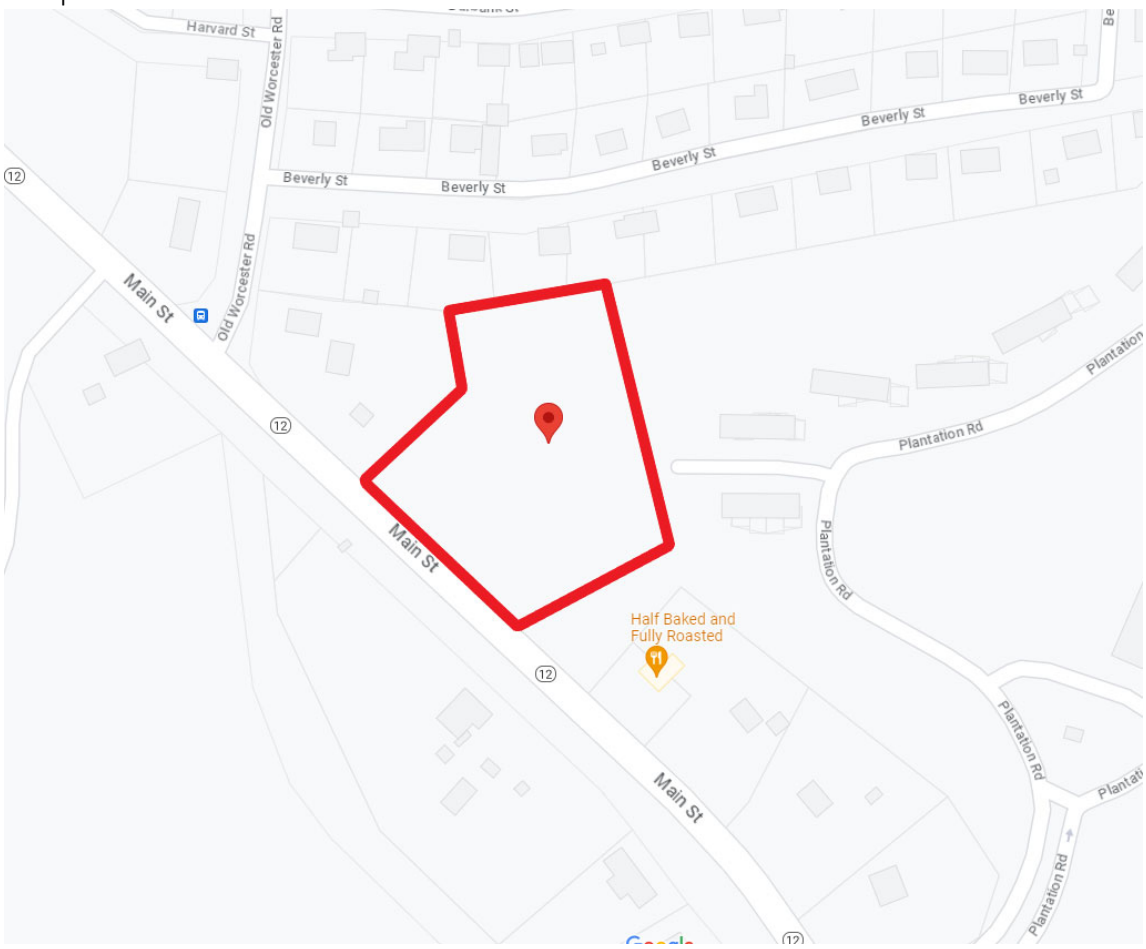
Stormwater Management Report

Date: June 26, 2023

Project: 3-Story Apartment Building
580 Main Street
Oxford, MA 01540

Prepared For: Ansari Builders
6 Edgewood Road
Westborough, MA 01581

Locus Map:



LAND DESIGN COLLABORATIVE

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Stormwater quality and quantity calculations have been performed for 580 Main Street (The Property) to demonstrate compliance with the MassDEP Stormwater Standards, as enumerated in the Wetland Protection Regulations (310 CMR 10) and Town of Oxford Local Stormwater Management Bylaws and Regulations.

The Property is located on and has access to/from Main Street and is situated between existing development land. The Property is south of Old Worcester Road, west of Beverly Street, east of Main Street, and north of a commercial property and a multi-family development (Plantation Road). The Property is currently undeveloped and owned by Ansari Builders (the Applicant). The French River is roughly a quarter mile west of the Property and Wellington Brook is roughly a quarter mile south of the Property.

The existing topography on site falls east to west and generally drains overland to a low area adjacent to Main Street, with a culvert near the northwest corner of the lot at Main Street. The Hodges Village Dam Flood Risk Management Project abuts the site, with a portion of their perpetual "flowage easement" (land at or below elevation 504) falling on the front of the Property. The US Army Corps of Engineers (ACE) has allowed the Applicant to build within the easement but to keep any "habitable dwelling" above and outside of the easement. Soils are mapped as Canton Fine Sandy Loam (HSG B) near the upper, northeastern part of the Property, and Merrimac Fine Sandy Loam and Udorthents (both HSG A) covering most of the Property. There are no FEMA flood zones (FIRM 25027C0813F) or areas of Natural Heritage & Endangered Species Program (NHESP) jurisdiction on the Property. An NHESP priority habitat (PH-926) is located west of Main Street (per MassMapper NHESP data layers).

The Applicant intends to develop the Property with a multi-story apartment complex with required parking, utility, and drainage infrastructure (the Project). Access to the site will be from the Property's frontage on Main Street. This will result in a crossing of the US ACE "flowage easement". As part of the US ACE approval for work in the "flowage easement", any volume below the 504' elevation required to build and install the road must be replicated and replaced on site to provide equivalent volume to that which exists.

This Report contains:

A) MassDEP Stormwater Management Checklist

B) Existing and Proposed Hydrologic Calculations (MassDEP Standards 1 & 2)

C) Water Quality Calculations (MassDEP Standards 3, 4, 5, 6 & 7)

D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, Long-Term Operations & Maintenance Plan, and Illicit Discharge Statement (MassDEP Standards 8, 9 & 10)

E) Soils Information

F) FEMA Map

G) Existing Hydrology Map

H) Proposed Hydrology Map

Chauncy Place | 45 Lyman Street | Terrace North | Suite 1
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508 952 6300 | LDCollaborative.com

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A) MassDEP Stormwater Management Checklist (8 pages)

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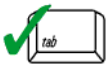
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date 6-20-2023

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

B) Pre- and Post-Development Hydrologic Calculations (Standards 1 & 2)

Standard 1)

The stormwater system has been designed to mimic existing conditions and infiltrate runoff during the 2-, 10- & 100-year storm events, collecting, treating, and discharging stormwater into the lower portion of the site. The proposed drainage system will mitigate water quality and quantity to match the existing conditions in that stormwater will be collected, treated, and discharged to the newly graded low portion of the site where surface infiltration will occur. Runoff from paved areas will be pretreated as required and the roof drains will discharge to the low point via a pipe, which will discharge through the retaining wall.

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Standard 2)

The Project results in new impervious surfaces. The proposed stormwater management system has been designed to mitigate stormwater runoff rates for the required storm events (refer to HydroCAD calculations), as summarized below.

EXXX Y	Existing Conditions Features where "E" designates "Existing"; XXX designates the area or feature "name"; and Y designates the feature - a sub-catchment "S", a basin/depression/pond/ "P", a conveyance/reach "R", or a point of interest/summation point/link "L"
PXXX- Y	Proposed Conditions Features where "P" designates "Proposed"; XXX designates area or feature "name"; and Y designates the feature - a sub-catchment "S", a basin/depression/pond/ "P", a conveyance/reach "R", or a point of interest/summation point/link "L"

Rates			
Point of Interest	Storm Event / Runoff (cubic feet/second)		
	2-Year	10-Year	100-Year
E100 P	0.00	0.00	0.00
P100 P	0.00	0.00	0.00

Volumes			
Point of Interest	Storm Event / Runoff (cubic feet)		
	2-Year	10-Year	100-Year
E100 P	0.00	0.00	0.00
P100 P	0.00	0.00	0.00

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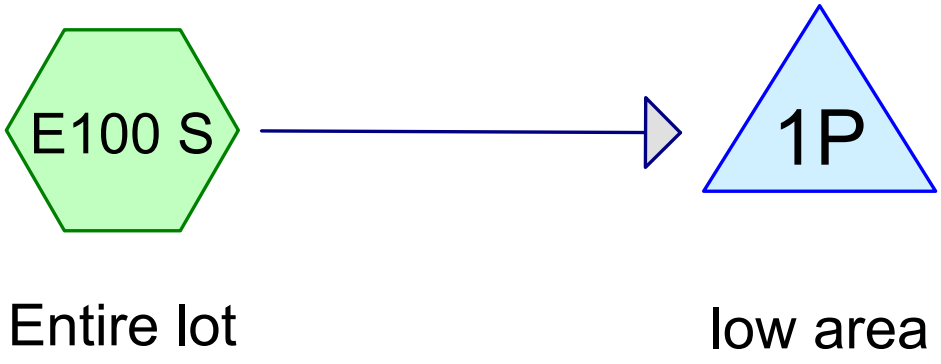


Subcat Reach Pond Link

Routing Diagram for 20-0017 EXISTING
Prepared by Land Design Collaborative

Project Notes

Rainfall events imported from "LDC.hcp"
Rainfall events imported from "LDC.hcp"

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
106,124	HSG A	E100 S
13,023	HSG B	E100 S
0	HSG C	
0	HSG D	
0	Other	
119,147		**TOTAL AREA**

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 E100 S: Entire lot Runoff Area=119,147 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=345' Tc=23.3 min CN=33 Runoff=0.00 cfs 0 cf

Pond 1P: low area Peak Elev=496.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Discarded=0.00 cfs 0 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf

Total Runoff Area = 119,147 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 119,147 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E100 S: Entire lot

[45] Hint: Runoff=Zero

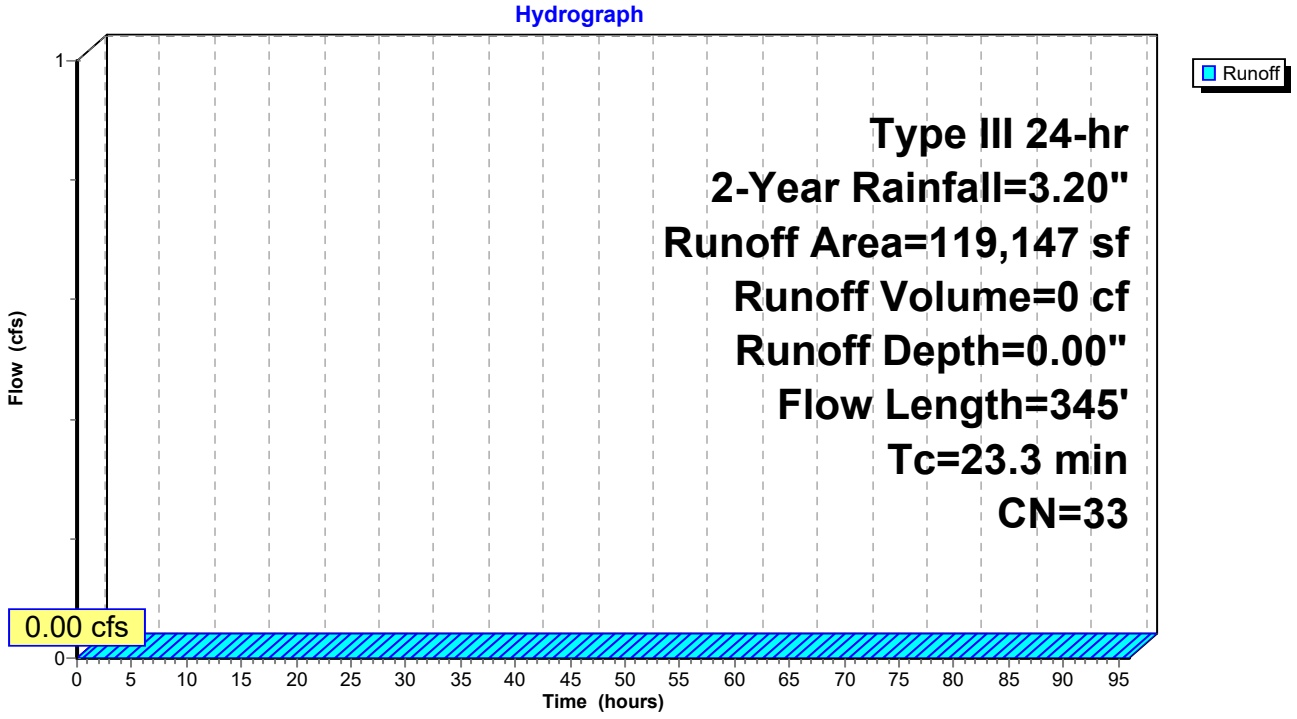
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 1P : low area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
106,124	30	Woods, Good, HSG A
13,023	55	Woods, Good, HSG B
119,147	33	Weighted Average
119,147		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		**Sheet Flow, Upper** Woods: Dense underbrush n= 0.800 P2= 3.20"
5.0	295	0.0380	0.97		**Shallow Concentrated Flow, lower** Woodland Kv= 5.0 fps
23.3	345	Total			

Subcatchment E100 S: Entire lot



Summary for Pond 1P: low area

Inflow Area = 119,147 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.00' @ 0.00 hrs Surf.Area= 6,265 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	404,234 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

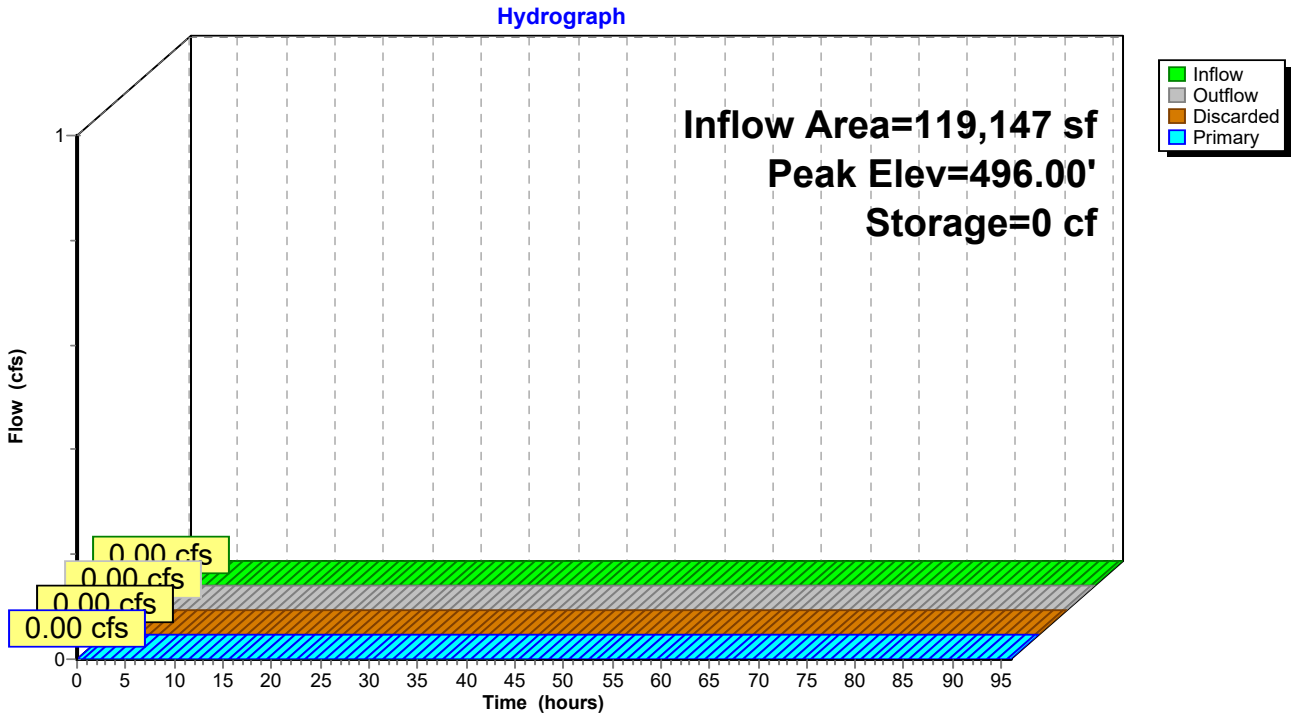
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
496.00	6,265	0	0	6,265
498.00	23,178	27,662	27,662	23,203
500.00	52,952	74,109	101,771	53,017
502.00	75,109	127,417	229,188	75,265
504.00	100,554	175,045	404,234	100,820

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**2=Exfiltration** (Passes 0.00 cfs of 0.35 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**1=Culvert** (Controls 0.00 cfs)

Pond 1P: low area



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 E100 S: Entire lot Runoff Area=119,147 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=345' Tc=23.3 min CN=33 Runoff=0.01 cfs 258 cf

Pond 1P: low area Peak Elev=496.00' Storage=12 cf Inflow=0.01 cfs 258 cf
Discarded=0.01 cfs 258 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 258 cf

Total Runoff Area = 119,147 sf Runoff Volume = 258 cf Average Runoff Depth = 0.03"
100.00% Pervious = 119,147 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E100 S: Entire lot

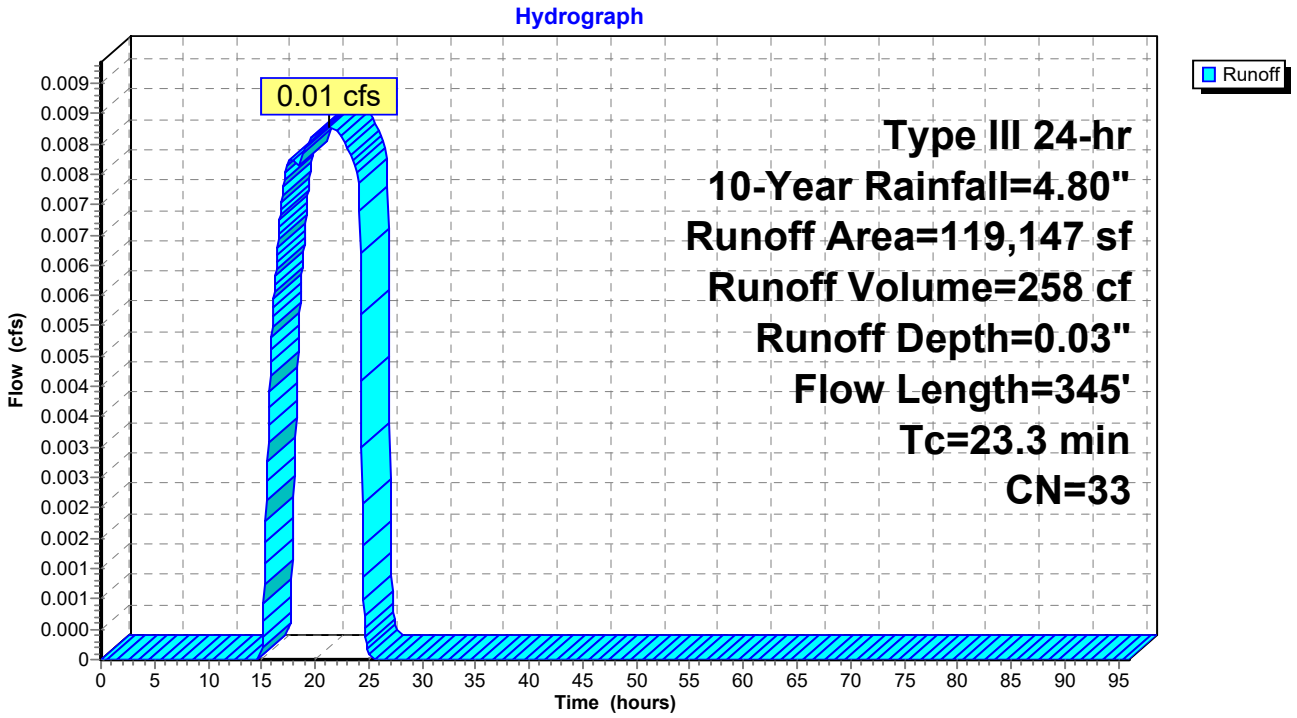
Runoff = 0.01 cfs @ 21.26 hrs, Volume= 258 cf, Depth= 0.03"
Routed to Pond 1P : low area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
106,124	30	Woods, Good, HSG A
13,023	55	Woods, Good, HSG B
119,147	33	Weighted Average
119,147		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		**Sheet Flow, Upper** Woods: Dense underbrush n= 0.800 P2= 3.20"
5.0	295	0.0380	0.97		**Shallow Concentrated Flow, lower** Woodland Kv= 5.0 fps
23.3	345	Total			

Subcatchment E100 S: Entire lot



Summary for Pond 1P: low area

Inflow Area = 119,147 sf, 0.00% Impervious, Inflow Depth = 0.03" for 10-Year event
Inflow = 0.01 cfs @ 21.26 hrs, Volume= 258 cf
Outflow = 0.01 cfs @ 21.61 hrs, Volume= 258 cf, Atten= 0%, Lag= 21.2 min
Discarded = 0.01 cfs @ 21.61 hrs, Volume= 258 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.00' @ 21.61 hrs Surf.Area= 6,276 sf Storage= 12 cf

Plug-Flow detention time= 23.0 min calculated for 258 cf (100% of inflow)
Center-of-Mass det. time= 23.1 min (1,229.1 - 1,206.1)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	404,234 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

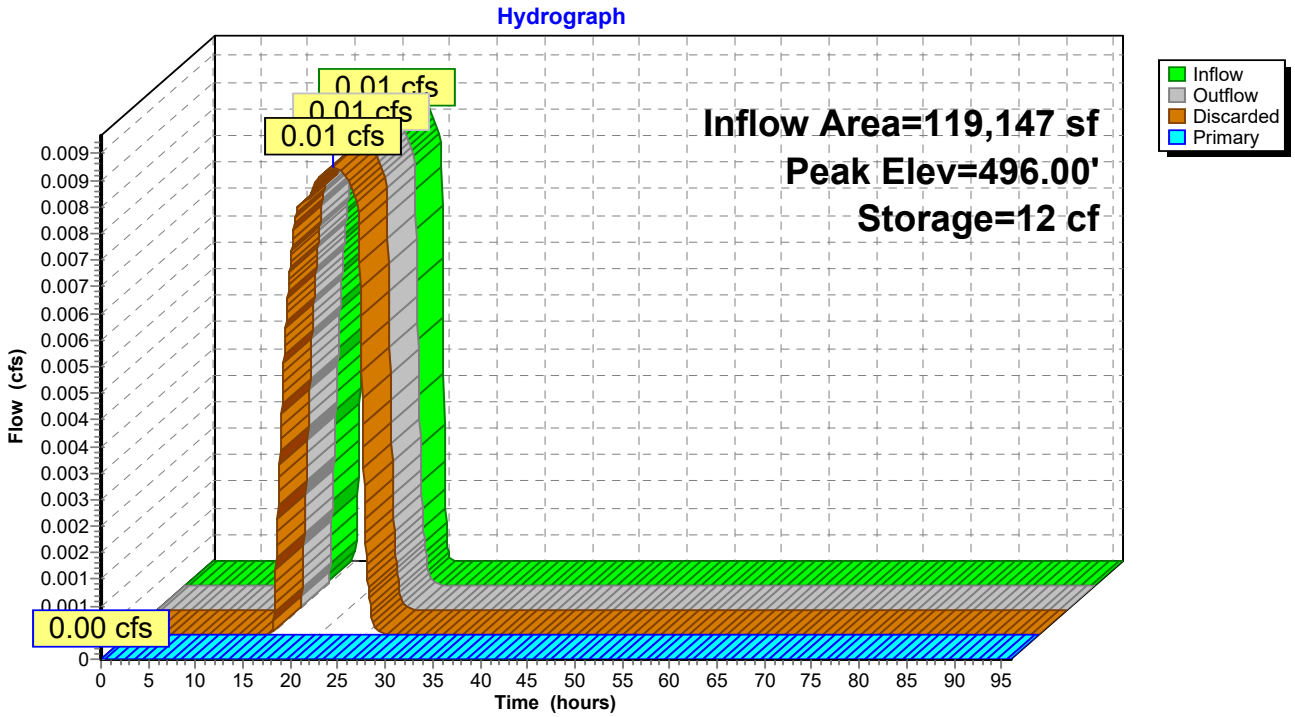
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
496.00	6,265	0	0	6,265
498.00	23,178	27,662	27,662	23,203
500.00	52,952	74,109	101,771	53,017
502.00	75,109	127,417	229,188	75,265
504.00	100,554	175,045	404,234	100,820

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.35 cfs @ 21.61 hrs HW=496.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.35 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 1P: low area



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 E100 S: Entire lot Runoff Area=119,147 sf 0.00% Impervious Runoff Depth=0.37"
Flow Length=345' Tc=23.3 min CN=33 Runoff=0.22 cfs 3,691 cf

Pond 1P: low area Peak Elev=496.04' Storage=224 cf Inflow=0.22 cfs 3,691 cf
Discarded=0.17 cfs 3,691 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 3,691 cf

Total Runoff Area = 119,147 sf Runoff Volume = 3,691 cf Average Runoff Depth = 0.37"
100.00% Pervious = 119,147 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E100 S: Entire lot

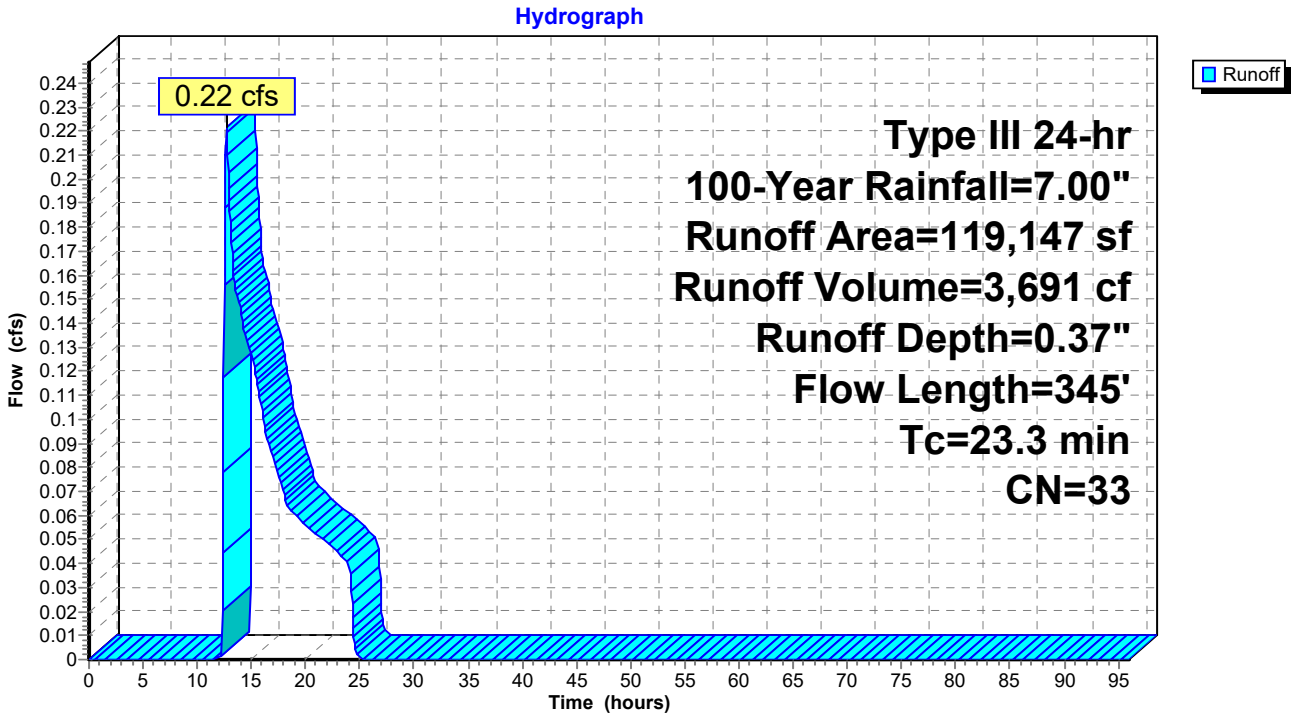
Runoff = 0.22 cfs @ 12.68 hrs, Volume= 3,691 cf, Depth= 0.37"
Routed to Pond 1P : low area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
106,124	30	Woods, Good, HSG A
13,023	55	Woods, Good, HSG B
119,147	33	Weighted Average
119,147		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		**Sheet Flow, Upper** Woods: Dense underbrush n= 0.800 P2= 3.20"
5.0	295	0.0380	0.97		**Shallow Concentrated Flow, lower** Woodland Kv= 5.0 fps
23.3	345	Total			

Subcatchment E100 S: Entire lot



Summary for Pond 1P: low area

Inflow Area = 119,147 sf, 0.00% Impervious, Inflow Depth = 0.37" for 100-Year event
Inflow = 0.22 cfs @ 12.68 hrs, Volume= 3,691 cf
Outflow = 0.17 cfs @ 13.25 hrs, Volume= 3,691 cf, Atten= 25%, Lag= 34.0 min
Discarded = 0.17 cfs @ 13.25 hrs, Volume= 3,691 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.04' @ 13.25 hrs Surf.Area= 6,470 sf Storage= 224 cf

Plug-Flow detention time= 23.2 min calculated for 3,691 cf (100% of inflow)
Center-of-Mass det. time= 23.1 min (1,025.4 - 1,002.4)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	404,234 cf	**Custom Stage Data (Pyramidal)** Listed below (Recalc)

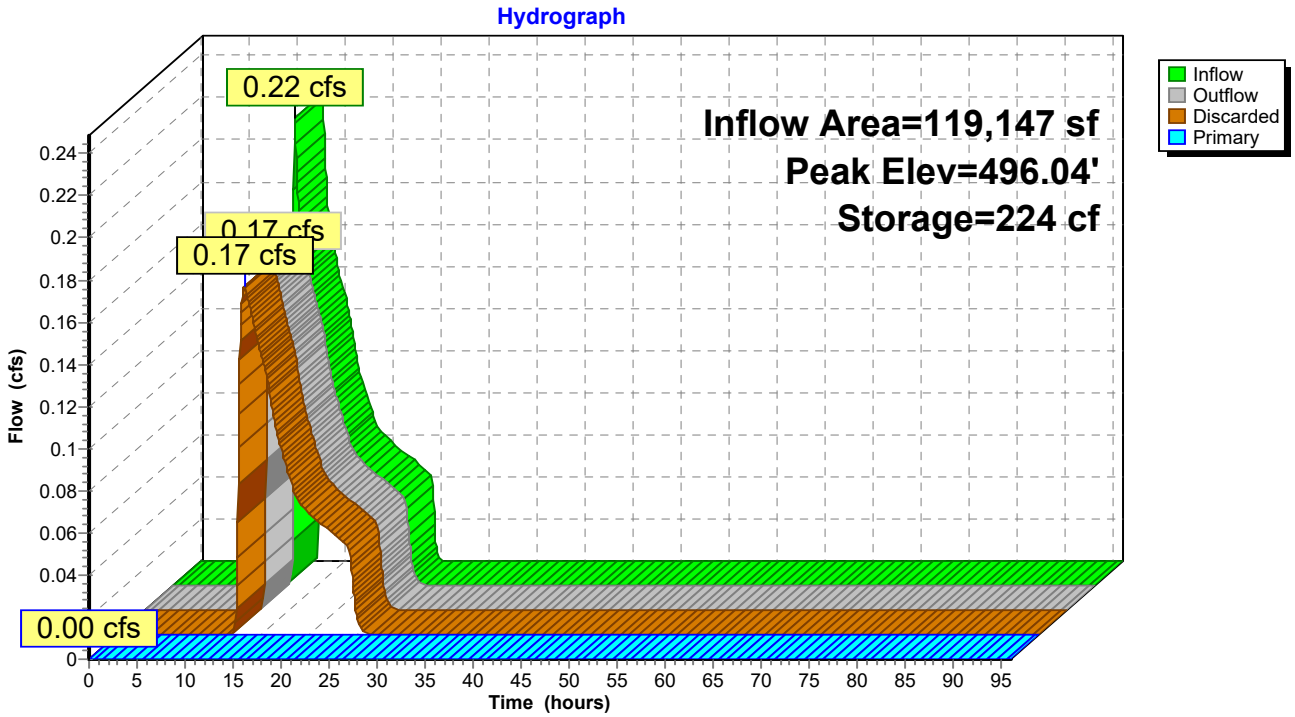
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
496.00	6,265	0	0	6,265
498.00	23,178	27,662	27,662	23,203
500.00	52,952	74,109	101,771	53,017
502.00	75,109	127,417	229,188	75,265
504.00	100,554	175,045	404,234	100,820

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.36 cfs @ 13.25 hrs HW=496.04' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**1=Culvert** (Controls 0.00 cfs)

Pond 1P: low area



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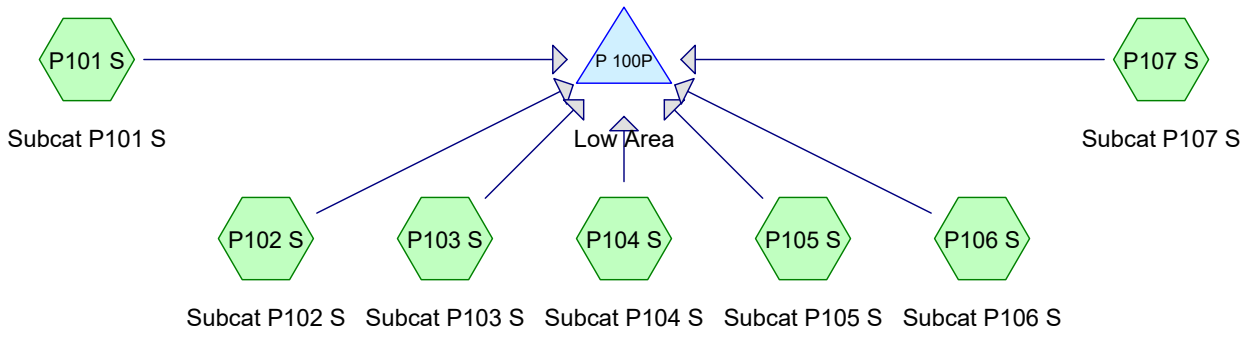


Subcat Reach Pond Link

Routing Diagram for 20-0017 PROPOSED
Prepared by Land Design Collaborative

Project Notes

Rainfall events imported from "LDC.hcp"
Rainfall events imported from "LDC.hcp"

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
106,123	HSG A	P101 S, P102 S, P103 S, P104 S, P105 S, P106 S, P107 S
13,024	HSG B	P101 S, P102 S, P103 S, P104 S
0	HSG C	
0	HSG D	
0	Other	
119,147		**TOTAL AREA**

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 P101 S: Subcat P101 S Runoff Area=47,361 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment P102 S: Subcat P102 S Runoff Area=22,650 sf 74.61% Impervious Runoff Depth=1.76"
Tc=6.0 min CN=85 Runoff=1.05 cfs 3,318 cf

Subcatchment P103 S: Subcat P103 S Runoff Area=4,182 sf 0.00% Impervious Runoff Depth=0.06"
Tc=6.0 min CN=46 Runoff=0.00 cfs 20 cf

Subcatchment P104 S: Subcat P104 S Runoff Area=16,204 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.13 cfs 4,007 cf

Subcatchment P105 S: Subcat P105 S Runoff Area=4,704 sf 77.78% Impervious Runoff Depth=1.76"
Tc=6.0 min CN=85 Runoff=0.22 cfs 689 cf

Subcatchment P106 S: Subcat P106 S Runoff Area=19,559 sf 82.85% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=88 Runoff=1.03 cfs 3,255 cf

Subcatchment P107 S: Subcat P107 S Runoff Area=4,487 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0 cf

Pond P 100P: Low Area Peak Elev=496.17' Storage=2,883 cf Inflow=3.42 cfs 11,289 cf
Discarded=0.98 cfs 11,289 cf Primary=0.00 cfs 0 cf Outflow=0.98 cfs 11,289 cf

Total Runoff Area = 119,147 sf Runoff Volume = 11,289 cf Average Runoff Depth = 1.14"
55.54% Pervious = 66,179 sf 44.46% Impervious = 52,968 sf

Summary for Subcatchment P101 S: Subcat P101 S

[45] Hint: Runoff=Zero

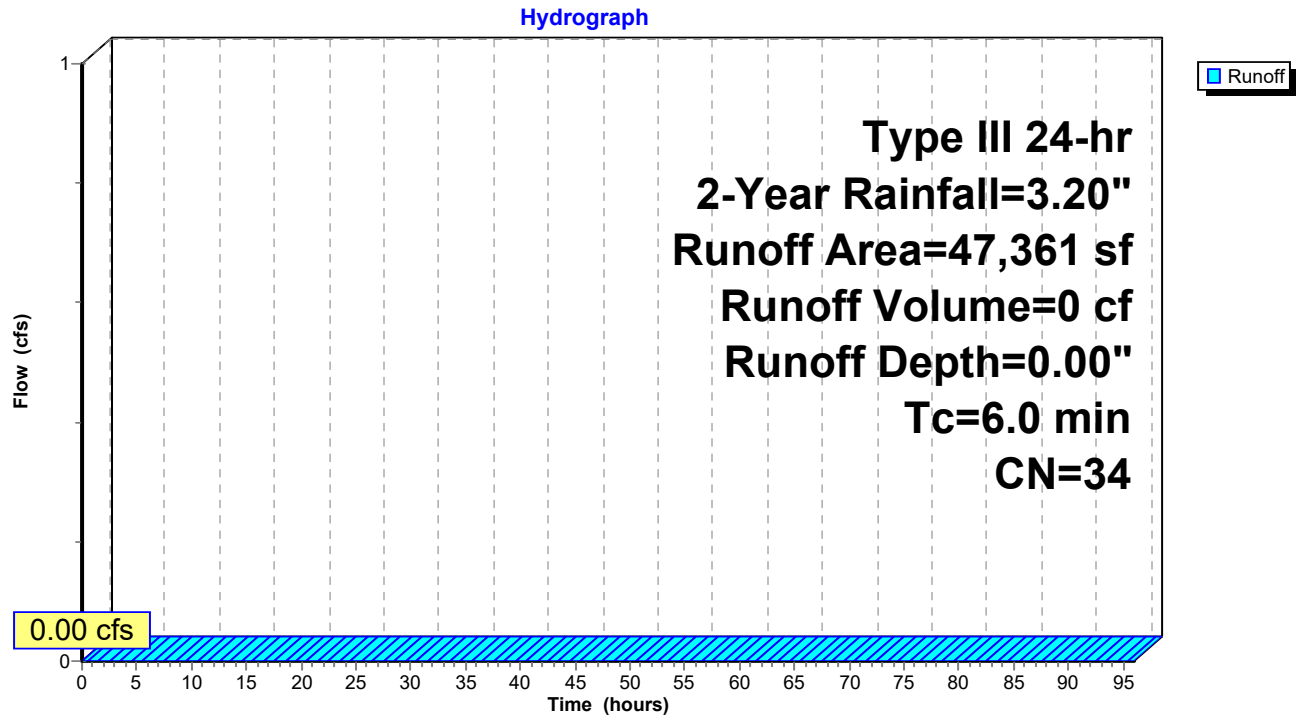
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
305	61	>75% Grass cover, Good, HSG B
27,007	30	Woods, Good, HSG A
0	98	Unconnected pavement, HSG A
20,049	39	>75% Grass cover, Good, HSG A
47,361	34	Weighted Average
47,361		100.00% Pervious Area

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

Subcatchment P101 S: Subcat P101 S



Summary for Subcatchment P102 S: Subcat P102 S

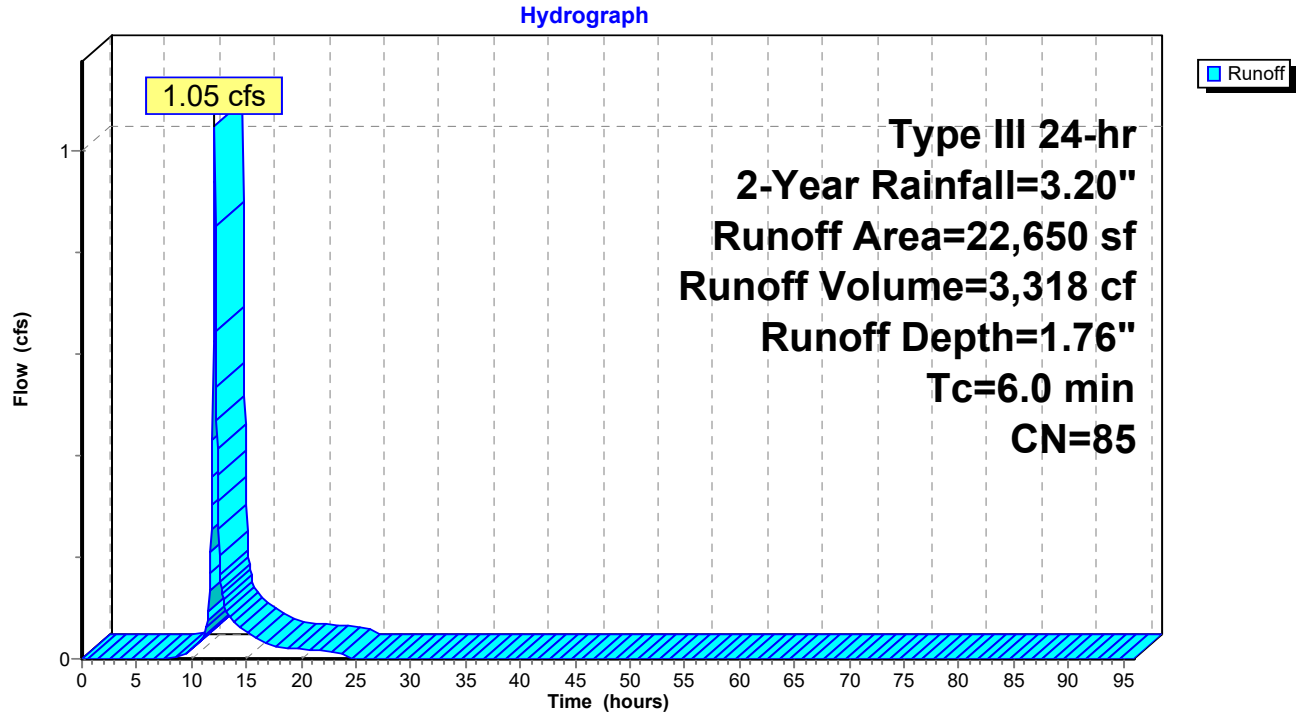
Runoff = 1.05 cfs @ 12.09 hrs, Volume= 3,318 cf, Depth= 1.76"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
9,060	98	Paved parking, HSG A
4,704	98	Paved parking, HSG B
1,699	61	>75% Grass cover, Good, HSG B
958	98	Unconnected pavement, HSG B
2,178	98	Unconnected pavement, HSG A
4,051	39	>75% Grass cover, Good, HSG A
22,650	85	Weighted Average
5,750		25.39% Pervious Area
16,900		74.61% Impervious Area
3,136		18.56% Unconnected

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

Subcatchment P102 S: Subcat P102 S



Summary for Subcatchment P103 S: Subcat P103 S

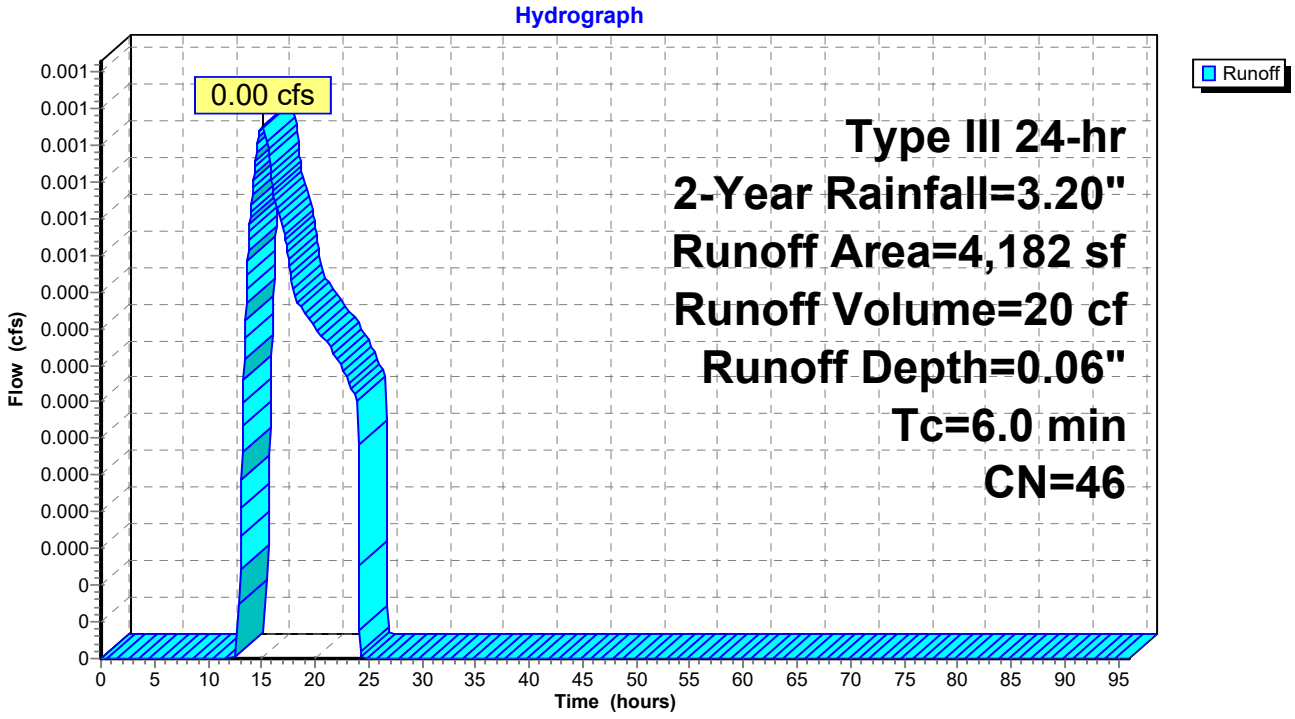
Runoff = 0.00 cfs @ 15.05 hrs, Volume= 20 cf, Depth= 0.06"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
1,525	61	>75% Grass cover, Good, HSG B
0	55	Woods, Good, HSG B
2,134	39	>75% Grass cover, Good, HSG A
523	30	Woods, Good, HSG A
4,182	46	Weighted Average
4,182		100.00% Pervious Area

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

Subcatchment P103 S: Subcat P103 S



Summary for Subcatchment P104 S: Subcat P104 S

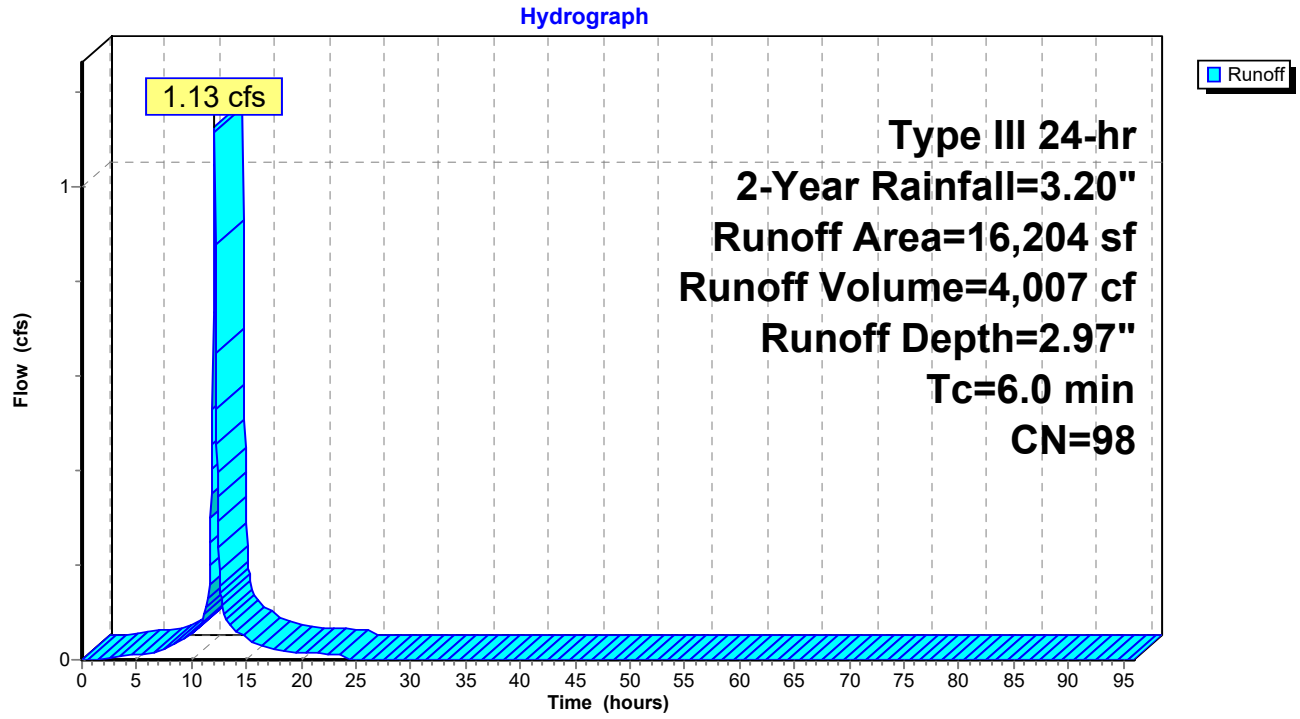
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 4,007 cf, Depth= 2.97"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,833	98	Roofs, HSG B
12,371	98	Roofs, HSG A
16,204	98	Weighted Average
16,204		100.00% Impervious Area

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

Subcatchment P104 S: Subcat P104 S



Summary for Subcatchment P105 S: Subcat P105 S

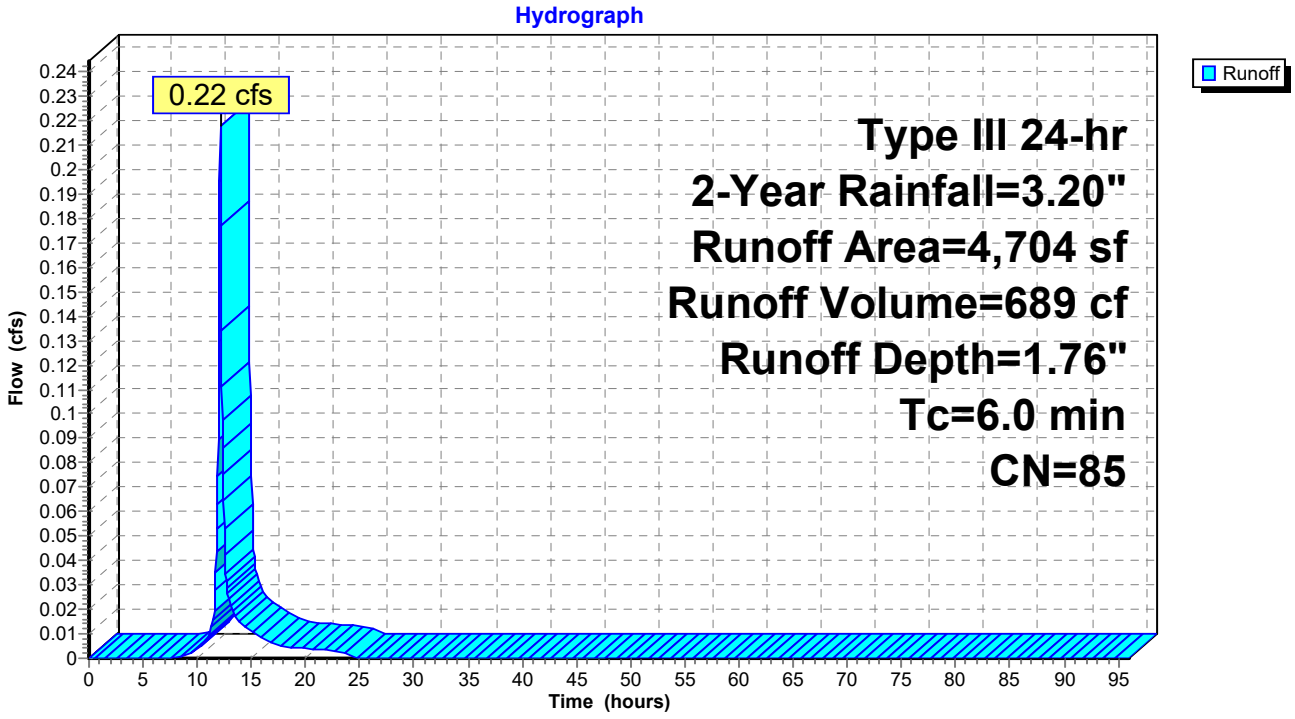
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 689 cf, Depth= 1.76"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
1,045	39	>75% Grass cover, Good, HSG A
1,002	98	Unconnected pavement, HSG A
2,657	98	Paved parking, HSG A
4,704	85	Weighted Average
1,045		22.22% Pervious Area
3,659		77.78% Impervious Area
1,002		27.38% Unconnected

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

Subcatchment P105 S: Subcat P105 S



Summary for Subcatchment P106 S: Subcat P106 S

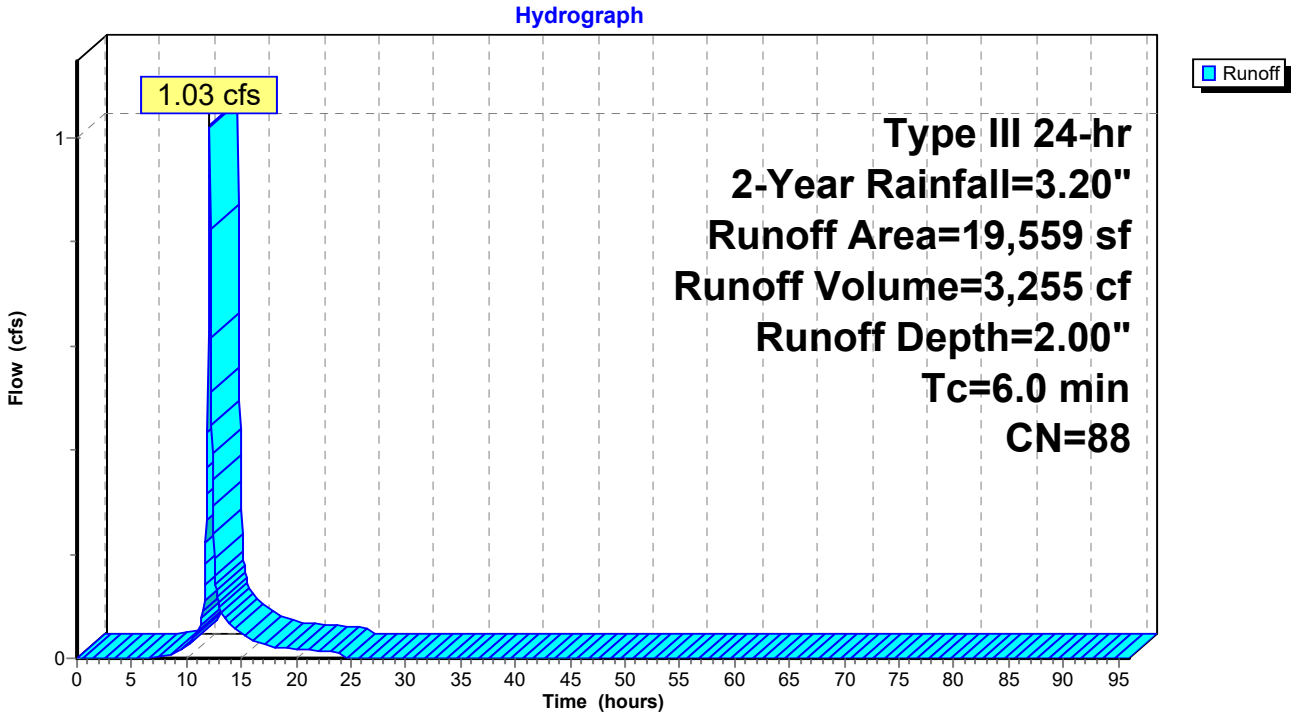
Runoff = 1.03 cfs @ 12.09 hrs, Volume= 3,255 cf, Depth= 2.00"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,354	39	>75% Grass cover, Good, HSG A
2,396	98	Unconnected pavement, HSG A
13,809	98	Paved parking, HSG A
19,559	88	Weighted Average
3,354		17.15% Pervious Area
16,205		82.85% Impervious Area
2,396		14.79% Unconnected

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

Subcatchment P106 S: Subcat P106 S



Summary for Subcatchment P107 S: Subcat P107 S

[45] Hint: Runoff=Zero

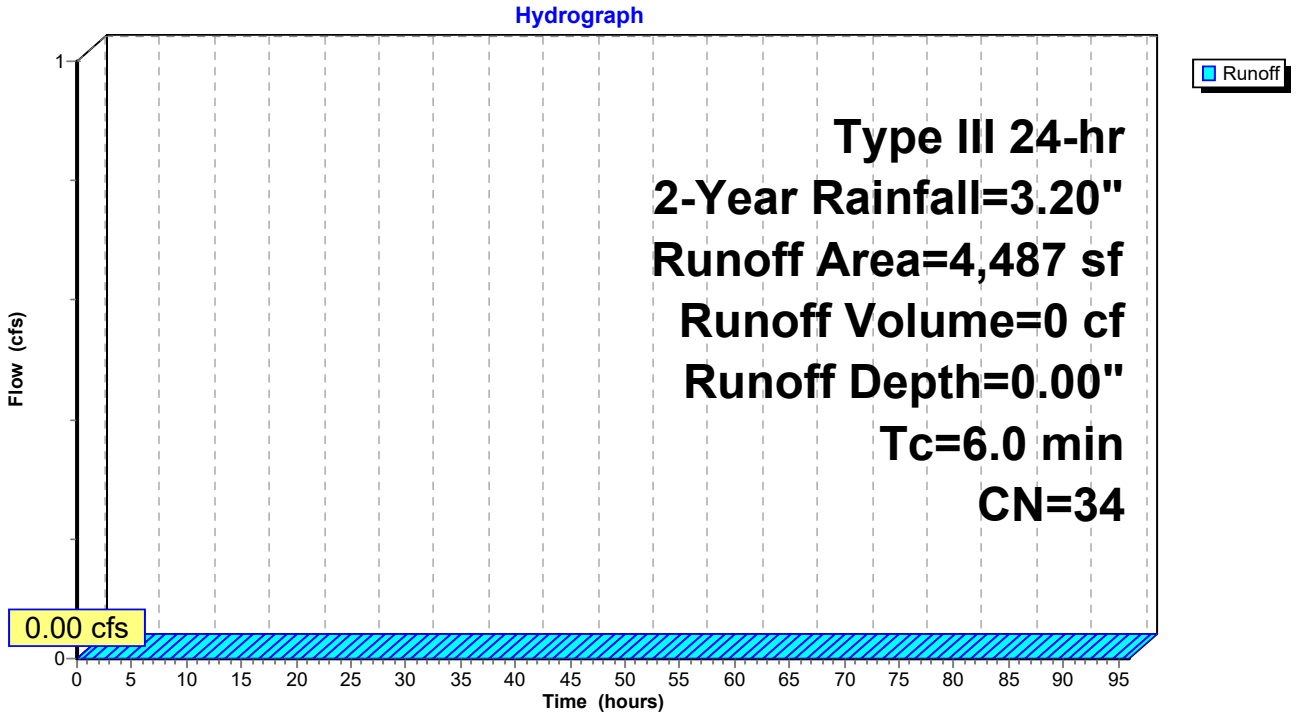
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2,657	30	Woods, Good, HSG A
1,830	39	>75% Grass cover, Good, HSG A
4,487	34	Weighted Average
4,487		100.00% Pervious Area

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

Subcatchment P107 S: Subcat P107 S



Summary for Pond P 100P: Low Area

Inflow Area = 119,147 sf, 44.46% Impervious, Inflow Depth = 1.14" for 2-Year event
Inflow = 3.42 cfs @ 12.09 hrs, Volume= 11,289 cf
Outflow = 0.98 cfs @ 12.44 hrs, Volume= 11,289 cf, Atten= 71%, Lag= 21.2 min
Discarded = 0.98 cfs @ 12.44 hrs, Volume= 11,289 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.17' @ 12.44 hrs Surf.Area= 17,573 sf Storage= 2,883 cf

Plug-Flow detention time= 29.5 min calculated for 11,283 cf (100% of inflow)
Center-of-Mass det. time= 29.5 min (828.2 - 798.6)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	415,519 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

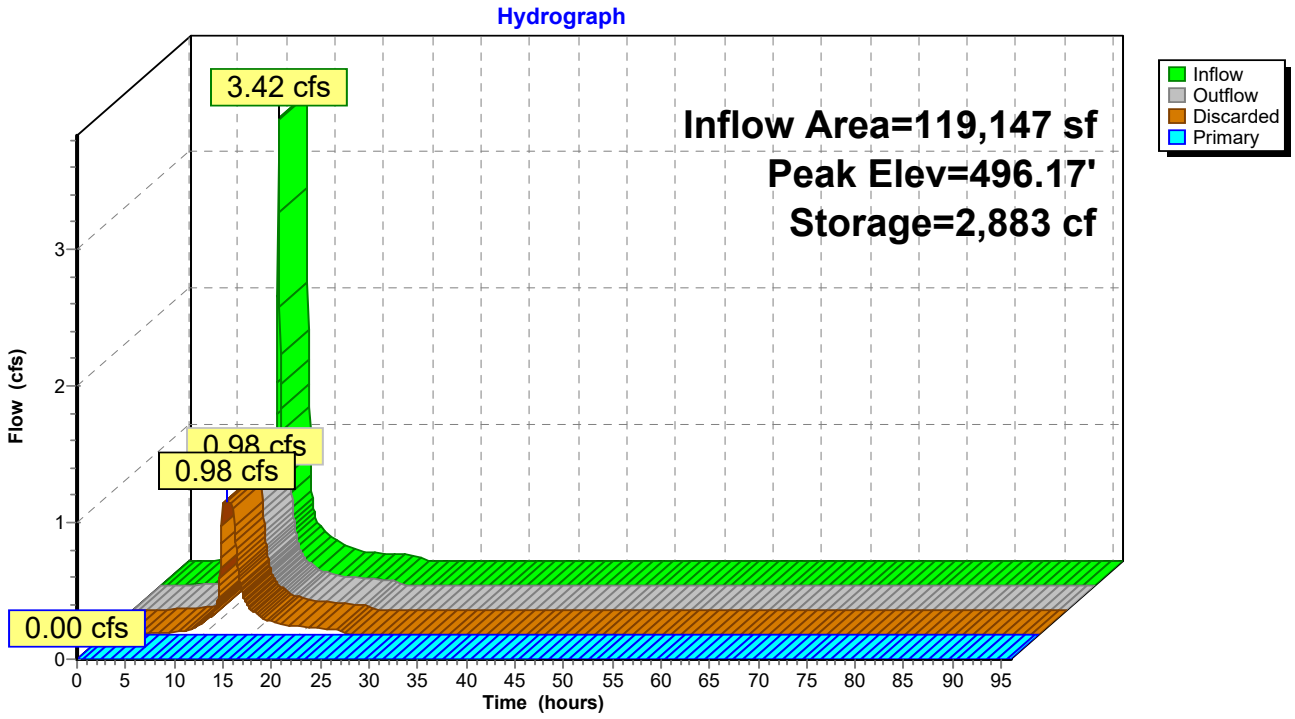
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
496.00	16,430	0	0
498.00	29,916	46,346	46,346
500.00	54,452	84,368	130,714
502.00	69,749	124,201	254,915
504.00	90,855	160,604	415,519

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.98 cfs @ 12.44 hrs HW=496.17' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.98 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**1=Culvert** (Controls 0.00 cfs)

Pond P 100P: Low Area



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 P101 S: Subcat P101 S Runoff Area=47,361 sf 0.00% Impervious Runoff Depth=0.04"
Tc=6.0 min CN=34 Runoff=0.01 cfs 163 cf

Subcatchment P102 S: Subcat P102 S Runoff Area=22,650 sf 74.61% Impervious Runoff Depth=3.18"
Tc=6.0 min CN=85 Runoff=1.88 cfs 6,009 cf

Subcatchment P103 S: Subcat P103 S Runoff Area=4,182 sf 0.00% Impervious Runoff Depth=0.42"
Tc=6.0 min CN=46 Runoff=0.02 cfs 148 cf

Subcatchment P104 S: Subcat P104 S Runoff Area=16,204 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.70 cfs 6,162 cf

Subcatchment P105 S: Subcat P105 S Runoff Area=4,704 sf 77.78% Impervious Runoff Depth=3.18"
Tc=6.0 min CN=85 Runoff=0.39 cfs 1,248 cf

Subcatchment P106 S: Subcat P106 S Runoff Area=19,559 sf 82.85% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=88 Runoff=1.75 cfs 5,671 cf

Subcatchment P107 S: Subcat P107 S Runoff Area=4,487 sf 0.00% Impervious Runoff Depth=0.04"
Tc=6.0 min CN=34 Runoff=0.00 cfs 15 cf

Pond P 100P: Low Area Peak Elev=496.34' Storage=6,032 cf Inflow=5.74 cfs 19,417 cf
Discarded=1.05 cfs 19,417 cf Primary=0.00 cfs 0 cf Outflow=1.05 cfs 19,417 cf

Total Runoff Area = 119,147 sf Runoff Volume = 19,417 cf Average Runoff Depth = 1.96"
55.54% Pervious = 66,179 sf 44.46% Impervious = 52,968 sf

Summary for Subcatchment P101 S: Subcat P101 S

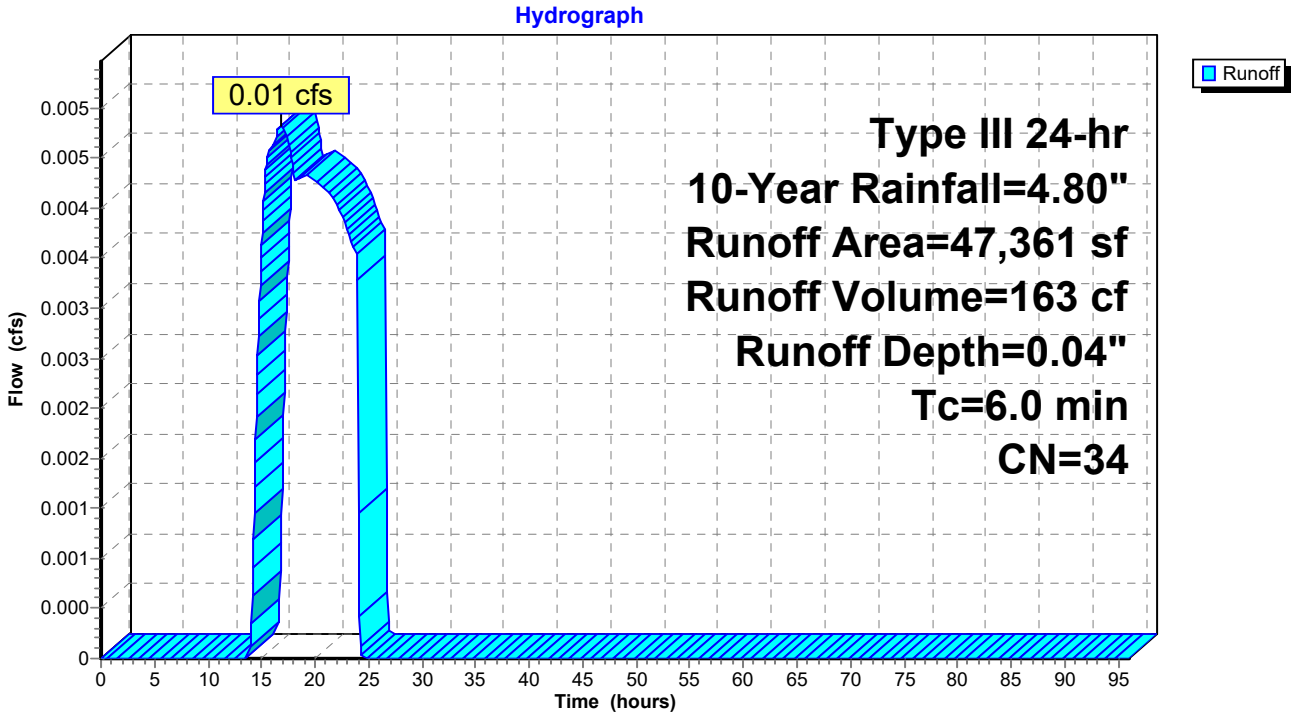
Runoff = 0.01 cfs @ 16.84 hrs, Volume= 163 cf, Depth= 0.04"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
305	61	>75% Grass cover, Good, HSG B
27,007	30	Woods, Good, HSG A
0	98	Unconnected pavement, HSG A
20,049	39	>75% Grass cover, Good, HSG A
47,361	34	Weighted Average
47,361		100.00% Pervious Area

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

Subcatchment P101 S: Subcat P101 S



Summary for Subcatchment P102 S: Subcat P102 S

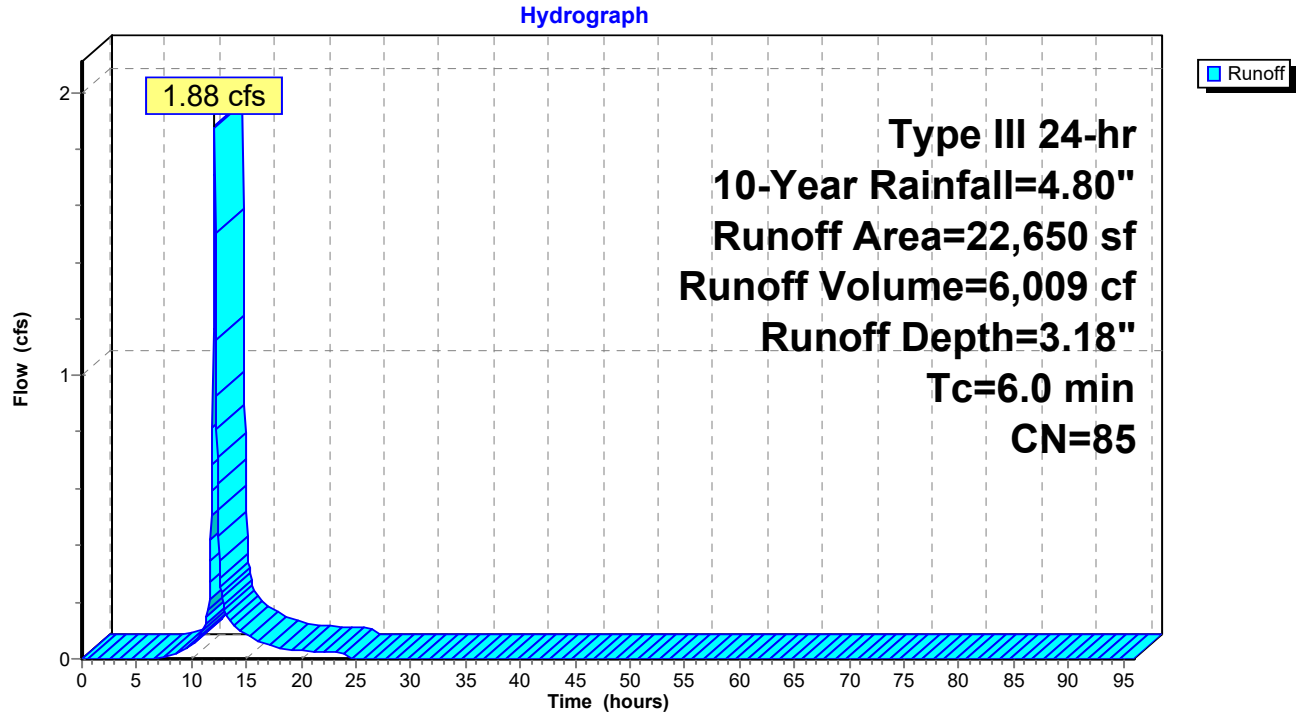
Runoff = 1.88 cfs @ 12.09 hrs, Volume= 6,009 cf, Depth= 3.18"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
9,060	98	Paved parking, HSG A
4,704	98	Paved parking, HSG B
1,699	61	>75% Grass cover, Good, HSG B
958	98	Unconnected pavement, HSG B
2,178	98	Unconnected pavement, HSG A
4,051	39	>75% Grass cover, Good, HSG A
22,650	85	Weighted Average
5,750		25.39% Pervious Area
16,900		74.61% Impervious Area
3,136		18.56% Unconnected

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

Subcatchment P102 S: Subcat P102 S



Summary for Subcatchment P103 S: Subcat P103 S

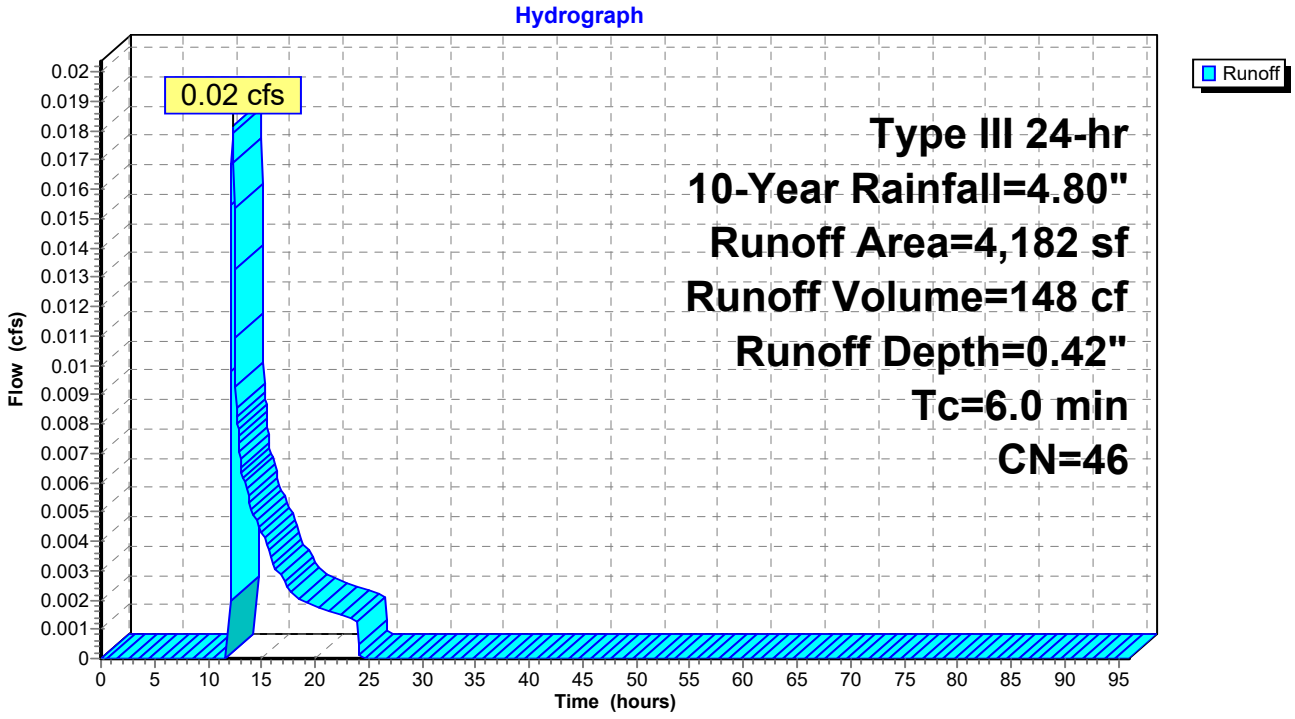
Runoff = 0.02 cfs @ 12.30 hrs, Volume= 148 cf, Depth= 0.42"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
1,525	61	>75% Grass cover, Good, HSG B
0	55	Woods, Good, HSG B
2,134	39	>75% Grass cover, Good, HSG A
523	30	Woods, Good, HSG A
4,182	46	Weighted Average
4,182		100.00% Pervious Area

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

Subcatchment P103 S: Subcat P103 S



Summary for Subcatchment P104 S: Subcat P104 S

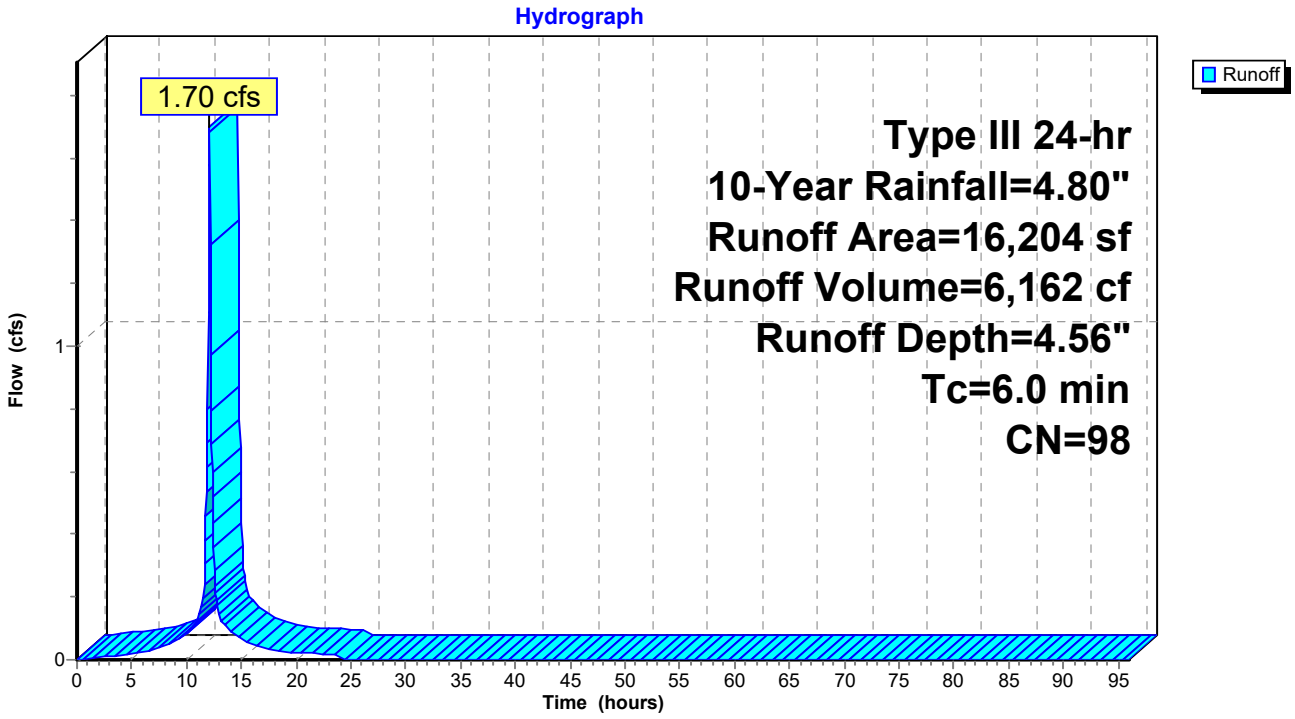
Runoff = 1.70 cfs @ 12.09 hrs, Volume= 6,162 cf, Depth= 4.56"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
3,833	98	Roofs, HSG B
12,371	98	Roofs, HSG A
16,204	98	Weighted Average
16,204		100.00% Impervious Area

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

Subcatchment P104 S: Subcat P104 S



Summary for Subcatchment P105 S: Subcat P105 S

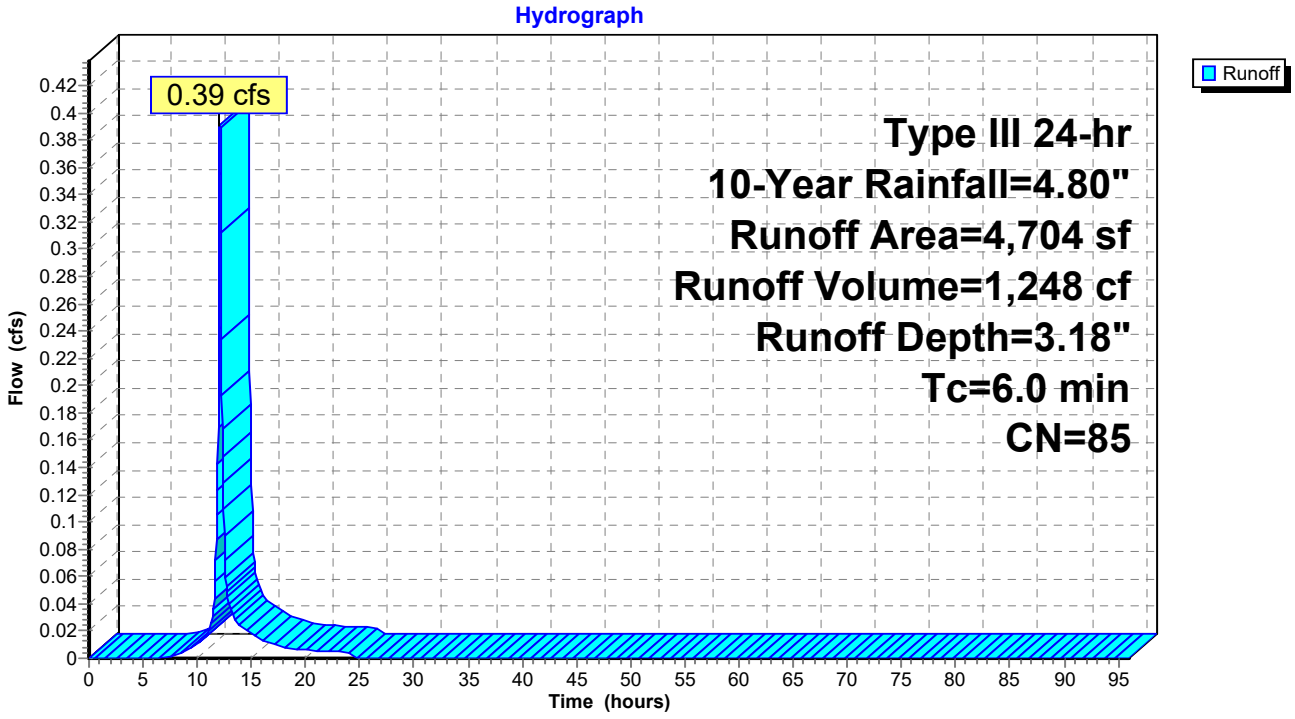
Runoff = 0.39 cfs @ 12.09 hrs, Volume= 1,248 cf, Depth= 3.18"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
1,045	39	>75% Grass cover, Good, HSG A
1,002	98	Unconnected pavement, HSG A
2,657	98	Paved parking, HSG A
4,704	85	Weighted Average
1,045		22.22% Pervious Area
3,659		77.78% Impervious Area
1,002		27.38% Unconnected

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

Subcatchment P105 S: Subcat P105 S



Summary for Subcatchment P106 S: Subcat P106 S

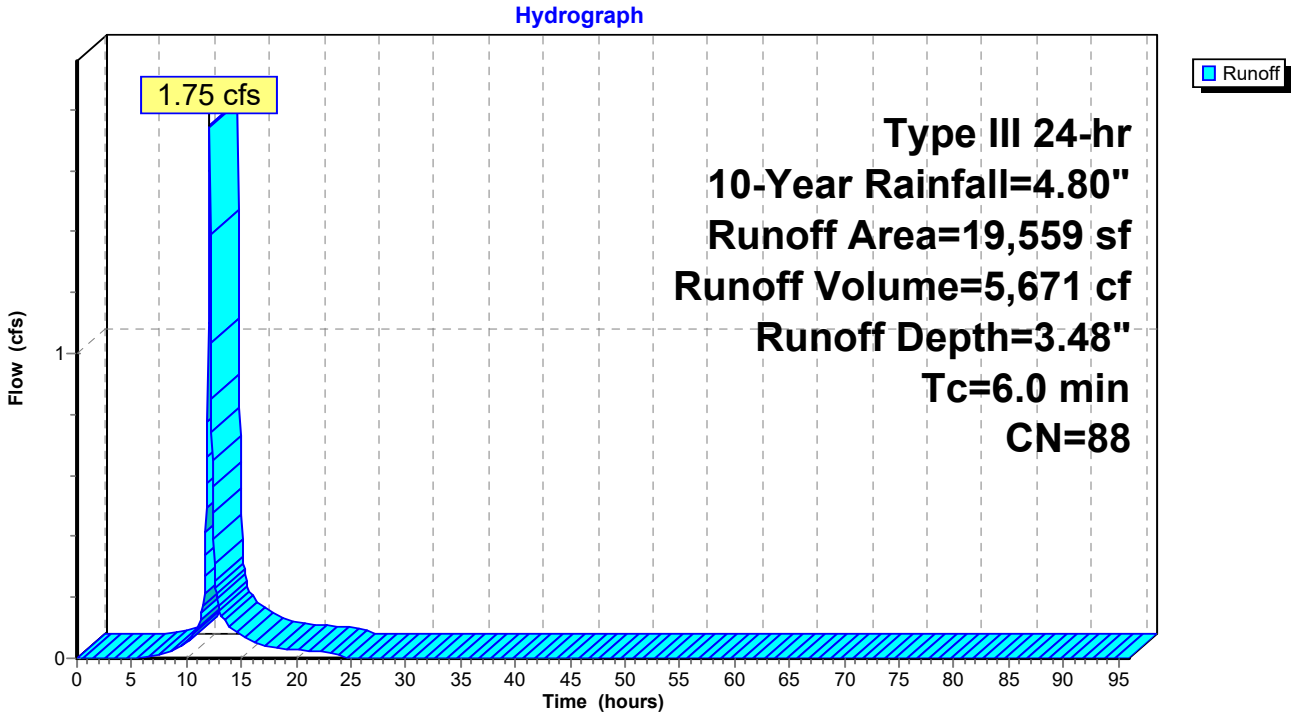
Runoff = 1.75 cfs @ 12.09 hrs, Volume= 5,671 cf, Depth= 3.48"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
3,354	39	>75% Grass cover, Good, HSG A
2,396	98	Unconnected pavement, HSG A
13,809	98	Paved parking, HSG A
19,559	88	Weighted Average
3,354		17.15% Pervious Area
16,205		82.85% Impervious Area
2,396		14.79% Unconnected

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

Subcatchment P106 S: Subcat P106 S



Summary for Subcatchment P107 S: Subcat P107 S

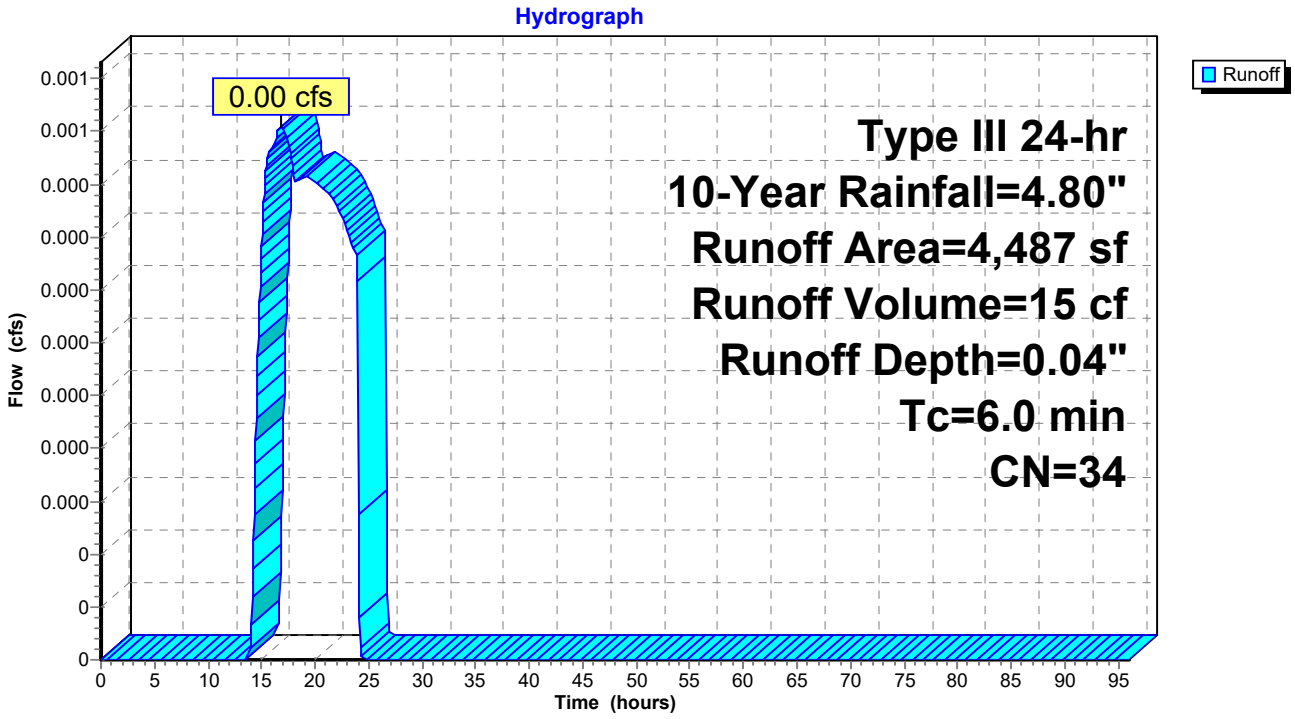
Runoff = 0.00 cfs @ 16.84 hrs, Volume= 15 cf, Depth= 0.04"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,657	30	Woods, Good, HSG A
1,830	39	>75% Grass cover, Good, HSG A
4,487	34	Weighted Average
4,487		100.00% Pervious Area

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

Subcatchment P107 S: Subcat P107 S



Summary for Pond P 100P: Low Area

Inflow Area = 119,147 sf, 44.46% Impervious, Inflow Depth = 1.96" for 10-Year event
Inflow = 5.74 cfs @ 12.09 hrs, Volume= 19,417 cf
Outflow = 1.05 cfs @ 12.55 hrs, Volume= 19,417 cf, Atten= 82%, Lag= 27.6 min
Discarded = 1.05 cfs @ 12.55 hrs, Volume= 19,417 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.34' @ 12.55 hrs Surf.Area= 18,743 sf Storage= 6,032 cf

Plug-Flow detention time= 47.2 min calculated for 19,407 cf (100% of inflow)
Center-of-Mass det. time= 47.2 min (838.5 - 791.3)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	415,519 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

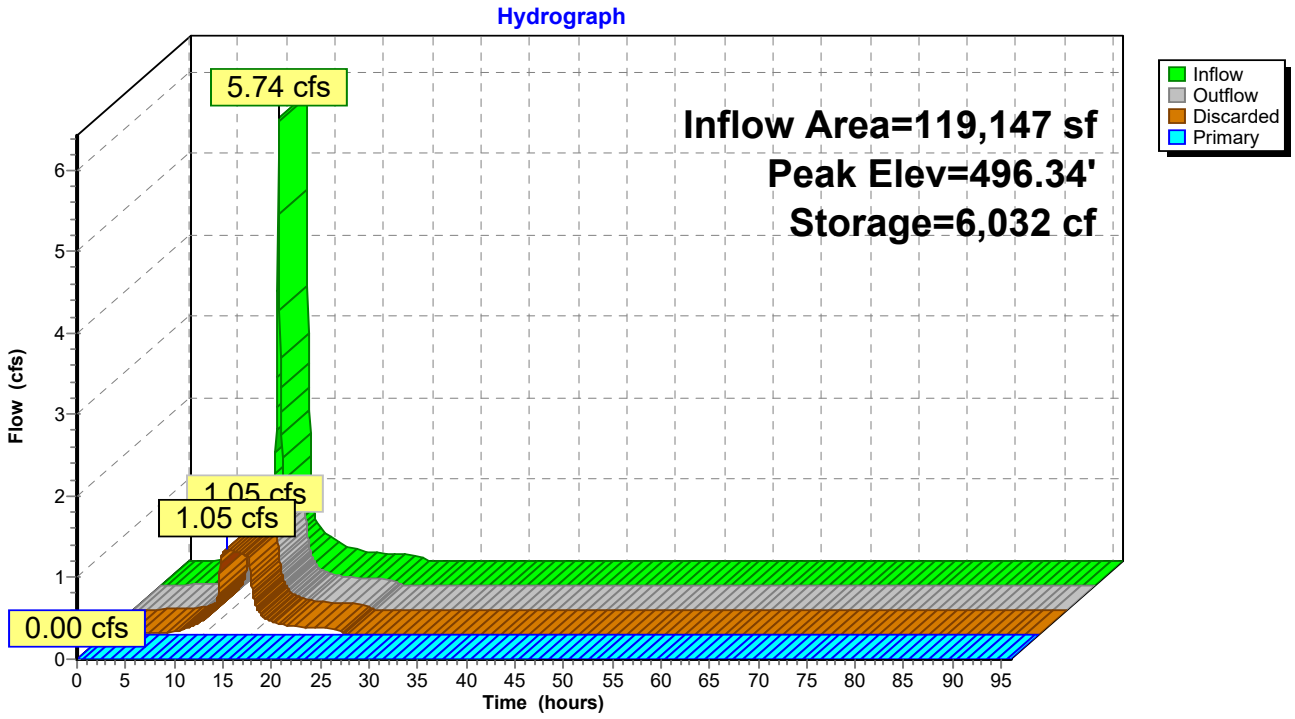
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
496.00	16,430	0	0
498.00	29,916	46,346	46,346
500.00	54,452	84,368	130,714
502.00	69,749	124,201	254,915
504.00	90,855	160,604	415,519

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.05 cfs @ 12.55 hrs HW=496.34' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 1.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**1=Culvert** (Controls 0.00 cfs)

Pond P 100P: Low Area



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 P101 S: Subcat P101 S Runoff Area=47,361 sf 0.00% Impervious Runoff Depth=0.43"
Tc=6.0 min CN=34 Runoff=0.16 cfs 1,703 cf

Subcatchment P102 S: Subcat P102 S Runoff Area=22,650 sf 74.61% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=85 Runoff=3.04 cfs 9,914 cf

Subcatchment P103 S: Subcat P103 S Runoff Area=4,182 sf 0.00% Impervious Runoff Depth=1.32"
Tc=6.0 min CN=46 Runoff=0.12 cfs 460 cf

Subcatchment P104 S: Subcat P104 S Runoff Area=16,204 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=2.49 cfs 9,129 cf

Subcatchment P105 S: Subcat P105 S Runoff Area=4,704 sf 77.78% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=85 Runoff=0.63 cfs 2,059 cf

Subcatchment P106 S: Subcat P106 S Runoff Area=19,559 sf 82.85% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=88 Runoff=2.75 cfs 9,117 cf

Subcatchment P107 S: Subcat P107 S Runoff Area=4,487 sf 0.00% Impervious Runoff Depth=0.43"
Tc=6.0 min CN=34 Runoff=0.02 cfs 161 cf

Pond P 100P: Low Area Peak Elev=496.61' Storage=11,254 cf Inflow=9.03 cfs 32,544 cf
Discarded=1.15 cfs 32,544 cf Primary=0.00 cfs 0 cf Outflow=1.15 cfs 32,544 cf

Total Runoff Area = 119,147 sf Runoff Volume = 32,544 cf Average Runoff Depth = 3.28"
55.54% Pervious = 66,179 sf 44.46% Impervious = 52,968 sf

Summary for Subcatchment P101 S: Subcat P101 S

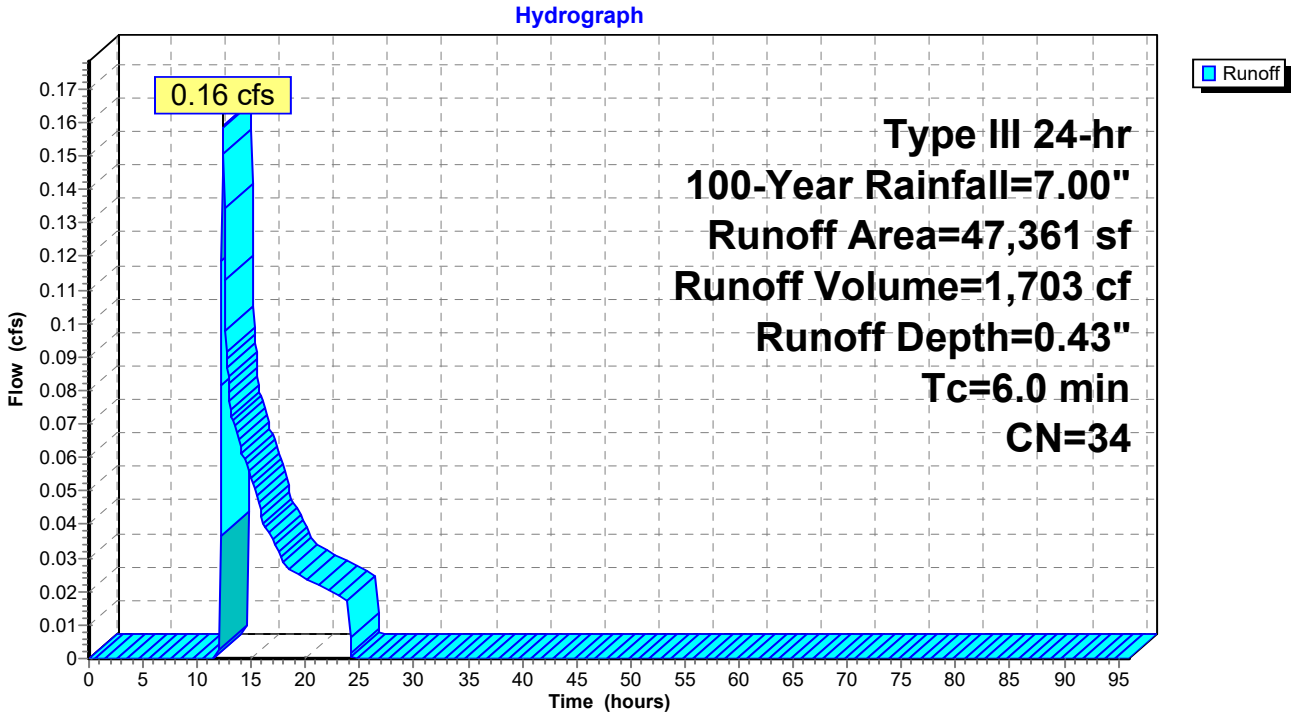
Runoff = 0.16 cfs @ 12.38 hrs, Volume= 1,703 cf, Depth= 0.43"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
305	61	>75% Grass cover, Good, HSG B
27,007	30	Woods, Good, HSG A
0	98	Unconnected pavement, HSG A
20,049	39	>75% Grass cover, Good, HSG A
47,361	34	Weighted Average
47,361		100.00% Pervious Area

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

Subcatchment P101 S: Subcat P101 S



Summary for Subcatchment P102 S: Subcat P102 S

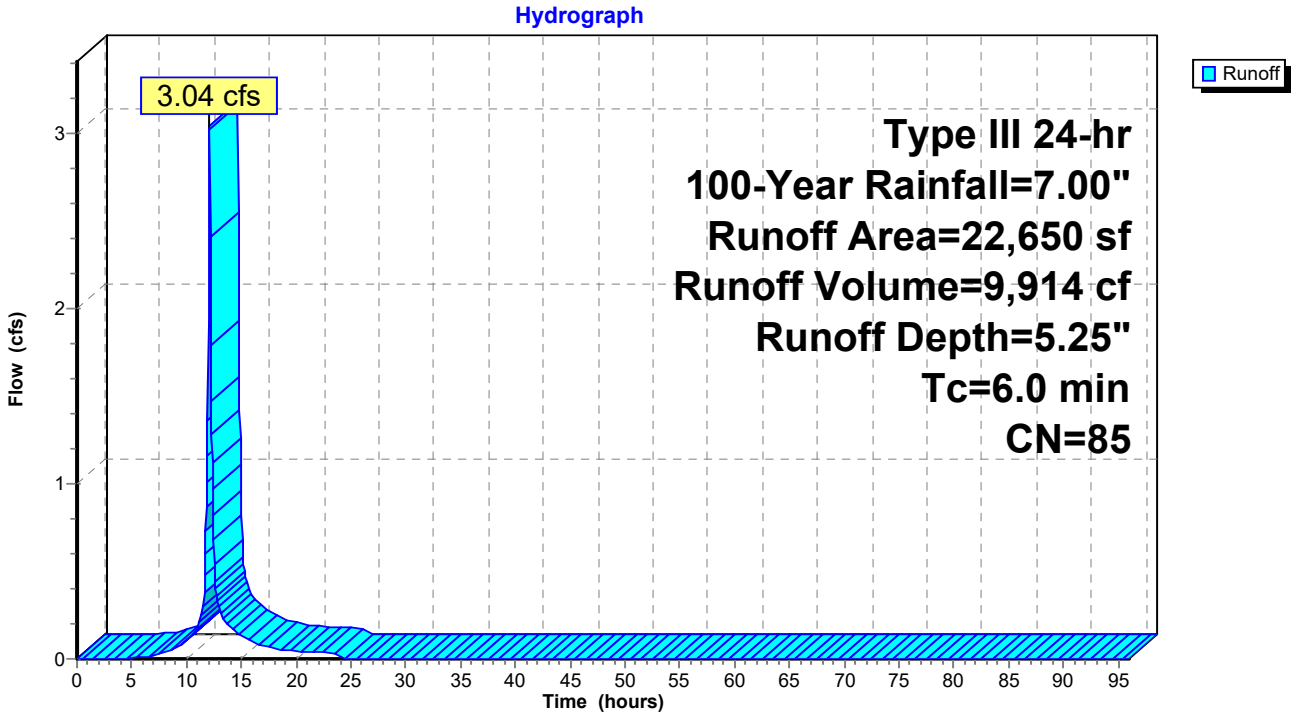
Runoff = 3.04 cfs @ 12.09 hrs, Volume= 9,914 cf, Depth= 5.25"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
9,060	98	Paved parking, HSG A
4,704	98	Paved parking, HSG B
1,699	61	>75% Grass cover, Good, HSG B
958	98	Unconnected pavement, HSG B
2,178	98	Unconnected pavement, HSG A
4,051	39	>75% Grass cover, Good, HSG A
22,650	85	Weighted Average
5,750		25.39% Pervious Area
16,900		74.61% Impervious Area
3,136		18.56% Unconnected

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

Subcatchment P102 S: Subcat P102 S



Summary for Subcatchment P103 S: Subcat P103 S

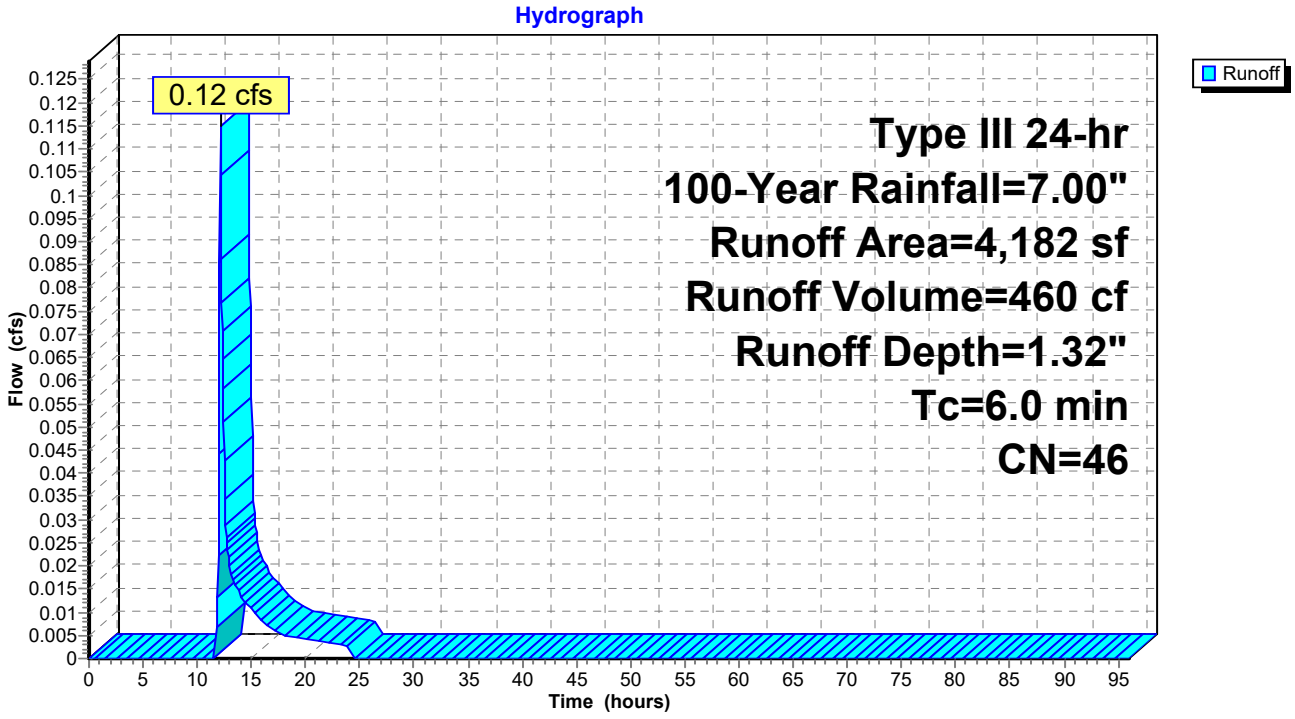
Runoff = 0.12 cfs @ 12.11 hrs, Volume= 460 cf, Depth= 1.32"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
1,525	61	>75% Grass cover, Good, HSG B
0	55	Woods, Good, HSG B
2,134	39	>75% Grass cover, Good, HSG A
523	30	Woods, Good, HSG A
4,182	46	Weighted Average
4,182		100.00% Pervious Area

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

Subcatchment P103 S: Subcat P103 S



Summary for Subcatchment P104 S: Subcat P104 S

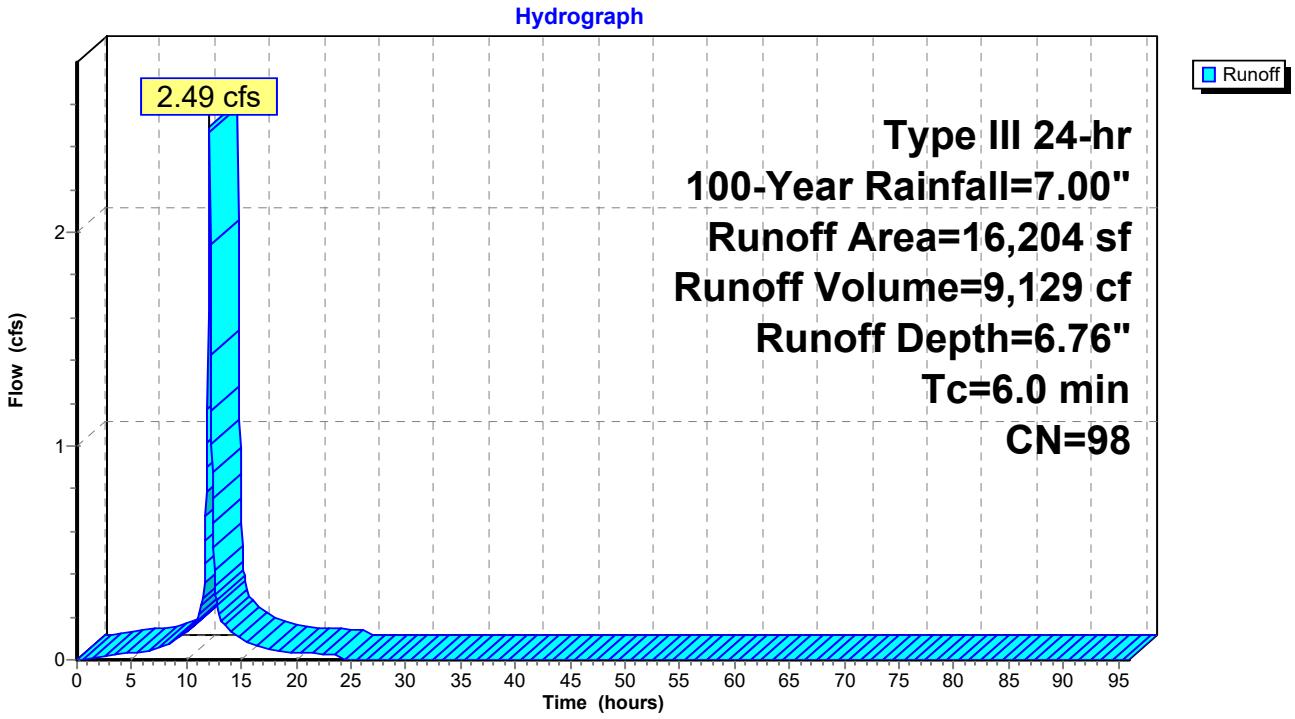
Runoff = 2.49 cfs @ 12.09 hrs, Volume= 9,129 cf, Depth= 6.76"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
3,833	98	Roofs, HSG B
12,371	98	Roofs, HSG A
16,204	98	Weighted Average
16,204		100.00% Impervious Area

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

Subcatchment P104 S: Subcat P104 S



Summary for Subcatchment P105 S: Subcat P105 S

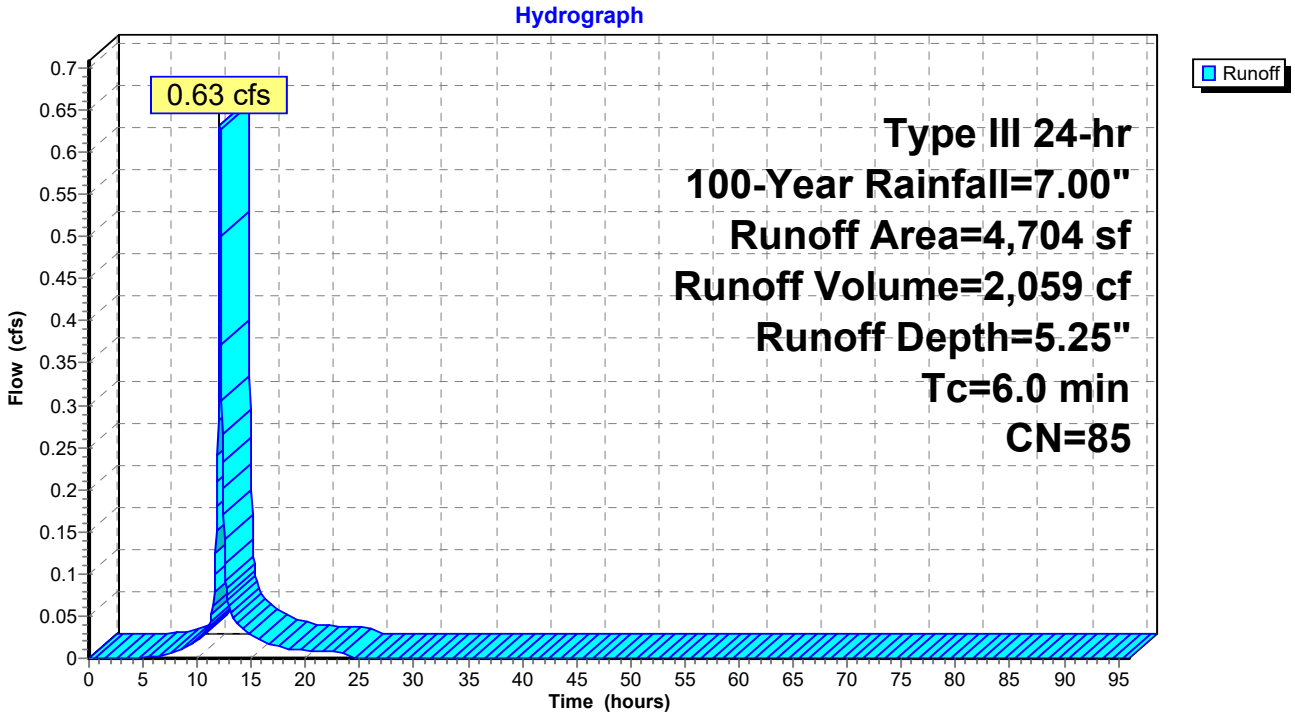
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 2,059 cf, Depth= 5.25"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
1,045	39	>75% Grass cover, Good, HSG A
1,002	98	Unconnected pavement, HSG A
2,657	98	Paved parking, HSG A
4,704	85	Weighted Average
1,045		22.22% Pervious Area
3,659		77.78% Impervious Area
1,002		27.38% Unconnected

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

Subcatchment P105 S: Subcat P105 S



Summary for Subcatchment P106 S: Subcat P106 S

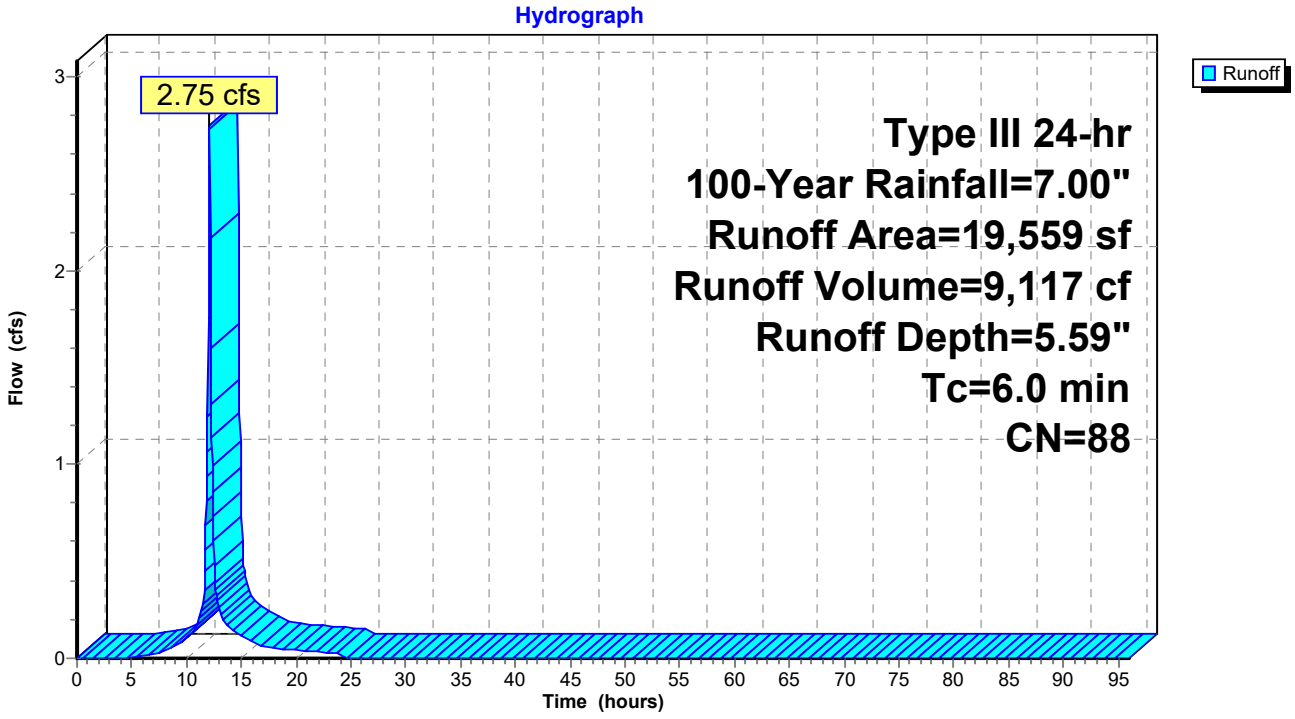
Runoff = 2.75 cfs @ 12.09 hrs, Volume= 9,117 cf, Depth= 5.59"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
3,354	39	>75% Grass cover, Good, HSG A
2,396	98	Unconnected pavement, HSG A
13,809	98	Paved parking, HSG A
19,559	88	Weighted Average
3,354		17.15% Pervious Area
16,205		82.85% Impervious Area
2,396		14.79% Unconnected

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

Subcatchment P106 S: Subcat P106 S



Summary for Subcatchment P107 S: Subcat P107 S

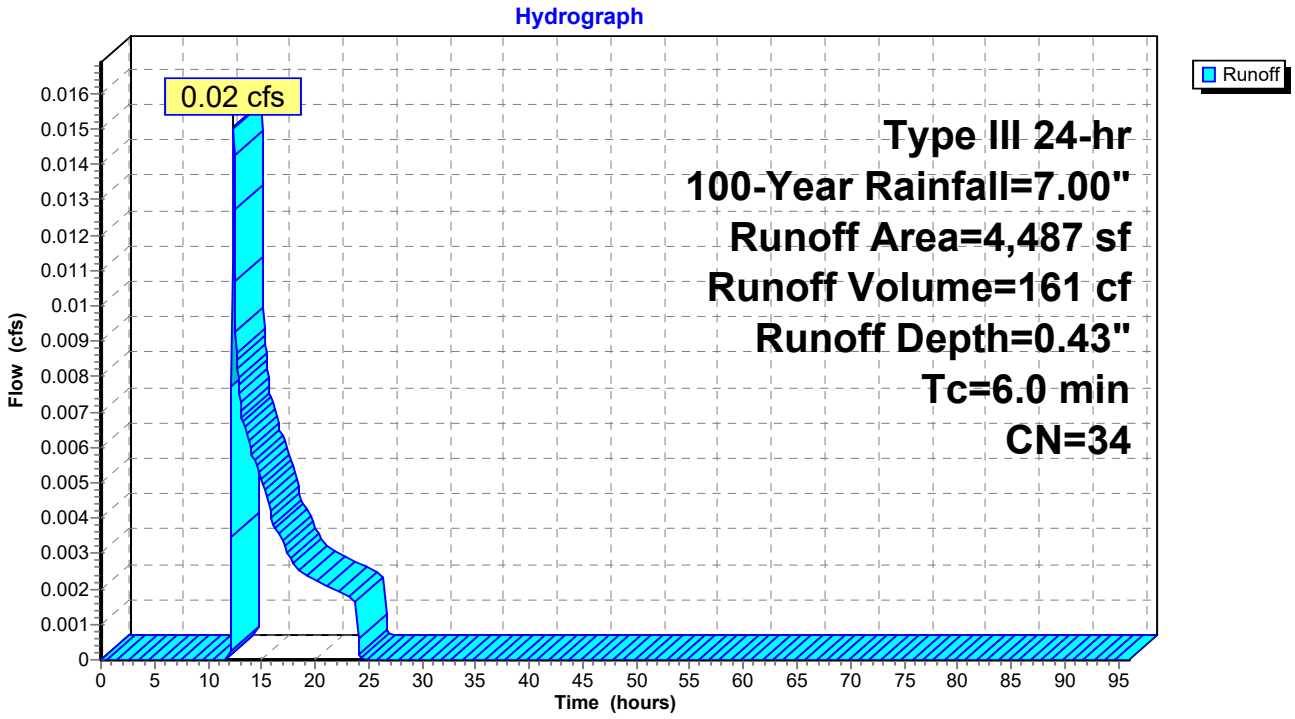
Runoff = 0.02 cfs @ 12.38 hrs, Volume= 161 cf, Depth= 0.43"
Routed to Pond P 100P : Low Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
2,657	30	Woods, Good, HSG A
1,830	39	>75% Grass cover, Good, HSG A
4,487	34	Weighted Average
4,487		100.00% Pervious Area

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

Subcatchment P107 S: Subcat P107 S



Summary for Pond P 100P: Low Area

Inflow Area = 119,147 sf, 44.46% Impervious, Inflow Depth = 3.28" for 100-Year event
Inflow = 9.03 cfs @ 12.09 hrs, Volume= 32,544 cf
Outflow = 1.15 cfs @ 12.74 hrs, Volume= 32,544 cf, Atten= 87%, Lag= 39.4 min
Discarded = 1.15 cfs @ 12.74 hrs, Volume= 32,544 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 496.61' @ 12.74 hrs Surf.Area= 20,536 sf Storage= 11,254 cf

Plug-Flow detention time= 82.7 min calculated for 32,527 cf (100% of inflow)
Center-of-Mass det. time= 82.7 min (872.3 - 789.7)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	415,519 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

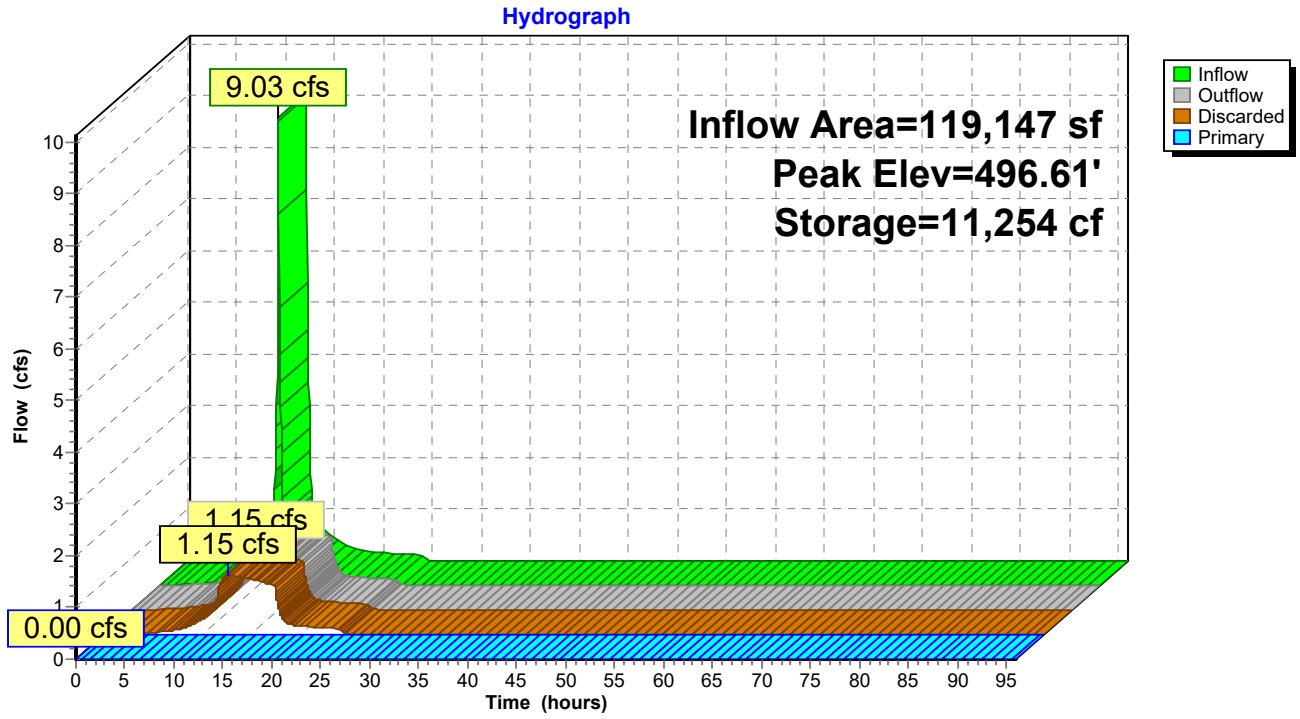
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
496.00	16,430	0	0
498.00	29,916	46,346	46,346
500.00	54,452	84,368	130,714
502.00	69,749	124,201	254,915
504.00	90,855	160,604	415,519

Device	Routing	Invert	Outlet Devices
#1	Primary	499.04'	**24.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 499.04' / 496.65' S= 0.0239 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	496.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.15 cfs @ 12.74 hrs HW=496.61' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 1.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=496.00' (Free Discharge)
↑└**1=Culvert** (Controls 0.00 cfs)

Pond P 100P: Low Area



No Information on This Page

C) Water Quality Calculations (Standards 3, 4, 5, 6 & 7)

The proposed stormwater management system is comprised of deep sump hooded catch basins, Water Quality Structure (WQS), drain manholes, pipes, and an above grade infiltration basin.

Standard 3)

The Project introduces 52,968 S.F. of impervious area to the previously undeveloped site. Stormwater runoff from the site is pretreated and then directed to the infiltration basin to provide recharge. The required recharge for the site based on the impervious area and corresponding soil types is 2,451 C.F. The proposed site plan provides roughly five times the required recharge for the two-year storm event, and far greater volume for the less frequent/larger storm events. The recharge provided during this storm event is 11,289 C.F., thereby meeting the recharge requirements.

Standard 4)

The Project introduces 52,968 S.F. of impervious surfaces, both pavement and roof top. The calculated water quality volume required for the site pavement areas (roofs excluded) is 1,532 C.F. Again, for the two-year storm event the volume recharged is 11,289 c.f., far exceeding the requirement. The proposed stormwater system will provide water quality volume in the deep sump catch basins, WQS, and below the overflow outlet from the infiltration area on site. The two treatment trains provide greater than 44% pretreatment and provide 85% and 97% TSS removal in total, respectively.

Standard 5)

This Standard is not applicable.

Standard 6)

This Standard is not applicable.

Standard 7)

This Standard is not applicable.

No Information on This Page

MassDEP Stormwater Standard 3 | Project: 580 Main Street | Date: Jun-23
TSS Removal | Project No: 20--0017 | Page: C-2

Critical Area - Yes or No: No

Treatment Train; Catch Basin w/ Sump to WQS to Infiltration Basin (Typ.)

BMP Name	TSS Removal Rate	Starting TSS	Amount Removed	Remaining Load
CB w/ Sump	25%	100%	25%	75%
WQS	80%	75%	60%	15%
Infiltration	80%	15%	12%	3%
	0%	3%	0%	3%
	0%	3%	0%	3%
		Total TSS Remaining:	3%	**OK**

MassDEP Stormwater Standard 3 Project: 580 Main Street Date: Jun-23
TSS Removal Project No: 20--0017 Page: C-3

Critical Area - Yes or No No

Treatment Train; Catch Basin w/ Sump to Infiltration Basin (Typ.)

BMP Name	TSS Removal Rate	Starting TSS	Amount Removed	Remaining Load
CB (WQS)	80%	100%	80%	20%
Infiltration	80%	20%	16%	4%
	0%	4%	0%	4%
	0%	4%	0%	4%
	0%	4%	0%	4%
		Total TSS Remaining:	4%	**OK**

Critical Area - Yes or No: No

Impervious Area	Area (S.F.)	Soil	Depth (inches)	Volume (C.F.)
Entire Site	43,473	A	0.60	2,174
Entire Site	9,495	B	0.35	276.9

Total Area 52,968 S.F. Volume Required **2,450.6** C.F.

Volume Provided below lowest invert (Static Method)

BMP			
P 100P	11,289	C.F.	(2-year discarded volume refer to HydroCAD report)

Volume Provided: **11,289.0** C.F. **OK**

Critical Area - Yes or No No

Watershed (Subcatchment)	Impervious Area (S.F.)	Required Depth (inches)	Required Volume (C.F.)
S101 (Roofs - A)	12,371	0.00	0.0
S102 (Roofs - B)	3,833	0.00	0.0
S 101 (Rest - A)	31,102	0.50	1,296
S 102 (Rest - B)	5,662	0.50	235.9

Total Area: 52,968 Volume Required: 1,532

Volume Provided (per HydroCAD)

BMP			
P 100P	11,289	C.F.	(See Stormwater Report) 2-year storm recharge volume

Volumes reported are below lowest invert (Static Method)

Volume Provided 11,289 C.F. **OK**

D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, and Long-Term Operations & Maintenance Plan (Standards 8, 9 & 10)

Standards 8 & 9)

Ansari Builders is responsible for implementation of the Construction Period Pollution Prevention Plan, the Long-Term Operation & Maintenance Plan, and the Long-Term Pollution Prevention Plan for 580 Main Street in Oxford, Massachusetts.

The sitework will result in more than one (1) acre of disturbance, therefore NPDES requirements of the Construction General Permit are applicable and a SWPPP is required. A SWPPP will be prepared prior to the start of construction once a contractor has been selected.

The stormwater management system for 580 Main Street is comprised of pervious areas, catch-basins, WQS, and a infiltration basin. Only stormwater may be discharged through these facilities, there shall be no connections of floor drains and/or sanitary connections. Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Standard 10)

No illicit connections to the stormwater management system are known or proposed. Sanitary wastewater and the garage floor drains will be discharged to the municipal sewage system.

No Information on This Page

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Natural Buffer	Daily	These areas are beyond the Limit of Work and are to be protected. Replace Limit of Work demarcation (flagging, berms/dikes, fencing or ECB's) when deteriorated. Should infringement into Natural Buffers occur, take corrective action immediately and implement mitigation measures (seeding, planting of native trees or shrubs) to restore Natural Buffers.		
Erosion Control Barriers (ECB)	Weekly and after major storms	Remove sediment before it has accumulated to one-half of the above-ground height of ECB's. Replace ECB's before they have deteriorated/decomposed to half their original height or every twelve (12) months, whichever comes first. Sediments to be removed and disposed of above the ECB line in an area to be stabilized later. Fabric to be disposed of offsite. Natural liners and wooden stakes may be left to decompose.		
Silt-sacks	Weekly and after major storms	Replace at least twice per year, or when sediment reaches two (2) inches in depth, or if flooding is observed. Dispose of materials offsite.		
Anti-tracking Pad	Daily	Replace at least one per year, or when effectiveness has diminished. Where sediment has been tracked-out offsite onto paved roads, sidewalks, or other paved areas offsite, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED.		
Equipment Storage and Refueling	Daily	Storage or refueling of construction equipment within one hundred (100) feet of any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED. Spill kits shall be readily available on site if refueling is to occur. All materials shall be disposed of offsite.		
Soil Stockpiles	Weekly and after major storms	Locate Stockpiles away from stormwater channels and conveyances. Provide ECB or Stone Check Dams around Stockpiles. Stockpiles that will remain unused for more than a month should be seeded with a quick cover		

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Soil Stockpiles (cont'd)		crop such as Ryegrass (10-30 lbs./acres). Hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED.		
Sediment Basins	Weekly and after major storms	Remove floatables and any accumulated debris or as soon as observed. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.		
Stone Check Dams	Weekly and after major storms	Remove sediment at least every other month or when sediment is six (6) inches deep.		
Dust Control	Daily	Minimizing disturbed areas and rapid seeding/stabilization of disturbed areas is the preferred option. Water or an acceptable Dust Palliative should be used on haul roads to prevent dust from emanating and leaving the site or affecting Natural Buffers.		
Outlet & Channel Protection	Weekly and after major storm events	Observe slopes downgradient of Sediment Basins for stability, integrity, and erosion and repair immediately with seed or Turf Reinforcement Mat (TRM) and seed as necessary.		

Potential Source of Pollution	Protective Measures
Reportable Spill(s)	• The Owner or its representative is responsible to notify appropriate authorities of any spills of hazardous/harmful materials. • Should a spill bypass a containment device – catch basin, water quality structure, berm, etc. – and impact a stormwater detention or retention facility, the Owner shall be responsible for clean-up, mitigation and restoration of the facility to its original condition.
Lawn/Landscape Maintenance	• Clippings and yard waste shall not be disposed of in stormwater management facilities. • Pesticides and fertilizers shall only be stored on site in approved containers within a structure. • Pesticides and fertilizers shall be applied at the proper time of year in the minimal effective quantity/concentration. They should not be applied when severe rainfall events are forecast. • Use drought-tolerant species to limit watering requirements, and mulch and compost to retain soil moisture. Irrigate at appropriate times of day - early morning and late evening – for the minimal period necessary to restore soil moisture. • Pet waste shall not be disposed of in stormwater management facilities.
De-icing	• Application rates of de-icing materials shall be the minimum acceptable to adequately treat storm-specific conditions. Multiple treatments are preferred to use of excessive quantities during the initial response. • De-icing materials may not be stored on site. • Non-toxic and inert materials (sand/gravel) are preferable in areas adjacent to stormwater management facilities and wetland resource areas. For general use, calcium magnesium acetate (CMA), calcium chloride and potassium acetate are preferable to sodium chloride.
Snow Removal	• Snow shall be piled in pervious areas where melt water can infiltrate (as designated on the plan). • Snow shall not be piled on catch basins, swales, or in stormwater basins. • Management of snow shall not create a nuisance or hazard. The Owner shall be responsible to remove snow from site if adequate area on site is not available. • Sediments deposited in snow storage areas shall be removed each spring and disposed of offsite.
Good House Keeping	• Store all chemicals and other potentially harmful/hazardous products in appropriate contains within a designated area in the building. • Gas and sand trap(s) must be maintained in accordance with the Massachusetts Plumbing Code (248 CMR 10). • Equipment and containers of any hazardous/harmful material must be stored more than one hundred (100) feet from a wetland resource area and in accordance with any Local, State or Federal permit for said equipment and/or containerized storage.

Responsible Party:

The owner or their assigns are responsible for the implementation of the Long-Term Operation & Maintenance Plan and the Long-Term Pollution Prevention Plan for 580 Main Street in Oxford, Massachusetts.

System Components:

The stormwater management system for 580 Main Street in Oxford, Massachusetts is comprised of pervious areas, CDS units (as catch basins and drain manholes), and infiltration basin, and stabilized discharge points. Only stormwater may be discharged through these facilities, there shall be no connections of floor drains and/or sanitary connections, and nothing shall be dumped into any of the System Components.

CDS Units (as catch basins and drain manholes) – the WQS are CDS 2015-4.

Open Infiltration Basin – open stormwater basin meant to capture, retain, and infiltrate stormwater. The basins are to be kept free of trash and debris. No yard waste and / or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store personal items in this area. No accessory structures are permitted in this area.

Pervious Areas – open, vegetated areas over which stormwater runoff flows slowly and in a sheeting manner. These areas are to be kept free of trash and debris. No yard waste and/or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store vehicles or other personal items in these areas. No accessory structures are permitted in these areas.

Outlet Protection – consists of stable vegetation and/or rock riprap.

Illicit Connections:

No illicit connections to the stormwater management system are proposed or shall be installed during construction. No future connections to the stormwater system shall be allowed without permission of the Town of Oxford. The proposed building will be served by a wastewater (sewer) system including pipes and manholes on site connected to the municipal system in Main Street.

Maintenance Schedule and Forms:

Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Snow Storage / Removal:

Refer to the following pages for specific requirements on snow storage and removal.

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Street/Pavement Sweeping	Annually (March – April)	Annually (March – April). Paved areas to be swept of sediments, trash, and debris. Sediments to be removed and disposed off-site.		
Deep Sump Hooded Catch Basins	Quarterly	At least twice per year, or when sediment reaches two (2) feet in depth, or if flooding is observed. Remove floatables and sediment and dispose of off-site.		
Water Quality Structure (CDS Units)	Monthly or per Manufacturer's Recommendations	At least twice per year, or per Manufacturer's Recommendations. Remove floatables and remove sediment when it reaches one (1) foot in depth. Dispose of debris and sediment off-site.		
Open Infiltration Basin	Monthly for first three (3) months Annually and after major storm events	Annually or after major storm events. Remove trash and debris, mow the upper-stage, side slopes, embankment, and emergency spillway(s). Observe downgradient slopes for stability, integrity, and erosion and repair immediately. Re-seed slopes to ensure dense vegetative cover. Remove sediment as necessary, but at least once every five (5) years and scarify bottom of basin after removal.		

No Information on This Page

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

E) Soils Information

No Information on This Page

Northeast Ecological Services

Wetland Scientists and Ecologists

September 30, 2019

Farooq Ansari
Ansari Builders, Inc
6 Edgewood Road
Westborough, MA 01581

Re: Wetland Resource Evaluation – 580 Main Street, Oxford, MA

Dear Mr. Ansari:

On September 27, 2019, Northeast Ecological Services (NES) inspected a property located at 580 Main Street in Oxford, Massachusetts. The purpose of the inspection was to identify and delineate wetland resource areas as defined by the Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00). The wetlands identification was based on wetlands identification and delineation methodology guidance provided by the Massachusetts Department of Environmental Protection (MADEP). Scott J. Heim of NES conducted the site inspection.

The Massachusetts Wetlands Protection Act regulations have established five freshwater wetland resource categories: (1) Bank, (2) Bordering Vegetated Wetlands, (3) Land Under Water Bodies and Waterways, (4) Land Subject to Flooding, and (5) Riverfront Area. The site was examined for areas that may qualify as any of the above wetland resource categories.

The site (Oxford Assessor Parcel 17-B07-04) is located to north of Main Street (Route 12) and consists of 2.73 acres. The property slopes steeply down to the north from Main Street and then rises to the north and east. The site is currently undeveloped and forested. The dominant vegetation throughout the site is fairly consistent and consists of eastern white pine (*Pinus strobus*) and bigtooth aspen (*Populus grandidentata*) in the tree overstory with black cherry (*Prunus serotina*), honeysuckle (*Linicera tatarica*) and northern red oak (*Quercus rubra*) dominating the sapling/shrub understory. Both goldenrods (*Solidago* spp.) and spotted jewelweed (*Impatiens capensis*) are predominant in the herbaceous understory.

The forested property presently consists of predominately upland plant species. Although portions of the property contain vegetation that may occur within wetlands as well as uplands, evidence of wetland hydrology or hydric soils were not observed. Based on the soil survey prepared by the Natural Resource Conservation Service the soils mapped on the site consist of Merrimac fine sandy loam (western portion of site), Canton fine sandy loam (northeastern portion of site) and Udorthents – smoothed (southeastern portion of site). Hydric soils are generally not associated with any of these mapped units. Based on soil borings conducted by NES during the site inspection, the soil throughout the property consists of bright (chroma color is 10YR 5/6 or 10YR 4/4) fine sandy loam immediately below the surface horizon. These characteristics are associated with non-hydric or upland soils. No areas of hydric soils or wetland hydrology were noted by NES on the property during the inspection. In addition, the site is not mapped as being present within the 100-year floodplain. Therefore, wetland resource areas as defined by the Massachusetts WPA regulations are not present on the site.

If you or the Oxford Conservation Commission have any questions concerning the wetlands resource evaluation conducted at the property, please call me at 508-320-2678 .

Sincerely,
NORTHEAST ECOLOGICAL SERVICES

Scott J. Heim, M.S.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Worcester County, Massachusetts, Southern Part

580 Main Street Oxford, MA

July 6, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 15, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	2.5	2.8%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	28.2	31.7%
420B	Canton fine sandy loam, 3 to 8 percent slopes	22.5	25.4%
651	Udorthents, smoothed	35.6	40.1%
Totals for Area of Interest		**88.8**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Worcester County, Massachusetts, Southern Part

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Freetown

Setting

Landform: Depressions, depressions, swamps, kettles, marshes, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 5 percent
Landform: Bogs, swamps, marshes, depressions, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, outwash plains, deltas, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9bfc
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 80 percent
Urban land: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Made land over firm coarse-loamy basal till and/or dense coarse-loamy lodgment till

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

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No Information on This Page

F) FEMA Flood Map

No Information on This Page

National Flood Hazard Layer FIRMette

FEMA

71°52'21"W 42°9'4"N

71°51'44"W 42°8'38"N

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

1:6,000

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 Cross Sections with 1% Annual Chance
- 17.5 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

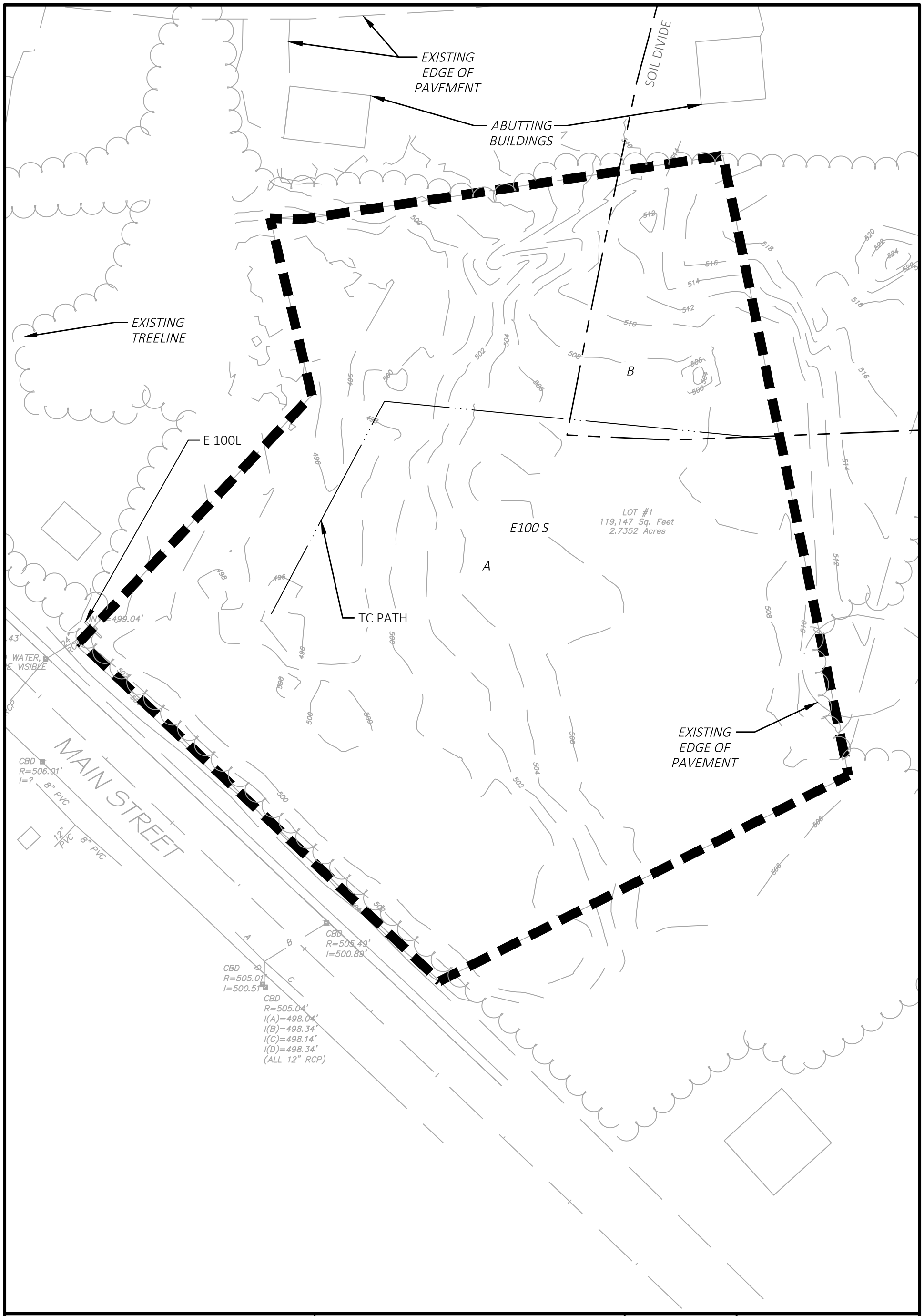
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/26/2023 at 3:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by 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.

No Information on This Page

G) Existing Watershed Map

No Information on This Page



Project Title:

Ansari Builders
6 Edgewood Road
Westborough, MA 01581

Sheet Title:

Existing Hydrology Map
580 Main Street
Oxford, MA 01540

Date: 06/30/2023 | Project No.: 20-0017 | Reference Plan No.: C-250 | Drawn By: ESM | Checked By: MJS

G-2

LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDCollaborative.com

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H) Proposed Watershed Map

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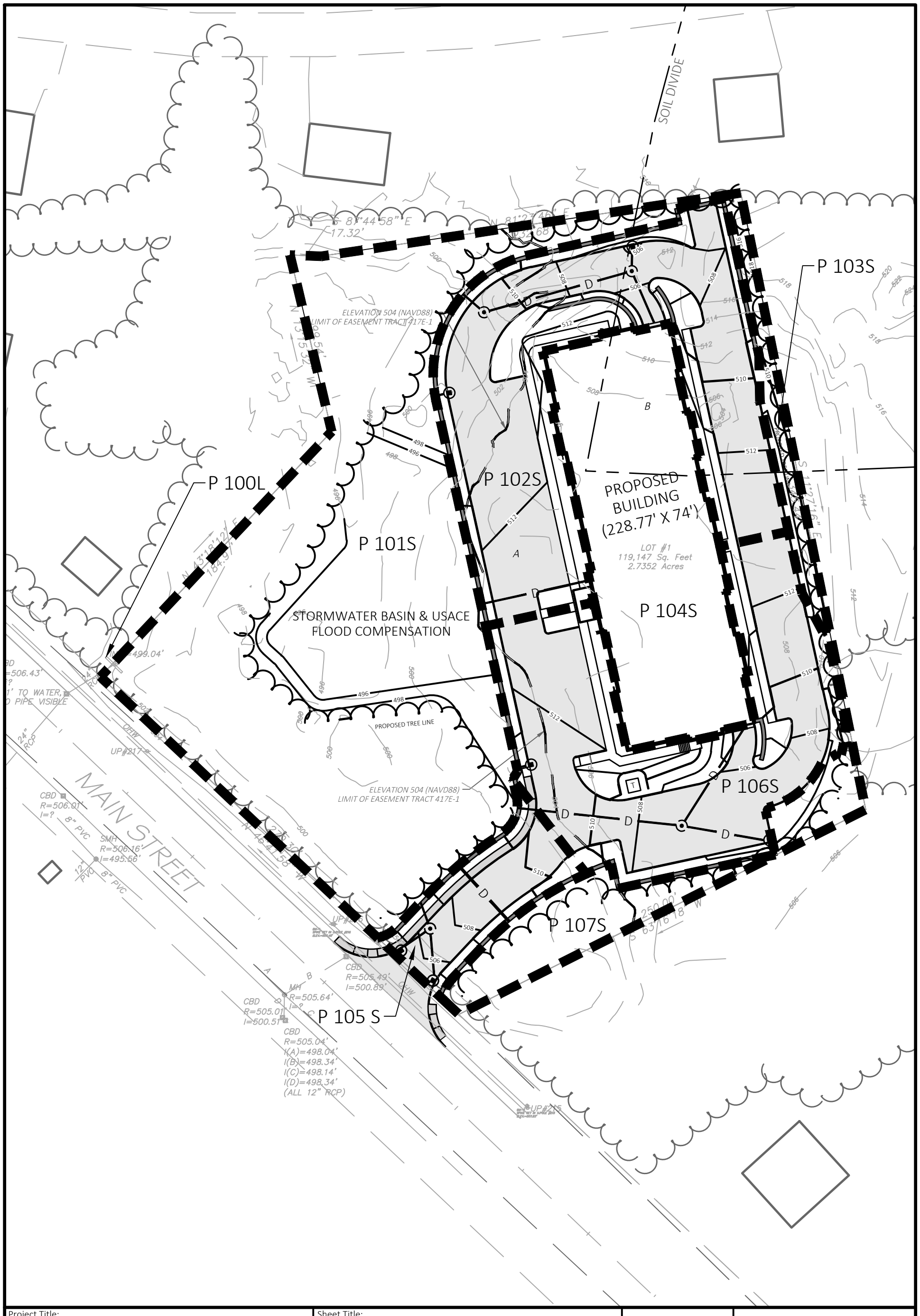

Project Title: Ansari Builders 6 Edgewood Road Westborough, MA 01581	Sheet Title: PROPOSED HYDROLOGY MAP 580 Main Street Oxford, MA 01540	N W E S	LAND DESIGN COLLABORATIVE Chauncy Place | Terrace North | Suite 1 45 Lyman Street Westborough, MA 01581 508.952.6300 | LDCollaborative.com	
Date: 06/30/2023	Project No.: 20-0017	Reference Plan No.: C-260	Drawn By: ESM	Checked By: MJS
0 25 50 100 150 Scale: 1" = 50'			H-2	

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