute springs or baseflow or perhaps replace the bioretention practice with a different type of practice.
8. Another possible source of poor drainage or clogging is that there can be too much water on top of the filter media when the bioretention practice fills up. Most specifications call for a maximum ponding depth of 12", but sometimes the ponding depth can be 18 or even 24". While this increases the amount of head pushing water down through the filter media, it can also lead to compaction or too much sediment building up. If the bioretention practice has a ponding depth greater than 12", consider configuring the outlet or large storm overflow to reduce the ponding depth to 12" or less. Check with the local stormwater authority to ensure that doing this will not compromise the required treatment volume of the practice.



Adding sand to a wick drain. The vertical perforated PVC pipe has already been placed in the auger hole.

9. If clogging is too severe to be fixed with wick drains or other remedies listed above, it may be necessary to rebuild the bioretention practice by digging up the existing soil, taking out any filter fabric that is between the filter media and underdrain stone, and rebuilding and replanting according to the design specifications.
10. Whatever the chosen remedy, check to ensure that the practice is filtering at the proper rate after the next several storm events.

The Chesapeake Stormwater Network (CSN) has produced an excellent reference guide for inspecting and diagnosing Bioretention issues, *Technical Bulletin #10, Bioretention Illustrated.* This tool can be used as an additional reference and can be downloaded using this link: http://chesapeakestormwater.net/category/publications/

Infiltration:

- Clogging of infiltration practices can be simple to resolve or fatal:
- On the *simple* side, clogging (or poor drainage) may arise from sediment, vegetative debris, parking lot grit, or other debris clogging the top few inches of soil or stone.
- With luck, the practice will have an observation well (vertical perforated PVC pipe with cap that extends through the stone reservoir in an infiltration trench or basin). Check the observation well three days after a storm event of ½" or more. If water is standing in the observation well to the surface, then the whole profile may be clogged (see below under *fatal*). If the observation well has only a few inches or no water and there is still water standing on the surface, then surface clogging is a likely culprit.
- For infiltration practices in soil (no stone reservoir), auger several holes around the infiltration surface area. If saturated soil seems to be on top of good, clean, dry soil, then surface clogging seems likely.
- For infiltration trenches and basins with a gravel reservoir, dig several holes around the surface to determine, again, whether there seems to be a layer of gravel clogged with sediment, leaves, vegetative debris, parking lot grit, etc. If possible, dig down to where the gravel meets the underlying soil to see whether a layer of filter fabric is present (which may be common with older practices). If this is the case, blinding of the filter fabric may be a cause of the clogging.
- For surface clogging, remove the affected material down to the level where the soil or gravel seems clean, and replace with clean material. If filter fabric seems to be a problem, it will be necessary to dig up the gravel, remove the filter fabric, and rebuild the reservoir layer in accordance with the current design specifications. In either case, check after a storm event to ensure that this has resolved the issue.
- On the *fatal* side, the underlying soil may not be suitable for infiltration, either due to soil characteristics, compaction during construction, or other causes. Check the original design package to see whether any soil testing was done at the time. It may be worthwhile to auger down to the infiltration interface layer (e.g., where stone reservoir meets the underlying soil and then another several inches below this interface), and take several soil samples for lab analysis to compare to current soil specifications (see information below about infiltration soil analysis).
- It may be that a geotechnical analysis would reveal that there is a good infiltration soil layer, but it is lower than the existing

interface. This would still require a complete rebuild and excavation down to the suitable soil layer. Restoring porosity at the designed elevation would require replacing soil above this suitable layer and avoiding compaction.

- Another option would be to convert the practice to a bioretention practice with an underdrain. Check with the local stormwater authority to see whether this would require any site plan or stormwater plan amendments or other permits.
- Many updated state stormwater manuals and specifications include protocols for infiltration soil testing and analysis that reference various ASTM standards. For example, see: *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing*.

Porous Pavement:

- As noted in **Section 12.3.6,** routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. Preventative maintenance is the best and most cost-effective way to prevent clogging in the first place.
- If there is standing water on the pavement surface 48 to 72 hours after a storm event of ½" or more, then the pavement surface is clogged.
- Check the design plan or as-built plan to see whether the porous pavement design includes an underdrain. There may also be underdrain cleanouts at the edge of the porous pavement.
- If there is an underdrain, the first thing to check is whether the underdrain is clogged, crushed, or broken. Check to see whether there is standing water in the underdrain cleanout 48 to 72 hours after a storm event. If the underdrain is dry, pour water into the underdrain with a hose and see whether it comes out the other end. If the underdrain is clogged, snake it out, as this is the first and easiest thing to try.
- If the underdrain is working, then clogging may be due to: (1) clogged surface or bedding layer; or (2) underlying soil is not suitable for infiltration for designs with no underdrain. First, refer to the guidance in **Section 12.3.6,** and then proceed as follows:
- If there is no underdrain and the design is based on soil infiltration under the pavement, it will be worthwhile to check the soil because unclogging the surface layer will likely not fix the problem. Check the original design package for any soil infiltration testing. It is likely worthwhile to remove the entire pavement section in several places down to the soil layer and to do a geotechnical investigation of the soil profile. See: ASTM C-1701/1701M and/or *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* for examples of soil infiltration protocols (URL above).
- If the soil is not suitable for an infiltration design, it will probably be necessary to rebuild the pavement using an underdrain design or possibly adding subsurface drainage along the perimeter of the parking area.
- If there is an underdrain or the soil is suitable for infiltration, the best approach to try to unclog the pavement is restorative sweeping with a vacuum sweeper. Regenerative air sweepers may not have enough suction to relieve the clogging.
- If vacuum sweeping is not successful, it may be necessary to rebuild any layers fouled with sediment and fines. It is likely that this will be confined to the bedding layer and gravel used in the paver stone joints, but some clogging can possibly move down into the underlying stone reservoir layer.
- The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011).*



Water standing on the parking surface 48 to 72 hours after a storm is an indication of clogging. Snow piles at the edge of the photo point to possible clogging from winter sanding or plowing.

Sand Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters.
- Also see **Section 12.3.6** for guidance on routine maintenance of the sedimentation and filter chambers.
- As with Bioretention, there can be various causes for clogged filters:
- Filter fabric layer under the filter media that has blinded or clogged
- Clogging of the surface of the filter layer or filter cartridges
- Bad filter media (e.g., sand media)
- "Plumbing" issues with configuration of overflow and underdrain pipes
- Fortunately, filters are usually confined within concrete vaults or manholes, so diagnosing and rectifying clogging problems should be more straightforward. Check the original design or as-built plans. Some of the following guidance may also be helpful:
- For proprietary cartridge or special filter media structures, consult the vendor or manufacturer for recommended solutions.
- See **Section 12.3.6** for guidance on removing the top layer of filter media and replacing with clean material, as well as vacuuming out any sedimentation chambers.
- If it is suspected that overflow or outlet pipes are not configured correctly, check against the design plans and also standard drawings from the manufacturer.
- Chronic clogging problems are likely due to excessively dirty drainage areas, including uncontrolled sources of sediment, oil and grease wash off, vegetative debris from surrounding trees or shrubs, or other sources. It will be important to check and resolve any controllable sources of clogging in the drainage area (see **Section 12.3.1**).



Standing water on the parking lot is evidence that this perimeter sand filter (under the sidewalk) is clogged.

Helpful Skills:

- Soil infiltration analysis techniques as per ASTM and/or current BMP design specifications
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention, sand filter media, or standard porous pavement types and bedding layers
- General practice of trying easier or less expensive strategies before jumping right to wholesale reconstruction of a practice

Equipment Typically Used for Unclogging Activities:

- Soil infiltration testing or geotechnical equipment
- Small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment control supplies
- Pavement demolition and repair equipment
- Mulch, plants, filter media, and other materials needed to rebuild practices

12.3.8 Vegetation

Applies Most Commonly To: Tree Planting, Swales, Bioretention, Green Roofs, and Ponds/Wetlands

Problem #1: Not enough vegetation; vegetation *is unhealthy*

Tree Planting, Swales, Bioretention:

- Test soil/media to ensure proper conditions exist for plant survival.
- Check water drawdown after a storm to make sure that wet/saturated conditions are not the cause of plant failure. If this IS an issue, see **Section 12.3.7.**
- Amend or enhance soil as needed; soil may need more organic material to support plants, but do not use uncomposted organic material or animal waste, as it will likely export undesirable nutrients to the stormwater system.
- If plants have continued to die, consider a different species or entire planting palette or revised planting plan **(photo to right shows the need for a whole new planting plan)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.



Ponds and Wetlands:

- See **Section 12.3.12** for general guidance on pond and wetland vegetation maintenance, as well as the following.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.

Green Roof:

- Consult with a green roof plant vendor about possible causes of plant failure. Lack of watering during initial establishment could be the main culprit.
- Work with a qualified vendor to develop and install a new planting plan.
- Speak with building facilities maintenance personnel to ensure they understand need for watering and caring for new plants after they are installed.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plant and/or wetland plant nurseries in general region

Problem #2: Too much vegetation, overgrown (with invasive species), not maintained

General Approach for All Practices:

- Determine which invasive plants are present. For a list of regulated and prohibited invasive plants in New York State, see *New York State Prohibited and Regulated Plants* (NYS DEC, NYS Agriculture and Markets, 2014) at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf . Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Review whether the original planting plan relied on these plants; for example, some wetland plans may rely on "aggressive colonizers" such as cat tails.
- For more detailed information regarding appropriate control measures for each species, consult the Cornell Cooperative Extension Invasive Species Program at the following link: http://ccetompkins.org/environment/invasive-nuisance-species/invasive-plants. If invasive species have taken over the facility, wholesale removal and replanting with desirable species may be necessary.
- If (non-invasive) plants are overgrown, (**example in photo to right**), remove, thin, or trim back excessive vegetation.
- If an entire new planting plan is deemed necessary, use SMP-Specific Guidance in the remainder of this manual, along with landscaping goals for the site location, to devise a plan that allows for adequate growth over a long period of time. A simple, clear planting design (**example in photo below**) with a long-term plan has the best chance of being maintained through time. Maintenance crews need to know which plants are part of the design versus weeds and how the practice should look from year to year.
- Develop a plan to ensure proper weeding, pruning, trimming, and replanting to maintain the plan over time.
- See **Section 12.3.12** for general guidance on pond and wetland vegetation maintenance, as well as the following.





Helpful Skills:

- Knowledge of exotic and invasive species is needed. Consult a local Cooperative Extension Office.
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application by a certified pesticide applicator. See DEC webpage for "Pesticide Applicator/Technician Guidance".
- Landscape architect
- Knowledge of wetland plants (for ponds/wetlands)
- Knowledge of SMP design (to understand hydrologic regime for plant selection)

Equipment Typically Used for Vegetation Maintenance Activities

- Soil auger to diagnose issues of soil drainage that may affect vegetation health
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move filter media, mulch, and other materials
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Planting bars, soil drills, etc.
- For planting in standing water (e.g., ponds, wetlands), pumps or pump-around systems and dirt bags or other ways to temporarily dewater planting area

12.3.9 Embankment and Overflow Condition

Applies Most Commonly To: Swales, Bioretention, and especially Ponds/Wetlands

Problem #1: Rill and channel erosion and bare dirt areas of embankments

Swales, Bioretention:



- Erosion and areas of bare dirt indicate two basic issues: 1) soils and moisture levels are not suitable for the plants or turf used; and 2) vegetation cannot take hold because of concentrated flow, physical wear, or poor soil conditions. Address these issues first with a soil/media test to ensure proper conditions exist for plant survival.
- High salt content from winter deicing of pavement is a common culprit of poor soil conditions for roadside plants. If this is the case, restore area with plant species that can tolerate salt levels, or replace edge plants with a stone diaphragm to intercept runoff from road.
- Amend or enhance soil as needed; soil may need more organic material to support dense ground cover.
- For concentrated flow and physical wear, redirect concentrated flow so that it disperses in mulched and vegetated areas. Anchor mulch and replant with vigorous plants recommended through the soils test.
- If plants have continued to die, consider a different species or entire planting palette or a revised planting plan (see **Section 12.3.8** and **photo to right)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:



- Where erosion has deposited soil within the pond or wetland water line, remove this material and reshape the slope.
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- To address rill and channel erosion, first obtain a soil sample test to get soil amendment recommendations. Undercut the eroded sections and replace with clean amended soil, based on the soil test, and reseed as appropriate for the season.
- It may be necessary to stake in seed blankets or erosion-resistant lining (e.g., erosion-control matting or even rock in extreme situations) to stabilize eroded areas. Again, choose seed types appropriate for the season.
- Based on soil test guidance, reseed bare areas to prevent further erosion.
- For persistent problems, reroute the flow to more stable receiving areas using berms, diversions, etc.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing.
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Problem #2: Settlement, loss of armoring material, erosion of emergency overflow

General Approach for All Practices:

- Settlement, loss of armoring material, erosion and accumulated debris can affect the dimension, water velocity or capacity of the emergency overflow such that embankment failure could occur in flood events (**photos below**).
- Inspect for exposure of soil or geotextile base material in the overflow and re-armor areas of exposure.
- In cases of settlement, a qualified engineer should be sought to assess its capacity and impact on pond capacity.
- Erosion of spillways should be repaired and revegetated as described for embankments.





Helpful Skills:

- Knowledge of sediment and erosion control practices for the area
- Completion of self-guided training on dam safety through Association of State Dam Safety Officials: http://www.damsafety.org

Problem #3: Impounding structure (embankment or dam) integrity issues due to tunneling or digging animals, woody vegetation, or seepage

Ponds/Wetlands:

- Impounding structure stability is a serious concern, especially where trees have become established on the slopes, or there's evidence of animal burrows or seepage.
- The best approach for trees on the crest, slopes, and adjacent to an impounding structure or embankment is to cut them down before they reach significant size. If large trees have been cut down but their root systems not removed, carefully monitor the area around the remaining stumps for signs of seepage.
- Exercise judgement for trees on the surrounding side slopes that are NOT impounding structures (not designed to hold back water in the pool). Sometimes a forested edge can enhance the appeal of a pond, but access for maintenance must also be available, and some trees can drop debris into ponds, leading to quality issues.
- Animal burrows can be dangerous to the structural integrity of the embankment because they weaken it and can create pathways for seepage. Professional exterminators may be needed to trap and remove animal pests.
- Seepage as water flow or boiling sand on the lower portion of the exterior slope or toe area of an impounding structure should be brought to the attention of a qualified engineer.
- Leakage around conveyance structures such as barrel pipes or spillways should be monitored for increase since the last inspection. A qualified engineer is needed to resolve issues of piping or seepage along the barrel pipe through a dam.
- Turbidity or cloudiness in seepage should also be brought to the attention of a qualified engineer.

Helpful Skills:

- Completion of self-guided training on dam safety through the Association of State Dam Safety Officials: http://www.damsafety.org

Equipment Typically Used for Embankment and Overflow Maintenance Activities

- Excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move filter media, mulch, and other materials
- Plants and/or seed mix, seed blanket and erosion control materials
- Rod and level for settlement measurements
- Clear glass bottle for seepage visual test

12.3.10 Structural Damage

Applies Most Commonly To: Any Practice

Problem: Structural damage to pipes, headwalls, standpipes, inlet/outlet structures, grates, curbs, and other structural components

- Structural components are necessary for water to flow into and out of stormwater practices as intended. This is a broad category that involves components composed of concrete, metal, plastic, and other materials. Some common examples include:
- Deteriorated or broken curbs that allow water to bypass a practice
- Slumping or sinkholes where soil meets a concrete drop inlet or outlet structure
- Broken or collapsed inlets
- Connections in an inlet or manhole structure that are not parged and are leaky
- Collapsed or crushed pipes (especially corrugated metal)
- Missing or broken steps or other safety features in a manhole or outlet control structure
- Root penetration and clogging of underdrain or other pipes
- Broken check dams
- There are too many particular instances to mention here, but the general idea is to inspect and repair any structural components that are affecting the performance of a practice or leading to a potential health or safety issue.

Helpful Skills:

- General contracting skills—concrete work, metal, proper joint sealing
- Routing out clogged pipes
- Perhaps CCTV experience to look for broken or clogged pipes

Equipment Typically Used for Fixing Erosion:

- General contracting
- CCTV

12.3.11 Pool Stability

Applies Most Commonly To: Ponds/Wetlands

Problem: Flooded or dry pond outlet issues

General Approach for Ponds and Wetlands:

- Note high-water marks on structures or pond banks and compare with outlet structure weir.
- If the outlet weir is submerged, investigate downstream for plugs such as beaver dams, woody debris or sediment bars. Refer to **Section 12.3.2** for removal of obstructions.
- If the pond is retaining more water than it is supposed to and there is no flow from the outlet with no visible blockages in the outlet pipe, look for obstructions above the weir or outlet pipe. Woody debris, vegetation and silt can plug outfall weirs or blind rock outfall protection. Removal of such blockages tends to be a hand exercise. A jet/vacuum truck or other heavy equipment may be needed to clear excessive or precarious blockages (**photo on right**).
- If the pond is too low and not holding water in the designated pool, the outlet structure should be closely inspected to see whether it has settled from the original construction or there is leakage through joints or cracks. Finding no deficiencies with the structure, investigate the pond embankment as described in **Section 12.3.9** for evidence of seepage.
- If there is no evidence of seepage and the outlet structure has no apparent structural defects, an engineer should be consulted to review the pond design and determine the proper outlet elevation.





Helpful Skills:

- The ability to navigate uneven surfaces, to follow ditch banks and to sight drainage obstructions is implicit with this task.
- Ability to use a level to sight adequate elevation fall is helpful.

Equipment Typically Used for Pool Stability Evaluations

- Bright flashlight for pipe inspection
- Manhole hook for manhole cover access
- Brush hook to clear debris and walking surfaces
- Rod and level to check elevation differentials

12.3.12 Pool Quality

Applies Most Commonly To: Ponds/Wetlands

Problem #1: Littoral shelves and pond edge: not enough vegetation; vegetation *is unhealthy;* invasive plants have taken over

Ponds and Wetlands:



- If there is not enough vegetation or no vegetation, determine whether maintenance practices have killed the plants. If so, work with the owner to educate those responsible for pond maintenance on correct methods. Consult plans for original planting and replant.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring. If ponds are overgrown so that less than 25% of the surface area is visible, the pond water level should be lowered to enable selective plant removal.
- Invasive plants, such as phragmites or common reed, should be removed with their roots. Be sure to restore areas that have been disturbed with replacement vegetation because root removal exposes soil to erosion. Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Native plants selected based on environmental conditions have the greatest chance for survival.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.

Helpful Skills:

- Landscaping/gardening
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plants and/or wetland plant nurseries in general region
- Familiarity with New York invasive terrestrial and wetland plants and their control: http://nyis.info/

Problem #2: Pond color, scum, odor, algae, and plant overgrowth



- Ponds that have algae covering more than 20% of the surface should have maintenance to remove it. Raking or mechanical harvesting of filamentous algae offers short-term control, but feasible long-term strategies should be considered.
- Pond maintenance companies should be relied on to identify the algae and appropriately control them. Pond specialists can control the algae growth in ponds, but its growth and reproduction are dependent on nutrients. When nutrients are in abundance, so will be the algae or vegetation.
- Plants can be used in shallow shelfs at inlets to take up nutrients. However, they must be maintained, and cuttings shall be removed to take nutrients out of the pond system.
- If (non-invasive) plants are overgrown, remove or trim back excessive vegetation. Remove cuttings and trimmings. Do not allow vegetative debris to remain in the pond.
- Pond clarity and color can be impacted by excessive sediment discharge or flow shortcircuiting. For issues of clarity and color, follow the recommendations in **Section 12.3.6**.
- If invasive aquatic plants are identified, follow DEC guidelines for reporting and controlling invasives (see **Section 12.3.8**).
- Some color, odor, and pond quality issues can be caused by leaks, spills, and other releases in the drainage area. Any petroleum odor or oily sheen (aside from natural rainbow sheen associated with decomposition of organic matter) should be reported to the appropriate state or local response agency. Other peculiar colors or odors can be investigated in collaboration with relevant agencies. Common issues are grease, paint, or other substances poured into storm drains, dumpster management, and stockpiles of various materials exposed to rainfall.

Helpful Skills:

- Ability to recognize invasive aquatic plants
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application by a certified pesticide applicator. See DEC webpage for “Pesticide Applicator/Technician Guidance”.
- Knowledge of wetland plants and common types of algae and aquatic weeds
- Knowledge of types of pond maintenance practices

Equipment Typically Used for Pool Quality Investigations

- High-top rubber boots
- Canoes or small boats
- Brush hook to clear vegetation and access pond bank
- Secchi disk to check and compare pond color and clarity
- Large-mouth bottle to collect algae and water quality samples
- Various materials to control aquatic weeds and algae

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Department of
Environmental
Conservation

APPENDIX N: NOTICE OF INTENT

NOI for coverage under Stormwater General Permit for Construction Activity

version 1.40

(Submission #: HQ6-08GD-GP2KA, version 1)

Details

Originally Started By	Patrick Mitchell
Alternate Identifier	MARLBOROUGH RESORT
Submission ID	HQ6-08GD-GP2KA
Submission Reason	New
Status	Draft

Form Input

Owner/Operator Information

Owner/Operator Name (Company/Private Owner/Municipality/Agency/Institution, etc.)
MARLBOROUGH RESORT

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
ACHENBAUM

Owner/Operator Contact Person First Name
MICHAEL

Owner/Operator Mailing Address
100 RING ROAD WEST SUITE 101

City
GARDEN CITY

State
NY

Zip
11530

Phone
845-568-6710

Email
michael@theghg.com

Federal Tax ID
N/A

> If the owner/operator is an organization, provide the Federal Tax ID number, or Employer Identification Number (EIN), in the format xx-xxxxxxx. If the owner/operator is an individual and not an organization, enter "Not Applicable" or "N/A" and do not provide the individual's social security number.

Project Location

Project/Site Name
MARLBOROUGH RESORT

Street Address (Not P.O. Box)
626 LATTINTOWN ROAD

Side of Street
East

City/Town/Village (THAT ISSUES BUILDING PERMIT)
MARLBOROUGH

State
NY

Zip
12542

DEC Region
3

> The DEC Region must be provided. Please use the NYSDEC Stormwater Interactive Map (https://gisservices.dec.ny.gov/gis/stormwater/) to confirm which DEC Region this site is located in. To view the DEC Regions, click on “Other Useful Reference Layers” on the left side of the map, then click on “DEC Administrative Boundary.” Zoom out as needed to see the Region boundaries.
> For projects that span multiple Regions, please select a primary Region and then provide the additional Regions as a note in Question 39.

County
ULSTER

Name of Nearest Cross Street
PENNY LANE

Distance to Nearest Cross Street (Feet)
150

Project In Relation to Cross Street
South

Tax Map Numbers Section-Block-Parcel
102.4-2-12

Tax Map Numbers
-2-13, 29, 3-8.32

> If the project does not have tax map numbers (e.g. linear projects), enter “Not Applicable” or "N/A".

1. Coordinates

Provide the Geographic Coordinates for the project site. The two methods are:
- Navigate to the project location on the map (below) and click to place a marker and obtain the XY coordinates.
- The "Find Me" button will provide the lat/long for the person filling out this form. Then pan the map to the correct location and click the map to place a marker and obtain the XY coordinates.

Navigate to your location and click on the map to get the X,Y coordinates
41.637007140193944,-73.98755759277836

Project Details

2. What is the nature of this project?
Redevelopment with increase in impervious area

> For the purposes of this eNOI, “New Construction” refers to any project that does not involve the disturbance of existing impervious area (i.e. 0 acres). If existing impervious area will be disturbed on the project site, it is considered redevelopment with either increase in impervious area or no increase in impervious area.

3. Select the predominant land use for both pre and post development conditions.

Pre-Development Existing Landuse
Commercial

Post-Development Future Land Use
Commercial

3a. If Single Family Subdivision was selected in question 3, enter the number of subdivision lots.
NONE PROVIDED

---

4. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area.

*** ROUND TO THE NEAREST TENTH OF AN ACRE. ***

Total Site Area (acres)
152.5

Total Area to be Disturbed (acres)
41.4

Existing Impervious Area to be Disturbed (acres)
5.5

Future Impervious Area Within Disturbed Area (acres)
9.6

5. Do you plan to disturb more than 5 acres of soil at any one time?
No

---

6. Indicate the percentage (%) of each Hydrologic Soil Group(HSG) at the site.

A (%)
0

B (%)
7

C (%)
63

D (%)
30

7. Is this a phased project?
Yes

8. Enter the planned start and end dates of the disturbance activities.

Start Date
06/30/2025

End Date
09/01/2028

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.
LATTINTOWN CREEK

> Drainage ditches and storm sewer systems are not considered surface waterbodies. Please identify the surface waterbody that they discharge to. If the nearest surface waterbody is unnamed, provide a description of the waterbody, such as, “Unnamed tributary to Niagara River.”

9a. Type of waterbody identified in question 9?
Stream/Creek On Site

Other Waterbody Type Off Site Description
NONE PROVIDED

9b. If "wetland" was selected in 9A, how was the wetland identified?
NONE PROVIDED

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001?
No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001?
No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters?
No

> Please use the DEC Stormwater Interactive Map (https://gisservices.dec.ny.gov/gis/stormwater/) to confirm if this site is located in one of the watersheds of an AA or AA-S classified water. To view the watershed areas, click on “Permit Related Layers” on the left side of the map, then click on “Class AA AAS Watersheds.”

If No, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as D (provided the map unit name is inclusive of slopes greater than 25%), E or F on the USDA Soil Survey?
No

If Yes, what is the acreage to be disturbed?
NONE PROVIDED

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area?
Yes

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)?
Yes

16. What is the name of the municipality/entity that owns the separate storm sewer system?
TOWN OF MARLBOROUGH

17. Does any runoff from the site enter a sewer classified as a Combined Sewer?
No

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law?
Yes

19. Is this property owned by a state authority, state agency, federal government or local government?
No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.)
No

Required SWPPP Components

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)?
Yes

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)?
Yes

If you answered No in question 22, skip question 23 and the Post-construction Criteria and Post-construction SMP Identification sections.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the 2015 or 2024 NYS Stormwater Management Design Manual?
Yes

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:
Professional Engineer (P.E.)

SWPPP Preparer
Passero Associates

Contact Name (Last, First)
LaPorta, Chris

Mailing Address
6 Front Street

City
Newburgh

State
NY

Zip
12550

Phone
845-328-1808

Email
claporta@passero.com

Download SWPPP Preparer Certification Form

Please take the following steps to prepare and upload your preparer certification form:

1) Click on the link below to download a blank certification form
2) The certified SWPPP preparer should sign this form
3) Scan the signed form
4) Upload the scanned document
Download SWPPP Preparer Certification Form

Please upload the SWPPP Preparer Certification
NONE PROVIDED
Comment
NONE PROVIDED

Erosion & Sediment Control Criteria

25. Has a construction sequence schedule for the planned management practices been prepared?
Yes

26. Select all of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural
Silt Fence
Stabilized Construction Entrance
Construction Road Stabilization
Dust Control
Check Dams
Sediment Basin
Storm Drain Inlet Protection

Biotechnical
None

Vegetative Measures
Mulching
Protecting Vegetation
Seeding
Topsoiling

Permanent Structural
Diversion
Land Grading
Rock Outlet Protection
Retaining Wall

Other
NONE PROVIDED

Post-Construction Criteria

*** IMPORTANT: Completion of Questions 27-39 is not required if response to Question 22 is No.**

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.
Preservation of Undisturbed Area
Preservation of Buffers
Reduction of Clearing and Grading
Locating Development in Less Sensitive Areas
Driveway Reduction
Building Footprint Reduction

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual.
All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout). (Acre-feet)
1.915

29. Post-construction SMP Identification

Use the Post-construction SMP Identification section to identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity that were used to reduce the Total WQv Required (#28).

Identify the SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use the Post-Construction SMP Identification section to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29. (acre-feet)
1.47

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28)?
No

If Yes, go to question 36. If No, go to question 32.

32. Provide the Minimum RRv required based on HSG. [Minimum RRv Required = (P) (0.95) (Ai) / 12, Ai=(s) (Aic)] (acre-feet)
.320

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?
Yes

If Yes, go to question 33.

Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. SMPs

Use the Post-construction SMP Identification section to identify the Standard SMPs and, if applicable, the Alternative SMPs to be used to treat the remaining total WQv (=Total WQv Required in #28 - Total RRv Provided in #30).

Also, provide the total impervious area that contributes runoff to each practice selected.

NOTE: Use the Post-construction SMP Identification section to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question #29. (acre-feet)
.45

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a).
1.92

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)?
Yes

If Yes, go to question 36.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv required and provided or select waiver (#36a), if applicable.

CPv Required (acre-feet)
3.48

CPv Provided (acre-feet)
3.52

36a. The need to provide channel protection has been waived because:
Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (#37a), if applicable.

Overbank Flood Control Criteria (Qp)

Pre-Development (CFS)
214.31

Post-Development (CFS)
164.52

Total Extreme Flood Control Criteria (Qf)

Pre-Development (CFS)
363.3

Post-Development (CFS)
281.66

37a. The need to meet the Qp and Qf criteria has been waived because:
NONE PROVIDED

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed?
Yes

If Yes, Identify the entity responsible for the long term Operation and Maintenance
Owner

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). (See question #32a) This space can also be used for other pertinent project information.
Total treatment using RRV techniques could not be met due to the poor soils onsite at the low points. WQv is met & minimum RRv is met.

Post-Construction SMP Identification

Runoff Reduction (RR) Techniques, Standard Stormwater Management Practices (SMPs) and Alternative SMPs

Identify the Post-construction SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

RR Techniques (Area Reduction)

Round to the nearest tenth

Total Contributing Acres for Conservation of Natural Area (RR-1)
3.654

Total Contributing Impervious Acres for Conservation of Natural Area (RR-1)
.967

Total Contributing Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
138.657

Total Contributing Impervious Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
3.65

Total Contributing Acres for Tree Planting/Tree Pit (RR-3)
0

Total Contributing Impervious Acres for Tree Planting/Tree Pit (RR-3)
0

Total Contributing Acres for Disconnection of Rooftop Runoff (RR-4)
.874

RR Techniques (Volume Reduction)

Total Contributing Impervious Acres for Disconnection of Rooftop Runoff (RR-4)
.874

Total Contributing Impervious Acres for Vegetated Swale (RR-5)
.08

Total Contributing Impervious Acres for Rain Garden (RR-6)
0

Total Contributing Impervious Acres for Stormwater Planter (RR-7)
0

Total Contributing Impervious Acres for Rain Barrel/Cistern (RR-8)
0

Total Contributing Impervious Acres for Porous Pavement (RR-9)
3.26

Total Contributing Impervious Acres for Green Roof (RR-10)
0

Standard SMPs with RRv Capacity

Total Contributing Impervious Acres for Infiltration Trench (I-1)
0

Total Contributing Impervious Acres for Infiltration Basin (I-2)
1.16

Total Contributing Impervious Acres for Dry Well (I-3)
0

Total Contributing Impervious Acres for Underground Infiltration System (I-4)
0

Total Contributing Impervious Acres for Bioretention (F-5)
.777

Total Contributing Impervious Acres for Dry Swale (O-1)
0

Standard SMPs

Total Contributing Impervious Acres for Micropool Extended Detention (P-1)
0

Total Contributing Impervious Acres for Wet Pond (P-2)
0

Total Contributing Impervious Acres for Wet Extended Detention (P-3)
0

Total Contributing Impervious Acres for Multiple Pond System (P-4)
0

Total Contributing Impervious Acres for Pocket Pond (P-5)
0

Total Contributing Impervious Acres for Surface Sand Filter (F-1)
0

Total Contributing Impervious Acres for Underground Sand Filter (F-2)
0

Total Contributing Impervious Acres for Perimeter Sand Filter (F-3)
0

Total Contributing Impervious Acres for Organic Filter (F-4)
0

Total Contributing Impervious Acres for Shallow Wetland (W-1)
0

Total Contributing Impervious Acres for Extended Detention Wetland (W-2)
0

Total Contributing Impervious Acres for Pond/Wetland System (W-3)
0

Total Contributing Impervious Acres for Pocket Wetland (W-4)
0

Total Contributing Impervious Acres for Wet Swale (O-2)
0

Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Total Contributing Impervious Area for Hydrodynamic
0

Total Contributing Impervious Area for Wet Vault
0

Total Contributing Impervious Area for Media Filter
0

"Other" Alternative SMP?
0

Total Contributing Impervious Area for "Other"
0

Provide the name and manufaturer of the alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

Manufacturer of Alternative SMP
NONE PROVIDED

Name of Alternative SMP
NONE PROVIDED

Other Permits

40. Identify other DEC permits, existing and new, that are required for this project/facility.
None
Freshwater Wetlands/Article 24
Water Supply
Stream Bed or Bank Protection/Article 15

If SPDES Multi-Sector GP, then give permit ID
NONE PROVIDED

If Other, then identify
NONE PROVIDED

41. Does this project require a US Army Corps of Engineers Wetland Permit?
Yes

If "Yes," then indicate Size of Impact, in acres, to the nearest tenth
.4

42. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.
NONE PROVIDED

MS4 SWPPP Acceptance

43. Is this project subject to the requirements of a regulated, traditional land use control MS4?
Yes - Please attach the MS4 Acceptance form below

If No, skip question 44

44. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI?
No

> Please note that per Part VII.H.4. of GP-0-20-001, the MS4 SWPPP Acceptance Form must be signed by a principal executive officer or ranking elected official of the MS4, or a duly authorized representative of that person.

MS4 SWPPP Acceptance Form Download

Download form from the link below. Complete, sign, and upload.
MS4 SWPPP Acceptance Form

MS4 Acceptance Form Upload
NONE PROVIDED
Comment
NONE PROVIDED

Owner/Operator Certification

Owner/Operator Certification Form Download

Download the certification form by clicking the link below. Complete, sign, scan, and upload the form.
Owner/Operator Certification Form (PDF, 45KB)

Upload Owner/Operator Certification Form

NONE PROVIDED

Comment

NONE PROVIDED

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: Marlboro Resort

eNOI Submission Number: HQ6-08GD-GP2KA

eNOI Submitted by: ☐ **Owner/Operator** ☑ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

_____

Signature

_____

Date

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-20-001)

Project Site Information

Project/Site Name

Marlboro Resort

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

The Gansevoort Hotel Group

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First name | MI | Last Name

Signature | Date

APPENDIX O: NOTICE OF TERMINATION

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): _____

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

_____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? _____ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

APPENDIX P: SPDES PERMIT

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020

Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature

Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

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Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* (“SWPPP”) the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

   (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s;

   (ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

   (vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

   (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

   (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

   (ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments

listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharges*.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume ("Cpv"): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria ("Qp"): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria ("Qf"): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be

calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

(i) No Affect
(ii) No Adverse Affect
(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits

must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land*

use control MS4, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with

the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

    a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection

schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:
   (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

   (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

   (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

   (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

   (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

   (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located

in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

   a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field,

superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for "*Commence (Commencement of) Construction Activities"* and "*Larger Common Plan of Development or Sale" also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system

and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

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

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

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

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed

training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State", excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW's, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

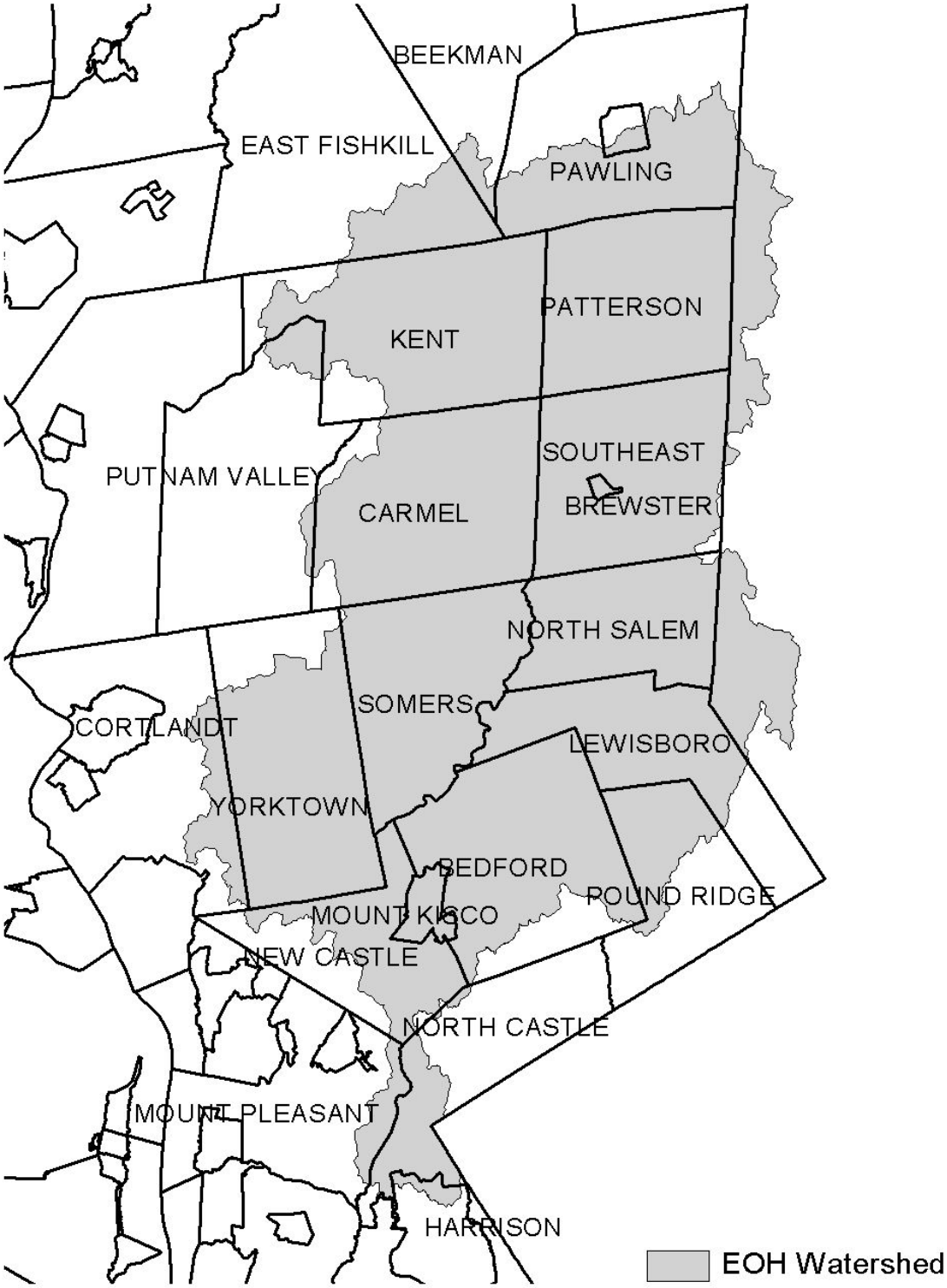


Figure 2 - Onondaga Lake Watershed



Figure 3 - Greenwood Lake Watershed

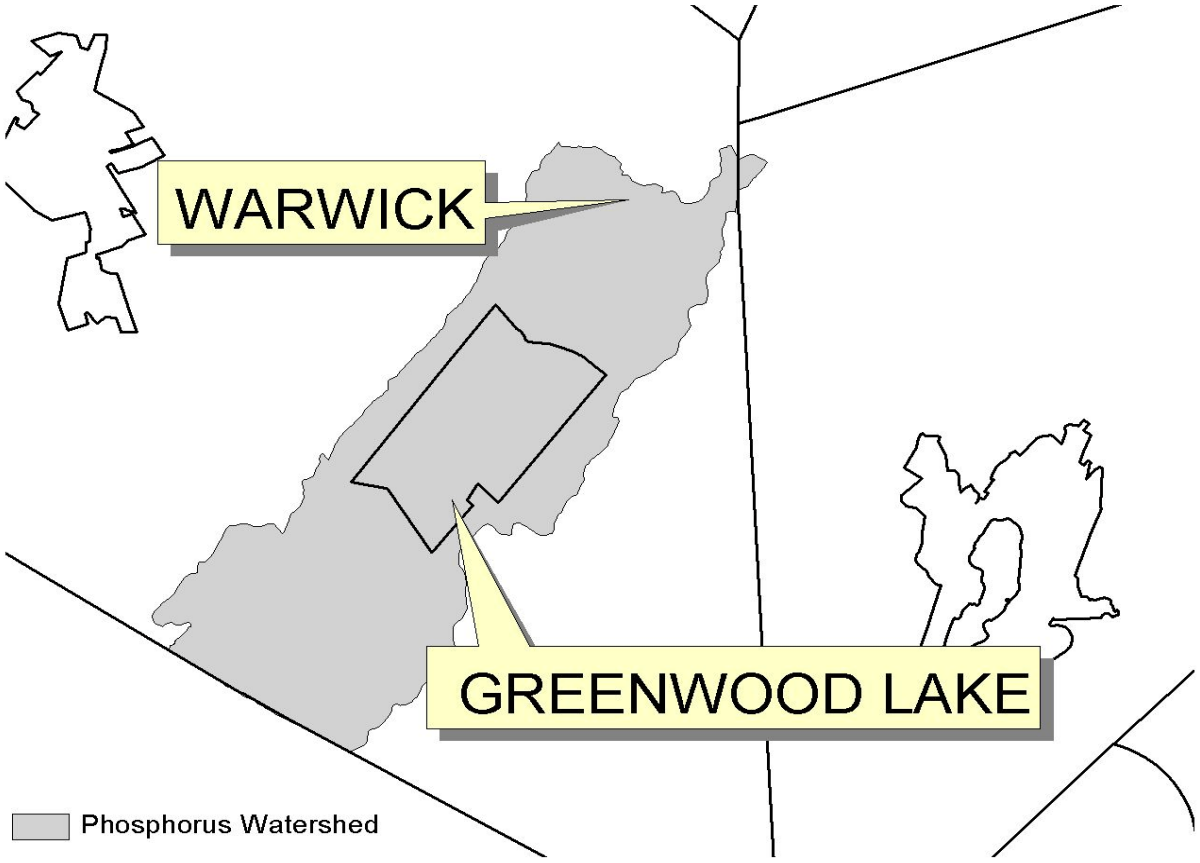


Figure 4 - Oscawana Lake Watershed

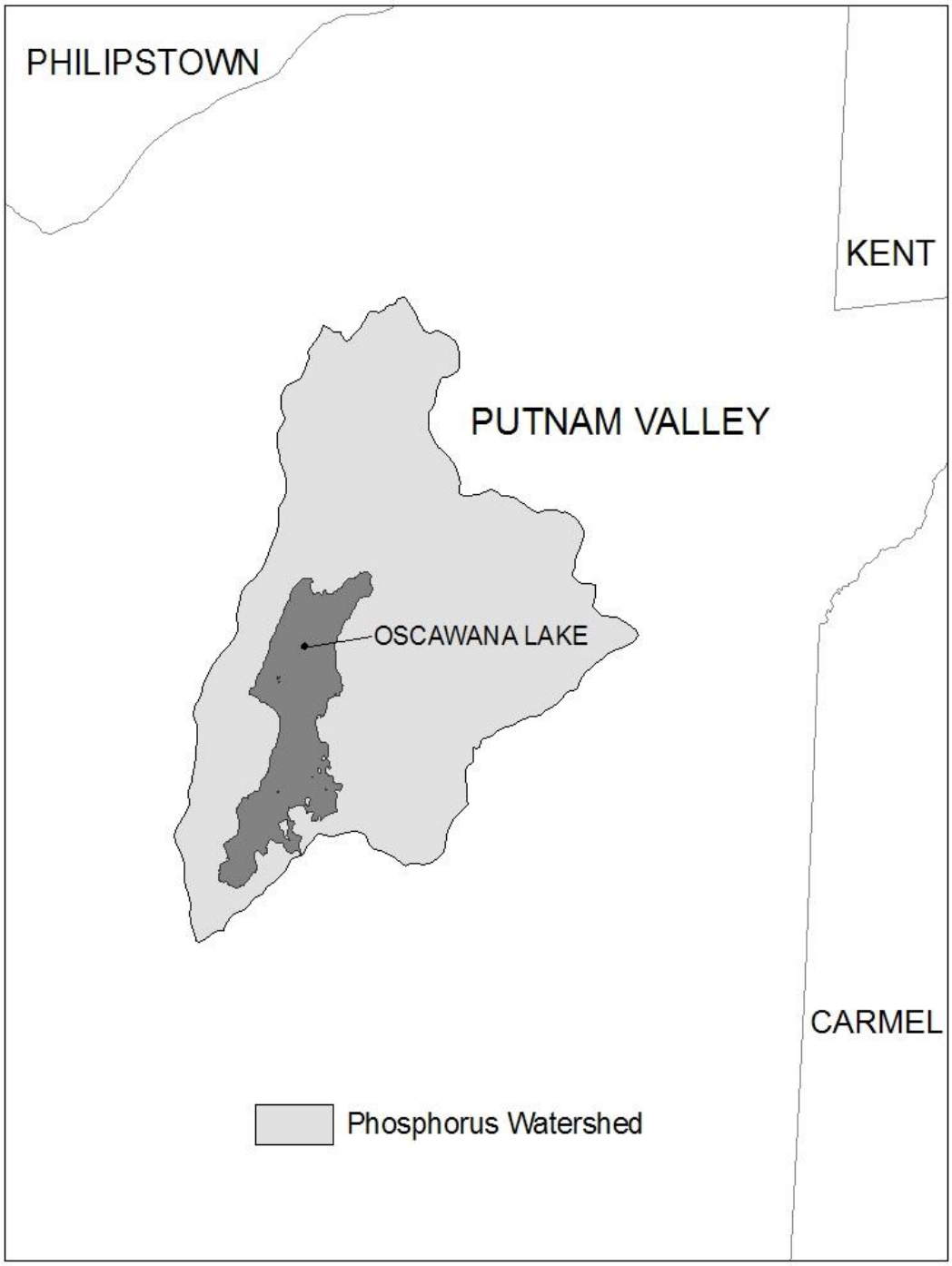
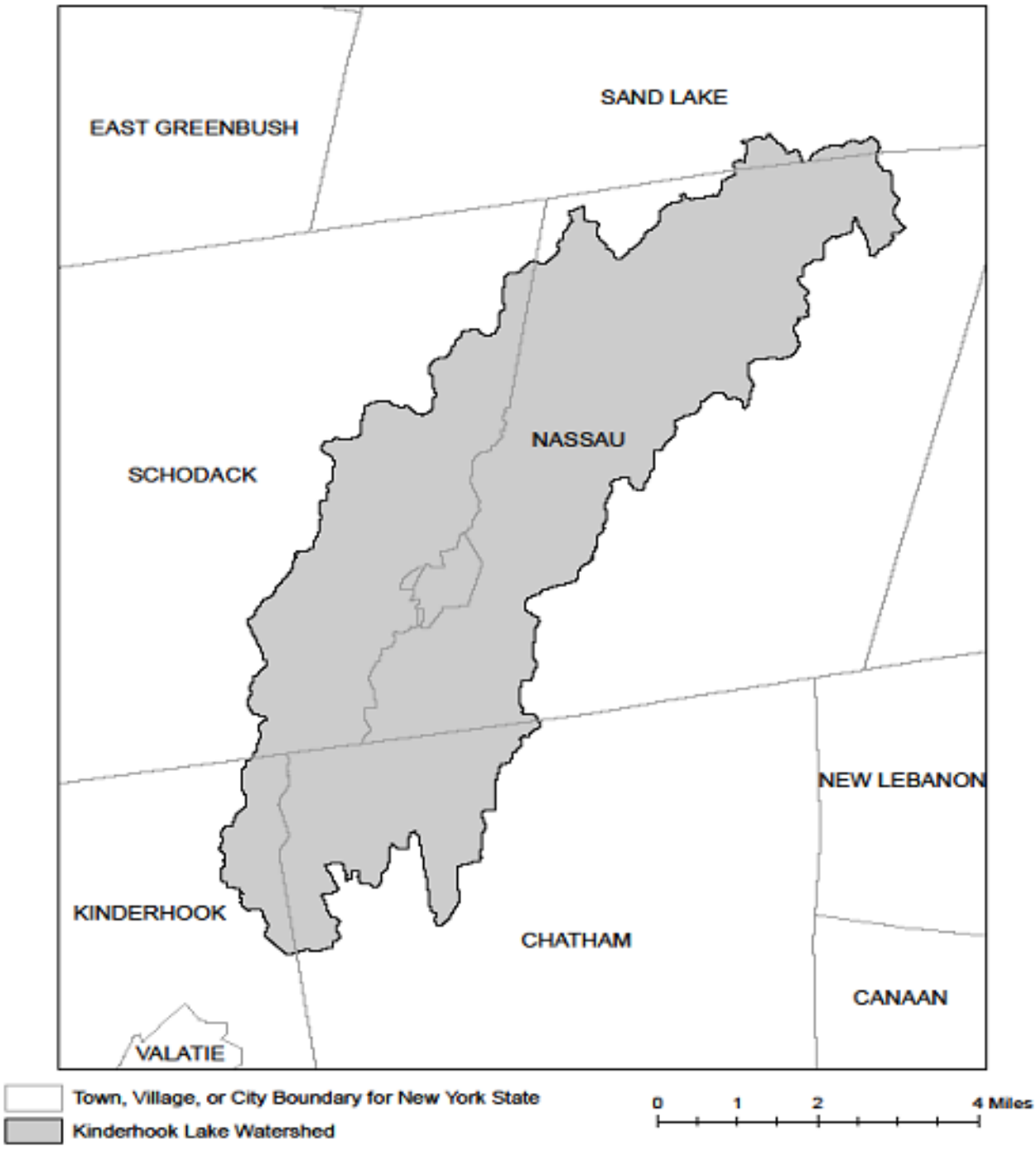


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using "The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy" dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

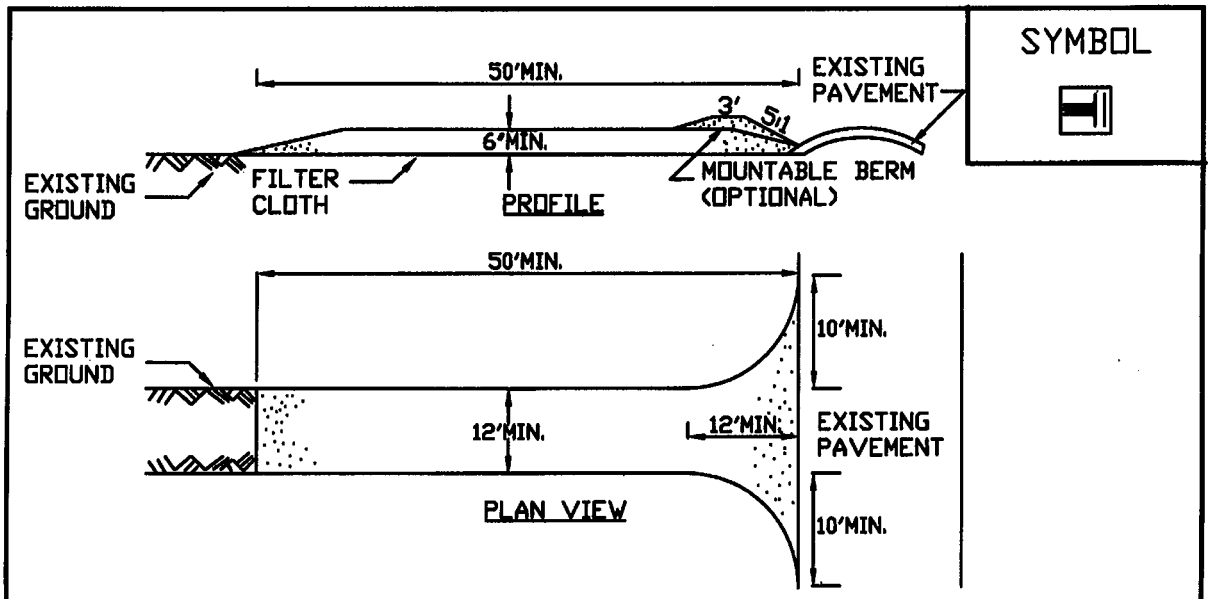
Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, NY 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, NY 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, NY 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, NY 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, NY 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, NY 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

APPENDIX Q: ESC DETAILS & BMP'S

Figure 5A.35
Stabilized Construction Entrance



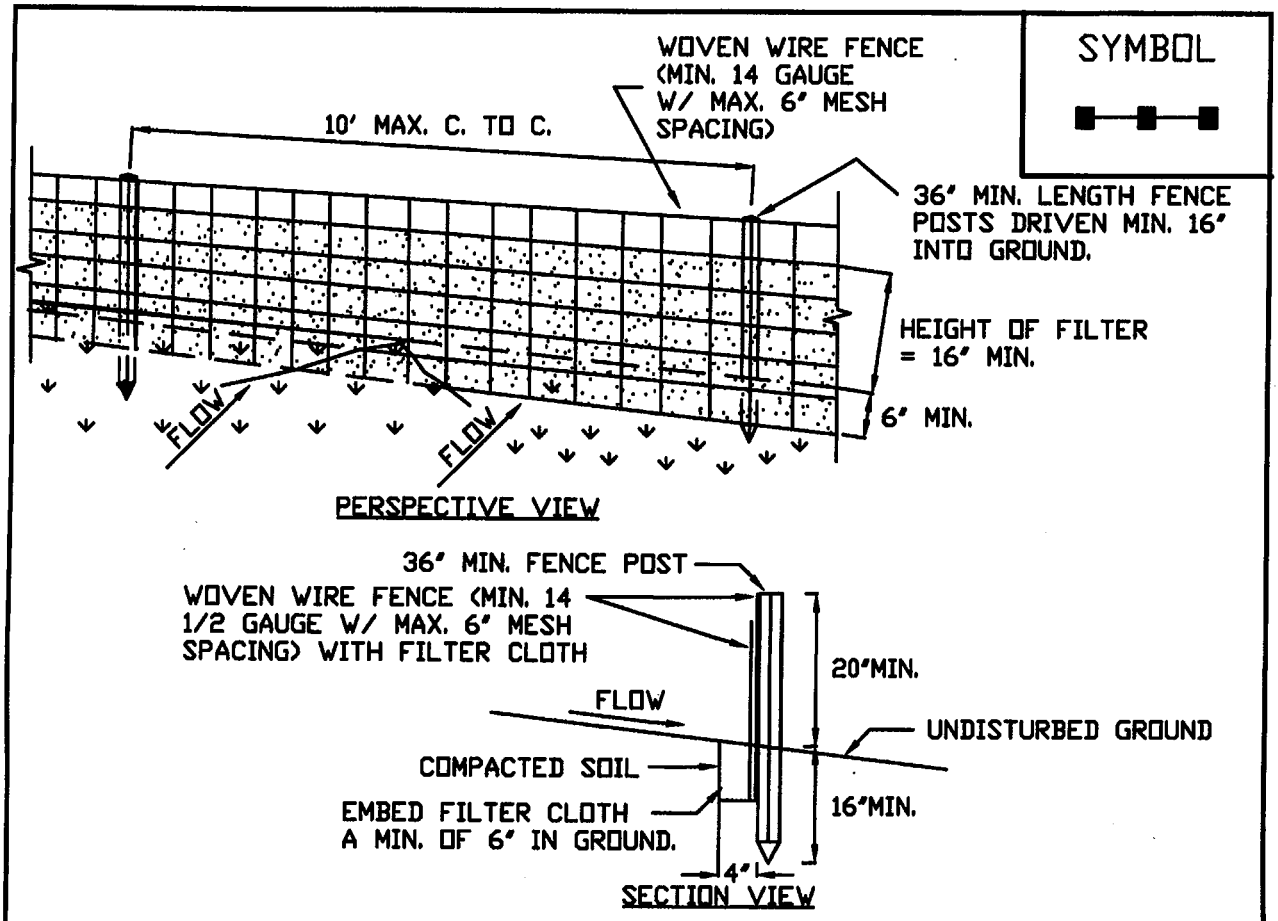
CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STABILIZED CONSTRUCTION ENTRANCE

Figure 5A.8
Silt Fence

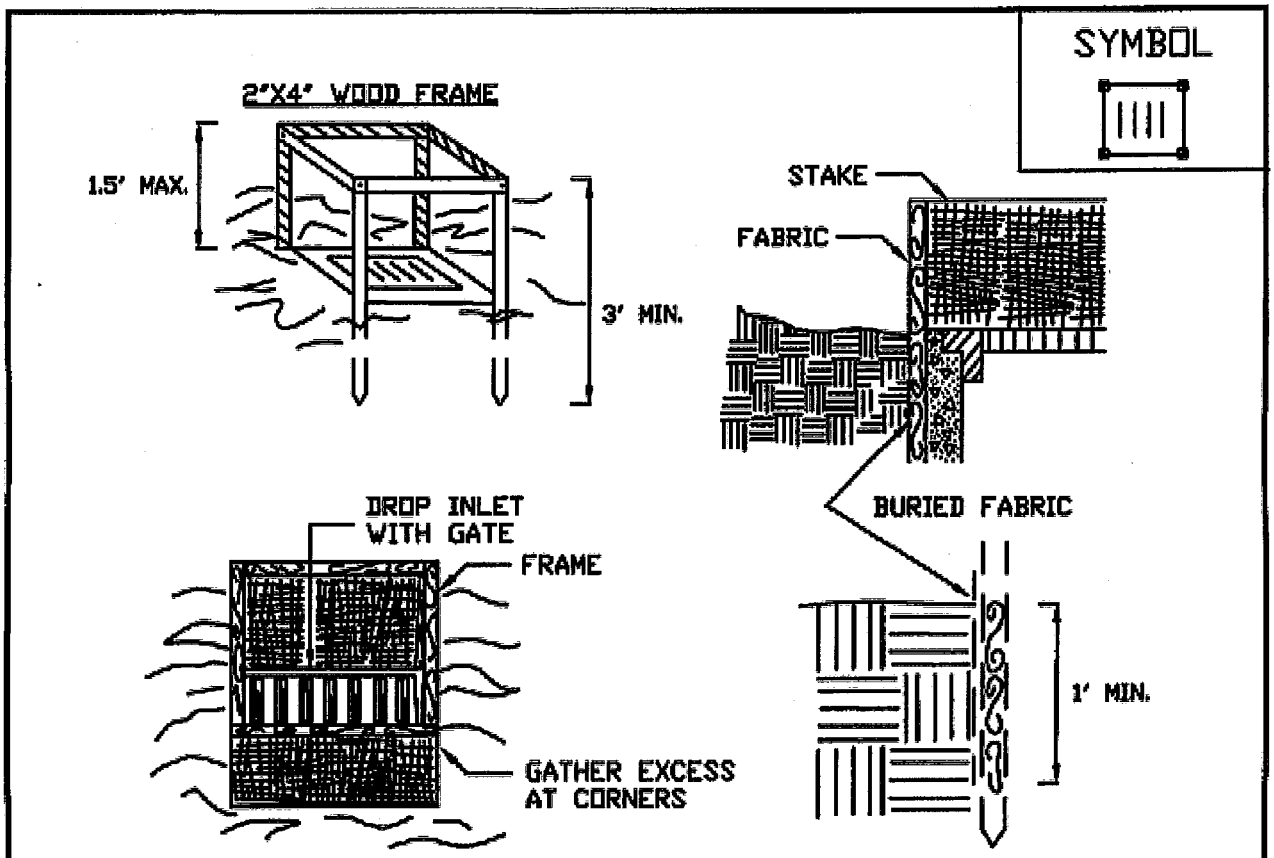


CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

Figure 5A.12
Filter Fabric Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

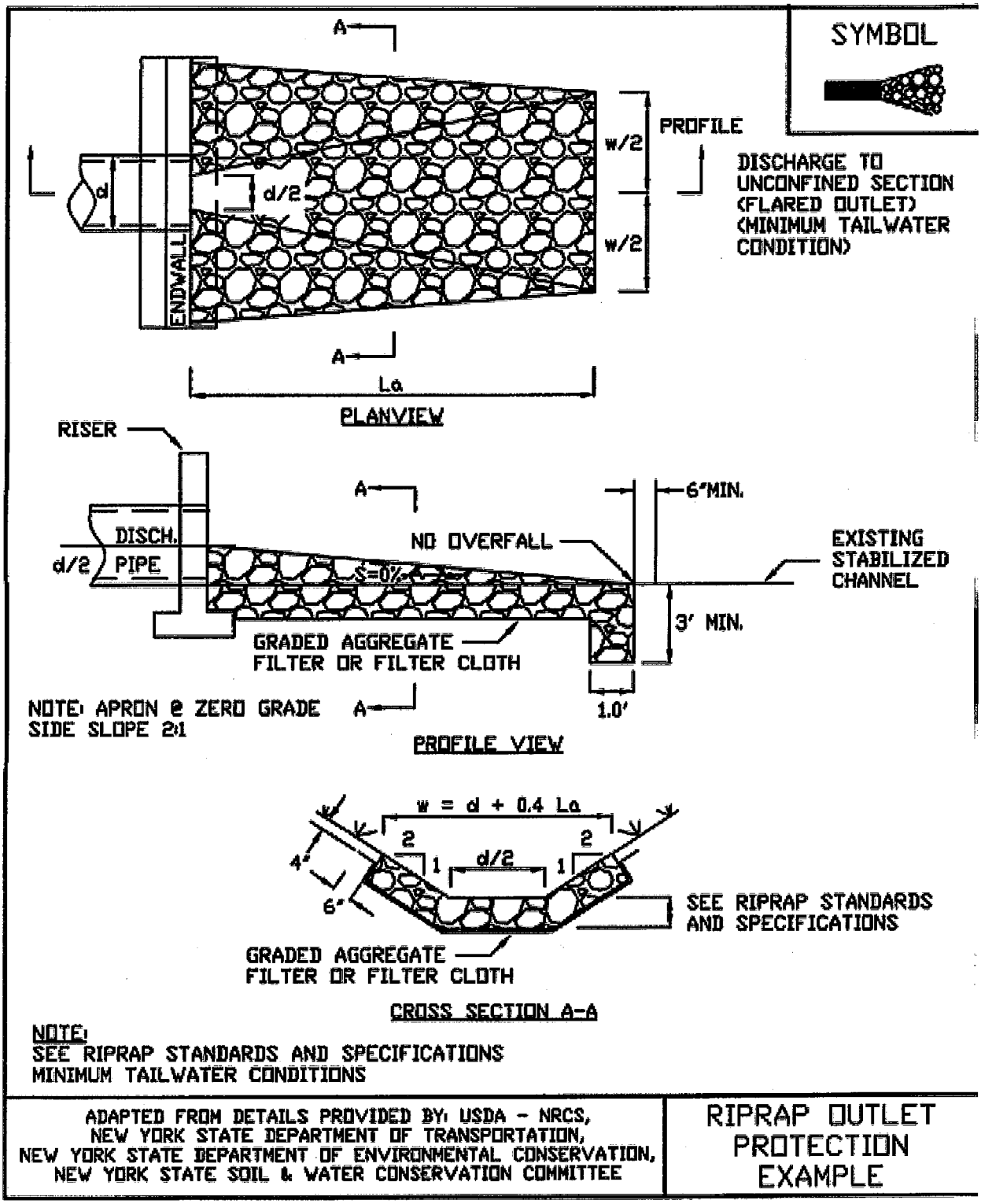
1. FILTER FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUN DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

FILTER FABRIC
DROP INLET
PROTECTION

Figure 5B.14
Riprap Outlet Protection Detail (1)



Agricultural Best Management Practice Systems Catalogue

NYS Soil and Water Conservation Committee

Approved June 2023

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Introduction – Purpose – Use of Catalogue

Agricultural Best Management Practice Systems Catalogue

The Agricultural Best Management Practices Catalogue was developed and approved by the NYS Soil and Water Conservation Committee in 2014 to replace The Agricultural Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in NYS. This revised and maintained Catalogue shall provide guidance during the watershed planning process to select appropriate Agricultural Best Management Practice Systems for the control and treatment of pollutants from agricultural nonpoint sources; this Catalogue will also service other NYS SWCC Cost-Share Programs. Utilizing a complete Agricultural BMP System ensures a consistent and effective approach to addressing resource concerns, provides levels of protection and benefits to the environment that partial systems may not deliver, results in an effective use of public resources, and supports the reporting and planning efforts throughout many watersheds both entirely within NYS and those extending beyond (e.g., Clean Water Act 303(d) Programs, Clean Water Plans, and TMDLs for Chesapeake Bay, Lake Champlain, Long Island Sound, Finger Lakes).

For more information on Clean Water Planning: https://www.dec.ny.gov/chemical/23835.html

What are Agricultural Best Management Practice (BMP) Systems?

Complete Agricultural BMP Systems may include one, two, or even a series of National Resources Conservation Service (NRCS) Conservation Practice Standards (CPS), referred to as Component BMPs.

Agricultural BMP Systems prevent or reduce the source or transport of substances originating from agricultural activities which may adversely affect surface and ground waters or other resources. While an Agricultural BMP System has Standards and Specifications associated with its installation, operation, and maintenance of Component BMPs, it does not impose effluent limits for specific pollutants. Rather, it provides an effective means of reducing or preventing the impact of nonpoint source pollutants from a specific resource concern. Agricultural Environmental Management (AEM) is a framework created to assist Soil and Water Conservation Districts and their partners in developing and delivering a science-based agricultural conservation program centered on local priorities and goals. A 5-Tiered AEM planning approach identifies resource concerns and Agricultural BMP System alternatives to address those concerns.

See the following for more information about the AEM 5-Tiered Approach to conservation:
https://agriculture.ny.gov/soil-and-water/agricultural-environmental-management

Resource Concerns and Agricultural Best Management Practice (BMP) Systems

The AEM Planning Process requires each individual management area or resource concern area to be clearly identified, assessed / evaluated, and planned as its own entity; this approach allows each of these areas to be planned as a complete Agricultural BMP System on their own. For example: a farm with two different barnyards, each evaluated as a possible resource concern, may be planned, and further treated by two separate Livestock Heavy Use Are Runoff Management Systems, each Agricultural BMP System unique to its own management area, considerations, and Component BMPs.

Agricultural BMP Systems and Component BMPs are expressed in unique measurable quantities and units (e.g., number, linear feet, square feet, acres); correct measurable units may be found in this Catalogue as well as the NRCS Field Office Technical Guide. Further unit descriptors in addition to required NRCS reportable units are acceptable and often beneficial (e.g., (Waste Transfer (CPS 634) - 1 NO, 100 ft), (Waste Storage Facility (CPS 313) – 1 NO, 2 Million Gallons)).

In some cases, multiple Agricultural BMP Systems may work within or adjacent one another to properly control and treat a resource concern; scenarios utilizing two or more Agricultural BMP Systems should have each System listed. For example: An Access Control System with an adjacent and supporting Riparian Buffer System, both Systems used in conjunction to address one or more resource concerns.

The Agricultural BMP Catalogue is not a design manual and should not be used to replace NRCS Conservation Practice Standards and Specifications.

Interacting with the Agricultural BMP Systems Catalogue

Updates to the Agricultural BMP Systems Catalogue may be conducted on an annual basis, as NRCS Conservation Practice Standards change, or when new information is available for incorporation. Please direct questions about content and application of this directory to the following NYS SWCC Staff:

Ron Bush, CNMP Specialist: Ronald.Bush@agriculture.ny.gov
Brendan Jordan, CNMP Specialist: Brendan.Jordan@agriculture.ny.gov
Greg Albrecht, AEM Coordinator, CNMP Specialist: Greg.Albrecht@agriculture.ny.gov

Table I – Agricultural BMP Systems and Potential Components BMPs

Access Control System

Access Control	472
Fence	382
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Access Road	560
Watering Facility	614
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Pumping Plant	533
Spring Development	574
Structure for Water Control	587
Stream Crossing	578
Water Well	642
Field Border	386

Agrichemical Handling and Storage System

Agrichemical Handling Facility	309
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Pumping Plant	533
Underground Outlet	620
Grassed Waterway	412

Composting System – Animal

Animal Mortality Facility	316
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Erosion Control Systems – Structural

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Feed Management System

Feed Management	592

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Irrigation Water Management System

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Irrigation Water Management System (continued)

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Livestock Heavy Use Area Runoff Management System

Heavy Use Area Protection	561
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Access Road	560
Roof Runoff Structure	558
Roofs and Covers	367
Conservation Cover	327
Critical Area Planting	342
Vegetated Treatment Area	635
Diversion	362
Grassed Waterway	412
Lined Waterway or Outlet	468
Pumping Plant	533
Sediment Basin	350
Subsurface Drain	606
Underground Outlet	620
Waste Separation Facility	632
Waste Storage Facility	313
Waste Transfer	634
Water and Sediment Control Basin (WASCOB)	638
Watering Facility	614

Manure and Agricultural Waste Treatment Systems

Waste Separation Facility	632
Waste Storage Facility	313
Waste Transfer	634
Waste Treatment	629
Anaerobic Digester	366
Composting Facility	317
Pumping Plant	533
Roofs and Covers	367
Heavy Use Area Protection	561

Nutrient Management System – Cultural

Nutrient Management	590

Pathogen Management System

Animal Mortality Facility	316
Composting Facility	317
Ground Water Testing	355
Access Control	472

Pathogen Management System (continued)

Anaerobic Digester	366
Fence	382
Heavy Use Area Protection	561
Waste Separation Facility	632
Waste Storage Facility	313
Waste Transfer	634
Waste Treatment	629
Vegetated Treatment Area	635
Nutrient Management	590
Roofs and Covers	367
Diversion	362

Petroleum and Oil Products Storage System

On-Farm Secondary Containment Facility	319
Access Road	560
Access Control	472
Heavy Use Area Protection	561
Conservation Cover	327

Prescribed Rotational Grazing System

Prescribed Grazing	528
Pasture and Hay Planting	512
Forage Harvest Management	511
Fence	382
Field Border	386
Trails and Walkways	575
Watering Facility	614
Livestock Pipeline	516
Pumping Plant	533
Structure for Water Control	587
Water Well	642
Spring Development	574
Pond	378
Access Road	560
Access Control	472
Grazing Land Mechanical Treatment	548
Brush Management	314

Prescribed Rotational Grazing System (continued)

Herbaceous Weed Treatment	315
Heavy Use Area Protection	561
Stream Crossing	578
Subsurface Drain	606
Underground Outlet	620

Process Wash Water Management System

Vegetated Treatment Area	635
Waste Separation Facility	632
Waste Transfer	634
Pumping Plant	533
Waste Storage Facility	313
Structure for Water Control	587
Subsurface Drain	606
Heavy Use Area Protection	561

Riparian Buffer System

Riparian Forest Buffer	391
Riparian Herbaceous Cover	390
Tree/Shrub Establishment	612
Tree/Shrub Site Preparation	490
Conservation Cover	327
Critical Area Planting	342
Stream Crossing	578
Access Control	472
Access Road	560
Trails and Walkways	575
Brush Management	314
Fence	382
Filter Strip	393
Pasture and Hay Planting	512
Grassed Waterway	412
Herbaceous Weed Treatment	315
Pest Management Conservation System	595
Lined Waterway or Outlet	468
Structure for Water Control	587
Water and Sediment Control Basin (WASCOB)	638

Short-Term Waste Collection and Transfer System

Waste Storage Facility	313
NYS SWCC Short-Term Waste Collection and Transfer System – Modified NRCS CPS Waste Storage Facility	*313*
Waste Transfer	634
Waste Separation Facility	632
Waste Treatment	629
Waste Facility Closure	360
Nutrient Management	590
Pumping Plant	533
Roofs and Covers	367
Subsurface Drain	606
Access Control	472
Access Road	560
Diversion	362
Fence	382
Heavy Use Area Protection	561
Hedgerow Planting	422
Pond Sealing or Lining – Geomembrane or Geosynthetic Clay Liner	521
Pond Sealing or Lining – Compacted Soil Treatment	520
Pond Sealing or Lining – Concrete	522

Silage Leachate Control and Treatment System

Vegetated Treatment Area	635
Waste Separation Facility	632
Waste Transfer	634
Pumping Plant	533
Dike	356
Diversion	362
Subsurface Drain	606
Structure for Water Control	587
Heavy Use Area Protection	561
Waste Storage Facility	313
Sprinkler System	442
Irrigation Water Management	449
Sediment Basin	350
Fence	382
Conservation Crop Rotation	328

Soil Health System

Conservation Crop Rotation	328
Conservation Cover	327
Contour Farming	330
Cover Crop	340
Pasture and Hay Planting	512
Mulching	484

Soil Health System (continued)

Residue and Tillage Management, No-Till	329
Residue and Tillage Management, Reduced Till	345
Strip Cropping	585

Stream Corridor and Shoreline Management System

Stream Habitat Improvement and Management	395
Streambank and Shoreline Protection	580
Clearing and Snagging	326
Critical Area Planting	342
Obstruction Removal	500
Open Channel	582
Stream Crossing	578
Riparian Forest Buffer	391
Riparian Herbaceous Cover	390
Tree/Shrub Establishment	612
Tree/Shrub Site Preparation	490
Access Control	472

Waste Storage and Transfer System

Waste Storage Facility	313
Waste Transfer	634
Waste Separation Facility	632
Waste Treatment	629
Waste Facility Closure	360
Nutrient Management	590
Pumping Plant	533
Roofs and Covers	367
Subsurface Drain	606
Access Control	472
Access Road	560
Composting Facility	317
Diversion	362
Fence	382
Heavy Use Area Protection	561
Hedgerow Planting	422
Pond Sealing or Lining – Geomembrane or Geosynthetic Clay Liner	521
Pond Sealing or Lining – Compacted Soil Treatment	520
Pond Sealing or Lining – Concrete	522

Table II – Structural Agricultural Conservation Practices

Coverage by the SPDES General Permit for Stormwater Discharges from Construction Activity may be required if a project involving one or more of the structural agricultural conservation practices listed below will disturb one (1) or more acres (5000 square feet in the New York City Watershed East of the Hudson) of soil. See the SPDES General Permit for Stormwater Discharges from Construction Activity for more information (www.dec.ny.gov/chemical/43133.html) and contact the NYSDEC with any questions.

NRCS Conservation Practice Standard (NY) https://efotg.sc.egov.usda.gov/#/state/NY/documents/section=4&folder=-3	**Practice Code**
Access Road	560
Agrichemical Handling Facility	309
Anaerobic Digester	366
Animal Mortality Facility	316
Composting Facility	317
Dike or Levee	356
Diversion	362
Dry Hydrant	432
Energy Efficiency Agricultural Operation	374
Fence	382
Forest Trails & Landings	655
Grade Stabilization Structure	410
Grassed Waterway	412
Heavy Use Area Protection	561
High Tunnel System	325
Irrigation Pipeline	430
Irrigation Reservoir	436
Lined Waterway or Outlet	468
Livestock Pipeline	516
Monitoring Well	353
Obstruction Removal (soil disturbing)	500
On-Farm Secondary Containment Facility	319
Open Channel	582
Pond	378
Pond Sealing or Lining - Compacted Soil Treatment	520
Pond Sealing or Lining - Concrete	522
Pond Sealing or Lining - Geomembrane or Geosynthetic Clay Liner	521
Pumping Plant	533
Road/ Trail/ Landing Closure & Treatment	654
Roof Runoff Structure	558
Roofs and Covers	367
Sediment Basin	350
Shallow Water Development and Management	646

NRCS Conservation Practice Standard (NY) https://efotg.sc.egov.usda.gov/#/state/NY/documents/section=4&folder=-3	**Practice Code**
Sinkhole Treatment	527
Spring Development	574
Stormwater Runoff Control	570
Stream Crossing	578
Streambank and Shoreline Protection	580
Structure for Water Control	587
Subsurface Drain	606
Trails and Walkways	575
Underground Outlet	620
Vegetative Treatment Area	635
Vertical Drain	630
Waste Facility Closure	360
Waste Separation Facility	632
Waste Storage Facility	313
Waste Transfer	634
Waste Treatment	629
Water Well	642
Watering Facility	614
Well Decommissioning	351
Wetland Creation	658
Wetland Enhancement	659
Wetland Restoration	657

Table III – Agricultural BMP System Lifespans

- The following listed lifespans are for Agricultural BMP Systems implemented through NYS AGM and NYS SWCC Cost-Share Programs.
- Agricultural BMP System Lifespan indicates the minimum term that Operation and Maintenance **MUST** be performed on the Agricultural BMP System. Implementation of an Operation and Maintenance (O&M) plan is required to assure efficient operation of the System and may extend the System lifespan, and its effectiveness, beyond the minimum term.
- Agricultural BMP System Design Criteria is variable depending on the Component BMPs that are used, and the specific resource concerns being addressed.

Agricultural BMP System	Lifespan (years)
Access Control System	10
Agrichemical Handling and Storage System	10
Composting System – Animal	10
Erosion Control System – Structural	10
Feed Management System	1
Integrated Pest Management Conservation System	1
Irrigation Water Management System	1
Livestock Heavy Use Area Runoff Management System	10
Manure and Agricultural Waste Treatment System	10
Nutrient Management System – Cultural	1
Pathogen Management System	10
Petroleum and Oil Products Storage System	10
Prescribed Rotational Grazing System	10
Process Wash Water Management System	10
Riparian Buffer System	10
Short-Term Waste Collection and Transfer System	10
Silage Leachate Control and Treatment System	10
Soil Health System	1 - 5
Stream Corridor and Shoreline Management System	10
Waste Storage and Transfer System	10

Access Control System

DEFINITION
An Access Control System provides for the permanent exclusion of livestock from a waterbody or hydrologically sensitive area to protect water quality.

WATER QUALITY PURPOSE
To prevent the direct deposition of manure and urine into waterbodies and hydrologically sensitive areas, and to protect the stability of the banks of a waterbody from livestock traffic.

POLLUTANT CONTROLLED
Nutrients, pathogens, biochemical oxygen demand (BOD), sediment, or thermal modification.

WHERE USED
On farmsteads, pastures, and fields where livestock have access to surface waterbodies and hydrologically sensitive areas, and a resource concern has been identified.

SYSTEM DESCRIPTION
An Access Control System involves the use of appropriate fence and associated components to exclude livestock from having significant direct access to surface waters and hydrologically sensitive areas to protect water quality. Other Component BMPs that provide an alternative source of water or allow for the controlled access to or crossing of streams may be included in the System.

In some cases, multiple Agricultural BMP Systems may work within or adjacent one another to properly control and treat a resource concern; scenarios utilizing two or more BMP Systems should have each System listed. For example: An Access Control System with an adjacent and supporting Riparian Buffer System, both Systems used in conjunction to address one or more resource concerns.

SYSTEM EFFECTIVENESS
Eliminating access of livestock to waterbodies and hydrologically sensitive areas prevents direct nutrient, pathogen, and organic matter contributions by livestock as well as protecting bank stability and vegetation, which leads to less erosion and improved wildlife habitat.

IMPACTS ON SURFACE WATER
Beneficial – reduces the risk of contamination from nutrients, pathogens, biochemical oxygen demand (BOD), sediment, and thermal modification.

IMPACTS ON GROUND WATER
Neutral - It may be beneficial in areas where groundwater is recharged directly from surface waterbodies or there is a direct surface connection to groundwater.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial by excluding livestock from the banks of waterbodies helping to maintain bank stability and vegetation reducing soil erosion and sedimentation.
Air: Neutral.
Plants: Beneficial by excluding livestock from the banks of waterbodies helping to maintain bank vegetation.

Animals: Beneficial as it can help protect riparian vegetation that in turn provides habitat, wildlife corridors and water quality benefits.
Humans: Beneficial by improving overall water quality and recreational opportunities.
Energy: Neutral but may be negative if alternative water requires pumping.

ADVANTAGES TO FARM

- Easy to implement.
- Relative low cost.
- Could improve neighbor relations due to livestock control and increased aesthetics in the stream corridor.

DISADVANTAGES TO FARM

- Requires fence maintenance and potential replacement after flood events.
- Often requires the installation of an alternative water supply system.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Some factors impacting cost include the type of livestock involved, the length and type of fence needed, the need for alternative water, and stream crossings.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the System:

- Pastures within the Access Control System shall be managed and maintained to remain vegetated, and the development of future resource concerns shall be avoided (e.g., heavily disturbed areas, runoff to nearby Highly Sensitive Areas).
- Basic maintenance to fence, crossings, and watering stations is needed.
- Periodic access of livestock to protected areas may be allowed, if in line with NRCS CPS Access Control, Riparian Herbaceous Buffer, or other relevant Standard operation and maintenance guidelines.
- Significant flooding may result in the need for repair or replacement.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Access Control	472	Acre	April 2019	10
Fence	382	Feet	October 2022	20
Trails and Walkways	575	Feet	September 2021	10
Access Road	560	Feet	March 2021	10
Watering Facility	614	Number	March 2021	10
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Livestock Pipeline	516	Feet	March 2021	20
Pond	378	Number	May 2018	20
Pumping Plant	533	Number	October 2022	15
Spring Development	574	Number	September 2021	20
Structure for Water Control	587	Number	March 2019	20
Stream Crossing	578	Number	January 2023	10
Water Well	642	Number	March 2021	20
Field Border	386	Acre	October 2017	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Pasture Management AEM Tier 2 Worksheet and Information Sheet
- Stream and Floodplain Management AEM Tier 2 Worksheet and Information Sheet

Agrichemical Handling and Storage System

DEFINITION
A permanent structure, with associated operation and maintenance procedures, that includes an impervious surface to provide an environmentally safe on-farm area for agrichemical storage, handling, mixing, loading, recovery, and rinsing.

WATER QUALITY PURPOSE
To reduce the potential for soil, groundwater, and surface water contamination during agrichemical storage, mixing, loading, unloading, rinsing, and recycling operations.

POLLUTANT CONTROLLED
Agrichemicals – (e.g., pesticides, fertilizers).

WHERE USED
On farms where current methods of storing, mixing, loading, and unloading of agrichemicals; and the rinsing of equipment or agrichemical containers are polluting or have the potential to pollute ground or surface waters; and a resource concern has been identified.

SYSTEM DESCRIPTION
An agrichemical mixing facility consists of a watertight containment structure comprised of a concrete pad and all necessary equipment for pumping, transferring, and storing water used in agrichemical mixing, loading, unloading, and rinsing operations. The size of the pad and storage capacity is related to the volume and size of the largest spray tank on the pad. Containment storage vessels incorporated into the facility design allow for the recovery of agrichemical, rinsate storage, plus handling/mixing/recovery/disposal. Surface runoff from a 25-year, 24-hour duration storm event is diverted away from the facility. A roof and sidewalls may be used to shelter the facility from rain, snow, and ice, preventing precipitation from accumulating on the pad and contaminating runoff.

SYSTEM EFFECTIVENESS
Little or no information exists on the documented effectiveness of agrichemical handling facilities on water quality improvement. Much is known about water quality impacts when these facilities are not available for agrichemical handling and rinsing operations. A recent study of commercial pesticide mixing and loading sites in Wisconsin, without pesticide handling facilities, found that two-thirds of the sites had significant groundwater contamination.

Pesticides were detected in groundwater at more than half of these sites, with concentrations exceeding groundwater standards at one-third of the sites surveyed. Officials and the pesticide industry in Wisconsin recognized that use of agrichemical mixing facilities minimize the potential for surface and groundwater contamination.

IMPACTS ON SURFACE WATER
Beneficial.

IMPACTS ON GROUND WATER
Beneficial.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial as it greatly reduces the risk of soil contamination due to leaks and spills.
Air: Beneficial as it greatly reduces the risk of air contamination resulting from leaks and spills.
Plants: Neutral.
Animals: Neutral.
Human: Beneficial as it improves environmental safety.
Energy: Neutral.

ADVANTAGES TO FARM

- Improves environmental safety by preventing contamination of ground and surface water from routine use and accidental spills.
- Allows compliance with federal and state regulations.
- Enhances owner / operator management.
- Promotes recycling of rinse water as tank make up water.
- Reduces liability risk.

DISADVANTAGES TO FARM

- Can be very expensive.
- Must perform maintenance frequently and diligently to ensure proper facility operation and water source protection.
- Expansive cropland acreage makes it difficult to pick one central location to protect and utilize exclusively.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the System:

- An Emergency Action Plan should be a part of the written O&M plan, in case of an accidental agrichemical spill, exposure, fire or other incident that could adversely affect environmental health. The plan should include a record-keeping component to accurately log spills, exposure, fire, or other incidents.
- Safe agrichemical handling procedures and frequent maintenance are critical to the performance of any agrichemical mixing facility.
- The proper disposal/utilization of rinsate, exterior wash water, accumulated sediment and spilled wastewater must be accomplished in accordance with the pesticide labeling requirements and federal, state and local laws and codes.
- Operator must perform periodic checks of any backflow prevention devices, inspect the pad and sump for cracks and leaks, clean the sump and pad between different chemical mixing operations and remove sediment accumulation from the sump.
- Personal protective equipment must be used during O&M procedures.
- Accurate records indicating maintenance, cleaning, and inspection of equipment are necessary.
- Pesticide containers are to be triple rinsed and properly recycled.

See the documents in Section 4 of the NRCS field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NYSDEC recommends that all pesticide rinsates, including wash waters from cleaning of spray equipment, should be collected and stored aboveground. Stored rinsates should be recycled for future mixing with the same concentrates.

An agrichemical storage facility should have good air ventilation and an impervious floor and sides to contain spills and leaks. The building should be locked at all times and be located adjacent to the pad.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Agrichemical Handling Facility	309	Number	October 2022	15
Access Road	560	Feet	March 2021	10
Access Control	472	Acre	April 2019	10
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Diversion	362	Feet	May 2017	10
Pumping Plant	533	Number	October 2022	15
Underground Outlet	620	Feet	September 2021	20
Grassed Waterway	412	Acre	September 2021	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Pesticide Storage, Mixing and Loading AEM Tier 2 Worksheet and Information Sheet

Composting System – Animal

DEFINITION
An on-farm System to safely facilitate the treatment or disposal through controlled aerobic decomposition of livestock and poultry carcasses, by micro-organisms into a biologically stable, soil-enriching material useful for soil amendment. This System is especially useful when rendering services are not available or too costly.

WATER QUALITY PURPOSE
To have a System for the safe decomposition and ultimate utilization of nutrients from animal composting in a safe environmental manner.

POLLUTANT CONTROLLED
Pathogens, nutrients.

WHERE USED
On farms where safe disposal of livestock carcasses is needed.

SYSTEM DESCRIPTION
A facility to safely compost animal carcasses. To protect surface and groundwater and allow for proper composting of animal carcasses, the facility may be located on lower permeability soils, an improved pad, or be a building with a roof and concrete floor, depending on the operation and need. Clean surface water will be diverted from the site and all contaminated run-off will be contained and treated.

Composting on the farm is accomplished by mixing an energy source (carbonaceous material: wood chips, sawdust, straw, corn cobs, or well-bedded horse manure) with a nutrient source (nitrogenous material: animal carcasses,) in a prescribed manner under aerobic conditions. Microorganisms (primarily bacteria and fungi) break down the raw organic waste under controlled conditions. Air, water, nutrients, surface area, temperature and pH are all important factors in the composting process.

Two types of carcass composting operations are common for on-farm use and either can be managed outside or in a controlled environment or building:

- The most common - Static Piles – carcasses are placed on bulky, high carbon organic material (such as wood chips) and then covered with more organic material and not turned during the composting process. Correct moisture content and bulk density facilitate air movement throughout the pile.
- Aerated Windrows - organic materials are formed into long narrow piles, called windrows, and turned periodically with power equipment to aerate the piles and promote the composting process. This method is the most suitable for smaller carcasses, such as poultry and but has been done on larger scales in the Midwest.

SYSTEM EFFECTIVENESS
Unsafe disposal of animal carcasses can be a large source of pathogens and nutrients. Proper composting, including the collection and treatment of any leachate from the process, greatly reduces the issues with pathogens and when the final product is land applied in accordance with a Nutrient Management Plan, the loss of nutrients is negligible.

IMPACTS ON SURFACE WATER
Beneficial - Improper disposal of carcasses can cause surface water contamination and a proper composting facility can eliminate the potential.

IMPACTS ON GROUND WATER
Beneficial - Improper burial or improper composting on well drained soils, shallow to fractured rock or near high groundwater tables can have negative effects on ground water quality. Proper composting facility will be installed in proper soils or lined and will not affect ground water quality.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial. Nutrients and organic matter will be incorporated in the soil and approve the soil health and nutrient values.
Air: Beneficial. Improper disposal or improperly operated composting facilities can cause major air quality issues on a farm. Properly operated and maintained composting facilities will create little to no odor.
Plants: Beneficial. Plants will benefit from increased nutrients in the soil.
Animals: Beneficial. Properly operated composting facilities will not be an attractant to wild animals or vectors.
Human: Beneficial. Protection of ground and surface water, odor control and vector control will all benefit humans.
Energy**:** Negative. Increased energy will be needed to properly run a composting system which requires increased equipment time over some forms of disposal (dragging carcass into woodlot), but energy use can be less than needed for proper burial.

ADVANTAGES TO FARM

- Can be done simply, at low cost and may not require engineering assistance (for non-structural composting facilities).
- Can utilize on-farm waste products for cover material, such as refusals, spoiled feed, etc.
- Compost can be used as a soil amendment increasing soil tilth and water-holding capacity.

DISADVANTAGES TO FARM

- Requires input (and possible purchase) of materials for composting, such as wood chips.
- Increased cost of initial investment (can be expensive, especially if a building or roofed structure).
- Higher degree of management by farm.
- Requires monitoring for run-off, temperature, proper covering with suitable materials.
- Some practices may require a SPDES permit for site disturbance.

SYSTEM LIFESPAN
Ten (10) years.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs can range from little to no out of pocket cost when there is a readily available supply of high carbon material for a base or can be very expensive for a building where large volumes of material are composted – range $0 to $150,000.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the System:

- Maintain correct operating temperatures, proper aeration, carbon to nitrogen (C: N) ratio, and perform periodic testing of compost.
- Check for run-off, kill zones or other signs of nutrient loss after storm events.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

Testing of compost for nutrients or heavy metals can be arranged through the local Cornell Cooperative Extension or through the Cornell Nutrient Analysis Laboratory.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
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NRCS Name	Standard #	Reportable Item	Date	Life Span
Animal Mortality Facility	316	Number	April 2016	15
Composting Facility	317	Number	September 2021	15
Access Road	560	Feet	March 2021	10
Diversion	362	Feet	May 2017	10
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Roofs and Covers	367	Number	October 2016	10
Vegetative Treatment Area	635	Acre	February 2017	10
Waste Storage Facility	313	Number	March 2018	15

Waste Transfer	634	Number	October 2022	15

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- National Engineering Handbook Part 637, Chapter 2 – Composting (NEH 637.0213, Dead Animal Composting)
- National Engineering Handbook Part 651
- Agricultural Waste Management Field Handbook, Chapter 10 Mortality Management (NEH 651.1007), NRCS or comparable extension publication
- Bonhotal, J., L Telega, J. Petzen. Natural Rendering: Composting Livestock Mortality and Butcher Waste. 2002. Cornell Waste Management Institute: http://compost.css.cornell.edu/naturalrenderingFS.pdf
- Northeast Regional Agricultural Engineering Service publication No. 54, On Farm Composting Handbook, Cornell Cooperative Extension, Ithaca, NY
- Waste Disposal AEM Tier 2 Worksheet and Information Sheet

Erosion Control System - Structural

DEFINITION
The construction of an Erosion Control System to control the loss of soil from sheet, ephemeral, rill or gully erosion on agricultural lands, farmsteads, and production areas. This includes Systems utilizing terraces, diversions, water and sediment control basins (WASCoBs), waterways (both grassed and lined), roof runoff practices, access roads, and associated earthmoving practices.

WATER QUALITY PURPOSE
To reduce all forms of erosion and thereby reducing sediment delivery to waterbodies. This includes shortening slope lengths, cutting off sheet and concentrated flows from adjacent land uses, stabilizing gullies and providing safe outlets for flowing waters.

POLLUTANT CONTROLLED
Sediment, nutrients, or pathogens.

WHERE USED
On erodible land, in both crop fields and pastures, where soil erosion and runoff must be controlled and the use of crop rotation, minimum tillage, or seeding does not or cannot limit the erosion to acceptable levels.

Within and adjacent farmsteads where excessive volumes of clean water concentrate and result in soil erosion and un-controlled runoff. This system would not be appropriate as a treatment method of concentrated nutrient-laden runoff (e.g., livestock heavy use area runoff, feed storage area runoff, waste storage and transfer sites); other practice systems within this Catalogue may apply to forementioned resource concern areas.

SYSTEM DESCRIPTION
This System may be one practice or several; terraces, diversion and WASCoB's are generally constructed across the slope, usually on the contour to intercept and conduct surface runoff at a non-erosive velocity to stable outlets, reducing ephemeral and gully erosion. These practices control erosion by shortening slope length and regulating surface runoff. They can outlet into established grassed waterways, flat vegetated areas or other stabilized outlets. They also can be total storage structures that release the flow through underground outlets within 24 to 48 hours, depending on crops grown. These Systems also act as sediment traps and help to reduce sediment-bound pollutants in surface run-off.

This System will also be used for the construction of waterways; grassed, lined or stone-centered, which are used to convey concentrated flows down slope to protected outlets to prevent gully erosion or to act as outlets for other erosion control practices. On slopes of less than 1% where out-of-bank flow will not cause erosion or property damage, the confinement of flow is not a design requirement.

Structures can be cropped, seeded to grasses and legumes to stabilize the slopes or lined with another material, such as rock, when velocities require.

Soil and water resources are often further conserved when structural erosion control practices are paired with cultural soil health practices (e.g., crop rotation, strip cropping, cover crop, conservation tillage) and nutrient management practices to further reduce pollutant transport and loss.

Within and adjacent farmsteads, Component BMPs may be compiled to collect, store, convey, and safely outlet clean water sources, thus protecting nearby management areas and infrastructure from possible damage or potential runoff.

SYSTEM EFFECTIVENESS
Structural erosion control practices are effective at reducing soil loss significantly as well as limiting nutrient losses and runoff.

IMPACTS ON SURFACE WATER
Beneficial – Terraces, diversions, waterways and WASCoB's reduce erosion by controlling surface runoff and gully erosion which lessen loads delivered to the receiving waterbody. Terraces, diversions, and WASCoBs can also reduce nutrient loading through settling in areas of water retention.

IMPACTS ON GROUND WATER
Slight to Moderate – Can be beneficial in areas where the groundwater is recharged from surface waterbodies. In the absence of a Nutrient Management Plan, terraces and diversions may increase nutrient leaching to groundwater. Impacts on groundwater may be reduced by increasing terrace or diversion release rates, thereby decreasing runoff storage time and potential soil saturation. Diversions decrease the amount of surface runoff infiltrating into the soil, reducing the risk of transporting nutrients and pesticides to groundwater. Waterways generally have little to no impact on ground water.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil: Beneficial to soil resources as soil loss will be diminished.
Air: Slightly beneficial and can have beneficial effects as erosion rates are reduced and the possibility that fines in the air will also be reduced.
Plants: Neutral.
Animals: Slightly beneficial improvement to wildlife as cross field practices could provide pathways for wildlife movement. Slight to moderate for fisheries as erosion rates will be lessened and delivery of sediment to waterbodies controlled.
Human: Slight to no effect on humans unless sediment reduction in waterbodies for public use are impacted.
Energy: Energy use may be slightly higher due to increased tractor use to go around conservation practices instead of normal plowing.

ADVANTAGES TO FARM
- Are relatively easy to design and install.
- Can be cheap to install for simple practices.
- May allow timelier planting and potential yield increases by removing surface runoff.
- Controls surface runoff and gully and ephemeral erosion.
- Can provides flood protection for crop fields.
- Stores runoff up to 48 hours, allowing sediment and sediment-bound pollutants to settle out.
- Protects management areas and farmstead infrastructure.
- Collects surface flows during storm events and provides safe clean water outlets.

DISADVANTAGES TO FARM
- Can take land out of crop production.
- Systems may need to be in conjunction with other conservation practices such as conservation tillage, crop rotations, and contour or strip cropping to bring soil loss to acceptable levels.

- Some systems can be very expensive and usually are not considered cost-effective management practices in relation to cultural control measures.
- Require increased maintenance as trapped sediment accumulates in the structure and removal of sediment or reconstruction is required to maintain capacity.
- Grassed waterways may be unsuitable for areas where a base flow exists (sustained wetness prevents adequate vegetative cover) unless a stone-center lining and a subsurface drain and surface inlet are installed.
- Use may be precluded or have an increased cost if a stable outlet is lacking.

SYSTEM LIFESPAN
Ten (10) years.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs can range from $1.00 per foot for a cross slope ditch to $10 a foot for storage structures with outlets.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system that need to be performed annually and after large storm events:

- Maintain capacity, storage, ridge height and outlets.
- Clean out inlets for underground outlets.
- Remove sediment build-up and redistribute.
- Inspect channel cross-section for stable side slopes, points of scour, rodent holes, and breaches.
- Check channel bottom for erosion or excessive scour, deposition of sediment or other obstructions.
- Outlets should be checked to ensure that they remain adequate, show no sign of erosion or loss of structural integrity.
- Vegetated structures will need to be periodically mowed.
- Periodic inspection and repair of roof runoff structures, outlets, access roads, etc.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS
Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*
For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a

Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Water and Sediment Control Basin	638	Number	March 2019	10
Sediment Basin	350	Number	May 2017	20
Diversion	362	Feet	May 2017	10
Grassed Waterway	412	Acre	September 2021	10
Filter Strips	393	Acre	October 2017	10
Grade Stabilization Structure	410	Number	March 2021	15
Critical Area Planting	342	Acre	October 2017	10
Lined Waterway or Outlet	468	Feet	September 2021	15
Conservation Cover	327	Acre	July 2019	5
Terrace	600	Feet	September 2021	10
Subsurface Drain	606	Feet	May 2020	20
Underground Outlet	620	Feet	September 2021	20
Obstruction Removal	500	Number	September 2021	10
Fence	382	Feet	October 2022	20
Access Road	560	Feet	March 2021	10
Roof Runoff Structure	558	Number	October 2022	15
Trails and Walkways	575	Feet	September 2021	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

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Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Soil Management AEM Tier 2 Worksheet and Information Sheet

Feed Management System

DEFINITION
The continual process of providing adequate, not excess, nutrients to dairy animals through the integration of feeding and crop management to reduce nutrient excretion in manure and nutrient accumulation in soil, lower potential pollution risks to water and air resources, and improve farm profitability.

WATER QUALITY PURPOSE
Reduces the accumulation and potential loss of nitrogen and phosphorus in manure from dairy farms.

POLLUTANT CONTROLLED
Nutrients, pathogens, biochemical oxygen demand (BOD), or ammonia.

WHERE USED
Dairy farms.

SYSTEM DESCRIPTION
Feed management is a continuous improvement process involving benchmarking, planning, implementation, and monitoring. It is facilitated by a feed management specialist and adopted and directed by farm management to meet goals in three areas:

1. improved nutrient use efficiency, homegrown feed utilization, and income-over-feed cost;
2. crop production and purchased feeds are optimized for the feeding system; and
3. reduced nutrient overfeeding, excretion, and accumulation.

Dairy farms using the feed management process pursue those goals often by improving the digestible nutrient content of homegrown feeds produced and fed; accurately estimating feed nutrient intakes by animals and tracking feed inventories; employing scientific standards to determine nutrient requirements and ration levels; and increasing the level of homegrown feeds (forages or grains) in the diet.

Feed management recommendations should be based on the best available research information. The USDA-NRCS Feed Management Standard (NY-592) provides specific technical details and references about planning, implementation, and operation and maintenance. The Cornell Precision Feed Management guidelines and Precision Feed Management Benchmarking tools provide further information for effective feed management with dairy cows. Management of feed rations and forages should be consistent with Cornell recommendations, where available; otherwise, National Research Council recommendations should be utilized.

SYSTEM EFFECTIVENESS
Improving a farm's nutrient mass balance (the amount of nutrients imported compared to the amount of nutrients exported) will reduce the amount of nutrients that have the potential to be lost to the environment. Changes in the feeding program can have a significant influence on farm nutrient management and its mass nutrient balance. While it varies widely by farm size and management, a substantial portion of the nutrients imported to dairy farms in the form of purchased (imported) feeds, and to a lesser degree fertilizers, often remains on the farm where they may accumulate in farm soils and may be lost to air and water resources. Farms that intensively manage their feeding program reduce

nutrient excretion in the manure, increase feed nutrient utilization, and subsequently improve the farm's mass nutrient balance.

A 60% reduction in nitrogen and phosphorus mass nutrient balances has been documented by Cornell University and Cornell Cooperative Extension research on over 40 dairy farms that adopted feed management practices between 2004 and 2008. Those dairy farms also realized lower operating costs ($1.33/CWT) and 11% higher milk production that similar sized farms not participating in the feed management process in the region.

IMPACTS ON SURFACE WATER
Beneficial, including nutrients and pathogens.

IMPACTS ON GROUND WATER
Beneficial, including nutrients and pathogens.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial, the soil health/conservation often must improve in order to optimize homegrown crop production for herd forage or grain needs.
Air: Beneficial, as it has the potential to reduce particulate matter from ammonia volatilization and nitrous oxide emissions.
Plants: Beneficial, as it can reduce nutrient losses and subsequent impacts on neighboring plant communities.
Animals: Beneficial, as it can reduce nutrient losses and subsequent impacts on terrestrial and aquatic habitat.
Human: Beneficial, as it can further safeguard drinking water sources, improve land and water resources for recreation, and provide economic growth.
Energy: Beneficial, as it can reduce use of transportation fuels for imported feed and fertilizer and improve livestock output per energy input.

ADVANTAGES TO FARM

- Potential to reduce nutrient losses and improve animal and crop production.
- Potential to improve herd/flock health.
- Often a positive impact on farm profitability.

DISADVANTAGES TO FARM

- Higher level of farm management is required may result in increased labor and equipment costs.
- Requires additional time and training to adjust to new management strategies.
- Cost to change management may be prohibitive for some farms.

SYSTEM LIFESPAN
One (1) year.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs for feed management depend on several factors, including the size and type of farm, existing level of farm management, feeding and feed storage facilities, history of herd, feed, and other farm records, available equipment, and familiarity with custom operators. Consultation fees for developing and maintaining a feed management plan should be considered in addition to the costs for feed and forage analyses.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. Feed management is a continuous improvement process, involving regular monitoring through benchmarking, planning to address opportunities, implementing those plans, and evaluating the plans via benchmarking.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

See Cornell Feed Management guidelines and Precision Feed Management Benchmarking tools as well as the USDA-NRCS Feed Management Standard (NY-592) for specific technical details about planning, implementation, and operation and maintenance.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Feed Management	592	Animals Units Affected	October 2022	1

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Cornell Precision Feed Management: https://cnydfc.cce.cornell.edu/topic.php?id=19
- Management of Dairy Feed Nutrients AEM Tier 2 Worksheet and Information Sheet

Integrated Pest Management System

DEFINITION
An ecologically based, site-specific integrated pest control strategy utilizing a combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies coupled with precision application techniques and Best Management Practices when pesticide application is warranted.

WATER QUALITY PURPOSE
To reduce pesticide use, availability, and losses to the environment in crop and livestock production.

POLLUTANT CONTROLLED
Pesticides.

WHERE USED
On all agricultural lands where pests will be managed, and a resource concern has been identified.

SYSTEM DESCRIPTION
Integrated Pest Management (IPM) strategies that keep pest populations below economically damaging levels and minimize pest resistance are used to reduce pest management risks to water quality and the environment. Specific IPM techniques include:

Prevention – activities such as cleaning equipment when leaving an infested area, using pest free seeds and transplants, and irrigation scheduling to limit situations that are conducive to disease development,

Avoidance – activities such as using pest resistant varieties, crop rotation, refuge management, and maintaining healthy and diverse plant communities,

Monitoring – activities such as crop scouting, establishing trap crops, degree-day modeling and weather forecasting to help target suppression strategies and avoid routine preventative treatments,

Suppression – activities such as the judicious use of cultural, mechanical, biological, and chemical control methods that reduce or eliminate a pest population or its impacts while minimizing risks to non-target organisms. As part of a suppression system, precision application techniques in an IPM system can further minimize pesticide risks to natural resources and humans. Examples of such techniques include: appropriate equipment calibration to include the correct rate, boom height, appropriate nozzle type, nozzle spacing, operating speed and pressure; computer-controlled application technologies; and advanced technology equipment.

SYSTEM EFFECTIVENESS
Overall, IPM is effective, profitable, and relatively safe. Few if any studies have established a solid link between IPM usage and reduction of pesticide levels in receiving waters. However, IPM has been credited with the reduction in chemical usage. IPM is an effective management practice for consideration in vegetables, fruit, ornamentals, or field crops especially where large amounts of pesticides are applied, waterbodies are adjacent to crop fields, and soils are highly permeable. Numerous studies have shown pesticide use can be reduced up to 45% in fields employing IPM strategies verses conventional fields. Pesticide use for the control of house flies in dairy barns can be reduced 50 to 80% if manure is removed on a timely basis and fly biological control agent populations are enhanced.

When a pesticide is used its effectiveness depends upon the proper application and placement of the chemical. It is estimated that 60% of sprayers have a calibration error rate greater than plus or minus 10%. Frequent calibration checks or computerized precision application greatly reduce this problem.

Associated conservation practices that provide for adequate plant nutrients and soil moisture, including a favorable pH and soil quality, can reduce plant stress, improve plant vigor and increase the plant's overall ability to tolerate pests thereby reducing the need for pesticide use.

IMPACTS ON SURFACE WATER
Beneficial – In most management options the availability of pesticides as a nonpoint source pollutant is reduced.

IMPACTS ON GROUND WATER
Beneficial – In most management options the availability of pesticides as a nonpoint source pollutant is reduced.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial as the use of pesticides generally declines reducing risk of carry over and accumulation in the soil.
Air**:** Beneficial as IPM strategies generally result in less pesticide drift.
Plants: Beneficial as overall less use of pesticide and more precise application is a benefit to non-target plants.
Animals: Beneficial as IPM strategies and precision application techniques reduce the impact of pesticides on non-target organisms such as pollinators.
Human: Beneficial as it is an economically and environmentally defensible practice which realizes a higher net return per acre due to improved commodity quality.
Energy: Neutral.

ADVANTAGES TO FARM

- Use of pesticides usually declines with the use of IPM strategies.
- Usually requires fewer pesticides on a per acre basis.
- IPM generally results in higher average per acre crop yield.

DISADVANTAGES TO FARM

- May result in more pesticide applications per growing season as scouting may find pest populations over threshold.
- Higher level of grower management is required which may result in increased labor and equipment costs.
- Requires additional time and training to adjust to new management strategies.
- May have control costs higher than conventional control techniques.
- Cost of some advanced technology equipment may not be economical for small pesticide applicators.

SYSTEM LIFESPAN
One (1) year for IPM plan and may vary up to 10 years for various application equipment.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. The cost of this system will be highly variable depending on the control strategies employed.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Scouting and monitoring is an on-going activity.
- O&M is specific for each prevention, avoidance, monitoring, and suppression technique used. Record keeping is an essential component of all these practices.
- Follow label directions when pesticides are used.
- Follow equipment manufacturer's directions.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS
Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*
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NRCS Name	Standard #	Reportable Item	Date	Life Span
Pest Management Conservation System	595	Acre	September 2020	1
Conservation Cover	327	Acre	July 2019	5
Herbaceous Weed Treatment	315	Acre	April 2021	5
Conservation Crop Rotation	328	Acre	October 2015	1
Field Border	386	Acre	October 2017	10

Filter Strip	393	Acre	October 2017	10
Forage Harvest Management	511	Acre	September 2021	1
Irrigation Water Management	449	Acre	October 2022	1

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Pesticide Use AEM Tier 2 Worksheet and Information Sheet

Irrigation Water Management System

DEFINITION
A planned System that determines and controls the rate, amount, placement, and timing of irrigation water.

WATER QUALITY PURPOSE
To reduce surface water runoff, including any associated erosion or leaching of nutrients and pesticides by applying irrigation water based upon the capacity of the soil to hold water and the needs of the crop.

POLLUTANT CONTROLLED
Sediment, nutrients, or pesticides.

WHERE USED
On agricultural fields requiring irrigation where the potential for surface water runoff or groundwater contamination exists, and a resource concern has been identified.

SYSTEM DESCRIPTION
Irrigation water management is utilized on cropland to supplement rainfall, and to apply fertilizer and pesticides to target crops. Several irrigation methods exist. Selection of the irrigation system to be used is based on the needs of the crop to be grown, soil type, topography, climate, distance to streams or other water bodies, and the source of water to be used for irrigation. To decrease non-point source pollution of surface and groundwater resources, water application must be at rates that minimize the transport of sediments, nutrients and chemicals to surface waters and that minimize the transport of nutrients and chemicals to groundwater.

The development of an "Irrigation Water Management Plan" that addresses the irrigation scheduling, in both timing and amount, control of runoff, minimizing deep percolation, and the uniform application of water is an essential component of this practice.

SYSTEM EFFECTIVENESS
This System can help prevent over irrigation and the resulting loss of sediment, nutrients, and pesticides by surface runoff and leaching.

IMPACTS ON SURFACE WATER
Beneficial.

IMPACTS ON GROUND WATER
Beneficial- Leaching losses of nutrients and pesticides are minimized when scheduling is a part of an irrigation water management system. However, other associated practices that promote infiltration may have adverse impacts on groundwater.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil: Beneficial by minimizing irrigation induced soil erosion and sedimentation.
Water: Beneficial by reducing water waste – applies what the crop needs.
Air: Beneficial by managing soil moisture to reduce particulate matter movement.
Plants: Neutral.
Animals: Neutral.

Human: Beneficial due to positive impacts on soil, water, air and energy.
Energy: Beneficial as it can reduce energy use.

ADVANTAGES TO FARM

- Manages air, soil, or plant micro-climate.
- Provides the medium and guidance for proper and safe chemigation and fertigation.
- Avoids crop stress due to under-irrigation and may increase crop yields.
- May reduce operating and labor costs.
- May reduce energy costs.

DISADVANTAGES TO FARM

- May require additional training, or an increase in irrigation management skills.
- Requires additional time and equipment to collect data.
- Changes in irrigation methods may require changes in equipment which can be costly.

SYSTEM LIFESPAN

One (1) year.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Some factors impacting cost include additional labor and equipment expenses to collect data and automated irrigation scheduling software may need to be purchased.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Accurate and timely records of rate, amount, timing and maintenance of equipment is a necessary component of this practice.
- A record keeping system and O&M plan must be prepared for the system.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Irrigation Water Management	449	Acre	October 2022	1
Irrigation Pipeline	430	Feet	September 2021	20
Irrigation Reservoir	436	Number	October 2022	15
Irrigation System, Microirrigation	441	Acre	October 2022	15
Sprinkler System	442	Acre	October 2022	15
Irrigation System, Surface and Subsurface	443	Acre	October 2017	15
Pumping Plant	533	Number	October 2022	15
Water Well	642	Number	March 2021	20
Nutrient Management	590	Acre	September 2020	1
Pest Management Conservation System	595	Acre	September 2020	1

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Irrigation Water Management AEM Tier 2 Worksheet and Information Sheet

Livestock Heavy Use Area Runoff Management System

DEFINITION
A System for the interception, collection, and safe treatment of runoff water from a barnyard or concentrated livestock area.

WATER QUALITY PURPOSE
To exclude clean water from the concentrated livestock areas and to reduce the transport of pollutants from barnyards and concentrated livestock areas into surface or groundwaters.

POLLUTANT CONTROLLED
Nutrients, sediments, pathogens, or biochemical oxygen demand (BOD).

WHERE USED
Barns, barnyards, loafing areas, paddocks, feedlots, calf hutch areas or any area where livestock concentrate, and a resource concern has been identified.

SYSTEM DESCRIPTION
The System is composed of one or more component practices. Structural practices may be employed to exclude clean water from areas of livestock concentrations (for example, diversions that intercept and transport upslope surface water away from barnyards and roof runoff systems that collect rainwater from barn roofs). Heavy Use Areas are used to facilitate clean up and direct polluted runoff where a variety of structural, vegetative and operational practices are used to treat polluted runoff and seepage from barnyards, loafing areas and other areas with concentrated waste. Examples include settling tanks, collection or vegetative treatment areas.

Alternatives also include elimination, utilizing gates and laneways to move livestock to barns or managed pastures, or as a last resort, installation of roofs to isolate the barnyard from precipitation.

SYSTEM EFFECTIVENESS
Because Livestock Heavy Use Area Management Systems are site-specific and are composed of one or more Component BMPs, System effectiveness varies. Key factors for effectiveness include success of cutting off clean water before it reaches pollutants, reducing the size of the affected area, and collecting and treating polluted run-off.

IMPACTS ON SURFACE WATER
Beneficial.

IMPACTS ON GROUND WATER
Beneficial - Can be negative if the abandoned heavy use areas are not remediated and nutrient laden soil and manure is not removed allowing nutrient losses to the groundwater.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil: Neutral.
Air: Beneficial. Clean barnyards, where manure and organics are collected more frequently, tend to have less odor issues.
Plants: Neutral.
Animals: Beneficial. Controlling or treating run-off leads to cleaner streams.

Human: Beneficial. Barnyard areas that are kept clean are more aesthetically pleasing and produce less odors, flies or vectors.
Energy: Negative. Increased fuel use.

ADVANTAGES TO FARM

- Dries up barnyard and loafing area.
- Improves ease of daily operating procedures.
- Less clean-up time during milking.
- Decreases the chance of milk production reduction during wet periods.
- Increased milk value due to lower somatic cell counts.
- Can include herd health benefits (less risk of mastitis and hoof rot in cattle).
- Depends on the system. Improved barnyards require more energy to clean up on a regular basis (more each day instead of a massive amount every few years) but are more efficient and can save energy required for cow-clean up, milking center clean-up (from less sediment and manure to treat).
- More manure collected to utilize for crop fertility.

DISADVANTAGES TO FARM

- Requires a higher level of producer management skill to achieve positive pollution control.
- May be expensive initial investment and operating costs.
- Increased fuel consumption.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Range: $3,000 to $150,000 or more, depending upon system design, complexity, and number of animals treated and total area to be treated.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Daily to weekly scraping of concrete pads.
- Maintain fences and gates.
- Re-grade barnyards as needed to control water.
- Maintain vegetation.
- Check roof gutters after heavy storm events and remove debris and ice.
- Maintain gravel/stone heavy use areas, if applicable.
- Ensure dosing on VTA to not overload system. Harvest and remove filter area vegetation.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities

Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

For an ANSACP grant application, it is required to utilize the Roof Screening Tool if a covered facility is included in the grant.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Access Control	472	Acres	April 2019	10
Trails and Walkways	575	Feet	September 2021	10
Fence	382	Feet	October 2022	20
Access Road	560	Feet	March 2021	10
Roof Runoff Structure	558	Number	October 2022	15
Roofs and Covers	367	Number	October 2016	10
Conservation Cover	327	Acre	July 2019	5
Critical Area Planting	342	Acre	October 2017	10
Vegetated Treatment Area	635	Acre	February 2017	10
Diversion	362	Feet	May 2017	10
Grassed Waterway	412	Acre	September 2021	10
Lined Waterway or Outlet	468	Feet	September 2021	15
Pumping Plant	533	Number	October 2022	15
Sediment Basin	350	Number	May 2017	20
Subsurface Drain	606	Feet	May 2020	20

Underground Outlet	620	Feet	September 2021	20
Waste Separation Facility	632	Number	October 2022	15
Waste Storage Facility	313	Number	March 2018	15
Waste Transfer	634	Number	October 2022	15
Water and Sediment Control Basin	638	Number	March 2019	10
Watering Facility	614	Number	March 2021	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Livestock Heavy Use Area AEM Tier 2 Worksheet and Information Sheet

Manure and Agricultural Waste Treatment System

DEFINITION
A System for the mechanical, chemical or biological treatment of agricultural wastes.

WATER QUALITY PURPOSE
Treating manure and other agricultural wastes in order to improve nutrient and pathogen management and reduce losses to surface water and groundwater.

POLLUTANT CONTROLLED
Nutrients, pathogens, biochemical oxygen demand (BOD), or ammonia.

WHERE USED
Any farm with agricultural wastes, such as manure, process wastewaters, crop residues, or other organic residues, where nutrient, pathogen, or odor management could be improved through treatment of the wastes.

SYSTEM DESCRIPTION
Manure and Agricultural Waste Treatment Systems encompass a broad set of technologies used to process wastes for the purposes of:

- improving ground and surface water quality by reducing the nutrient content, biochemical oxygen demand (BOD), or pathogen levels of agricultural waste;
- improving air quality by reducing odors and gaseous emissions;
- producing value added byproducts; or
- facilitating desirable waste handling, storage, or land application alternatives.

This Agricultural BMP System applies where the form and characteristics of agricultural waste make it difficult to manage, where changing the form or composition provides additional utilization alternatives, and where conventional waste management alternatives are deemed not as effective.

Systems may be comprised of one or more of the following established treatment practices:

- anaerobic digestion;
- liquid solid separation;
- biological or chemical amendments;
- manure or agricultural waste composting facility (other than animal carcass);
- waste facility cover (and flare, where applicable).

Manure and Agricultural Waste Treatment Systems are often also combined with other Agricultural BMP Systems and Component BMPs, such as waste storage and transfer, composting, vegetated treatment areas, Nutrient Management Plans, etc.

SYSTEM EFFECTIVENESS
Manure and Agricultural Waste Treatment Systems must be planned, designed, implemented, and maintained to address the unique set of resource concerns for each farm, so Systems will be comprised of different components and achieve varying levels of effectiveness. In general, any System that utilizes high temperatures (such as anaerobic digestion) for prolonged periods will achieve significant pathogen control and odor control, allowing for improved nutrient management, water quality protection and neighbor relations. If such a System is anaerobic, it will also result in enhanced methane

production/capture which, if flared or used for heat or electricity production, could have positive greenhouse gas and renewable energy benefits. Systems that cover manure and other wastes reduce total volume by eliminating additions from precipitation and reduce ammonia, methane, and odor compound emissions. Systems that separate the waste into liquid and solid pools allow for more precise and efficient nutrient management (pumping, drag line application, incorporation, etc.) as well as the potential for value added products (solids re-used as bedding, compost for sale off farm, lower-risk solid manure for nutrient applications in sensitive areas, etc.). Most of these Systems do not make nutrients disappear, but they concentrate, separate, etc. nutrients into forms that facilitate more efficient for re-use by crops or sale/export from the farm.

IMPACTS ON SURFACE WATER

Beneficial - including reduced losses of nutrients, biochemical oxygen demand (BOD), ammonia, and pathogens.

IMPACTS ON GROUND WATER

Beneficial - including nutrients and pathogens.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial if system allows more precise application of nutrients with less soil compaction. Could be neutral or negative if the system results in significant manure/waste organic matter to be sold/exported from farm and not returned to cropland.

Air: Beneficial, as it has the potential to reduce emissions of ammonia, greenhouse gas, and odor compounds. May be negative if the treatment system is not operated correctly.

Plants: Beneficial, as it can reduce nutrient losses and subsequent impacts on neighboring plant communities.

Animals: Beneficial, as it can reduce pathogen losses as well as nutrient losses and subsequent impacts on terrestrial and aquatic habitat.

Human: Beneficial, as it can further safeguard drinking water sources, improve land and water resources for recreation, reduce odor, and provide economic growth.

Energy: Beneficial, as such systems often improve the use of on-farm nutrients, thereby reducing energy for fertilizer production and transport. Some treatment systems also allow for on-farm energy production.

ADVANTAGES TO FARM

- Reduced nutrient losses.
- Improved productivity of crops and livestock as well as greater management flexibility.
- Can have a positive impact on farm profitability and diversify income streams.
- Improved neighbor relations.

DISADVANTAGES TO FARM

- High capital costs, early stage of technology, sometimes inadequate infrastructure to deliver energy to market, competition with much larger energy entities, etc. may present significant barriers to entry.
- Soil organic matter may decline if systems involve significant exports/sales of manure solids.
- Higher level of farm management required may result in increased labor and equipment costs.
- Requires significant additional time and training to adjust to new management strategies.

SYSTEM LIFESPAN
Variable depending on Component BMPs of the System but generally 10 years.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. The cost is variable depending on the type of manure and agricultural waste treatment system. More complex systems, such as anaerobic digestion, coupled with liquid solid separation, electricity generation, solids composting, effluent storage, and drag hose land application, can be very expensive to design, build, and operate, but allow farms to realize other economic, community, and environmental goals.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. Very regular monitoring and maintenance are required with these systems, according to the O&M associated with the various system components.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS
Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*
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NRCS Name	Standard #	Reportable Item	Date	Life Span
Waste Separation Facility	632	Number	October 2022	15
Waste Storage Facility	313	Number	March 2018	15
Waste Transfer	634	Number	October 2022	15
Waste Treatment	629	Number	October 2013	10
Anaerobic Digester	366	Number	March 2019	25

Composting Facility	317	Number	September 2021	15
Pumping Plant	533	Number	October 2022	15
Roofs and Covers	367	Number	October 2016	10
Heavy Use Area Protection	561	Sq. Feet	September 2021	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Cornell University Dairy Environmental Systems: https://cals.cornell.edu/pro-dairy/our-expertise/environmental-systems
- Greenhouse Gas Mitigation Opportunities AEM Tier 2 Worksheet
- IS#2 Dairy Manure Storage & & Greenhouse Gas Mitigation Opportunities
- IS#3 Planning for Quantitative Methane Capture & Destruction from Liquid Dairy Manure Storage

Nutrient Management System - Cultural

DEFINITION
Managing the amount (rate), source, placement (method of application), and timing of plant nutrient and soil amendment applications for efficient use by crops and reduced losses to the environment. If applicable, this can include addressing the issues from farmstead areas as it relates to non-point sources of pollutants.

WATER QUALITY PURPOSE
To reduce or prevent nutrient losses from runoff, erosion, and leaching to surface and groundwater resources.

POLLUTANT CONTROLLED
Sediment, nutrients, pathogens, biochemical oxygen demand (BOD), or ammonia.

WHERE USED
Cropland, hayland, pasture, vegetable and fruit production, orchards, vineyards, turf, biomass production, and ornamental production, including greenhouses.

SYSTEM DESCRIPTION
Nutrients are managed for the economic production of crops, forages, pasture, ornamentals, and biomass, and the protection of natural resources. Cultural nutrient management consists of applying nutrients and soil amendments to crops in the right amount, right source, right method, and right timing ("the 4Rs") according to several, integrated factors:

- farm management and goals including realistic crop yields;
- an accurate estimate of crop nutrient needs;
- nutrients credits in soil and manure;
- nutrient credits from crop residues;
- risk assessments for runoff, leaching, and erosion;
- setbacks from hydrologically active areas;
- weather and soil conditions; and
- adaptive management over time.

A well-integrated Nutrient Management Plan provides recommendations for manure, fertilizer, process wastewaters, composts, or lime applications according to the factors, above. It promotes nutrient use efficiency and controls nutrient loss by focusing on the use of on-farm nutrient sources, emphasizing the 4Rs, and, in many cases, reducing nutrient imports onto farms. Nutrient Management Plan recommendations should be based on the best available research information for the soils and climate in New York State. Nutrient applications and their management should be consistent with Cornell Nutrient Guidelines.

SYSTEM EFFECTIVENESS
Proper nutrient management prevents excessive applications, can decrease nutrient imports on farms, and reduces the potential for nutrient loss. Long-term experimentation demonstrates that recommendations based on field research, conducted in New York, provide the best estimate of economic response and improved nutrient cycling for our conditions. Several studies from Cornell University demonstrate reductions in whole farm nutrient balances and nutrient purchases as well as nutrient losses via runoff and leaching through improved nutrient management.

Specifically, there are many management opportunities that advance conservation and crop productivity through nutrient applications made with the 4Rs, including:

- counting nitrogen credits from soil organic matter, past manure applications, and crop residues can significantly reduce the need for supplemental nitrogen fertilizer without sacrificing crop yield;
- regular soil and manure testing helps make the most of on-farm nutrient sources and better target purchased fertilizers, saving money and excess nutrient applications without sacrificing crop yield;
- on-farm tracking of soil tests, manure tests, and field records over time improves confidence in the nutrient management program and allows continual improvement through adaptive management;
- incorporating/injecting manure soon after application to a growing crop or just before planting in the spring can increase the nitrogen supply from the manure, reduce the need for supplemental nitrogen fertilizer, reduce the risk of over applying phosphorus relative to crop uptake, and reduce risk of surface runoff losses;
- considering hydrologically active areas, weather, field risk assessments, and timing of crop nutrient use to prioritize nutrient applications improves crop uptake and lowers risk of runoff or leaching;
- using cover crops scavenges nutrients remaining after the main crop, reducing losses from runoff, erosion, and leaching, as well as conserving nutrients and organic matter for the following crop;
- applying fertilizer with a method and timing to allow optimal plant uptake reduces losses and improves efficiency;
- etc.

IMPACTS ON SURFACE WATER

Beneficial - including nutrients, sediment, and pathogens.

IMPACTS ON GROUND WATER

Beneficial - including nitrogen and pathogens.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial, as it generally improves soil health and reduces erosion.

Air: Beneficial, as it has the potential to reduce particulate matter from ammonia volatilization and odors.

Plants: Beneficial, as it can reduce nutrient losses and subsequent impacts on neighboring plant communities.

Animals: Beneficial, as it can reduce pathogen losses as well as nutrient losses and subsequent impacts on terrestrial and aquatic habitat.

Human: Beneficial, as it can further safeguard drinking water sources, improve land and water resources for recreation, reduce odor, and provide economic growth.

Energy: Beneficial, as it can reduce use of farm fuels, energy for fertilizer manufacturing and transportation fuels for imported fertilizer and feed.

ADVANTAGES TO FARM

- Reduced nutrient losses and improved nutrient use efficiency.
- Improved crop yield and quality, often across the range of optimal and extreme weather conditions (improved soil health).

- Beneficial or neutral impact on farm profitability.
- Improved neighbor relations.

DISADVANTAGES TO FARM

- Higher level of farm management required may result in increased labor, equipment costs, and capital investment (e.g., manure storage).
- Requires additional time and training to adjust to new management strategies.
- Cost to change management may be prohibitive for some farms.

SYSTEM LIFESPAN

One (1) year.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs depend on several factors, including the size and type of farm, existing level of farm management, history of nutrient analyses and farm records, available equipment, familiarity with custom operators, and, on livestock farms, existing manure storage and transfer capacity. Consultation fees for developing and maintaining a nutrient management plan should be considered in addition to the costs for soil testing and manure nutrient analyses.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- annual updating of the nutrient management plan.
- soil testing every three years and manure analyses once per calendar year.
- records showing manure tests, date and conditions when applied, amount applied, application method, manure source, and location.
- crop management records are maintained.
- calibration of manure and fertilizer application equipment

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

See Cornell Nutrient Guidelines and the USDA-NRCS Nutrient Management Practice Standard (NY-590) for specific technical details about planning, implementation, and operation and maintenance.

Nutrient Management Plans are limited to the management of nutrients and soil health/conservation practices on fields, pastures, and in greenhouses. Comprehensive Nutrient Management Plans (CNMPs) address resource concerns across fields, pastures, and farmstead concentrated sources on livestock farms and should be given priority consideration where:

- excess nutrients are produced or imported;
- other farm related environmental concerns exist (e.g., silage leachate runoff, barnyard runoff, milkhouse wastewater, petroleum product storage, pesticide storage, mixing and loading, pesticide use and waste disposal);
- the farm has been determined to be a Concentrated Animal Feeding Operation (CAFO) by NYS Department of Environmental Conservation;
- etc.

Note: a Nutrient Management Plan (NRCS Standard 590), alone, does not meet the NYS requirements for CAFOs. A Comprehensive Nutrient Management Plan (NRCS Standard 312) must be developed for these farms.

Nutrient Management Plans, Comprehensive Nutrient Management Plans, and certain Component BMPs may be eligible for cost-sharing. Check with the local NRCS or SWCD office to determine practice eligibility and the availability of funds.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Nutrient Management	590	Acre	September 2020	1

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Cornell Nutrient Guidelines for Field Crops: http://nmsp.cals.cornell.edu/guidelines/nutrientguide.html
- Cornell Nutrient Guidelines for Vegetable Crops: https://www.vegetables.cornell.edu/crops
- Cornell Nutrient Guidelines for Grapes: https://cals.cornell.edu/cornell-agritech/products-we-research/grapes
- Cornell Nutrient Guidelines for Berries: https://cals.cornell.edu/cornell-agritech/products-we-research/berries
- Cornell Nutrient Guidelines for Tree Fruits: https://cals.cornell.edu/cornell-agritech/products-we-research/tree-fruits
- Cornell Guidelines for Greenhouses: www.greenhouse.cornell.edu
- Cornell Guidelines for Turf: https://turf.cals.cornell.edu/
- Nutrient Management: Manure and Fertilizer AEM Tier 2 Worksheet and Information Sheet

Pathogen Management System

DEFINITION
Use of preventative measures, livestock management and conservation practices to provide multiple barriers to the introduction, replication, and survival of pathogens in domestic livestock and reducing the risk of pathogen contamination of surface and groundwater resources by treatment or controlling the movement of pathogens to water.

WATER QUALITY PURPOSE
To reduce the threat to surface and ground water from contamination by pathogenic organisms (e.g., Giardia and Cryptosporidium) found in farm animals.

POLLUTANT CONTROLLED
Pathogens or nutrients.

WHERE USED
Primarily on agricultural land (livestock and poultry operations) where a resource concern has been identified citing runoff from young stock housing or exercise lots or land receiving manure applications containing feces from infected animals which could enter a nearby watercourse.

SYSTEM DESCRIPTION
A Pathogen Management System Plan which incorporates a 4-barrier approach, as described below, shall be developed. The Pathogen Management Plan will address each of the four barriers. A veterinarian, or other qualified professional, utilizing the protocol from the New York State Cattle Health Assurance Program (NYSCHAP), or other similar protocols for appropriate species, shall develop the first two barriers.

The **FIRST** barrier is reducing the potential for pathogens to enter the farm. This shall be accomplished by carrying out actions such as the following:

- The testing of non-chlorinated water supplies that serve the herd or flock for fecal coliform bacteria
- Establishing appropriate biosecurity measures, including those controlling people, pets, pests and other animals, equipment or materials that may transport pathogens from other sources.
- Maintaining good hygiene and minimizing herd or flock contact with manure from other animal groups.
- Maintaining an accurate animal identification system and record of all health events

The **SECOND** barrier minimizes cross-contamination among animals and amplification of infection within a herd or flock. This shall be accomplished by actions such as:

- Keeping animal raising areas clean and dry,
- Proper worker hygiene when moving between facilities or animal groups,
- Ensuring that all feeds are stored and handled properly, and feeding utensils are clean, specifically avoiding manure contamination of feed.
- Implementing rodent and pest control programs,
- Separating pre-weaned animals to prevent direct contact with another young animal and with adult manure,
- Isolating infected animals until they are no longer infectious,

- Identifying the order in which animals should be fed (e.g., youngest to oldest, etc. depending upon the pathogen of concern).

The **THIRD** barrier provides for collection, handling, and treatment of manure and wastes appropriately to minimize the spread of the pathogens. This shall be accomplished by practices such as:

- Vegetated Treatment Areas (635) conservation practice standard to reducing runoff
- Composting (317) conservation practice standard for the composting of manures
- Animal Mortality (316) conservation practice standard for proper disposal of animal mortalities
- Waste Storage Structure (313) conservation practice standard to extension of waste storage time or isolation of waste storages to take advantage of pathogen die-off using:
    - Anaerobic Digester (366) conservation practice standard
    - Groundwater Testing (355) conservation practice standard

The **FORTH** barrier restricts movement of contaminated feces into watercourses or groundwater. This shall be accomplished by practices such as:

- Diversion (362) conservation practice standard to divert clean water away from livestock facilities
- Nutrient Management (590) conservation practice standard to spreading manure.
- Access Control (472) conservation practice standard for the exclusion of animals from waterbodies, such as streams, creeks, rivers and lakes
- Fence (382) conservation practice standard for isolating septic systems, leach fields and filter areas, and other septage disposal areas from grazing animals
- Protecting aquifer recharge areas and wellheads from manure runoff from fields
- Filter Strips (393), Riparian Forested Buffer (391) Riparian Herbaceous Cover (390) conservation practice standards

SYSTEM EFFECTIVENESS

Pollution prevention effectiveness increases if a multi-barrier approach is implemented that controls pathogens at the source (e.g., improved calf management) while also controlling pathogen transport on the farm (e.g., composting of infected manure) and controlling pollutants at the water course (e.g., vegetative filter strip).

IMPACTS ON SURFACE WATER

Potential for significant reduction in the risk of waterborne disease outbreaks from agricultural activities.

IMPACTS ON GROUND WATER

Actual risk of pathogens from agricultural activities polluting groundwater sources still needs to be determined. Avoiding spreading of infected manure on karst topography and within recharge areas of wells would reduce risk of well contamination.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Neutral.
Air: Neutral.
Plants: Beneficial, as it often also results in reduced nutrient losses which can lead to less fertilization of off-site plant communities.
Animals: Beneficial, as it can reduce pathogen losses, transmission of pathogens to wildlife, and nutrient losses all of which can impact wildlife and their habitat.

Human: Beneficial, as it can further safeguard drinking water sources and improve land and water resources for recreation.
Energy: Neutral.

ADVANTAGES TO FARM

- Practices to improve health and survivability of young stock can increase overall farm production, profitability, and, in some cases, labor efficiency.
- Further reduces risk of pathogen contamination of farm wells used for drinking water.

DISADVANTAGES TO FARM

- Some solutions may involve high costs of providing separate housing facilities for raising calves on farms.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost, from no cost to $1000 to 1500 per calf if separate housing and waste storage is needed.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- periodic plan review to determine if adjustments or modifications to the plan are needed.
- inspection and maintenance of animal exclusion.
- on-going monitoring of animal health is needed to determine practice effectiveness.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

For this System to be cost-shared, several criteria must be met. At a minimum, a Pathogen Management Plan (PMP) or a PMP included in a CNMP must be completed. All Four Tiers must be implemented for any one practice to be cost-shared. For example, to qualify for alternative calf housing (Tier 2), the farm must have implemented Tier I and agrees to implement Tier 3 and 4 during the Lifespan of the practice.

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Animal Mortality Facility	316	Number	April 2016	15
Composting Facility	317	Number	September 2021	15
Groundwater Testing	355	Number	March 2021	1
Access Control	472	Acres	April 2019	10
Anaerobic Digester	366	Number	March 2019	25
Fence	382	Feet	October 2022	20
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Waste Separation Facility	632	Number	October 2022	15
Waste Storage Facility	313	Number	March 2018	15
Waste Transfer	634	Number	October 2022	15
Waste Treatment	629	Number	October 2013	10
Vegetated Treatment Area	635	Acre	February 2017	10
Nutrient Management	590	Acre	September 2020	1
Roofs and Covers	367	Number	October 2016	10
Diversion	362	Feet	May 2017	10

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- NYS Cattle Health Assurance Program: http://nyschap.vet.cornell.edu
- Water Borne Pathogens AEM Tier 2 Worksheet and Information Sheet

Petroleum and Oil Products Storage System

DEFINITION

An oil and petroleum product storage tank is a stationary facility which may include one or more above ground tanks, underground tanks, or a combination of both, for the storage, transfer, and usage of liquid oil or oil products such as diesel fuel, gasoline, kerosene, fuel oil, lubrication oil, hydraulic oil, crop oil, vegetable oil, waste oils, or animal fat. A Petroleum and Oil Products Storage System involves planning, implementation of standard operating procedures, proper tank siting, design and installation, spill and overfill prevention, leak monitoring and inspection, secondary containment, operation and maintenance, and emergency action planning.

WATER QUALITY PURPOSE

To prevent contamination of surface and groundwater from oil product storage facility leaks and spills.

POLLUTANT CONTROLLED

Petroleum/oil products and biochemical oxygen demand (BOD) (for organic oil products).

WHERE USED

On agricultural operations where liquid oil products are stored or utilized, and a resource concern has been identified.

SYSTEM DESCRIPTION

This System consists of a combination of one or more of the following depending on the water quality risk posed by the storage facility as well as the regulatory requirements defined by NYS DEC and USEPA:

1. Proper storage tank siting – includes consideration of soil characteristics (corrosivity, permeability, bearing capacity, etc.), depth to groundwater, distance from a surface waterbody or drinking water well, location of floodplains, vehicular traffic patterns around the tank site, and distance from existing and planned farm buildings.

2. Proper tank design and installation – includes the use of corrosion resistant tanks and pipes (i.e., tank contains label that it conforms with 6 NYCRR Part 614), double wall tanks with wall thickness of at least 7/16th inch to protect against ballistics, steel posts to protect against vehicular traffic, anchoring or diking to avoid floatation in areas subject to flooding, a roof over tank to exclude rain water, etc., and utilizing an experienced tank installer who is familiar with state petroleum tank installation requirements.

3. Spill and overfill prevention equipment – includes color coding of fill ports, operating and shutoff valves, gauges and high-level alarms, automated shutoff devices, tank labels (showing design and working capacity), spill catchment basin for fill ports of underground storage tanks.

4. Leak monitoring and tank inspection – includes checking of aboveground tank for corrosion and leaks, installing underground piping access ports for leak testing, installing a concrete pad under aboveground tanks to detect levels and installation of a monitoring well (e.g., 4" slotted plastic pipe) between underground storage tank and secondary containment barrier.

5. Secondary containment barrier – includes aboveground engineered dikes, curbs, liners, or diversion system designed to contain spills from above-ground tank rupture, overfills, vandals and

equipment failure. Also included are drainage provisions for storm water that accumulates within the dike, curb or liner and installing double-wall tanks.

6. Spill emergency response plan – includes a written emergency plan at the storage facility location that shows action to be taken in case of a spill, leak, fire or explosion. Cleanup equipment should also be available at the site.

SYSTEM EFFECTIVENESS
When properly designed, installed, maintained, and managed this System may significantly reduce the risk of a contamination event occurring from the spill or leak of an oil product.

IMPACTS ON SURFACE WATER
Beneficial as a complete System should greatly reduce the risk of contaminants from reaching a surface water body.

IMPACTS ON GROUND WATER
Beneficial as a complete System should greatly reduce the risk of contaminants from reaching groundwater.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil**:** Beneficial by reducing the risk of leaks and spills that could contaminate soil.
Air**:** Neutral.
Plants**:** Beneficial as movement of product offsite following a major spill or leak could destroy vegetation.
Animals**:** Beneficial as movement of product offsite could have a detrimental effect on animal health and habitat.
Human**:** Beneficial by reducing the risk of health impacts through contamination of water and air resources.
Energy**:** Neutral.

ADVANTAGES TO FARM
- May provide direct protection to farmstead water supply if water source is a well.
- Can save product.
- May reduce farmer liability.

DISADVANTAGES TO FARM
- Requires continuous monitoring for potential leakage.

SYSTEM LIFESPAN
Ten (10) years.

COST
Each Agricultural BMP System is unique and must be customized for every situation in which it is employed resulting in a wide and variable range in cost. Factors impacting cost may include site characteristics, and the number of upgrades or add-ons to the system are required to reduce risk or comply with regulations.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Daily inspection for leaks either visually or check of leak monitoring system.
- All applicable State and Federal regulations and manufacturers recommendations regarding operation and maintenance and record keeping will be followed.
- An emergency action plan should be developed and may be required for certain threshold volumes.

See documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

Leaks from underground petroleum storage are difficult to detect especially since most of the tanks installed on farms lack a leak monitoring system. Also, most landowners are unaware of the significant groundwater contamination risk to their own water supply posed by these storage tanks.

Farms with certain types and capacities of petroleum or oil product storages are required to comply with the NYS Department of Environmental Conservation (DEC) Petroleum Bulk Storage (PBS) regulation or the US EPA's Spill Prevention, Control, and Countermeasure (SPCC) regulation. To absolutely determine whether a farm is regulated under PBS or SPCC and the regulatory requirements for each, please visit these web sites: www.dec.ny.gov/chemical/287.html
www.epa.gov/ceppo/web/content/spcc/

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NRCS Name	Standard #	Reportable Item	Date	Life Span
On-Farm Secondary Containment Facility	319	Number	October 2022	15
Access Road	560	Feet	March 2021	10

Access Control	472	Acre	April 2019	10
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Conservation Cover	327	Acre	July 2019	5

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- NYS Department of Environmental Conservation (DEC) Petroleum Bulk Storage (PBS) regulation: www.dec.ny.gov/chemical/287.html
- US EPA's Spill Prevention, Control, and Countermeasure (SPCC) regulation: www.epa.gov/ceppo/web/content/spcc/
- Petroleum and Oil Products Storage AEM Tier 2 Worksheet and information Sheet

Prescribed Rotational Grazing System

DEFINITION
A Prescribed Rotational Grazing System using 5 or more paddocks for a grazing season, alternating paddocks to allow for forage vigor and re-growth. Livestock graze for no more than 7 days before they are rotated to another paddock.

WATER QUALITY PURPOSE
To prevent soil erosion; reduce water runoff that may transport nutrients, sediments, and pathogens; and allow for the management of animal manure and nutrients.

POLLUTANT CONTROLLED
Sediment, nutrients, pathogens, biochemical oxygen demand (BOD), or ammonia.

WHERE USED
On continuously grazed pastures, and fields including cropland that can be converted to pasture where a resource concern has been identified.

SYSTEM DESCRIPTION
A Prescribed Rotational Grazing System involves subdividing pastures and hayfields into grazing units called paddocks. The size and number of paddocks depend on the level of pasture productivity, stocking rate of livestock, and the residency period in the paddock. Individual paddocks are grazed for a period long enough to harvest available forage, and then rotated to allow optimal re-growth of the forage before livestock are returned to the paddock. Livestock may be moved as often as twice per day but at least once per week. The frequent rotation of livestock allows forage to recover from grazing, permitting plant re-growth and resulting in increased plant productivity.

SYSTEM EFFECTIVENESS
Many of the resource concerns associated with livestock on pasture are the result of overgrazing and allowing livestock direct access to surface waterbodies. When comparing Prescribed Rotational Grazing Systems to continuous grazing, forage quality is improved, and ground cover is increased reducing erosion and runoff potential. Prescribed Rotational Grazing Systems reduce the time livestock spend grazing on any single paddock and improve the uniformity of manure and urine deposition over the pasture allowing for improved plant utilization and reduced runoff of nutrients. Controlled grazing pressure increases the quality and quantity of forage, thereby reducing the fiber content in manure and increasing the speed of manure decomposition. Livestock manure from a prescribed rotational grazing system is less likely to cause surface water pollution compared to a continuous grazing system. Because Prescribed Rotational Grazing Systems improve overall pasture yields, farmers can fence out riparian areas, wetlands, and other areas adjacent to waterbodies and still meet or exceed their pasture requirements.

IMPACTS ON SURFACE WATER
Beneficial as the practices reduces erosion and water runoff that may transport nutrients, sediment, and pathogens to waterbodies.

IMPACTS ON GROUND WATER
Beneficial as the System can improve the distribution of nutrients across a farm, address areas of livestock concentration, and result in a conversion of row crop acres to perennial pasture seedings.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial by reducing erosion, sedimentation, and improving or maintaining soil quality.
Air: Beneficial as it has the potential to reduce motorized equipment use and sequester carbon.
Plants: Neutral.
Animals: Beneficial as it may provide or improve wildlife habitat.
Human: Beneficial as farmers have reported positive comments from their nonfarm neighbors who like seeing livestock out on lush green pasture.
Energy: Beneficial by allowing livestock to harvest their own feed and spread their own manure saving fossil fuels in the process.

ADVANTAGES TO FARM

- It allows for the recovery of the economic investment in 1 to 5 years.
- Promotes harvest efficiency thus maximizing animal production per acre.
- Has the potential to lower annual feed costs and reduce dependence on purchased feeds.
- Proper implementation can improve forage quality, species composition, and yield.
- Can reduce energy, labor and equipment requirements.
- Practice has the potential to improve livestock health.

DISADVANTAGES TO FARM

- Requires a high degree of management skills.
- May be necessary to install stabilized stream crossing and alternative water supplies to provide livestock access to all grazed forage resources while protecting riparian areas and waterbodies.
- Requires a fencing system to subdivide existing pastures.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Some factors which will influence cost include:

- the number and type of livestock;
- system design, including the number and size of paddocks;
- the need for and design of watering facilities;
- pasture improvement needs such as seeding, lime, fertilizer, and pest management; laneway and stream crossing needs; and
- the amount and condition of existing fence.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Soil analysis on at least a 3-year rotation to determine pH and fertility needs.
- Periodic forage analyses from actual pasture samples should be done about 3 times throughout the growing season.
- Excess forage growth (spring flush) must be captured either by mechanically harvesting or allowing another livestock group to graze it.
- Paddocks must be rotated according to forage growth stage.
- Basic maintenance as needed to fences, laneways, crossings, and watering stations.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

Stream crossing or disturbance of stream banks may require a permit.

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Prescribed Grazing	528	Acre	May 2018	1
Pasture and Hay Planting	512	Acre	March 2022	5
Forage Harvest Management	511	Acre	September 2021	1
Fence	382	Feet	October 2022	20
Field Border	386	Acre	October 2017	10
Trails and Walkways	575	Feet	September 2021	10
Watering Facility	614	Number	March 2021	10
Livestock Pipeline	516	Feet	March 2021	20
Pumping Plant	533	Number	October 2022	15
Structure for Water Control	587	Number	March 2019	20
Water Well	642	Number	March 2021	20
Spring Development	574	Number	September 2021	20

Pond	378	Number	May 2018	20
Access Road	560	Feet	March 2021	10
Access Control	472	Acre	April 2019	10
Grazing Land Mechanical Treatment	548	Acre	May 2011	1
Brush Management	314	Acre	March 2018	10
Herbaceous Weed Treatment	315	Acre	April 2021	5
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Stream Crossing	578	Number	January 2023	10
Subsurface Drain	606	Feet	May 2020	20
Underground Outlet	620	Feet	September 2021	20

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Pasture Management AEM Tier 2 Worksheet and Information Sheet

Process Wash Water Management System

DEFINITION

A System designed for the collection, storage, treatment and disposal of effluents from processes on farms that include milking centers, horse washing, egg washing, vegetable washing and fruit washing. They may contain milk solids, nutrients, liniments, organic matter and soil along with detergents, acid rinses and sanitizer, all mixed with a quantity of water. This System is not applicable for wash water containing manure and other animal waste or for wash water from commercial processing like cheese production or vegetable or fruit processing (like vineyard waste).

WATER QUALITY PURPOSE

To reduce the organic and nutrient component of the liquid waste from regular processes on a farm, into receiving waters.

POLLUTANT CONTROLLED

Primarily biodegradable organics and soluble phosphorous. Secondary pollutants include ammonia, nitrates, or pathogens.

WHERE USED

On operations where water is used to assist in the on-farm processing or clean-up of organic materials in areas such as milking centers, horse barns, egg farms or produce washing facilities that are not part of a value-added operations (such as cheese or wine making, commercial processing, etc.) or that require a NYS SPEDES Permit or are deemed to be a point source of pollution.

SYSTEM DESCRIPTION

The System is composed of an area where water is used to either clean up the barn or facility or is used to clean the animals or products. The wastewater is collected and then treated by a combination of tanks for settling of materials, transfer to proper waste storage structures, daily or periodic spreading or treatment by the use of vegetative measures or a combination there of.

SYSTEM EFFECTIVENESS

These Systems can be very effective in the removal of organic material including milk solids, soil, nutrients and some chemicals when properly installed and maintained on a regular basis or incorporated into a waste management system and land applied in accordance with a Nutrient Management Plan.

IMPACTS ON SURFACE WATER

Beneficial - Reduces phosphorous, fecal coliform and organics loading.

IMPACTS ON GROUND WATER

Beneficial if sited properly and care is given to avoid areas of shallow bedrock or groundwater.

IMPACTS ON OTHER RESOURCES

Soil: Beneficial by adding nutrients when applied in accordance with a Nutrient Management Plan.
Air: Negative if system is not operated or managed properly.
Plants: Beneficial.
Animals: Neutral.
Human: Beneficial as system protect water quality.

Energy: Negative to Beneficial depending on the system designed and its additional energy use or energy saving.

ADVANTAGES TO FARM

- Can be treated separately and does not need to add additional water to manure system.
- Can be made to perform with gravity and be relatively management free.
- Can be relatively inexpensive.

DISADVANTAGES TO FARM

- Some systems need high level of management to perform correctly.
- May require additional pumps and tanks that require clean-out and maintenance on a regular basis.
- Can be expensive if major modification to the existing infrastructure is required.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Cost can run from $3,000 to $45,000 depending on the complexity of the system and the material to be treated.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- Tanks installed in the system for settling of solids, collection of milk fats, etc. need to be emptied on a regular basis.
- Pumps need to be monitored, maintained and or replaced.
- Vegetated treatments need to be mowed and material removed.
- Flocculation systems need to be emptied and maintained.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

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Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Vegetated Treatment Area	635	Acres	February 2017	10
Waste Separation Facility	632	Number	October 2022	15
Waste Transfer	634	Number	October 2022	15
Pumping Plant	533	Number	October 2022	15
Waste Storage Facility	313	Number	March 2018	15
Structure for Water Control	587	Number	March 2019	20
Subsurface Drain	606	Feet	May 2020	20
Heavy Use Area Protection	561	Sq. Feet	September 2021	10

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Process Wash Water AEM Tier 2 Worksheet and Information Sheet

Riparian Buffer System

DEFINITION
An area of grasses, sedges, rushes, ferns, legumes, forbs, shrubs, or trees tolerant of intermittent flooding or saturated soils located adjacent to and up-gradient from waterbodies.

WATER QUALITY PURPOSE
To intercept surface runoff, subsurface flow and shallow groundwater flow from agricultural sources in order to reduce excess amounts of pollutants. Systems can be used to create shade to lower or maintain surface water temperature, and to reduce pesticide drift from entering a waterbody.

POLLUTANT CONTROLLED
Sediment, nutrients, pesticides, biochemical oxygen demand (BOD), or thermal modification.

WHERE USED
This System can be applied to agricultural lands adjacent to permanent or intermittent waterbodies where a resource concern has been identified. This System is not applied to stabilize stream banks or shorelines, as a standalone System; this System and Component BMPs may be used in conjunction with the Stream Corridor and Shoreline Management System to aid in the stabilization of stream banks or shorelines.

SYSTEM DESCRIPTION
A Riparian Buffer System consists of an area containing a variety of vegetation situated between agricultural lands and waterbodies that are designed to filter surface runoff and shallow groundwater by encouraging sheet flow and infiltration and impede concentrated flow. The type and extent of vegetation is suited to the soil and hydrology of the site and for the water quality purpose. Up to three distinct zones may be employed to achieve desired results. In all cases livestock must be excluded or controlled. Appropriate site preparation is essential to establishing desired vegetation, and practices that promote the vigor and reproduction of desired plant species, including pest management, may be employed. In addition, excessive sheet-rill and concentrated flow erosion may need to be controlled in the areas immediately adjacent and up-gradient of the buffer area.

SYSTEM EFFECTIVENESS
A Riparian Buffer System will be most effective when used as a component of an overall conservation system including nutrient management, pest management, and runoff, sediment and erosion control practices. The filtering effects of riparian buffers are most effective when used in conjunction with erosion reducing management practices. Riparian buffers can be very effective for sediment and sediment-bound pollutant removal with trapping efficiencies exceeding 50%. Riparian buffers are less effective at removing soluble phosphorous or nitrates.

IMPACTS ON SURFACE WATER
Beneficial – this System does not generally address pollutants at the source (thermal modification is an exception), but “polishes” surface runoff by removing additional amounts of pollutants such as sediment, soil attached nutrients, and organic matter.

IMPACTS ON GROUND WATER
Neutral – It may be beneficial in areas where groundwater is recharged directly from surface waterbodies or there is a direct surface connection to groundwater.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Neutral.
Air: Beneficial by increasing carbon storage in plant biomass and soils.
Plants: Neutral.
Animals: Beneficial by improving riparian habitat and potentially providing a source of detritus and large woody debris. Provides food and cover for fish, wildlife, and livestock. Establish and maintain habitat corridors. Enhance pollen, nectar, and nesting habitat for pollinators. Improves overall surface water quality.
Human: Increase water storage on flood plains potentially reducing flood impacts.
Energy: Neutral.

ADVANTAGES TO FARM

- Provides a low cost, cost-effective approach to treat agricultural runoff.
- Restore, improve, or maintain riparian plant communities.
- May provide a buffer for cropland and farm infrastructure from flood damage.

DISADVANTAGES TO FARM

- May take cropland and pasture out of production.
- Requires a large land area.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Factors impacting costs may include buffer length, width, types of vegetation, and the need for associated practices to exclude livestock or maintain sheet flow.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized to the situation. The following are generally key components to the operation and maintenance of the system:

- Inspections conducted annually and immediately following severe storms for evidence of sediment deposit, erosion, or concentrated flow channels.
- Avoid use of fertilizers, pesticides, other chemicals, vehicular traffic or disturbance of vegetation and litter inconsistent with erosion control and buffering objectives.
- Portions of the buffer may need to be periodically mowed and the clippings removed to promote dense vegetative growth and removal of nutrients.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

Some activities may require stream disturbance or wetlands permits.

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Riparian Forest Buffer	391	Acre	September 2021	15
Riparian Herbaceous Cover	390	Acre	May 2011	5
Tree/Shrub Establishment	612	Acre	April 2017	15
Tree/Shrub Site Preparation	490	Acre	September 2021	1
Conservation Cover	327	Acre	July 2019	5
Critical Area Planting	342	Acre	October 2017	10
Stream Crossing	578	Number	January 2023	10
Access Control	472	Acre	April 2019	10
Access Road	560	Feet	March 2021	10
Trails & Walkways	575	Feet	September 2021	10
Brush Management	314	Acre	March 2018	10
Fence	382	Feet	October 2022	20
Filter Strip	393	Acre	October 2017	10
Pasture and Hay Planting	512	Acre	March 22	5
Grassed Waterway	412	Acre	September 2021	10
Herbaceous Weed Treatment	315	Acre	April 2021	5
Pest Management Conservation System	595	Acre	September 2020	1
Structure for Water Control	587	Number	March 2019	20
Lined Waterway or Outlet	468	Feet	September 2021	15

Water & Sediment Control Basin	638	Number	March 2019	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Stream and Floodplain Management AEM Tier 2 Worksheet and Information Sheet

Short-Term Waste Collection and Transfer System

DEFINITION
A System designed for the collection, transfer, and short-term storage for up to 60 days of generated or imported agricultural materials, including manure, by-products, process wastewater, or organic material being utilized as a land applied nutrient source or amendment rather than animal feed or bedding.

Waste is a Natural Resources Conservation Service - Conservation Practice Standard term used in reference to manure, agricultural by-products, wastewater, and contaminated runoff from agricultural production or processing.

WATER QUALITY PURPOSE
To reduce surface and subsurface loss of nutrients from concentrated livestock areas, manure, or other agricultural materials.

POLLUTANT CONTROLLED
Nutrients, pathogens, or organics.

WHERE USED
This Agricultural BMP System is designed, aligned, and intended to serve both Animal Feeding Operations (AFOs), such as a smaller dairy, beef, horse, sheep, and goat farms, as well as crop farms. Concentrated Animal Feeding Operation (CAFO)-permitted farms are directed to plan and implement NRCS CPS Waste Transfer (634) or NRCS CPS Waste Storage Facility (313) using the Waste Storage and Transfer System.

The System, described above, is appropriate for all situations on farms where agricultural materials, such as manure, by-products, process wastewater, or organic material are currently managed such that a resource concern has been identified; and where the proper collection, transfer, and short-term storage of materials is recommended to address resource concerns and improve nutrient utilization.

The purpose of this System is to aid daily spread farms (or farms receiving imported agricultural materials) in addressing primarily farmstead nutrient management resource concerns, as well as improving application flexibility to fields and pastures, given factors such as weather, seasonal workload, crop management timing, or field conditions. Properly collecting, transferring, and storing agricultural materials around farmstead facilities will protect adjacent resources, as well as organize and efficiently support manure transfer and targeted field applications. Due to the short-term storage duration, the System requires regular monitoring of manure or material amounts in the storage and applications to fields based on the Farm's Nutrient Management Plan.

This System is not used to contain and facilitate an aerobic microbial ecosystem for the decomposition of manure, other organic material, or both. Thus, NRCS CPS Composting Facility (317) is not an allowable BMP in a Short-Term Waste Collection and Transfer System, because the limited duration does not effectively support biological processes necessary for proper composting.

This System may be utilized to address resource concerns associated with existing barns, bedded pack facilities, and heavy use areas. The Waste Storage and Transfer System would be appropriate if a new or future bedded pack / composted bedded pack system is planned and necessary to treat the resource concerns.

SYSTEM DESCRIPTION

The System may be composed of multiple component practices that collect agricultural materials and effectively transfer materials to application equipment or to a structural NRCS CPS Waste Storage Facility (313). System design is dependent upon the farm, site location and management considerations.

Systems may address one or multiple manure sources or imported agricultural materials and their existing transfer areas; collection of multiple sources to one appropriately planned NRCS CPS Waste Storage Facility (313) or multiple Waste Storage Facilities per each source is allowed.

Depending on the existing agricultural material's consistency (i.e., solid, semi-solid, liquid), consider the implications of storing waste, environmental inputs (precipitation), or combining variable waste streams of different consistency. System design will depend upon the existing manure handling equipment or will include provisions for procuring alternative equipment (e.g., solid vs. liquid manure spreader).

NRCS CPS Roofs and Covers (367) is required to exclude clean water and maintain appropriate manure moisture content for solid / semi-solid NRCS CPS Waste Storage Facilities (313). Excessive moisture will increase the potential for air emissions of volatile organic compounds, ammonia, and nitrous oxide, and may lead to anaerobic conditions, which will increase the potential for emissions of methane and hydrogen sulfide.

NRCS CPS Roofs and Covers (367) is not required for liquid NRCS CPS Waste Storage Facilities (313).

Consider a minimum storage duration capacity of 30 days of agricultural materials. Systems designed to manage materials below the minimum storage duration capacity may become overwhelmed easily, possibly resulting in resource concerns at the transfer or storage areas.

Future planning considerations: compatibility with future, longer-duration Waste Storage and Transfer Systems should be considered when siting and sizing Short-Term Waste Collection and Transfer Systems.

To both address the farmstead resource concerns and properly recycle nutrients on fields and pastures, Short-Term Waste Collection and Transfer Systems proposed for NYS SWCC Funding Programs shall have one of the following plan types completed before submitting the project for program application and a complete system meeting all NRCS Standards must result:

- *AEM Tier 3A Farmstead + Nutrient Management-Core Plan combination or*
  - *Requires a Certified Crop Adviser*
  - *See details below regarding use of The NYS Soil and Water Conservation Committee Short-Term Waste Collection and Transfer System Modified NRCS CPS Waste Storage Facility (313) Policy*
- *AEM Tier 3A Farmstead + Full 590 Nutrient Management Plan combination or*
  - *Requires an AEM Certified Planner*
- *CNMP*
  - *Requires an AEM Certified Planner*

This Policy does not require a Comprehensive Nutrient Management Plan (CNMP) for the planning and implementation of NRCS CPS Waste Storage Facilities (313) included in this BMP System with a storage duration less than 60 days of farm generated or imported agricultural materials.

NRCS CPS Waste Storage Facilities (313) planned and designed without a Full NRCS CPS Nutrient Management Plan (590) or a Comprehensive Nutrient Management Plan would not meet all requirements of the (313) Standard and would not be eligible for Federal Cost-Share Programs.

SYSTEM EFFECTIVENESS

NRCS CPS Waste Transfer (634) is effective in reducing losses from agricultural materials (especially where runoff potential or leaching potential risk is high) by properly collecting, controlling, and conveying materials around farmstead facilities to either manure application equipment or a NRCS CPS Waste Storage Facility (313)

NRCS CPS Waste Transfer (634) paired with a short-term NRCS CPS Waste Storage Facilities (313) is also effective in reducing loss of nutrients and pathogens by safely storing agricultural materials during critical runoff periods and applying materials and nutrients under the guidelines of the Farm's Nutrient Management Plan.

IMPACTS ON SURFACE WATER

Beneficial when agricultural materials and nutrients are applied in accordance with a Nutrient Management Plan and NRCS CPS Waste Transfers (634) and NRCS CPS Waste Storage Facilities (313) are designed and operated according to the Plan.

IMPACTS ON GROUND WATER

Beneficial as agricultural materials will be better controlled at the farmstead.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial as agricultural materials can replenish organic material and matter in the soil and improve soil health.

Air: Negative or beneficial. When agricultural materials, such as manure and wastes, is stored and applied at certain times of the year, odor issues increase for that time period unless the material is applied and incorporated or injected. Conversely, by storing waste, odors are not created when spreading daily. Greenhouse gas emissions may be the same or a modest increase relative to the management without a Short-Term Waste Collection and Transfer System, but can be mitigated with practices that maintain manure in a dryer, largely aerobic state (methane); limit the time manure is in storage (methane), especially during months with higher ambient temperatures; and apply manure for improved nitrogen use by crops (nitrous oxide).

Plants: Beneficial as nutrients may be applied based on agronomic guidelines within the Nutrient Management Plan.

Animals: Beneficial as improved nutrient management on cropland can improve habitat (especially aquatic).

Human: Beneficial as system protects water quality while also improving farm aesthetics, management, and crop production.

Energy: Beneficial depending on the system designed and its additional energy use or energy saving.

ADVANTAGES TO FARM

- Allows the farm to effectively collect and transfer agricultural materials around the farmstead.
- Allows livestock manure and other waste to be treated as a valuable nutrient resource rather than a waste.
- May reduce cost for purchased commercial fertilizer.
- May avoid or eliminate the need for daily spreading and allow for strategic and efficient spreading activities and targeted manure applications based on the Nutrient Management Plan.

- Can improve aesthetics and relations with neighbors if managed properly.
- Helps to reduce nutrient loss when runoff and erosion potential is high.

DISADVANTAGES TO FARM

- Can be expensive to implement and operate the System based on site constraints and existing infrastructure.
- Requires increased level of management and labor especially during times of application.
- May require additional equipment or expensive operation and maintenance procedures.
- May result in significant nutrient loss if emptied when surface runoff and erosion potential is high.
- May cause damage to streams and fish if storage structure leaks or fails.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the System:

- A written plan should be prepared for each system designed, including regular removal of manure or material from the System and application to fields or pastures according to a Nutrient Management Plan.
- Accurate records of timing of manure or material application and location need to be kept.
- Storages must be fenced or walled, and warning signs maintained.
- Pumps need to be regularly checked and maintained.
- Safety measures need to be kept up to date.
- Other items need to be addressed based on specific system requirements.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a

Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span**
Waste Storage Facility	313	Number	March 2018	15 years
NYS SWCC Short-Term Waste Collection and Transfer System Modified NRCS CPS Waste Storage Facility (313) Policy ***	313	Number	March 2018 (NRCS) – October 2022 NYS SWCC Program Policy	15 Years
Waste Transfer	634	Number	October 2022	15 Years
Waste Separation Facility	632	Number	October 2022	15 Years
Waste Treatment	629	Number	October 2013	10 Years
Waste Facility Closure	360	Number	May 2020	15 Year
Nutrient Management	590	Acre	September 2020	1 year
Pumping Plant	533	Number	October 2022	15 Years
Roofs and Covers	367	Number	October 2016	10 Years
Subsurface Drain	606	Feet	May 2020	20 Years
Access Control	472	Acre	April 2019	10 Years
Access Road	560	Feet	March 2021	10 Years
Diversion	362	Feet	May 2017	10 Years
Fence	382	Feet	October 2022	20 Years
Heavy Use Area Protection	561	Sq. Feet	October 2021	10 Years
Hedgerow Planting	422	Feet	May 2011	15 Years
Pond Sealing or Lining – Geomembrane or Geosynthetic Clay Liner	521	Sq. Feet	March 2019	20 Years

Pond Sealing or Lining – Compacted Soil Treatment	520	Sq. Feet	May 2017	15 Years
Pond Sealing or Lining – Concrete	522	Sq. Feet	May 2017	20 Years

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

***The NYS Soil and Water Conservation Committee Short-Term Waste Collection and Transfer System Modified NRCS CPS Waste Storage Facility (313) Policy should be utilized by Professional Engineers when designing and certifying NRCS CPS Waste Storage Facilities (313) that are planned, supported, and operated as part of the Short-Term Waste Collection and Transfer System from a combination of NYS AEM Tier 3A Farmstead and Nutrient Management-Core Plans. These NRCS CPS Waste Storage Facilities (313) are eligible for funding from NYS SWCC Cost-Share Programs, but not Federal Cost-Share Programs.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Manure and Fertilizer Storage AEM Tier 2 Worksheet and Information Sheets
- Nutrient Management: Manure and Fertilizer AEM Tier 2 Worksheet and Information Sheets
- Greenhouse Gas Mitigation Opportunities AEM Tier 2 Worksheets and Information Sheets
- 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- The NYS Soil and Water Conservation Committee Short-Term Waste Collection and Transfer System Modified NRCS CPS Waste Storage Facility (313) Policy

Silage Leachate Control and Treatment System

DEFINITION
A System designed to reduce the generation of silage leachate and for the collection, storage, treatment and disposal of effluents and runoff from the storage of silage crops from upright and bunk silos, as well as silage storage bags.

WATER QUALITY PURPOSE
To manage silage leachate to reduce surface and ground water biochemical oxygen demand (BOD) loading as well as nutrient loading.

POLLUTANT CONTROLLED
Nutrients, sediment, organic loading or biochemical oxygen demand (BOD).

WHERE USED
In situations where the storage of silage and haylage can yield effluent and runoff which can enter either a surface water body or ground water and a resource concern has been identified. This practice can be used in barnyards, farmsteads, fields, or other areas where upright silos, bunk silos and silage bagging systems are located.

SYSTEM DESCRIPTION
Silage effluent and runoff control would be composed of a combination of structural and non-structural management practices to control the source of the material or manage the collection and treatment or disposal of it. Source reduction can lessen the amount of low-flow high concentrate leachate produced and can be accomplished with several management techniques including growing the proper variety of corn for the area, harvesting when corn or haylage are at the proper maturity and at the correct moisture content along with proper operation and maintenance of the structure. When source reduction does not eliminate leachate, a system to collect, store or treat the silo effluent and runoff can be installed. If a suitable waste storage is available, the silage leachate can be transferred there. Otherwise, a system to separate low and high flows, collection of low flows and a treatment system such as a Vegetated Treatment Area is required. Relocation of silage storage to an area that is not a resource concern is another option. The System should also include an area for the storage of waste or spoiled feed for later application to crop fields in accordance with a Nutrient Management Plan. Use of covered storage and exclusion of surface water runoff from the storage area will also reduce the overall amount of liquid requiring treatment.

SYSTEM EFFECTIVENESS
Silage leachate exerts a high organic loading on the receiving water and produces a high biochemical oxygen demand (BOD) which will deplete available dissolved oxygen resulting in fish kills, tastes and odors, and a general unaesthetic appearance. The proper management of leachate from silos and other types of storage facilities can significantly reduce these problems. In addition, Silage Leachate Control and Treatment Systems may provide Component BMPs which may greatly reduce or eliminate the degradation of clean water entering the site, stabilize the management area to reduce disturbed ground or access roads (reducing erosion, runoff, and sedimentation), allow better collection and management of waste or spoiled feed, and greatly influence the overall source of potential contaminates by incorporating proper feed harvesting and feed storage practices, as well as end use feed management practices.

IMPACTS ON SURFACE WATER
Beneficial - Reduces organic loading and resultant depletion of dissolved oxygen.

IMPACTS ON GROUND WATER
Beneficial - The oxygen depletion in ground water resulting from organic loading can cause bad odors and tastes which may be sustained for extended periods of time due to very low re-aeration rates.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil: Beneficial when leachate is applied in accordance with a Nutrient Management Plan.
Air: Negative is system is not operated or managed properly.
Plants: Beneficial by eliminating kill zones and correct application rates.
Animals: Beneficial – protects fish from high BOD.
Human: Beneficial as system protects water quality but can be negative if not operated or maintained effectively.
Energy: Negative to Beneficial depending on the system design and its additional energy use or energy saving.

ADVANTAGES TO FARM
- May be corrected by growing a different variety of corn and changing timing of harvest.
- Can be built as a gravity system.
- Can be plumbed into existing waste management system.
- The system design includes an area for waste feed storage for utilization as a nutrient source.

DISADVANTAGES TO FARM
- Can be expensive if separate collection and storage are required.
- Due to amino acid content of silage leachate, collection facilities should be made of corrosion resistant material and land application should be carefully managed to prevent kill-off.
- Require heightened level of management as run-off is precipitation driven and solid separation can require frequent maintenance.

SYSTEM LIFESPAN
Ten (10) years.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Cost can run from $3,000 to $70,000 or more depending on the complexity of the system.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:
- Low flow/high flow separation must be adjusted frequently to ensure capture of adequate low flow.
- Checking solid separation after each rainfall to remove debris.
- Keeping records of where silage leachate is applied to reduce potential over application.
- Periodic inspection and repair of storage facility to assure no leakage through floors and walls.
- Periodic inspection and repair of pipes and other connections to eliminate leakage opportunities.
- Tanks installed must be checked for need for emptying.

- Periodic inspection and repair of roads, heavy use areas, and waste feed management areas.
- Maintain clean water practices associated with the management areas.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
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NRCS Name	Standard #	Reportable Item	Date	Life Span
Vegetated Treatment Area	635	Acre	February 2017	10
Waste Separation Facility	632	Number	October 2022	15
Waste Transfer	634	Number	October 2022	15
Pumping Plant	533	Number	October 2022	15
Dike	356	Feet	December 2012	20
Diversion	362	Feet	May 2017	10
Subsurface Drain	606	Feet	May 2020	20
Sediment Basin	350	Number	May 2017	20
Structure for Water Control	587	Number	March 2019	20
Heavy Use Area Protection	561	Sq. Feet	September 2021	10
Waste Storage Facility	313	Number	March 2018	15

Sprinkler System	442	Acre	October 2022	15
Irrigation Water Management	449	Acre	October 2022	1
Fence	382	Feet	October 2022	20
Conservation Crop Rotation	328	Acre	October 2015	1

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Silage Storage AEM Tier 2 Worksheet and Information Sheet

Soil Health System

DEFINITION
Soil Health Systems employ cultural (i.e., non-structural, cultural or management-based) measures such as crop rotation, tillage, mulching, cover cropping, or other practices according to a soil conservation plan to control soil erosion, reduce run-off, and enhance soil health.

WATER QUALITY PURPOSE
To reduce the detachment, transport, and loss of sediment and solid-phase nutrients as well as runoff volumes.

POLLUTANT CONTROLLED
Sediment, nutrients, pathogens, pesticides, or biochemical oxygen demand (BOD).

WHERE USED
Cropland, pasture, vegetable and fruit production, orchards, vineyards, or biomass production areas where a resource concern has been identified.

SYSTEM DESCRIPTION
Soil Health Systems consist of non-structural, management-based practices working in concert to control soil erosion, reduce runoff volumes, enhance soil health, and improve productivity of the land. Such systems advance soil health, water quality, and productivity through a few general approaches, including:

- reducing the intensity of tillage and oxidization of soil organic matter;
- maintaining greater soil cover throughout the year, by living crops or crop residues;
- preventing or slowing sheet and rill flows;
- increasing the diversity of crops grown throughout the rotation; and
- increasing organic matter additions to the soil, by crop residues or amendments.

Individual practices often utilized in soil health systems include:

- residue and tillage management, such as no-till, zone-till, mulch-till, etc.;
- cover crops;
- strip cropping;
- contour planting;
- long term perennial forage or biomass planting on cropland acres;
- mulching;
- etc.

The Soil Health System is based on a well-integrated, Cropland Soil Conservation Plan (or a Soil Conservation Plan within a broader Nutrient Management Plan or Comprehensive Nutrient Management Plan). The Plan is utilized to assess risk of water and wind erosion and other soil health resource concerns and make specific recommendations for how various practices will work together to address those concerns. These recommendations may extend beyond the cultural practices addressed with this System to dovetail with other Agricultural BMP Systems on the farm, including Erosion Control System - Structural, Nutrient Management System - Cultural, Prescribed Rotational Grazing System, etc.

SYSTEM EFFECTIVENESS

A systems approach to soil health provides multiple barriers against soil erosion and water quality degradation while improving soil function. Crop rotation, conservation tillage, cover cropping, strip cropping, organic matter amendments (manure, compost, green manures, mulch, etc.) and other cultural conservation practices help protect soil from erosion by wind and water and help maintain or increase soil organic matter. Soil organic matter improves soil tilth, reduces susceptibility to compaction, increases nutrient and water holding capacity, slows the movement of pesticides through the soil, reduces runoff losses, and protects against erosion. Several tons of soil loss per acre can be avoided annually with these practices, as well as significant improvements in nutrient use efficiency and crop production. Soil and water resources are often further conserved when cultural soil health practices are paired with structural soil conservation systems and nutrient management, per the multiple barrier approach.

IMPACTS ON SURFACE WATER

Beneficial - including reduced losses of sediment, nutrients, pathogens, pesticides, and biochemical oxygen demand (BOD).

IMPACTS ON GROUND WATER

Beneficial in most cases, but may be negative in some soil types with annual crops in long-term no-till because significant macropores may establish and aid the loss of nutrients and pathogens to groundwater or tile drainage systems.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial, as it generally improves soil health and reduces erosion.
Air: Beneficial, as it can reduce dust and fossil fuel combustion used in crop production.
Plants: Beneficial, as it can reduce sediment and nutrient losses and subsequent impacts on neighboring plant communities.
Animals: Beneficial, as it can reduce off-site impacts from sediment, nutrients, pathogens, pesticides, and biochemical oxygen demand (BOD) on terrestrial and aquatic habitats.
Human: Beneficial, as it can further safeguard drinking water sources, improve land and water resources for recreation, reduce maintenance costs on public infrastructure (e.g., road ditches, culverts, reservoirs), and provide economic growth.
Energy: Beneficial, as it can reduce use of farm fuels, energy for fertilizer manufacturing, and transportation fuels for imported fertilizer and feed.

ADVANTAGES TO FARM

- Potential to reduce soil loss, reduce negative effects of extreme weather years on crop production, and improve crop yield and quality.
- Improved labor efficiency and timing for crop management.
- Often a neutral or positive impact on farm profitability.
- Improved neighbor relations.

DISADVANTAGES TO FARM

- Higher level of farm management required may result in increased labor and equipment costs.
- Requires additional time and training to adjust to new management strategies.

SYSTEM LIFESPAN

1 to 5 years depending on components in the soil health system.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs depend on several factors, including the size and type of farm, existing level of farm management, availability of equipment, familiarity/availability of custom operators, etc.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. Often annual evaluation and fine tuning of cultural conservation system is required because many component practices are annual practices and can be refined based on prior years' experiences and the current year's conditions.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS
Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NOTE: a soil conservation plan, alone, does not meet the NYS requirements for CAFOs. A Comprehensive Nutrient Management Plan must be developed for these farms. Compliance with USDA Food Security Act program requirements should be considered.

See the USDA-NRCS Field Office Technical Guide for specific technical details about planning, implementation, and operation and maintenance. Guidance for the AEM Base Program provides details on developing Tier 3A cropland conservation plans. Also, the Cornell Soil Health Program offers technical resources for advancing soil health and productivity.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*
For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Conservation Crop Rotation	328	Acre	October 2015	1
Conservation Cover	327	Acre	July 2019	5
Contour Farming	330	Acre	March 2019	5
Cover Crop	340	Acre	October 2015	1

Pasture and Hay Planting	512	Acre	March 2022	5
Mulching	484	Acre	March 2019	1
Residue and Tillage Management, No-Till	329	Acre	October 2017	1
Residue and Tillage Management, Reduced Till	345	Acre	October 2017	1
Strip Cropping	585	Acre	March 2019	5

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

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REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Cornell Soil Health Program: http://soilhealth.cals.cornell.edu/
- Soil Management AEM Tier 2 Worksheet and Information Sheet

Stream Corridor and Shoreline Management System

DEFINITION
A planned System of vegetation, structures, bio-technology, or management techniques to stabilize or protect stream channels, streambanks and shorelines while also enhancing natural hydrologic processes and improving fish and wildlife habitat.

WATER QUALITY PURPOSE
To reduce sediment and nutrients entering waterbodies from eroding channels, streambanks, and shorelines. Systems can be used to maintain, improve, or restore the physical, chemical and biological functions of a stream, constructed channel, or shoreline while also protecting the designated use classification of the waterbody.

POLLUTANT CONTROLLED
Sediment, nutrients, or thermal modification.

WHERE USED
Streambanks, constructed channels, lake shores, estuaries and coastal shorelines on agricultural land.

SYSTEM DESCRIPTION
The System may be composed of a variety of operational, structural, and vegetative Agricultural BMP System and Component BMPs that may be aimed at one specific goal, such as controlling streambank erosion, or at a combination of goals. Component BMPs may be implemented within several areas of the stream corridor and shoreline area (i.e., within the channel, along the banks, or in the immediate riparian zones). Listed below are some of the components that may be utilized in a Stream Corridor and Shoreline Management System:

- Implement management techniques such as removing impeding vegetation along the banks (clearing) or selectively removing woody snags, sediment depositions/drifts, or other obstructions (snagging) that have negative impacts on stream flow and increase either bank or channel erosion.
- Establish vegetation to prevent or reduce erosion along the streambank toe, within adjacent riparian zones, and associated floodplains. Examples include shrubs, trees, grasses, rushes and sedges among other site-specific species; see Critical Area Planting practice as well.
- Install structural improvements such as slope stabilization, filter fabric, riprap, deflectors, sediment fencing, bulkheads, or groin systems.
- Employ biotechnical alternatives such as willow wattles, coir logs or direct seeding.
- Utilize fluvial geomorphology techniques.

SYSTEM EFFECTIVENESS
The effectiveness of a Streambank and Shoreline Management System should be evaluated based on the Component BMPs installed. In general, the System can attenuate the peak flow and bed load of the stream, reduce soil erosion, and decrease sediment and nutrient delivery to waterbodies. The System should not degrade the stream channel beyond tolerable limits, increase or promote new erosion concerns, increase sedimentation, induce gully formations, or disrupt stream habitat, the natural flow regime, and the interaction between the stream and the floodplain.

IMPACTS ON SURFACE WATER
Beneficial - Can control erosion rates and sediment delivery to receiving water bodies. Improving vegetation along a waterbody may decrease thermal modification, thus enhancing the freshwater biome and water quality.

IMPACTS ON GROUND WATER
Neutral - Vegetative cover and some structural practices may increase infiltration.

IMPACTS ON OTHER RESOURCES (OFF-SITE)
Soil: Beneficial by minimizing soil erosion.
Air: Neutral.
Plants: Beneficial by establishing streambank vegetation.
Animal: Beneficial for wildlife corridor establishment and fish habitat.
Human: Beneficial. Increased recreational opportunities, stable fish habitat. Reduction of flood impacts on agricultural lands and civil infrastructure.
Energy: Neutral.

ADVANTAGES TO FARM
- Stops loss of agricultural land.
- Improves fish and wildlife habitat.
- Restores water flow, capacity and direction.
- Improve landscape aesthetics.
- Protects best use of water bodies.
- Improved neighbor relations.

DISADVANTAGES TO FARM
- Cost of structural practices may be substantial.
- Can move problem areas downstream.
- Investment of practices may be lost by severe storm damage.
- Operation and Maintenance program has significant costs of time and money.

SYSTEM LIFESPAN
Ten (10) years.

COST
Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Costs can vary greatly. For example, bio-technical components can cost as little as $5 per linear foot while structural components could cost in excess of $200 per foot.

OPERATION AND MAINTENANCE
Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:
- Debris should be removed from the stabilized streambank or shoreline.
- Structural practices should be inspected and repaired after storm events.
- Vegetation destroyed by bank failure must be replaced to maintain cover integrity.
- Subsequent planting or establishment of failed vegetation to practice integrity.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

Streambank and shoreline disturbance generally require a DEC and or Army Corp of Engineer permit. Other permits from various agencies may also be required.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

For the most current information on each NRCS Conservation Practice Standard, please go to the NY Field Office Technical Guide (FOTG) at https://efotg.sc.egov.usda.gov/#/state/NY/documents.
Use the drop box in the left side to reach Section 4 – Practice Standards and Supporting Documents, click on the folder for Conservation Practice Standards & Support Documents and locate the appropriate practice. Under each practice, you will find, at the minimum, the practice standard. You may also find: a Statement of Work; Practice Overview; Implementation Requirement; Conservation Practice Effects Network Diagram; and other document that will assist in the planning, installation, or operation of the practice.

NRCS Name	Standard #	Reportable Item	Date	Life Span
Stream Habitat Improvement and Management	395	Acre	September 2020	5
Streambank and Shoreline Protection	580	Feet	September 2021	20
Clearing and Snagging	326	Feet	May 2017	5
Critical Area Planting	342	Acre	October 2017	10
Obstruction Removal	500	Number	September 2021	10
Open Channel	582	Feet	October 2016	15
Stream Crossing	578	Number	January 2023	10
Riparian Forest Buffer	391	Acre	September 2021	15
Riparian Herbaceous Cover	390	Acre	May 2011	5
Tree/Shrub Establishment	612	Acre	April 2017	15

Tree/Shrub Site Preparation	490	Acre	September 2021	1
Access Control	472	Acre	April 2019	10

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Stream and Floodplain Management AEM Tier 2 Worksheet and Information Sheet

Waste Storage and Transfer System

DEFINITION
A System designed for the collection, transfer, or storage of agricultural livestock and recognizable process waste.

WATER QUALITY PURPOSE
To reduce surface and subsurface loss of nutrients.

POLLUTANT CONTROLLED
Nutrients, pathogens, or organics.

WHERE USED
In situations where the collection, transfer, or storage of manure or other organic waste is recommended to address water quality concerns and improve a farm's ability to apply nutrients with the right timing, placement, method, and rate for recycling by crops. This includes scenarios where storage addresses seasonal limitations for manure application due to lack of suitable crop and hayland to safely apply during adverse weather or field conditions. It may also include Systems to better collect manure and other organic wastes for application to fields, without significant (if any) storage component. This System can be used whenever waste is transferred or stored and includes manure, milking center waste, process wastewater, silage leachate, barnyard run-off, etc. These Systems may also include the use of bedded pack or composting bedded pack barns.

SYSTEM DESCRIPTION
The System is composed of multiple Component BMPs that collect agricultural waste and transport it to a structural storage facility. System design is dependent upon agricultural operation, site location and management considerations. A Waste Storage and Transfer System controls the loss of nutrients and pathogens by safely storing waste during critical runoff and leaching periods. It can include the use of storage covers to trap greenhouse gases or to limit rainfall contribution to spreading volumes.

(NOTE: Prior to adoption of a Waste Storage and Transfer System, a Comprehensive Nutrient Management Plan needs to be developed.)

SYSTEM EFFECTIVENESS
Storing waste is effective in reducing losses of nitrogen and phosphorus when surface runoff and erosion potential is high. Storages can reduce pathogen loads through die-off during storage and when applied to soil and incorporated. Significant nutrient loss and water quality degradation may result if the storage is emptied when surface runoff, leaching or erosion potential is high, or waste is applied at non-agronomically recommended rates. A Comprehensive Nutrient Management Plan is an important component of this practice.

IMPACTS ON SURFACE WATER
Beneficial when waste is applied in accordance with a Comprehensive Nutrient Management Plan and transfers are designed and operated according to the Plan.

IMPACTS ON GROUND WATER

Beneficial as applications of waste can be timed to coincide with plant uptake and not during times of nutrient loss to groundwater. However, care must be taken in site selection and construction of storage facilities.

IMPACTS ON OTHER RESOURCES (OFF-SITE)

Soil: Beneficial as organic waste can replenish organic matter in the soil and improve soil health.
Air: Negative or beneficial. When waste is stored and applied at certain times of the year, odor issues increase for that time period unless incorporation of waste is utilized. But conversely, by storing waste, odors are not created when daily spread. Covers trap greenhouse gases and collect them for flaring or use.
Plants: Beneficial as nutrients can be applied during times of plant uptake.
Animals: Beneficial as improved nutrient management on cropland can improve habitat (especially aquatic).
Human: Beneficial as system protect water quality.
Energy: Beneficial depending on the system designed and its additional energy use or energy saving.

ADVANTAGES TO FARM

- Allows for spreading at certain times of the year and eliminated the need for daily spreading.
- Allows for semi-solid or liquid manure which lends itself to gravity systems.
- Can allow for irrigation of waste.
- Allows livestock manure and other waste to be treated as a resource rather than a waste.
- Reduces cost for purchased commercial fertilizer.
- Can improve aesthetics and relations with neighbors if managed properly.
- Helps to reduce nutrient loss when runoff and erosion potential is high.

DISADVANTAGES TO FARM

- Can be expensive if soils are not suitable and liners or other materials need to be utilized.
- Require increased level of management and manpower especially during times of application.
- Requires increased management and energy when sand is used for bedding.
- Requires frequent maintenance.
- May result in significant nutrient loss if emptied when surface runoff and erosion potential is high.
- May cause serious damage to streams and fish if storage structure leaks or fail.

SYSTEM LIFESPAN

Ten (10) years.

COST

Each Agricultural BMP System is unique and must be customized to the situation in which it is employed resulting in a wide and variable range in cost. Cost can run from $30,000 to $400,000 or more depending on the complexity of the system.

OPERATION AND MAINTENANCE

Each Agricultural BMP System is unique and must be customized for every situation. The following are generally key components to the operation and maintenance of the system:

- A written plan should be prepared for each system designed.
- Accurate records of timing of manure application and location need to be kept.
- Storages must be fenced, and warning signs maintained.

- Earthen storages require mowing several times a year to keep the growth of woody vegetation down and to be able to scout for rodent damage of the dike.
- Settled solids need to be removed on a regular basis increasing frequency with use of inorganics like sand bedding.
- Pumps need to be regularly checked and maintained.
- Safety measures need to be kept up to date.
- Other items need to be addressed based on specific system requirements.

See the documents in Section 4 of the NRCS Field Office Technical Guide (FOTG) under the specific conservation practice standard being utilized for additional information on operation and maintenance needs.

MISCELLANEOUS COMMENTS

Agricultural BMP Systems and associated component practices that will eliminate or provide effective treatment of one or more resource concerns may be eligible for cost-share funding. Compliance with Federal, State, and local laws should be adhered to including the potential need for construction stormwater permits, plans, and practices; other permits; as well as contacting Underground Utilities Protection before excavation, SHPO, and others as applicable. Livestock farms that have been designated as a CAFO are required to comply with CAFO regulations.

NRCS CONSERVATION PRACTICE STANDARDS TO UTILIZE*

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NRCS Name	Standard #	Reportable Item	Date	Life Span
Waste Storage Facility	313	Number	March 2018	15 years
Waste Transfer	634	Number	October 2022	15 Years
Waste Separation Facility	632	Number	October 2022	15 Years
Waste Treatment	629	Number	October 2013	10 years
Waste Facility Closure	360	Number	May 2020	15 Year
Nutrient Management	590	Acre	September 2020	1 year
Pumping Plant	533	Number	October 2022	15 Years
Roofs and Covers	367	Number	October 2016	10 Years
Subsurface Drain	606	Feet	May 2020	20 Years

Access Control	472	Acre	April 2019	10 Years
Access Road	560	Feet	March 2021	10 Years
Composting Facility	317	Number	September 2021	15 Years
Diversion	362	Feet	May 2017	10 Years
Fence	382	Feet	October 2022	20 Years
Heavy Use Area Protection	561	Sq. Feet	September 2021	10 Years
Hedgerow Planting	422	Feet	May 2011	15 Years
Pond Sealing or Lining – Geomembrane or Geosynthetic Clay Liner	521	Sq. Feet	March 2019	20 Years
Pond Sealing or Lining – Compacted Soil Treatment	520	Sq. Feet	May 2017	15 Years
Pond Sealing or Lining – Concrete	522	Sq. Feet	May 2017	20 Years

*This is a listing of the primary Component BMPs to use but is not all inclusive and other NRCS Conservation Practice Standards may be utilized. Please check with a SWCC representative for approval.

**NYS Program Lifespans (listed above in Table III) refers to the minimum time period that a program participant must perform Operation and Maintenance of an Agricultural BMP System and the Component BMPs. Alternatively, NRCS CPS Lifespans (as found in the Standards) refer to specific design criteria and defines how long a conservation practice should function under an appropriate level of Operation and Maintenance. To meet NRCS Standards, a conservation practice must be designed to meet the CPS Lifespan, and all materials and installation methods must meet or exceed the NRCS defined Lifespan criteria.

REFERENCES

- USDA NRCS FOTG for NY: https://efotg.sc.egov.usda.gov/#/state/NY/documents
- Manure and Fertilizer Storage AEM Tier 2 Worksheet and Information Sheet
- Nutrient Management: Manure and Fertilizer AEM Tier 2 Worksheet and Information Sheet

New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Deep-Ripping and Decompaction

April 2008

New York State
Department of Environmental Conservation

Document Prepared by:

John E. Lacey,
Land Resource Consultant and Environmental Compliance Monitor
(Formerly with the Division of Agricultural Protection and Development Services,
NYS Dept. of Agriculture & Markets)

Alternative Stormwater Management
Deep-Ripping and Decompaction

Description

The two-phase practice of 1) “Deep Ripping;” and 2) “Decompaction” (deep subsoiling), of the soil material as a step in the cleanup and restoration/landscaping of a construction site, helps mitigate the physically induced impacts of soil compression; i.e.: soil compaction or the substantial increase in the bulk density of the soil material.

Deep Ripping and Decompaction are key factors which help in restoring soil pore space and permeability for water infiltration. Conversely, the physical actions of cut-and-fill work, land grading, the ongoing movement of construction equipment and the transport of building materials throughout a site alter the architecture and structure of the soil, resulting in: the mixing of layers (horizons) of soil materials, compression of those materials and diminished soil porosity which, if left unchecked, severely impairs the soil’s water holding capacity and vertical drainage (rainfall infiltration), from the surface downward.

In a humid climate region, compaction damage on a site is virtually guaranteed over the duration of a project. Soil in very moist to wet condition when compacted, will have severely reduced permeability. Figure 1 displays the early stage of the deep-ripping phase (Note that all topsoil was stripped prior to construction access, and it remains stockpiled until the next phase – decompaction – is complete). A heavy-duty tractor is pulling a three-shank ripper on the first of several series of incrementally deepening passes through the construction access corridor's densely compressed subsoil material. Figure 2 illustrates the approximate volumetric composition of a loam surface soil when conditions are good for plant growth, with adequate natural pore space for fluctuating moisture conditions.



Fig. 1. A typical deep ripping phase of this practice, during the first in a series of progressively deeper “rips” through severely compressed subsoil.

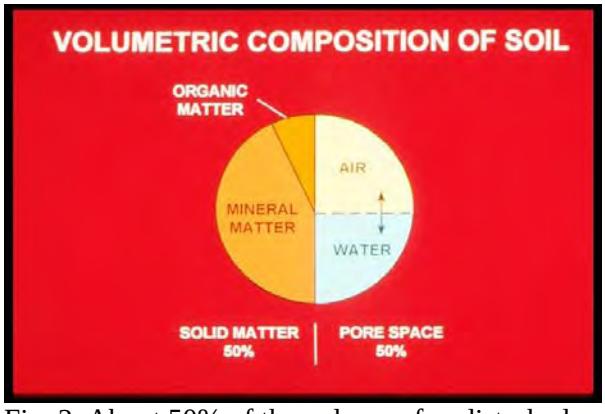


Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

The objective of Deep Ripping and Decompaction is to effectively fracture (vertically and laterallly) through the thickness of the physically compressed subsoil material (see Figure 3), restoring soil porosity and permeability and aiding infiltration to help reduce runoff. Together with topsoil stripping, the "two-phase" practice of Deep Ripping and Decompaction first became established as a "best management practice" through ongoing success on commercial farmlands affected by heavy utility construction right-of-way projects (transmission pipelines and large power lines).



Fig. 3. Construction site with significant compaction of the deep basal till subsoil extends 24 inches below this exposed cut-and-fill work surface.

Soil permeability, soil drainage and cropland productivity were restored. For broader construction application, the two-phase practice of Deep Ripping and Decompaction is best adapted to areas impacted with significant soil compaction, on contiguous open portions of large construction sites and inside long, open construction corridors used as temporary access over the duration of construction. Each mitigation area should have minimal above-and-below-ground obstructions for the easy avoidance and maneuvering of a large tractor and ripping/decompacting implements. Conversely, the complete two-phase practice is not recommended in congested or obstructed areas due to the limitations on tractor and implement movement.

Benefits

Aggressive "deep ripping" through the compressed thickness of exposed subsoil before the replacement/respreading of the topsoil layer, followed by "decompaction," i.e.: "sub-soiling," through the restored topsoil layer down into the subsoil, offers the following benefits:

- Increases the project (larger size) area's direct surface infiltration of rainfall by providing the open site's mitigated soil condition and lowers the demand on concentrated runoff control structures

- Enhances direct groundwater recharge through greater dispersion across and through a broader surface than afforded by some runoff-control structural measures

- Decreases runoff volume generated and provides hydrologic source control

- May be planned for application in feasible open locations either alone or in

conjunction with plans for structural practices (e.g., subsurface drain line or infiltration basin) serving the same or contiguous areas

- Promotes successful long-term revegetation by restoring soil permeability, drainage and water holding capacity for healthy (rather than restricted) root-system development of trees, shrubs and deep rooted ground cover, minimizing plant drowning during wet periods and burnout during dry periods.

Feasibility / Limitations

The effectiveness of Deep Ripping and Decompaction is governed mostly by site factors such as: the original (undisturbed) soil's hydrologic characteristics; the general slope; local weather/timing (soil moisture) for implementation; the space-related freedom of equipment/implement maneuverability (noted above in **Recommended Application of Practice**), and by the proper selection and operation of tractor and implements (explained below in **Design Guidance**). The more notable site-related factors include:

Soil

In the undisturbed condition, each identified soil type comprising a site is grouped into one of four categories of soil hydrology, Hydrologic Soil Group A, B, C or D, determined primarily by a range of characteristics including soil texture, drainage capability when thoroughly wet, and depth to water table. The natural rates of infiltration and transmission of soil-water through the undisturbed soil layers for Group A is "high" with a low runoff potential while soils in Group B are moderate in infiltration and the transmission of soil-water with a moderate runoff potential, depending somewhat on slope. Soils in Group C have slow rates of infiltration and transmission of soil-water and a moderately high runoff potential influenced by soil texture and slope; while soils in Group D have exceptionally slow rates of infiltration and transmission of soil-water, and high runoff potential.

In Figure 4, the profile displays the undisturbed horizons of a soil in Hydrologic Soil Group C and the naturally slow rate of infiltration through the subsoil. The slow rate of infiltration begins immediately below the topsoil horizon (30 cm), due to the limited amount of macro pores, e.g.: natural subsoil fractures, worm holes and root channels. Infiltration after the construction-induced mixing and compression of such subsoil material is virtually absent; but can be restored back to this natural level with the two-phase practice of deep ripping and decompaction, followed by the permanent establishment of an appropriate, deep taproot

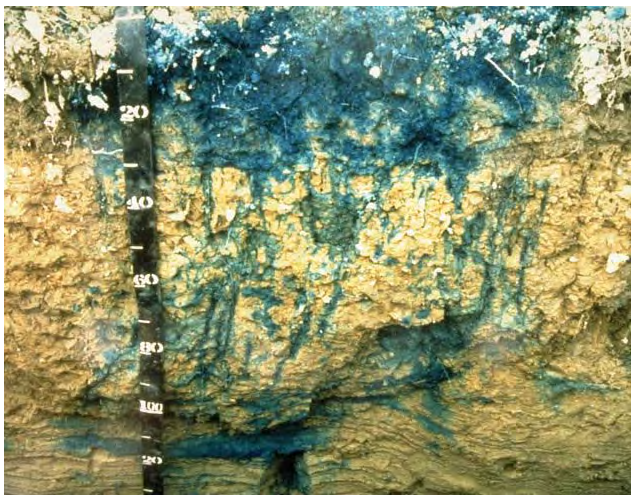


Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

lawn/ground cover to help maintain the restored subsoil structure. Infiltration after construction-induced mixing and compression of such subsoil material can be notably rehabilitated with the Deep Ripping and Decompaction practice, which prepares the site for the appropriate long-term lawn/ground cover mix including deep taproot plants such as clover, fescue or trefoil, etc. needed for all rehabilitated soils.

Generally, soils in Hydrologic Soil Groups A and B, which respectively may include deep, well-drained, sandy-gravelly materials or deep, moderately well-drained basal till materials, are among the easier ones to restore permeability and infiltration, by deep ripping and decompaction. Among the many different soils in Hydrologic Soil Group C are those unique glacial tills having a natural fragipan zone, beginning about 12 to 18 inches (30 – 45cm), below surface. Although soils in Hydrologic Soil Group C do require a somewhat more carefully applied level of the Deep Ripping and Decompaction practice, it can greatly benefit such affected areas by reducing the runoff and fostering infiltration to a level equal to that of pre-disturbance.

Soils in Hydrologic Soil Group D typically have a permanent high water table close to the surface, influenced by a clay or other highly impervious layer of material. In many locations with clay subsoil material, the bulk density is so naturally high that heavy trafficking has little or no added impact on infiltration; and structural runoff control practices rather than Deep Ripping and Decompaction should be considered.

The information about Hydrologic Soil Groups is merely a general guideline. Site-specific data such as limited depths of cut-and-fill grading with minimal removal or translocation of the inherent subsoil materials (as analyzed in the county soil survey) or, conversely, the excavation and translocation of deeper, unconsolidated substratum or consolidated bedrock materials (unlike the analyzed subsoil horizons' materials referred to in the county soil survey) should always be taken into account.

Sites made up with significant quantities of large rocks, or having a very shallow depth to bedrock, are not conducive to deep ripping and decompation (subsoiling); and other measures may be more practical.

Slope

The two-phase application of 1) deep ripping and 2) decompaction (deep subsoiling), is most practical on flat, gentle and moderate slopes. In some situations, such as but not limited to temporary construction access corridors, inclusion areas that are moderately steep along a project's otherwise gentle or moderate slope may also be deep ripped and decompacted. For limited instances of moderate steepness on other projects, however, the post-construction land use and the relative alignment of the potential ripping and decompaction work in relation to the lay of the slope should be reviewed for safety and practicality. In broad construction areas predominated by moderately steep or steep slopes, the practice is generally not used.

Local Weather/Timing/Soil Moisture

Effective fracturing of compressed subsoil material from the exposed work surface, laterally and vertically down through the affected zone is achieved only when the soil material is moderately dry to moderately moist. Neither one of the two-phases, deep ripping nor decompaction (deep

subsoiling), can be effectively conducted when the soil material (subsoil or replaced topsoil) is in either a "plastic" or "liquid" state of soil consistency. Pulling the respective implements legs through the soil when it is overly moist only results in the "slicing and smearing" of the material or added "squeezing and compression" instead of the necessary fracturing. Ample drying time is needed for a "rippable" soil condition not merely in the material close to the surface, but throughout the material located down to the bottom of the physically compressed zone of the subsoil.

The "poor man's Atterberg field test" for soil plasticity is a simple "hand-roll" method used for quick, on-site determination of whether or not the moisture level of the affected soil material is low enough for: effective deep ripping of subsoil; respreading of topsoil in a friable state; and final decompaction (deep subsoiling). Using a sample of soil material obtained from the planned bottom depth of ripping, e.g.: 20 - 24 inches below exposed subsoil surface, the sample is hand rolled between the palms down to a 1/8-inch diameter thread. (Use the same test for stored topsoil material before respreading on the site.) If the respective soil sample crumbles apart in segments no greater than 3/8 of an inch long, by the time it is rolled down to 1/8 inch diameter, it is low enough in moisture for deep ripping (or topsoil replacement), and decompaction. Conversely, as shown in Figure 5, if the rolled sample stretches out in increments greater than 3/8 of an inch long before crumbling, it is in a "plastic" state of soil consistency and is too wet for subsoil ripping (as well as topsoil replacement) and final decompaction.



Fig. 5. Augered from a depth of 19 inches below the surface of the replaced topsoil, this subsoil sample was hand rolled to a 1/8-inch diameter. The test shows the soil at this site stretches out too far without crumbling; it indicates the material is in a plastic state of consistence, too wet for final decompaction (deep subsoiling) at this time.

Design Guidance

Beyond the above-noted site factors, a vital requirement for the effective Deep Ripping and Decompaction (deep subsoiling), is implementing the practice in its distinct, two-phase process:

1) Deep rip the affected thickness of exposed subsoil material (see Figure 10 and 11), aggressively fracturing it before the protected topsoil is reapplied on the site (see Figure 12); and

2) Decompact (deep subsoil), simultaneously through the restored topsoil layer and the upper half of the affected subsoil (Figure 13). The second phase, "decompaction," mitigates the partial recompaction which occurs during the heavy process of topsoil spreading/grading. Prior to deep ripping and decompacting the site, all construction activity, including construction equipment and material storage, site cleanup and trafficking (Figure 14), should be finished; and the site closed off to further disturbance. Likewise, once the practice is underway and the area's soil permeability and

rainfall infiltration are being restored, a policy limiting all further traffic to permanent travel lanes is maintained.

The other critical elements, outlined below, are: using the proper implements (deep, heavy-duty rippers and subsoilers), and ample pulling-power equipment (tractors); and conducting the practice at the appropriate speed, depth and pattern(s) of movement.

Note that an appropriate plan for the separate practice of establishing a healthy perennial ground cover, with deep rooting to help maintain the restored soil structure, should be developed in advance. This may require the assistance of an agronomist or landscape horticulturist.

Implements

Avoid the use of all undersize implements. The small-to-medium, light-duty tool will, at best, only "scarify" the uppermost surface portion of the mass of compacted subsoil material. The term "chisel plow" is commonly but incorrectly applied to a broad range of implements. While a few may be adapted for the moderate subsoiling of non-impacted soils, the majority are less durable and used for only lighter land-fitting (see Figure 6).



Fig. 6. A light duty chisel implement, not adequate for either the deep ripping or decompaction (deep subsoiling) phase.



Fig. 7. One of several variations of an agricultural ripper. This unit has long, rugged shanks mounted on a steel V-frame for deep, aggressive fracturing through Phase 1.

Use a "heavy duty" agricultural-grade, deep ripper (see Figures 7,9,10 and 11) for the first phase: the lateral and vertical fracturing of the mass of exposed and compressed subsoil, down and through, to the bottom of impact, prior to the replacement of the topsoil layer. (Any oversize rocks which are uplifted to the subsoil surface during the deep ripping phase are picked and removed.) Like the heavy-duty class of implement for the first phase, the decompaction (deep subsoiling) of Phase 2 is conducted with the heavy-duty version of the deep subsoiler. More preferable is the angled-leg variety of deep subsoiler (shown in Figures 8 and 13). It minimizes the inversion of the subsoil and topsoil layers while laterally and vertically fracturing the upper half of the previously ripped subsoil layer and all of the topsoil layer by delivering a momentary, wave-like "lifting and shattering" action up through the soil layers as it is pulled.

Pulling-Power of Equipment

Use the following rule of thumb for tractor horsepower (hp) whenever deep ripping and decompacting a significantly impacted site: For both types of implement, have at least 40 hp of tractor pull available for each mounted shank/ leg.

Using the examples of a 3-shank and a 5-shank implement, the respective tractors should have 120 and 200 hp available for fracturing down to the final depth of 20-to-24 inches per phase. Final depth for the deep ripping in Phase 1 is achieved incrementally by a progressive series of passes (see Depth and Patterns of Movement, below); while for Phase 2, the full operating depth of the deep subsoiler is applied from the beginning.

The operating speed for pulling both types of implement should not exceed 2 to 3 mph. At this slow and managed rate of operating speed, maximum functional performance is sustained by the tractor and the implement performing the soil fracturing. Referring to Figure 8, the implement is the 6-leg version of the deep angled-leg subsoiler. Its two outside legs are "chained up" so that only four legs will be engaged (at the maximum depth), requiring no less than 160 hp, (rather than 240 hp) of pull. The 4-wheel drive, articulated-frame tractor in Figure 8 is 174 hp. It will be decompacting this unobstructed, former construction access area simultaneously through 11 inches of replaced topsoil and the upper 12 inches of the previously deep-ripped subsoil. In constricted areas of Phase 1) Deep Ripping, a medium-size tractor with adequate hp, such as the one in Figure 9 pulling a 3-shank deep ripper, may be more maneuverable.



Fig. 8. A deep, angled-leg subsoiler, ideal for Phase 2 decompaction of after the topsoil layer is graded on top of the ripped subsoil.



Fig. 9. This medium tractor is pulling a 3-shank deep ripper. The severely compacted construction access corridor is narrow, and the 120 hp tractor is more maneuverable for Phase 1 deep ripping (subsoil fracturing), here.

Some industrial-grade variations of ripping implements are attached to power graders and bulldozers. Although highly durable, they are generally not recommended. Typically, the shanks or "teeth" of these rippers are too short and stout; and they are mounted too far apart to achieve the well-distributed type of lateral and vertical fracturing of the soil materials necessary to restore soil permeability and infiltration. In addition, the power graders and bulldozers, as pullers, are far less maneuverable for turns and patterns than the tractor.

Depth and Patterns of Movement

As previously noted both Phase 1 Deep Ripping through significantly compressed, exposed subsoil and Phase 2 Decompaction (deep subsoiling) through the replaced topsoil and upper subsoil need to be performed at maximum capable depth of each implement. With an implement's guide wheels attached, some have a "normal" maximum operating depth of 18 inches, while others may go deeper. In many situations, however, the tractor/implement operator must first remove the guide wheels and other non essential elements from the implement. This adapts the ripper or the deep subsoiler for skillful pulling with its frame only a few inches above surface, while the shanks or legs, fracture the soil material 20-to-24 inches deep.

There may be construction sites where the depth of the exposed subsoil's compression is moderate, e.g.: 12 inches, rather than deep. This can be verified by using a ¾ inch cone penetrometer and a shovel to test the subsoil for its level of compaction, incrementally, every three inches of increasing depth. Once the full thickness of the subsoil's compacted zone is finally "pieced" and there is a significant drop in the psi measurements of the soil penetrometer, the depth/thickness of compaction is determined. This is repeated at several representative locations of the construction site. If the thickness of the site's subsoil compaction is verified as, for example, ten inches, then the Phase 1 Deep Ripping can be correspondingly reduced to the implement's minimum operable depth of 12 inches. However, the Phase 2 simultaneous Decompation (subsoiling) of an 11 inch thick layer of replaced topsoil and the upper subsoil should run at the subsoiling implements full operating depth.



Fig. 10. An early pass with a 3-shank deep ripper penetrating only 8 inches into this worksite's severely compressed subsoil.



Fig. 11. A repeat run of the 3-shank ripper along the same patterned pass area as Fig. 9; here, incrementally reaching 18 of the needed 22 inches of subsoil fracture.

Typically, three separate series (patterns) are used for both the Phase 1 Deep Ripping and the Phase 2 Decompaction on significantly compacted sites. For Phase 1, each series begins with a moderate depth of rip and, by repeat-pass, continues until full depth is reached. Phase 2 applies the full depth of Decompation (subsoiling), from the beginning.

Every separate series (pattern) consists of parallel, forward-and-return runs, with each progressive

pass of the implement's legs or shanks evenly staggered between those from the previous pass. This compensates for the shank or leg-spacing on the implement, e.g., with 24-to-30 inches between each shank or leg. The staggered return pass ensures lateral and vertical fracturing actuated every 12 to 15 inches across the densely compressed soil mass.

Large, Unobstructed Areas

For larger easy areas, use the standard patterns of movement:

- The first series (pattern) of passes is applied lengthwise, parallel with the longest spread of the site; gradually progressing across the site's width, with each successive pass.

- The second series runs obliquely, crossing the first series at an angle of about 45 degrees.

- The third series runs at right angle (or 90 degrees), to the first series to complete the fracturing and shattering on severely compacted sites, and avoid leaving large unbroken blocks of compressed soil material. (In certain instances, the third series may be optional, depending on how thoroughly the first two series loosen the material and eliminate large chunks/blocks of material as verified by tests with a ¾-inch cone penetrometer.)



Fig. 12. Moderately dry topsoil is being replaced on the affected site now that Phase 1 deep ripping of the compressed subsoil is complete.



Fig. 13. The same deep, angled-leg subsoiler shown in Fig. 7 is engaged at maximum depth for Phase 2, decompaction (deep soiling), of the replaced topsoil and the upper subsoil materials.

Corridors

In long corridors of limited width and less maneuverability than larger sites, e.g.: along compacted areas used as temporary construction access, a modified series of pattern passes are used.

- First, apply the same initial lengthwise, parallel series of passes described above.

● A second series of passes makes a broad “S” shaped pattern of rips, continually and gradually alternating the “S” curves between opposite edges inside the compacted corridor.

● The third and final series again uses the broad, alternating S pattern, but it is “flip-flopped” to continually cross the previous S pattern along the corridor’s centerline. This final series of the S pattern curves back along the edge areas skipped by the second series.

Maintenance and Cost

Once the two-phase practice of Deep Ripping and Decompation is completed, two items are essential for maintaining a site’s soil porosity and permeability for infiltration. They are: planting and maintaining the appropriate ground cover with deep roots to maintain the soil structure (see Figure 15); and keeping the site free of traffic or other weight loads.

Note that site-specific choice of an appropriate vegetative ground-cover seed mix, including the proper seeding ratio of one or more perennial species with a deep taproot system and the proper amount of lime and soil nutrients (fertilizer mix) adapted to the soil-needs, are basic to the final practice of landscaping, i.e: surface tillage, seeding/planting/fertilizing and culti-packing or mulching is applied. The "maintenance" of an effectively deep-ripped and decompacted area is generally limited to the successful perennial (long-term) landscape ground cover; as long as no weight-bearing force of soil compaction is applied.



Fig. 14. The severely compacted soil of a temporary construction yard used daily by heavy equipment for four months; shown before deep ripping, topsoil replacement, and decompaction.



Fig. 15. The same site as Fig. 14 after deep ripping of the exposed subsoil, topsoil replacement, decompaction through the topsoil and upper subsoil and final surface tillage and revegetation to maintain soil permeability and infiltration.

The Deep Ripping and Decompaction practice is, by necessity, more extensive than periodic subsoiling of farmland.The cost of deep ripping and decompacting (deep subsoiling), will vary according to the depth and severity of soil-material compression and the relative amount of tractor and implement time that is required. In some instances, depending on open maneuverability, two-to-three acres of compacted project area may be deep-ripped in one day. In other situations of more severe compaction and - or less maneuverability, as little as one acre may be fully ripped in a day. Generally, if the Phase 1) Deep Ripping is fully effective, the Phase 2) Decompaction should be completed in 2/3 to 3/4 of the time required for Phase 1.

Using the example of two acres of Phase 1) Deep Ripping in one day, at $1800 per day, the net cost is $900 per acre. If the Phase 2) Decompacting or deep subsoiling takes 3/4 the time as Phase 1, it costs $675 per acre for a combined total of $1575 per acre to complete the practice (these figures do not include the cost of the separate practice of topsoil stripping and replacement). Due to the many variables, it must be recognized that cost will be determined by the specific conditions or constraints of the site and the availability of proper equipment.

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- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe*; and, *for 913* (smaller-frame model) *V-Ripper*. Deep, angled-leg subsoiler. Access by internet search of: B*igham Brothers Shear Bolt Paratill-Subsoiler.*
http://salesmanual.deere.com/sales/salesmanual/en_NA/primary_tillage/2008/feature/rippers/915v_pattern_frame.html?sbu=ag&link=prodcat Last visited March 08.

- Soils data of USDA Natural Resources Conservation Service. *NRCS Web Soil Survey.* http://websoilsurvey.nrcs.usda.gov/app/ and *USDA-NRCS Official Soil Series Descriptions; View by Name.* http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi . *Last visited Jan. 08.*

- Soil penetrometer information. Access by internet searches of: *Diagnosing Soil Compaction using a Penetrometer (soil compaction tester), PSU Extension;* as well as *Dickey-john Soil Compaction Tester*.
http://www.dickey-johnproducts.com/pdf/SoilCompactionTest.pdf and http://cropsoil.psu.edu/Extension/Facts/uc178pdf Last visited Sept. 07

STANDARD AND SPECIFICATIONS FOR CHECK DAM



Definition & Scope

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Conditions Where Practice Applies

This practice is used as a **temporary** and, in some cases, a **permanent** measure to limit erosion by reducing velocities in open channels that are degrading or subject to erosion or where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore: $$S = \frac{h}{s}$$

Where: S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{0.04\ \frac{\text{ft}}{\text{ft}}} = 50\ \text{ft}$$

For stone check dams: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 3.1 on page 3.3 for details.

Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

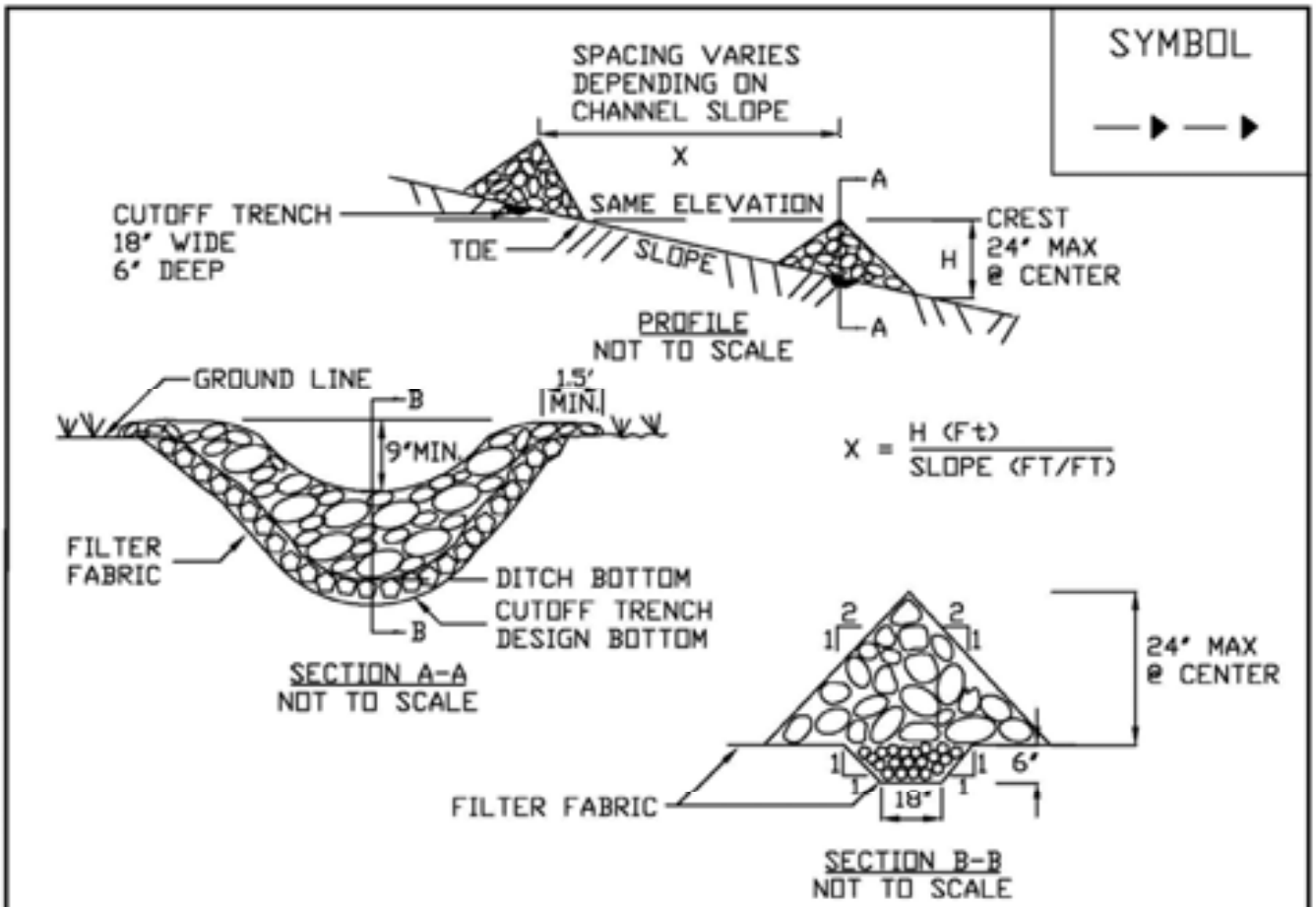
For filter sock or fiber roll check dams: The check dams will be anchored by staking the dam to the earth contact surface. The dam will extend to the top of the bank. The check dam will have a splash apron of NYS DOT #2 crushed stone extending a minimum 3 feet downstream from the dam and 1 foot up the sides of the channel. The compost and materials for a filter sock check dam shall meet the requirements shown in the standard for Compost Filter Sock on page 5.7.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

Figure 3.1
Stone Check Dam Detail



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUH OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STONE CHECK DAM

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT



Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION DITCH



Definition & Scope

A **temporary** excavated drainage way to intercept sediment laden water and divert it to a sediment trapping device or to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet.

Conditions Where Practice Applies

Construction ditches are constructed:

1. to divert flows from entering a disturbed area.
2. intermittently across disturbed areas to shorten overland flow distances.
3. to direct sediment laden water along the base of slopes to a trapping device.
4. to transport offsite flows across disturbed areas such as rights-of-way.

Ditches collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.2 on page 3.6 for details.

General

	Ditch A	Ditch B
Drainage Area	<5 Ac	5-10 Ac
Bottom Width of Flow Channel	4 ft.	6 ft.
Depth of Flow Channel	1 ft.	1 ft.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specification for Grassed Waterways on page 3.23 and 3.24.

Stabilization

Stabilization of the ditch shall be completed within 2 days of installation in accordance with the appropriate standard and specifications for vegetative stabilization or stabilization with mulch as determined by the time of year. The flow channel shall be stabilized as per the following criteria:

The seeding for vegetative stabilization shall be in accordance with the standard on Page 4.78. The seeded area will be mulched in accordance with the standard on Page 4.39.

Type of Treatment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP[2], Sod, or lined with plastic or 2" stone
3	5.1-8.0%	Seed and cover with RECP[2], Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

1 In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.
2 Rolled Erosion Control Product.

Outlet

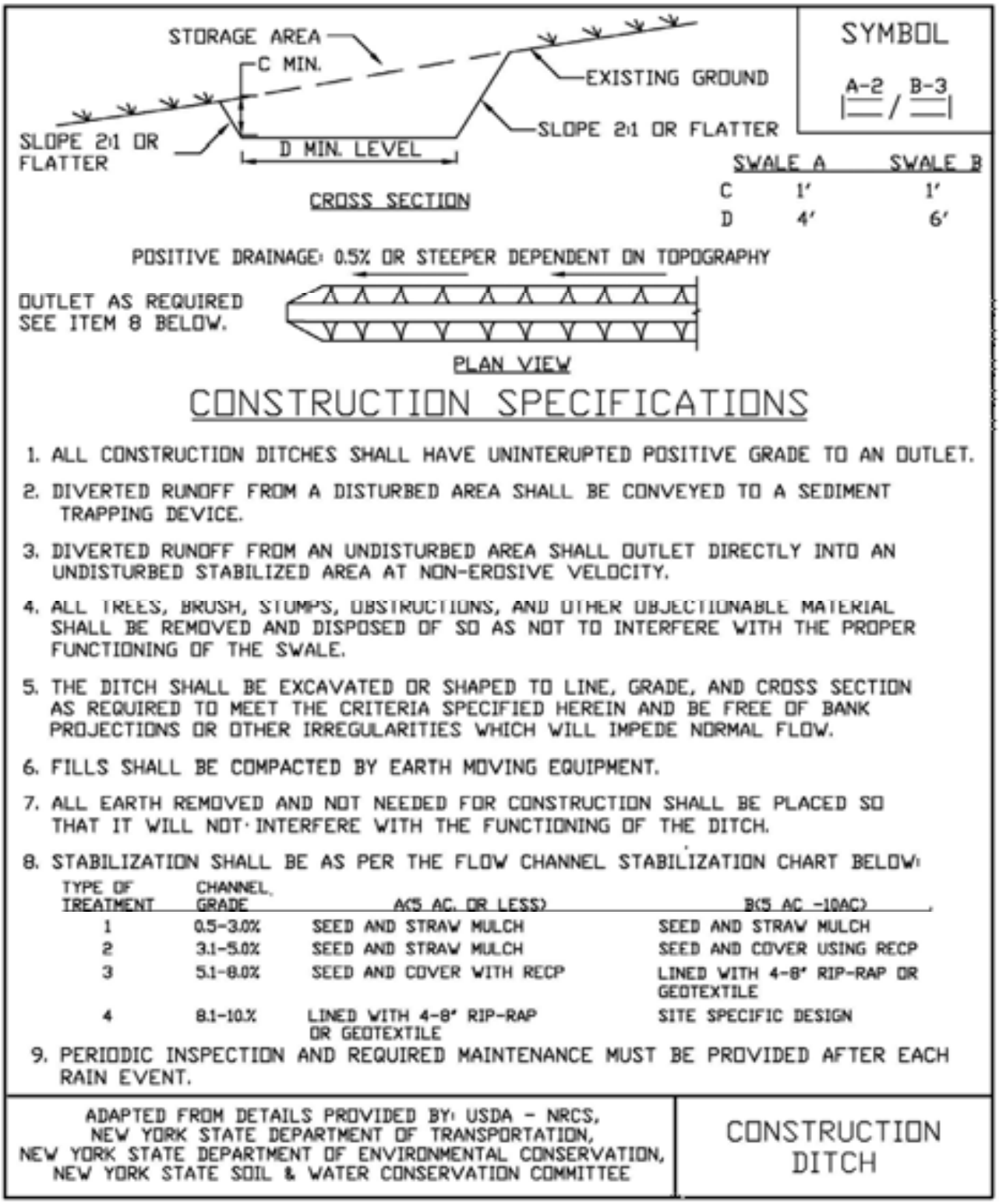
Ditch shall have an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.

Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the ditch is adequately stabilized.

The on-site location may need to be adusted to meet field conditions in order to utilize the most suitable outlet condition.

If a ditch is used to divert clean water flows from entering a disturbed area, a sediment trapping device may not be needed.

Figure 3.2
Construction Ditch Detail



CONSTRUCTION SPECIFICATIONS

1. ALL CONSTRUCTION DITCHES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE DITCH SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE DITCH.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

TYPE OF TREATMENT	CHANNEL GRADE	A(5 AC. OR LESS)	B(5 AC. -10AC)
1	0.5-3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1-5.0%	SEED AND STRAW MULCH	SEED AND COVER USING RECP
3	5.1-8.0%	SEED AND COVER WITH RECP	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE
4	8.1-10.%	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE	SITE SPECIFIC DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

CONSTRUCTION DITCH

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION



Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR DIVERSION



Definition & Scope

A drainage way of parabolic or trapezoidal cross-section with a supporting ridge on the lower side that is constructed across the slope to intercept and convey runoff to stable outlets at non-erosive velocities.

Conditions Where Practice Applies

Diversions are used where:

1. Runoff from higher areas has potential for damaging properties, causing erosion, or interfering with, or preventing the establishment of, vegetation on lower areas.
2. Surface and/or shallow subsurface flow is damaging sloping upland.
3. The length of slopes needs to be reduced so that soil loss will be kept to a minimum.

Diversions are only applicable below stabilized or protected areas. Avoid establishment on slopes greater than fifteen percent. Diversions should be used with caution on soils subject to slippage. Construction of diversions shall be in compliance with state and local drainage and water laws.

Design Criteria

Location

Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, seep planes (when seepage is a problem), and the development layout.

Capacity

Peak rates of runoff values used in determining the capacity requirements shall be calculated using the most current hydrologic data from the Northeast Regional Climate Center in an appropriate model.

The constructed diversion shall have capacity to carry, as a minimum, the peak discharge from a 10 year frequency rainfall event with freeboard of not less than 0.3 feet.

Diversions designed to protect homes, schools, industrial buildings, roads, parking lots, and comparable high-risk areas, and those designed to function in connection with other structures, shall have sufficient capacity to carry peak runoff expected from a storm frequency consistent with the hazard involved.

Cross Section

The diversion channel shall be parabolic or trapezoidal in shape. Parabolic Diversion design charts are provided in Tables 3.2, 3.3 and 3.4 on pages 3.10, 3.12 and 3.13**.** The diversion shall be designed to have stable side slopes. The side slopes shall not be steeper than 2:1 and shall be flat enough to ensure ease of maintenance of the diversion and its protective vegetative cover.

The ridge shall have a minimum width of four feet at the design water elevation; a minimum of 0.3 feet freeboard and a reasonable settlement factor shall be provided.

Velocity and Grade

The permissible velocity for the specified method of stabilization will determine the maximum grade. Maximum permissible velocities of flow for the stated conditions of stabilization shall be as shown in Table 3.1 on page 3.10 of this standard.

Diversions are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with, or before, the diversions.

Outlets

Each diversion must have an adequate outlet. The outlet may be a grassed waterway, vegetated or paved area, grade stabilization structure, flow spreader, flow diffuser, stable watercourse, or subsurface drain outlet. In all cases, the outlet must convey runoff to a point where outflow will not cause damage. Vegetated outlets shall be installed before diversion construction, if needed, to ensure establishment of

vegetative cover in the outlet channel.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Stabilization

Vegetated diversions shall be stabilized in accordance with the following tables.

Table 3.1
Diversion Maximum Permissible Design Velocities Table

Soil Texture	Retardance and Cover	Permissible Velocity (ft / second) for Selected Channel Vegetation
Sand, Silt, Sandy loam, silty loam, loamy sand (ML, SM, SP, SW)	C-Kentucky 31 tall fescue and Kentucky bluegrass	3.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	2.5
Silty clay loam, Sandy clay loam (ML-CL, SC)	C-Kentucky 31 tall fescue and Kentucky bluegrass	4.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	3.5
Clay (CL)	C-Kentucky 31 tall fescue and Kentucky bluegrass	5.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	4.0
[1] Annuals—Use only as temporary protection until permanent vegetation is established.		

Table 3.2 - Retardance Factors for Various Grasses and Legumes Table

Retardance	Cover	Condition
A	Reed canarygrass	Excellent stand, tall (average 36 inches)
B	Smooth bromegrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue	Good stand, unmowed (average 18 inches)
	Grass-legume mixture—Timothy, smooth bromegrass, or Orchard grass with birdsfoot trefoil	Good stand, uncut (average 20 inches)
	Reed canarygrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue, with birdsfoot trefoil or ladino clover	Good stand, uncut (average 18 inches)
C	Redtop	Good stand, headed (15 to 20 inches)
	Grass-legume mixture—summer (Orchard grass, redtop, Annual ryegrass, and ladino or white clover)	Good stand, uncut (6 to 8 inches)
	Kentucky bluegrass	Good stand, headed (6 to 12 inches)
D	Red fescue	Good stand, headed (12 to 18 inches)
	Grass-legume mixture—fall, spring (Orchard grass, redtop, Annual ryegrass, and white or ladino clover)	Good stand, uncut (4 to 5 inches)

Figure 3.4
Diversion Detail

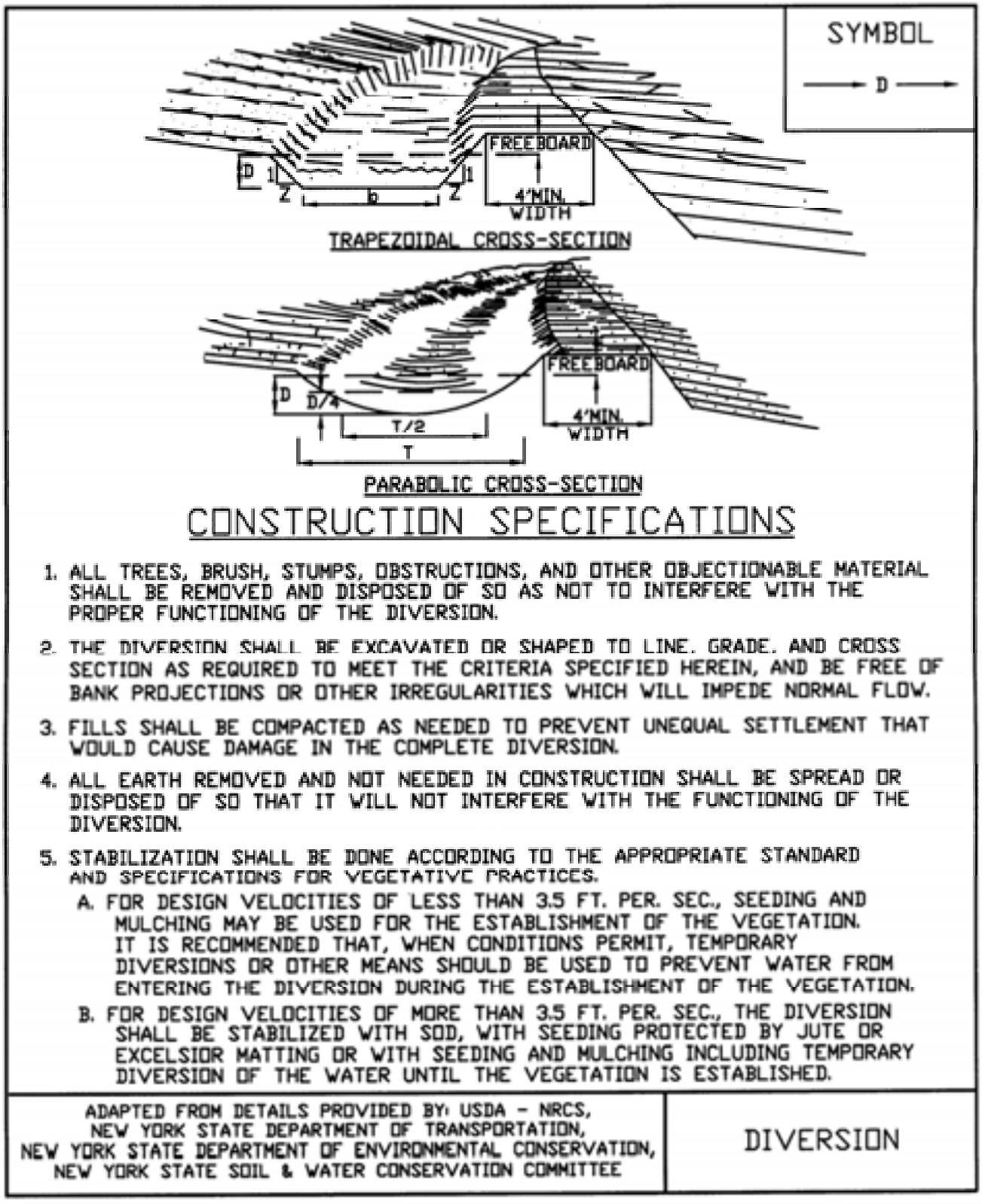


Table 3.3
Parabolic Diversion Design, Without Freeboard Tables - 1 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 0.50

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	9	1.6	1.6																							
20	11	1.6	1.7																							
25	14	1.6	1.7	9	1.9	2.1																				
30	17	1.6	1.7	11	1.9	2.2	8	2.2	2.5																	
35	20	1.6	1.7	12	1.9	2.3	9	2.1	2.6																	
40	22	1.6	1.7	14	1.8	2.3	11	2.1	2.7																	
45	25	1.5	1.7	16	1.8	2.3	12	2.0	2.8																	
50	28	1.5	1.7	18	1.8	2.4	13	2.0	2.8	10	2.4	3.2														
55	31	1.5	1.7	19	1.9	2.4	15	2.0	2.8	11	2.4	3.3														
60	33	1.5	1.7	21	1.8	2.4	16	2.0	2.8	11	2.4	3.3														
65	36	1.5	1.8	23	1.8	2.4	17	2.0	2.9	12	2.4	3.3														
70	39	1.5	1.7	24	1.8	2.4	18	2.0	2.9	13	2.3	3.4														
75	42	1.5	1.8	26	1.8	2.4	19	2.0	2.9	14	2.3	3.4	11	2.7	3.7											
80	44	1.5	1.8	28	1.8	2.4	21	2.0	2.9	15	2.3	3.4	12	2.7	3.8											
90	50	1.5	1.8	31	1.8	2.4	24	2.0	2.9	17	2.3	3.4	13	2.7	3.8											
100	55	1.5	1.8	35	1.8	2.4	26	2.0	2.9	19	2.3	3.5	15	2.6	3.9	12	3.0	4.1								

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.0

V_1 based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	13	1.1	1.5	8	1.3	2.0																				
20	18	1.1	1.5	11	1.3	2.1	8	1.5	2.6																	
25	22	1.1	1.5	14	1.3	2.1	9	1.5	2.6	8	1.6	3.0														
30	27	1.1	1.5	17	1.3	2.1	11	1.5	2.7	9	1.6	3.0														
35	31	1.1	1.5	19	1.3	2.2	13	1.5	2.8	11	1.6	3.1	8	1.8	3.6											
40	35	1.1	1.5	22	1.3	2.1	15	1.4	2.8	12	1.5	3.1	9	1.8	3.7											
45	40	1.1	1.5	25	1.3	2.2	17	1.5	2.8	13	1.6	3.2	10	1.8	3.7											
50	44	1.1	1.5	28	1.3	2.2	19	1.4	2.8	15	1.5	3.2	11	1.8	3.7	9	2.0	4.2								
55	48	1.1	1.5	30	1.3	2.2	20	1.4	2.8	16	1.5	3.3	12	1.8	3.8	10	2.0	4.3								
60	53	1.1	1.5	33	1.3	2.2	22	1.4	2.8	18	1.5	3.3	14	1.7	3.8	10	2.0	4.3								
65	57	1.1	1.5	36	1.3	2.2	24	1.4	2.8	19	1.5	3.3	15	1.7	3.8	11	2.0	4.3	9	2.2	4.7					
70	61	1.1	1.5	38	1.3	2.2	25	1.4	2.8	21	1.5	3.3	16	1.7	3.9	12	2.0	4.4	10	2.2	4.7					
75	66	1.1	1.5	41	1.3	2.2	26	1.4	2.9	22	1.5	3.3	17	1.7	3.9	13	2.0	4.5	11	2.2	4.7					
80	70	1.1	1.5	44	1.3	2.2	29	1.4	2.9	24	1.5	3.3	18	1.7	3.9	14	2.0	4.6	11	2.2	4.9					
90	79	1.1	1.5	49	1.3	2.2	33	1.4	2.9	27	1.5	3.3	20	1.7	3.9	15	1.9	4.5	13	2.2	4.9	11	2.4	5.2		
100	87	1.1	1.5	55	1.3	2.2	37	1.4	2.9	29	1.5	3.3	22	1.7	3.9	17	1.9	4.5	14	2.2	4.9	12	2.4	5.3		

Table 3.4
Parabolic Diversion Design, Without Freeboard Tables - 2 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.5

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 - 2.0			V_1 - 2.5			V_1 - 3.0			V_1 - 3.5			V_1 - 4.0			V_1 - 4.5			V_1 - 5.0			V_1 - 5.5			V_1 - 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	17	0.9	1.4	11	1.1	1.9	8	1.2	2.4																		
20	23	0.9	1.4	15	1.0	1.9	10	1.2	2.5	7	1.4	3.0	5	1.5	3.4												
25	28	0.9	1.4	19	1.0	1.9	12	1.2	2.6	8	1.4	3.2	7	1.5	3.6												
30	34	0.9	1.4	22	1.0	1.9	15	1.2	2.6	10	1.3	3.2	8	1.5	3.6	7	1.6	4.0									
35	40	0.9	1.4	26	1.0	2.0	17	1.1	2.6	12	1.3	3.3	10	1.4	3.7	8	1.6	4.1									
40	45	0.9	1.4	30	1.0	1.9	20	1.2	2.6	14	1.3	3.3	11	1.4	3.7	9	1.6	4.2	7	1.8	4.6						
45	51	0.9	1.4	33	1.0	2.0	22	1.1	2.6	15	1.3	3.4	12	1.4	3.8	10	1.5	4.3	8	1.8	4.6						
50	56	0.9	1.4	37	1.0	2.0	25	1.1	2.7	17	1.3	3.4	14	1.4	3.9	11	1.5	4.3	9	1.8	4.8						
55	62	0.9	1.5	41	1.0	2.0	27	1.1	2.6	19	1.3	3.4	15	1.4	3.9	12	1.5	4.3	10	1.7	4.9	8	1.9	5.1			
60	67	0.9	1.5	44	1.0	2.0	30	1.1	2.7	20	1.3	3.4	16	1.4	3.9	14	1.5	4.4	11	1.7	4.9	9	1.9	5.2			
65	73	0.9	1.5	48	1.0	2.0	32	1.1	2.7	22	1.3	3.4	18	1.4	3.9	15	1.5	4.4	11	1.7	5.0	10	1.9	5.3			
70	78	0.9	1.5	51	1.0	2.0	34	1.1	2.7	24	1.3	3.4	19	1.4	3.9	16	1.5	4.4	12	1.7	4.9	10	1.9	5.4	9	2.1	5.6
75	83	0.9	1.5	55	1.0	2.0	37	1.1	2.7	25	1.3	3.4	21	1.4	3.9	17	1.5	4.4	13	1.7	5.0	11	1.9	5.4	9	2.1	5.6
80	89	0.9	1.5	59	1.0	2.0	39	1.1	2.7	27	1.3	3.4	22	1.4	3.9	18	1.5	4.4	14	1.7	5.0	12	1.9	5.5	10	2.1	5.8
90	100	0.9	1.5	66	1.0	2.0	44	1.1	2.7	30	1.3	3.5	25	1.4	3.9	20	1.5	4.4	15	1.7	5.0	13	1.9	5.4	11	2.0	5.9
100				73	1.0	2.0	49	1.1	2.7	33	1.3	3.5	27	1.4	3.9	22	1.5	4.5	17	1.7	5.1	15	1.9	5.5	12	2.0	6.0

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 2.0

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 based on Retardance "C"

Q	V_1 - 2.0			V_1 - 2.5			V_1 - 3.0			V_1 - 3.5			V_1 - 4.0			V_1 - 4.5			V_1 - 5.0			V_1 - 5.5			V_1 - 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	21	0.8	1.3	13	0.9	1.9	9	1.0	2.4	7	1.2	2.9															
20	28	0.8	1.3	17	0.9	1.9	12	1.0	2.4	9	1.1	3.0	7	1.3	3.5	5	1.4	3.8									
25	35	0.8	1.3	21	0.9	1.9	15	1.0	2.4	11	1.1	3.0	8	1.3	3.7	7	1.4	4.0									
30	41	0.8	1.3	26	0.9	1.9	18	1.0	2.5	13	1.1	3.0	10	1.2	3.7	8	1.3	4.2	7	1.5	4.5						
35	48	0.8	1.4	30	0.9	1.9	22	1.0	2.4	15	1.1	3.1	11	1.2	3.8	9	1.3	4.2	8	1.5	4.5						
40	55	0.8	1.3	34	0.9	1.9	25	1.0	2.5	18	1.1	3.1	13	1.2	3.8	11	1.3	4.3	9	1.5	4.7	7	1.7	5.0			
45	62	0.8	1.4	38	0.9	1.9	28	1.0	2.5	20	1.1	3.1	14	1.2	3.8	12	1.3	4.3	10	1.4	4.8	8	1.6	5.2			
50	68	0.8	1.4	42	0.9	1.9	31	1.0	2.5	22	1.1	3.1	16	1.2	3.9	13	1.3	4.3	11	1.4	4.8	9	1.6	5.3	8	1.7	5.6
55	75	0.8	1.4	46	0.9	1.9	34	1.0	2.5	24	1.1	3.1	17	1.2	3.8	14	1.3	4.3	12	1.4	4.9	10	1.6	5.3	8	1.7	5.8
60	82	0.8	1.4	51	0.9	1.9	37	1.0	2.5	26	1.1	3.1	19	1.2	3.9	16	1.3	4.4	13	1.4	4.8	11	1.6	5.3	9	1.7	5.7
65	88	0.8	1.4	55	0.9	1.9	40	1.0	2.5	28	1.1	3.1	21	1.2	3.9	17	1.3	4.4	14	1.4	4.9	11	1.6	5.4	10	1.7	5.7
70	95	0.8	1.4	59	0.9	1.9	43	1.0	2.5	30	1.1	3.1	22	1.2	3.9	18	1.3	4.4	15	1.4	4.9	12	1.6	5.4	10	1.7	5.8
75				63	0.9	1.9	46	1.0	2.5	32	1.1	3.2	24	1.2	3.9	20	1.3	4.4	16	1.4	5.0	13	1.6	5.5	11	1.7	5.9
80				67	0.9	2.0	48	1.0	2.5	35	1.1	3.1	25	1.2	3.9	21	1.3	4.4	17	1.4	4.9	14	1.6	5.4	12	1.7	6.0
90				75	0.9	2.0	54	1.0	2.5	39	1.1	3.2	28	1.2	3.9	23	1.3	4.4	19	1.4	4.9	16	1.6	5.5	13	1.7	5.9
100				83	0.9	2.0	60	1.0	2.5	43	1.1	3.2	31	1.2	3.9	26	1.3	4.4	21	1.4	5.0	17	1.6	5.5	15	1.7	6.0

STANDARD AND SPECIFICATIONS FOR DUST CONTROL



Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR FERTILIZER APPLICATION



Definition & Scope

The **permanent** incorporation of fertilizer into the planting zone of the soil profile to provide nutrient amendments to the soil for vigorous support to plant and vegetation growth.

Conditions Where Practice Applies

This standard applies to all areas where permanent seeding, sodding, and plant establishment is required. All application of fertilizer shall be in accordance with Nutrient Runoff Law - ECL Article 17, Title 21. Phosphorus runoff poses a threat to water quality. Therefore, under New York Law, fertilizer containing phosphorus may only be applied to lawn or non-agricultural turf when:

1. A soil test indicates that additional phosphorus is needed for growth of that lawn or non-agricultural turf, or

2. The fertilizer is used for newly established lawn or non -agricultural turf during the first growing season.

For projects located within watersheds where enhanced phosphorus removal standards are required as part of its post-construction stormwater management plan, use of any fertilizer containing more than 0.67 percent phosphate ($P_2 0_5$) content will be done only with a valid soil test demonstrating the need for that formulation.

Design Criteria

Fertilizer is sold with an analysis printed on the tag or bag shown as three numbers separated by a dash, such as 5-10-5. The first number is the percent of the total weight of the bag that is nitrogen (N), the second is the percent of phosphate (phosphorus, P), and the third is the percent of potash (potassium, K). Other elements are sometimes included and are listed with these three basic components.

For example a 40 lb bag of 5-10-5 fertilizer contains 5% of 40 lbs of Nitrogen which equals 2 lbs. There is 10% of 40 lbs of phosphate (phosphorus) which equals 4 lbs, and there is 5% of potash (potassium), another 2 lbs., for a total of 8 lbs of active fertilizer in the 40 lb bag. The rest is filler to aid in spreading the material over the area to be treated.

Specify the design fertilizer mix and application rates based on the results of the soil tests.

Specifications

1. In no case shall fertilizer be applied between December 1 and April 1 annually.

2. Fertilizer shall not be spread within 20 feet of a surface water.

3. Any fertilizer falling or spilled into impervious surface areas such as parking lots, roadways, and sidewalks should be immediately contained and legally applied or placed in an appropriate container.

4. Incorporate the fertilizer, and lime if specified, into the top 2-4 inches of the topsoil or soil profile.

5. When applying fertilizer by hydro seeding care should be taken to apply mix only to seed bed areas at an appropriate flow rate to prevent erosion and spraying onto impervious areas.



STANDARD AND SPECIFICATIONS FOR FIBER ROLL



Definition & Scope

A fiber roll is a coir (coconut fiber), straw, or excelsior roll encased in netting of jute, nylon, or burlap to dissipate energy along streambanks, channels, and bodies of water and to reduce sheet flow on slopes.

Conditions Where Practice Applies

Fiber rolls are used where the water surface levels are relatively constant. Artificially controlled streams for hydropower are not good candidates for this technique. The rolls provide a good medium for the introduction of herbaceous vegetation. Planting in the fiber roll is appropriate where the roll will remain continuously wet.

Design Criteria

1. The roll is placed in a shallow trench dug below baseflow or in a 4 inch trench on the slope contour and anchored by 2" x 2", 3-foot long posts driven on each side of the roll (see Figure 4.8).

2. The roll is contained by a 9-gauge non-galvanized wire placed over the roll from post to post. Braided nylon rope (1/8" thick) may be used.

3. The anchor posts shall be spaced laterally 4 feet on center on both sides of the roll and driven down to the top of the roll.

4. Soil is placed behind the roll and planted with suitable herbaceous or woody vegetation. If the roll will be continuously saturated, wetland plants may be planted into voids created in the upper surface of the roll.

5. Where water levels may fall below the bottom edge of the roll, a brush layer of willow should be installed so as to lay across the top edge of the roll.

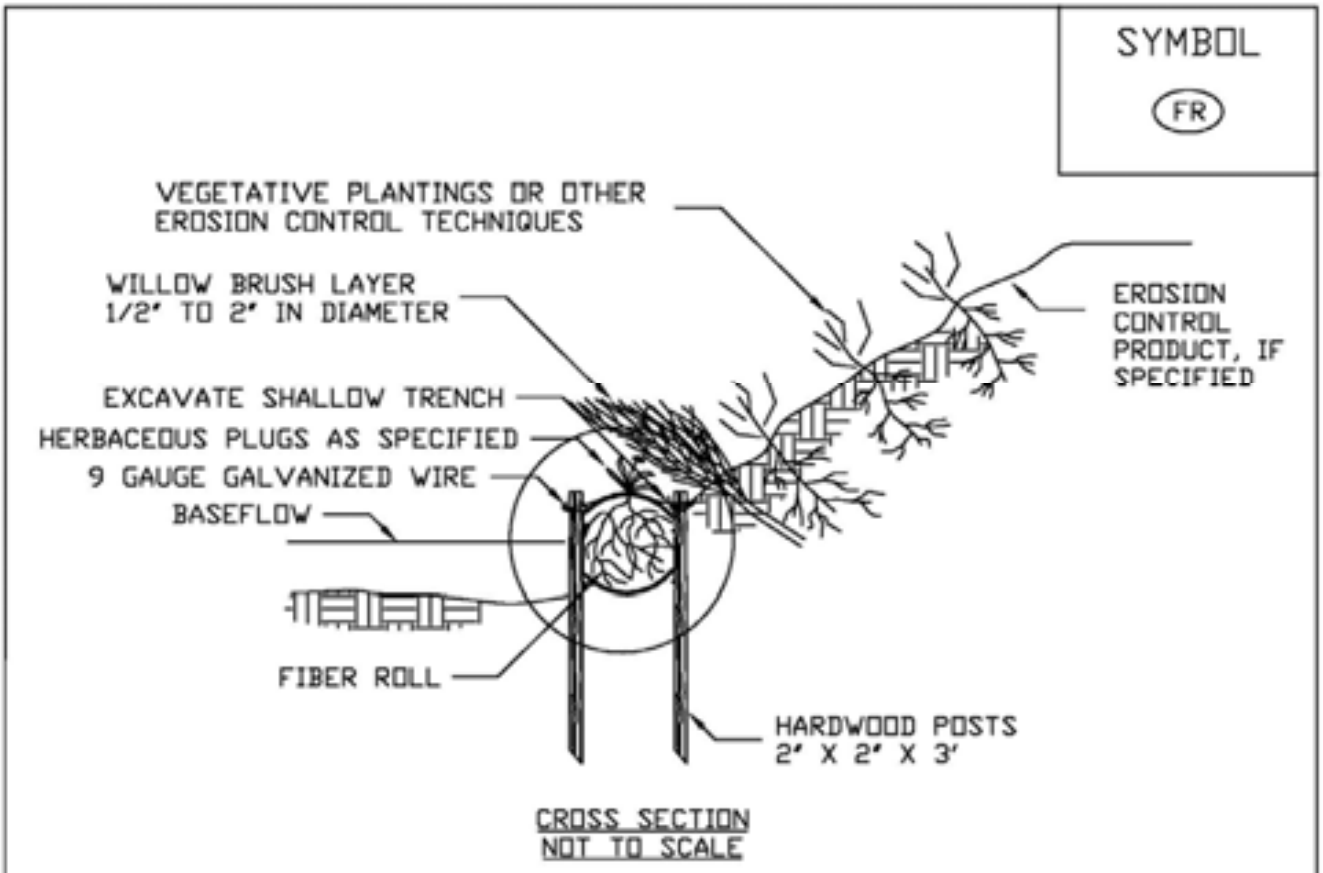
6. Where fiber rolls are used to reduce sheet flow on slopes they should be at least 12" in diameter and spaced according to the straw bale dike standard for sediment control.

Maintenance

Due to the susceptibility of plant materials to the physical constraints of the site, climate conditions, and animal populations, it is necessary to inspect installations frequently. This is especially important during the first year or two of establishment. Plant materials missing or damaged should be replaced as soon as possible. Sloughs or breaks in drainage pattern should be reestablished for the site as quickly as possible to maintain stability.



Figure 4.8
Fiber Roll



CONSTRUCTION SPECIFICATIONS

1. EXCAVATE A SHALLOW TRENCH SLIGHTLY BELOW BASEFLOW OR A 4" TRENCH ON SLOPE CONTOURS.
2. PLACE THE ROLL IN THE TRENCH AND ANCHOR WITH 2" x 2" POSTS PLACED ON BOTH SIDES OF THE ROLL AND SPACED LATERALLY ON 2' TO 4' CENTERS. TRIM THE TOP OF THE POSTS EVEN WITH THE EDGE OF THE ROLL, IF NECESSARY.
3. NOTCH THE POSTS AND TIE TOGETHER, ACROSS THE ROLL, WITH 9 GAUGE GALVANIZED WIRE OR 1/8" DIAMETER BRAIDED NYLON ROPE..
4. PLACE SOIL EXCAVATED FROM THE TRENCH BEHIND THE ROLL AND HAND TAMP. PLANT WITH SUITABLE HERBACEOUS OR WOODY VEGETATION AS SPECIFIED ELSEWHERE IN THE CONTRACT DOCUMENTS. VEGETATION SHALL BE PLACED IMMEDIATELY ADJACENT TO THE ROLL TO PROMOTE ROOT GROWTH INTO THE FIBER. HERBACEOUS VEGETATION, IF SPECIFIED, SHALL BE PLANTED INTO THE FIBER ROLL.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

FIBER ROLL

STANDARD AND SPECIFICATIONS FOR LANDGRADING



Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.

2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)

3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.

   A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.

   B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.

   C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9

4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:

   A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.

   B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.

   C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.



Figure 4.9
Typical Section of Serrated Cut Slope

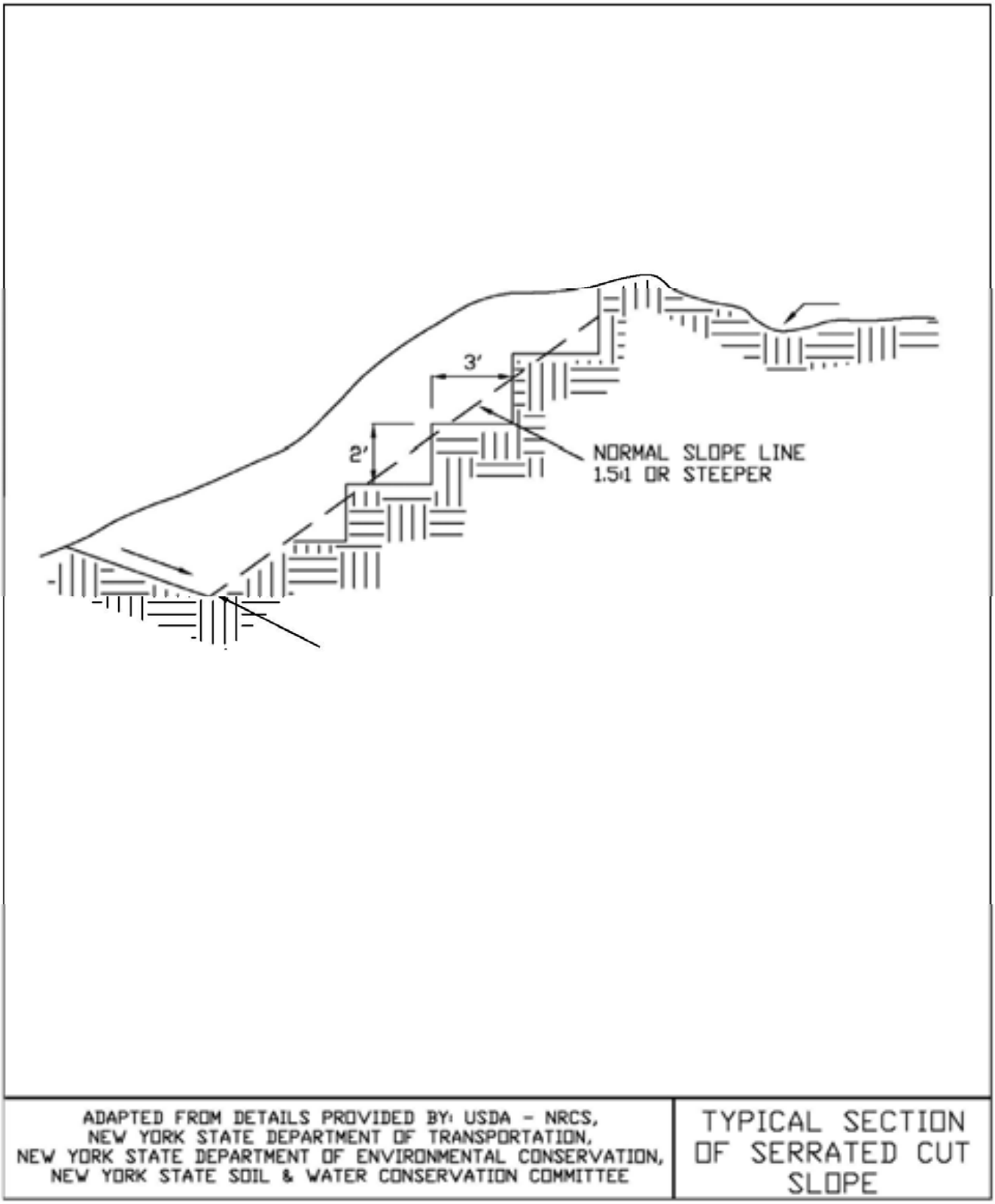


Figure 4.10
Landgrading

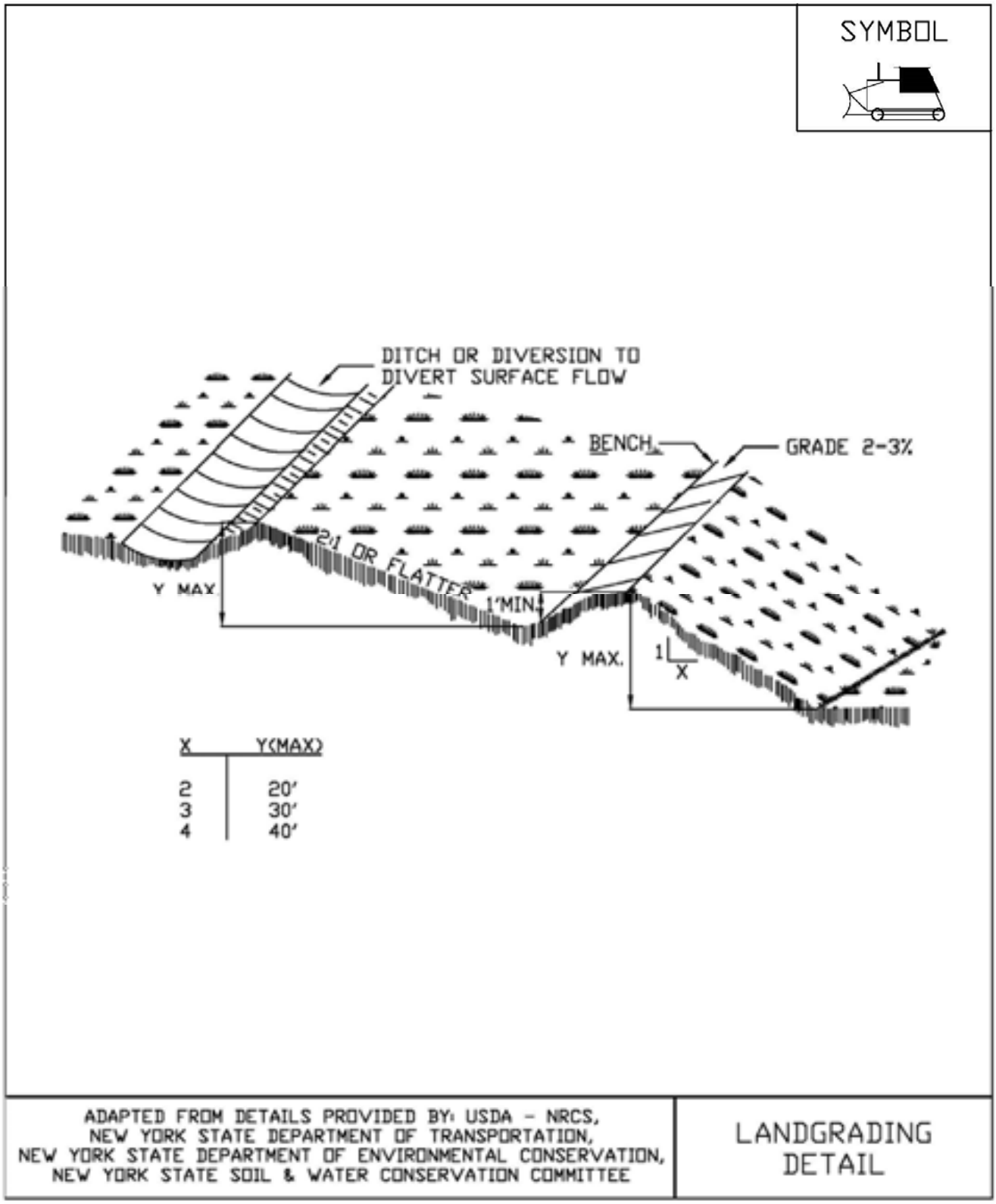
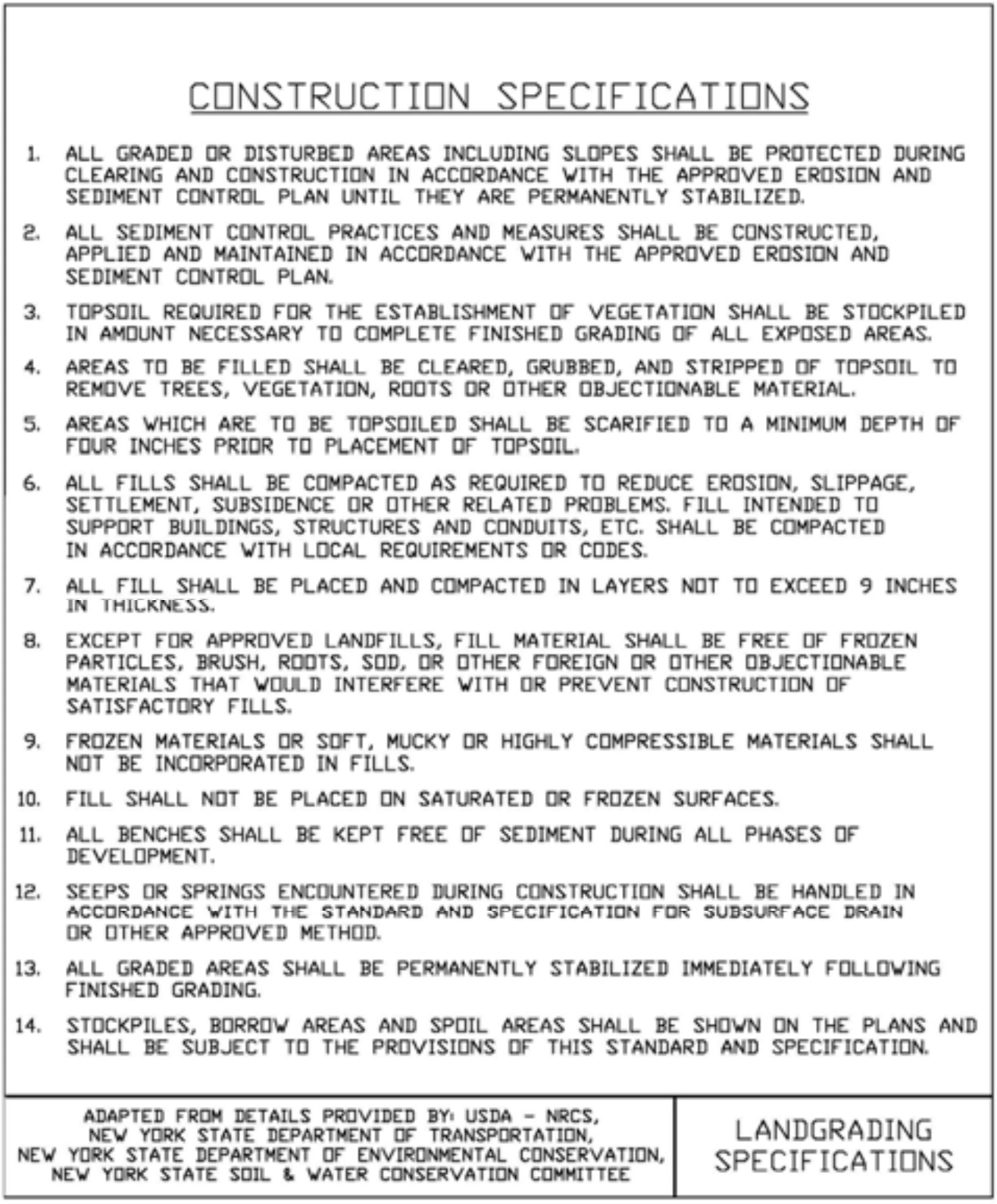


Figure 4.11
Landgrading - Construction Specifications



CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

LANDGRADING
SPECIFICATIONS

STANDARD AND SPECIFICATIONS FOR PROTECTING VEGETATION DURING CONSTRUCTION



Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

   A. Inventory:

      1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

      2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

   B. Planning:

      1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See "Determine Limits of Clearing and Grading" on page 2.2).

      2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

      3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

      4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

      5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

      6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

   A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

   B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

   C. Trenching across tree root systems should be the same minimum distance from the trunk, as in "B". Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

   D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable

vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the “Susceptibility of Tree Species to Compaction.”

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION



Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A

well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

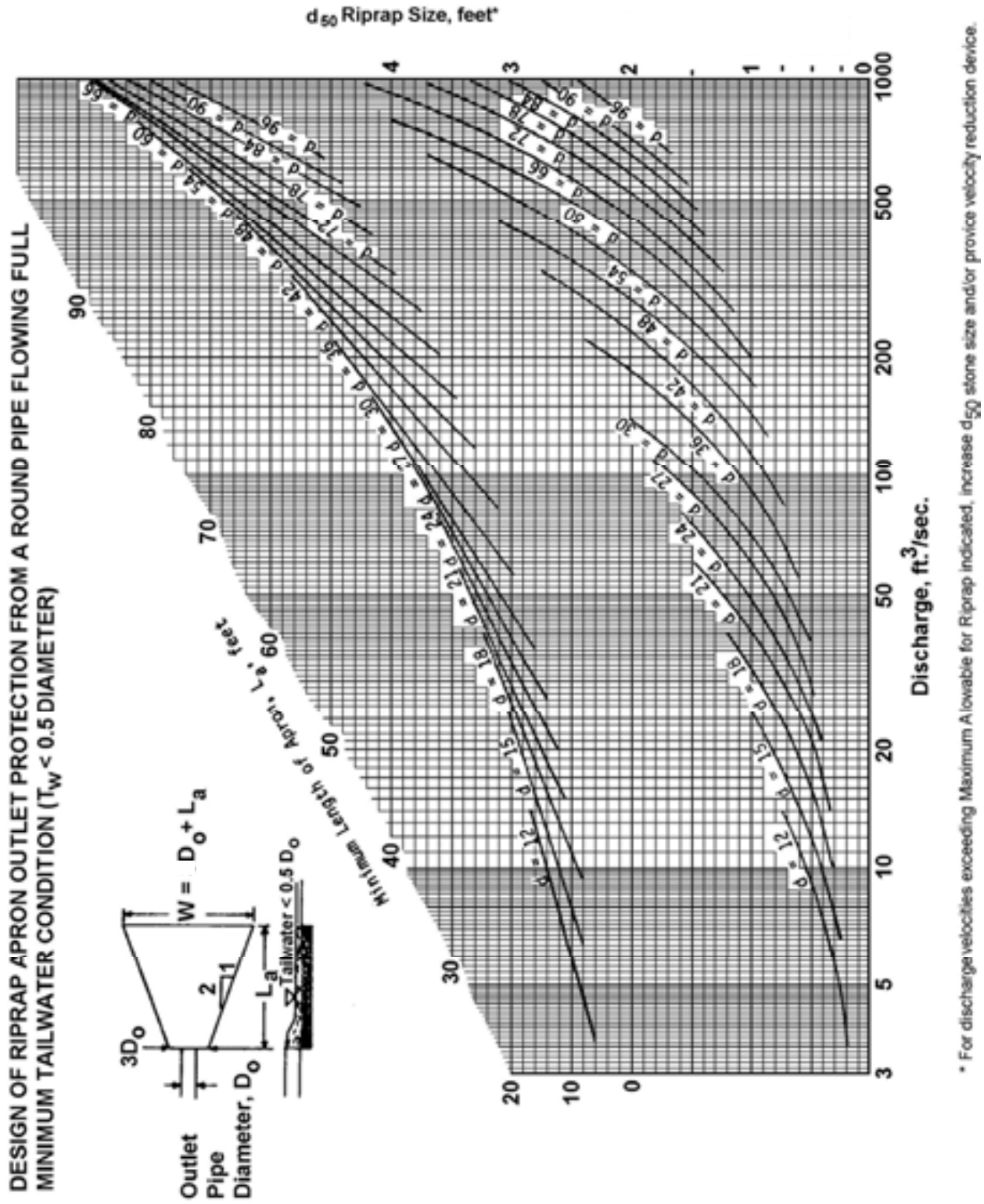


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

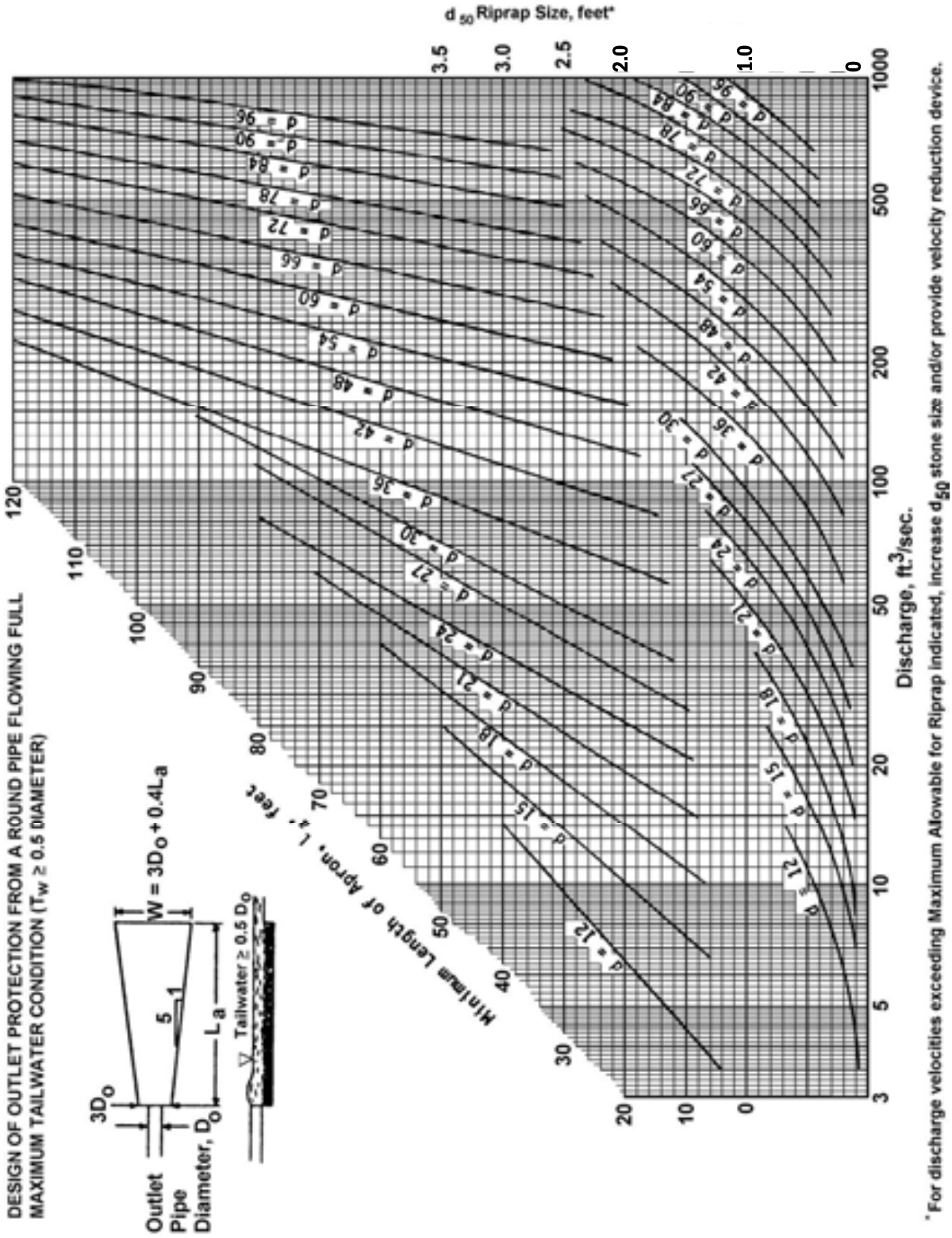


Figure 3.18
Riprap Outlet Protection Detail (1)

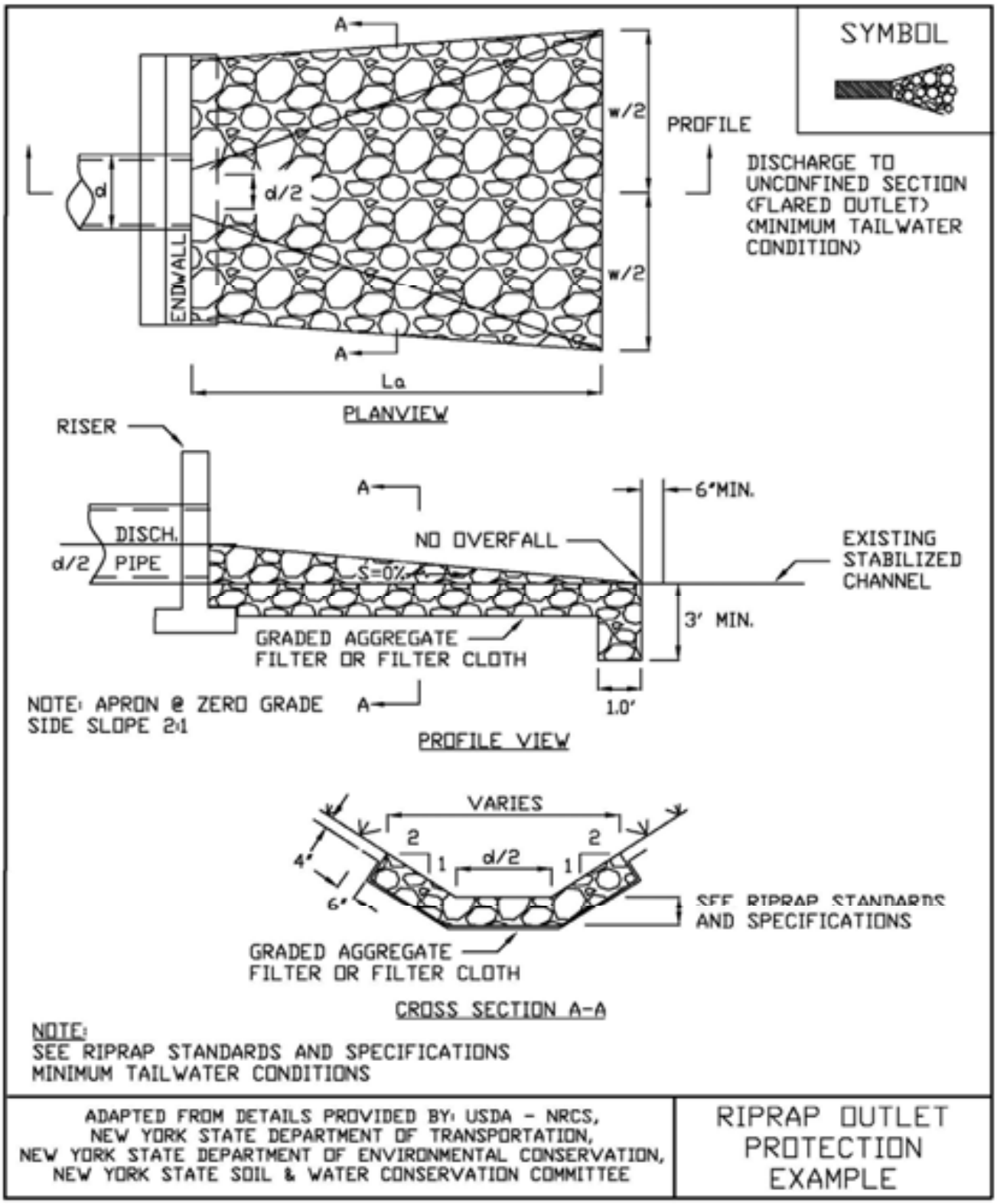


Figure 3.19
Riprap Outlet Protection Detail (2)

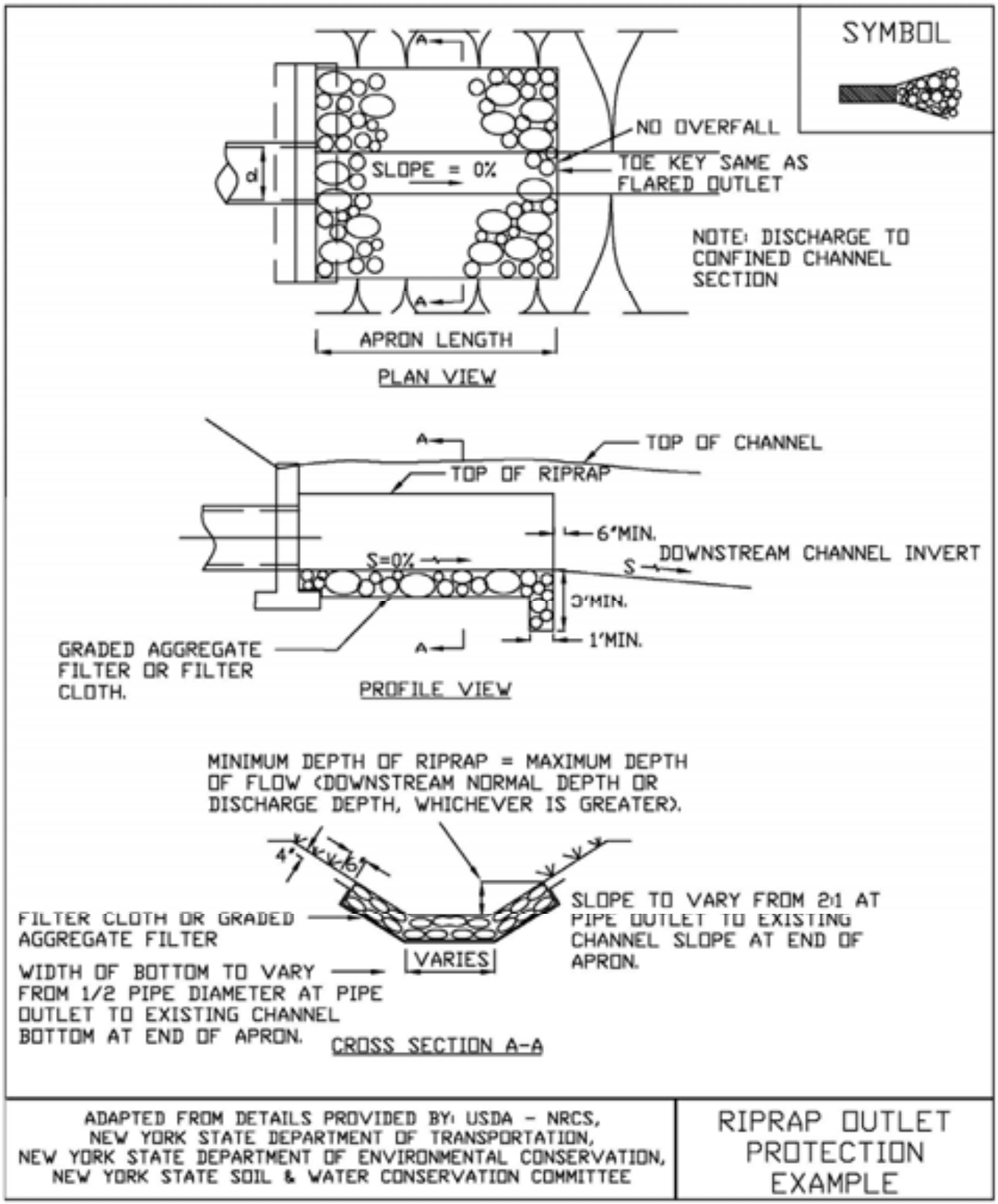
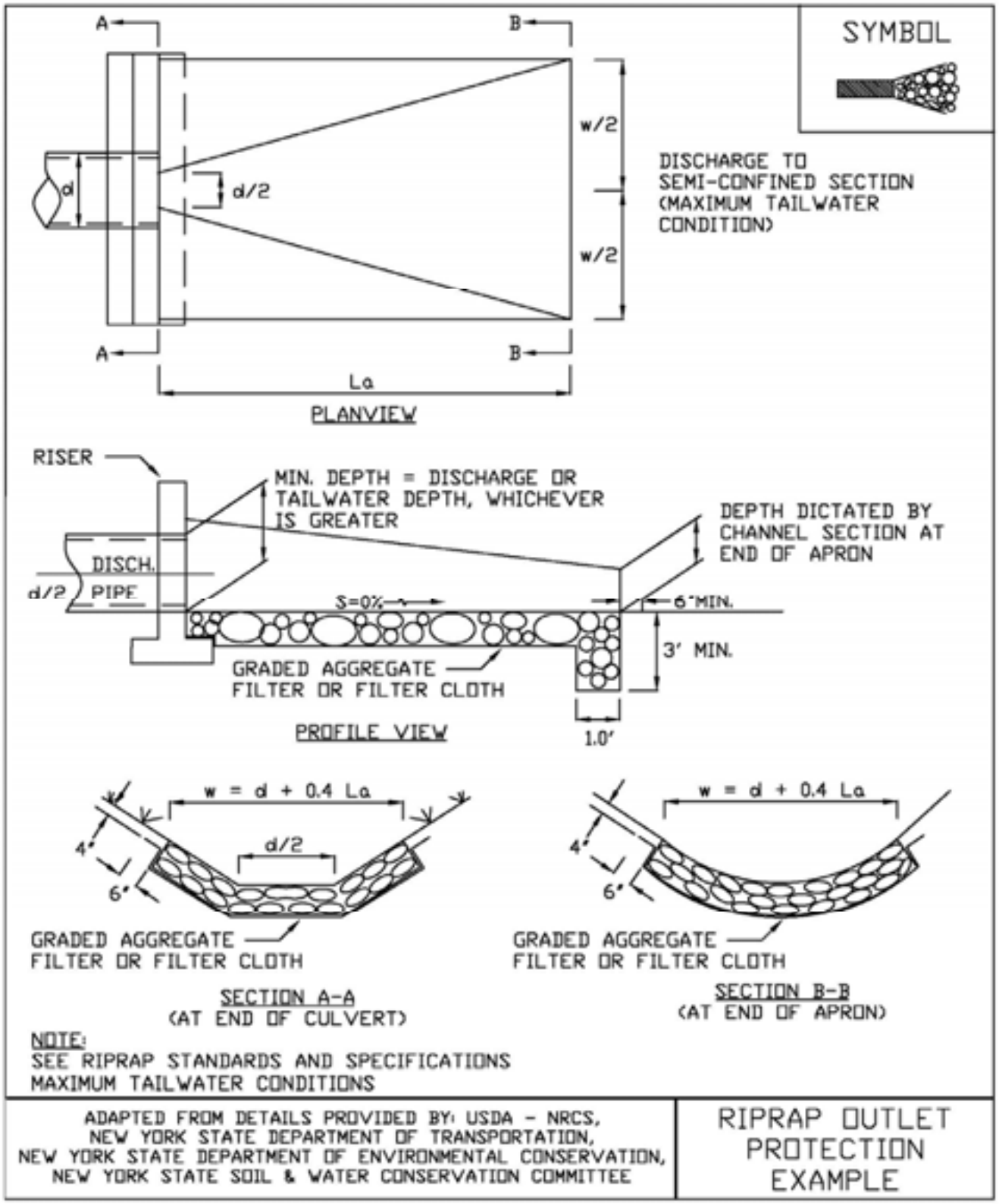


Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION





Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.



STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS



Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

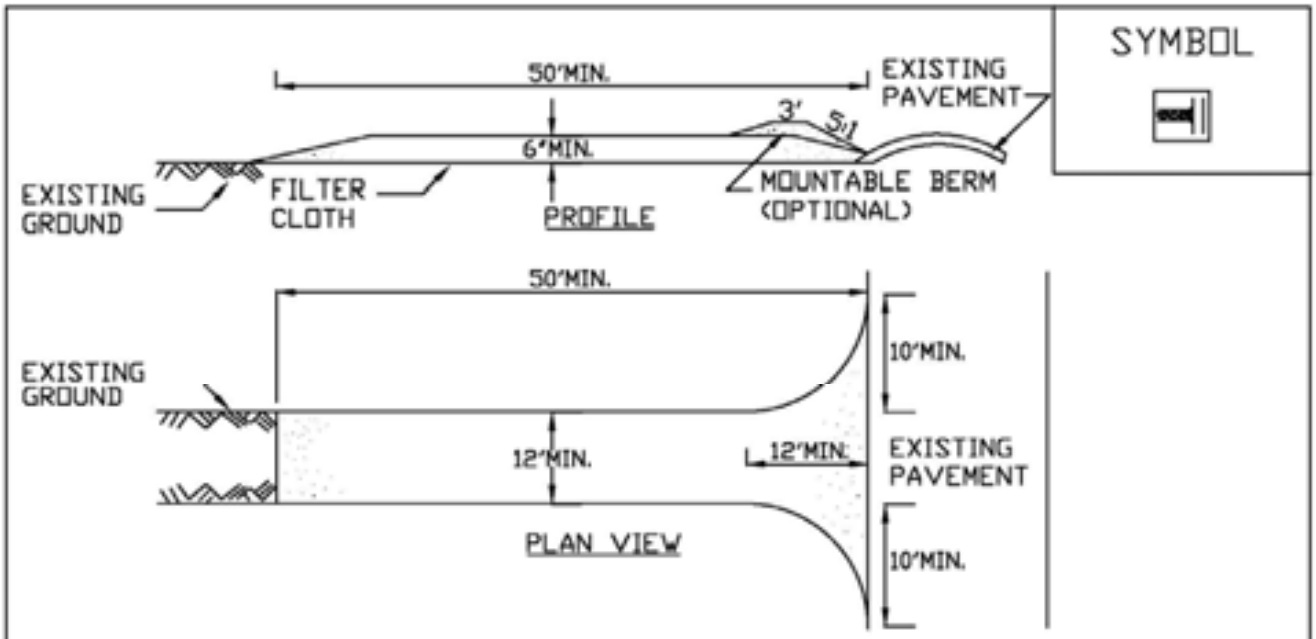
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION



Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

STANDARD AND SPECIFICATIONS FOR BUFFER FILTER STRIP



Land Slope (%)	Minimum Filter Strip Width (ft.)
≤10	50
20	60
30	85
40	105
50	125
60	145
70	165

Definition & Scope

A **temporary/permanent** well vegetated grassed area below a disturbed area that can be used to remove sediment from runoff prior to it reaching surface waters or other designated areas of concern, such as parking lots and road pavement.

Condition Where Practice Applies

This practice is effective when the flow is in the form of sheet flow and the vegetative cover is established prior to disturbance. Surface water must be protected from sediment-laden runoff until buffer filter strip vegetation is established, and then the proposed disturbance can be undertaken. This practice is effective when the flow is in the form of sheet flow (maximum of 150 feet).

Design Criteria

1. The vegetation should be a well established perennial grass. Wooded and brushy areas are not acceptable for purposes of sediment removal.

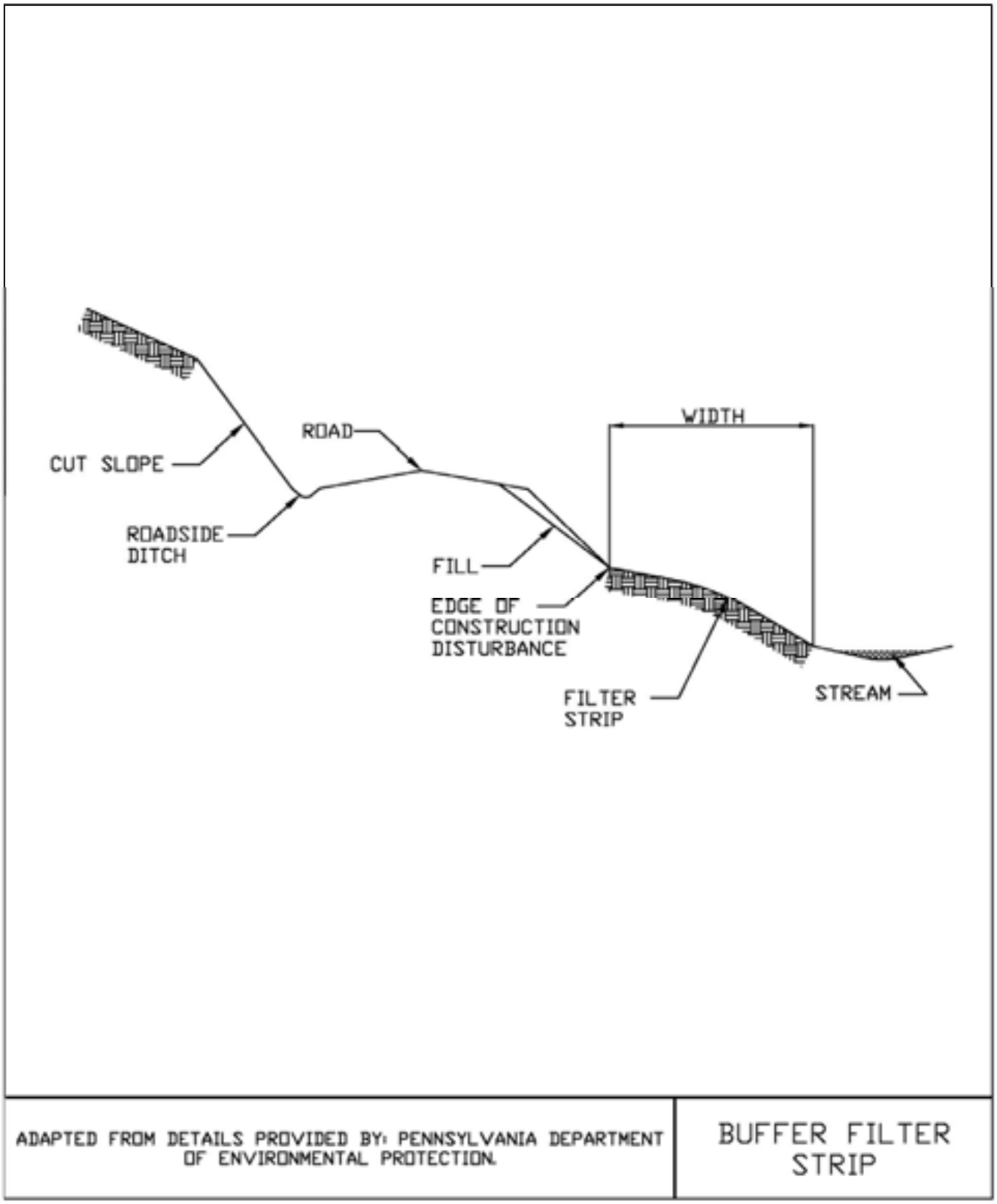
2. The minimum buffer filter strip width for stream protection shall be in accordance with the following table:

3. The minimum buffer filter strip width to protect paved areas during construction is 20 feet.

Maintenance

If at any time the width of the buffer filter strip has been reduced by sediment deposition to half its original width or concentrated flow has developed, suitable additional practices should be installed. The erosion and sediment control plan shall include these details.

Figure 5.1
Buffer Filter Strip



STANDARD AND SPECIFICATIONS FOR COMPOST FILTER SOCK



Definition & Scope

A **temporary** sediment control practice composed of a degradable geotextile mesh tube filled with compost filter media to filter sediment and other pollutants associated with construction activity to prevent their migration offsite.

Condition Where Practice Applies

Compost filter socks can be used in many construction site applications where erosion will occur in the form of sheet erosion and there is no concentration of water flowing to the sock. In areas with steep slopes and/or rocky terrain, soil conditions must be such that good continuous contact between the sock and the soil is maintained throughout its length. For use on impervious surfaces such as road pavement or parking areas, proper anchorage must be provided to prevent shifting of the sock or separation of the contact between the sock and the pavement. Compost filter socks are utilized both at the site perimeter as well as within the construction areas. These socks may be filled after placement by blowing compost into the tube pneumatically, or filled at a staging location and moved into its designed location.

Design Criteria

1. Compost filter socks will be placed on the contour with both terminal ends of the sock extended 8 feet upslope at a 45 degree angle to prevent bypass flow.

2. Diameters designed for use shall be 12" – 32" except that 8" diameter socks may be used for residential lots to control areas less than 0.25 acres.

3. The flat dimension of the sock shall be at least 1.5 times the nominal diameter.

4. The **Maximum Slope Length** (in feet) above a compost filter sock shall not exceed the following limits:

Dia. (in.)	Slope %						
	2	**5**	**10**	**20**	**25**	**33**	**50**
8	225*	200	100	50	20	—	—
12	250	225	125	65	50	40	25
18	275	250	150	70	55	45	30
24	350	275	200	130	100	60	35
32	450	325	275	150	120	75	50
* Length in feet							



5. The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.**

6. The compost filter sock fabric material shall meet the

7. Compost filter socks shall be anchored in earth with 2" x 2" wooden stakes driven 12" into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.

8. All specific construction details and material specifications shall appear on the erosion and sediment control constructions drawings when compost filter socks are included in the plan.

Maintenance

1. Traffic shall not be permitted to cross filter socks.

2. Accumulated sediment shall be removed when it reaches half the above ground height of the sock and disposed of in accordance with the plan.

3. Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired in the manner required by the manufacturer or replaced within 24 hours of inspection notification.

4. Biodegradable filter socks shall be replaced after 6 months; photodegradable filter socks after 1 year. Polypropylene socks shall be replaced according to the manufacturer's recommendations.

5. Upon stabilization of the area contributory to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the stabilization plan. For removal the mesh can be cut and the compost spread as an additional mulch to act as a soil supplement.

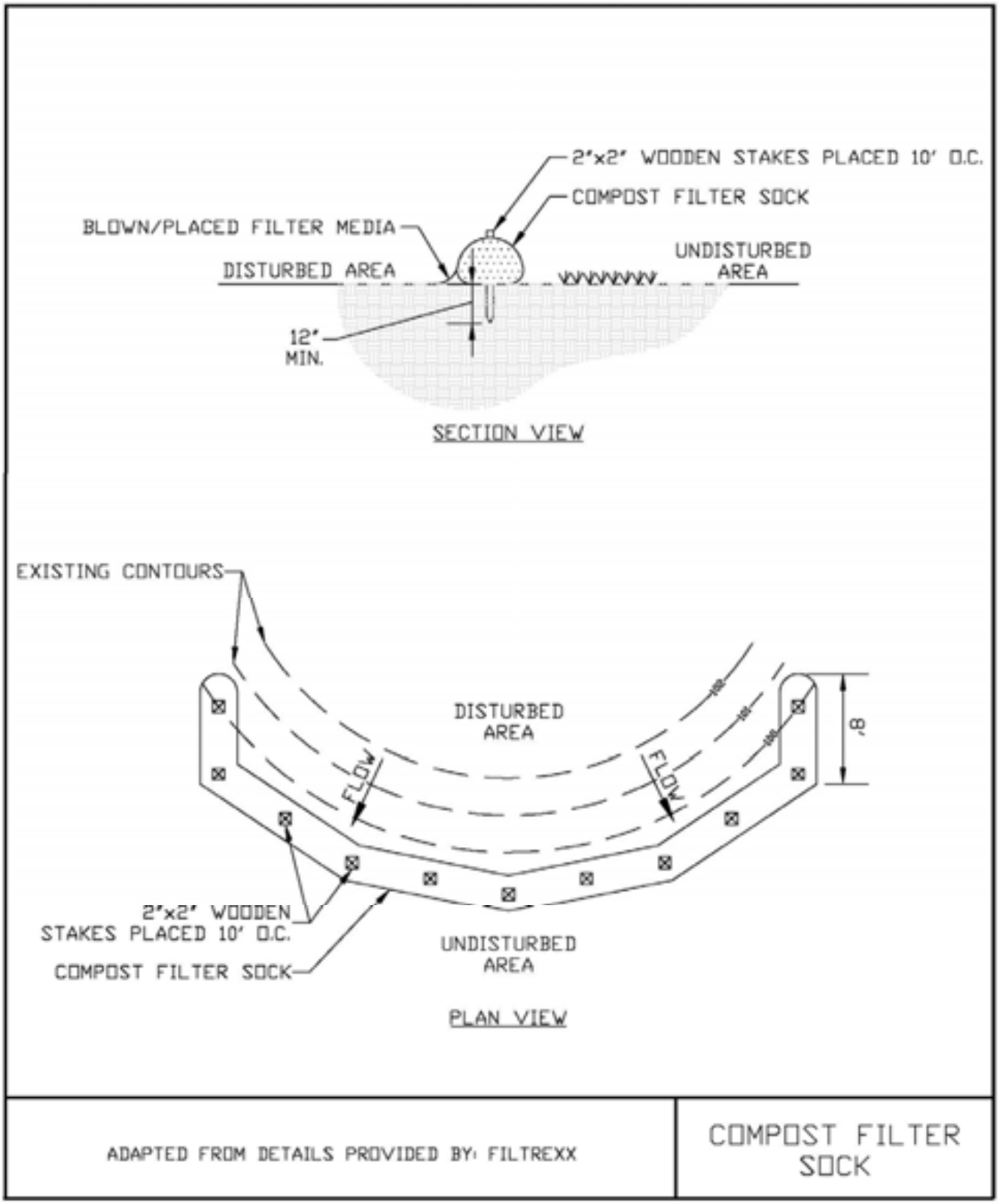
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Table 5.2 - Compost Standards Table

Organic matter content	25% - 100% (dry weight)
Organic portion	Fibrous and elongated
pH	6.0 – 8.0
Moisture content	30% - 60%
Particle size	100% passing a 1" screen and 10 - 50% passing a 3/8" screen
Soluble salt concentration	5.0 dS/m (mmhos/cm) maximum

Figure 5.2
Compost Filter Sock



STANDARD AND SPECIFICATIONS FOR GEOTEXTILE FILTER BAG



Definition & Scope

A **temporary** portable device through which sediment laden water is pumped to trap and retain sediment prior to its discharge to drainageways or off-site.

Condition Where Practice Applies

On sites where space is limited such as urban construction or linear projects (e.g. roads and utility work) where rights-of-way are limited and larger de-silting practices are impractical.

Design Criteria

1. Location - The portable filter bag should be located to minimize interference with construction activities and pedestrian traffic. It should also be placed in a location that is vegetated, relatively level, and provides for ease of access by heavy equipment, cleanout, disposal of trapped sediment, and proper release of filtered water.

   The filter bag shall also be placed at least 50 feet from all wetlands, streams or other surface waters.

2. Size - Geotextile filter bag shall be sized in accordance with the manufacturers recommendations based on the pump discharge rate.

Materials and Installation

1. The geotextile material will have the following attributes:

Minimum Grab Tensile Strength	200 lbs.
Minimum Grab Tensile Elongation	50 %
Minimum Trapezoid Tear Strength	80 lbs.
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40 - 80 US sieve
Minimum UV Resistance	70%
Minimum Flow Thru Rate	70 gpm/sq ft

2. The bag shall be sewn with a double needle machine using high strength thread, double stitched “Joe” type capable of minimum roll strength of 100 lbs/inch (ASTM D4884).

3. The geotextile filter bag shall have an opening large enough to accommodate a 4 inch diameter discharge hose with an attached strap to tie off the bag to the hose to prevent back flow.

4. The geotextile shall be placed on a gravel bed 2 inches thick, a straw mat 4 inches thick, or a vegetated filter strip to allow water to flow out of the bag in all directions.

Maintenance

1. The geotextile filter bag is considered full when remaining bag flow area has been reduced by 75%. At this point, it should be replaced with a new bag.

2. Disposal may be accomplished by removing the bag to an appropriate designated upland area, cut open, remove the geotextile for disposal, and spread sediment contents and seeded and mulched according to the vegetative plan.

STANDARD AND SPECIFICATIONS FOR MULCHING



Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/ acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.



Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7”	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2”	9 cu. yds.	405 cu. yds.	3”	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/yd. 60-90 lbs./roll	48” x 50 yds. or 48” x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4’ x 112.5’ or 8’ x 112.5’.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP



Definition & Scope

A **temporary** sediment control device formed by excavation and/or embankment to intercept sediment-laden runoff and trap the sediment in order to protect drainageways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainageway, at a storm drain inlet, or other points of collection from a disturbed area for one construction season.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If the drainage area to the proposed trap location exceeds 5 acres, or the trap is in place beyond one construction season, or any of the additional design criteria presented here cannot be met, a full Sediment Basin must be used. See Standard and Specification for Sediment Basin on page 5.19.

Drainage Area

The maximum drainage area for all sediment traps shall be 5 acres.

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must **not be located any closer than 20 feet** from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. A minimum length to width ratio of 2:1 should be provided. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of traps I-II, and 1/3 the depth for trap III. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All earth embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

All traps must be seeded and mulched immediately after construction.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are three (3) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Stone Outlet Sediment Trap
III. Compost Filter Sock Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The preferred method of dewatering the sediment trap is by surface skimmer. See Dewatering Device Standard, page 5.10. If the riser alone is used for dewatering, the top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or
2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment trap is interchangeable in the field with stone outlet provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

Select pipe diameter from the following table:
See details for Pipe Outlet Sediment Trap ST-I in Figure 5.25 and 5.26 on pages 5.49 and 5.50.

Optional sediment trap dewatering devices are shown on Figure 5.29 on Page 5.53.

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter



II. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-II in Figure 5.27 on page 5.51



III. Compost Sock Sediment Trap

A compost sock sediment trap consists of a trap formed by creating an enclosure of geotextile mesh tubes filled with a compost filter media. These traps are used in locations where there is no opportunity to direct runoff into larger traps or well vegetated areas. This could occur at site entrances and access points or in tight areas due to construction boundary limits.

Surface runoff can be directed to the trap with standard conveyance practices. Groundwater or surface ponding in low areas can be pumped into the compost sock sediment trap with appropriate energy dissipation at the pump outlet to prevent scour.

Design criteria for Compost Sock Sediment Trap

1. The maximum drainage area tributary to the trap shall be 5 acres.

2. The minimum settled height above ground shall be 2.0 feet formed by staking 3 compost filter socks in a pyramid as shown in Figure 5.28 on page 5.52.

3. The storage volume provided in the compost sock sediment trap shall be 3,600 cubic feet per tributary drainage acre.

4. If necessary, additional storage area can be created by excavating a sump 1 foot deep beginning at least 5 feet away from the inside sock.

5. All compost filter sock materials, mesh, and compost, will meet the material specifications listed in the Compost Filter Sock standard. No spillway is required.

6. Compost filter sock sediment traps shall be inspected weekly and after every rainfall event. Sediment shall be removed when it reaches one third, 1/3, the height of the trap.

7. The maximum limit of use for a compost sock sediment trap is one (1) year. The existing trap shall be replaced if there is a need for a trap beyond that time limit.

8. Upon completion of the work, the compost sock sediment trap shall be removed. The compost within the socks may be used during cleanup as a vegetative growth medium in accordance with the site stabilization plan.



Figure 5.25
Pipe Outlet Sediment Trap: ST-I

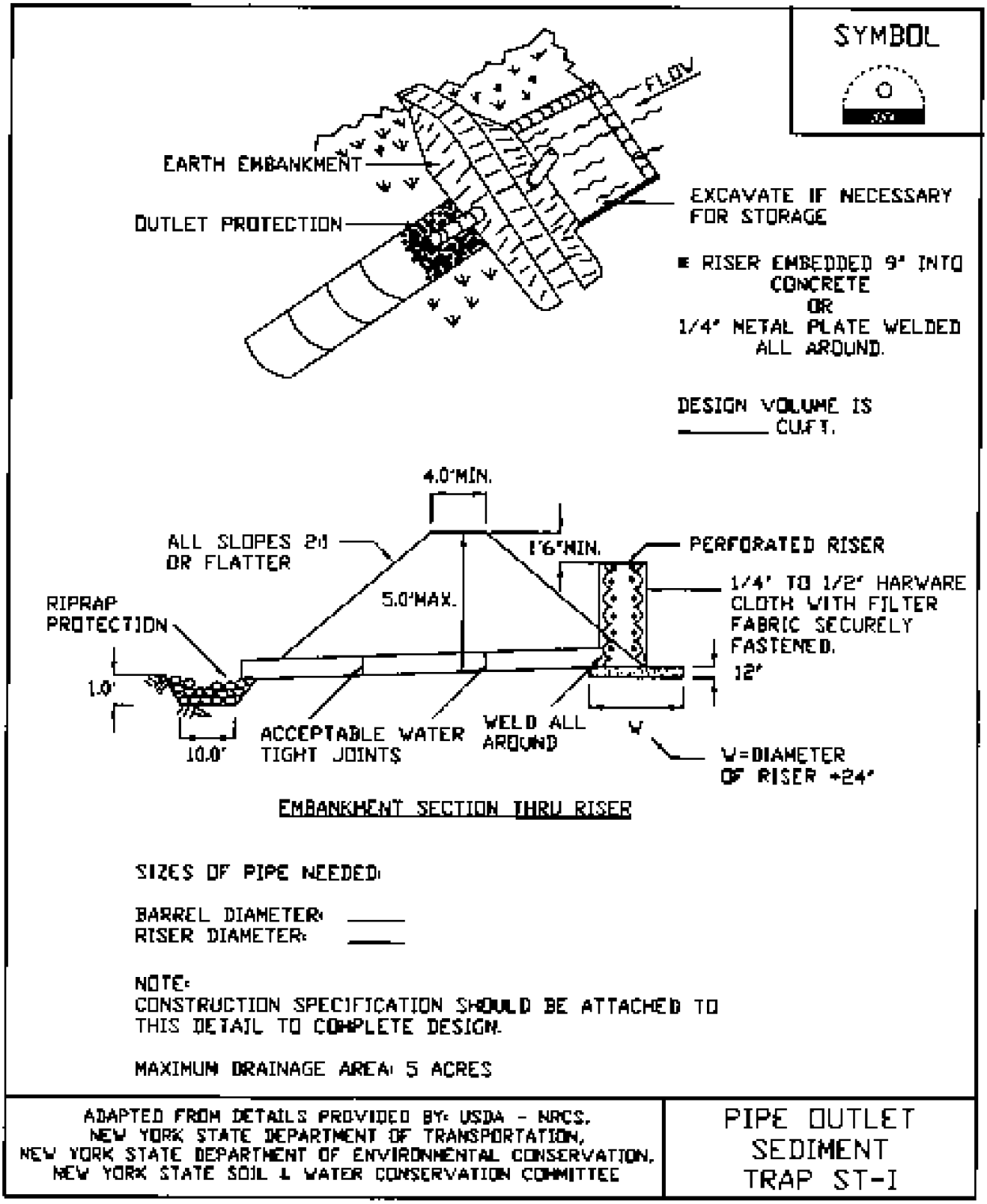


Figure 5.26
Pipe Outlet Sediment Trap: ST-I - Construction Specifications

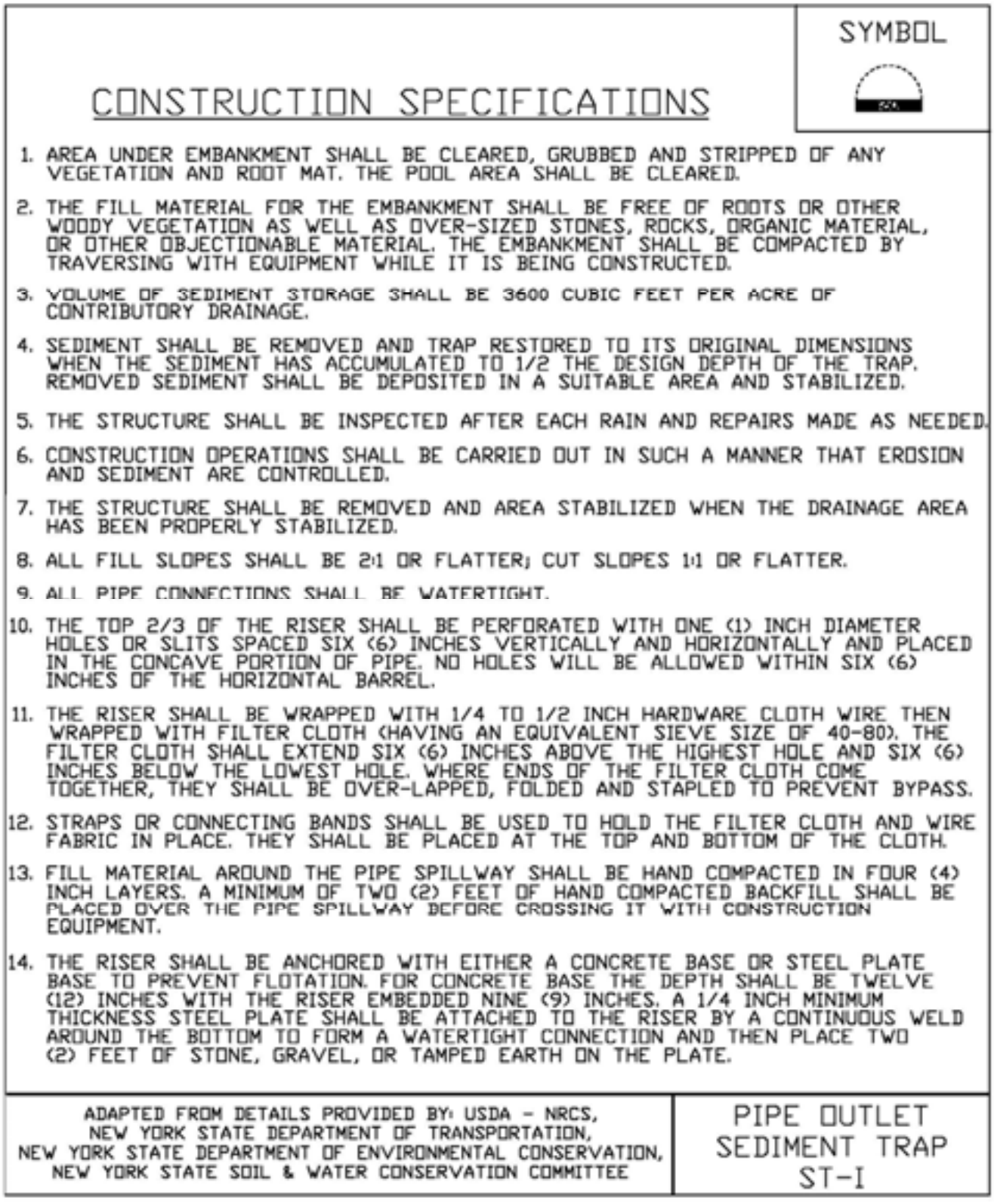
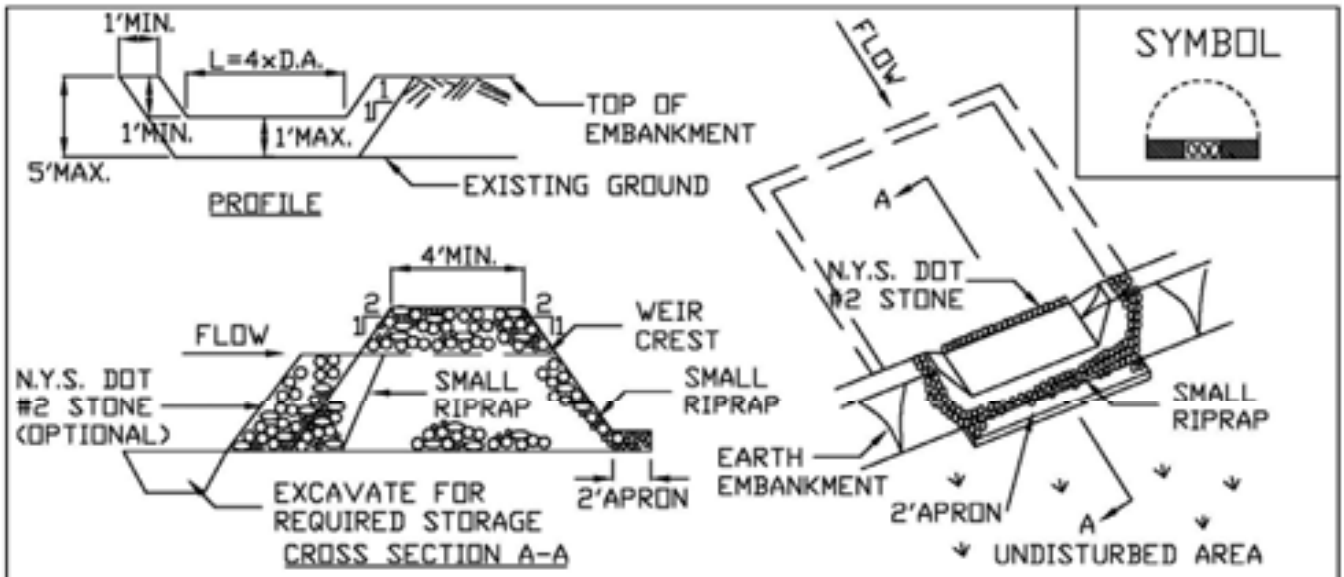


Figure 5.27
Stone Outlet Sediment Trap: ST-II



OPTION: A ONE FOOT LAYER OF N.Y.S. DOT #2 STONE MAY BE PLACED ON THE UPSTREAM SIDE OF THE RIPRAP INPLACE OF THE EMBEDDED FILTER CLOTH.

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIPRAP 4"-8" ALONG WITH A 1' THICKNESS OF 2" AGGREGATE PLACED ON THE UP-GRADE SIDE ON THE SMALL RIPRAP OR EMBEDDED FILTER CLOTH IN THE RIPRAP.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. IT SHALL BE PLACED ON SITE AND STABILIZED.
6. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
8. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

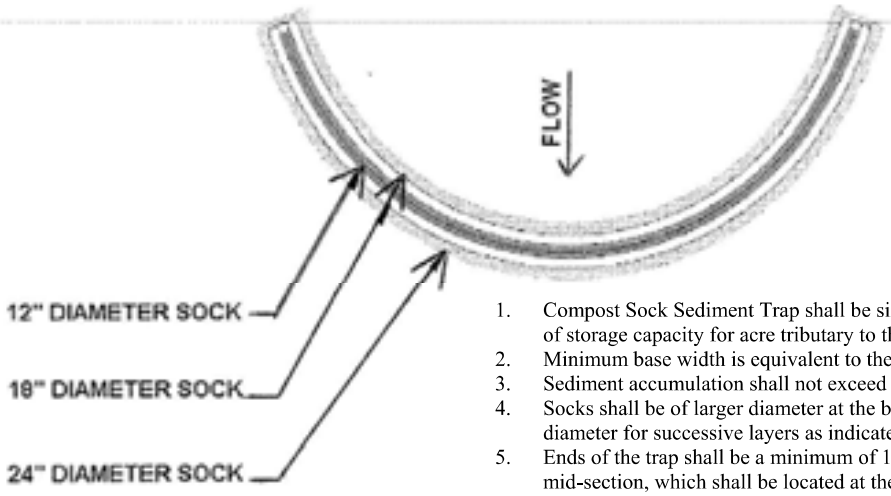
MAXIMUM DRAINAGE AREA 5 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STONE OUTLET SEDIMENT TRAP ST-II

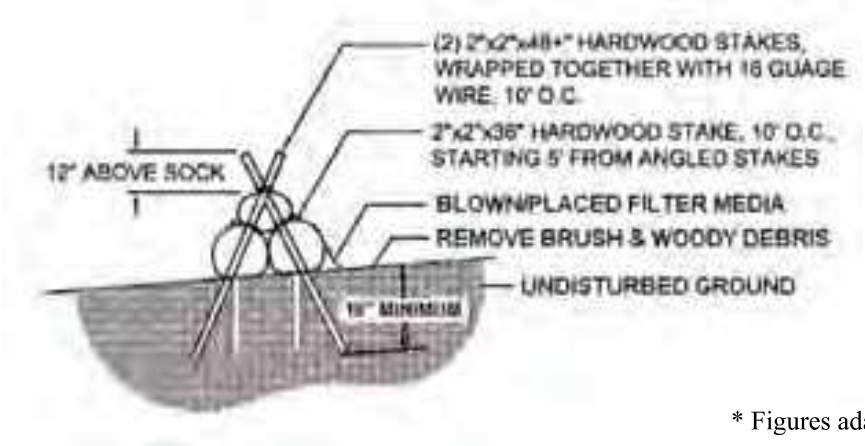
Figure 5.28
Compost Filter Sock Sediment Trap: ST-III

Plan View



1. Compost Sock Sediment Trap shall be sized to provide 3,600 cubic feet of storage capacity for acre tributary to the trap.
2. Minimum base width is equivalent to the height.
3. Sediment accumulation shall not exceed 1/3 the total height of the trap.
4. Socks shall be of larger diameter at the base of the trap and decrease in diameter for successive layers as indicated to the left.
5. Ends of the trap shall be a minimum of 1 foot higher in elevation that the mid-section, which shall be located at the point of discharge.

Staking Detail



* Figures adapted from Filtrexx

Specifications:

1. Sock infill and filter media material shall meet the standards of Table 5.1 on page 5.8 . Compost shall meet the compost filter sock standard of Table 5.2 on page 5.8.

2. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form as shown above. Minimum trap height is one 24 inch diameter sock. Additional storage may be provided by means of an excavated sump 12 inches deep extending 1 to 3 feet upslope of the socks along the lower side of the trap.

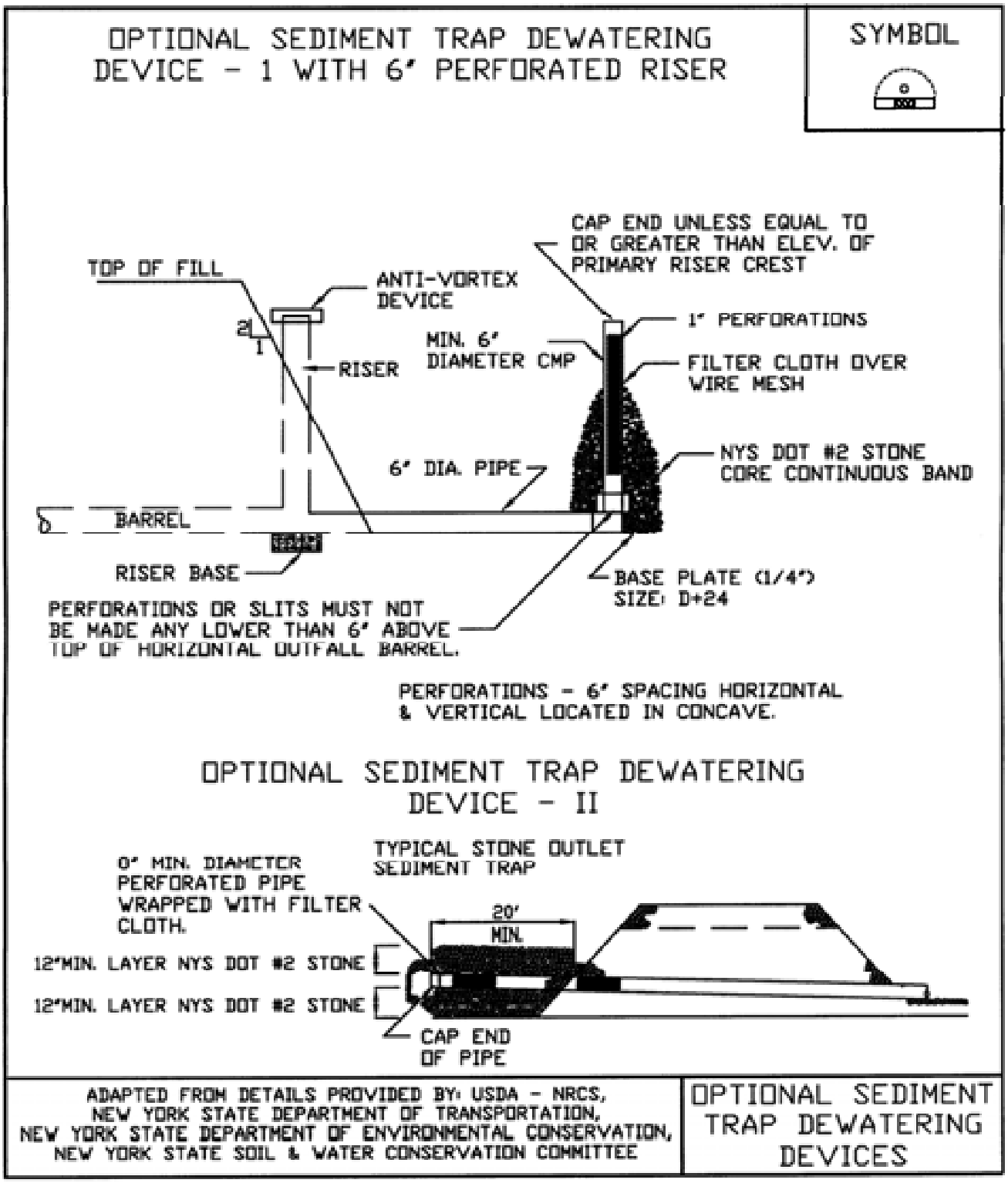
3. Compost sock sediment traps shall provide 3,600 cubic feet storage capacity with 12 inches of freeboard for each tributary drainage acreage. (See manufacturer for anticipated settlement.)

4. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required.

5. Compost sock sediment traps shall be inspected weekly and after each runoff event. Sediment shall be removed when it reaches 1/3 the height of the socks.

6. Photodegradable and biodegradable socks shall not be used for more than 1 year.

Figure 5.29
Optional Sediment Trap Dewatering Devices
for Traps with <5 Acres Drainage Area



STANDARD AND SPECIFICATIONS FOR SILT FENCE



Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and
2. Maximum ponding depth of 1.5 feet behind the fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.
2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.
3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

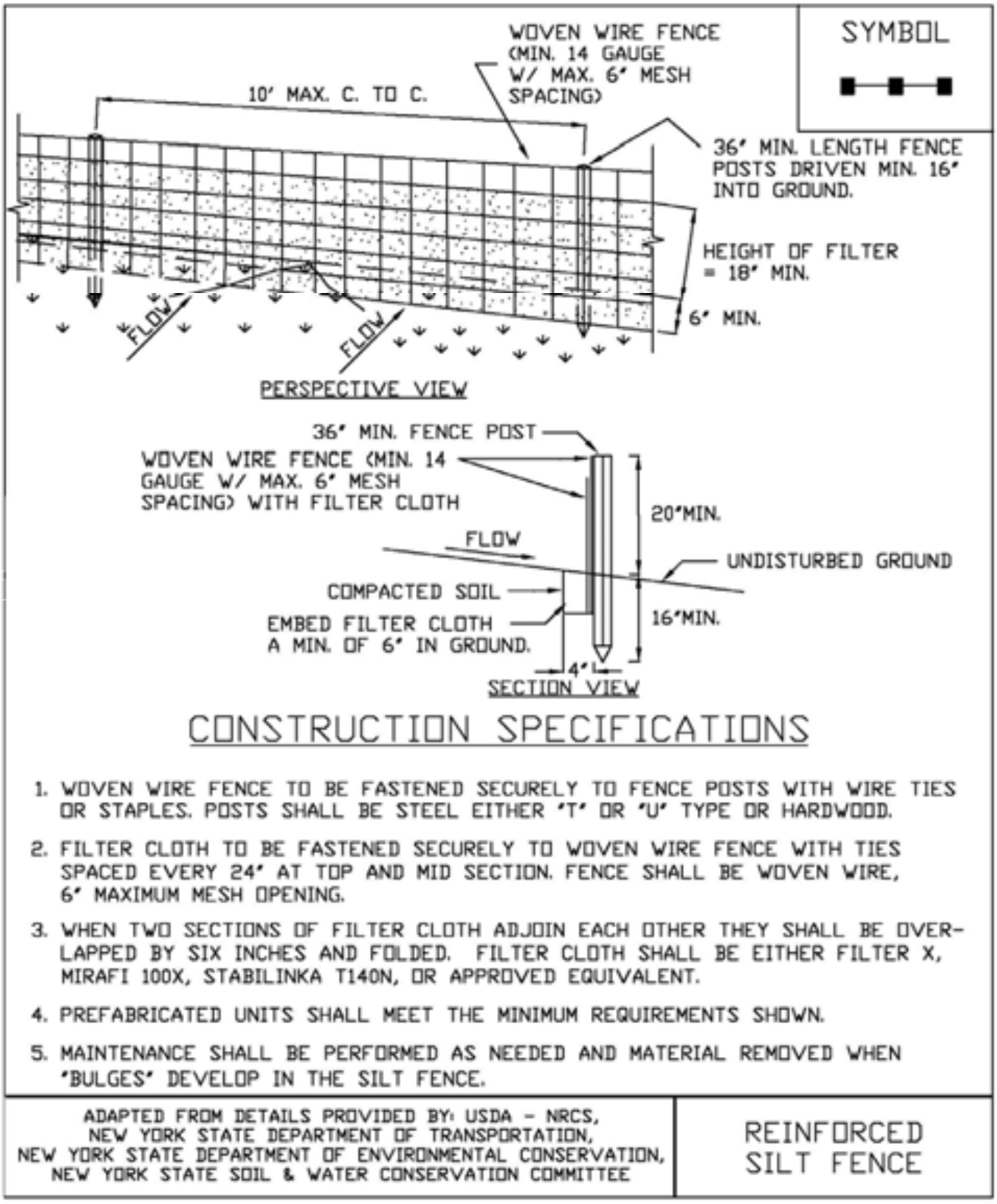
Reinforced Silt Fence



Super Silt Fence



Figure 5.30
Reinforced Silt Fence



STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION



Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.



Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for "Particle Size" 100% will pass the 1/2" sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**



2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

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

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per "Deep Ripping and De-compaction, DEC 2008".

STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION



Definition & Scope

A **temporary** barrier with low permeability, installed around inlets in the form of a fence, berm or excavation around an opening, detaining water and thereby reducing the sediment content of sediment laden water by settling thus preventing heavily sediment laden water from entering a storm drain system.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This practice shall be used with an upstream buffer strip if placed at a storm drain inlet on a paved surface. It may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are five (5) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Paved Surface Inlet Protection
V. Manufactured Insert Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. Erosion control/temporary stabilization measures must be implemented on the disturbed drainage area tributary to the inlet. The crest elevations of these practices shall provide storage and minimize bypass flow.

Type I – Excavated Drop Inlet Protection

This practice is generally used during initial overlot grading after the storm drain trunk line is installed.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection



This practice is generally used during final elevation grading phases after the storm drain system is completed.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to

unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

Type III – Stone and Block Drop Inlet Protection

This practice is generally used during the initial and intermediate overlot grading of a construction site.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilize in a manner appropriate to the site.

Type IV – Paved Surface Inlet Protection



This practice is generally used after pavement construction has been done while final grading and soil stabilization is occurring. These practices should be used with upstream buffer strips in linear construction applications, and with temporary surface stabilization for overlot areas, to reduce the sediment load at the practice. This practice includes sand bags, compost filter socks, geo-tubes filled with ballast, and manufactured surface barriers. Pea gravel can also be used in conjunction with these practices to improve performance. When the inlet is not at a low point, and is offset from the pavement or gutter line, protection should be selected and installed so that flows are not diverted around the inlet.



The drainage area should be limited to 1 acre at the drain inlet. All practices will be placed at the inlet perimeter or beyond to maximize the flow capacity of the inlet. Practices shall be weighted, braced, tied, or otherwise anchored to prevent movement or shifting of location on paved surfaces. Traffic safety shall be integrated with the use of this practice. All practices should be marked with traffic safety cones as appropriate. Structure height shall not cause flooding or by-pass flow that would cause additional erosion.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any broken or damaged components should be replaced. Check all materials for proper anchorage and secure as necessary.

Type V - Manufactured Insert Inlet Protection



The drainage area shall be limited to 1 acre at the drain inlet. All inserts will be installed and anchored in accordance with the manufacturers recommendations and design details. The fabric portion of the structure will equal or exceed the performance standard for the silt fence fabric. The inserts will be installed to preserve a minimum of 50 percent of the open, unobstructed design flow area of the storm drain inlet opening to maintain capacity for storm events.

Figure 5.31
Excavated Drop Inlet Protection

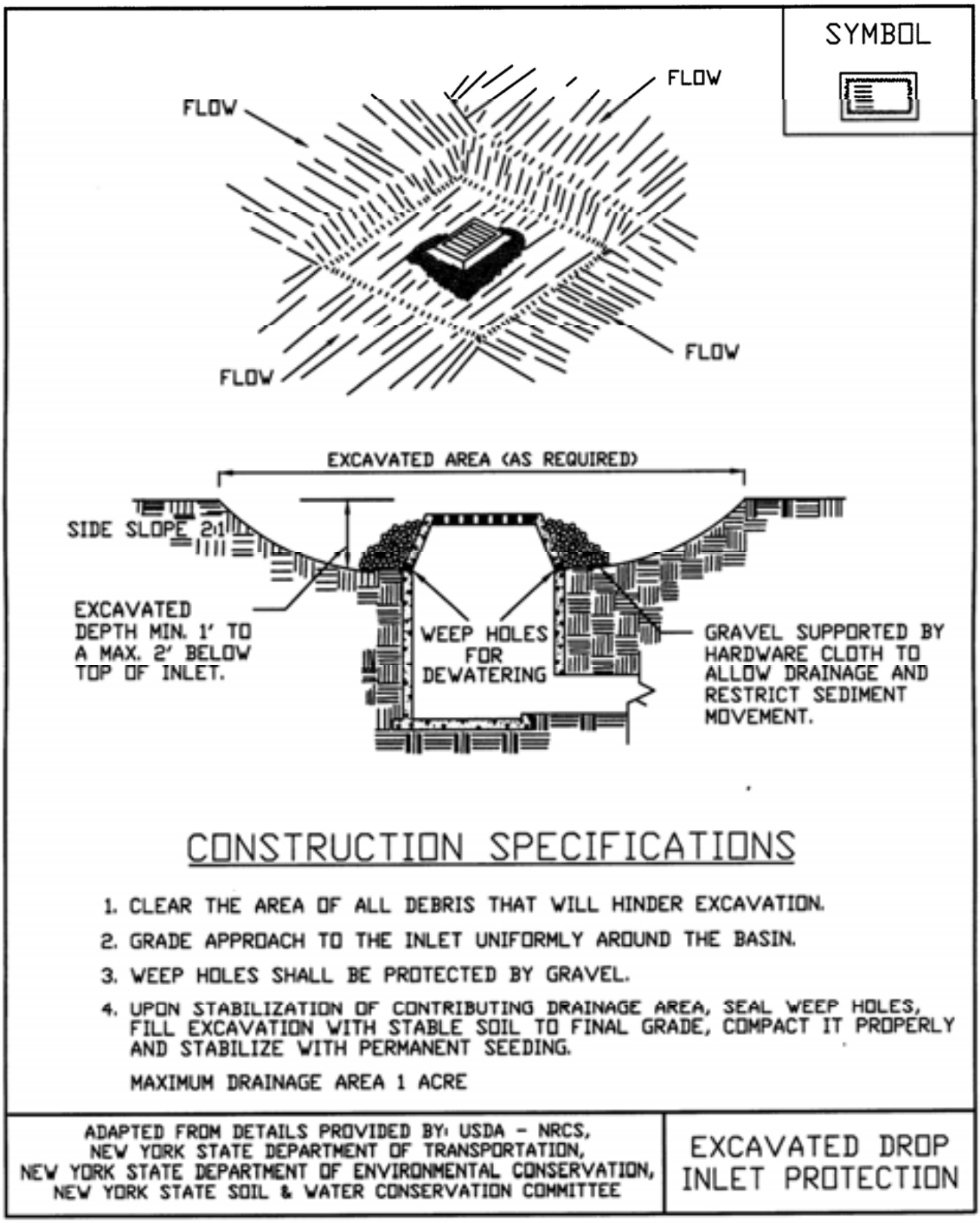


Figure 5.32
Fabric Drop Inlet Protection

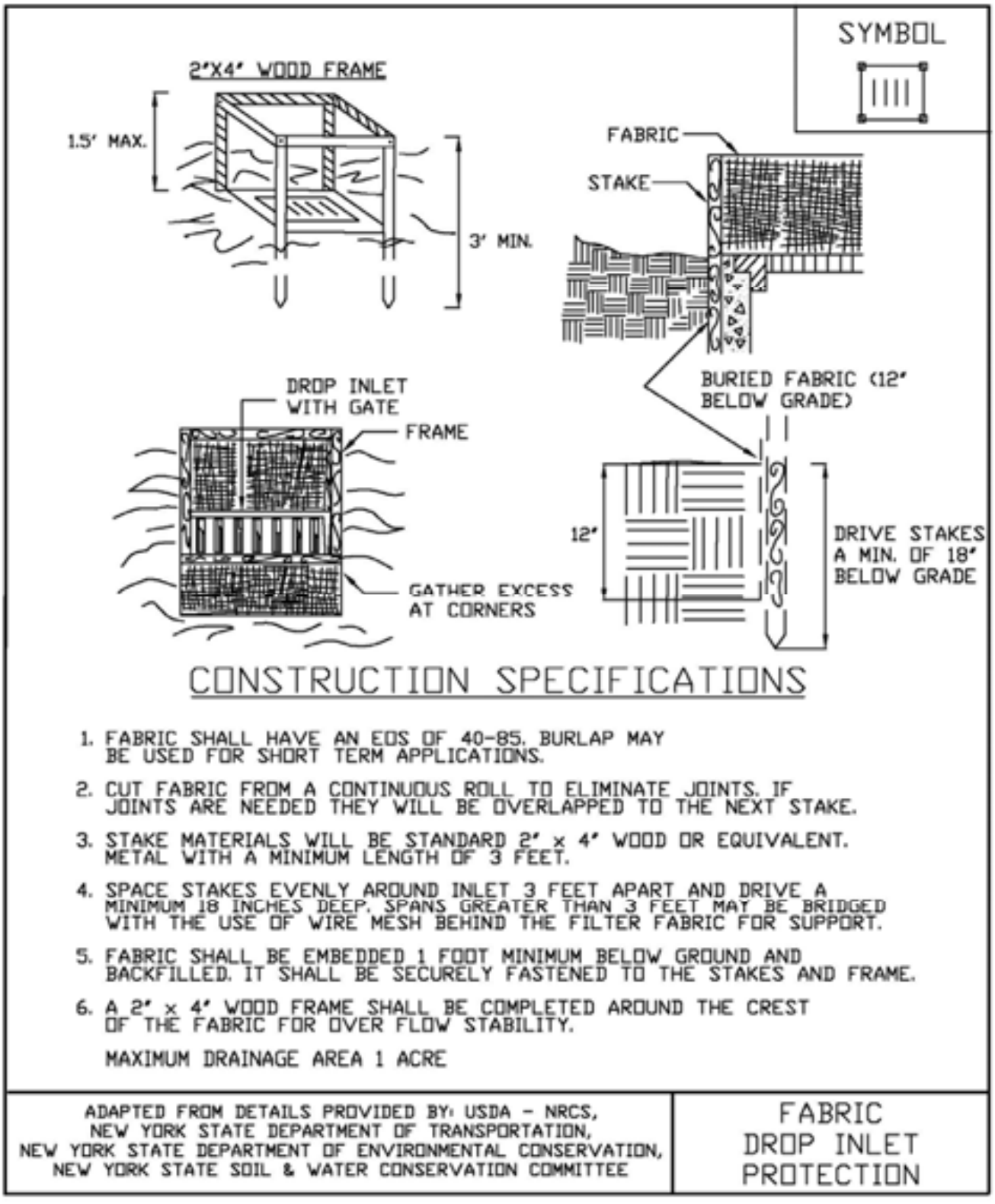
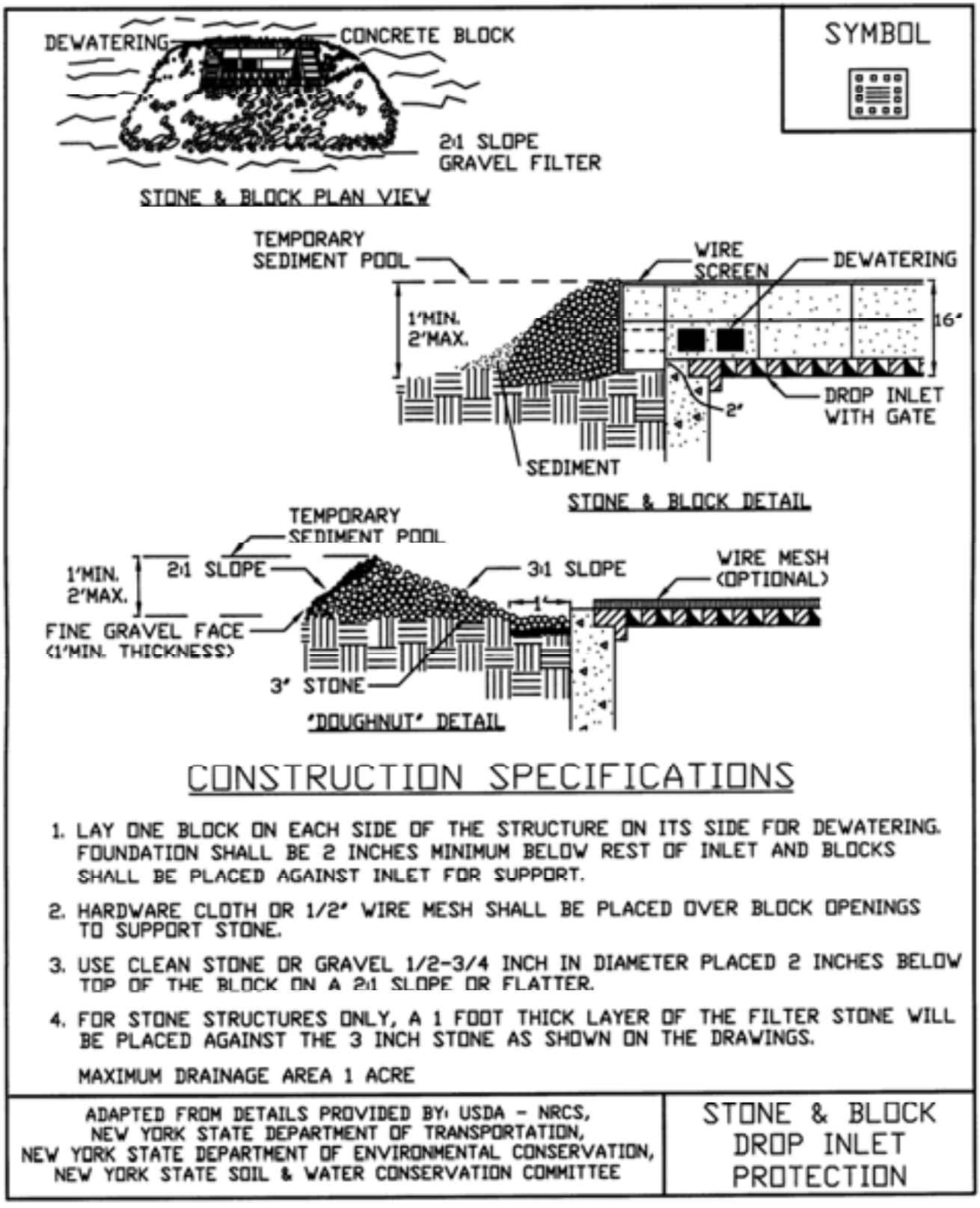


Figure 5.33
Stone & Block Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2-3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STONE & BLOCK DROP INLET PROTECTION

STANDARD AND SPECIFICATIONS FOR SURFACE ROUGHENING



Definition & Scope

Roughening a bare soil surface whether through creating horizontal grooves across a slope, stair-stepping, or tracking with construction equipment to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for trapping of sediment.

Conditions Where Practice Applies

All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1.

Design Criteria

There are many different methods to achieve a roughened soil surface on a slope. No specific design criteria is required. However, the selection of the appropriate method depends on the type of slope. Methods include tracking, grooving, and stair-stepping. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method.

Construction Specifications

1. Cut Slope, No mowing.

   A. Stair-step grade or groove cut slopes with a gradient steeper than 3:1 (Figure 4.18).

   B. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes of soft rock with some soil are particularly suited to stair-step grading.

   C. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" to the vertical wall.

   D. Do not make vertical cuts more than 2 feet in soft materials or 3 feet in rocky materials.

Grooving uses machinery to create a series of ridges and depressions that run perpendicular to the slope following the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.

2. Fill Slope, No mowing

   A. Place fill to create slopes with a gradient no steeper than 2:1 in lifts 9 inches or less and properly compacted. Ensure the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep. Use grooving as described above to roughen the slope, if necessary.

   B. Do not back blade or scrape the final slope face.

3. Cuts/Fills, Mowed Maintenance

   A. Make mowed slopes no steeper than 3:1.

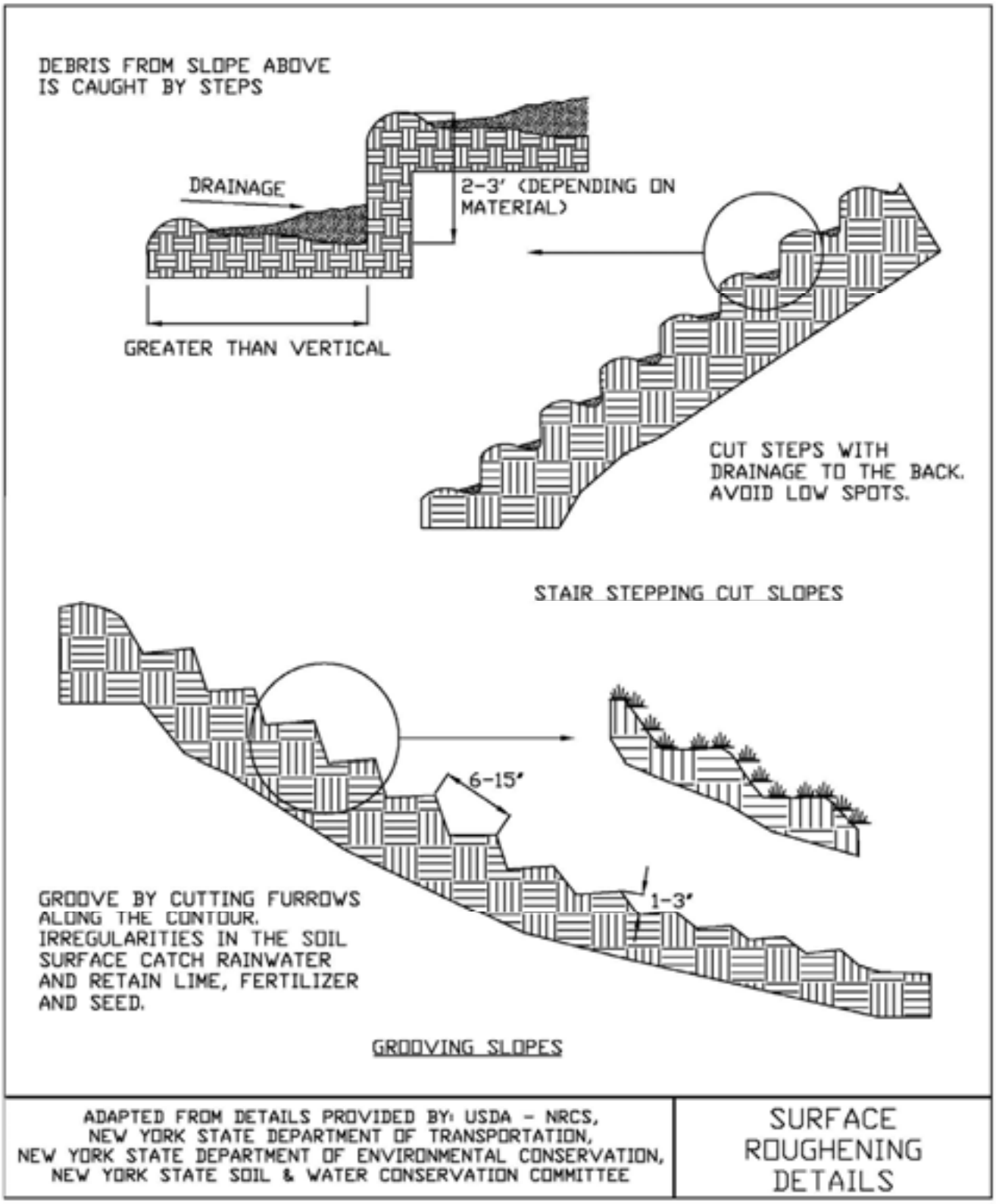
   B. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of such tillage equipment on the contour.

   C. Make grooves at least 1 inch deep and a maximum of 10 inches apart.

   D. Excessive roughness is undesirable where mowing is planned.

Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described. (It has been used as a method to track down mulch.) Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

Figure 4.18
Surface Roughening



STANDARD AND SPECIFICATIONS FOR TOPSOILING



Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.

2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.

3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.

2. Complete rough grading and final grade, allowing for depth of topsoil to be added.

3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.

4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.

2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.

3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.

4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.

5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.

6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.

2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.

3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

APPENDIX R: SWPPP CHECKLIST

Stormwater Pond/Wetland Operation, Maintenance and Management Inspection Checklist

Project _____
Location: _____
Site Status: _____

Date: _____
Time: _____

Inspector: _____

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Embankment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embankment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6.Pond, toe & chimney drains clear and functioning		
7.Seeps/leaks on downstream face		
8.Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam “As-Built”		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
10. Emergency spillway clear of obstructions and debris		
11. Other (specify)		
2. Riser and principal spillway (Annual)		
Type: Reinforced concrete _____ Corrugated pipe _____ Masonry _____ 1. Low flow orifice obstructed		
2. Low flow trash rack. a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation insider riser		
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Pond drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
10. Other (specify)		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
3. Permanent Pool (Wet Ponds) (monthly)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays		
1.Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Pond Areas		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low flow channels clear of obstructions		
5. Standing water or wet spots		
6. Sediment and / or trash accumulation		
7. Other (specify)		
6. Condition of Outfalls (Annual , After Major Storms)		
1. Riprap failures		
2. Slope erosion		
3. Storm drain pipes		
4.Endwalls / Headwalls		
5. Other (specify)		
7. Other (Monthly)		
1. Encroachment on pond, wetland or easement area		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes.		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Wetland Vegetation (Annual)		
1. Vegetation healthy and growing Wetland maintaining 50% surface area coverage of wetland plants after the second growing season. (If unsatisfactory, reinforcement plantings needed)		
2. Dominant wetland plants: Survival of desired wetland plant species Distribution according to landscaping plan?		
3. Evidence of invasive species		
4. Maintenance of adequate water depths for desired wetland plant species		
5. Harvesting of emergent plantings needed		
6. Have sediment accumulations reduced pool volume significantly or are plants “choked” with sediment		
7. Eutrophication level of the wetland.		
8. Other (specify)		

Comments:

Actions to be Taken:

Bioretention Operation, Maintenance and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Monthly)		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Monthly)		
Dewaters between storms		
No evidence of standing water		
5. Sediment Deposition (Annual)		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual)		
Filter bed has not been blocked or filled inappropriately		

Comments:

Actions to be Taken: