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July 11, 2025 Project 25.166

Town of Arlington
Engineering Department
51 Grove Street
Arlington, MA 02476
781-316-3320

Re: **Stormwater Narrative**
126 Broadway Street
Arlington, MA

Project Description:

The proposed development includes the removal of the existing dwelling and the construction of a multi-unit dwelling. The project site will have a small driveway with some outdoor parking. Refer to Appendix A for the MA Stormwater Checklist.

Existing Conditions:

Infrastructure: The project has a single-family home with a large single curb cut driveway. The property also has a detached garage. The property has a large bit. Concrete driveway and a small porch and walkway that heads towards Broadway. The project does not have any known on-site drainage systems. Refer to Appendix B for a orthophotograph plan, priority resource plan and site location plan provided from MassMapper.

Topography: The property is generally flat with the existing ground elevation ranging from 100 – 101 ft. Most of the runoff flows towards Broadway and Everett Street, which eventually makes it into the Towns MS4 system.

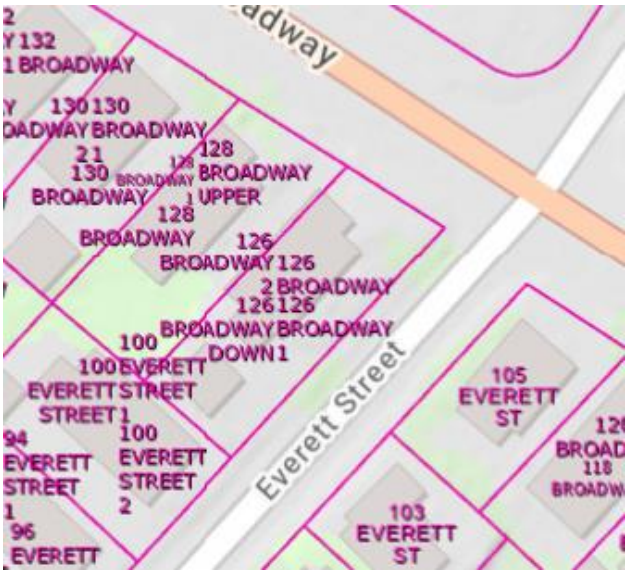
Ground cover: The existing vegetation is grass lawn in fair/good condition. The site currently has two City trees located on the frontage along Everett Street.

Soils: The likely soil types for the property reference from the Natural Resource Conservation Services (NRCS) soil mapping database can be seen in the table below. For additional NRCS soils data, refer to Appendix C.

Map Unit Symbol	Map Unit Name	Rating
626B	Merrimac-Urban Land Complex (0-8%)	HSG A

Soil testing was performed by Chongris Engineering to determine groundwater and soil texture. No redox features, seepage or standing water was observed during testing. The ESHGW is assumed to be 120” below ground surface (bottom of excavation). Refer to the Site Plan for more information regarding the field test pits.

Resource Areas: Based on MassMapper from 07/11/2025, there are no on-site resource areas on the property within the limit of work that require additional permitting.



Hydrology: The hydrological analysis for estimating stormwater runoff for the existing conditions of the property was performed using HydroCAD which employs Technical Release 20 (TR-20) for computations and the Natural Resource Conservation Service (NRCS) guidelines for analytical procedures. All the measured and calculated input values to compute runoff rates and volumes, such as impervious area, time of concentration, weighted curve numbers are provided herein.

Rainfall depths used in the analysis were obtained from NOAA Atlas 14, vol. 10, ver 3 for the project locus. Refer to Appendix D for more information regarding NOAA rainfall depths.

Table 1 – Design Rainfall Depths

Storm Frequency	Rainfall Depth (inches)
2 - yr	3.28
10 - yr	5.17
25 – yr	6.35
100 - yr	8.17

Proposed Conditions:

Infrastructure: The existing dwelling is proposed to be removed. The new structure is much larger and will take up most of the lot. The proposed structure will be a five-story mixed-use building. The property will have commercial units on the first floor. The remaining floors will be residential. The first floor will also have a open parking garage. A small driveway and parking is also proposed. The remaining area that is not building or driveway is to be grass and/or plantings. The proposed structure will be serviced by City sewer and water. The property will be serviced by an underground electric service.

Topography: Minimum adjustments to the on-site topography will be performed to accommodate development. The finish grade will mimic the existing grade, with any runoff not collected in the infiltration system flowing towards Broadway and Everett street, eventually making it into the towns MS4 system.

Ground cover: There will be modifications to existing ground cover to accommodate the proposed structure. All areas of the property that are not building and/or driveway will either be grass or planting beds.

Soils: Any fill brought onto the site for the proposed project shall be clean and well draining.

Prior to any stormwater installation, the design engineer shall inspect and document the soil conditions at all location where infiltration structures are to be considered.

Resource Areas: No development is proposed within a wetland resource or protectable wetland area.

Hydrology: The design points for the hydrological analysis was placed in a manner to analysis runoff entering the surround properties. The proposed conditions hydrological analysis was performed using Hydrocad which utilizes NRCS guidelines for analytical processes and technical resale 20 (TR-20) for calculations. Refer to Appendix E for the existing and proposed Drainage Maps. Refer to Appendix F and G for the existing and proposed Hydrocad Outputs, respectively.

Stormwater Tables

Table 1 – Peak Rates of Runoff

Design Point	Condition	2 – Year (cfs)	10 – Year (cfs)	25 – Year (cfs)	100 – Year (cfs)
Design Point #1 (1R)	Existing	0.10	0.28	0.41	0.61
	Proposed	0.03	0.28	0.57	0.80

Table 2 – Peak Runoff Volume

Desing Point	Condition	2 – Year (cf)	10 – Year (cf)	25 – Year (cf)	100 – Year (cf)
Design Point #1 (1R)	Existing	394	975	1,390	2,078
	Proposed	125	646	1,054	1,722

Table 3 - Infiltration System #1 Summary Table (rates)

Flow (cfs)	2 – Year (cfs)	10 – Year (cfs)	25 – Year (cfs)	100 – Year (cfs)
In	0.26	0.41	0.50	0.64
Out (1) (exfiltration)	0.01	0.01	0.01	0.01
Out (2) (culvert)	0.00	0.20	0.44	0.60

Table 4 - Infiltration System #1 Summary Table (volume)

Flow (cfs)	2 – Year (cf)	10 – Year (cf)	25 – Year (cf)	100 – Year (cf)
In	910	1,473	1,826	2,369
Out (1) (exfiltration)	910	1,143	1,126	1,330
Out (2) (culvert)	0.00	330	600	1,039

Table 5 – Exfiltration Rates & Groundwater for Infil. Sys #1

		Permeability of Soil				
Structure	**Bottom Area (sf)**	**(In/hr)**	**Ft/sec**	**Exfiltration Rate (cfs)**	**System Bottom El.**	**Ground Water El.**
Infil. Sys. #1	236.81	2.41	0.0000557	0.01	95.00	91.00

COMPLIANCE WITH STORMWATER MANAGEMENT STANDARDS

The following are the ten (10) MassDEP Stormwater Standards followed by a brief description of how each standard is satisfied under the stormwater management system proposed for this project.

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

There is no new untreated stormwater discharges proposed with the completion of the project. There are no new stormwater conveyances that discharge directly to wetlands or waters of the commonwealth.

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

Under proposed conditions, peak rate of runoff is managed by the proposed infiltration systems. The remaining runoff will continue to flow off site.

A chart summarizing the peak discharge rates for 2-, 10-, 25-, 50- and 100-year storm events is shown below.

Table 1 – Peak Rates of Runoff

Design Point	Condition	2 – Year (cfs)	10 – Year (cfs)	25 – Year (cfs)	100 – Year (cfs)
Design Point #1 (1R)	Existing	0.10	0.28	0.41	0.61
	Proposed	0.03	0.28	0.57	0.80

The above table indicates that the existing peak discharge rates do not exceed the proposed peak discharge rates for the 2 and 10 year rain events.

Table 2 – Peak Runoff Volume

Desing Point	Condition	2 – Year (cf)	10 – Year (cf)	25 – Year (cf)	100 – Year (cf)
Design Point #1 (1R)	Existing	394	975	1,390	2,078
	Proposed	125	646	1,054	1,722

The above table indicates that the existing peak volumes do not exceed the proposed peak discharge rates for the 2, 10, 25 and 100-year rain events.

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

The proposed project will allow stormwater runoff to infiltrate groundwater using subsurface infiltration systems. Please note the Interceptor drain was not considered in this calculation.

Infiltration System #1

*Required Recharge Volume (R_v) = (F) * (A_{IMP})*
A_{IMP} = Total Impervious Area= 4,344 s.f.
Target Depth Factor for Hydrologic Soil Group A (F) = 0.60-inch
*Require Recharge Volume (R_v) = 0.60-inch/12 * 4,344 s.f. =218 c.f.*
Volume Provided: 563 c.f. (from Hydrocad)

Volume Provided = 563 c.f. > 218 c.f.

BMP Drawdown Calculations Infiltration System:

Infil. System #1:
Drawdown Time (D_w) = Volume (c.f.) / [Hydraulic Cond. (ft./hr.)x bottom area (s.f.)]
Bottom Area of BMP = 236.81 s.f.
Total Storage Volume of Reservoir = 563 c.f.
Hydraulic Conductivity = 2.41 in./hr = 0.20 ft./hr. (Rawls rate from T2.3.3 of Stormwater Handbook)
Dw = 563 c.f. / [0.20 ft./hr. x 236.81 s.f.] = 12 hrs > 72 hrs

Since the drawdown time for the proposed BMP is less than 72 hours, the standard is met for this project.

Standard 4: *Water Quality – Stormwater management systems shall be designed to remove 90% of the average postconstruction load of Total Suspended Solids (TSS). The standard is met with pollution prevention plans, stormwater BMPs sized to capture required water volume, and pretreatment measures.* ***Local regulations require 60% of the average annual load of Total Phosphorus to be removed.***

TSS REMOVAL:

The proposed conditions provide no new increase in untreated stormwater discharge relative to the existing conditions. The proposed stormwater management systems has been designed to remove a minimum of 90% of the average annual post-construction load of Total Suspended Solids (TSS). This is being done by collecting and storing more than 1-inch rain volume over the impervious area of the site. Details on the treatment trains that have been incorporated into the design are shown below.

Slide deck for Meeting #4 from Mass DEP, titled "Design Standards for Post Construction Stormwater Management" slide #24 states that a 90% removal of TSS can be met with by recharging 1" rain depth of the impervious area of the site.

Total Impervious Area on Site: 4,344 SF
1" Rain Volume over Total Site: 362 CF

Treatment Train 1 (Infil System 1): *This treatment train consist of a subsurface infiltration systems. No pretreatment is proposed prior to discharge into the system. A portion of the driveway is proposed to be collected and conveyed into a separate stormwater infiltration system. The overall TSS removal for this train is 90%. The MassDEP TSS Removal Spreadsheet is shown below.*

Infiltration System #1
Total Area of Impervious Area: 4,344 SF
1" Rain Volume over Impervious Area: 362 CF
Volume Provided from Infil. Sys 563 CF > 362 CF

Total Volume Provided = 563 CF > 362 CF, therefore this standard is met.

See Mass DEP Removal Chart Below.

TSS Removal Chart

TSS Removal Calculation Worksheet

Location: 50 Laurel Road Weston

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infil. Sys. w/ 1" rain storage vol.	0.90	1.00	0.90	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
Total TSS Removal =			90%	

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
Prepared By: AJC
Date: 11/21/2024

*Equals remaining load from previous BMP (E) which enters the BMP

Phosphorus Removal:

Appendix F, Attachment 3, Figure 3-11 of the MA MS4 General Permit states that phosphorus removal of 60% is met when a minimum of 1" depth of runoff from impervious area is collected and stored on site for a infiltration rate of 2.41 in/hr.

Total Impervious Area on Site: 4,344 SF

1" Rain Volume over Total Site: 362 CF

Storage Provided: 563 CF (from hydrocad), therefore this standard is met.

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

The proposed project is not considered a LUHPPL. Therefore, compliance with the additional requirements of Standard 5 is not required.

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

Standard 6 is not applicable to this project given that stormwater will not be discharge to a critical area.

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

This project is considered a New Development and all standards have been met to the maximum extent practicable.

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

A construction period Stormwater Management and Erosion Control Plan is included in Appendix H of this report. The plan presents the minimum soil erosion and sediment control practices to be used during construction.

A SWPPP is not required for this project.

Standard 9: *A Long-Term Operation and Maintenance Plan shall be implemented.*

A long term pollution prevention plan and Operation and maintenance Plan are included in Appendix I.

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

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning, condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing, and water used to clean residential buildings without detergents. The Owner is not aware of any existing illicit discharges to the Site and is not proposing any illicit discharges as part of the project. An Illicit Discharge Statement is provided on the O&M plan and a signed copy will be provided upon completion of the project.

PROPOSED EROSION CONTROLS

Erosion control measures listed below will be utilized to help reduce any impacts to the surrounding areas during construction.

- 12” Filtrex Soxx
- Construction Entrance

CONCLUSION

Chongris Engineering believes that the proposed project has been designed in accordance with Local Regulations. Chongris Engineering respectfully requests a approval from the Planning Board granting permission for the work described above and shown on the submitted plan.

We look forward to working with you on this project. If you have any questions regarding this proposal, do not hesitate to contact us.

Sincerely,
Chongris Engineering LLC

Aleksandr Chongris, P.E.

INDEX:

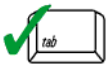
APPENDIX A

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.

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

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:

- [X] No disturbance to any Wetland Resource Areas
- [X] Site Design Practices (e.g. clustered development, reduced frontage setbacks) (high density residential building)
- [ ] 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): LID were considered but due to site constraints subsurface infiltration system are pripsoed.

Standard 1: No New Untreated Discharges

- [X] 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. The overall volume for the 100 year storm is less than existing conditions.

Standard 3: Recharge

☒ Soil Analysis provided. (field soil testing performed in june 2025)

☒ 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. (ESHGW separation is greater than or equal to 4 ft)

☐ 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 (> 1 provided)

☐ 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.

Not needed

☐ 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.

Not discharging to critical areas.

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:

Treated as new development

- ☐ 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.

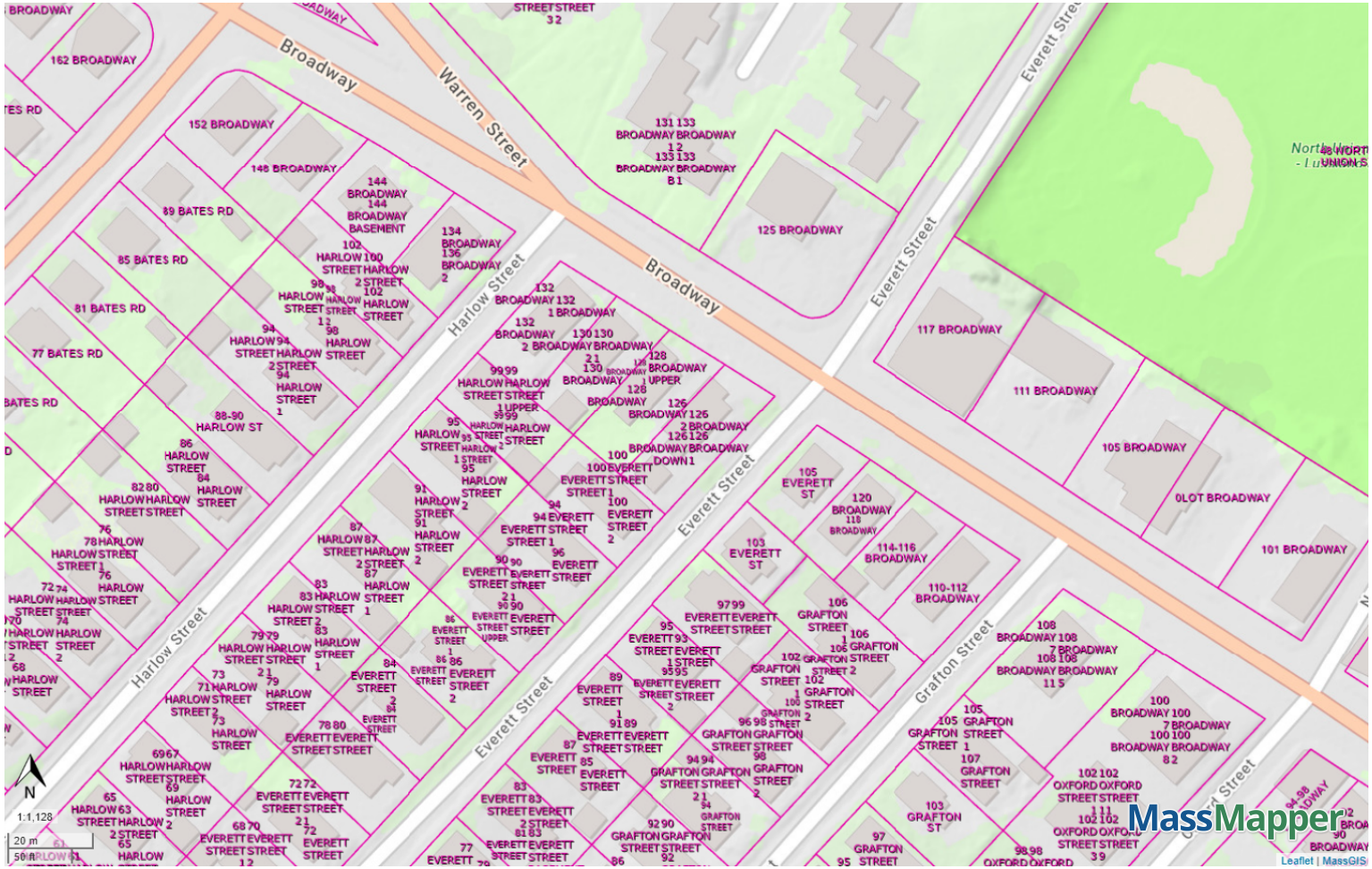
Standard 10: Prohibition of Illicit Discharges

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

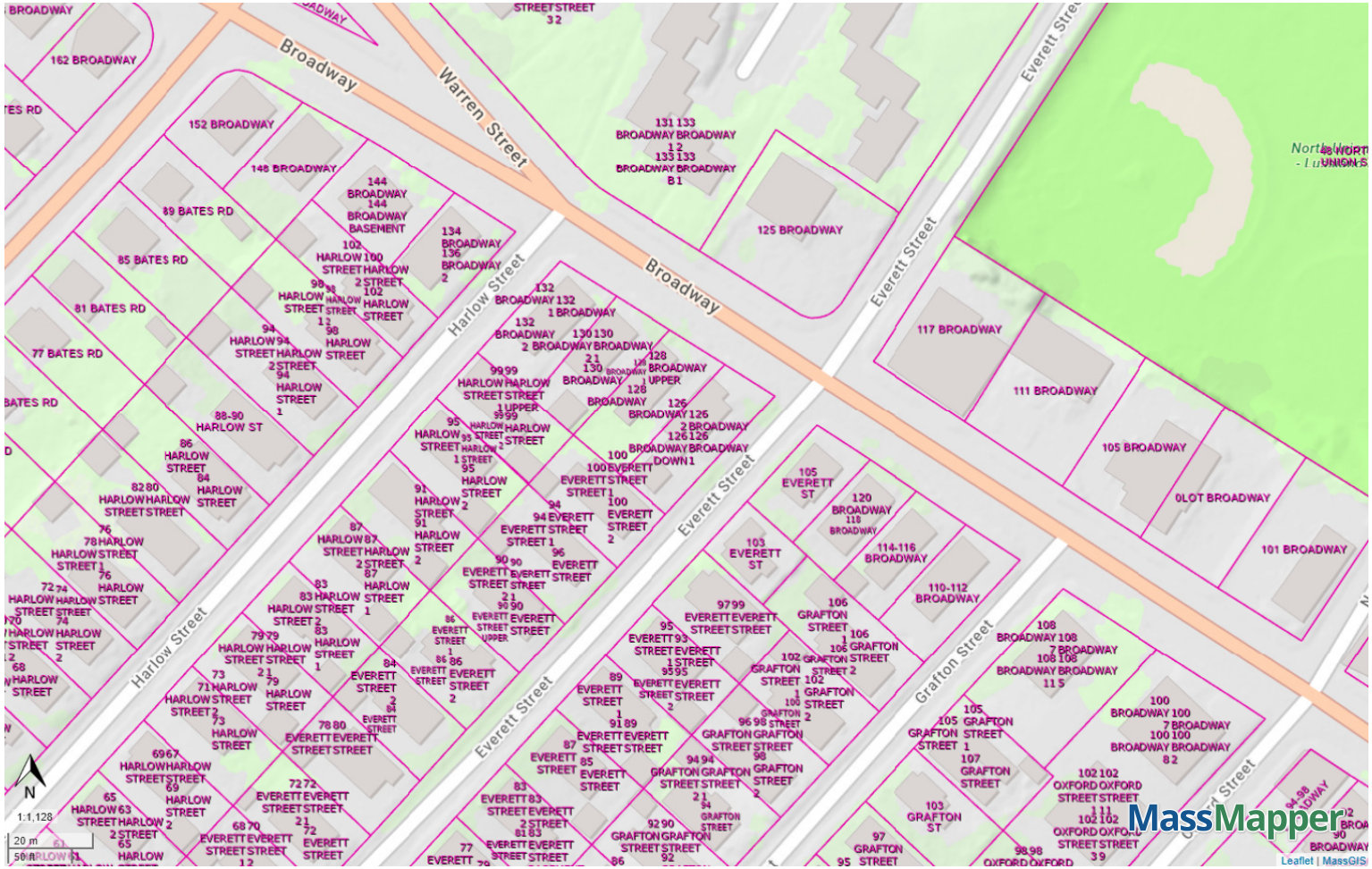
☒ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX B



Property Tax Parcels



Areas of Critical Environmental Concern
ACECs

IWPAs

Zone IIs

Zone Is

Zone C

Zone B

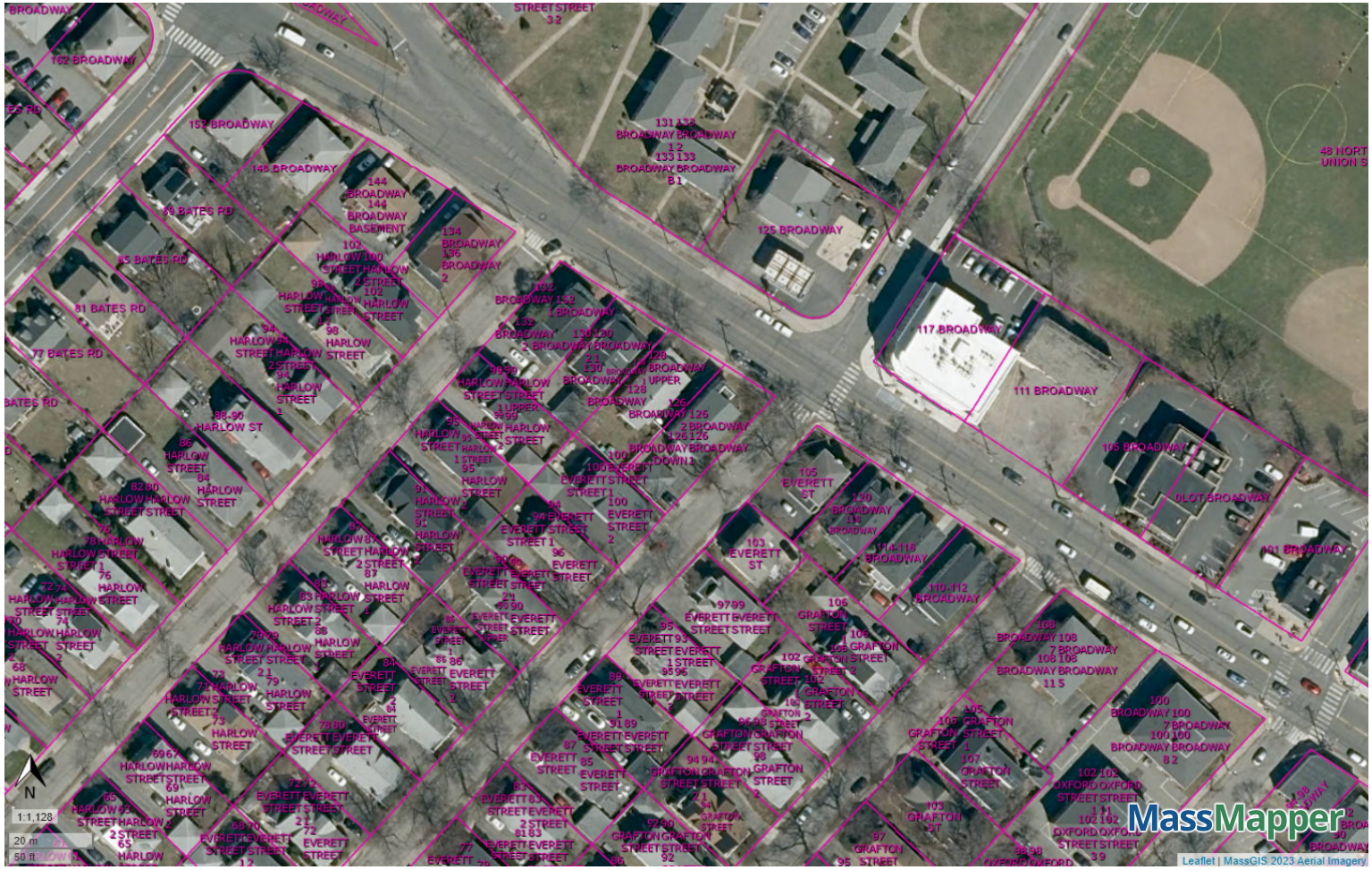
Zone A

NHESP Certified Vernal Pools

NHESP Estimated Habitats of Rare Wildlife

FEMA National Flood Hazard Layer

Property Tax Parcels



Property Tax Parcels

APPENDIX C

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 Middlesex County, Massachusetts

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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 Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

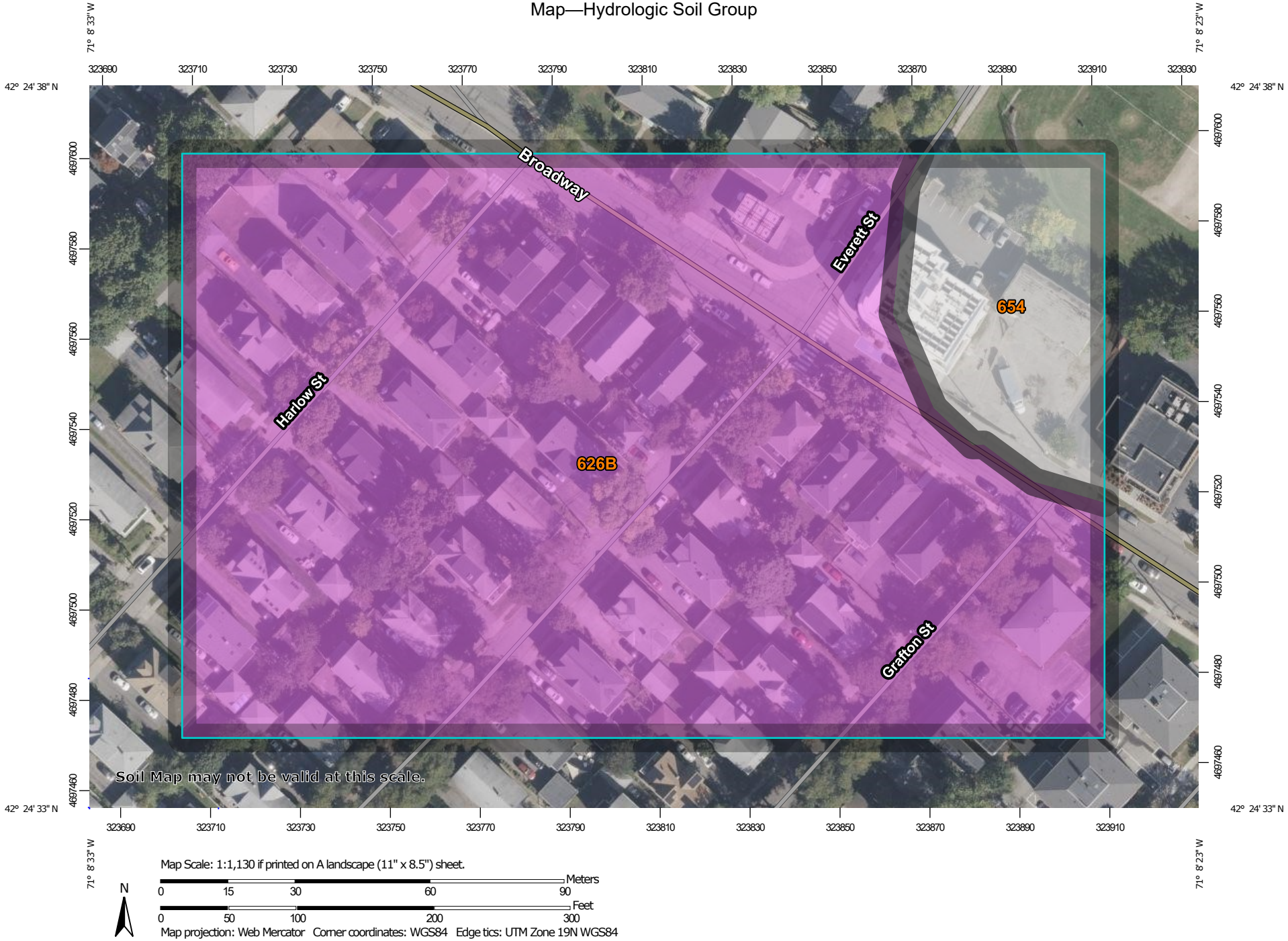
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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

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

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

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



Map Scale: 1:1,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 24, Aug 27, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	5.9	88.8%
654	Udorthents, loamy		0.7	11.2%
Totals for Area of Interest			**6.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D

NOAA Atlas 14, Volume 10, Version 3
Location name: Arlington, Massachusetts, USA*
Latitude: 42.4102°, Longitude: -71.1412°
Elevation: 31 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.304** (0.237-0.384)	**0.372** (0.290-0.471)	**0.484** (0.376-0.615)	**0.576** (0.444-0.737)	**0.704** (0.528-0.951)	**0.799** (0.587-1.11)	**0.901** (0.646-1.31)	**1.02** (0.688-1.51)	**1.21** (0.781-1.85)	**1.36** (0.861-2.13)
10-min	**0.430** (0.335-0.544)	**0.527** (0.411-0.668)	**0.686** (0.532-0.873)	**0.817** (0.631-1.05)	**0.998** (0.748-1.35)	**1.13** (0.833-1.57)	**1.28** (0.915-1.85)	**1.45** (0.975-2.14)	**1.71** (1.11-2.62)	**1.93** (1.22-3.02)
15-min	**0.506** (0.395-0.640)	**0.620** (0.483-0.786)	**0.806** (0.626-1.03)	**0.961** (0.742-1.23)	**1.17** (0.880-1.59)	**1.33** (0.980-1.85)	**1.50** (1.08-2.18)	**1.70** (1.15-2.51)	**2.01** (1.30-3.08)	**2.27** (1.44-3.55)
30-min	**0.693** (0.540-0.877)	**0.850** (0.662-1.08)	**1.11** (0.859-1.41)	**1.32** (1.02-1.69)	**1.62** (1.21-2.18)	**1.83** (1.35-2.54)	**2.07** (1.49-3.01)	**2.35** (1.58-3.47)	**2.79** (1.80-4.27)	**3.16** (2.00-4.95)
60-min	**0.879** (0.686-1.11)	**1.08** (0.842-1.37)	**1.41** (1.09-1.79)	**1.68** (1.30-2.15)	**2.06** (1.54-2.78)	**2.33** (1.72-3.24)	**2.64** (1.90-3.83)	**3.00** (2.02-4.43)	**3.56** (2.31-5.46)	**4.05** (2.56-6.34)
2-hr	**1.14** (0.896-1.43)	**1.41** (1.10-1.77)	**1.84** (1.44-2.32)	**2.20** (1.71-2.79)	**2.69** (2.03-3.62)	**3.05** (2.27-4.22)	**3.45** (2.51-5.01)	**3.95** (2.67-5.78)	**4.74** (3.08-7.20)	**5.42** (3.44-8.41)
3-hr	**1.33** (1.05-1.66)	**1.64** (1.29-2.05)	**2.14** (1.68-2.69)	**2.56** (2.00-3.24)	**3.13** (2.38-4.20)	**3.56** (2.65-4.89)	**4.02** (2.93-5.81)	**4.61** (3.12-6.70)	**5.54** (3.60-8.36)	**6.35** (4.04-9.78)
6-hr	**1.72** (1.37-2.14)	**2.12** (1.68-2.63)	**2.76** (2.18-3.45)	**3.29** (2.59-4.14)	**4.03** (3.07-5.35)	**4.57** (3.42-6.23)	**5.16** (3.77-7.38)	**5.90** (4.01-8.51)	**7.07** (4.62-10.6)	**8.09** (5.16-12.3)
12-hr	**2.20** (1.76-2.72)	**2.70** (2.15-3.33)	**3.51** (2.79-4.35)	**4.18** (3.31-5.22)	**5.10** (3.92-6.72)	**5.79** (4.36-7.81)	**6.53** (4.79-9.22)	**7.45** (5.09-10.6)	**8.87** (5.81-13.1)	**10.1** (6.46-15.2)
24-hr	**2.65** (2.13-3.24)	**3.28** (2.64-4.02)	**4.31** (3.46-5.31)	**5.17** (4.12-6.41)	**6.35** (4.91-8.30)	**7.22** (5.47-9.68)	**8.17** (6.03-11.5	**9.36** (6.41-13.2)	**11.2** (7.37-16.4)	**12.8** (8.22-19.1)
2-day	**3.01** (2.45-3.67)	**3.80** (3.09-4.64)	**5.10** (4.12-6.24)	**6.18** (4.96-7.60)	**7.66** (5.96-9.97)	**8.74** (6.68-11.7)	**9.94** (7.42-13.9)	**11.5** (7.90-16.1)	**14.0** (9.22-20.3)	**16.2** (10.4-23.9)
3-day	**3.30** (2.69-4.00)	**4.16** (3.39-5.05)	**5.55** (4.51-6.77)	**6.71** (5.41-8.23)	**8.31** (6.50-10.8)	**9.47** (7.27-12.6)	**10.8** (8.08-15.0)	**12.5** (8.59-17.4)	**15.2** (10.0-21.9)	**17.6** (11.4-25.9)
4-day	**3.58** (2.93-4.32)	**4.46** (3.64-5.40)	**5.90** (4.80-7.17)	**7.10** (5.74-8.67)	**8.75** (6.86-11.3)	**9.95** (7.66-13.2)	**11.3** (8.48-15.7)	**13.0** (9.01-18.1)	**15.9** (10.5-22.8)	**18.4** (11.9-26.9)
7-day	**4.34** (3.57-5.22)	**5.26** (4.32-6.33)	**6.76** (5.54-8.17)	**8.01** (6.52-9.73)	**9.73** (7.66-12.4)	**11.0** (8.48-14.4)	**12.4** (9.31-17.0)	**14.2** (9.83-19.5)	**17.1** (11.3-24.3)	**19.6** (12.7-28.4)
10-day	**5.04** (4.16-6.04)	**5.98** (4.94-7.18)	**7.53** (6.19-9.06)	**8.81** (7.20-10.7)	**10.6** (8.35-13.4)	**11.9** (9.18-15.5)	**13.3** (9.99-18.1)	**15.1** (10.5-20.6)	**17.9** (11.9-25.3)	**20.4** (13.2-29.4)
20-day	**7.04** (5.86-8.38)	**8.07** (6.71-9.61)	**9.76** (8.08-11.7)	**11.2** (9.17-13.4)	**13.1** (10.4-16.3)	**14.5** (11.2-18.5)	**16.0** (12.0-21.2)	**17.8** (12.5-24.0)	**20.3** (13.6-28.4)	**22.4** (14.6-31.9)
30-day	**8.70** (7.28-10.3)	**9.80** (8.18-11.6)	**11.6** (9.64-13.8)	**13.1** (10.8-15.6)	**15.1** (12.0-18.7)	**16.7** (12.9-21.1)	**18.3** (13.6-23.8)	**19.9** (14.0-26.8)	**22.2** (14.9-30.8)	**24.1** (15.7-34.0)
45-day	**10.8** (9.06-12.7)	**12.0** (10.0-14.1)	**13.9** (11.6-16.4)	**15.4** (12.8-18.4)	**17.6** (14.0-21.6)	**19.3** (14.9-24.1)	**21.0** (15.5-26.9)	**22.6** (15.9-30.1)	**24.7** (16.6-34.0)	**26.2** (17.1-36.8)
60-day	**12.6** (10.6-14.8)	**13.8** (11.6-16.2)	**15.8** (13.2-18.6)	**17.4** (14.5-20.7)	**19.7** (15.7-24.1)	**21.5** (16.6-26.7)	**23.2** (17.2-29.5)	**24.8** (17.5-32.8)	**26.7** (18.0-36.6)	**28.1** (18.4-39.3)

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

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

Please refer to NOAA Atlas 14 document for more information.

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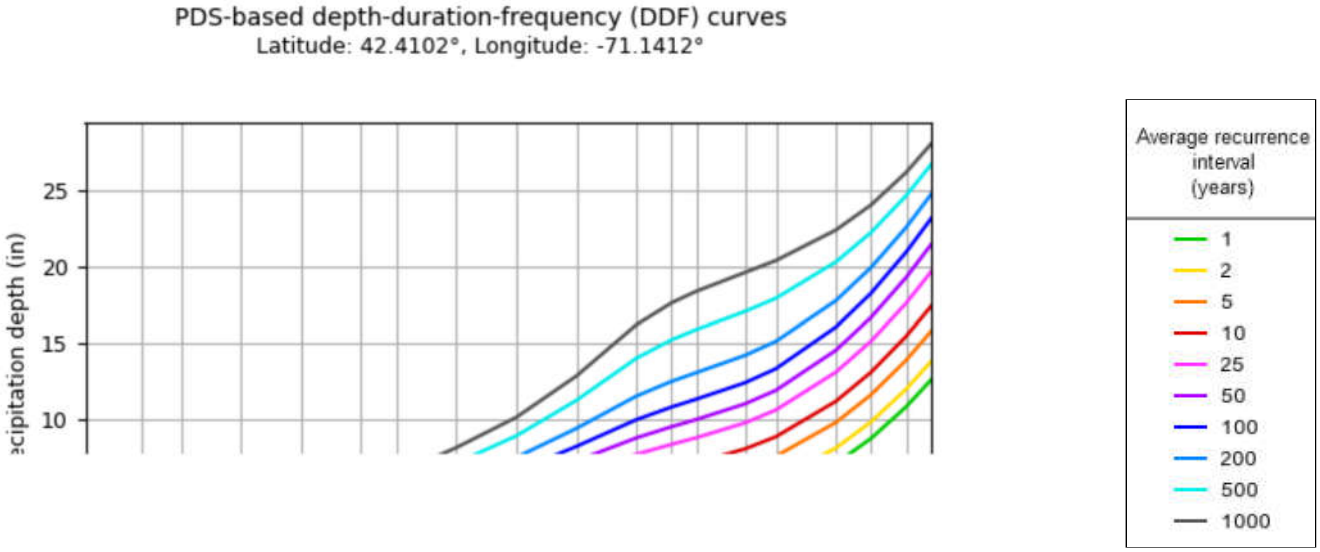
PF graphical



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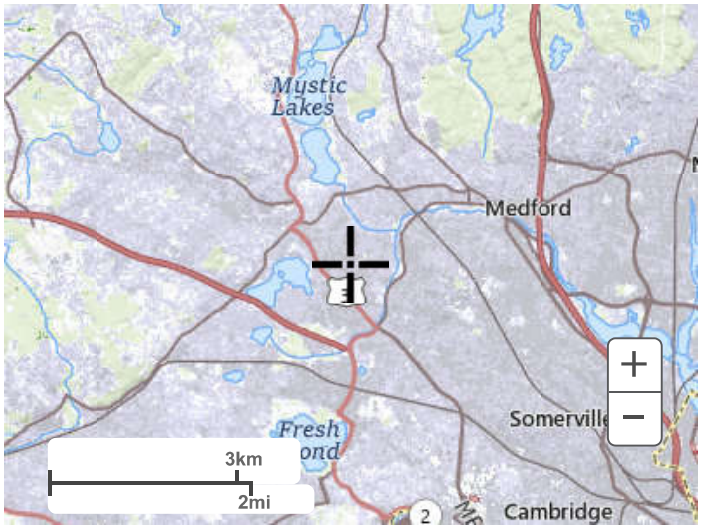
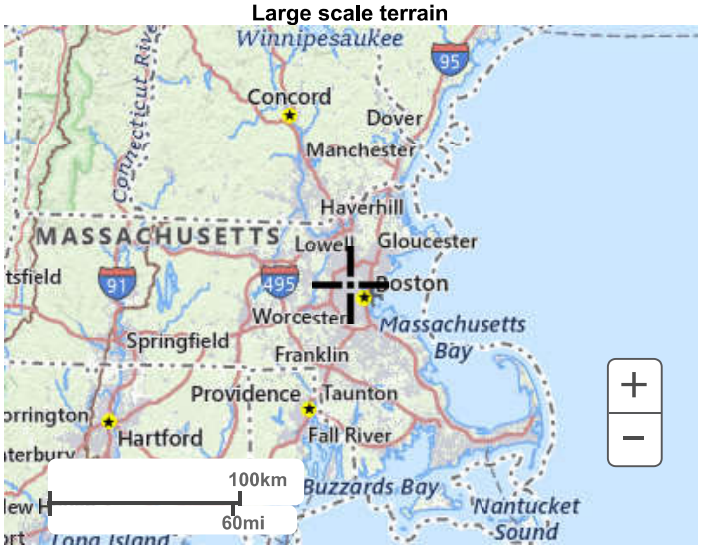
Maps & aerials

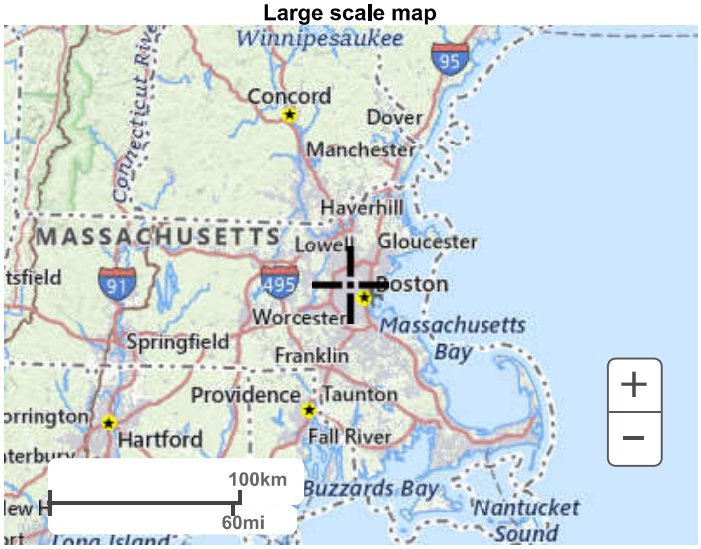
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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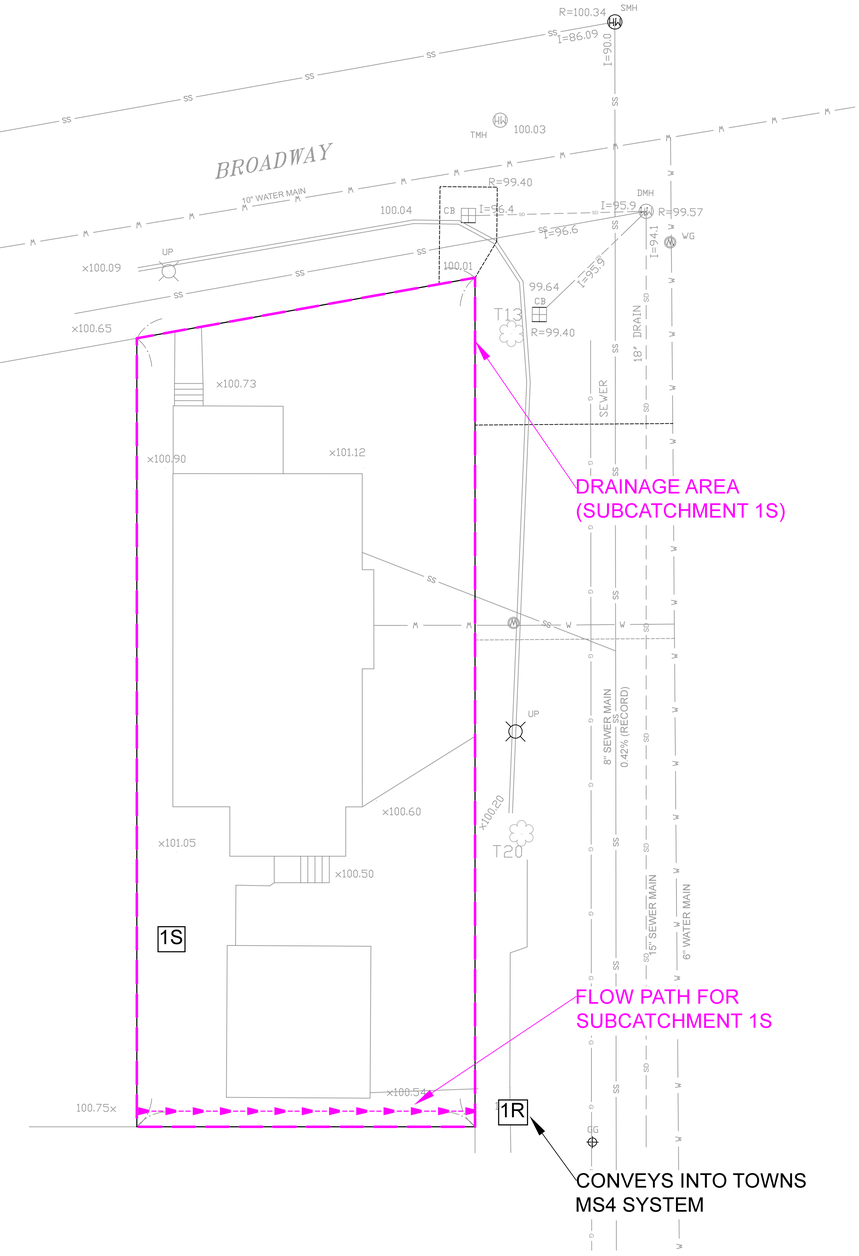
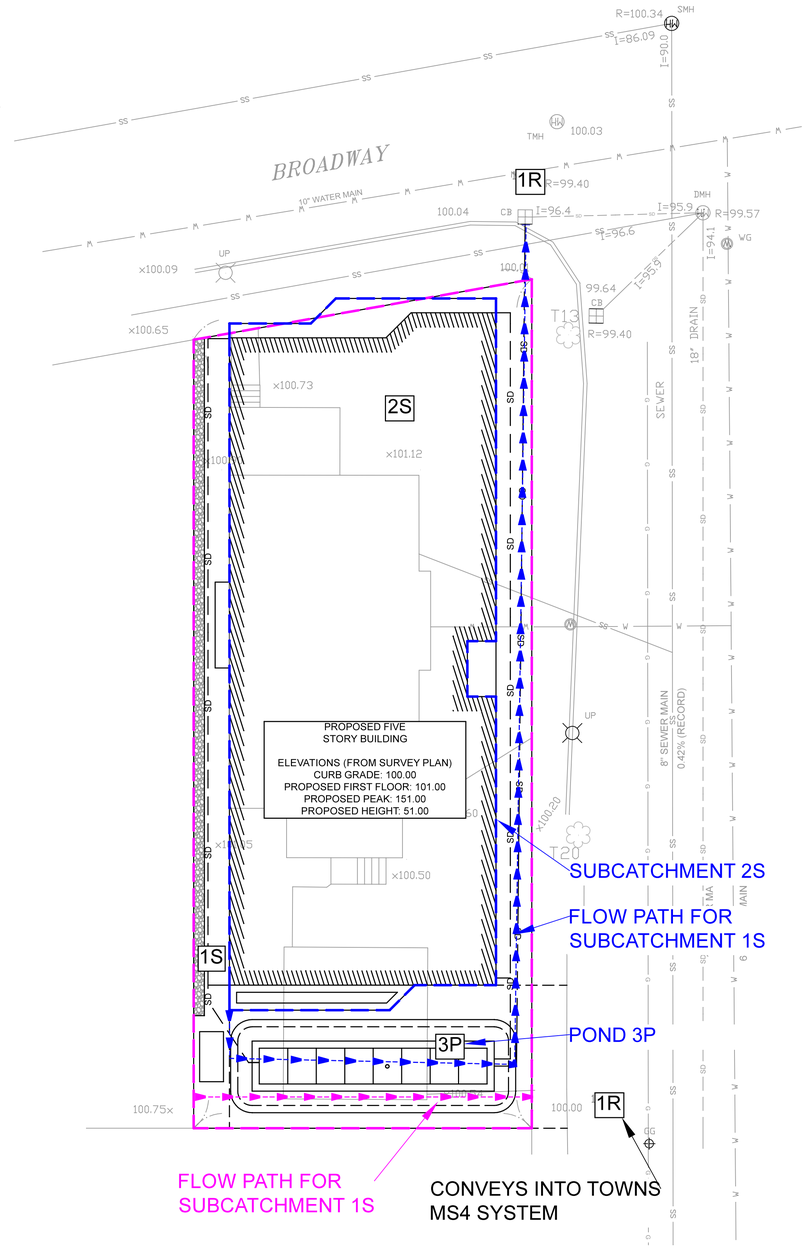
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX E



EXISTING DRAIN MAP
1" = 10'



PROPOSED DRAIN MAP
1" = 10'

0 2.5 5 10
1"=10'

Prepared By:

256 Beacon Street
Andover, MA 01810
chongrisengineering.com
alek@chongrisengineering.com
978-655-0885

I CERTIFY THAT I AM CURRENTLY APPROVED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION PURSUANT TO 310 CMR 15.017 TO CONDUCT SOIL EVALUATIONS AND THAT THE ABOVE ANALYSIS HAS BEEN PERFORMED BY ME CONSISTENT WITH THE REQUIRED TRAINING, EXPERTISE, AND EXPERIENCE DESCRIBED IN310 CMR 15.017. I FURTHER CERTIFY THAT THE RESULTS OF MY SOIL EVALUATION, AS INDICATED ON THE ATTACHED SOIL EVALUATION FORM ARE ACCURATE AND IN ACCORDANCE WITH 310 CMR 15.100 THROUGH 15.107.

Plan Title:

126 BROADWAY STREET
ARLINGTON, MA

DRAINAGE MAP

Address Info:

126 BROADWAY STREET
ARLINGTON, MA

PID: 030-03-04

LOT SIZE: 0.12 ACRES

Owner Info:

126 BROADWAY LLC
77 OAK STREET, STE. B3
NEWTON, MA
978-815-1486

Rev. No.	Rev. Date	Description

Date: 07/09/2025

Drawn by:

Approved by:

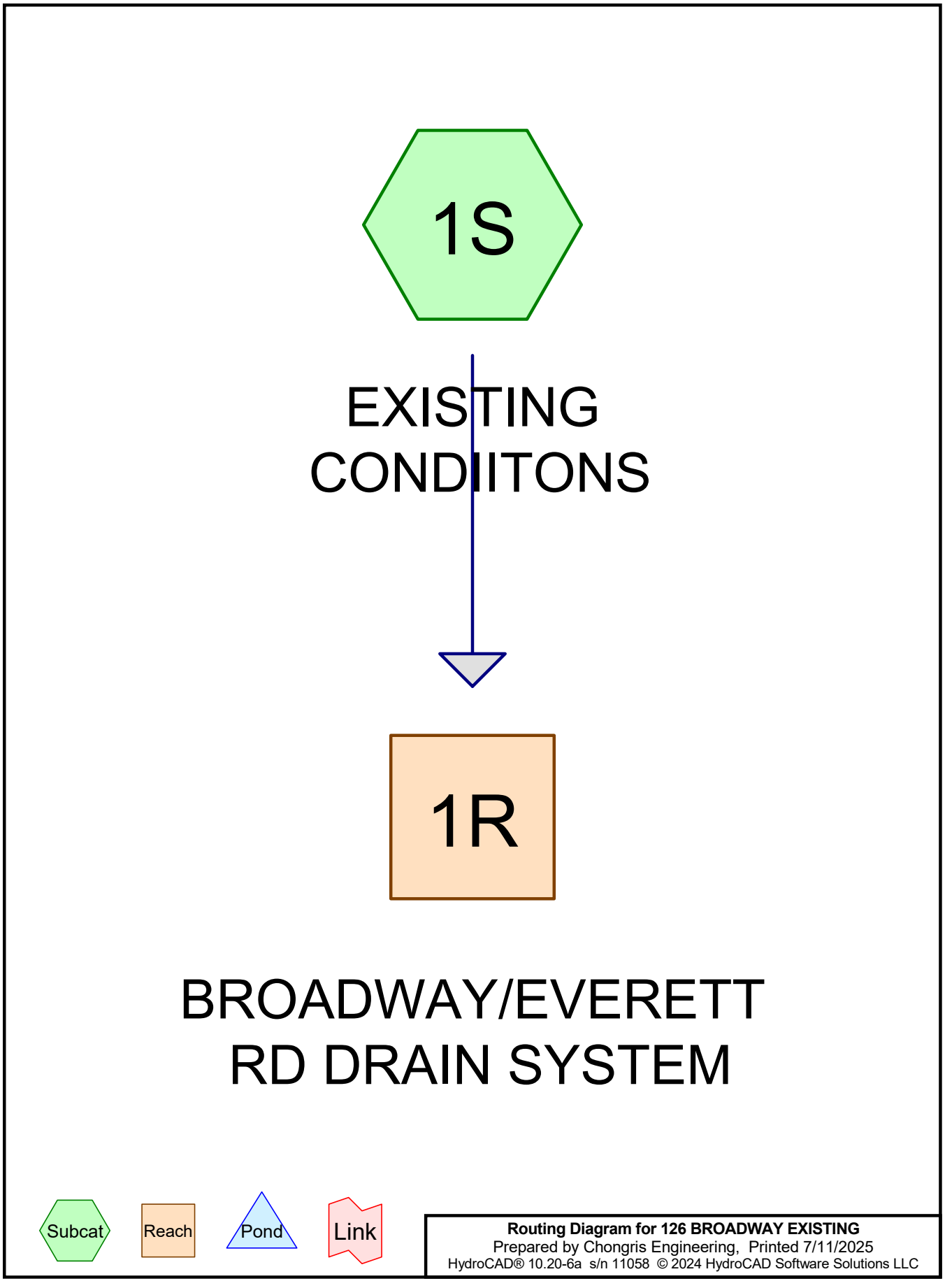
Job Number: 25.166

DRAINAGE MAP

SCALE: AS NOTED

SHEET 1 OF 1

APPENDIX F


1S
EXISTING
CONDIITONS
1R
BROADWAY/EVERETT
RD DRAIN SYSTEM
Subcat
Reach
Pond
Link
Routing Diagram for 126 BROADWAY EXISTING
Prepared by Chongris Engineering, Printed 7/11/2025
HydroCAD® 10.20-6a s/n 11058 © 2024 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr-24	Type III 24-hr		Default	24.00	1	3.28	2
2	10-yr-24	Type III 24-hr		Default	24.00	1	5.17	2
3	25-yr-24	Type III 24-hr		Default	24.00	1	6.35	2
4	100-yr-24	Type III 24-hr		Default	24.00	1	8.17	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,529	39	>75% Grass cover, Good, HSG A (1S)
867	98	Driveway, HSG A (1S)
427	98	Garage, HSG A (1S)
1,367	98	House, HSG A (1S)
146	98	Porch, HSG A (1S)
71	98	Walkway, HSG A (1S)
5,407	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
5,407	HSG A	1S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
5,407		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
2,529	0	0	0	0	2,529	>75% Grass cover, Good	
867	0	0	0	0	867	Driveway	
427	0	0	0	0	427	Garage	
1,367	0	0	0	0	1,367	House	
146	0	0	0	0	146	Porch	
71	0	0	0	0	71	Walkway	
5,407	**0**	**0**	**0**	**0**	**5,407**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDIITONS Runoff Area=5,407 sf 53.23% Impervious Runoff Depth=0.88"
Flow Length=241' Tc=8.4 min CN=70 Runoff=0.10 cfs 394 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.10 cfs 394 cf
Outflow=0.10 cfs 394 cf

Total Runoff Area = 5,407 sf Runoff Volume = 394 cf Average Runoff Depth = 0.88"
46.77% Pervious = 2,529 sf 53.23% Impervious = 2,878 sf

Summary for Subcatchment 1S: EXISTING CONDIITONS

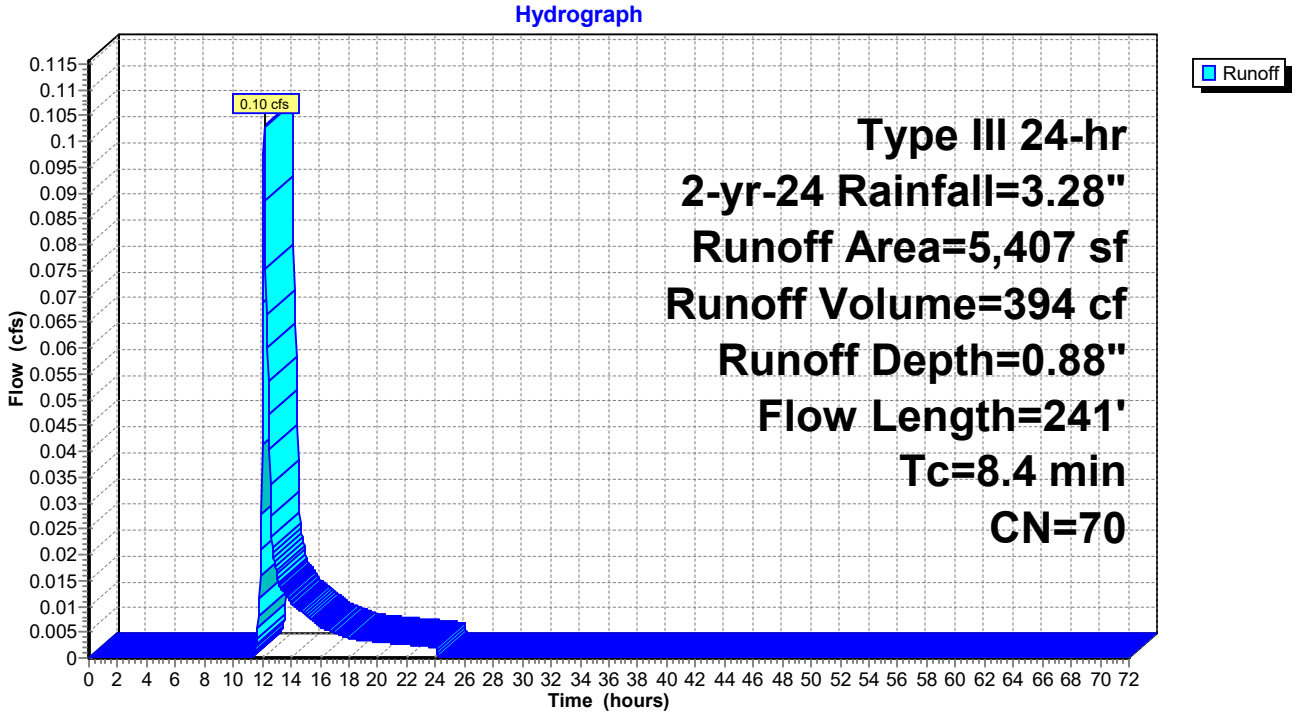
Runoff = 0.10 cfs @ 12.14 hrs, Volume= 394 cf, Depth= 0.88"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr-24 Rainfall=3.28"

	Area (sf)	CN	Description
*	1,367	98	House, HSG A
*	427	98	Garage, HSG A
*	146	98	Porch, HSG A
*	71	98	Walkway, HSG A
*	867	98	Driveway, HSG A
	2,529	39	>75% Grass cover, Good, HSG A
	5,407	70	Weighted Average
	2,529		46.77% Pervious Area
	2,878		53.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: EXISTING CONDIITONS



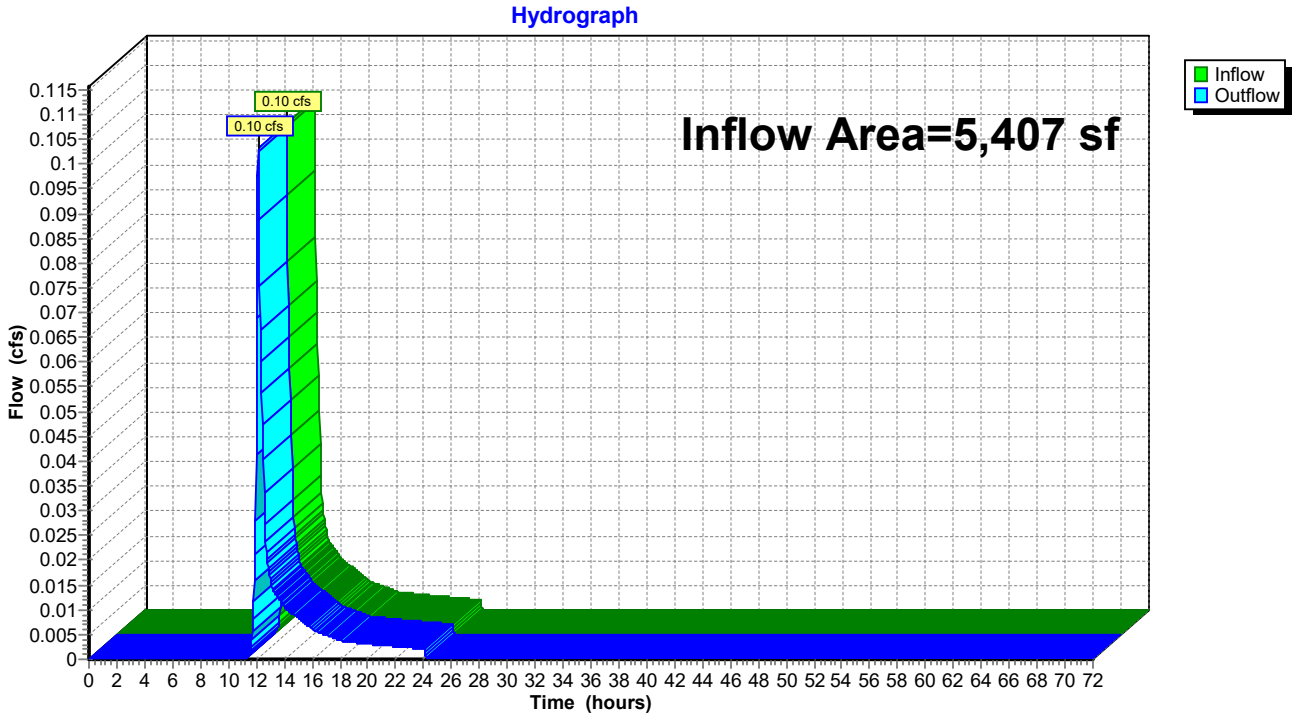
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 53.23% Impervious, Inflow Depth = 0.88" for 2-yr-24 event
Inflow = 0.10 cfs @ 12.14 hrs, Volume= 394 cf
Outflow = 0.10 cfs @ 12.14 hrs, Volume= 394 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDIITONS Runoff Area=5,407 sf 53.23% Impervious Runoff Depth=2.16"
Flow Length=241' Tc=8.4 min CN=70 Runoff=0.28 cfs 975 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.28 cfs 975 cf
Outflow=0.28 cfs 975 cf

Total Runoff Area = 5,407 sf Runoff Volume = 975 cf Average Runoff Depth = 2.16"
46.77% Pervious = 2,529 sf 53.23% Impervious = 2,878 sf

Summary for Subcatchment 1S: EXISTING CONDIITONS

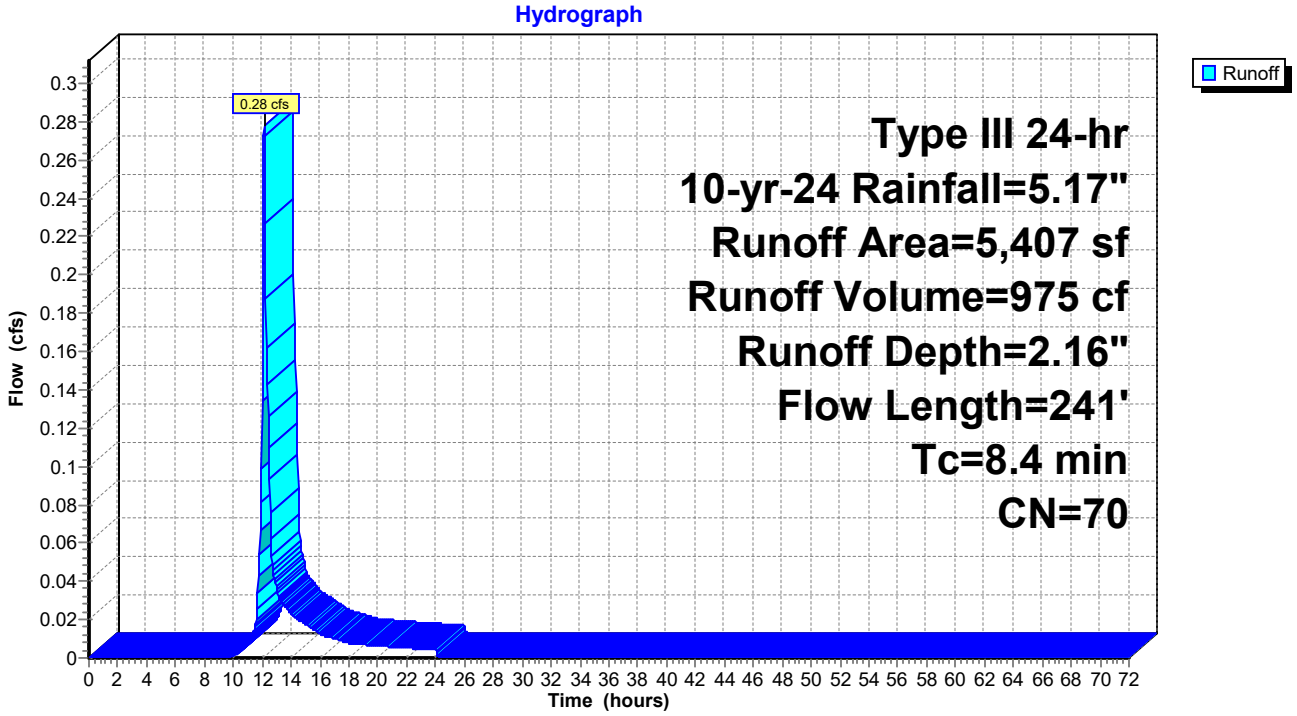
Runoff = 0.28 cfs @ 12.13 hrs, Volume= 975 cf, Depth= 2.16"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr-24 Rainfall=5.17"

	Area (sf)	CN	Description
*	1,367	98	House, HSG A
*	427	98	Garage, HSG A
*	146	98	Porch, HSG A
*	71	98	Walkway, HSG A
*	867	98	Driveway, HSG A
	2,529	39	>75% Grass cover, Good, HSG A
	5,407	70	Weighted Average
	2,529		46.77% Pervious Area
	2,878		53.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: EXISTING CONDIITONS



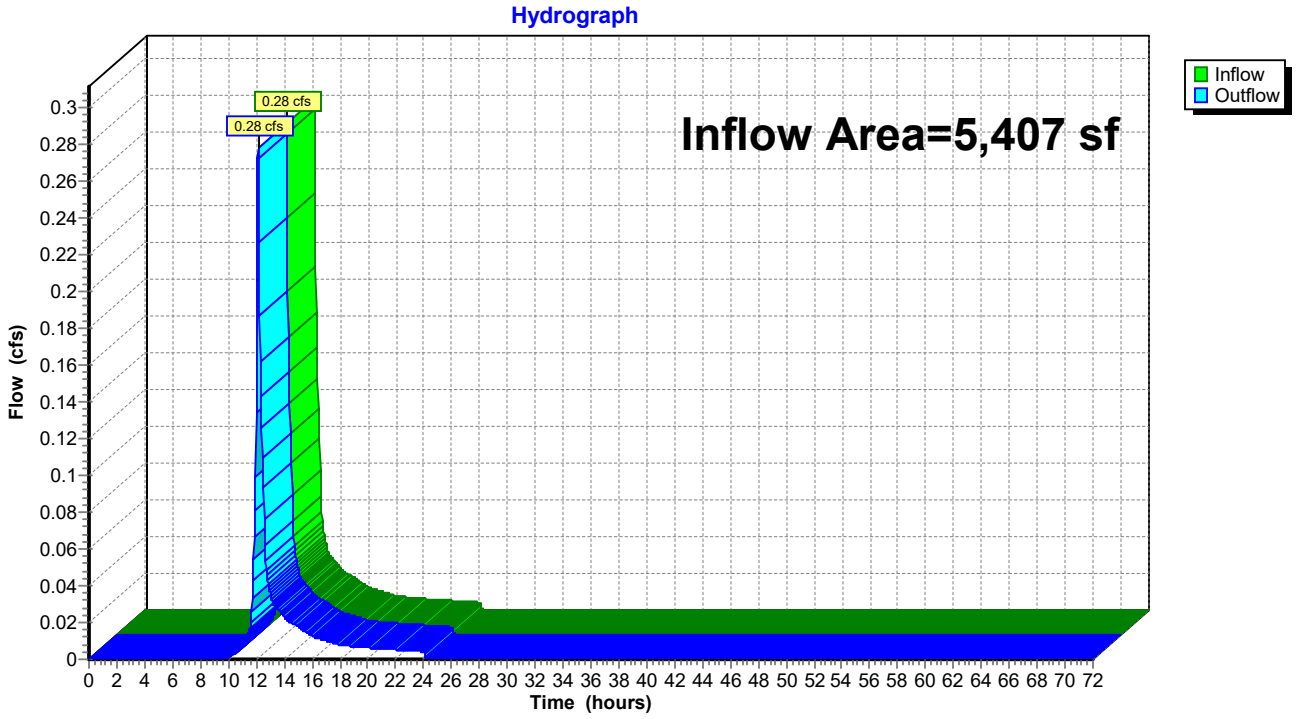
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 53.23% Impervious, Inflow Depth = 2.16" for 10-yr-24 event
Inflow = 0.28 cfs @ 12.13 hrs, Volume= 975 cf
Outflow = 0.28 cfs @ 12.13 hrs, Volume= 975 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDIITONS Runoff Area=5,407 sf 53.23% Impervious Runoff Depth=3.09"
Flow Length=241' Tc=8.4 min CN=70 Runoff=0.41 cfs 1,390 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.41 cfs 1,390 cf
Outflow=0.41 cfs 1,390 cf

Total Runoff Area = 5,407 sf Runoff Volume = 1,390 cf Average Runoff Depth = 3.09"
46.77% Pervious = 2,529 sf 53.23% Impervious = 2,878 sf

Summary for Subcatchment 1S: EXISTING CONDIITONS

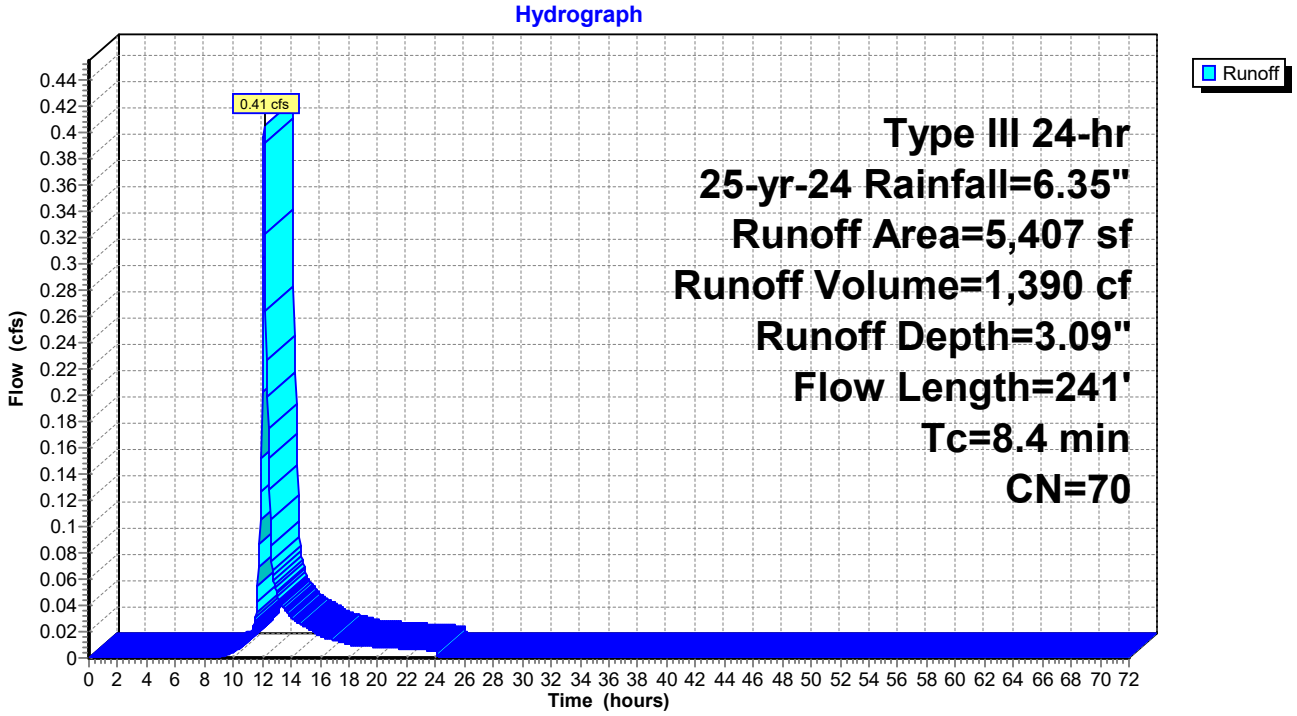
Runoff = 0.41 cfs @ 12.12 hrs, Volume= 1,390 cf, Depth= 3.09"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr-24 Rainfall=6.35"

	Area (sf)	CN	Description
*	1,367	98	House, HSG A
*	427	98	Garage, HSG A
*	146	98	Porch, HSG A
*	71	98	Walkway, HSG A
*	867	98	Driveway, HSG A
	2,529	39	>75% Grass cover, Good, HSG A
	5,407	70	Weighted Average
	2,529		46.77% Pervious Area
	2,878		53.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: EXISTING CONDIITONS



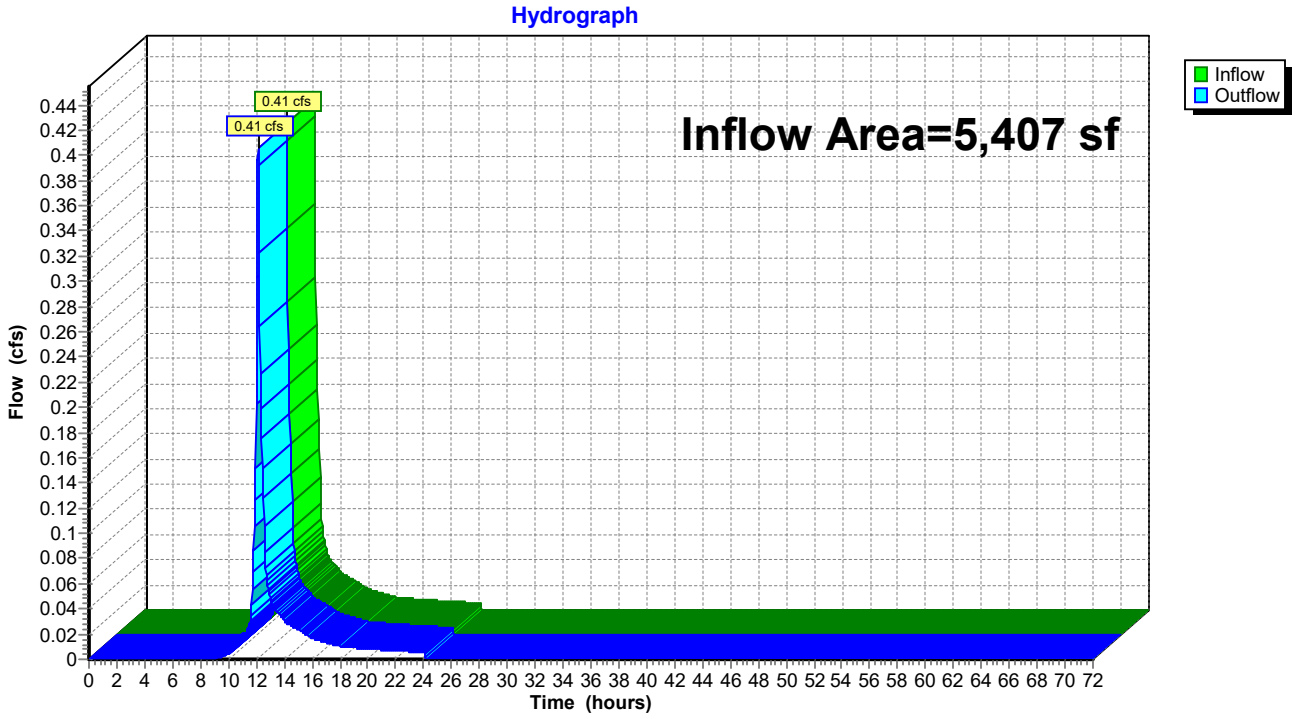
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 53.23% Impervious, Inflow Depth = 3.09" for 25-yr-24 event
Inflow = 0.41 cfs @ 12.12 hrs, Volume= 1,390 cf
Outflow = 0.41 cfs @ 12.12 hrs, Volume= 1,390 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDIITONS Runoff Area=5,407 sf 53.23% Impervious Runoff Depth=4.61"
Flow Length=241' Tc=8.4 min CN=70 Runoff=0.61 cfs 2,078 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.61 cfs 2,078 cf
Outflow=0.61 cfs 2,078 cf

Total Runoff Area = 5,407 sf Runoff Volume = 2,078 cf Average Runoff Depth = 4.61"
46.77% Pervious = 2,529 sf 53.23% Impervious = 2,878 sf

Summary for Subcatchment 1S: EXISTING CONDIITONS

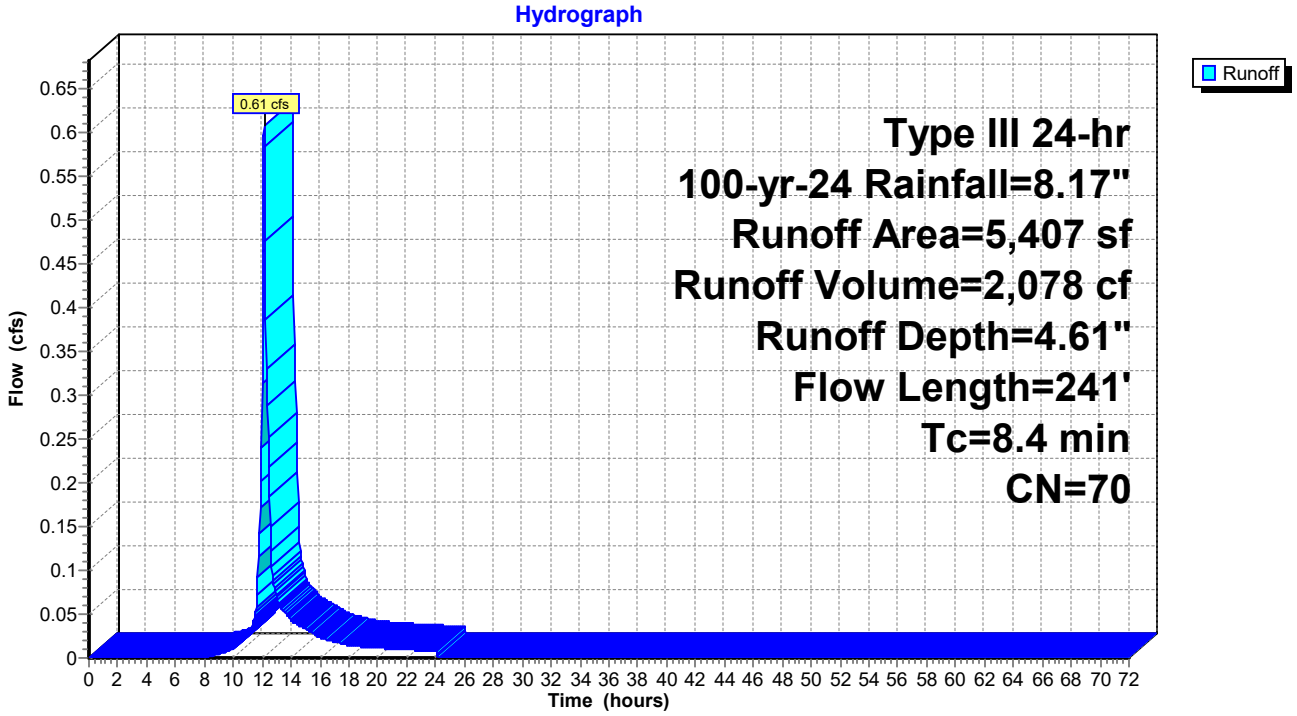
Runoff = 0.61 cfs @ 12.12 hrs, Volume= 2,078 cf, Depth= 4.61"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr-24 Rainfall=8.17"

	Area (sf)	CN	Description
*	1,367	98	House, HSG A
*	427	98	Garage, HSG A
*	146	98	Porch, HSG A
*	71	98	Walkway, HSG A
*	867	98	Driveway, HSG A
	2,529	39	>75% Grass cover, Good, HSG A
	5,407	70	Weighted Average
	2,529		46.77% Pervious Area
	2,878		53.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: EXISTING CONDIITONS



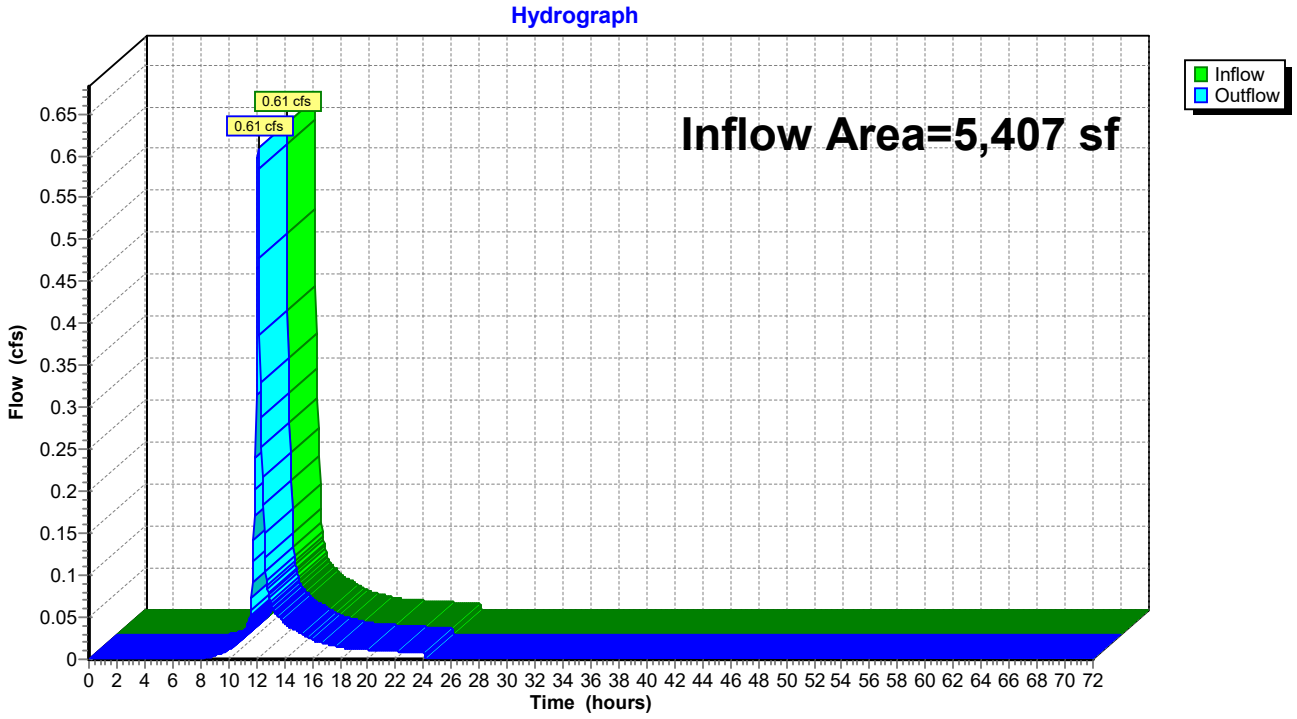
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 53.23% Impervious, Inflow Depth = 4.61" for 100-yr-24 event
Inflow = 0.61 cfs @ 12.12 hrs, Volume= 2,078 cf
Outflow = 0.61 cfs @ 12.12 hrs, Volume= 2,078 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



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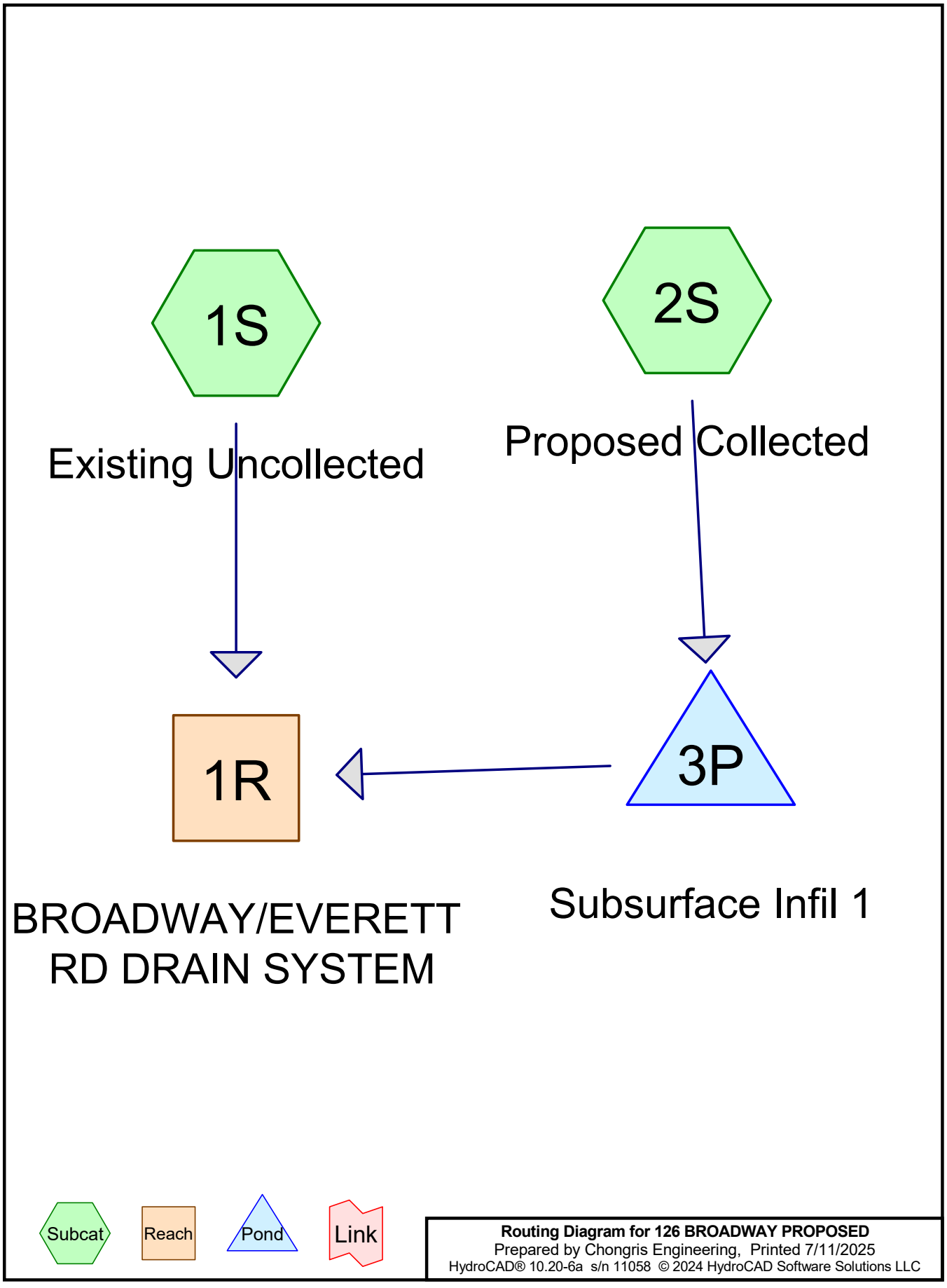
APPENDIX G



Routing Diagram for 126 BROADWAY PROPOSED
Prepared by Chongris Engineering, Printed 7/11/2025
HydroCAD® 10.20-6a s/n 11058 © 2024 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr-24	Type III 24-hr		Default	24.00	1	3.28	2
2	10-yr-24	Type III 24-hr		Default	24.00	1	5.17	2
3	25-yr-24	Type III 24-hr		Default	24.00	1	6.35	2
4	100-yr-24	Type III 24-hr		Default	24.00	1	8.17	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,063	49	50-75% Grass cover, Fair, HSG A (1S)
761	98	Driveway, HSG A (1S)
3,583	98	Structure, HSG A (2S)
5,407	**88**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
5,407	HSG A	1S, 2S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
5,407		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
1,063	0	0	0	0	1,063	50-75% Grass cover, Fair	
761	0	0	0	0	761	Driveway	
3,583	0	0	0	0	3,583	Structure	
5,407	**0**	**0**	**0**	**0**	**5,407**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	3P	98.10	96.40	118.0	0.0144	0.010	0.0	6.0	0.0	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Existing Uncollected Runoff Area=1,824 sf 41.72% Impervious Runoff Depth=0.83"
Flow Length=241' Tc=8.4 min CN=69 Runoff=0.03 cfs 125 cf

Subcatchment 2S: Proposed Collected Runoff Area=3,583 sf 100.00% Impervious Runoff Depth=3.05"
Tc=6.0 min CN=98 Runoff=0.26 cfs 910 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.03 cfs 125 cf
Outflow=0.03 cfs 125 cf

Pond 3P: Subsurface Infil 1 Peak Elev=97.65' Storage=408 cf Inflow=0.26 cfs 910 cf
Discarded=0.01 cfs 910 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 910 cf

Total Runoff Area = 5,407 sf Runoff Volume = 1,035 cf Average Runoff Depth = 2.30"
19.66% Pervious = 1,063 sf 80.34% Impervious = 4,344 sf

Summary for Subcatchment 1S: Existing Uncollected

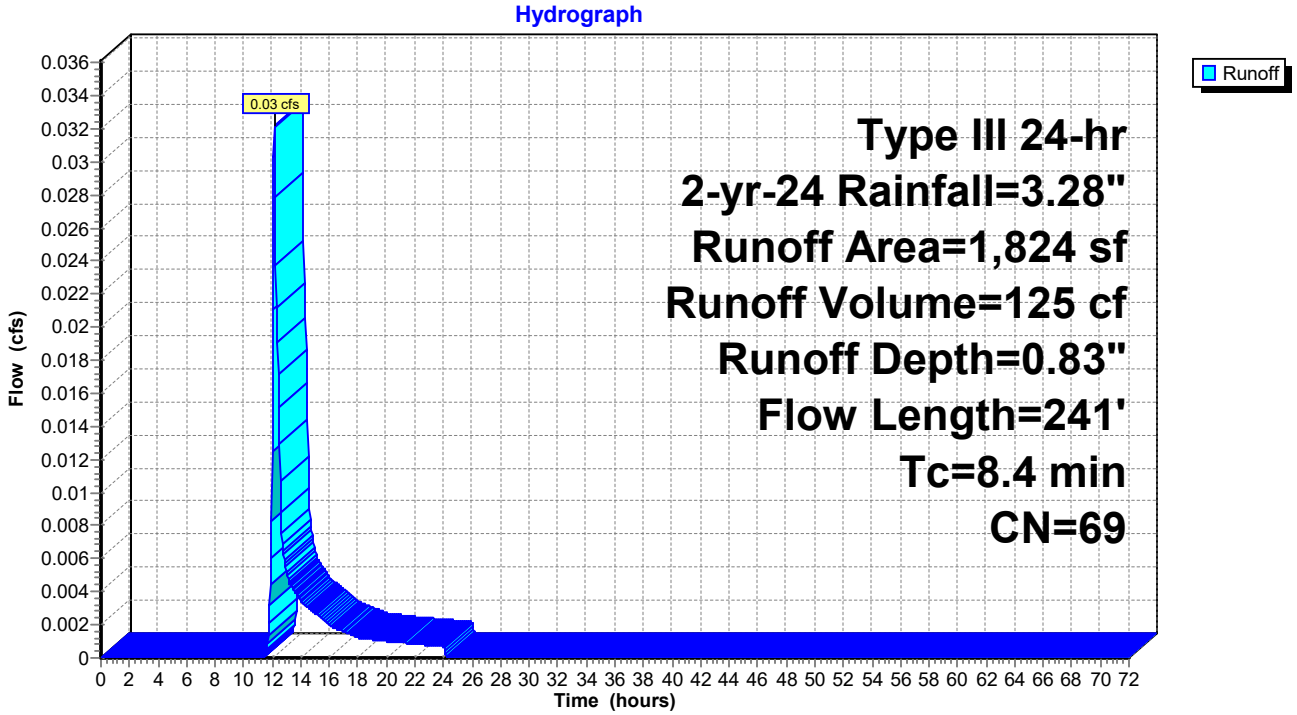
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 125 cf, Depth= 0.83"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr-24 Rainfall=3.28"

	Area (sf)	CN	Description
*	761	98	Driveway, HSG A
	1,063	49	50-75% Grass cover, Fair, HSG A
	1,824	69	Weighted Average
	1,063		58.28% Pervious Area
	761		41.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: Existing Uncollected



Summary for Subcatchment 2S: Proposed Collected

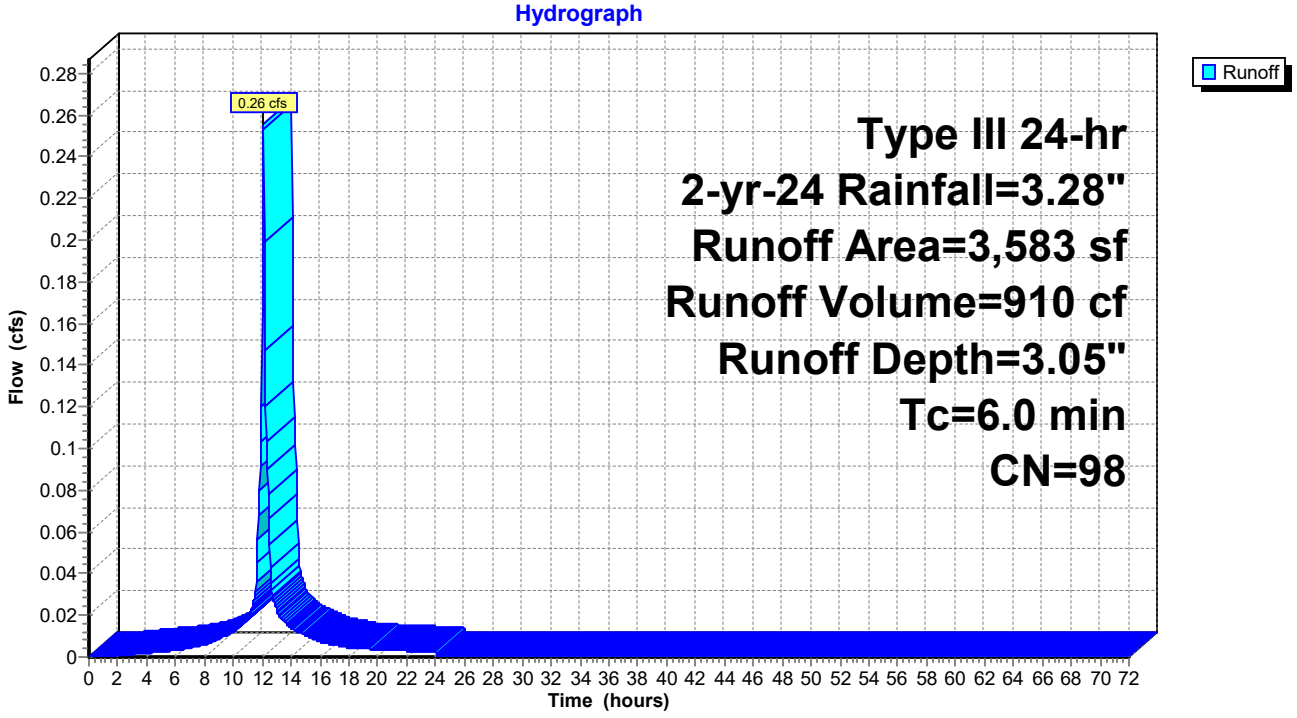
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 910 cf, Depth= 3.05"
Routed to Pond 3P : Subsurface Infil 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr-24 Rainfall=3.28"

	Area (sf)	CN	Description
*	3,583	98	Structure, HSG A
	3,583		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1					**Direct Entry, Direct Entry**
0.1	0	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Proposed Collected



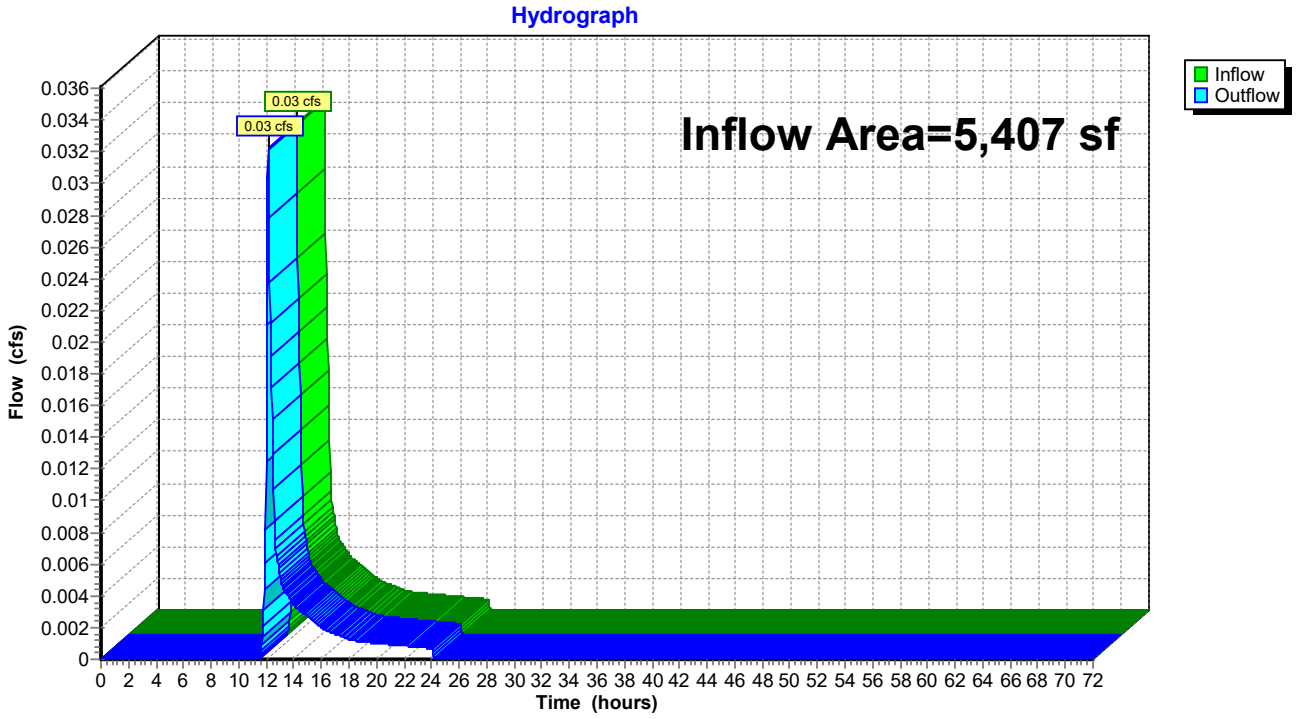
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 80.34% Impervious, Inflow Depth = 0.28" for 2-yr-24 event
Inflow = 0.03 cfs @ 12.14 hrs, Volume= 125 cf
Outflow = 0.03 cfs @ 12.14 hrs, Volume= 125 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Summary for Pond 3P: Subsurface Infil 1

Inflow Area = 3,583 sf,100.00% Impervious, Inflow Depth = 3.05" for 2-yr-24 event
Inflow = 0.26 cfs @ 12.09 hrs, Volume= 910 cf
Outflow = 0.01 cfs @ 10.80 hrs, Volume= 910 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.01 cfs @ 10.80 hrs, Volume= 910 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 97.65' @ 14.12 hrs Surf.Area= 237 sf Storage= 408 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 253.5 min (1,009.4 - 755.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	95.00'	257 cf	**7.00'W x 33.83'L x 4.00'H Field A** 947 cf Overall - 306 cf Embedded = 641 cf x 40.0% Voids
#2A	95.50'	306 cf	**Cultec R-360HD** x 8 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf
		563 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	95.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	98.10'	**6.0" Round Culvert** L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 98.10' / 96.40' S= 0.0144 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 10.80 hrs HW=95.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=95.00' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 3P: Subsurface Infil 1 - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf

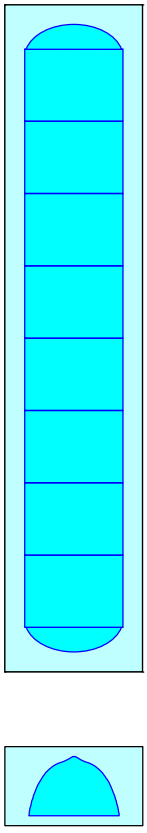
8 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 31.83' Row Length +12.0" End Stone x 2 = 33.83' Base Length
1 Rows x 60.0" Wide + 12.0" Side Stone x 2 = 7.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

8 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 1 Rows = 306.1 cf Chamber Storage

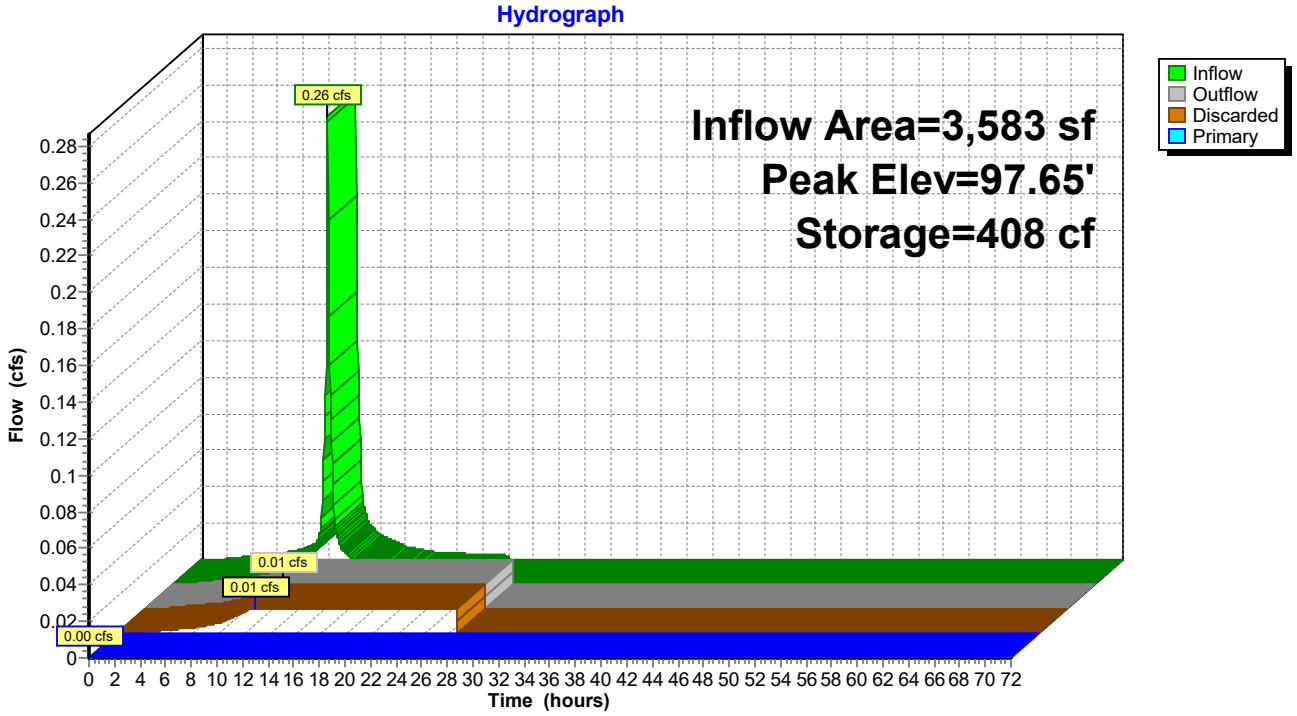
947.3 cf Field - 306.1 cf Chambers = 641.3 cf Stone x 40.0% Voids = 256.5 cf Stone Storage

Chamber Storage + Stone Storage = 562.6 cf = 0.013 af
Overall Storage Efficiency = 59.4%
Overall System Size = 33.83' x 7.00' x 4.00'

8 Chambers
35.1 cy Field
23.8 cy Stone



Pond 3P: Subsurface Infil 1



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Existing Uncollected Runoff Area=1,824 sf 41.72% Impervious Runoff Depth=2.08"
Flow Length=241' Tc=8.4 min CN=69 Runoff=0.09 cfs 316 cf

Subcatchment 2S: Proposed Collected Runoff Area=3,583 sf 100.00% Impervious Runoff Depth=4.93"
Tc=6.0 min CN=98 Runoff=0.41 cfs 1,473 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.28 cfs 646 cf
Outflow=0.28 cfs 646 cf

Pond 3P: Subsurface Infil 1 Peak Elev=98.38' Storage=503 cf Inflow=0.41 cfs 1,473 cf
Discarded=0.01 cfs 1,143 cf Primary=0.20 cfs 330 cf Outflow=0.21 cfs 1,473 cf

Total Runoff Area = 5,407 sf Runoff Volume = 1,789 cf Average Runoff Depth = 3.97"
19.66% Pervious = 1,063 sf 80.34% Impervious = 4,344 sf

Summary for Subcatchment 1S: Existing Uncollected

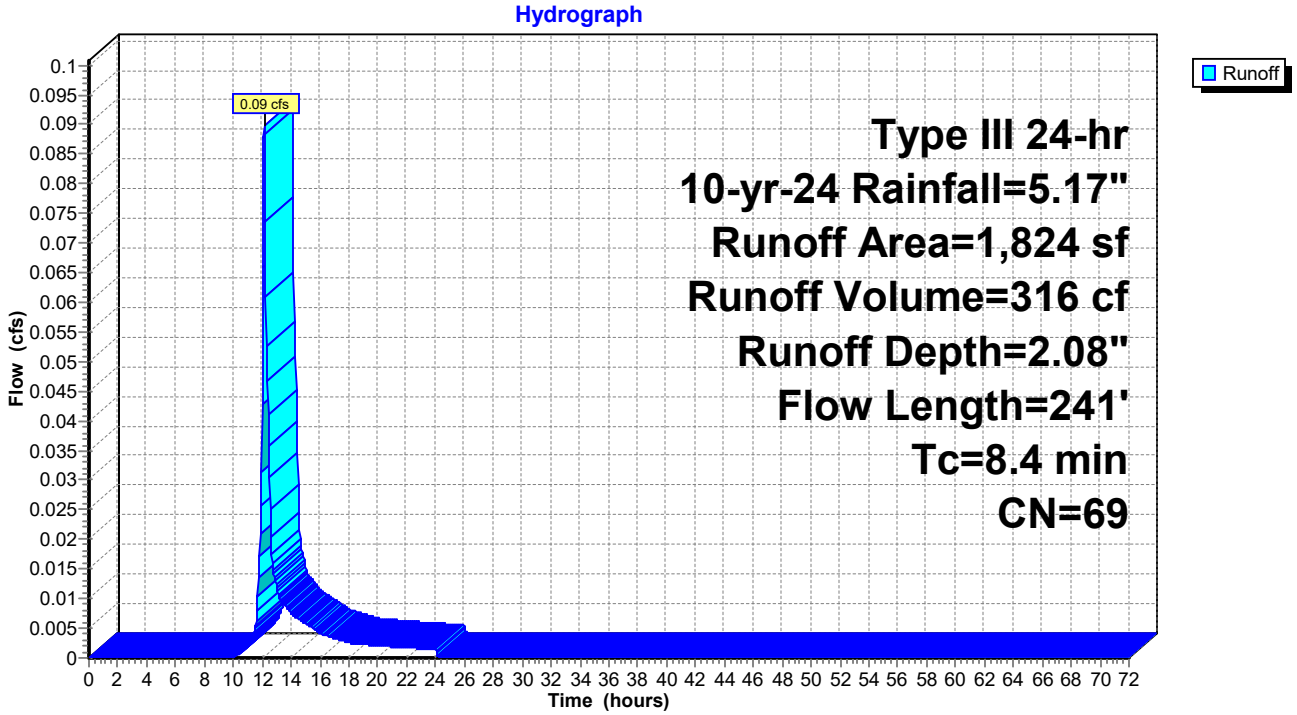
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 316 cf, Depth= 2.08"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr-24 Rainfall=5.17"

	Area (sf)	CN	Description
*	761	98	Driveway, HSG A
	1,063	49	50-75% Grass cover, Fair, HSG A
	1,824	69	Weighted Average
	1,063		58.28% Pervious Area
	761		41.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: Existing Uncollected



Summary for Subcatchment 2S: Proposed Collected

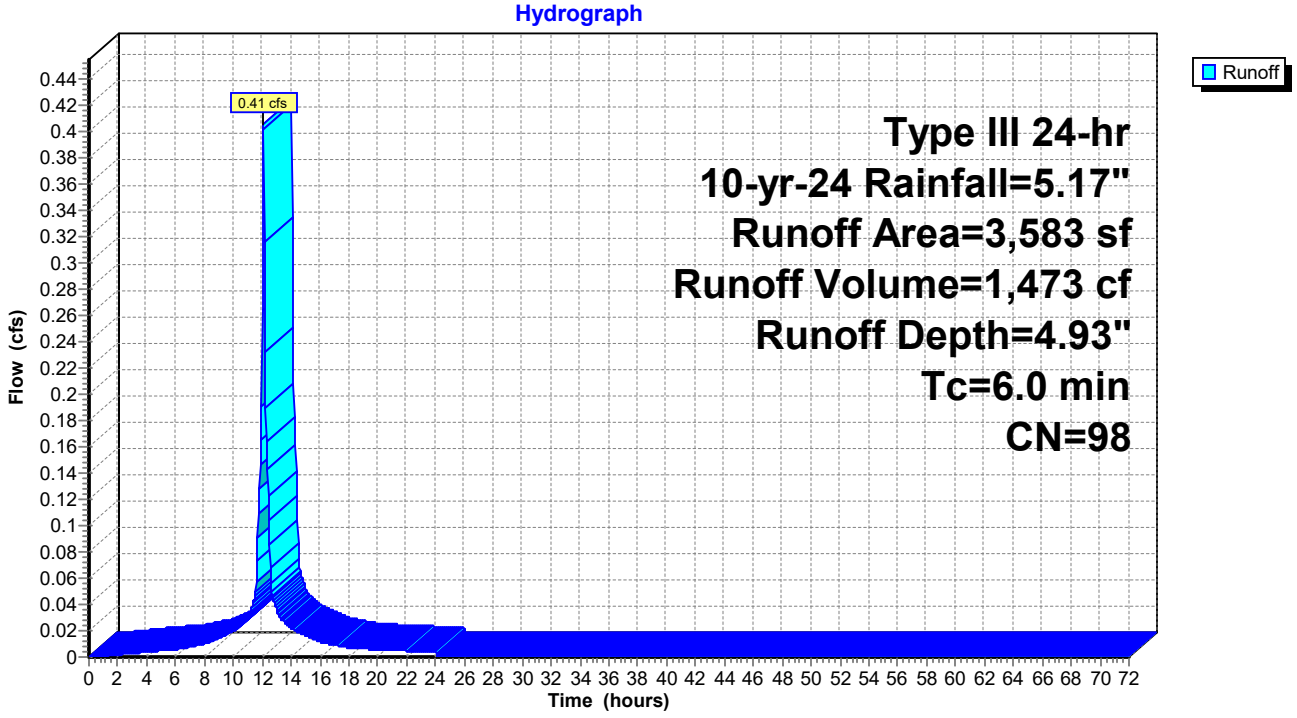
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,473 cf, Depth= 4.93"
Routed to Pond 3P : Subsurface Infil 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr-24 Rainfall=5.17"

	Area (sf)	CN	Description
*	3,583	98	Structure, HSG A
	3,583		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1					**Direct Entry, Direct Entry**
0.1	0	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Proposed Collected



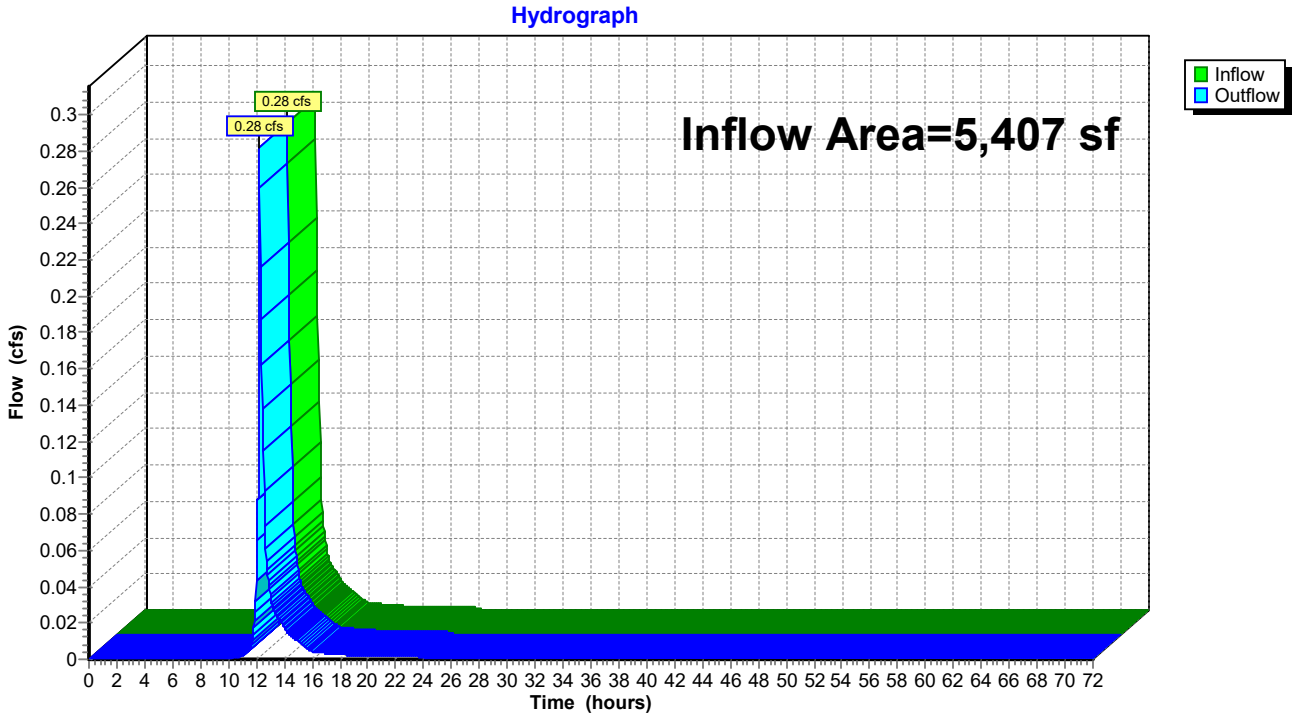
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 80.34% Impervious, Inflow Depth = 1.43" for 10-yr-24 event
Inflow = 0.28 cfs @ 12.22 hrs, Volume= 646 cf
Outflow = 0.28 cfs @ 12.22 hrs, Volume= 646 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Summary for Pond 3P: Subsurface Infil 1

Inflow Area = 3,583 sf,100.00% Impervious, Inflow Depth = 4.93" for 10-yr-24 event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,473 cf
Outflow = 0.21 cfs @ 12.24 hrs, Volume= 1,473 cf, Atten= 48%, Lag= 9.0 min
Discarded = 0.01 cfs @ 9.35 hrs, Volume= 1,143 cf
Primary = 0.20 cfs @ 12.24 hrs, Volume= 330 cf
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 98.38' @ 12.24 hrs Surf.Area= 237 sf Storage= 503 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 241.2 min (988.7 - 747.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	95.00'	257 cf	**7.00'W x 33.83'L x 4.00'H Field A** 947 cf Overall - 306 cf Embedded = 641 cf x 40.0% Voids
#2A	95.50'	306 cf	**Cultec R-360HD** x 8 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf
		563 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	95.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	98.10'	**6.0" Round Culvert** L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 98.10' / 96.40' S= 0.0144 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 9.35 hrs HW=95.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.20 cfs @ 12.24 hrs HW=98.37' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.20 cfs @ 1.78 fps)

Pond 3P: Subsurface Infil 1 - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf

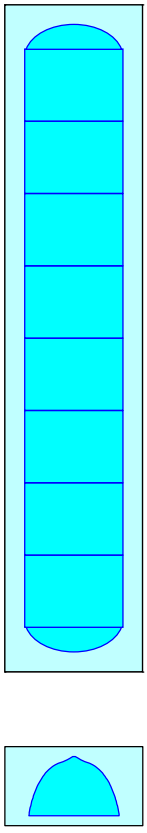
8 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 31.83' Row Length +12.0" End Stone x 2 = 33.83' Base Length
1 Rows x 60.0" Wide + 12.0" Side Stone x 2 = 7.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

8 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 1 Rows = 306.1 cf Chamber Storage

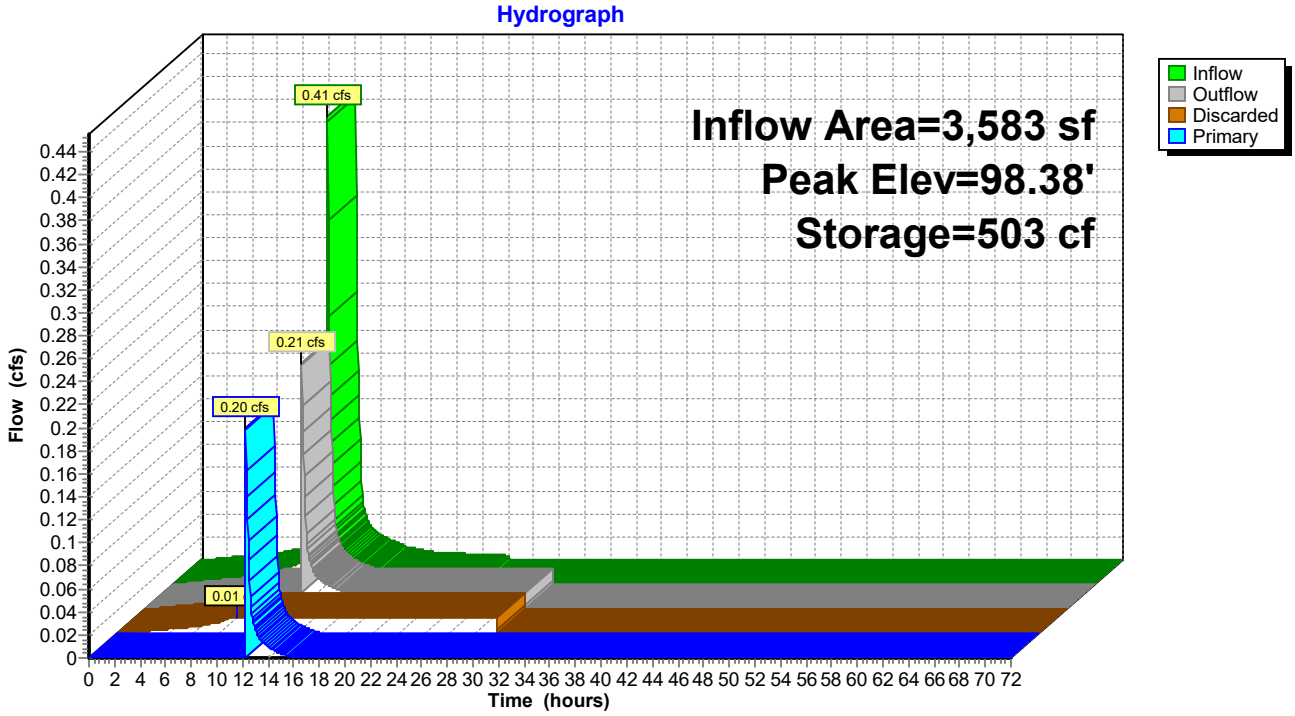
947.3 cf Field - 306.1 cf Chambers = 641.3 cf Stone x 40.0% Voids = 256.5 cf Stone Storage

Chamber Storage + Stone Storage = 562.6 cf = 0.013 af
Overall Storage Efficiency = 59.4%
Overall System Size = 33.83' x 7.00' x 4.00'

8 Chambers
35.1 cy Field
23.8 cy Stone



Pond 3P: Subsurface Infil 1



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Existing Uncollected Runoff Area=1,824 sf 41.72% Impervious Runoff Depth=2.99"
Flow Length=241' Tc=8.4 min CN=69 Runoff=0.13 cfs 454 cf

Subcatchment 2S: Proposed Collected Runoff Area=3,583 sf 100.00% Impervious Runoff Depth=6.11"
Tc=6.0 min CN=98 Runoff=0.50 cfs 1,825 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.57 cfs 1,054 cf
Outflow=0.57 cfs 1,054 cf

Pond 3P: Subsurface Infil 1 Peak Elev=98.56' Storage=521 cf Inflow=0.50 cfs 1,825 cf
Discarded=0.01 cfs 1,226 cf Primary=0.44 cfs 600 cf Outflow=0.45 cfs 1,826 cf

Total Runoff Area = 5,407 sf Runoff Volume = 2,279 cf Average Runoff Depth = 5.06"
19.66% Pervious = 1,063 sf 80.34% Impervious = 4,344 sf

Summary for Subcatchment 1S: Existing Uncollected

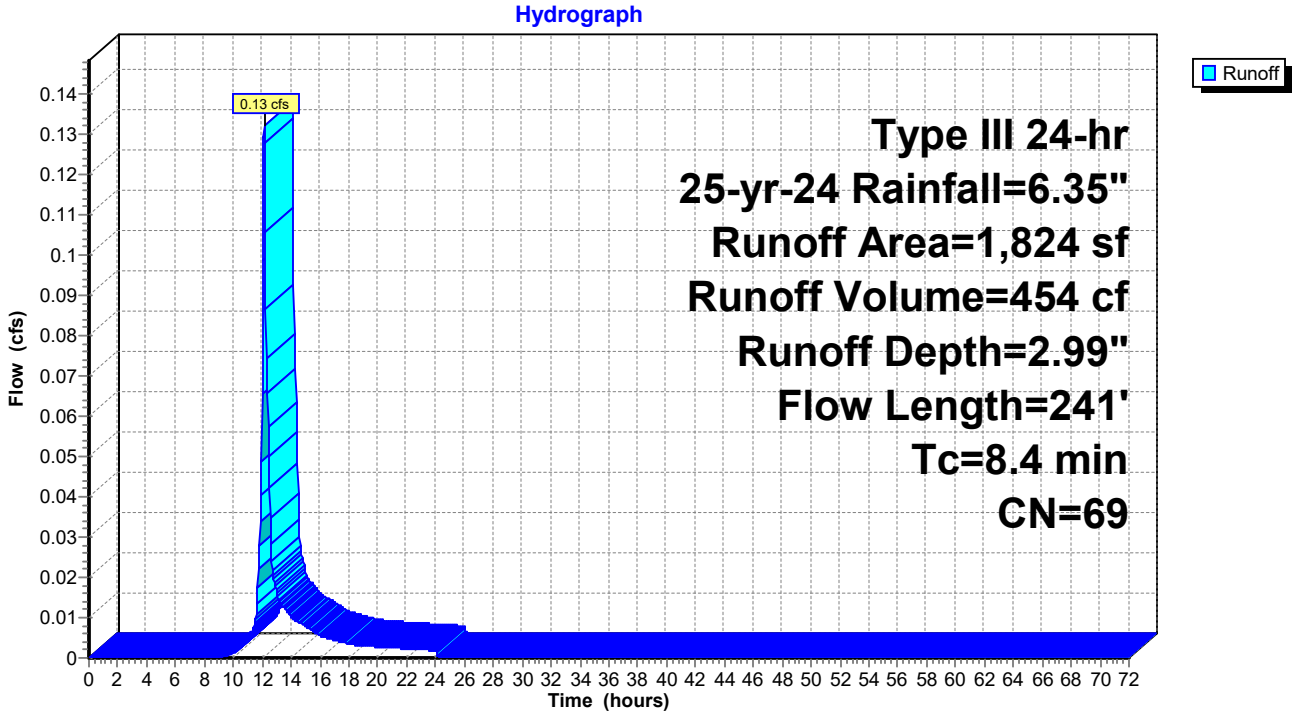
Runoff = 0.13 cfs @ 12.12 hrs, Volume= 454 cf, Depth= 2.99"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr-24 Rainfall=6.35"

	Area (sf)	CN	Description
*	761	98	Driveway, HSG A
	1,063	49	50-75% Grass cover, Fair, HSG A
	1,824	69	Weighted Average
	1,063		58.28% Pervious Area
	761		41.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: Existing Uncollected



Summary for Subcatchment 2S: Proposed Collected

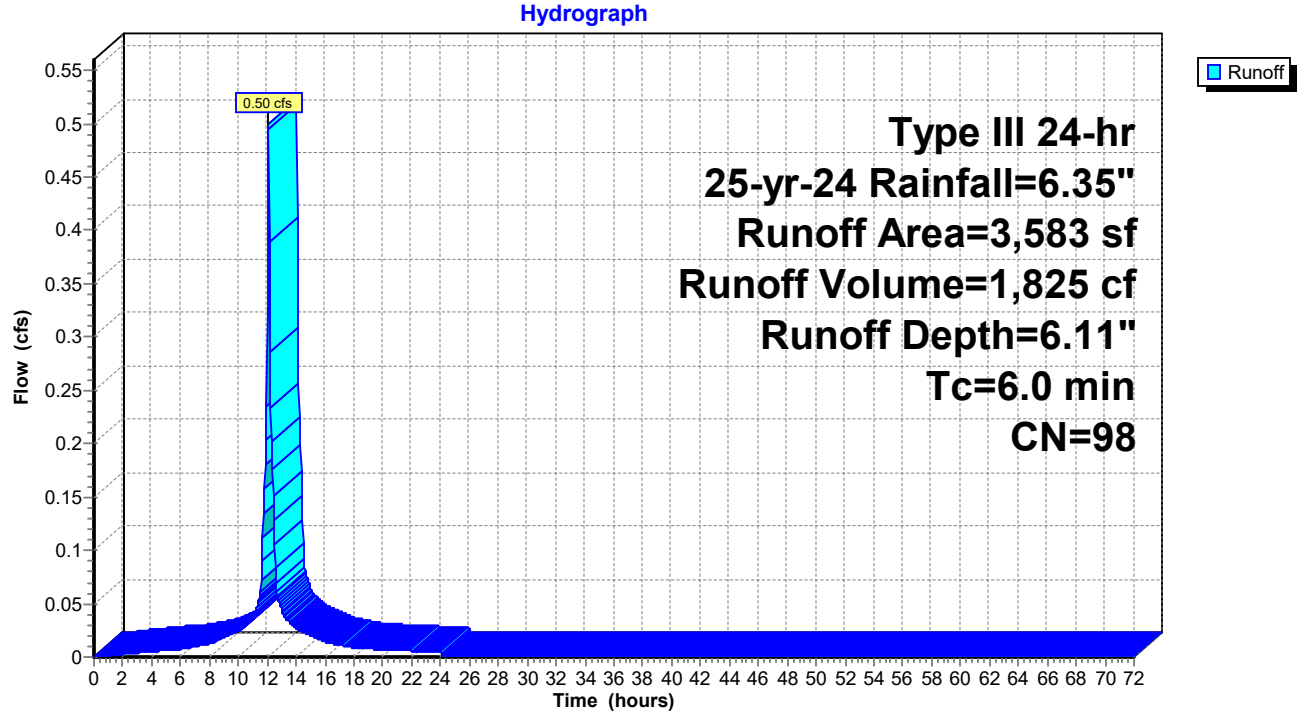
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 1,825 cf, Depth= 6.11"
Routed to Pond 3P : Subsurface Infil 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr-24 Rainfall=6.35"

	Area (sf)	CN	Description
*	3,583	98	Structure, HSG A
	3,583		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1					**Direct Entry, Direct Entry**
0.1	0	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Proposed Collected



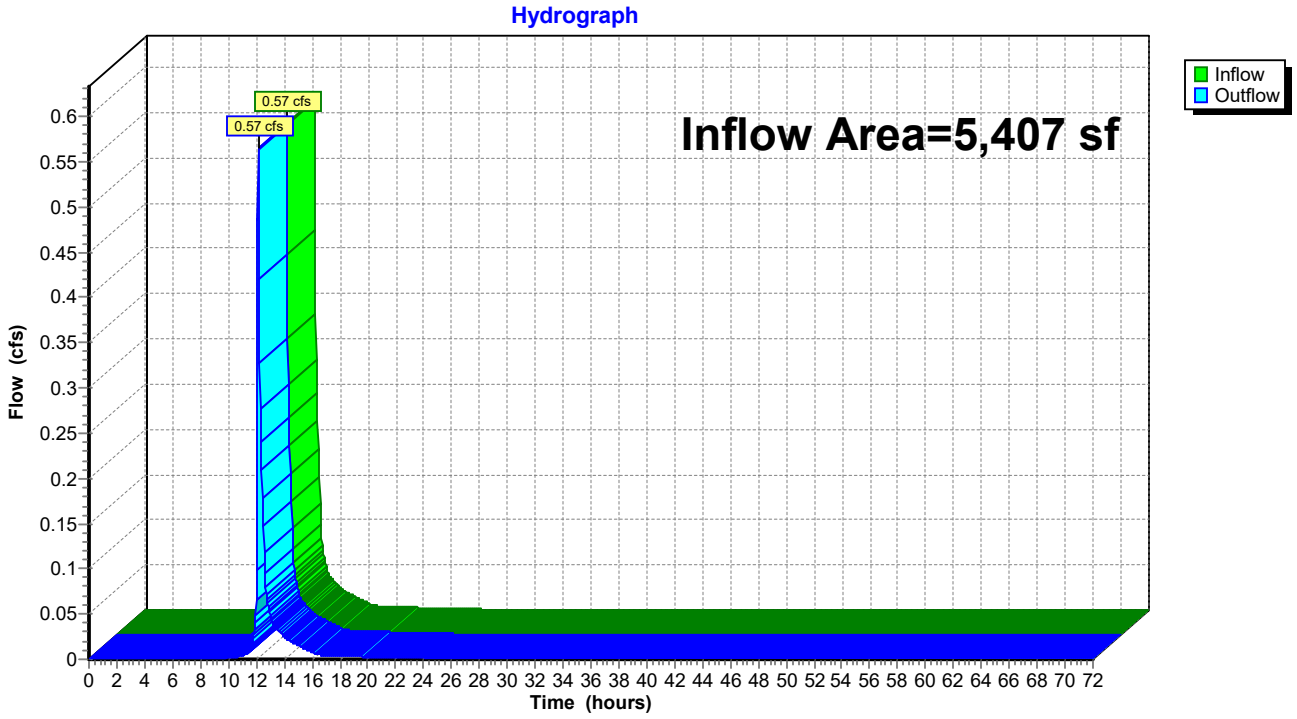
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 80.34% Impervious, Inflow Depth = 2.34" for 25-yr-24 event
Inflow = 0.57 cfs @ 12.14 hrs, Volume= 1,054 cf
Outflow = 0.57 cfs @ 12.14 hrs, Volume= 1,054 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Summary for Pond 3P: Subsurface Infil 1

Inflow Area = 3,583 sf,100.00% Impervious, Inflow Depth = 6.11" for 25-yr-24 event
Inflow = 0.50 cfs @ 12.09 hrs, Volume= 1,825 cf
Outflow = 0.45 cfs @ 12.14 hrs, Volume= 1,826 cf, Atten= 10%, Lag= 3.5 min
Discarded = 0.01 cfs @ 8.75 hrs, Volume= 1,226 cf
Primary = 0.44 cfs @ 12.14 hrs, Volume= 600 cf
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 98.56' @ 12.15 hrs Surf.Area= 237 sf Storage= 521 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 214.3 min (958.6 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	95.00'	257 cf	**7.00'W x 33.83'L x 4.00'H Field A** 947 cf Overall - 306 cf Embedded = 641 cf x 40.0% Voids
#2A	95.50'	306 cf	**Cultec R-360HD** x 8 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf
		563 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	95.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	98.10'	**6.0" Round Culvert** L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 98.10' / 96.40' S= 0.0144 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 8.75 hrs HW=95.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.43 cfs @ 12.14 hrs HW=98.55' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.43 cfs @ 2.29 fps)

Pond 3P: Subsurface Infil 1 - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf

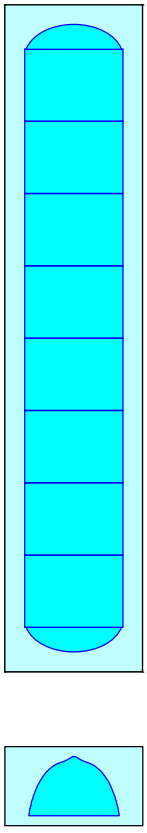
8 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 31.83' Row Length +12.0" End Stone x 2 = 33.83' Base Length
1 Rows x 60.0" Wide + 12.0" Side Stone x 2 = 7.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

8 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 1 Rows = 306.1 cf Chamber Storage

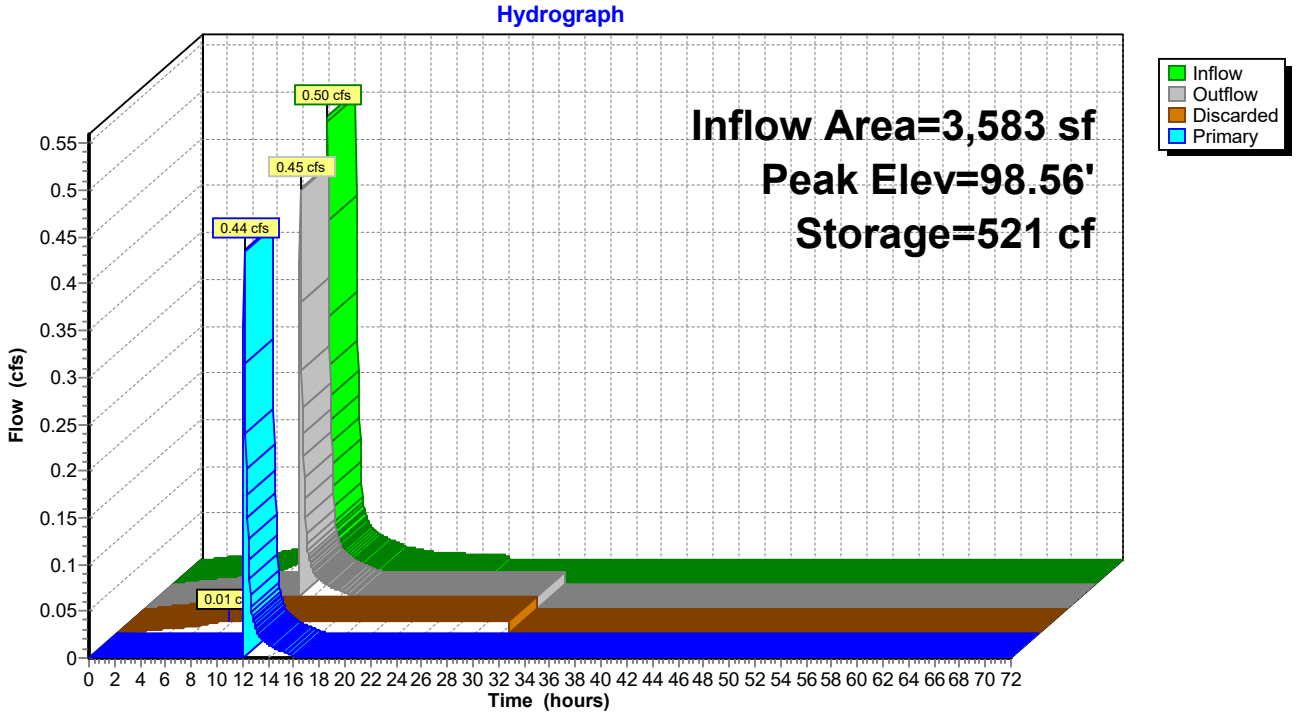
947.3 cf Field - 306.1 cf Chambers = 641.3 cf Stone x 40.0% Voids = 256.5 cf Stone Storage

Chamber Storage + Stone Storage = 562.6 cf = 0.013 af
Overall Storage Efficiency = 59.4%
Overall System Size = 33.83' x 7.00' x 4.00'

8 Chambers
35.1 cy Field
23.8 cy Stone



Pond 3P: Subsurface Infil 1



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Existing Uncollected Runoff Area=1,824 sf 41.72% Impervious Runoff Depth=4.49"
Flow Length=241' Tc=8.4 min CN=69 Runoff=0.20 cfs 683 cf

Subcatchment 2S: Proposed Collected Runoff Area=3,583 sf 100.00% Impervious Runoff Depth=7.93"
Tc=6.0 min CN=98 Runoff=0.64 cfs 2,368 cf

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM Inflow=0.80 cfs 1,722 cf
Outflow=0.80 cfs 1,722 cf

Pond 3P: Subsurface Infil 1 Peak Elev=98.75' Storage=539 cf Inflow=0.64 cfs 2,368 cf
Discarded=0.01 cfs 1,330 cf Primary=0.60 cfs 1,039 cf Outflow=0.61 cfs 2,369 cf

Total Runoff Area = 5,407 sf Runoff Volume = 3,051 cf Average Runoff Depth = 6.77"
19.66% Pervious = 1,063 sf 80.34% Impervious = 4,344 sf

Summary for Subcatchment 1S: Existing Uncollected

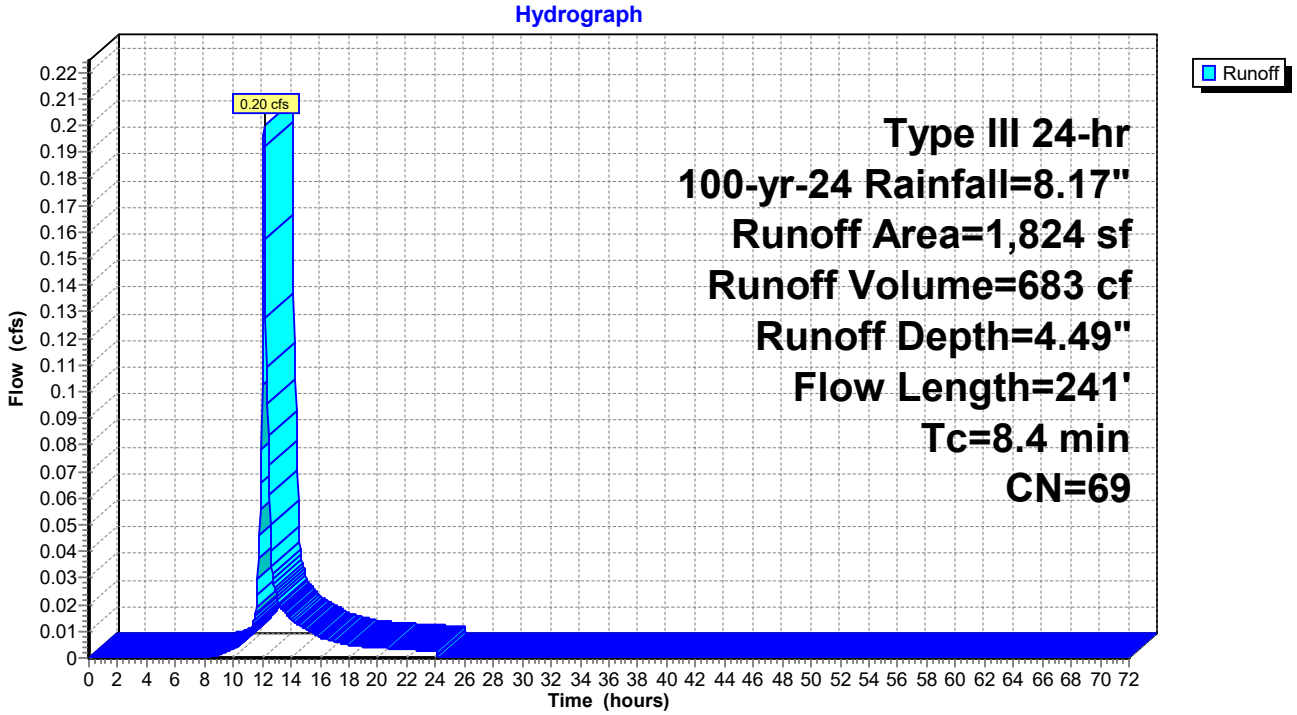
Runoff = 0.20 cfs @ 12.12 hrs, Volume= 683 cf, Depth= 4.49"
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr-24 Rainfall=8.17"

	Area (sf)	CN	Description
*	761	98	Driveway, HSG A
	1,063	49	50-75% Grass cover, Fair, HSG A
	1,824	69	Weighted Average
	1,063		58.28% Pervious Area
	761		41.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
2.8	191	0.0260	1.13		**Shallow Concentrated Flow, SCF** Short Grass Pasture Kv= 7.0 fps
8.4	241	Total			

Subcatchment 1S: Existing Uncollected



Summary for Subcatchment 2S: Proposed Collected

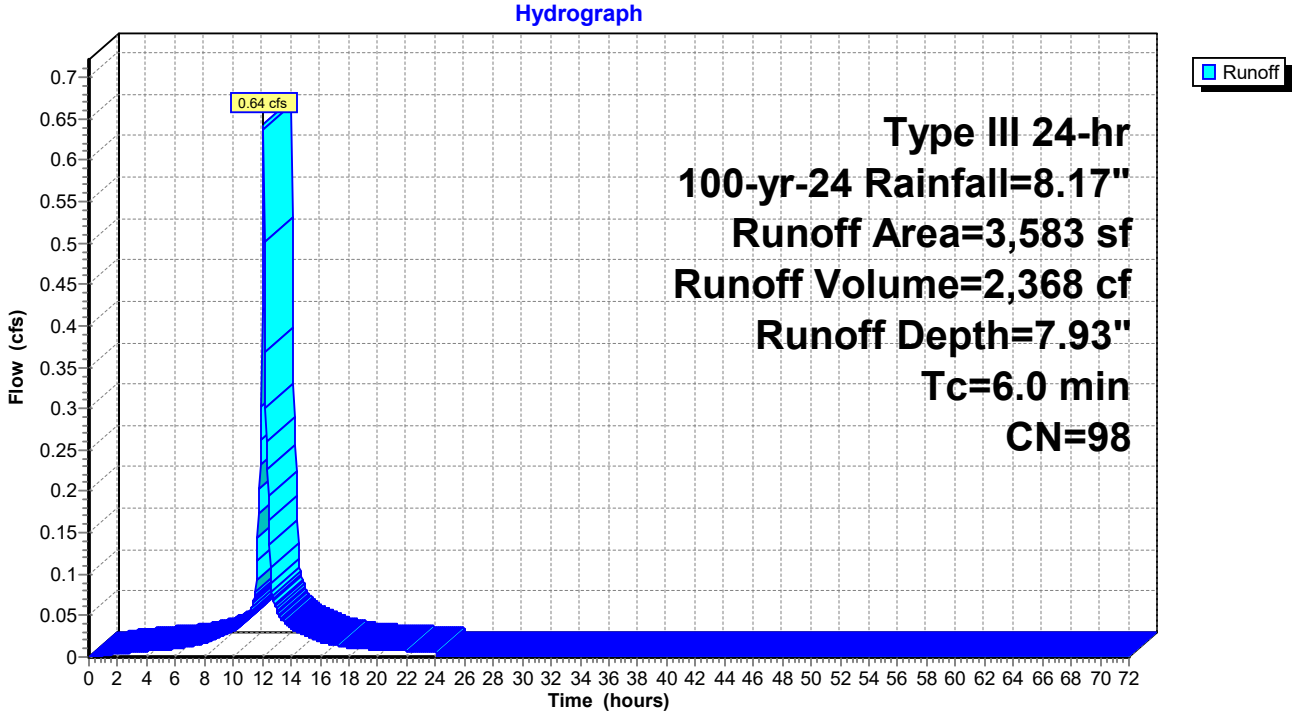
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,368 cf, Depth= 7.93"
Routed to Pond 3P : Subsurface Infil 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr-24 Rainfall=8.17"

	Area (sf)	CN	Description
*	3,583	98	Structure, HSG A
	3,583		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1					**Direct Entry, Direct Entry**
0.1	0	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Proposed Collected



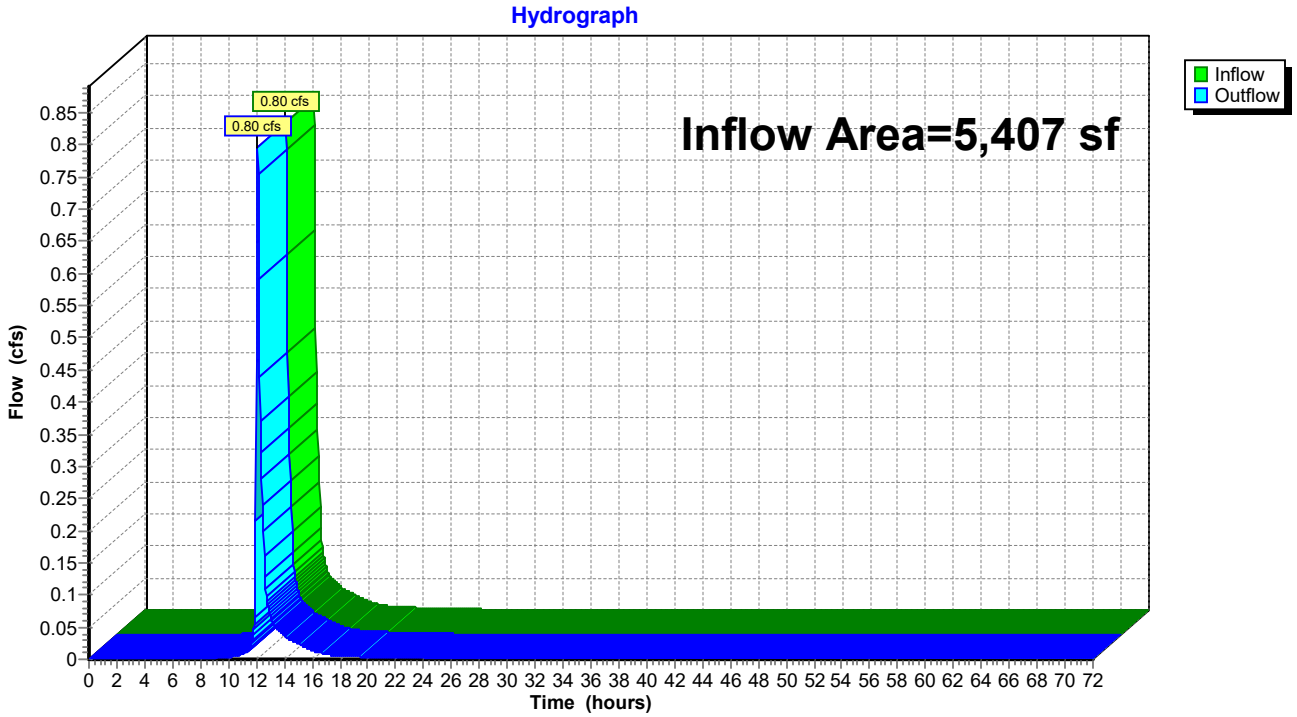
Summary for Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,407 sf, 80.34% Impervious, Inflow Depth = 3.82" for 100-yr-24 event
Inflow = 0.80 cfs @ 12.12 hrs, Volume= 1,722 cf
Outflow = 0.80 cfs @ 12.12 hrs, Volume= 1,722 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 5R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: BROADWAY/EVERETT RD DRAIN SYSTEM



Summary for Pond 3P: Subsurface Infil 1

Inflow Area = 3,583 sf,100.00% Impervious, Inflow Depth = 7.93" for 100-yr-24 event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,368 cf
Outflow = 0.61 cfs @ 12.11 hrs, Volume= 2,369 cf, Atten= 6%, Lag= 1.6 min
Discarded = 0.01 cfs @ 7.80 hrs, Volume= 1,330 cf
Primary = 0.60 cfs @ 12.11 hrs, Volume= 1,039 cf
Routed to Reach 1R : BROADWAY/EVERETT RD DRAIN SYSTEM

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 98.75' @ 12.11 hrs Surf.Area= 237 sf Storage= 539 cf

Plug-Flow detention time= 185.5 min calculated for 2,367 cf (100% of inflow)
Center-of-Mass det. time= 185.9 min (926.9 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	95.00'	257 cf	**7.00'W x 33.83'L x 4.00'H Field A** 947 cf Overall - 306 cf Embedded = 641 cf x 40.0% Voids
#2A	95.50'	306 cf	**Cultec R-360HD** x 8 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf
		563 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	95.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	98.10'	**6.0" Round Culvert** L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 98.10' / 96.40' S= 0.0144 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 7.80 hrs HW=95.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.58 cfs @ 12.11 hrs HW=98.73' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.58 cfs @ 2.97 fps)

Pond 3P: Subsurface Infil 1 - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 1 rows = 12.9 cf

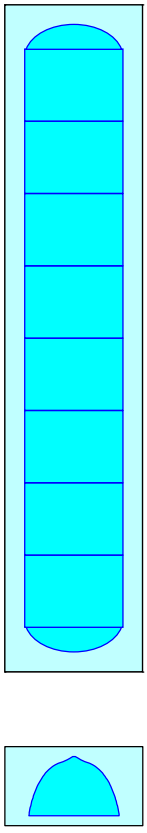
8 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 31.83' Row Length +12.0" End Stone x 2 = 33.83' Base Length
1 Rows x 60.0" Wide + 12.0" Side Stone x 2 = 7.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

8 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 1 Rows = 306.1 cf Chamber Storage

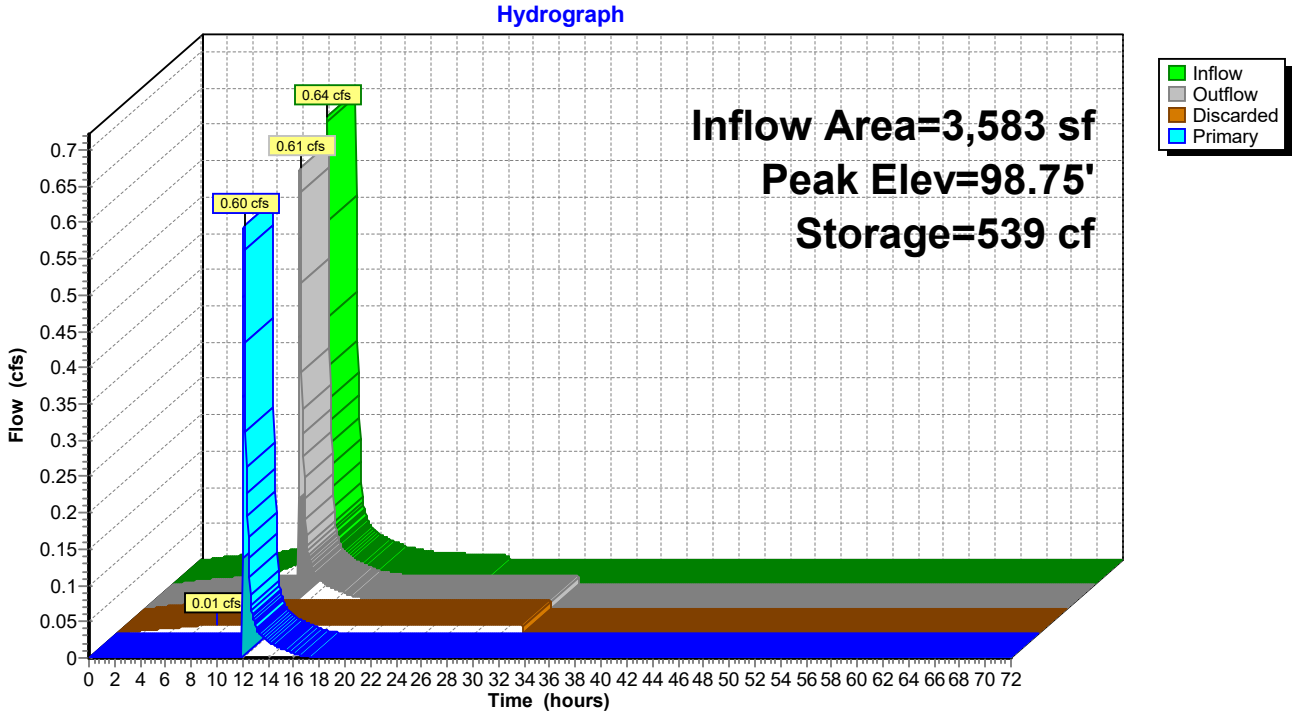
947.3 cf Field - 306.1 cf Chambers = 641.3 cf Stone x 40.0% Voids = 256.5 cf Stone Storage

Chamber Storage + Stone Storage = 562.6 cf = 0.013 af
Overall Storage Efficiency = 59.4%
Overall System Size = 33.83' x 7.00' x 4.00'

8 Chambers
35.1 cy Field
23.8 cy Stone



Pond 3P: Subsurface Infil 1



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APPENDIX H

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDMENTATION CONTROL PLAN

Project Location: 126 Broadway Arlington, MA

Owner Name:

Party Responsible for Maintenance:

The Contractor will be responsible for pollution prevention and erosion and sediment controls as follows below.

Stormwater Management and Erosion Control Plan:

Refer to the approved site plans for details regarding the stormwater management system and erosion control plans. The plans provide the minimum requirements for the prevention of erosion and sedimentation due to construction impacts.

General Construction Sequence:

1. After all permits are issued, the general construction sequence is as follows:
2. Set erosion control along the site as shown in the approved plans.
3. Mobilize construction equipment to site.
4. Remove existing structure
5. Remove topsoil (remove off site as needed)
6. Perform construction of dwelling
7. Install utilities (order to be determined by contractor).
8. Prepare final grading prior to paving/final landscaping.
9. Stabilize the site as shown in the approved plans.

Erosion and Sedimentation Control During Construction Activities

The Contractor shall comply with the following temporary erosion and sediment control to minimize the discharge of pollutants in the stormwater from construction activities.

Construction Entrance:

A construction entrance is to be installed as shown on the approved plans. All sediment tracked, spilled, dropped, or washed onto the public right-of-way will be swept up immediately and properly disposed off-site. Sediment will be swept from the driveway at least weekly, or more often if necessary.

Haybales & Silt Fence

Filtrexx Soxx are proposed to be installed as shown on the plan as an erosion control barrier. The perimeter controls are to be installed prior to the commencement of any work on-site in accordance with the design plans. The Contractor shall keep additional haybales and silt fencing weather protected on site in case the original perimeter controls need to be replaced.

Erosion control barriers will be inspected weekly and immediately after storm events to ensure it is intact and that there are no gaps where the fence meets the ground or tears along the length of the fence. If gaps or tears are found during the inspection, the fabric will be repaired or replaced immediately. Accumulated sediment will be removed from the base if it reaches one-third the height of the wattle and properly disposed off-site. If accumulated sediment is creating noticeable strain on the fabric and might fail from a sudden storm event, the sediment will be removed more frequently. Before the hay bales and silt fence are removed from the project area,

the sediment will be removed. The erosion control barriers will be removed and properly disposed of off-site following the stabilization of disturbed areas **and approval from Town Permitting Authority**. The hay bales will likely need to be replaced if the construction extends over 6 months.

Surface Stabilization:

The surface of all disturbed areas shall be stabilized during and after construction as soon as practical but no more than fourteen days after construction activity has temporarily or permanently ceased on that portion of the site. Temporary measures shall be taken during construction to prevent erosion and siltation. No construction sediment shall be allowed to enter any infiltration systems. All disturbed slopes will be stabilized with a permanent vegetative cover. Stabilization netting or tackifier applied with hydroseeding shall be used on all slopes greater than 3:1. Some or all of the following measures will be utilized on this project as conditions may warrant.

1. Temporary Seeding
2. Temporary Mulching
3. Permanent Seeding
4. Hydroseeding
5. Placement of Hay
6. Placement of Jute Netting

Water shall be applied as required to control dust on site.

Stockpile Area:

Locate the stockpile area so it does not interfere with work on the site. A-Horizon soils shall be separate from B and C horizon soils. Existing soils and imported soils should not exceed a 2:1 slope. Surround all stockpiles with silt fence or erosion control socks if piles are to be untouched for more than 5 days. If the piles are to be unused for 14 days or more, the piles are to be seeded or covered with plastic or mulch.

Street Sweeping:

Any sediment tracked onto public right-of-way or parking areas shall be swept at the end of each working day.

Pollution Prevention

A typical construction site generates pollutants through construction activities. The following identifies preventative measures to reduce the opportunity for pollutants to the enter the stormwater runoff stream.

Waste Management

All waste materials will be collected and disposed of into one metal trash dumpster in the materials storage area. Only trash and construction debris from the site will be deposited in the dumpster. No construction materials will be buried on-site. All personnel will be instructed, during tailgate training sessions, regarding the correct disposal of trash and construction debris. Notices that state these practices will be posted on site and the individual who manages day-today site operations will be responsible for seeing that these practices are followed.

Trash dumpsters will be installed once the materials storage area has been established. The dumpsters will be inspected weekly and immediately after storm events. The dumpster will be emptied weekly and taken to a landfill. If trash and construction debris are exceeding the dumpster's capacity, the dumpsters will be emptied more frequently.

Hazardous or Toxic Waste

Hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall not be placed in the dumpster and disposed of daily accordingly with local, state, and federal regulations.

Construction Vehicles & Equipment

Construction vehicles and equipment shall be parked outside the 100 ft buffer at the end of each working day. Refueling should be performed off site. If refueling is to occur onsite it must be performed beyond the 100 ft buffer.

Spill Prevention & Response Plans

Spill Control Practices shall be in conformance with the guidelines set forth in the NPDES CGP 2017. Spills must be cleaned up immediately, using dry cleanup methods where possible and dispose of used materials property. Spill areas may not be cleaned up by hosing the area down. The source of the spill must be eliminated to prevent a discharge or a continuation of an ongoing discharge. Spill kits shall be readily available onsite during construction.

Maintenance:

- The site contractor will be responsible for implementing each control identified as part of this Construction Period Pollution Prevention and Erosion and Sedimentiaon Control Plan.
- The site contractor will be responsible for inspecting all sediment and erosion controls periodically and after each rainfall event. Records of the inspections shall be prepared and maintained on-site by the contractor.
- Damaged or deteriorated items will be repaired immediately after identification or at the direction of the Commission.
- The Site Contractor shall comply with the General Notes regarding Erosion Control as shown on the Site Plans.
- Sediment shall be removed from barriers when it reaches one-half the height of the barrier or as determined by periodic field inspection or manufacturer recommendations.
- The stabilized construction exits shall be inspected weekly. The exits shall be maintained by adding additional clean, angular, durable stone to remove sediment from the tires of construction vehicles when exiting the site. Adjacent roadways shall be kept clean and swept as needed to avoid deposition of sediment as a result of construction traffic exiting the Site.
- Dust pollution shall be controlled using an on-site water source and/or an approved soil stabilization product.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.

APPENDIX I

Longterm Pollution Prevention Plan

Project Location: 126 Broadway Arlington, MA

Owner Name:

Owner Number:

Owner Email:

Owner Address:

As-built Plan Reference:

Plan Title:

Date:

Prepared by:

Party Responsible for Maintenance:

The property owners are responsible for maintaining and servicing the proposed stormwater management design post construction. During construction, the contractor will be responsible for stormwater management maintenance.

_____(signature) Date: _____

Maintenance of Pavement Systems:

Regular maintenance of pavement surface will prevent pollutants such as oil and grease, trash and sediments from entering the stormwater system and/or resource areas. The following practices should be performed.

- Utilize vacuum sweepers to clean asphalt surfaces seasonally or as needed. Dispose of collected materials off site.
- Check loading and dumpster areas (if applicable)
- Routinely pick up and remove litter from parking areas and surrounding landscape areas.

Maintenance of Stormwater Structures:

All stormwater structures should be maintenance in accordance with the O&M submitted with this report.

Maintenance of Vegetated Areas:

Regular maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of the pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. The following practices should be implemented.

- Inspect vegetated areas on semi-annual basis, remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Clean any soil deposited on pavement.
- Reseed bare areas of lawn.
- Avoid cutting crash shorter than 4” in height.

OPERATIONS AND MAINTENANCE PLAN

Project Location: 126 Broadway Arlington, MA

Owner Name:

Owner Number:

Owner Email:

Owner Address:

Plan Reference:

Plan Title:

Date:

Prepared by:

As-built Plan Reference:

Plan Title:

Date:

Prepared by:

Party Responsible for Maintenance:

The property owners are responsible for maintaining and servicing the proposed stormwater management design post construction. During construction, the contractor will be responsible for stormwater management maintenance.

_____(signature) Date: _____

Inspections will be performed in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Handbook. The Site Plans identify the location of each BMP to be inspected and maintained as described in this Section.

The following stormwater management system features will be evaluated during each inspection:

Vegetated Surfaces:

Inspection Frequency: Bi-annually in Summer and Winter

Special Inspection Event(s): Spring Snow Melt

All vegetative surfaces will be observed to identify locations of settlement, erosion, and other impacts from the proposed redevelopment.

Driveway Sweeping

Inspection Frequency: Bi-annually in Summer and Winter

Special Inspection Event(s): Spring Snow Melt

The driveway shall be inspected at least every six months for sweeping. Sweeping shall be performed immediately following final snowmelt and completion of winter sanding. Sweeping shall be performed after every major storm event in the non-freezing months. Disposal of the sweepings must be in accordance with applicable local, state and federal guidelines and regulations.

Stormwater Infiltration Chambers:

Inspection Frequency: Every 3 months

Special Inspection Event(s): After every major storm event

Subsurface infiltration management systems should be inspected quarterly for sediment accumulation, blockages, structural deficiencies, and any other defects that may impair the intended functions of the chambers. The system should be inspected via the inspection ports provided and should include the inlet to the system. A log of the sediment depth should be maintained. Measure the sediment depth visually by opening the inspection port and the use of a flashlight and measuring rod. If sediment reaches a three-inch depth, the sediment is to be removed by vacuum or jet spray.

Downspouts

Inspection Frequency: Every 3 months

Special Inspection Event(s): After every major storm event

The downspouts shall be inspected quarterly for sediment / leaf accumulation, blockages, structural deficiencies, and any other defects that may impair the intended functions of the downspouts. The system shall be inspected via the cleanout as shown in the details in the approved site plan.

Discharge Trench/Interceptor Drain:

Inspection Frequency: Every 3 months

Special Inspection Event(s): After every major storm event

The discharge trench should be inspected quarterly for sediment accumulation, blockages, and structural deficiencies. Discharge trench should be vacuumed as needed. The discharge trench must be inspected 48-hours after every major storm for signs of blockage and excess sedimentation.

Reporting and Record Keeping:

The responsible party shall be responsible for maintaining accurate logs for all maintenance and inspections. The maintenance logs shall be kept on site for a minimum of five (5) years and be available for inspection by the City of Arlington. An example of a site maintenance log is attached at the end of the O&M Plan.

Changes to O&M Plan:

The owner of the stormwater management system shall notify the City of Arlington or its designated reviewing agent of changes in ownership or assignment of financial responsibility.

By signing below the responsible party agrees that they have read and understood the O&M plan required by the City of Arlington.

_____(signature)

Illicit Discharge Statement

At no time will the owner or any: other individual utilizes the stormwater management system for any purpose other than its intended use. The stormwater management system as shown on the attached site plan at no time shall receive discharges other than stormwater, this includes "wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, raw materials, toxic pollutants, hazardous substances, oil or grease."

_____(signature)

Stormwater Operations and Maintenance BMP Inspection Form

Project Address:

Owner:

Inspection By: _____

Date of Inspection: _____

Date of Recent Rainfall/Storm: _____

Reason for Inspection: _____

	Condition	Action Required
Vegetation:		

	Condition	Action Required
Driveway Sweeping:		

Infiltration System Components:

	Sediment Depth	Water Depth	Action Required
Chamber System			
Downspouts			
Interceptor Drain			

Notes/Diagram:

Storage and Use Requirements for Fertilizers, pesticides and herbicides:

Limit fertilizer and pesticide/herbicide use. Use only as directed by licensed/train landscape professionals. No fertilizes, pesticides ore herbicides to be used within the 100 ft buffer without approval from Conservation. Store all chemicals off site.

Management of Snow & Ice:

Snow removal is to be performed by a private contractor. Snow is to be stockpiled in the designated snow storage area shown on the approved plans. The amount of deicing chemicals shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be performed.

- No oil or sodium chloride shall be used during or after construction for the control of dust or ice and snow.
- Devices used for spreading deicing materials should be capable of varying the rate of application based on the site-specific condition.
- Salt and Sand should be stockpiled off site.

Spill Prevention and Response

Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the building and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

- Spill Hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
- Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
- The owner shall have the following equipment and materials on hand to address a spill cleanup: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
- All spills shall be cleaned up immediately after discovery.
- Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at 888-304-1133.
- Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan

Vehicle Washing:

Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The proposed project does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place onsite at such frequency to cause concern.

Illicit Discharges:

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning, condensation, footing drains, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing, and water used to clean residential buildings without detergents. The Owner is not aware of any existing illicit discharges to the Site and is not proposing any illicit discharges as part of the project. An Illicit Discharge Statement is provided on the O&M plan and a signed copy will be provided upon completion of the project.

Septic System Maintenance:

Not applicable.