Stormwater Analysis & Report
For
Residential Definitive Subdivision at Massapoag Street Weymouth, MA

April, 2020
Revised November 19, 2021
Revised January 11, 2022

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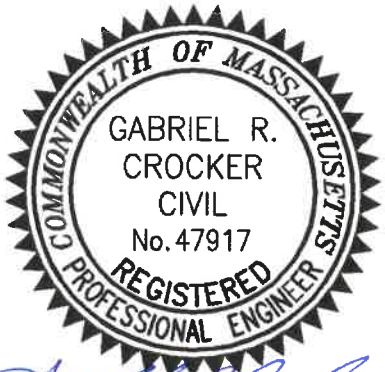

1-11-2022

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SECTION 1 - NARRATIVE

1.1 EXECUTIVE SUMMARY

In accordance with the provisions of the Rules and Regulations of the Planning Board of Weymouth, Massachusetts Governing the Subdivision of Land, the Applicant, Weathervane Massapoag, LLC proposes to develop a residential subdivision consisting of seven (7) single family lots as an extension to the existing Massapoag Street, a private-way.

The site is bounded by existing residential properties to the east and south, woods and wetlands to the north and west. The site topography ranges from a high of approximately 206' in front of the existing house and then slopes down toward the existing wetlands along the north, west and south sides, to an approximate low elevation of 162 to the north, 167 to the west and 183 to the south and to Massapoag Street at 190 +/- to the east. The Braintree town line exists along the western edge of the property. The site is mostly wooded and includes an existing single-family residential house with existing driveway and shed. **The extension of Massapoag Street, including the roundabout has been constructed along with utilities within the road right of way. Please refer to the Definitive Subdivision Plans revised 2/11/22.**

The property consists of 5.4 +/- acres in total in Weymouth and approximately 0.08 acres in Braintree (note the Braintree land is not counted toward the required subdivision and/or zoning requirements in Weymouth). The property is Zoned Residence R-1 and is located within the Watershed Protection District. **The wetland to the north of the project is tributary to the Mill River which is and Outstanding Resource Water and a critical area under the MA DEP Stormwater Standards.** The site is entirely outside of the FEMA 100-year floodplain and is not located within any NHESP Estimated or Priority Habitat areas. Please refer to Section 1.9 - Figures for the accompanying figures.

The proposed project consists of subdividing the property into seven (7) single-family residential parcels meeting the requirements of the Residence R-1 district and Watershed Protection District as well as the subdivision roadway extension and associated drainage and utility infrastructure. The project is considered a new development and has been designed to comply with the Massachusetts Stormwater Regulations. The Applicant is seeking several subdivision design waivers as you'll see on the plans and accompanying Planning Board Application submittal.

1.2 OBJECTIVE OF CALCULATIONS

The purpose of this stormwater analysis is to examine the stormwater runoff from the proposed site based upon the Massachusetts Department of Environmental Protection Stormwater Management Standards and the applicable provisions of the Town of Weymouth subdivision requirements.

The goal of the stormwater management system design on this project is to provide improved water quality, match/reduce post-development peak runoff rates below pre-development peak flow rates, minimize total area of land disturbance needed, maximize the opportunities for recharge and infiltration, and protect the surrounding area from any potential flooding and/or environmental impacts associated with the unmitigated condition. The following stormwater hydrology calculations were performed using the 2-year, 10-year, 25-year, and 100-year frequency, **NOAA-14 precipitation data** and were compared for both pre-development and post-development conditions.

1.3 METHODOLOGY

We utilized the latest version of Hydro CAD for the overall stormwater hydrology/routing analysis to assess and compare peak rates of runoff at the various discharge points from the subject property. We then utilized the Hydraflow Storm Sewers Extension Pack through AutoCAD Civil 3d to analyze the pipe design and to select appropriate pipe sizing.

Refer to Section 1.3 – Hydrocad Model, which includes the detailed print-out of the HydroCAD Model Reports for the 2, 10, 25 and 100-year storms as well as Section 7 – Hydraulic Pipe Analysis / Sizing, which includes the Hydraflow reports for the 10 and 100-year storms for pipe capacity analysis and sizing.

1.4 SITE HYDROLOGY

Existing Conditions

Please refer to the attached Existing Conditions Watershed Analysis Plan in Section 3 of this report. The property has been divided into several subcatchment areas based on the existing site topography and flow paths. These subcatchments then combine where appropriate from an analysis standpoint where they discharge toward wetland resource areas and the existing Massapoag Street right-of-way. Each subcatchment area has been analyzed and assigned an appropriate Curve Number to represent the existing vegetative cover and underlying soils conditions. Times of concentration have been computed and the extent of pervious vs. impervious cover computed. This data was then input into HydroCAD to determine peak rates of runoff at the various design points (identified as "Points of Analysis") which provide the locations for which to compare existing versus proposed conditions to document compliance that the peak rates have been reduced in the regulatory storm events as required. A Summary table is provided in the Hydrology Model Results and Conclusions Section below.

Proposed Conditions

Please refer to the attached Proposed Conditions Watershed Analysis Plan in Section 3 of this report. The proposed subdivision has been divided several subcatchment areas and

the stormwater underground infiltration chambers and their respective outlets have been modeled. Appropriate Times of Concentration and Curve Numbers have been assigned for each catchment area. A Summary table is provided in the Hydrology Model Results and Conclusions Section below.

Hydrology Model Results and Conclusions

The goal of the stormwater design for the project is to fully comply with the Massachusetts Stormwater Standards and the Town of Weymouth regulations. This analysis confirms that the stormwater system is receiving proper treatment and peak rates of runoff have been matched or reduced to below pre-development rates using stormwater Best Management Practices including deep sump hooded catch basins, **grass conveyance swales, water quality units, and two (2) underground infiltration chamber systems. The underground infiltration systems have been sized and designed to infiltrate the required recharge and provide peak flow attenuation.** The water quality (CDS) unit has been properly sized in accordance with MADEP guidance for water quality flows. The results of the pre- and post-development hydrology calculations provided in Section 3 are summarized in the following table:

Peak Rate Analysis				
Point of Analysis	**2-Yr (CFS)**	**10-Yr (CFS)**	**25-Yr (CFS)**	**100-Yr (CFS)**
#1 Existing	0.00	0.01	0.06	0.39
#1 Proposed	0.00	0.00	0.01	**0.36**
#2 Existing	0.00	0.01	0.05	0.43
#2 Proposed	0.00	0.01	0.05	**0.29**
#3 Existing	0.00	0.05	0.16	0.48
#3 Proposed	0.00	0.01	0.04	**0.17**
#4 Existing	0.08	0.15	0.20	0.26
#4 Proposed	0.00	0.00	0.00	0.00

Point of Analysis	2-Yr (AcFt)	10-Yr (AcFt)	25-Yr (AcFt)	100-Yr (AcFt)
#1 Existing	0.000	0.008	0.027	0.074
#1 Proposed	0.000	0.001	**0.003**	**0.078**
#2 Existing	0.000	0.006	0.030	0.095
#2 Proposed	0.000	**0.005**	**0.016**	**0.083**
#3 Existing	0.001	0.012	0.025	0.050
#3 Proposed	0.000	0.004	0.009	0.020
#4 Existing	0.006	0.011	0.015	0.020
#4 Proposed	0.000	0.000	0.000	0.000
Total Existing	0.007	0.037	0.097	0.239
Total Proposed	0.000	**0.010**	**0.028**	**0.181**

In all cases storm events, the proposed peak rates are less than or equal to the predevelopment peak rates. The project results in an overall decrease in stormwater volume discharge for all storm events. Collectively there is less volume discharging to the wetlands in the proposed condition compared to the existing.

As can be seen based on the above tables, the peak stormwater runoff rates **and volumes** generated by the development are the same or less in post development conditions versus the existing conditions in all cases. Refer to Section 3 for copies of the HydroCAD Analysis and pre and post development watershed plans.

1.5 STORMWATER MANAGEMENT

The following section describes each of the ten (10) Massachusetts Stormwater Management Standards and describes how the project complies with each.

Standard 1: No New Untreated Discharges – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

All new stormwater system conveyances are treated prior to discharge. The drainage system has been designed to direct stormwater runoff from impervious areas through stormwater BMPs designed to capture, convey, treat, detain, recharge and infiltrate the runoff prior to discharge.

Standard 2: Peak Rate Attenuation – Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

The stormwater BMPs employed result in peak discharge rates not being exceeded from predevelopment conditions.

Standard 3: Recharge – Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The stormwater system has been designed to comply and exceed the minimum recharge volume requirements.

Standard 4: Water Quality – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The project utilizes deep sump hooded catch basins water quality units underground infiltration chambers to fully comply with the TSS requirements of 80% removal. The water quality are designed to treat the 1" water quality volume (WQV) for the impervious area captured on site due to the site being within a critical area. In addition, deep sump hooded catch basins are proposed. Calculations for water quality volume can be found in Section 4.3, and treatment train efficiency can be found in Section 4.4. A long-term Operation and Maintenance Manual for these systems can be found in Section 5.

Standard 5: Land Uses with Higher Potential Pollutant Loads – For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The project is not considered a LUHPPL (Land Use with Higher Potential Pollutant Load).

Standard 6: Critical Areas – Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near

or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

The wetland to the north of the project is tributary to the Mill River which is and Outstanding Resource Water and a critical area under the MA DEP Stormwater Standards, therefore the project has been design to comply with all applicable Stormwater Standards and to treat 1-inch of water quality volume.

Standard 7: Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable – A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The project qualifies as a new development and has been designed to comply with the requirements as if it were entirely new development.

Standard 8: Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control – A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

An Erosion and Sedimentation Controls Plan has been incorporated into the Site Plans.

Standard 9: Operation and Maintenance Plan – A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A long-term Operation and Maintenance Plan has been incorporated herein. See Section 5 of the Report.

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

An Illicit Discharge Compliance Statement is included as required.

1.6 BEST MANAGEMENT PRACTICES (BMP'S)

A system of deep sump hooded catch basins, and underground infiltration chambers will be used to treat stormwater runoff on the site. See Section 4.5: Total Suspended Solids (TSS) Calculations.

1.7 PIPE SIZING

Refer to Section 7 for the output results from the Hydraflow Sewer Storm Sewers Extension for AutoCAD Civil 3D. Hydraflow utilized the Rational Method. The tributary area for each inlet/subcatchment area has been computed along with pipe length, slope and friction coefficient. The Rational Method is then utilized to determine the hydraulic grade line. For design purposes, this approach was used to size the pipes such that the 10-year storm event is contained within the pipe. The 100-year storm was then checked to confirm the hydraulic grade line for the pipe network does not exceed the rim elevations of the drainage structures.

1.8 CONCLUSION

In conclusion, the project has been designed in accordance with the requirements of the MA Stormwater Management Regulations and in compliance with the Town of Weymouth Stormwater Management and Erosion Control By-Law.

1.9 FIGURES

The following pages contain the following accompanying figures:

FIG 1 SITE LOCUS USGS MAP
FIG 2 SITE LOCUS ORTHOGRAPHIC MAP
FIG 3 NHESP HABITAT MAP
FIG 4 FEMA FLOODPLAIN MAP
FIG 5 MASSDEP WETLANDS MAP

CROCKER DESIGN GROUP, LLC.

2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-820-0416

MASSACHUSETTS

TITLE:

USGS MAP

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WEYMOTH, MA

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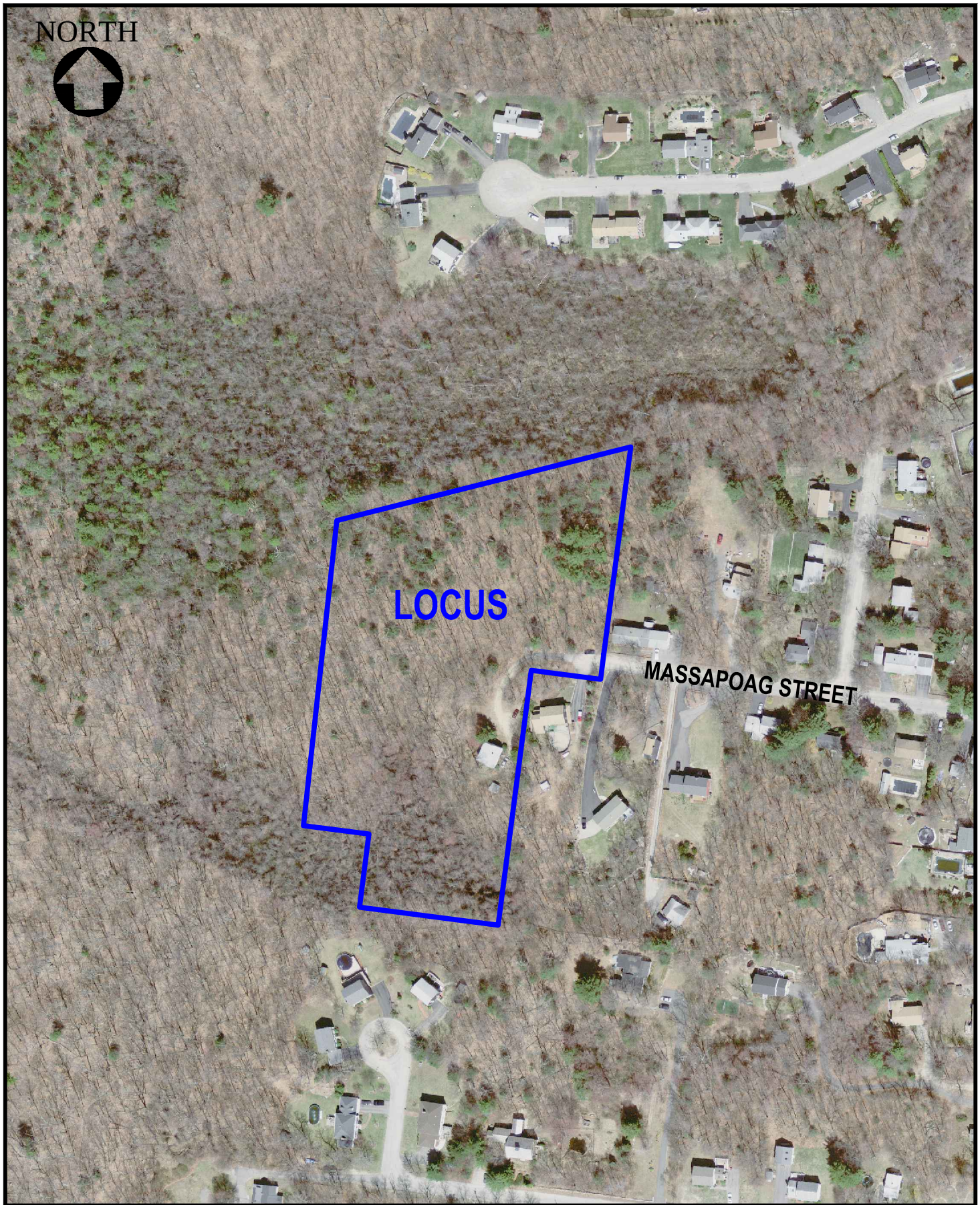

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2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-820-0416

MASSACHUSETTS

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AERIAL MAP

MASSPOAG STREET,
WEYMOUTH, MA

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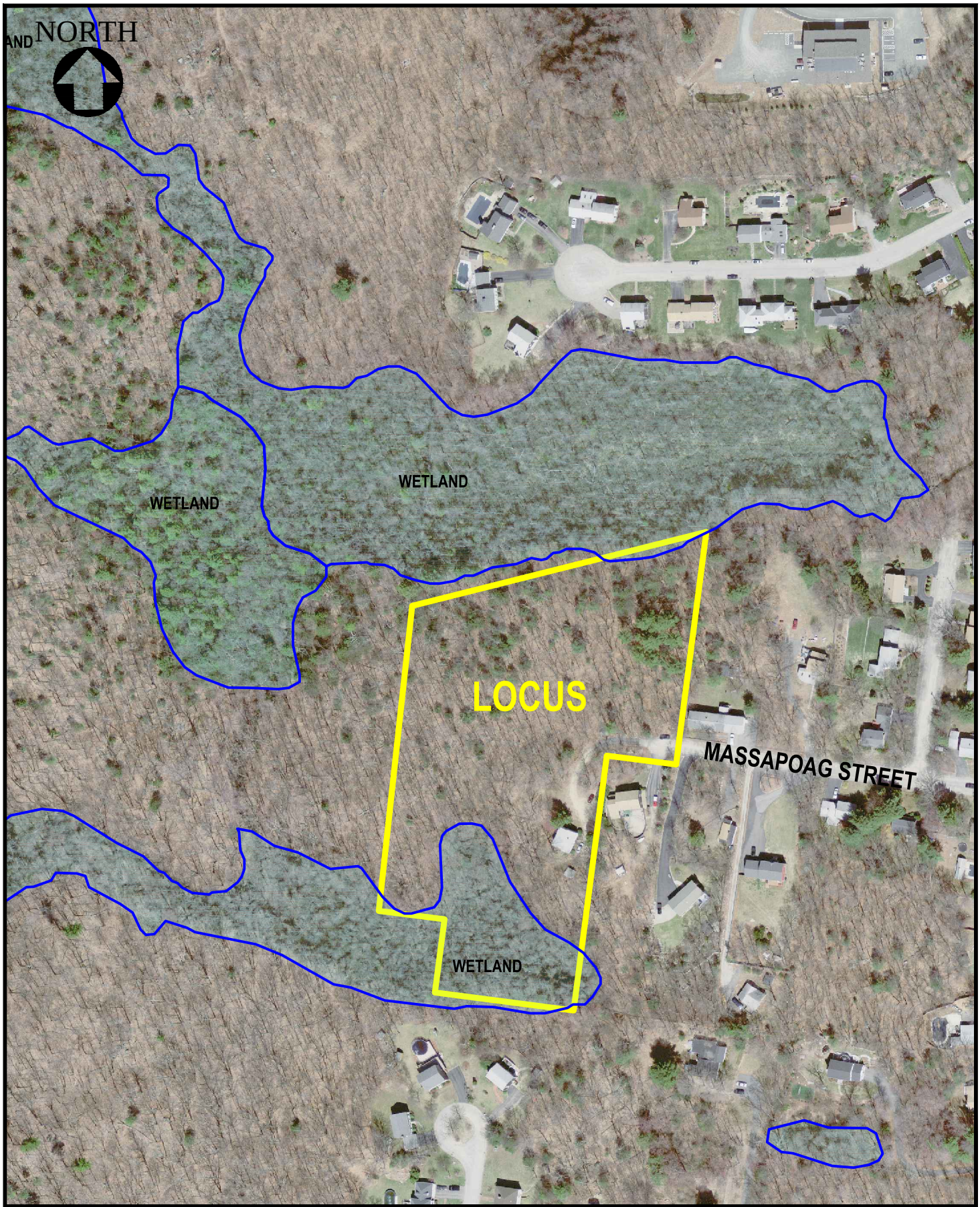

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MASSACHUSETTS

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WEYMOUTH, MA

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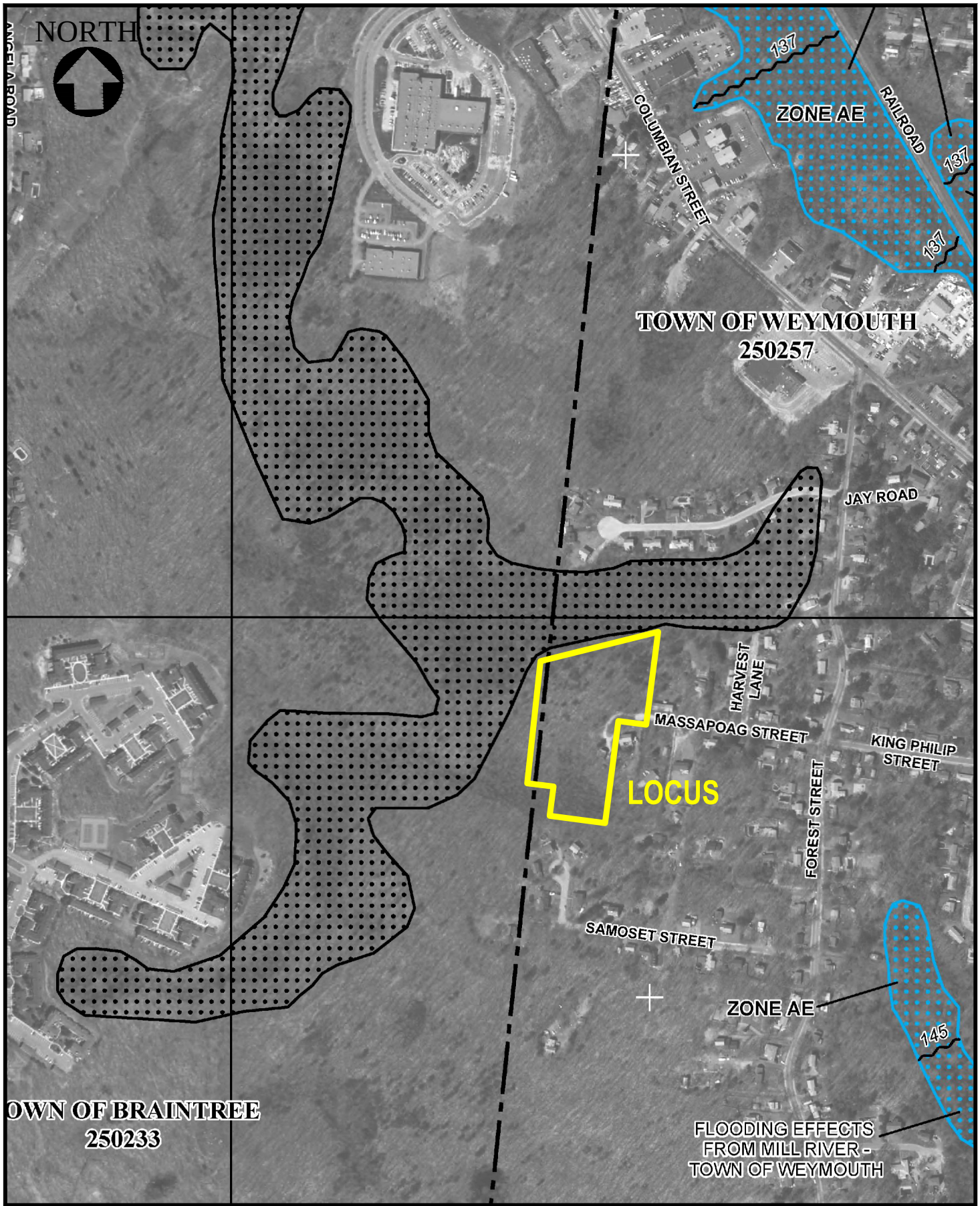

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HINGHAM, MA 02043
P: 781-820-0416

MASSACHUSETTS

TITLE:

FEMA MAP

MASSPOAG STREET,
WEYMOUTH, MA

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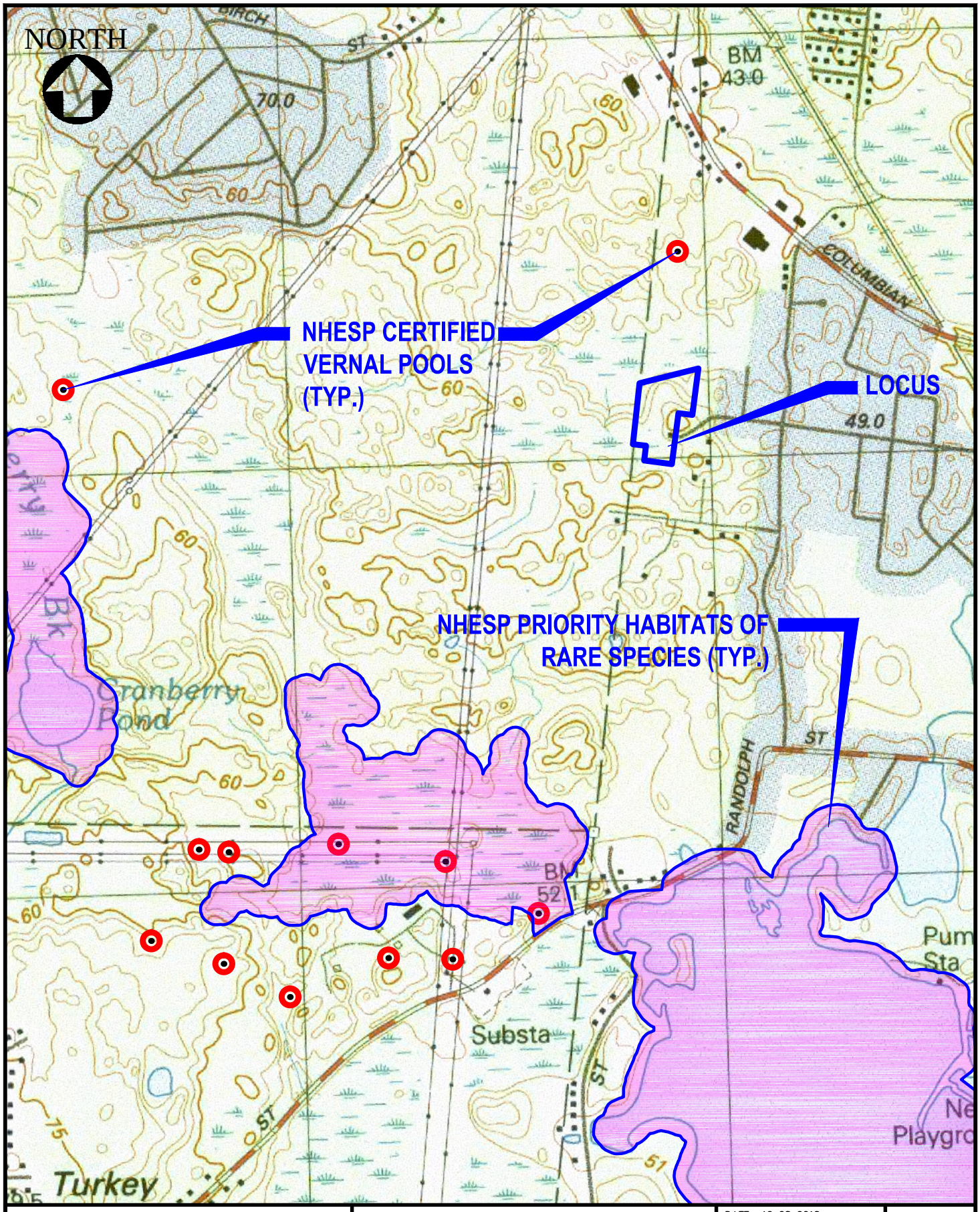

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MASSACHUSETTS

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WEYMOUTH, MA

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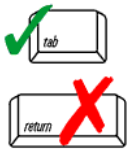
SECTION 2 – STORMWATER CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

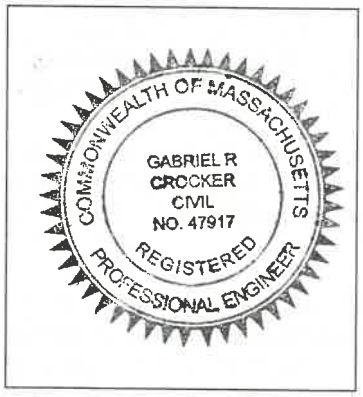
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date 1/13/2022

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Standard 10: Massachusetts Stormwater Standards Handbook

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

To the best of our knowledge and professional belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. The design of the site based on the plans entitled "DIVISION SUBDIVISION PLAN FOR MASSAPOAG STREET, WEYMOUTH, MA" prepared by Crocker Design Group, LLC, 2 Sharp Street, Unit A, Hingham, Massachusetts, show a separation and no direct connection between the stormwater management systems and the wastewater and/ or groundwater on the site. To the maximum extent practicable, the design prevents entry of illicit discharges into the stormwater management system.

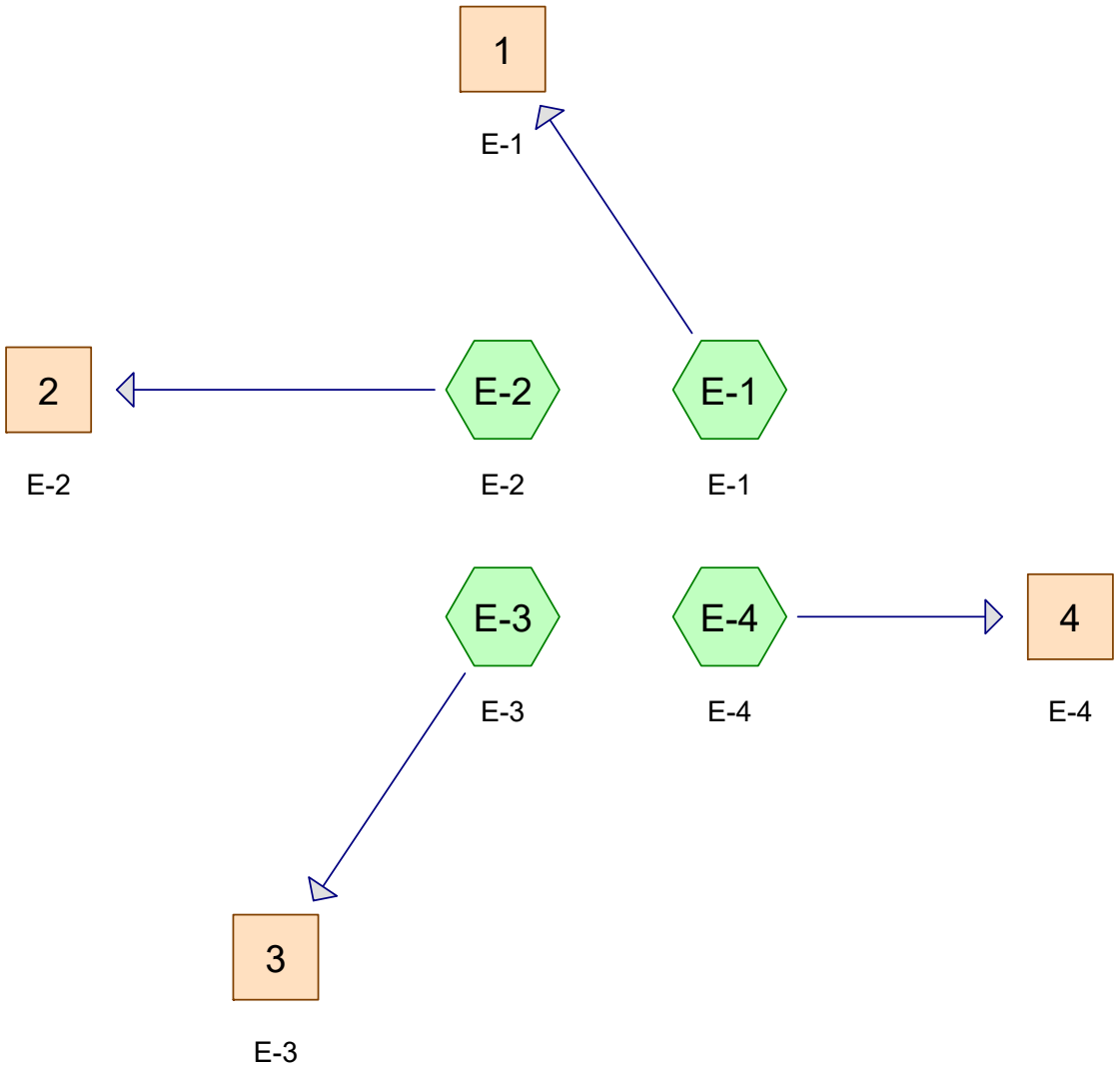
Engineer's Name: Gabe Crocker
(please print)

Engineer's Signature: _____ Date: 1/11/2022

Company: Crocker Design Group, LLC.

SECTION 3 – STORMATER HYDROLOGY MODEL

3.1 EXISTING HYDROLOGY



Subcat Reach Pond Link

Routing Diagram for Massapoag Watershed with EC noaa
Prepared by {enter your company name here}, Printed 1/4/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.010	49	50-75% Grass cover, Fair, HSG A (E-4)
0.141	98	Paved parking, HSG A (E-1, E-2, E-3, E-4)
3.594	32	Woods/grass comb., Good, HSG A (E-1, E-2, E-3)

Summary for Subcatchment E-1: E-1

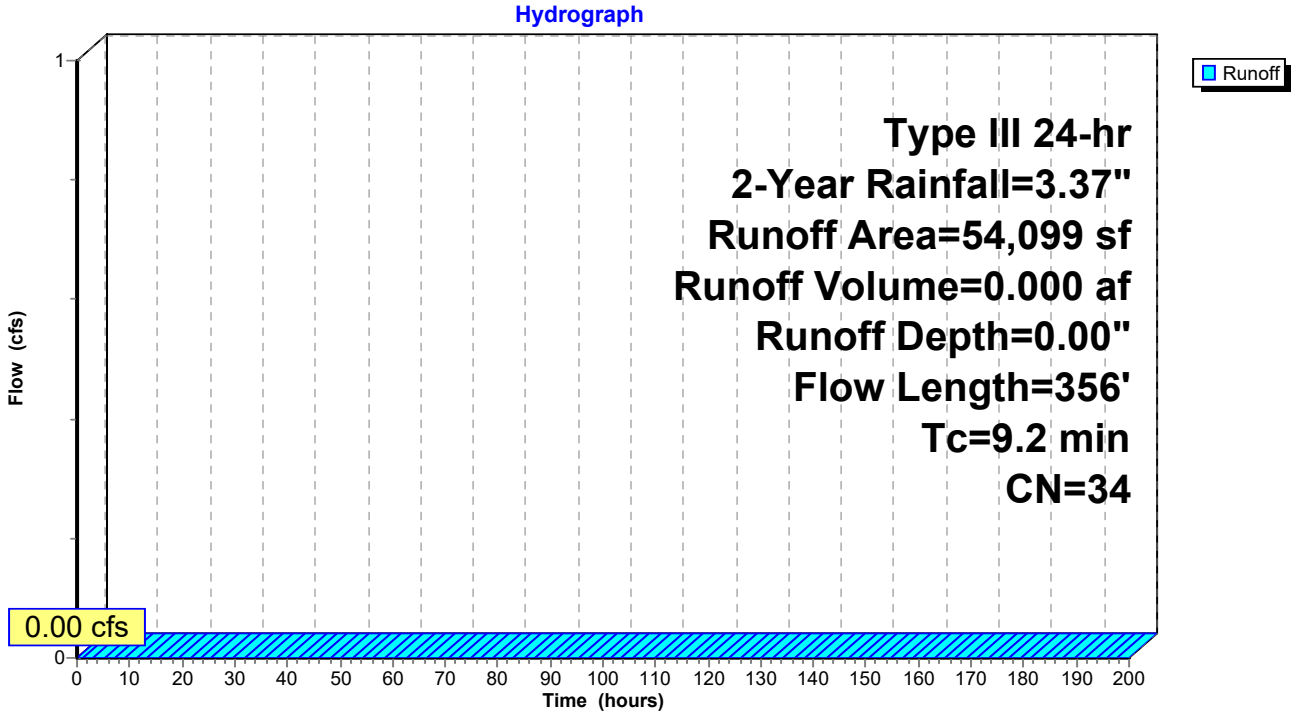
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (sf)	CN	Description
52,183	32	Woods/grass comb., Good, HSG A
1,916	98	Paved parking, HSG A
54,099	34	Weighted Average
52,183		96.46% Pervious Area
1,916		3.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.7	306	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	356	Total			

Subcatchment E-1: E-1



Summary for Subcatchment E-2: E-2

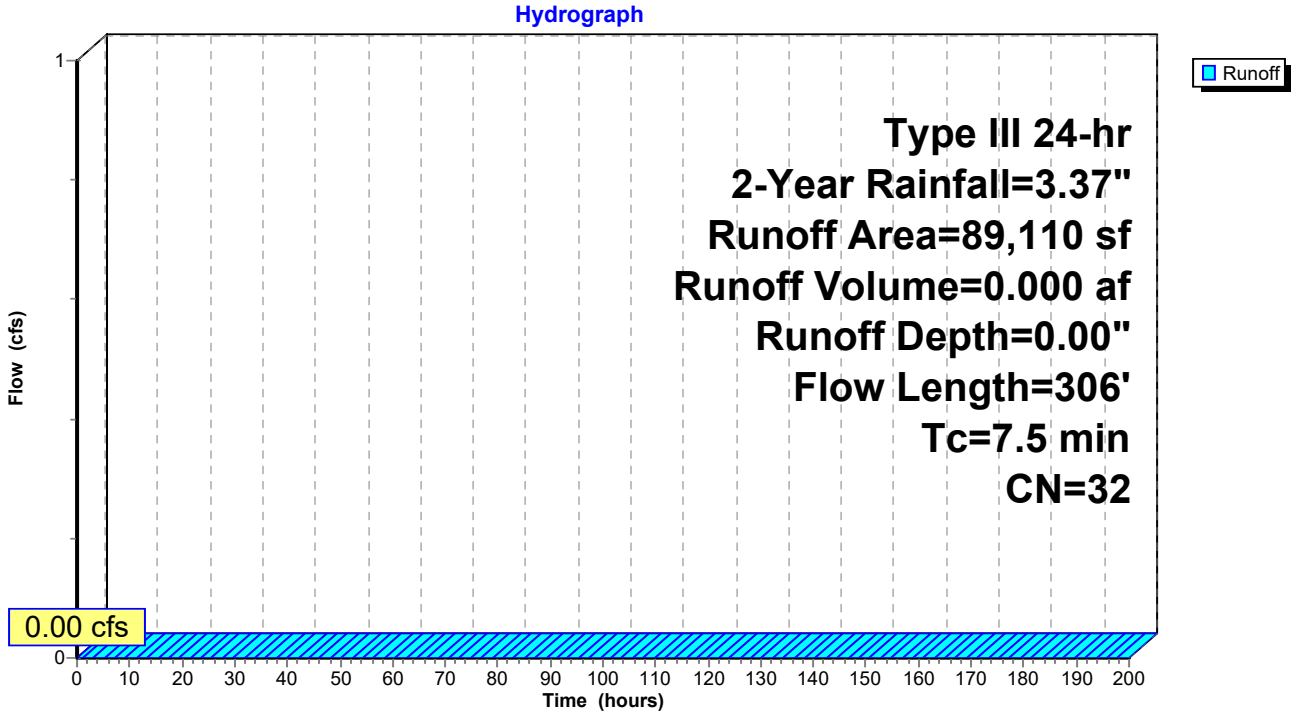
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (sf)	CN	Description
88,738	32	Woods/grass comb., Good, HSG A
372	98	Paved parking, HSG A
89,110	32	Weighted Average
88,738		99.58% Pervious Area
372		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.6	256	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	306	Total			

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

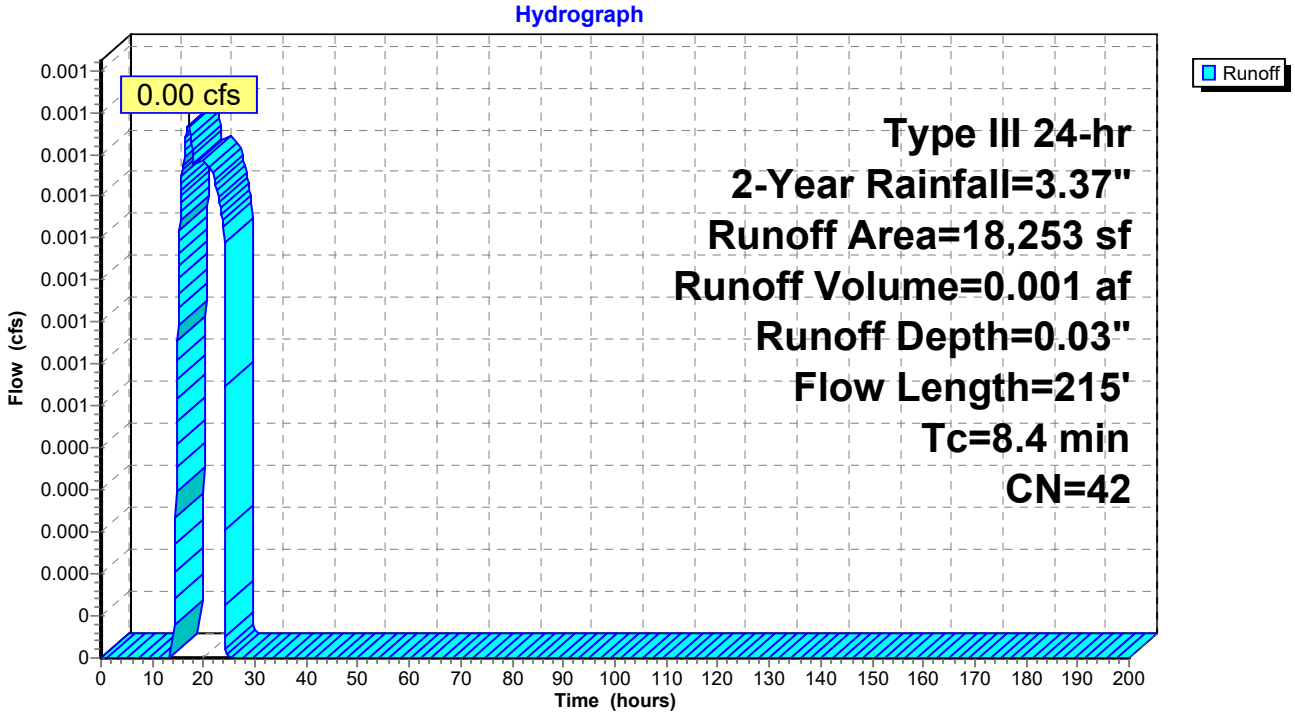
Runoff = 0.00 cfs @ 17.05 hrs, Volume= 0.001 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (sf)	CN	Description
15,616	32	Woods/grass comb., Good, HSG A
2,637	98	Paved parking, HSG A
18,253	42	Weighted Average
15,616		85.55% Pervious Area
2,637		14.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1100	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.2	165	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.4	215	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

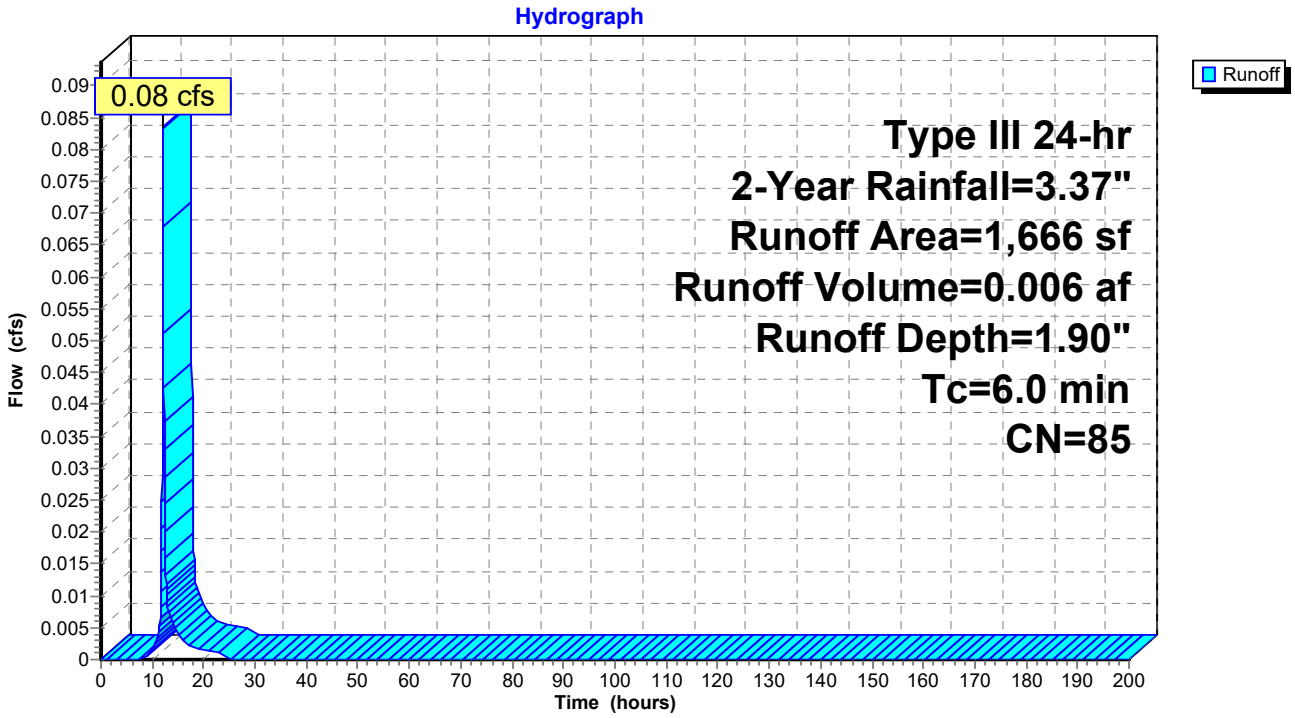
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (sf)	CN	Description
1,210	98	Paved parking, HSG A
456	49	50-75% Grass cover, Fair, HSG A
1,666	85	Weighted Average
456		27.37% Pervious Area
1,210		72.63% Impervious Area

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

Subcatchment E-4: E-4

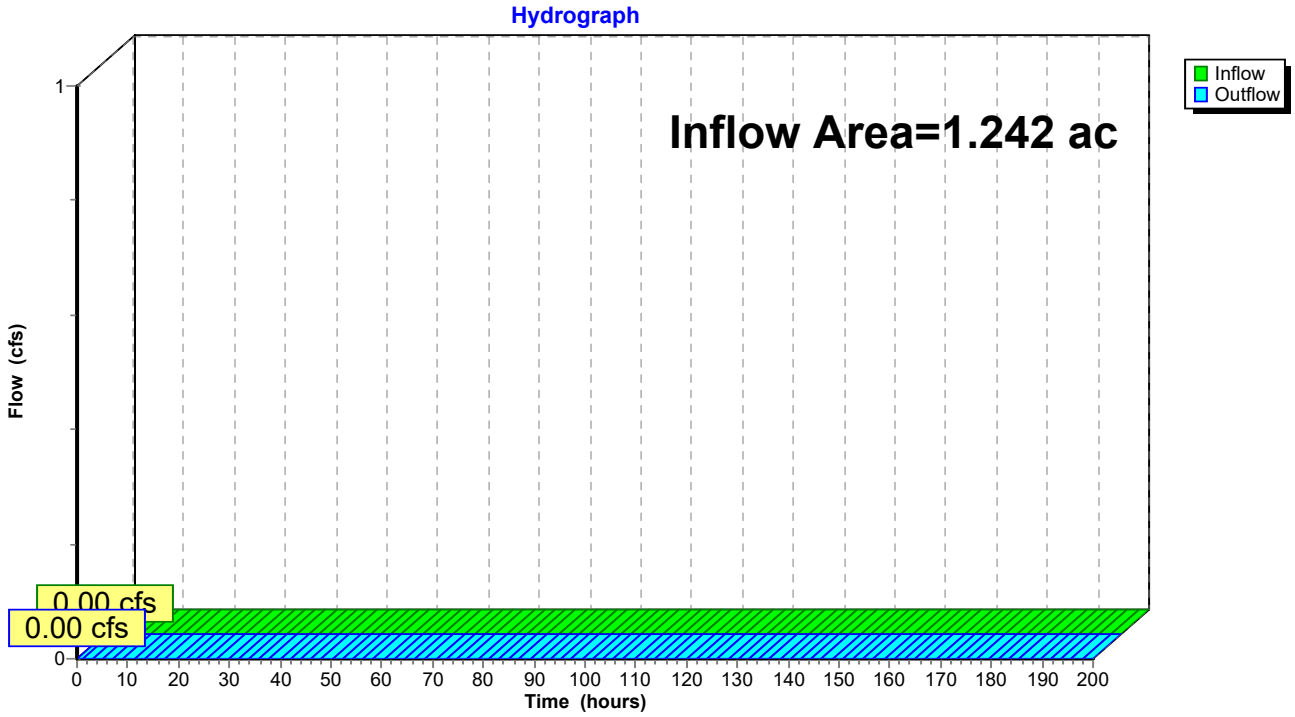


Summary for Reach 1: E-1

Inflow Area = 1.242 ac, 3.54% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: E-1

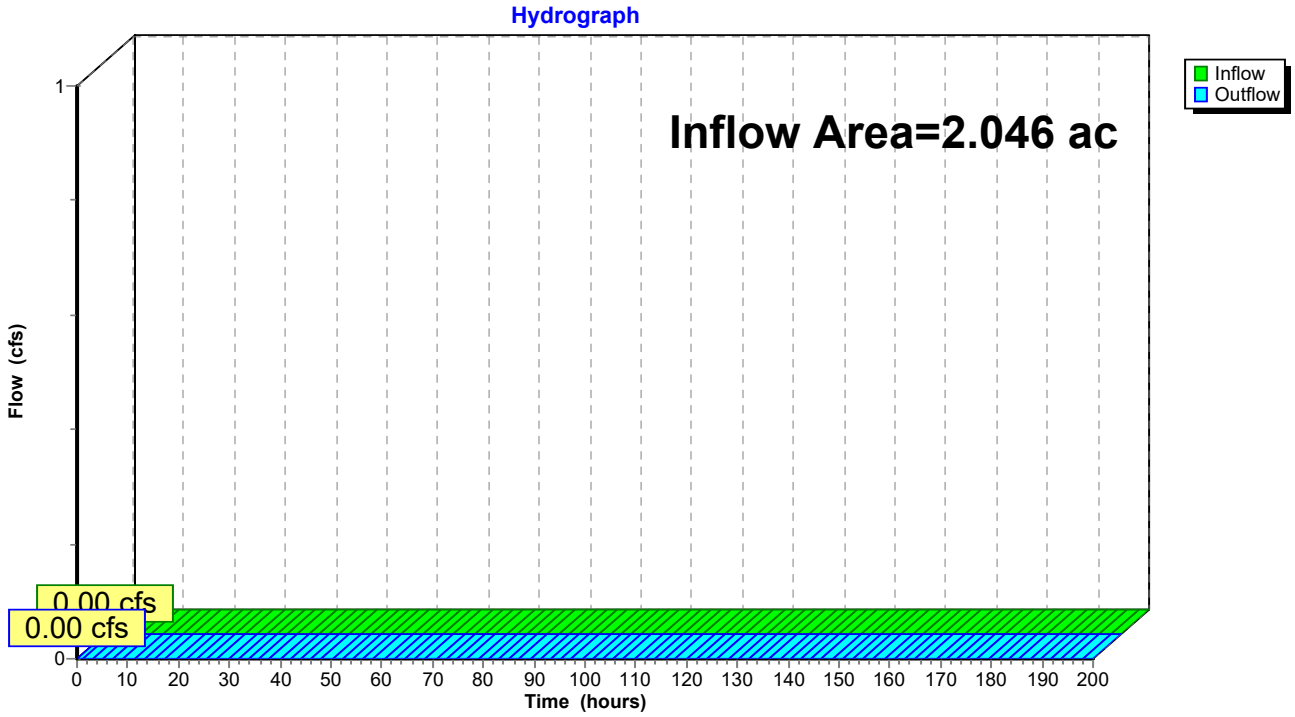


Summary for Reach 2: E-2

Inflow Area = 2.046 ac, 0.42% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: E-2

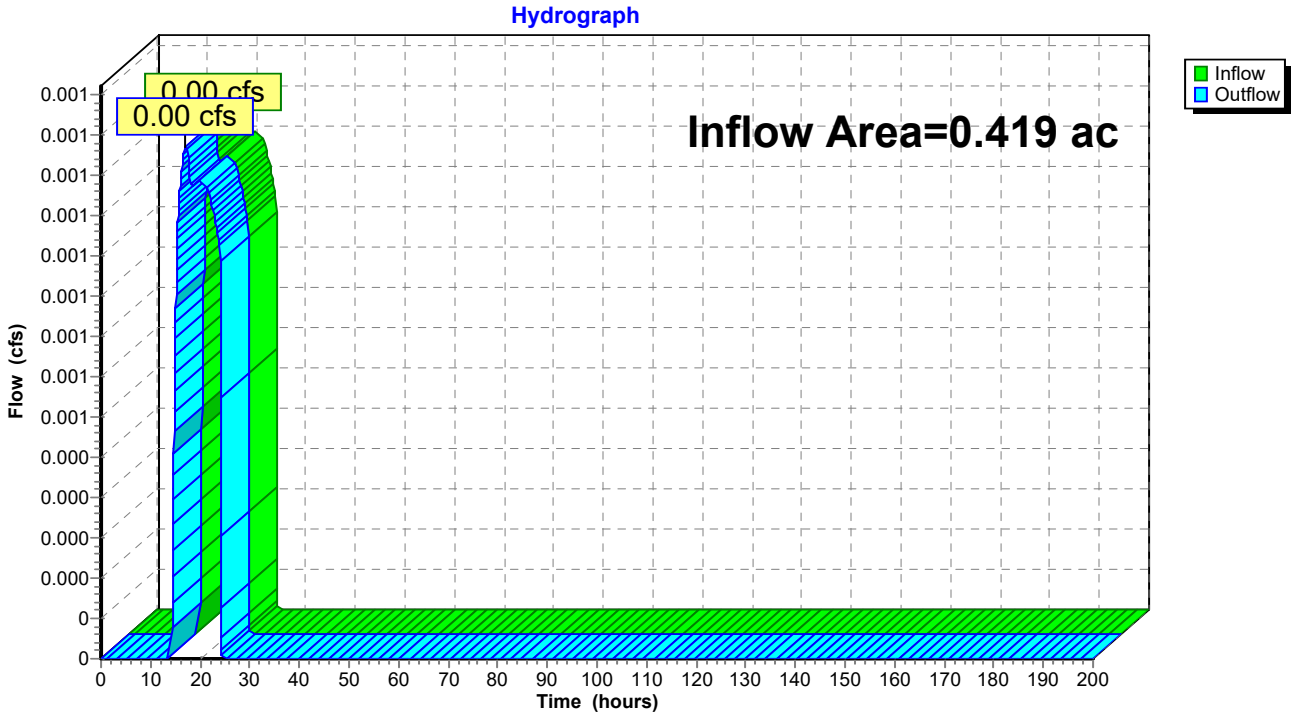


Summary for Reach 3: E-3

Inflow Area = 0.419 ac, 14.45% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.00 cfs @ 17.05 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 17.05 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: E-3

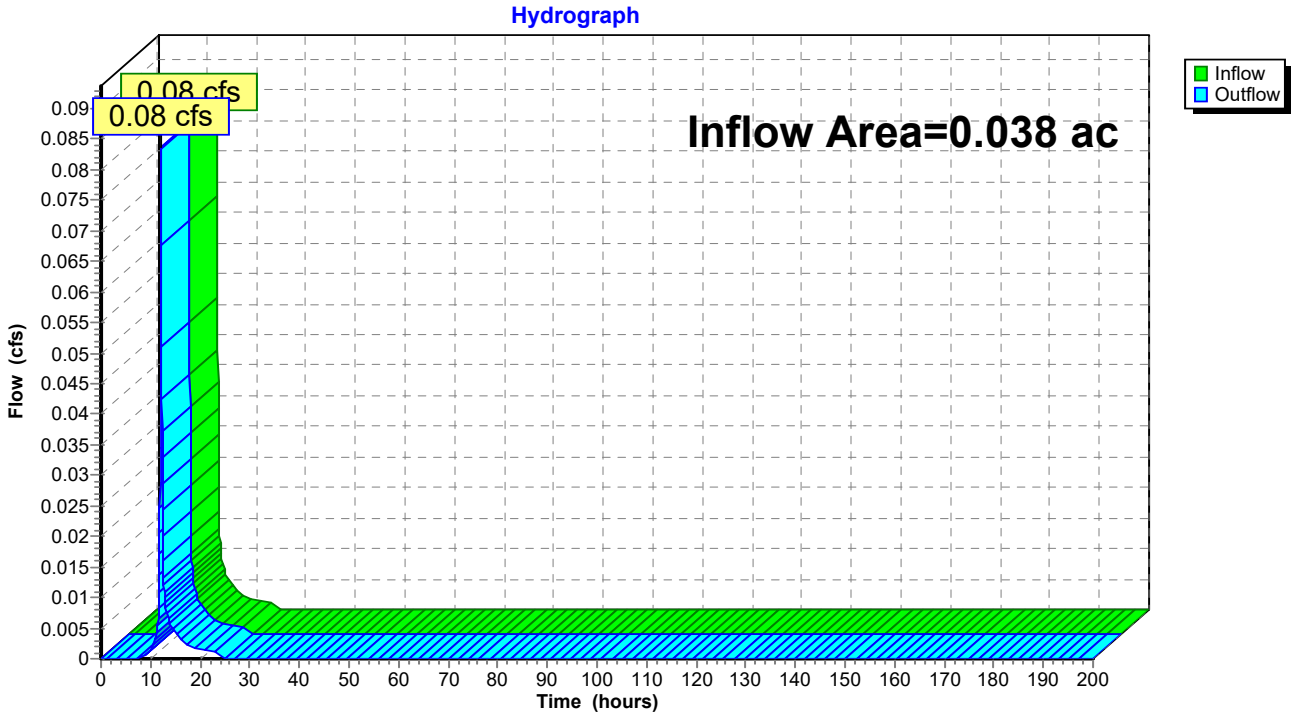


Summary for Reach 4: E-4

Inflow Area = 0.038 ac, 72.63% Impervious, Inflow Depth = 1.90" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 4: E-4



Summary for Subcatchment E-1: E-1

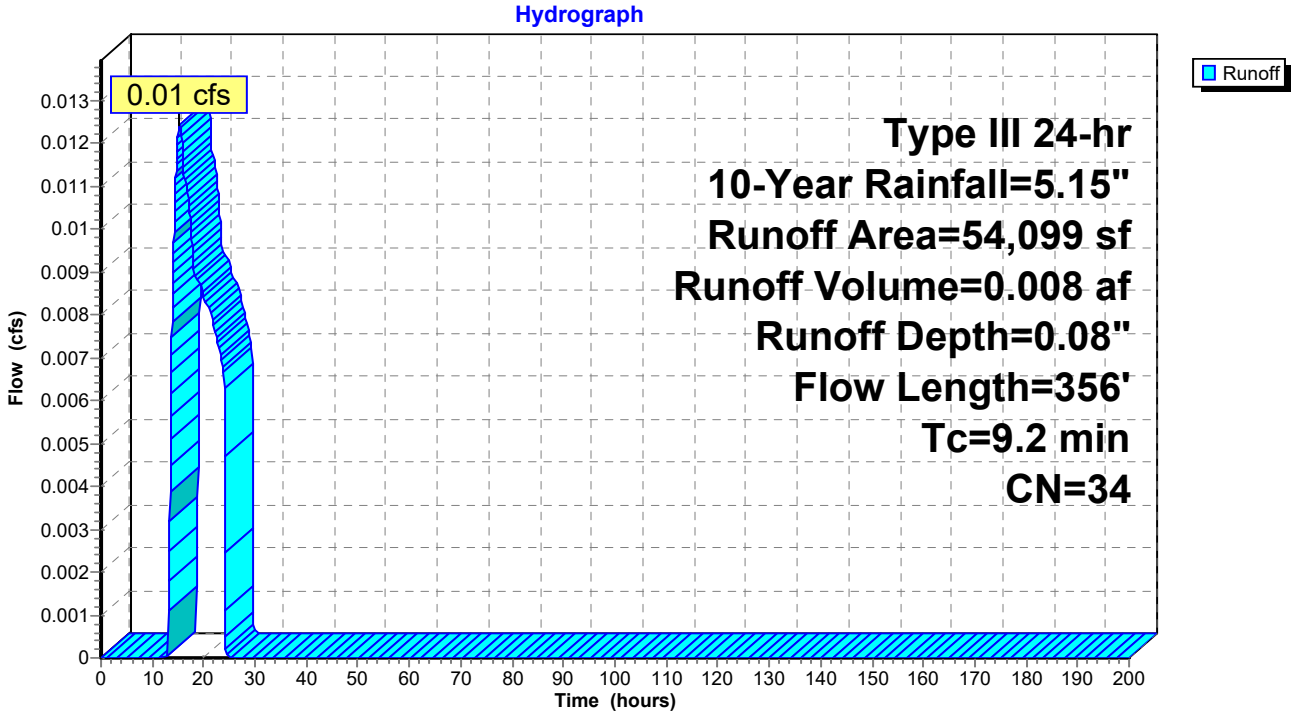
Runoff = 0.01 cfs @ 15.30 hrs, Volume= 0.008 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
52,183	32	Woods/grass comb., Good, HSG A
1,916	98	Paved parking, HSG A
54,099	34	Weighted Average
52,183		96.46% Pervious Area
1,916		3.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.7	306	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	356	Total			

Subcatchment E-1: E-1



Summary for Subcatchment E-2: E-2

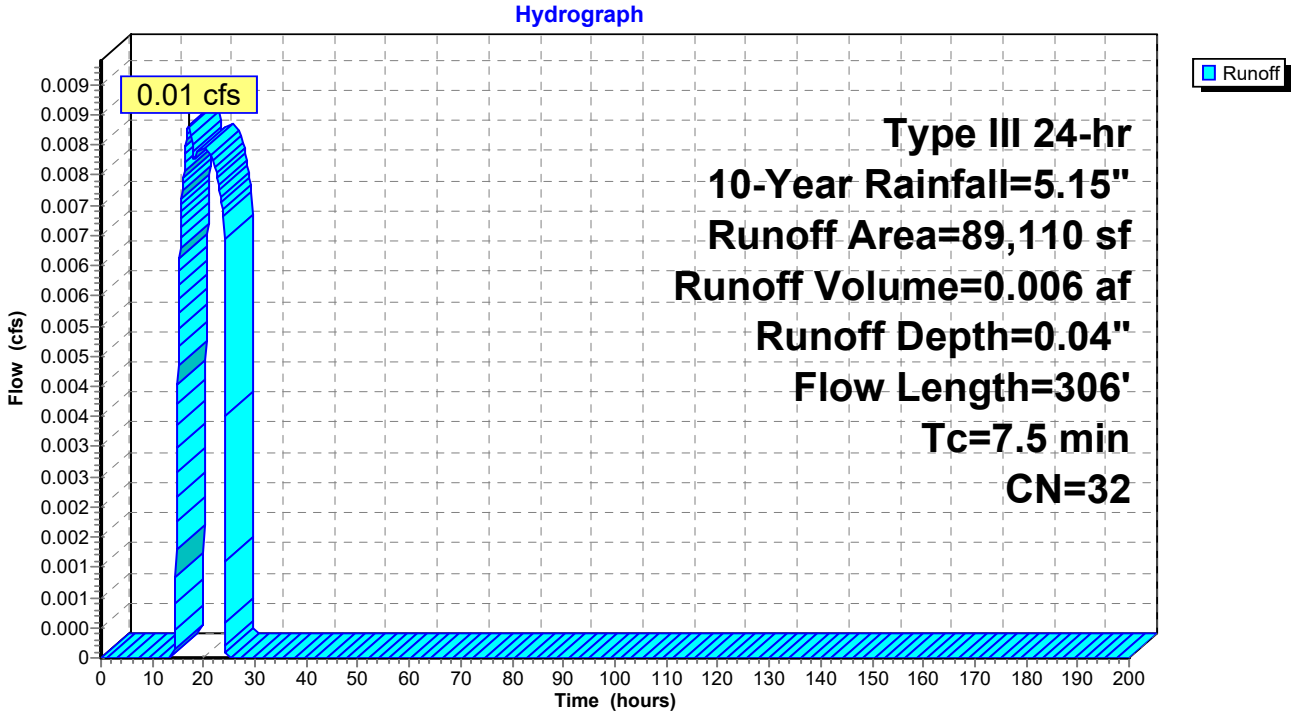
Runoff = 0.01 cfs @ 17.14 hrs, Volume= 0.006 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
88,738	32	Woods/grass comb., Good, HSG A
372	98	Paved parking, HSG A
89,110	32	Weighted Average
88,738		99.58% Pervious Area
372		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.6	256	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	306	Total			

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

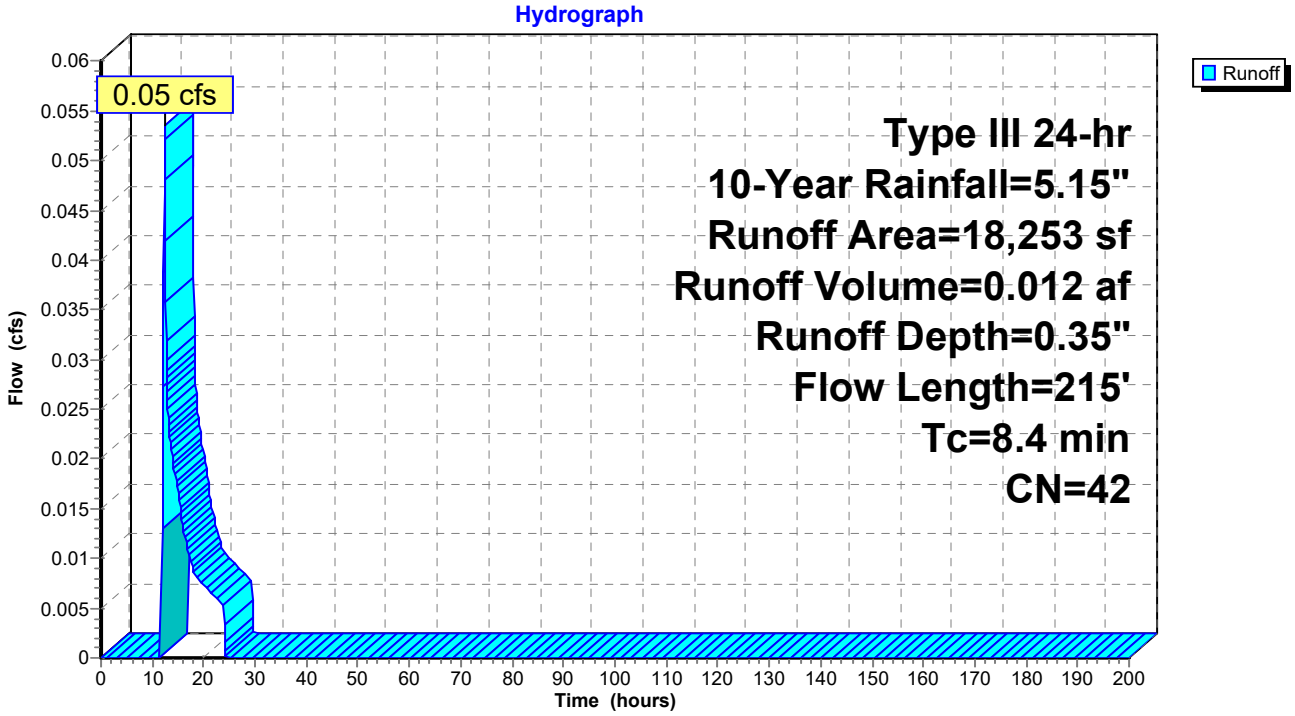
Runoff = 0.05 cfs @ 12.40 hrs, Volume= 0.012 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
15,616	32	Woods/grass comb., Good, HSG A
2,637	98	Paved parking, HSG A
18,253	42	Weighted Average
15,616		85.55% Pervious Area
2,637		14.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1100	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.2	165	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.4	215	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

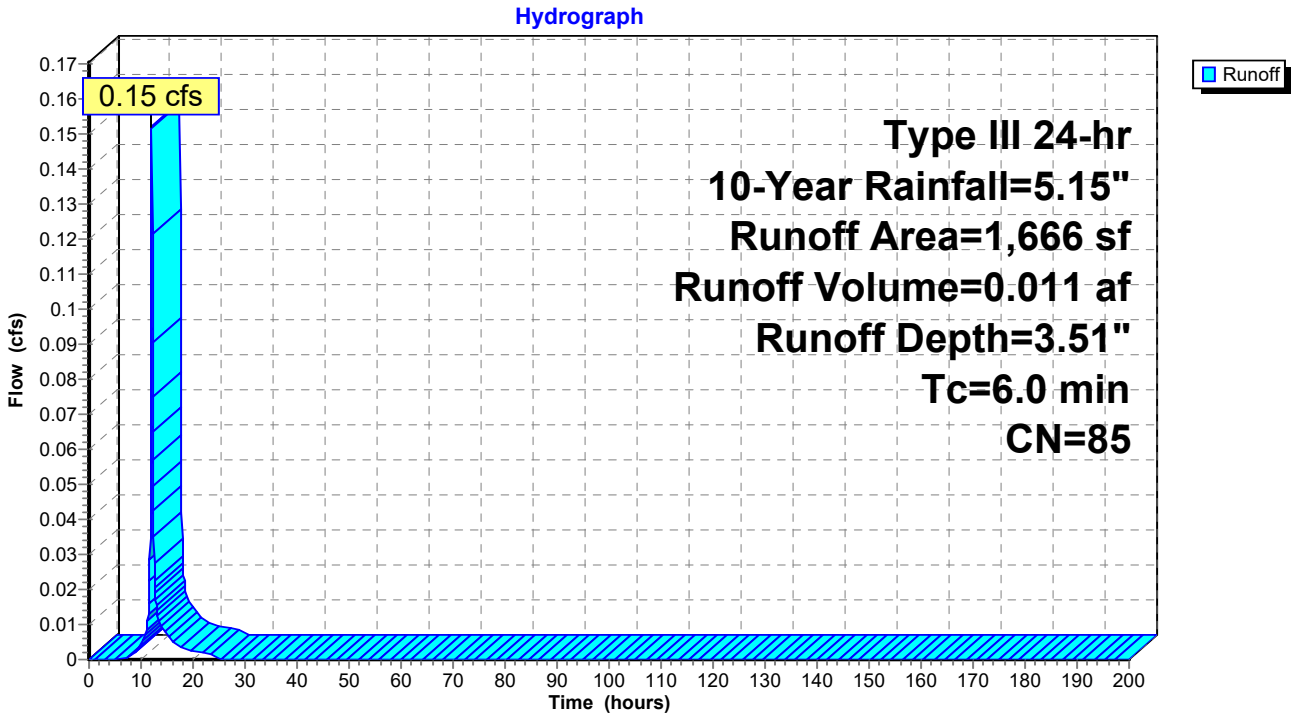
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
1,210	98	Paved parking, HSG A
456	49	50-75% Grass cover, Fair, HSG A
1,666	85	Weighted Average
456		27.37% Pervious Area
1,210		72.63% Impervious Area

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

Subcatchment E-4: E-4

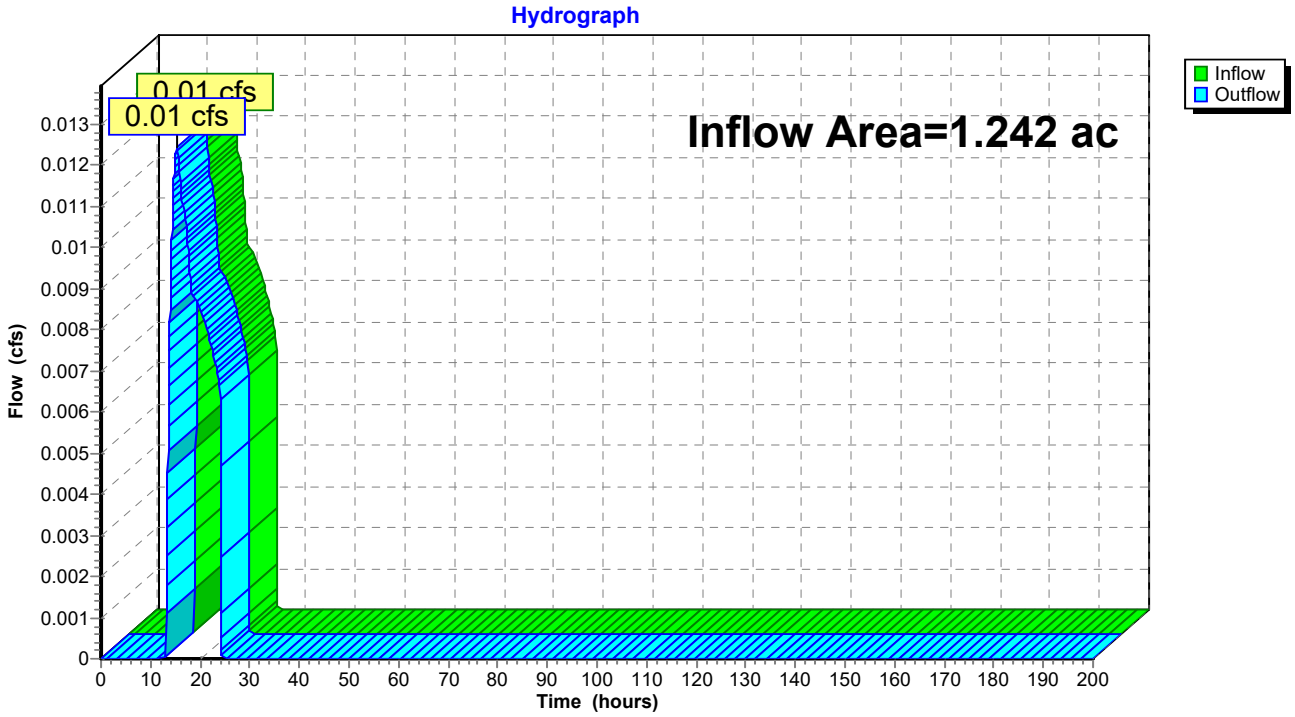


Summary for Reach 1: E-1

Inflow Area = 1.242 ac, 3.54% Impervious, Inflow Depth = 0.08" for 10-Year event
Inflow = 0.01 cfs @ 15.30 hrs, Volume= 0.008 af
Outflow = 0.01 cfs @ 15.30 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: E-1

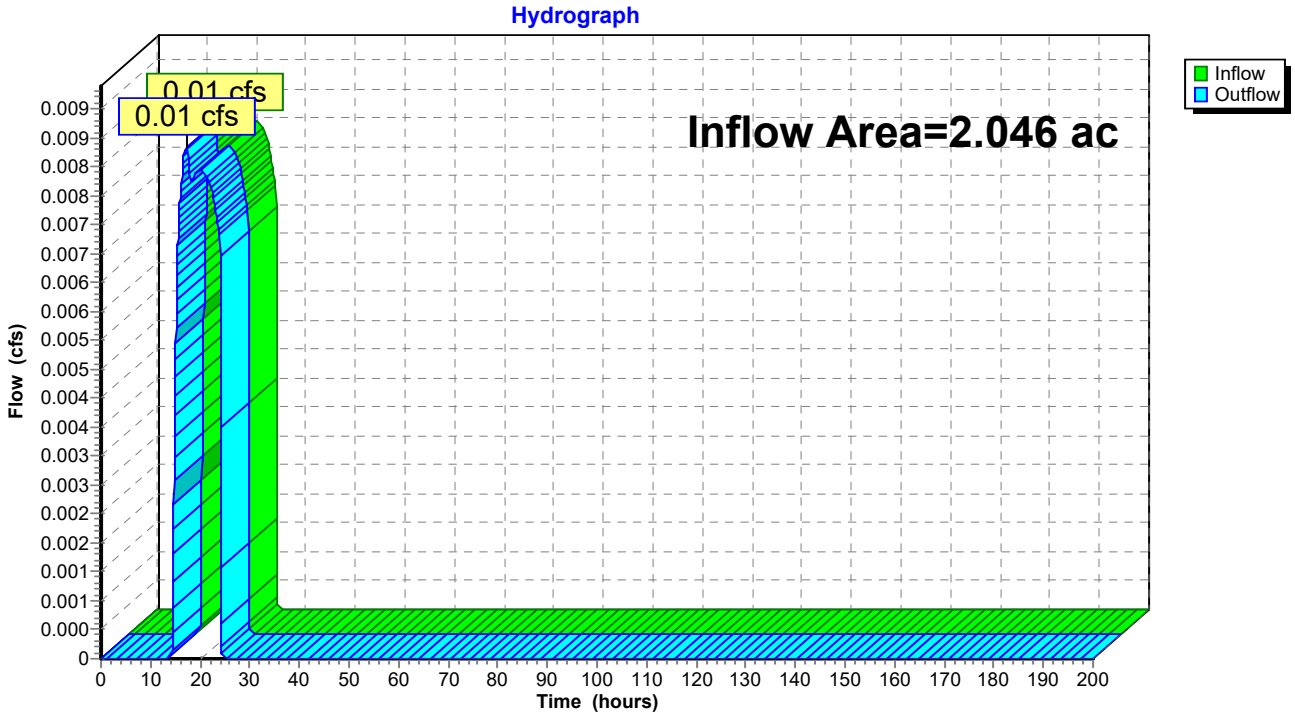


Summary for Reach 2: E-2

Inflow Area = 2.046 ac, 0.42% Impervious, Inflow Depth = 0.04" for 10-Year event
Inflow = 0.01 cfs @ 17.14 hrs, Volume= 0.006 af
Outflow = 0.01 cfs @ 17.14 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: E-2

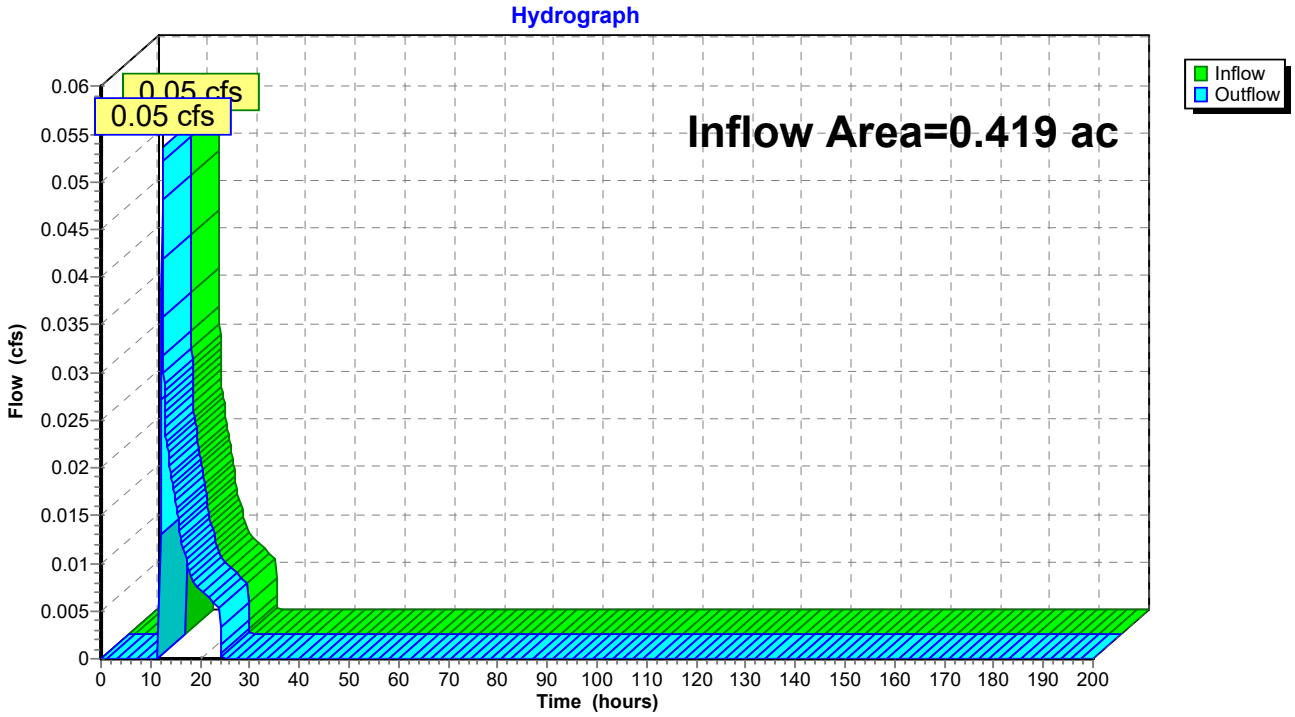


Summary for Reach 3: E-3

Inflow Area = 0.419 ac, 14.45% Impervious, Inflow Depth = 0.35" for 10-Year event
Inflow = 0.05 cfs @ 12.40 hrs, Volume= 0.012 af
Outflow = 0.05 cfs @ 12.40 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: E-3

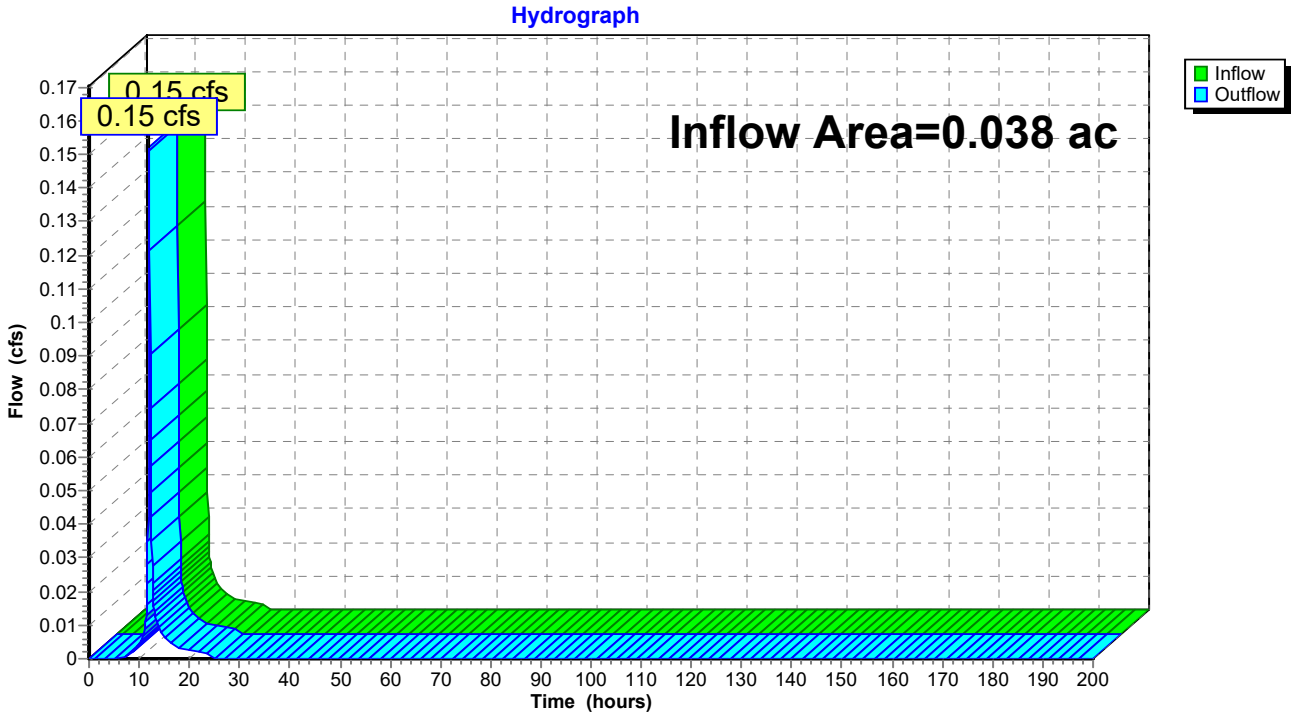


Summary for Reach 4: E-4

Inflow Area = 0.038 ac, 72.63% Impervious, Inflow Depth = 3.51" for 10-Year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 4: E-4



Summary for Subcatchment E-1: E-1

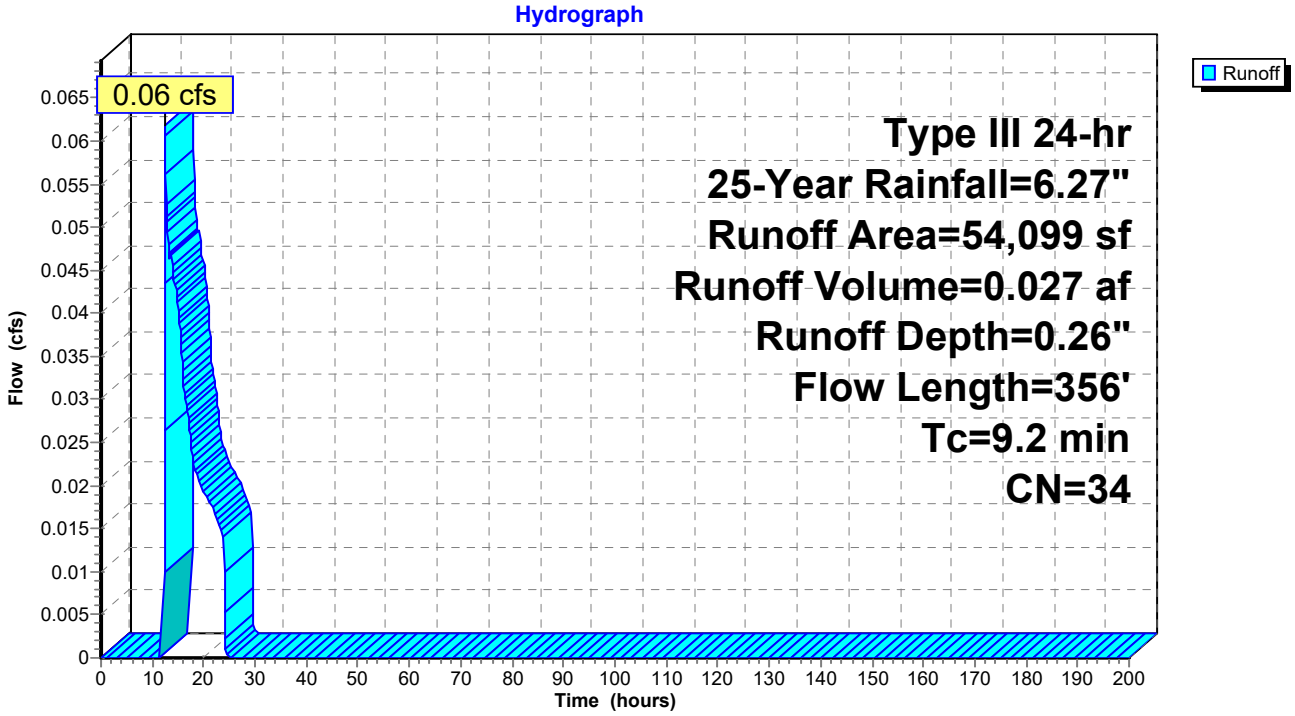
Runoff = 0.06 cfs @ 12.52 hrs, Volume= 0.027 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

Area (sf)	CN	Description
52,183	32	Woods/grass comb., Good, HSG A
1,916	98	Paved parking, HSG A
54,099	34	Weighted Average
52,183		96.46% Pervious Area
1,916		3.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.7	306	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	356	Total			

Subcatchment E-1: E-1



Summary for Subcatchment E-2: E-2

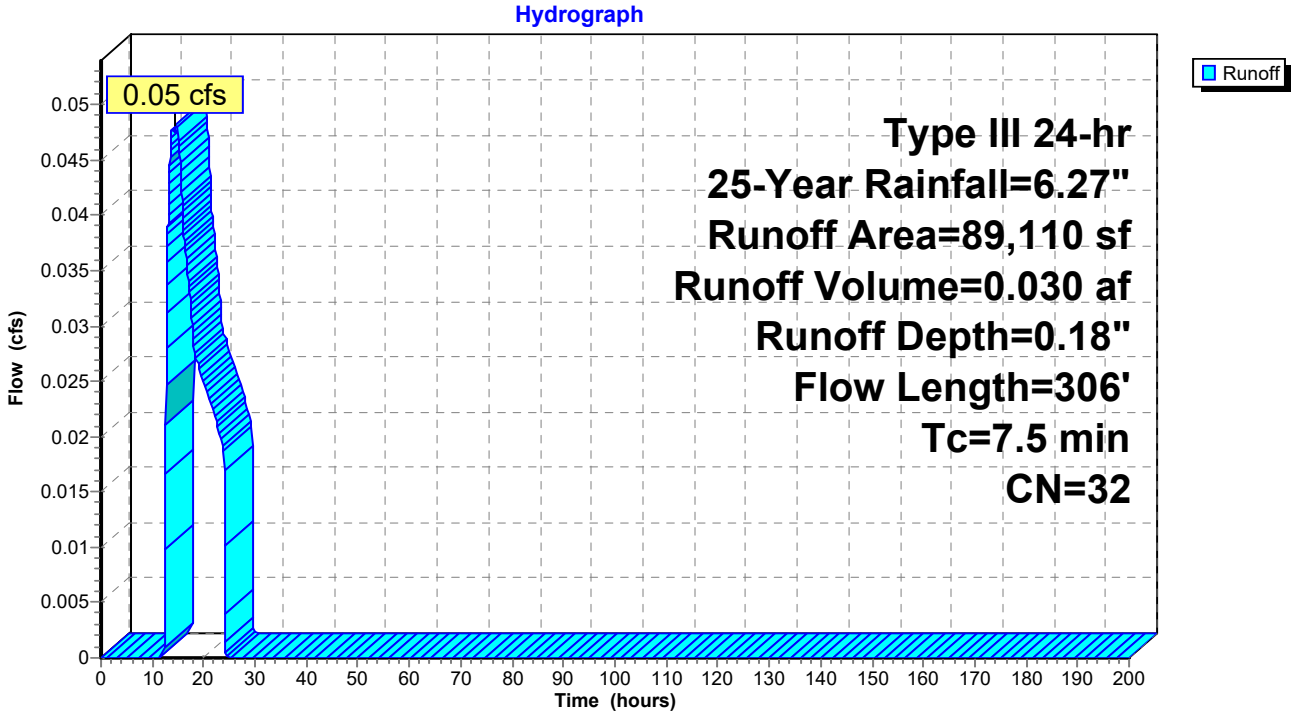
Runoff = 0.05 cfs @ 14.58 hrs, Volume= 0.030 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

Area (sf)	CN	Description
88,738	32	Woods/grass comb., Good, HSG A
372	98	Paved parking, HSG A
89,110	32	Weighted Average
88,738		99.58% Pervious Area
372		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.6	256	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	306	Total			

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

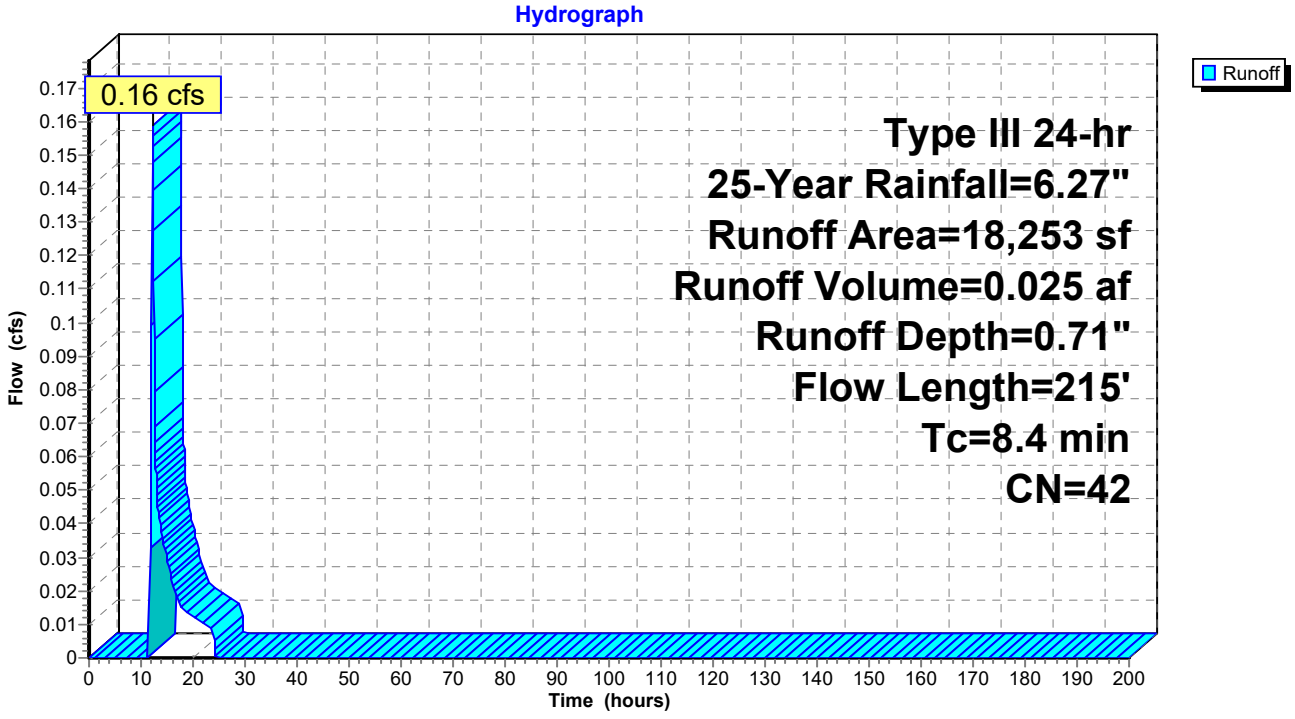
Runoff = 0.16 cfs @ 12.21 hrs, Volume= 0.025 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

Area (sf)	CN	Description
15,616	32	Woods/grass comb., Good, HSG A
2,637	98	Paved parking, HSG A
18,253	42	Weighted Average
15,616		85.55% Pervious Area
2,637		14.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1100	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.2	165	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.4	215	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

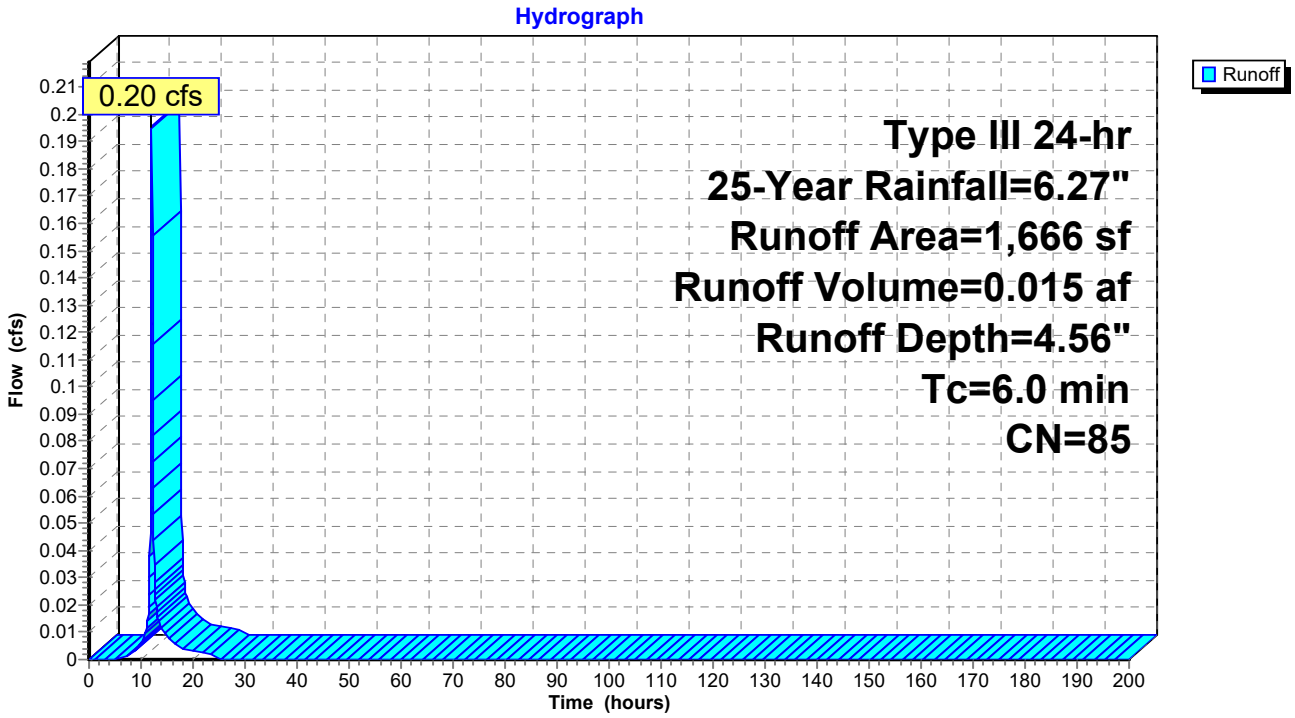
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

Area (sf)	CN	Description
1,210	98	Paved parking, HSG A
456	49	50-75% Grass cover, Fair, HSG A
1,666	85	Weighted Average
456		27.37% Pervious Area
1,210		72.63% Impervious Area

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

Subcatchment E-4: E-4

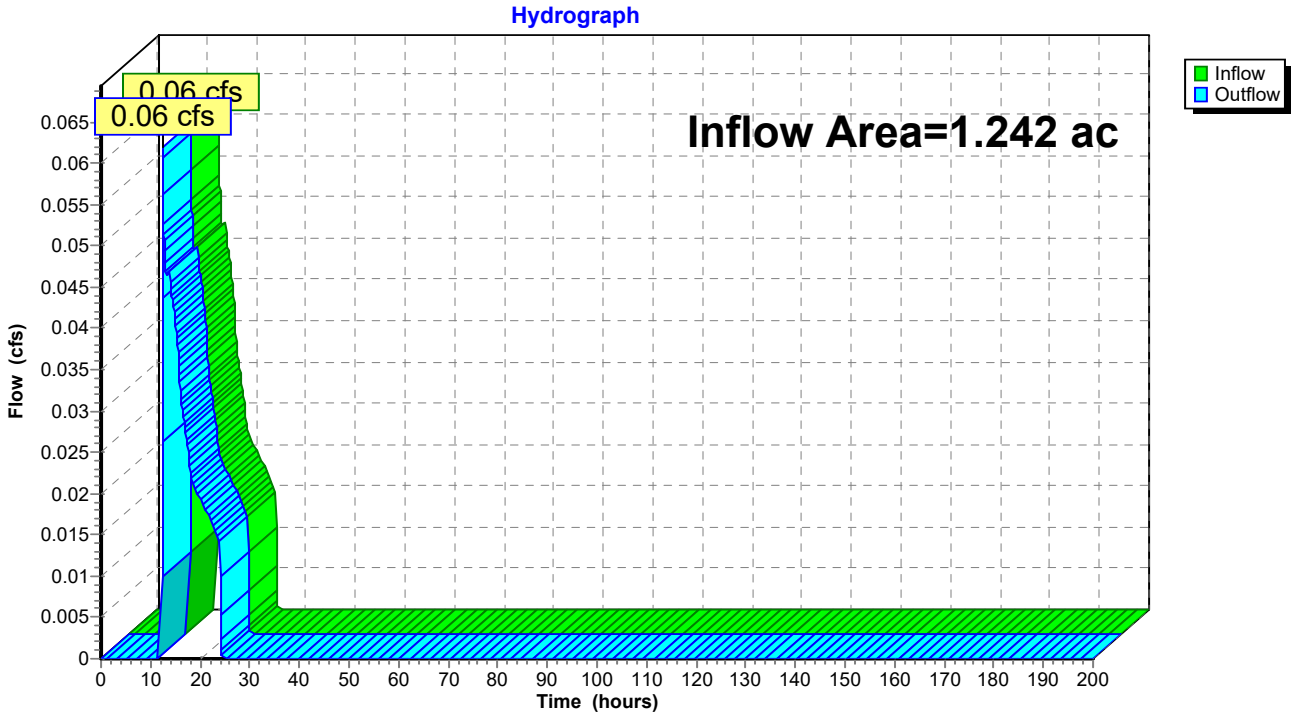


Summary for Reach 1: E-1

Inflow Area = 1.242 ac, 3.54% Impervious, Inflow Depth = 0.26" for 25-Year event
Inflow = 0.06 cfs @ 12.52 hrs, Volume= 0.027 af
Outflow = 0.06 cfs @ 12.52 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: E-1

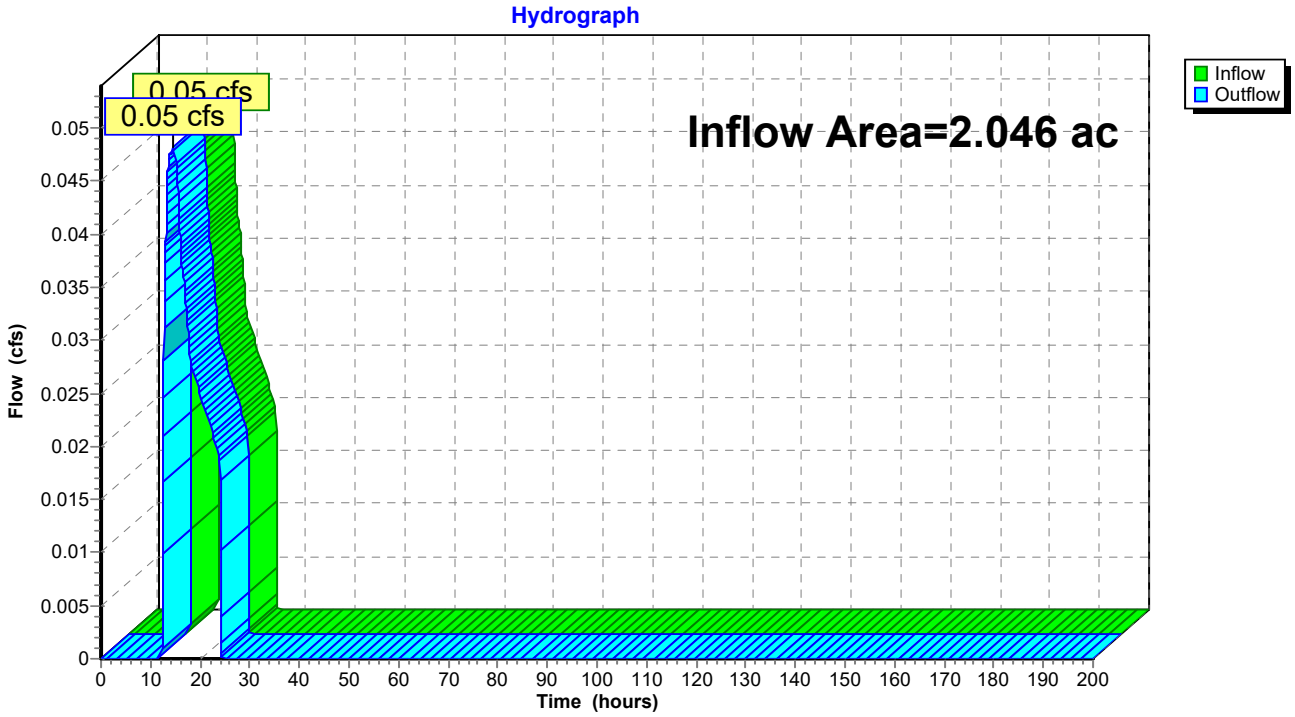


Summary for Reach 2: E-2

Inflow Area = 2.046 ac, 0.42% Impervious, Inflow Depth = 0.18" for 25-Year event
Inflow = 0.05 cfs @ 14.58 hrs, Volume= 0.030 af
Outflow = 0.05 cfs @ 14.58 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: E-2

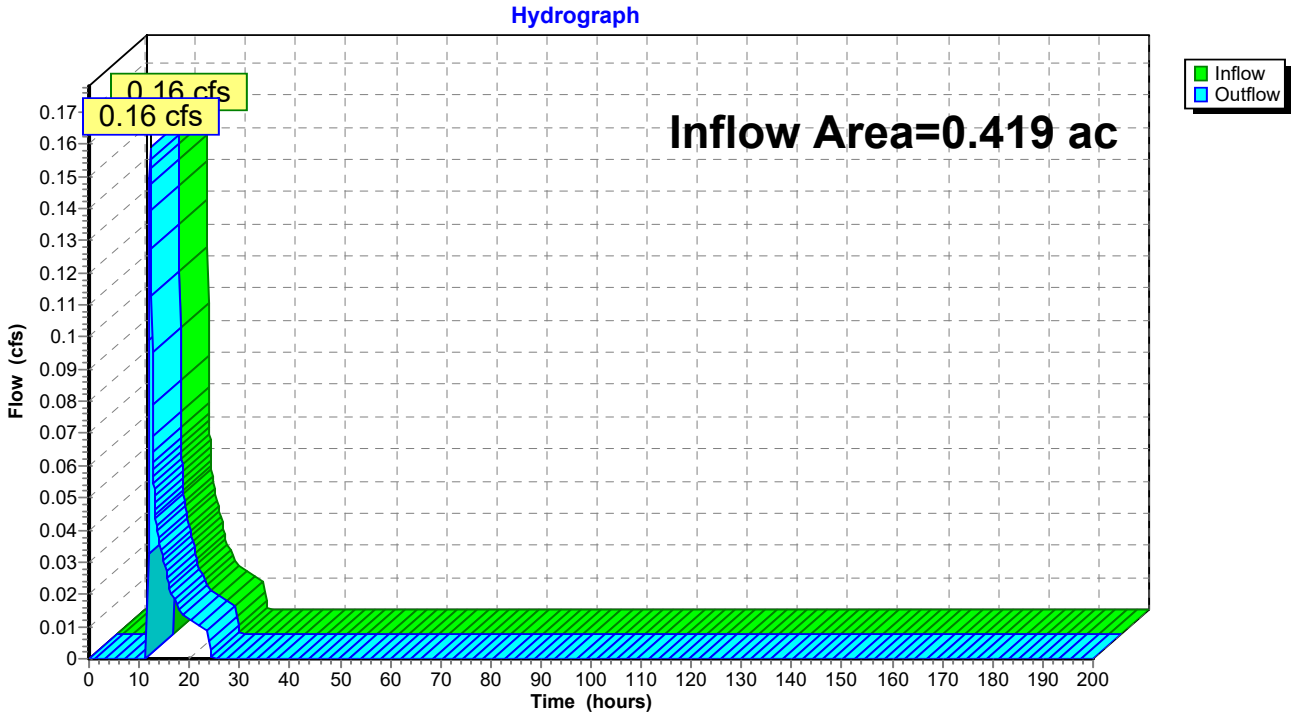


Summary for Reach 3: E-3

Inflow Area = 0.419 ac, 14.45% Impervious, Inflow Depth = 0.71" for 25-Year event
Inflow = 0.16 cfs @ 12.21 hrs, Volume= 0.025 af
Outflow = 0.16 cfs @ 12.21 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: E-3

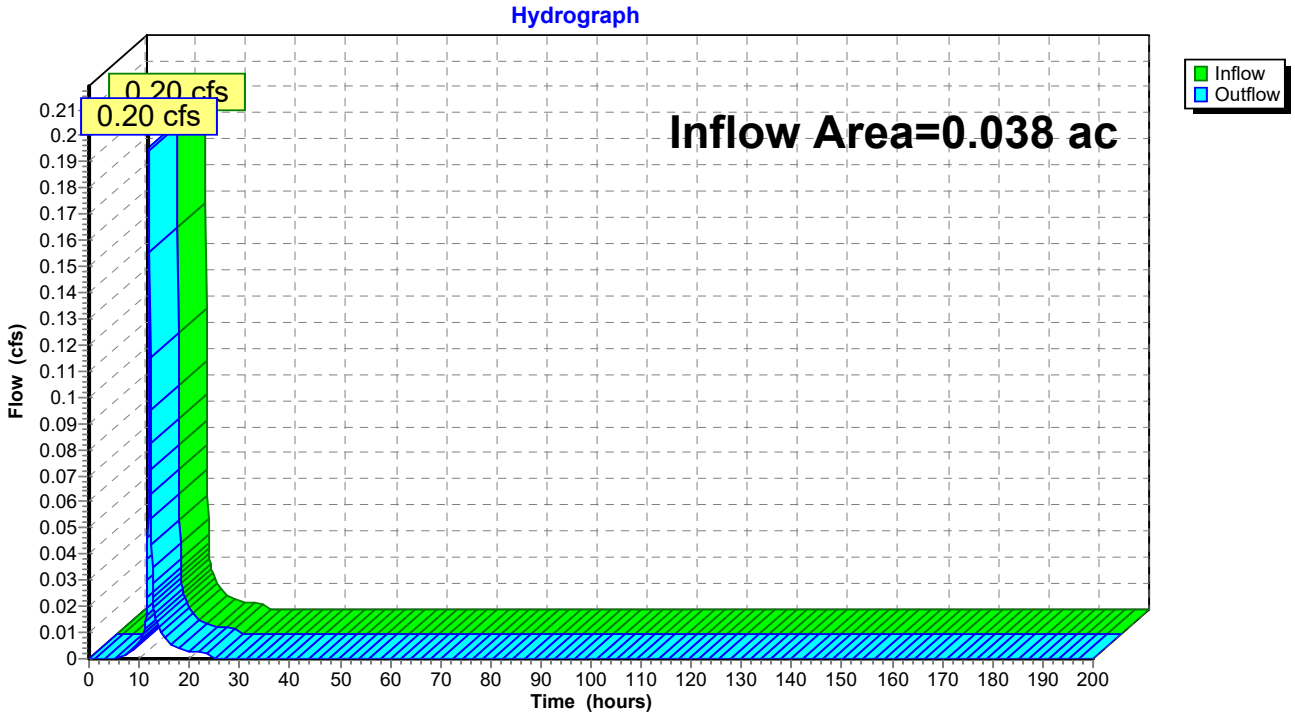


Summary for Reach 4: E-4

Inflow Area = 0.038 ac, 72.63% Impervious, Inflow Depth = 4.56" for 25-Year event
Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af
Outflow = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 4: E-4



Summary for Subcatchment E-1: E-1

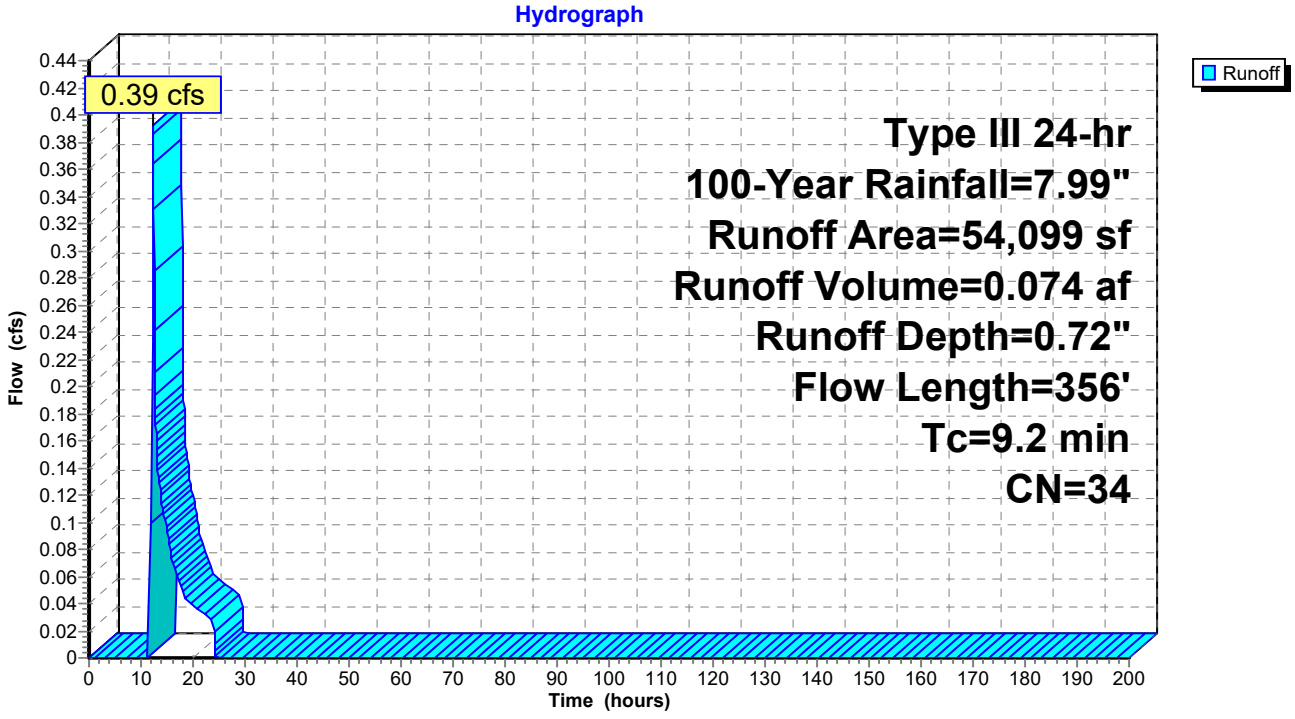
Runoff = 0.39 cfs @ 12.35 hrs, Volume= 0.074 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
52,183	32	Woods/grass comb., Good, HSG A
1,916	98	Paved parking, HSG A
54,099	34	Weighted Average
52,183		96.46% Pervious Area
1,916		3.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.7	306	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	356	Total			

Subcatchment E-1: E-1



Summary for Subcatchment E-2: E-2

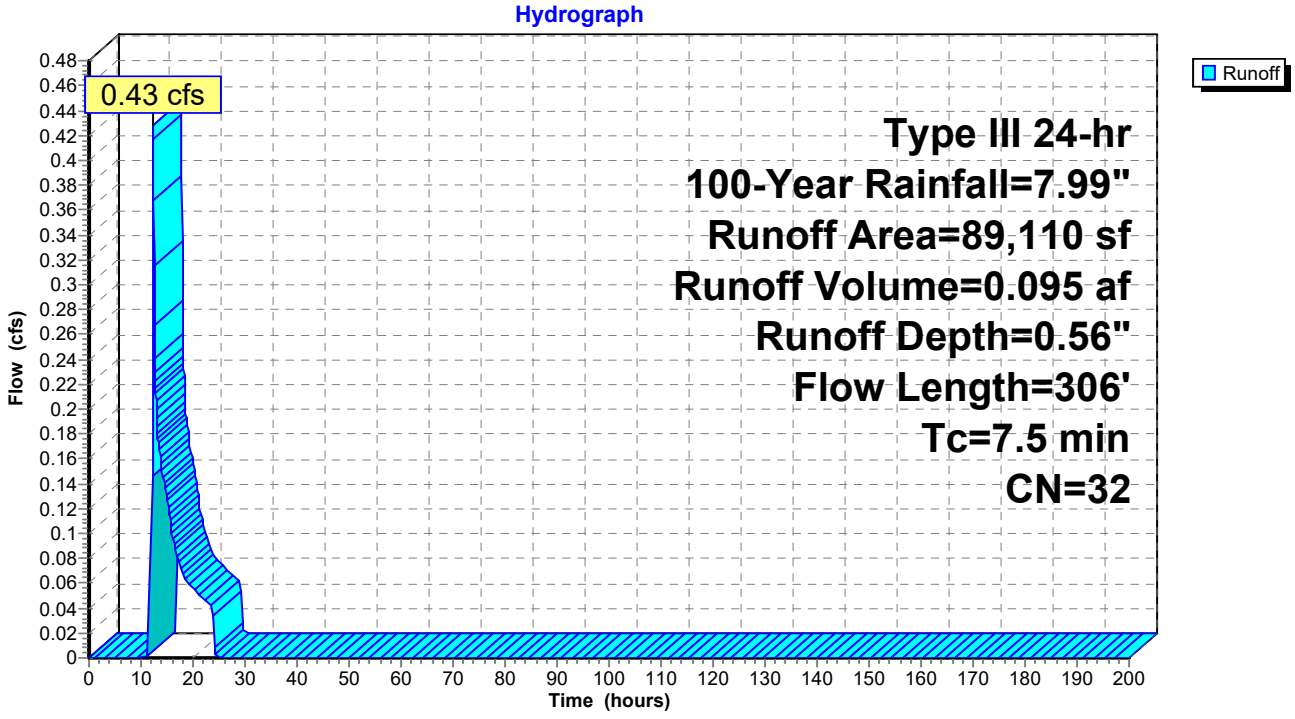
Runoff = 0.43 cfs @ 12.38 hrs, Volume= 0.095 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
88,738	32	Woods/grass comb., Good, HSG A
372	98	Paved parking, HSG A
89,110	32	Weighted Average
88,738		99.58% Pervious Area
372		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.6	256	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	306	Total			

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

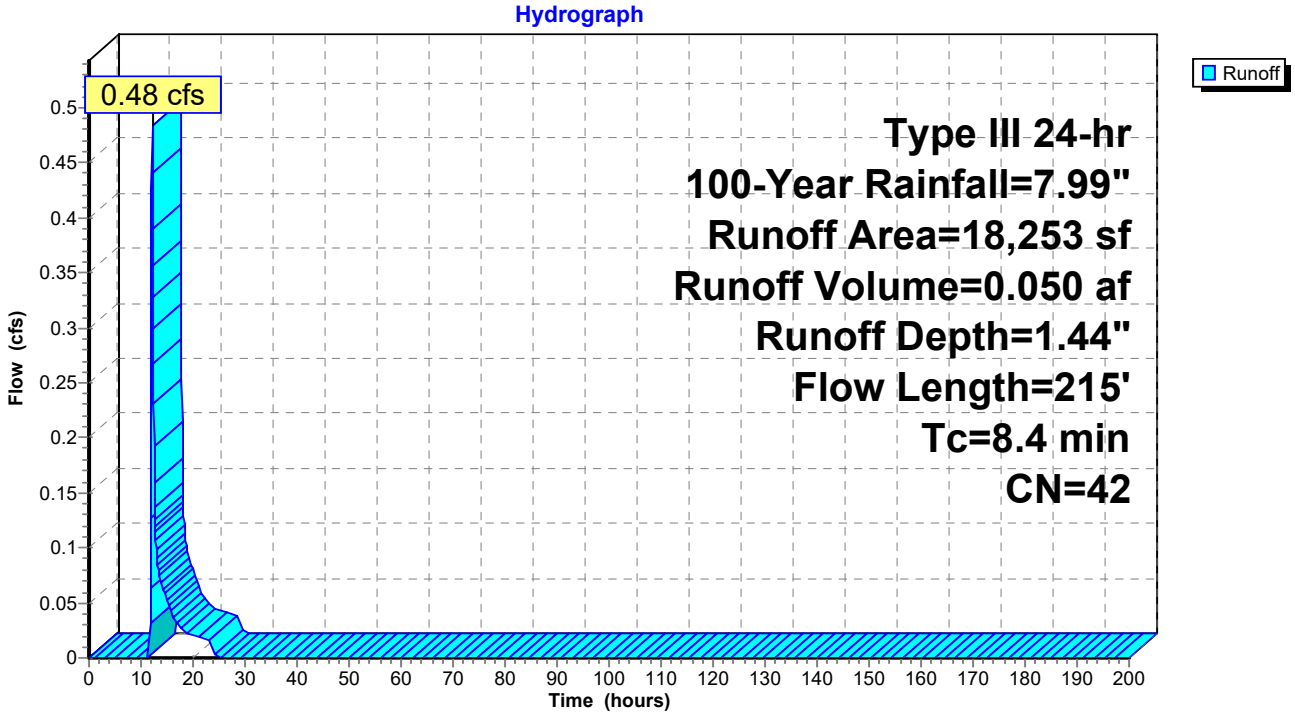
Runoff = 0.48 cfs @ 12.15 hrs, Volume= 0.050 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
15,616	32	Woods/grass comb., Good, HSG A
2,637	98	Paved parking, HSG A
18,253	42	Weighted Average
15,616		85.55% Pervious Area
2,637		14.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1100	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.2	165	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.4	215	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

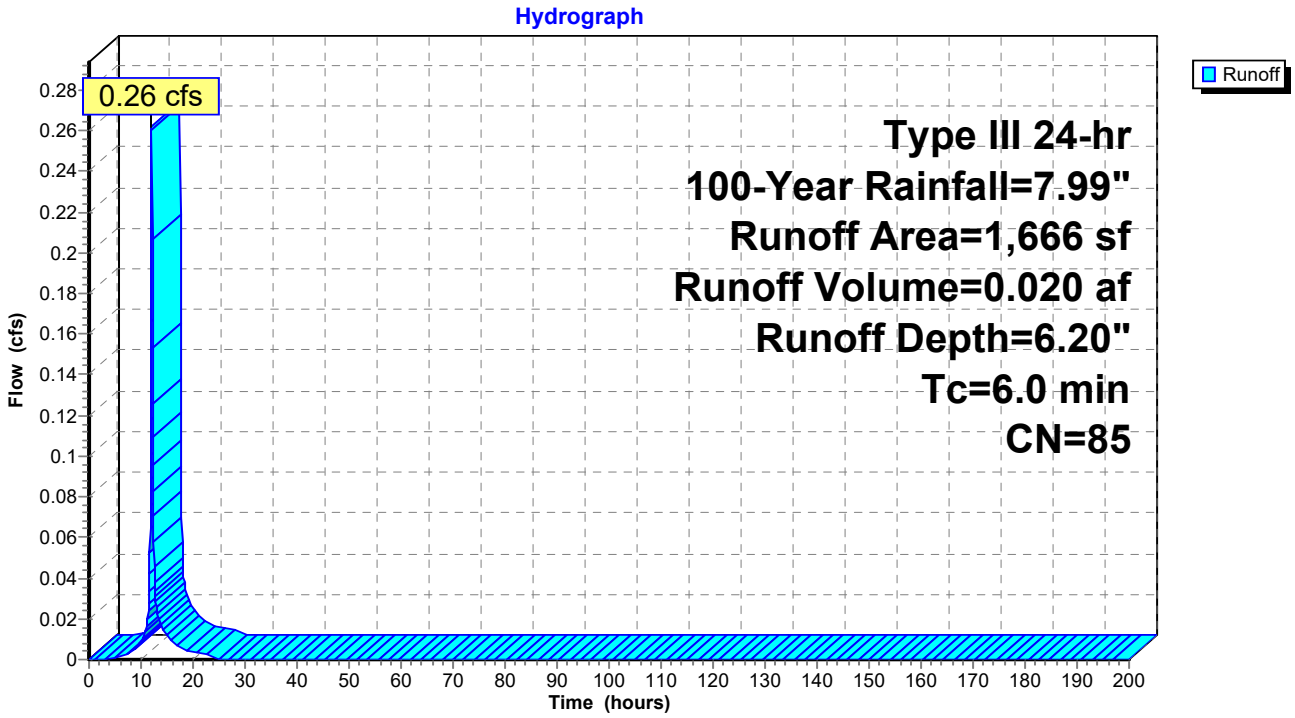
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
1,210	98	Paved parking, HSG A
456	49	50-75% Grass cover, Fair, HSG A
1,666	85	Weighted Average
456		27.37% Pervious Area
1,210		72.63% Impervious Area

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

Subcatchment E-4: E-4

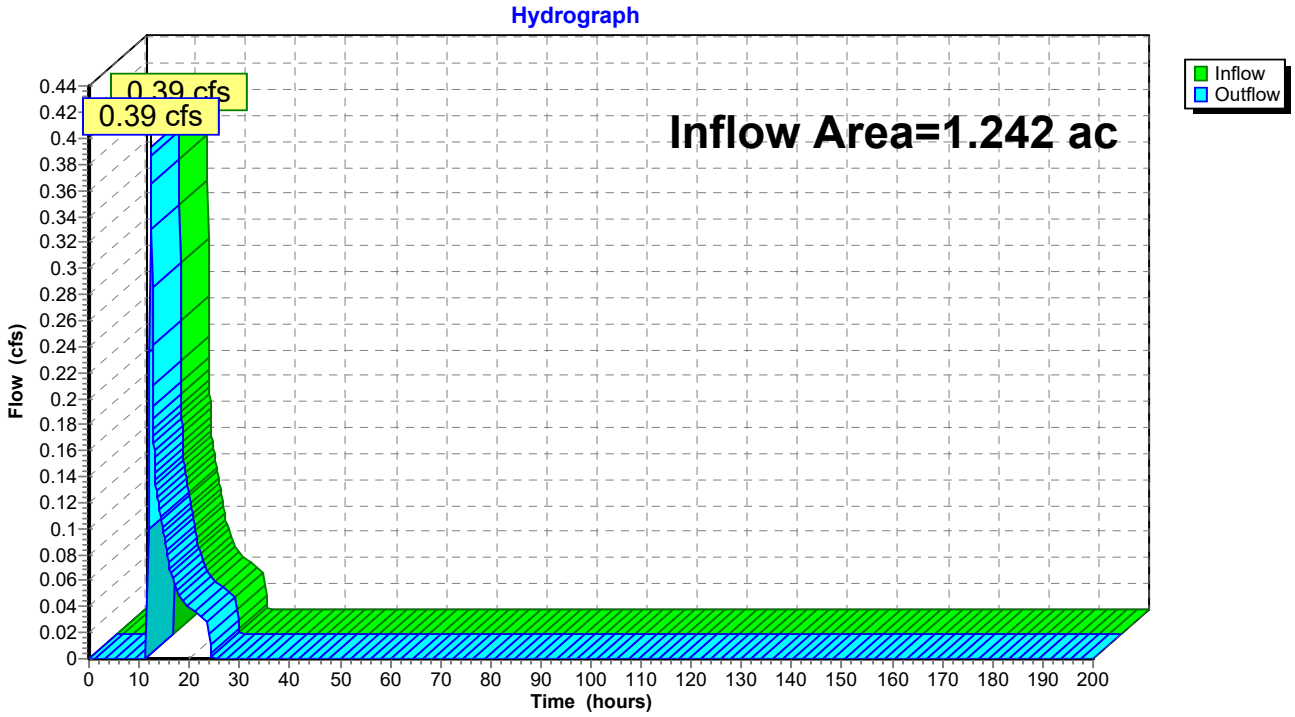


Summary for Reach 1: E-1

Inflow Area = 1.242 ac, 3.54% Impervious, Inflow Depth = 0.72" for 100-Year event
Inflow = 0.39 cfs @ 12.35 hrs, Volume= 0.074 af
Outflow = 0.39 cfs @ 12.35 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: E-1

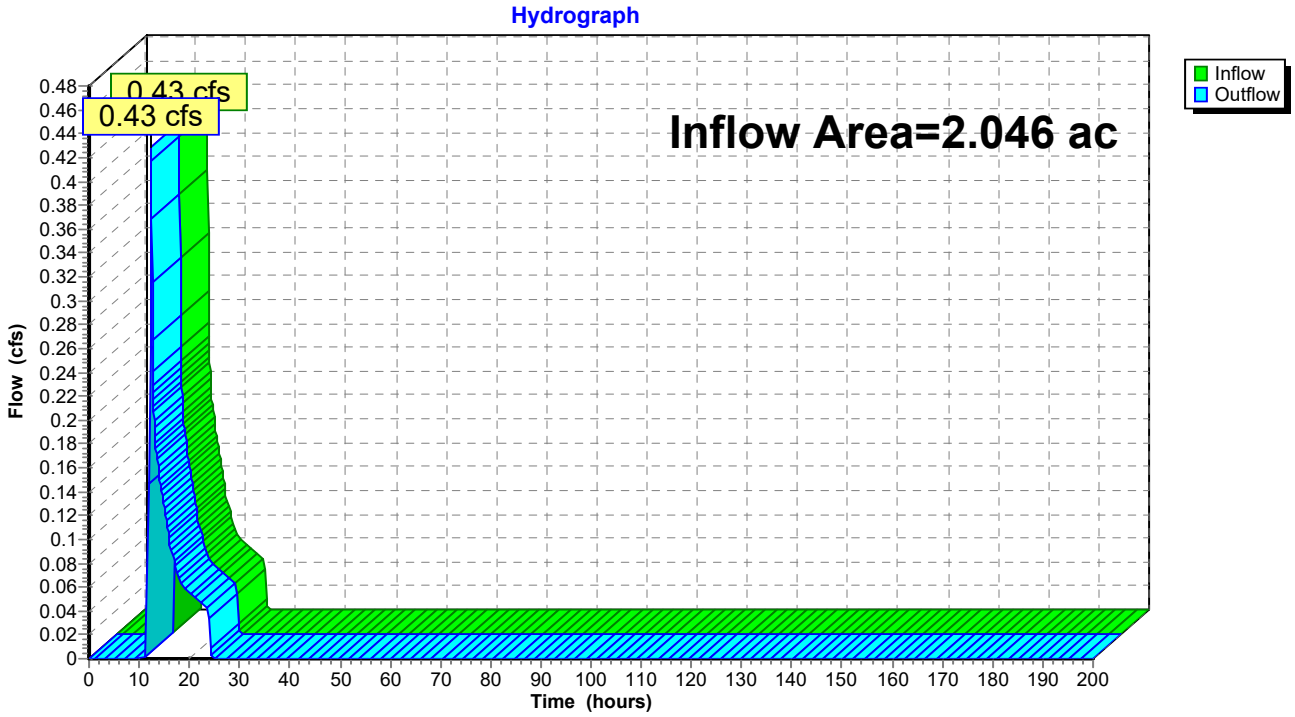


Summary for Reach 2: E-2

Inflow Area = 2.046 ac, 0.42% Impervious, Inflow Depth = 0.56" for 100-Year event
Inflow = 0.43 cfs @ 12.38 hrs, Volume= 0.095 af
Outflow = 0.43 cfs @ 12.38 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: E-2

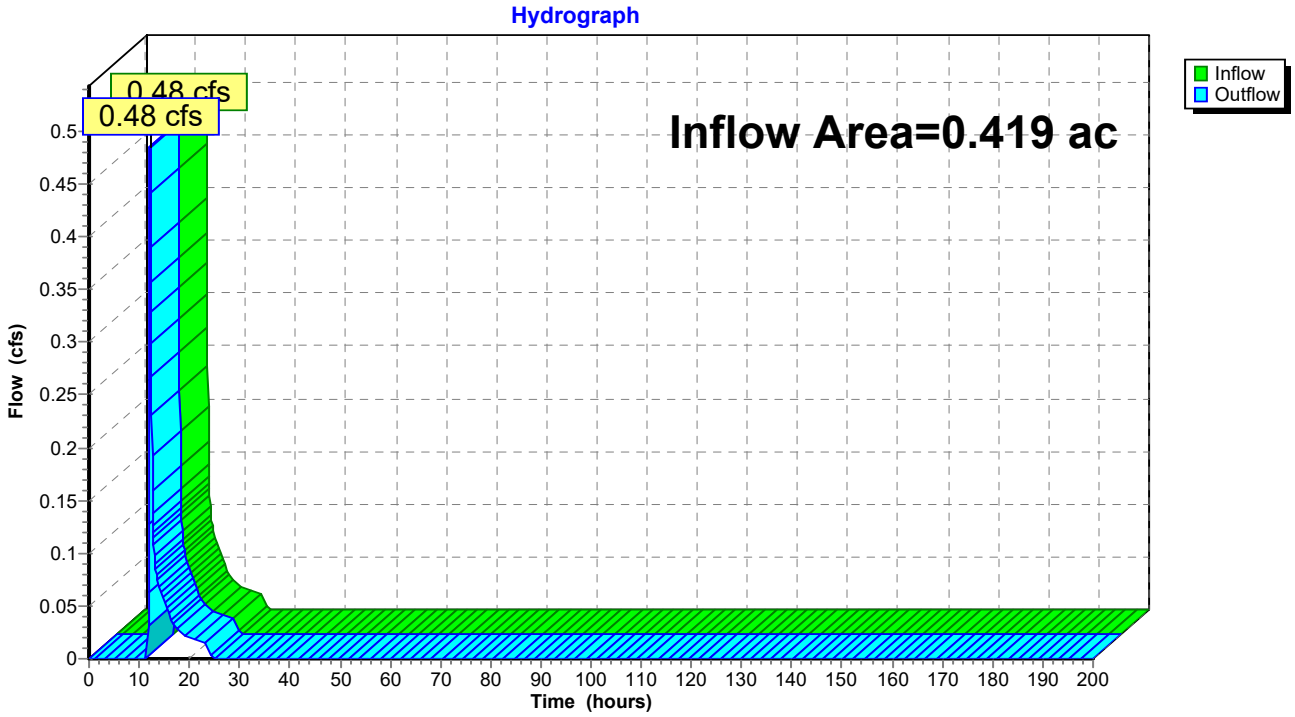


Summary for Reach 3: E-3

Inflow Area = 0.419 ac, 14.45% Impervious, Inflow Depth = 1.44" for 100-Year event
Inflow = 0.48 cfs @ 12.15 hrs, Volume= 0.050 af
Outflow = 0.48 cfs @ 12.15 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: E-3

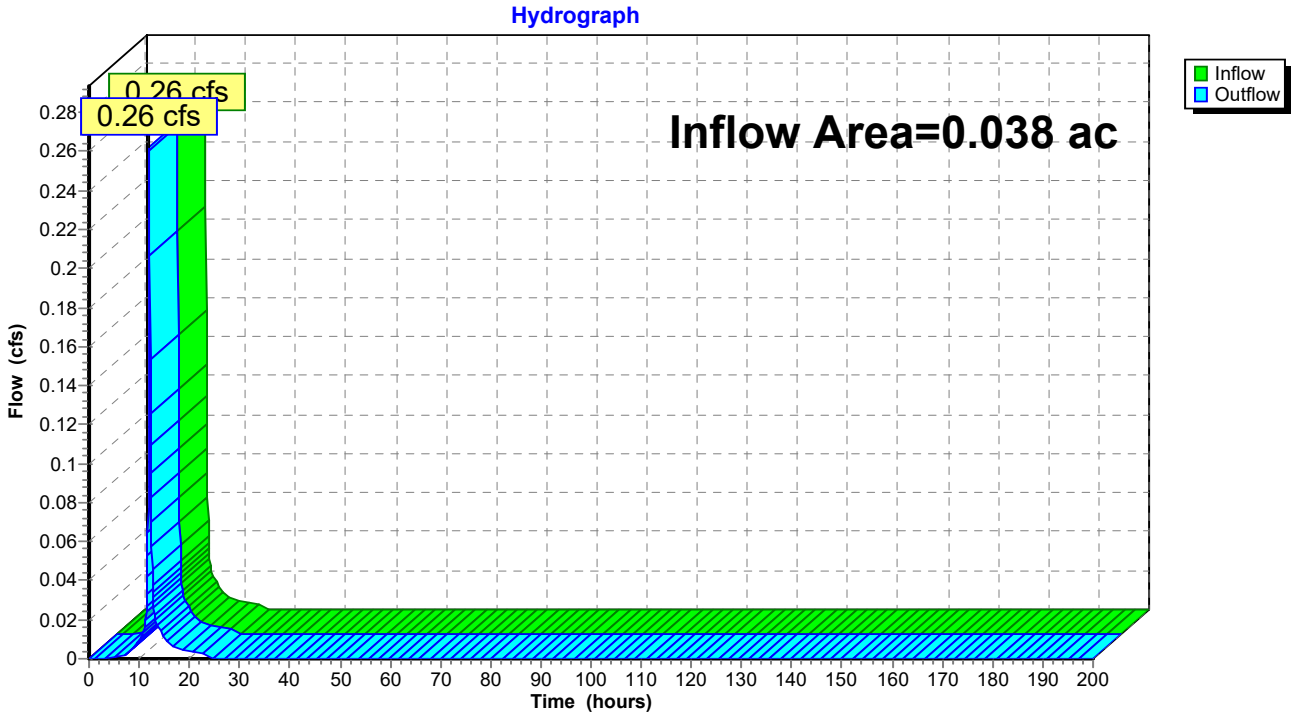


Summary for Reach 4: E-4

Inflow Area = 0.038 ac, 72.63% Impervious, Inflow Depth = 6.20" for 100-Year event
Inflow = 0.26 cfs @ 12.09 hrs, Volume= 0.020 af
Outflow = 0.26 cfs @ 12.09 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 4: E-4



52
(HR-B/D)

424C
(HR-A)

52
(HR-B/D)

POINT OF DISCHARGE 1
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.01 cfs
25-YEAR STORM = 0.06 cfs
100-YEAR STORM = 0.39 cfs

POINT OF DISCHARGE 2
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.01 cfs
25-YEAR STORM = 0.05 cfs
100-YEAR STORM = 0.43 cfs

POINT OF DISCHARGE 3
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.05 cfs
25-YEAR STORM = 0.16 cfs
100-YEAR STORM = 0.48 cfs

POINT OF DISCHARGE 4
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.08 cfs
10-YEAR STORM = 0.15 cfs
25-YEAR STORM = 0.20 cfs
100-YEAR STORM = 0.26 cfs

E-1
AREA=54,099 SF
TC=9.2 MIN.
CN=32

E-2
AREA=89,110 SF
TC=7.5 MIN.
CN=30

E-3
AREA=18,253 SF
TC=8.4 MIN.
CN=40

E-4
AREA=1,666 SF
TC=6.0 MIN.
CN=82

306 FT SCF
258 FT SCF
50 FT SF
50 FT SF
50 FT SF
50 FT SF
166 FT SCF

MASSAPOAG STREET

Map unit symbol	Map unit name	Rating
52	Freetown muck, 0 to 1 percent slopes	B/D
424C	Canton fine sandy loam, 8 to 15 percent slopes, extremely bouldery	A

SF=SHEET FLOW
SCF= SHALLOW CONCENTRATED FLOW

APPROVAL UNDER THE SUBDIVISION CONTROL LAW
WEYMOUTH PLANNING BOARD

DATE:

PLANNING BOARD ENDORSEMENT DOES NOT IMPLY CONFORMANCE WITH TOWN OF WEYMOUTH ZONING BY-LAW.

N

SCALE: 1"=40'

FOR REGISTRY USE ONLY

40 20 0 40 80

Date	Description	No.
10.08.21	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	3.
4.23.20	REVISED PER TOWN STAFF COMMENTS	2.
2.05.19	REVISED WETLAND FLAGS AND LOT	1.

Revisions

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

10-8-2021

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

CROCKER DESIGN GROUP, LLC.

2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-820-0416

MASSACHUSETTS

Project

DEFINITIVE SUBDIVISION PLAN

MASSAPOAG STREET
WEYMOUTH, MA

Prepared for

BRISTOL BROS. DEVELOPMENT CORP.

190 OLD DERBY STREET, SUITE 311
HINGHAM, MA 02043

Drawing Title

EXISTING CONDITIONS WATERSHED ANALYSIS PLAN

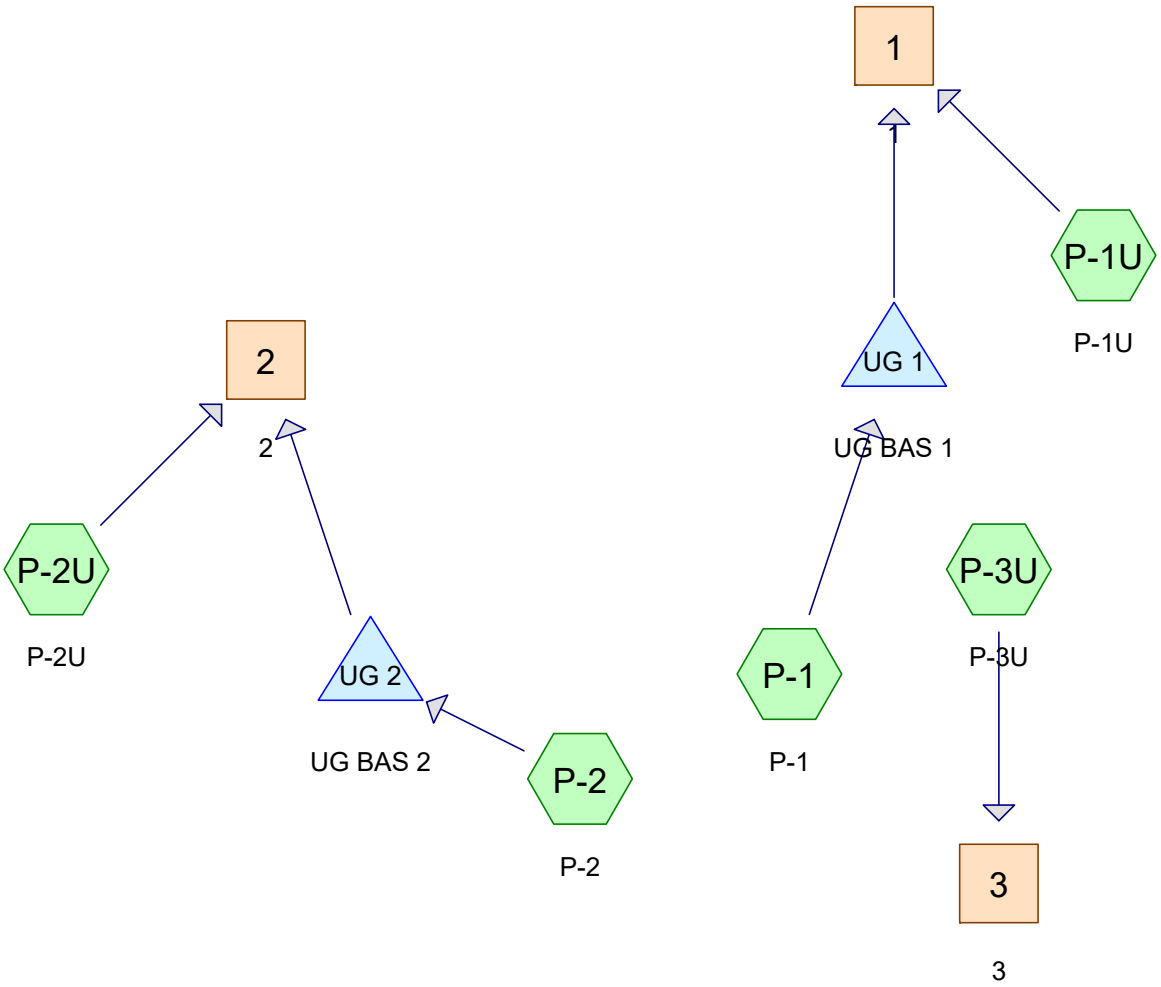
Project No.	100-029
Date	12.20.2018
Scale	1"=40'
Drawn By	SZA
Approved By	GC

Drawing No.

EW-1

SECTION 3 – STORMATER HYDROLOGY MODEL

3.2 PROPOSED HYDROLOGY



Subcat Reach Pond Link

Routing Diagram for Massapoag Watershed with PC noaa
Prepared by {enter your company name here}, Printed 2/9/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.061	98	2 driveways (P-1)
0.103	98	3 houses (P-2)
0.207	98	4 houses (P-1)
0.114	98	5 driveways (P-2)
2.352	39	>75% Grass cover, Good, HSG A (P-1, P-1U, P-2)
0.264	98	Massapoag road (P-1, P-2)
0.029	98	POOL (P-1)
0.912	32	Woods/grass comb., Good, HSG A (P-1U, P-2U, P-3U)
0.020	98	ex house to remain (P-3U)
0.031	98	ex. offsite driveways, HSG A (P-1)
0.067	98	exist offsite houses, HSG A (P-1)
0.005	55	rip rap (P-1U)
0.096	55	rip rap, HSG A (P-2U)

Summary for Subcatchment P-1: P-1

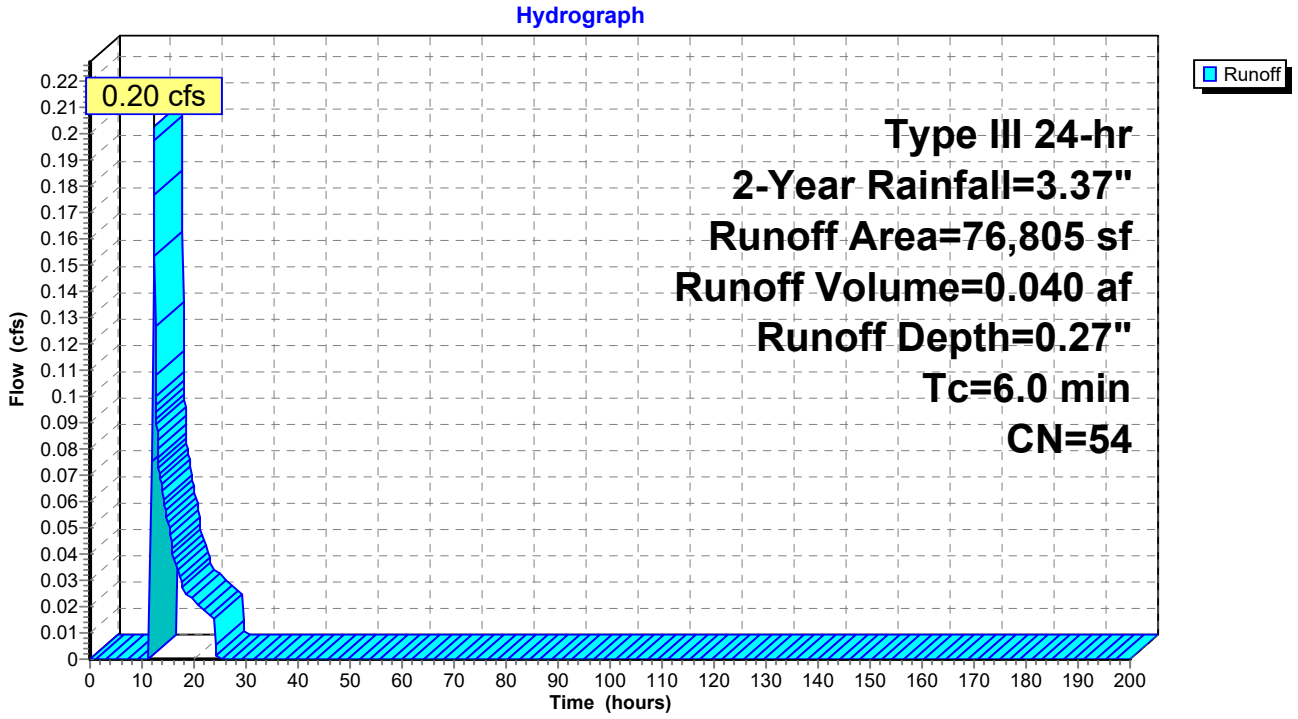
Runoff = 0.20 cfs @ 12.33 hrs, Volume= 0.040 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

	Area (sf)	CN	Description
*	2,640	98	2 driveways
	57,025	39	>75% Grass cover, Good, HSG A
*	9,000	98	4 houses
*	2,600	98	Massapoag road
*	2,930	98	exist offsite houses, HSG A
*	1,350	98	ex. offsite driveways, HSG A
*	1,260	98	POOL
	76,805	54	Weighted Average
	57,025		74.25% Pervious Area
	19,780		25.75% Impervious Area

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

Subcatchment P-1: P-1



Summary for Subcatchment P-1U: P-1U

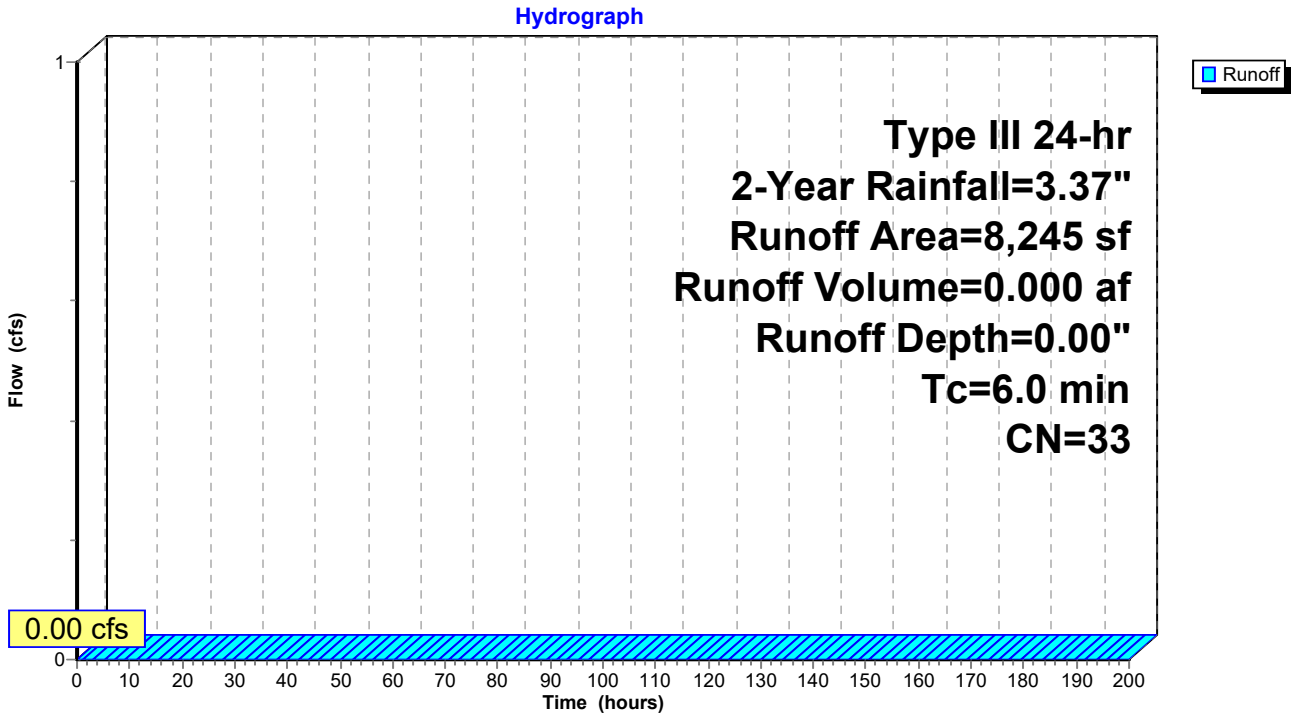
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

	Area (sf)	CN	Description
	960	39	>75% Grass cover, Good, HSG A
	7,085	32	Woods/grass comb., Good, HSG A
*	200	55	rip rap
	8,245	33	Weighted Average
	8,245		100.00% Pervious Area

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

Subcatchment P-1U: P-1U



Summary for Subcatchment P-2: P-2

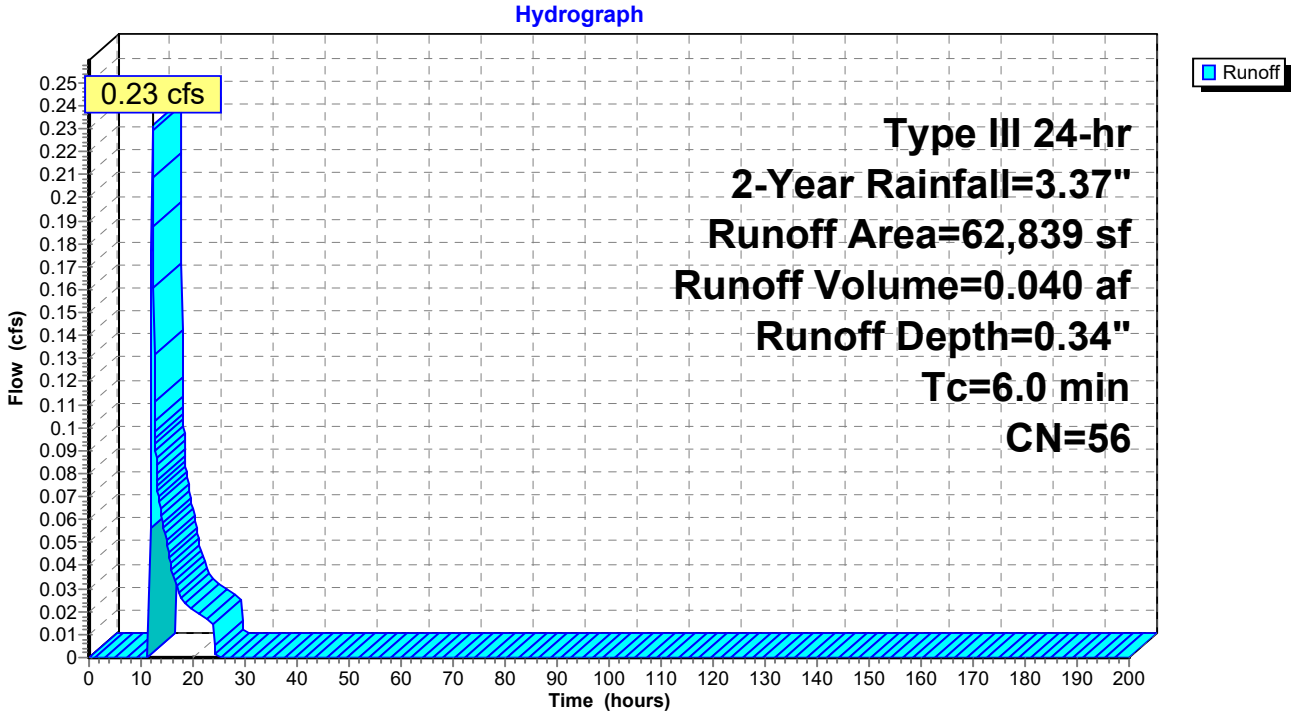
Runoff = 0.23 cfs @ 12.25 hrs, Volume= 0.040 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

	Area (sf)	CN	Description
*	4,960	98	5 driveways
	44,479	39	>75% Grass cover, Good, HSG A
*	8,900	98	Massapoag road
*	4,500	98	3 houses
	62,839	56	Weighted Average
	44,479		70.78% Pervious Area
	18,360		29.22% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-2U: P-2U

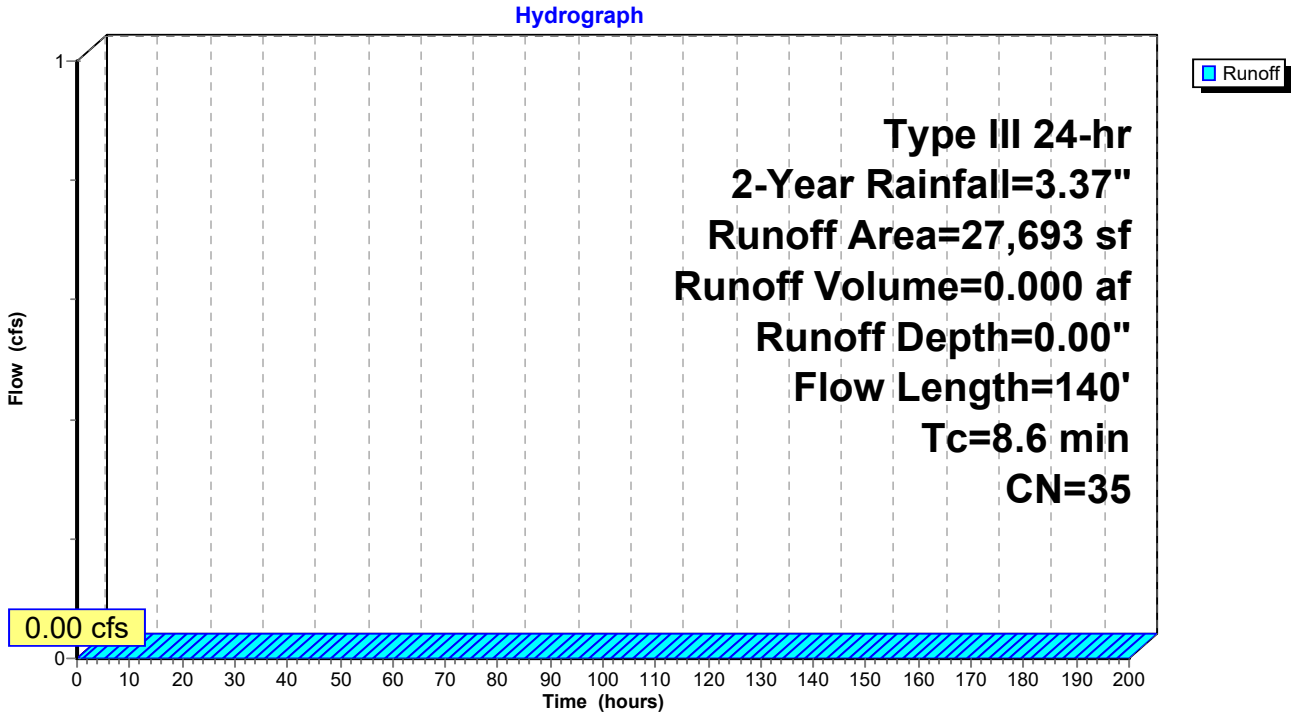
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

	Area (sf)	CN	Description
	23,493	32	Woods/grass comb., Good, HSG A
*	4,200	55	rip rap, HSG A
	27,693	35	Weighted Average
	27,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.1	90	0.0800	1.41		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
8.6	140	Total			

Subcatchment P-2U: P-2U



Summary for Subcatchment P-3U: P-3U

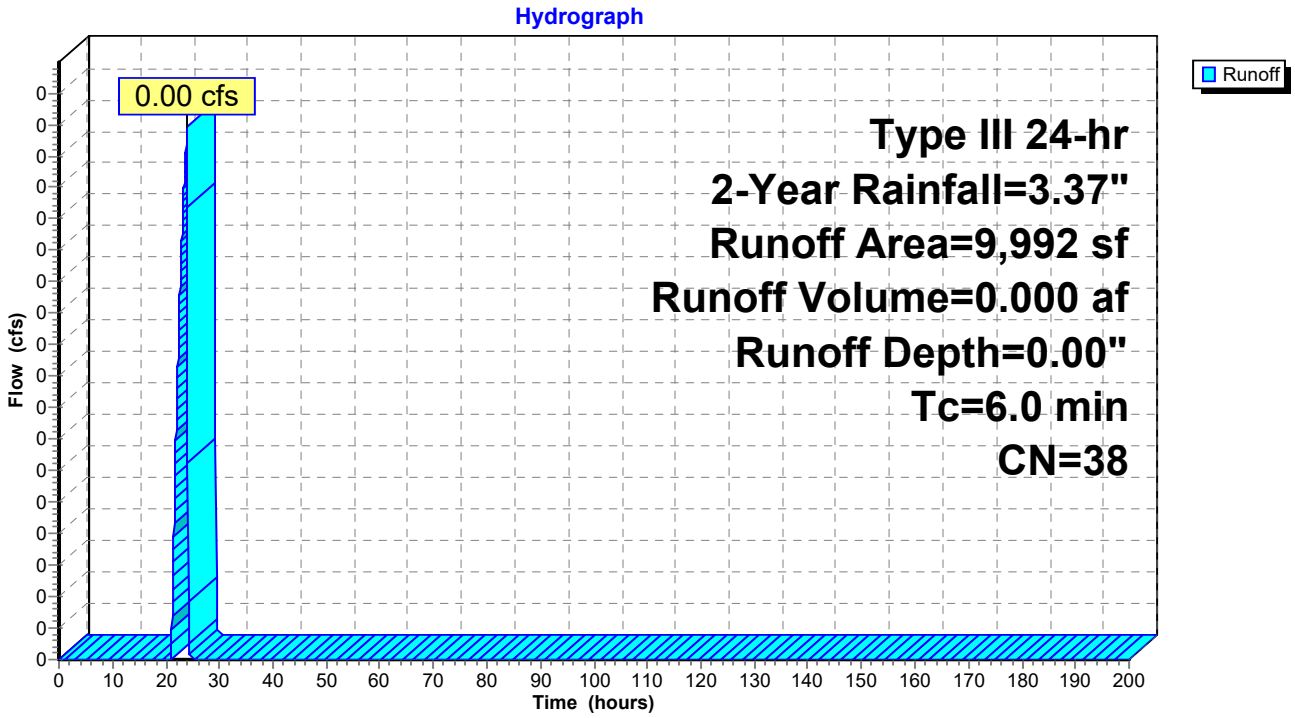
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

	Area (sf)	CN	Description
	9,142	32	Woods/grass comb., Good, HSG A
*	850	98	ex house to remain
	9,992	38	Weighted Average
	9,142		91.49% Pervious Area
	850		8.51% Impervious Area

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

Subcatchment P-3U: P-3U

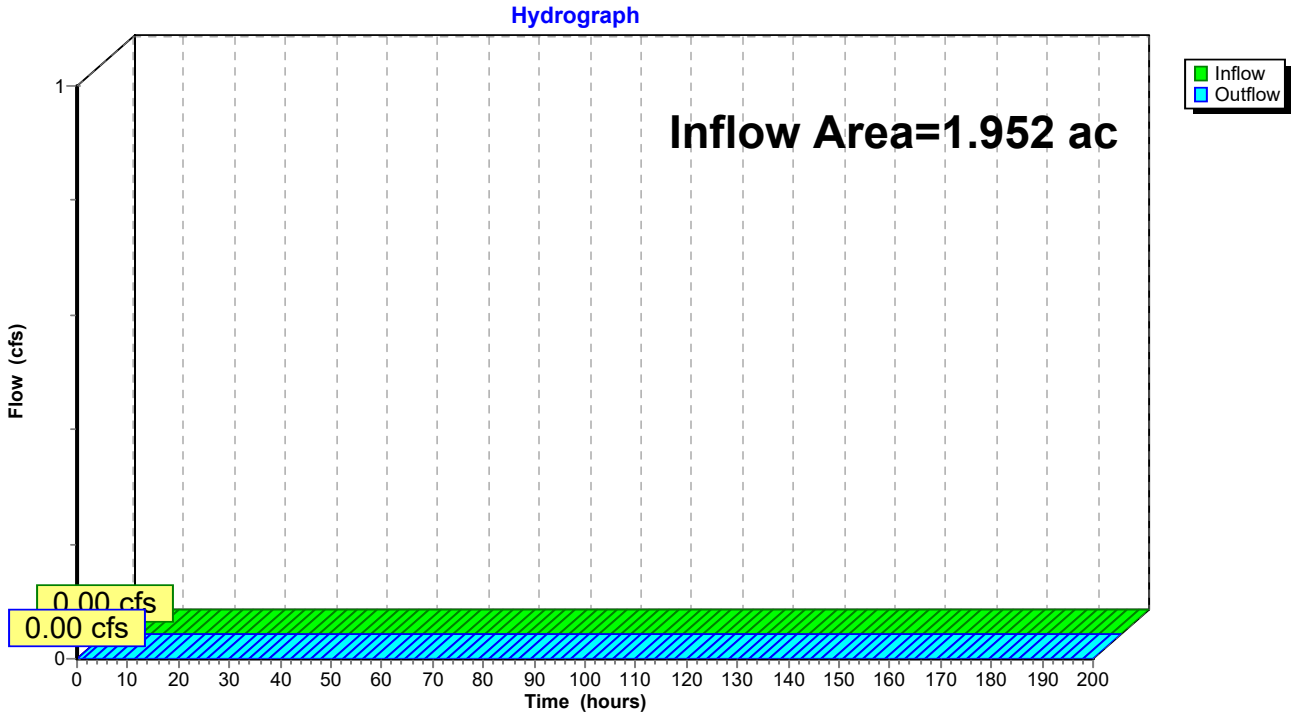


Summary for Reach 1: 1

Inflow Area = 1.952 ac, 23.26% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: 1

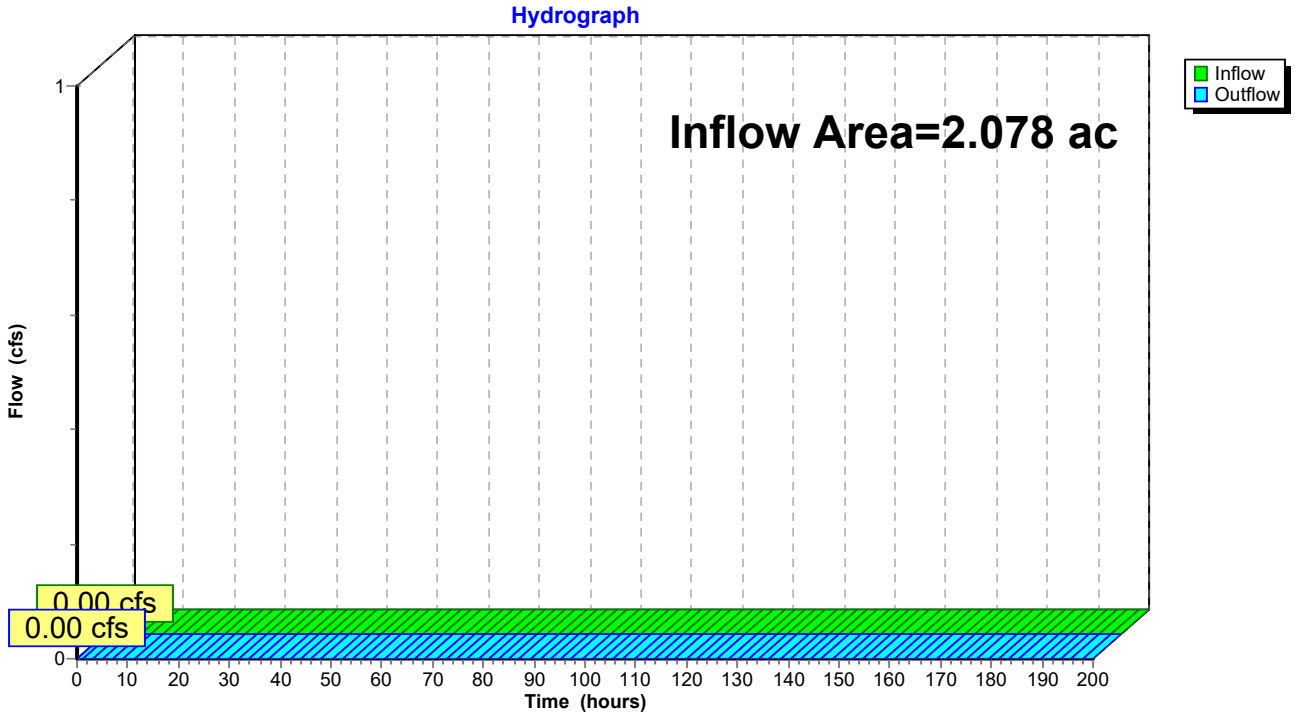


Summary for Reach 2: 2

Inflow Area = 2.078 ac, 20.28% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: 2

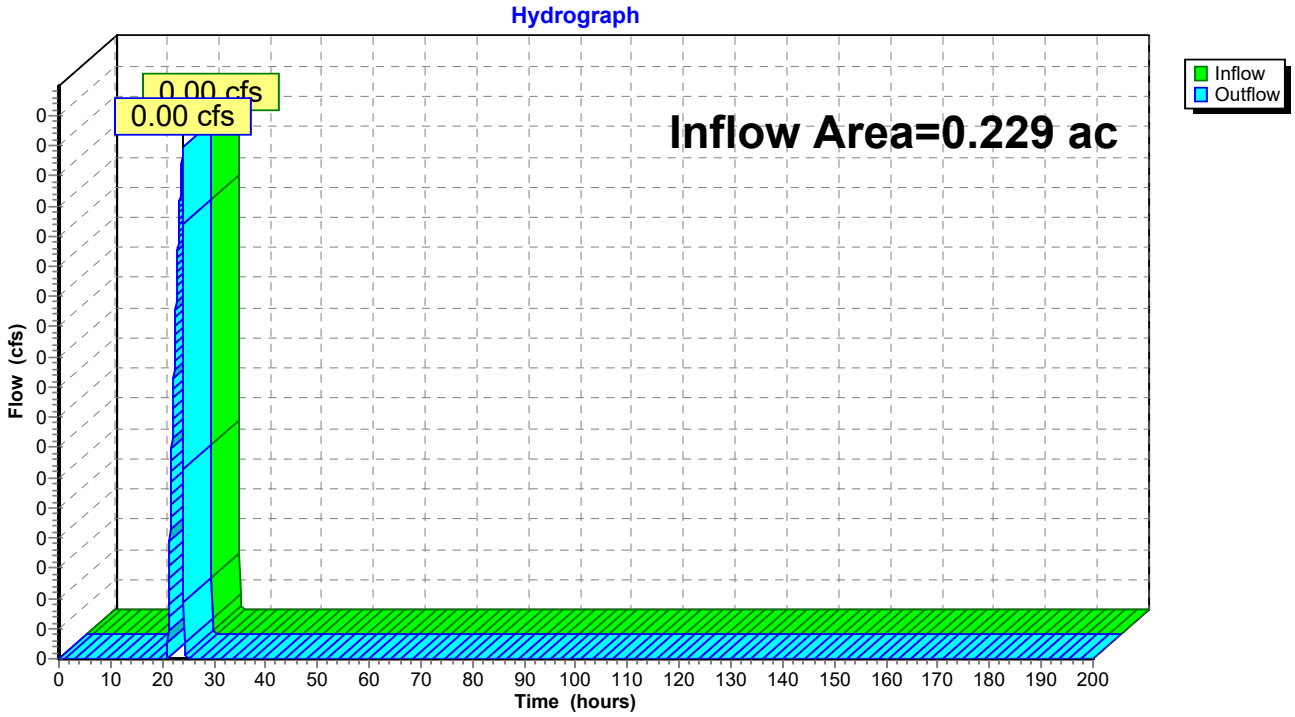


Summary for Reach 3: 3

Inflow Area = 0.229 ac, 8.51% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: 3



Summary for Pond UG 1: UG BAS 1

Inflow Area = 1.763 ac, 25.75% Impervious, Inflow Depth = 0.27" for 2-Year event
Inflow = 0.20 cfs @ 12.33 hrs, Volume= 0.040 af
Outflow = 0.19 cfs @ 12.40 hrs, Volume= 0.040 af, Atten= 5%, Lag= 4.7 min
Discarded = 0.19 cfs @ 12.40 hrs, Volume= 0.040 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 165.04' @ 12.40 hrs Surf.Area= 3,544 sf Storage= 52 cf

Plug-Flow detention time= 4.5 min calculated for 0.040 af (100% of inflow)
Center-of-Mass det. time= 4.5 min (957.5 - 953.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,197 cf	**58.50'W x 60.58'L x 3.50'H Field A** 12,403 cf Overall - 4,410 cf Embedded = 7,993 cf x 40.0% Voids
#2A	165.50'	4,410 cf	**ADS_StormTech SC-740 +Cap** x 96 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 96 Chambers in 12 Rows
		7,607 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Horizontal area**
#2	Device 3	167.96'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.78'	**12.0" Round RCP_Round 12"** L= 17.7' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.78' / 167.60' S= 0.0102 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.20 cfs @ 12.40 hrs HW=165.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 1: UG BAS 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

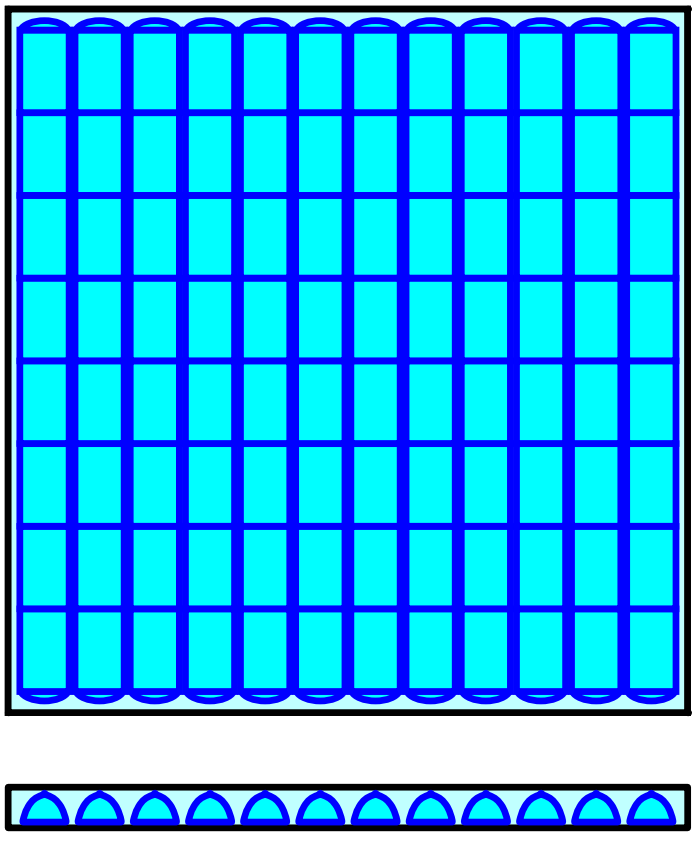
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 12.0" Side Stone x 2 = 58.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

96 Chambers x 45.9 cf = 4,410.2 cf Chamber Storage

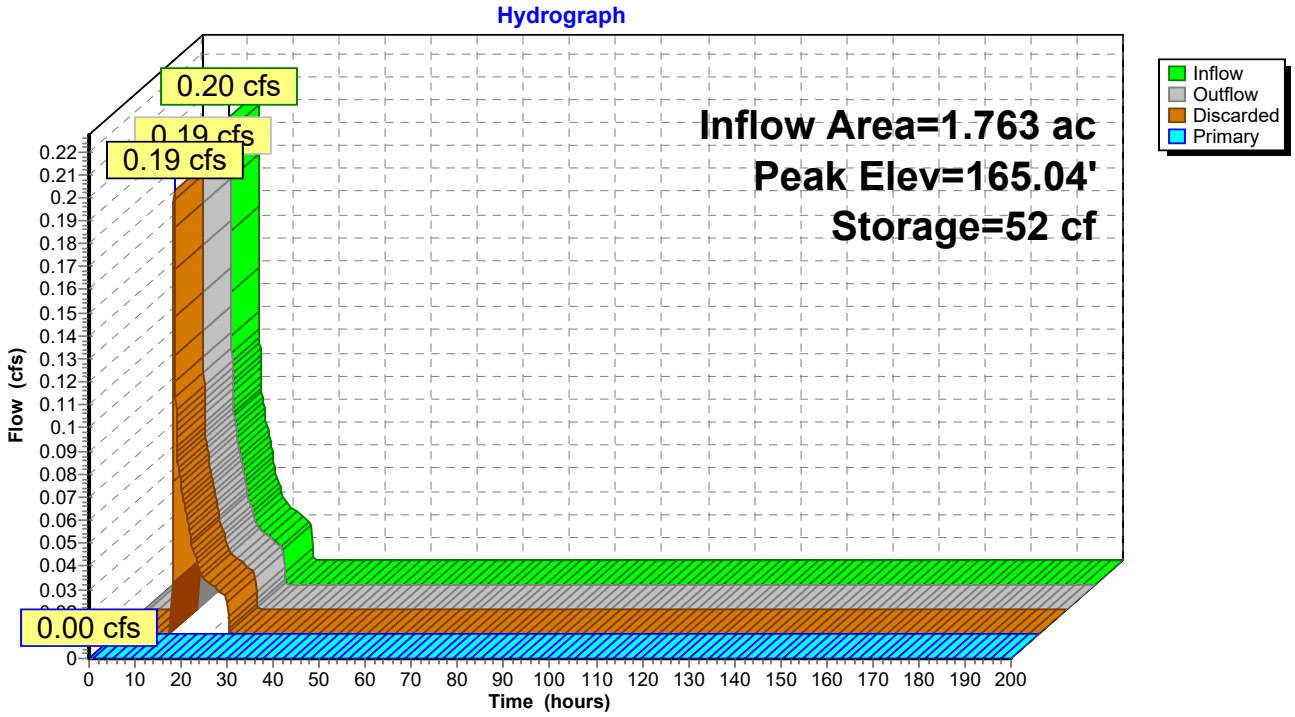
12,403.1 cf Field - 4,410.2 cf Chambers = 7,992.8 cf Stone x 40.0% Voids = 3,197.1 cf Stone Storage

Chamber Storage + Stone Storage = 7,607.4 cf = 0.175 af
Overall Storage Efficiency = 61.3%
Overall System Size = 60.58' x 58.50' x 3.50'

96 Chambers
459.4 cy Field
296.0 cy Stone



Pond UG 1: UG BAS 1



Summary for Pond UG 2: UG BAS 2

Inflow Area = 1.443 ac, 29.22% Impervious, Inflow Depth = 0.34" for 2-Year event
Inflow = 0.23 cfs @ 12.25 hrs, Volume= 0.040 af
Outflow = 0.12 cfs @ 12.57 hrs, Volume= 0.040 af, Atten= 47%, Lag= 19.1 min
Discarded = 0.12 cfs @ 12.57 hrs, Volume= 0.040 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 165.19' @ 12.57 hrs Surf.Area= 2,179 sf Storage= 165 cf

Plug-Flow detention time= 9.6 min calculated for 0.040 af (100% of inflow)
Center-of-Mass det. time= 9.6 min (947.4 - 937.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,357 cf	**80.08'W x 27.21'L x 5.67'H Field A** 12,348 cf Overall - 3,956 cf Embedded = 8,392 cf x 40.0% Voids
#2A	165.75'	3,956 cf	**ADS_StormTech MC-3500 d +Cap** x 33 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 33 Chambers in 11 Rows Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf
		7,313 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Device 3	170.20'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.14'	**12.0" Round RCP_Round 12"** L= 17.2' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.14' / 166.80' S= 0.0198 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 12.57 hrs HW=165.19' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 2: UG BAS 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

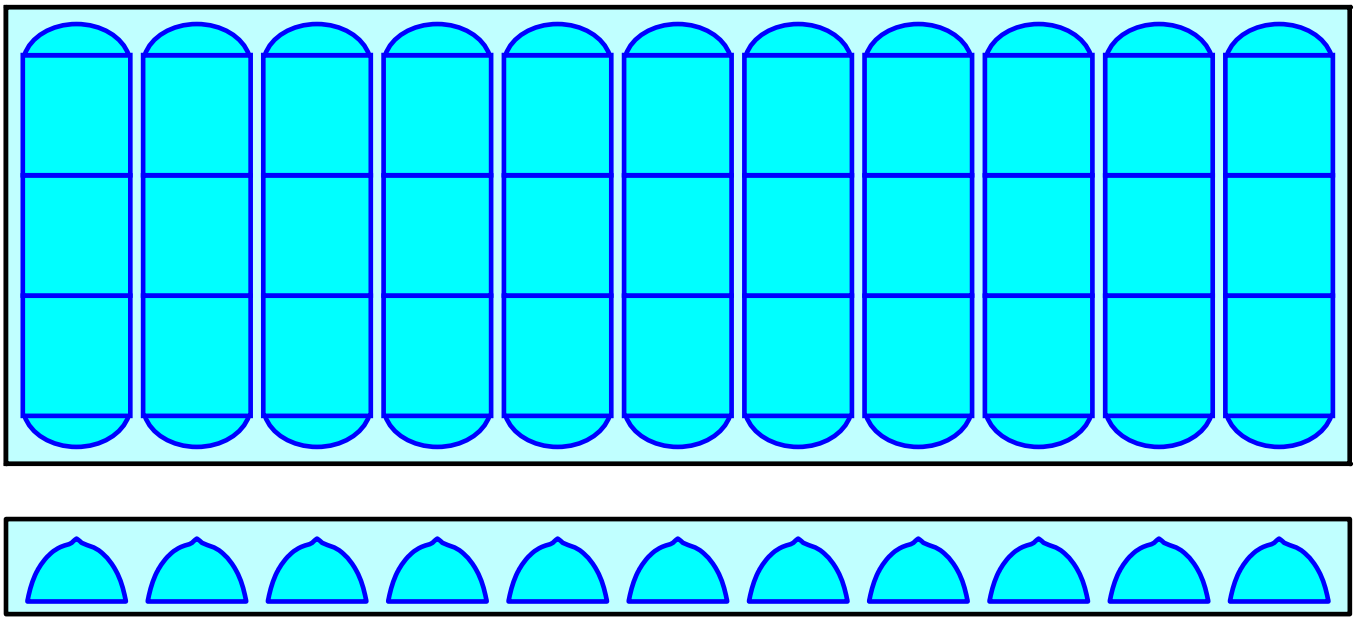
3 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 25.21' Row Length +12.0" End Stone x 2 = 27.21' Base Length
11 Rows x 77.0" Wide + 9.0" Spacing x 10 + 12.0" Side Stone x 2 = 80.08' Base Width
9.0" Base + 45.0" Chamber Height + 14.0" Cover = 5.67' Field Height

33 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 11 Rows = 3,956.2 cf Chamber Storage

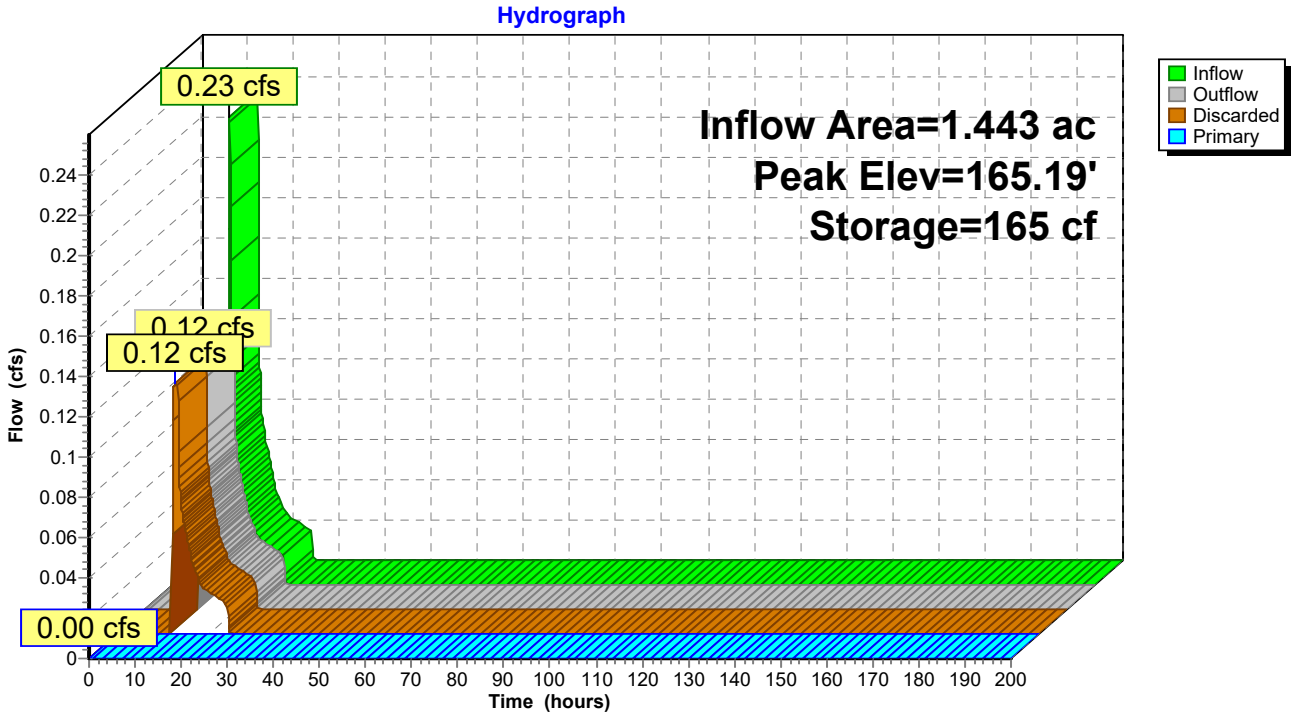
12,348.0 cf Field - 3,956.2 cf Chambers = 8,391.8 cf Stone x 40.0% Voids = 3,356.7 cf Stone Storage

Chamber Storage + Stone Storage = 7,312.9 cf = 0.168 af
Overall Storage Efficiency = 59.2%
Overall System Size = 27.21' x 80.08' x 5.67'

33 Chambers
457.3 cy Field
310.8 cy Stone



Pond UG 2: UG BAS 2



Summary for Subcatchment P-1: P-1

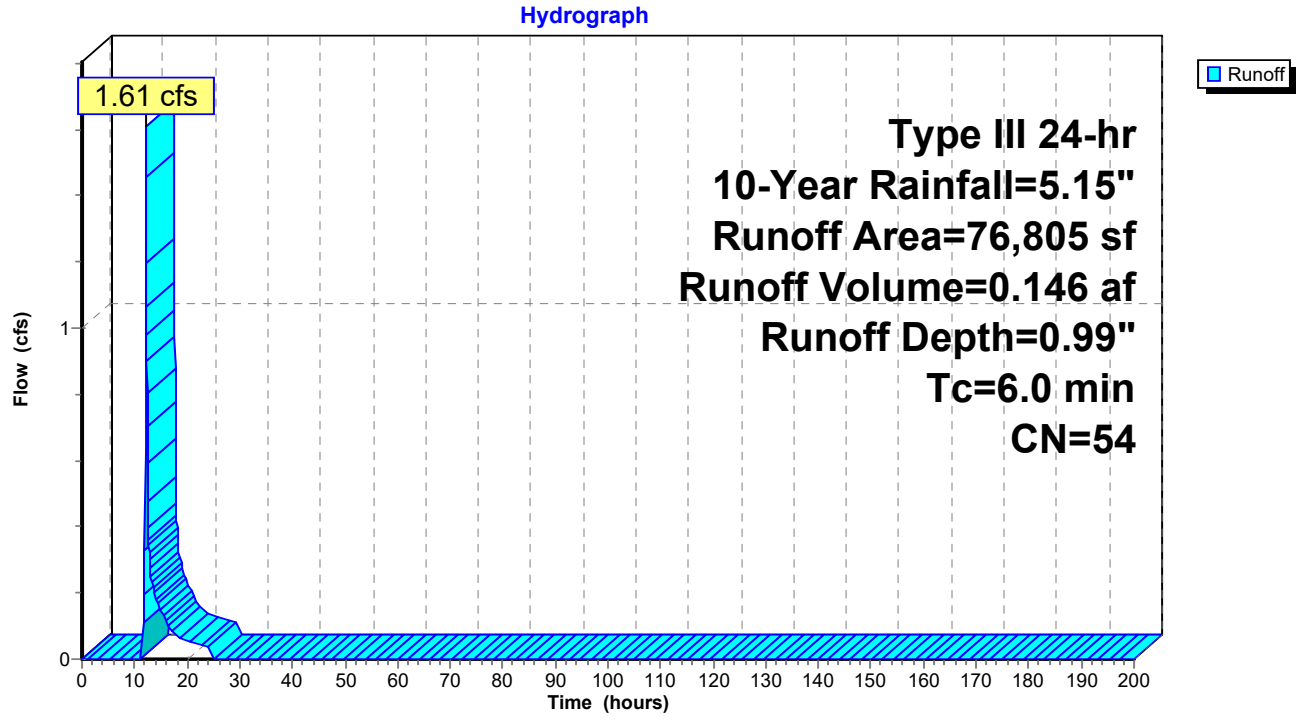
Runoff = 1.61 cfs @ 12.11 hrs, Volume= 0.146 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	2,640	98	2 driveways
	57,025	39	>75% Grass cover, Good, HSG A
*	9,000	98	4 houses
*	2,600	98	Massapoag road
*	2,930	98	exist offsite houses, HSG A
*	1,350	98	ex. offsite driveways, HSG A
*	1,260	98	POOL
	76,805	54	Weighted Average
	57,025		74.25% Pervious Area
	19,780		25.75% Impervious Area

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

Subcatchment P-1: P-1



Summary for Subcatchment P-1U: P-1U

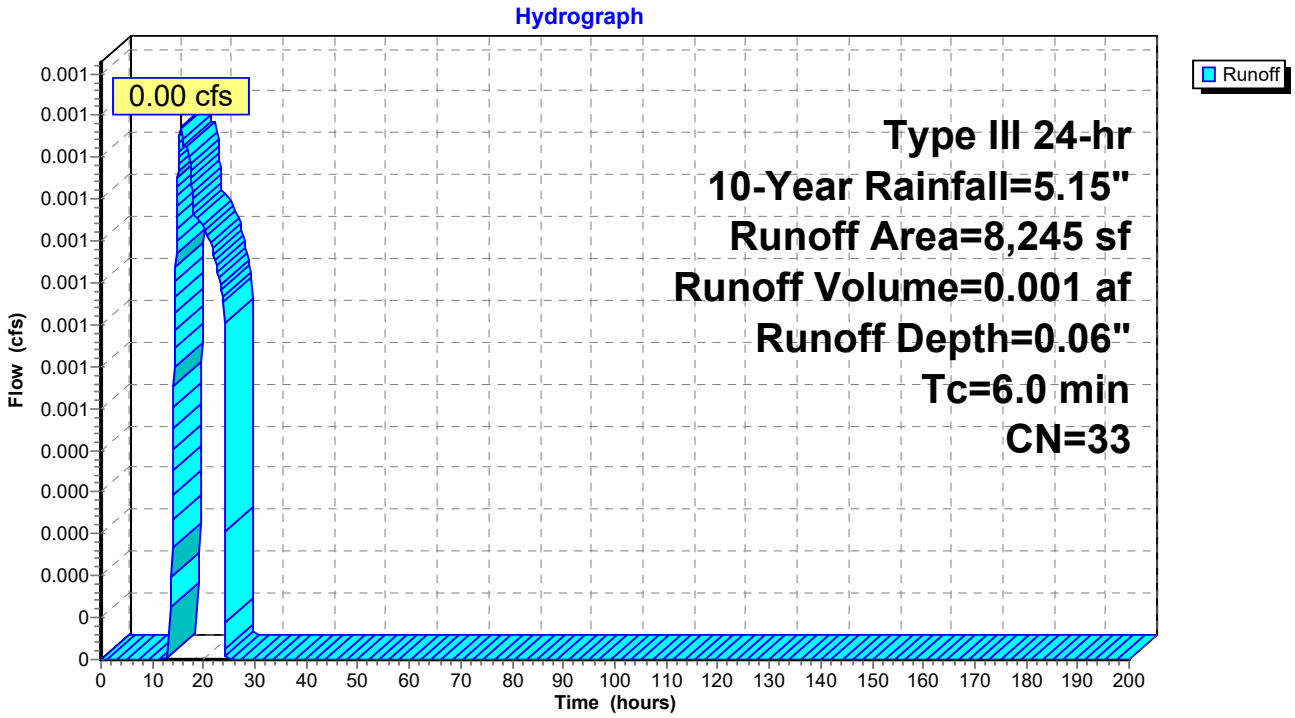
Runoff = 0.00 cfs @ 15.61 hrs, Volume= 0.001 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
	960	39	>75% Grass cover, Good, HSG A
	7,085	32	Woods/grass comb., Good, HSG A
*	200	55	rip rap
	8,245	33	Weighted Average
	8,245		100.00% Pervious Area

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

Subcatchment P-1U: P-1U



Summary for Subcatchment P-2: P-2

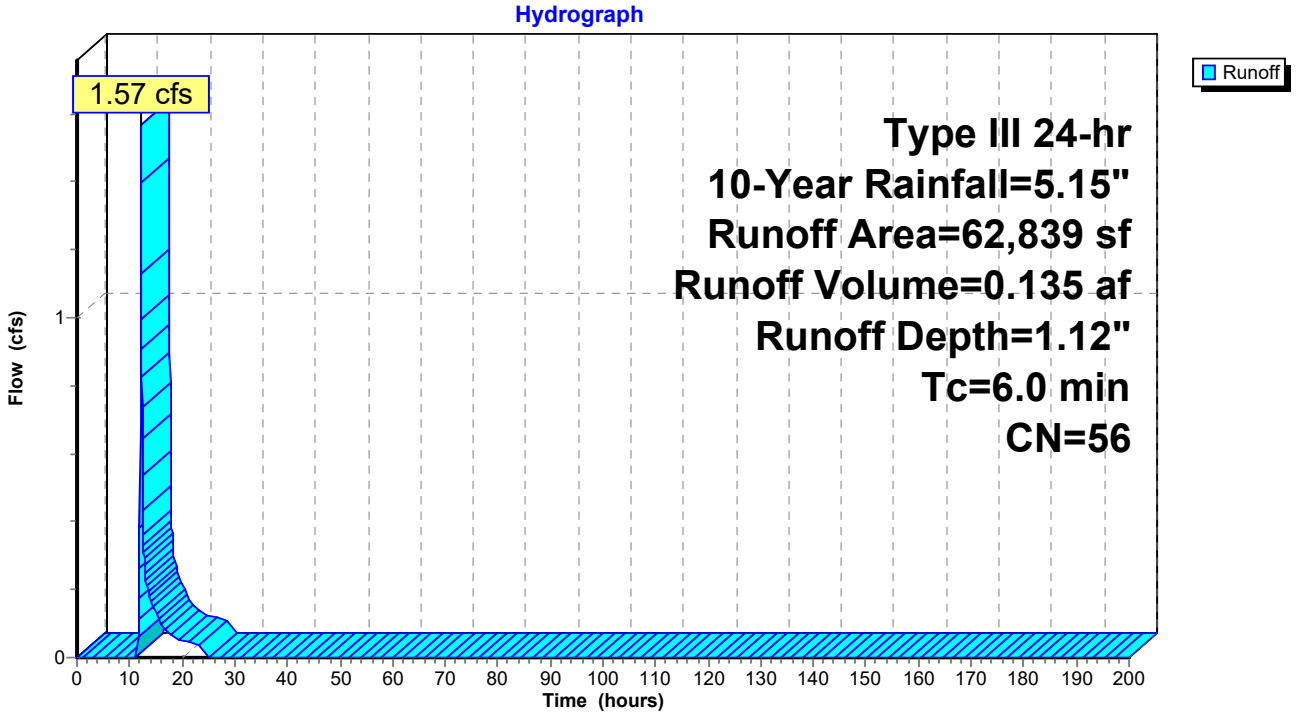
Runoff = 1.57 cfs @ 12.11 hrs, Volume= 0.135 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	4,960	98	5 driveways
	44,479	39	>75% Grass cover, Good, HSG A
*	8,900	98	Massapoag road
*	4,500	98	3 houses
	62,839	56	Weighted Average
	44,479		70.78% Pervious Area
	18,360		29.22% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-2U: P-2U

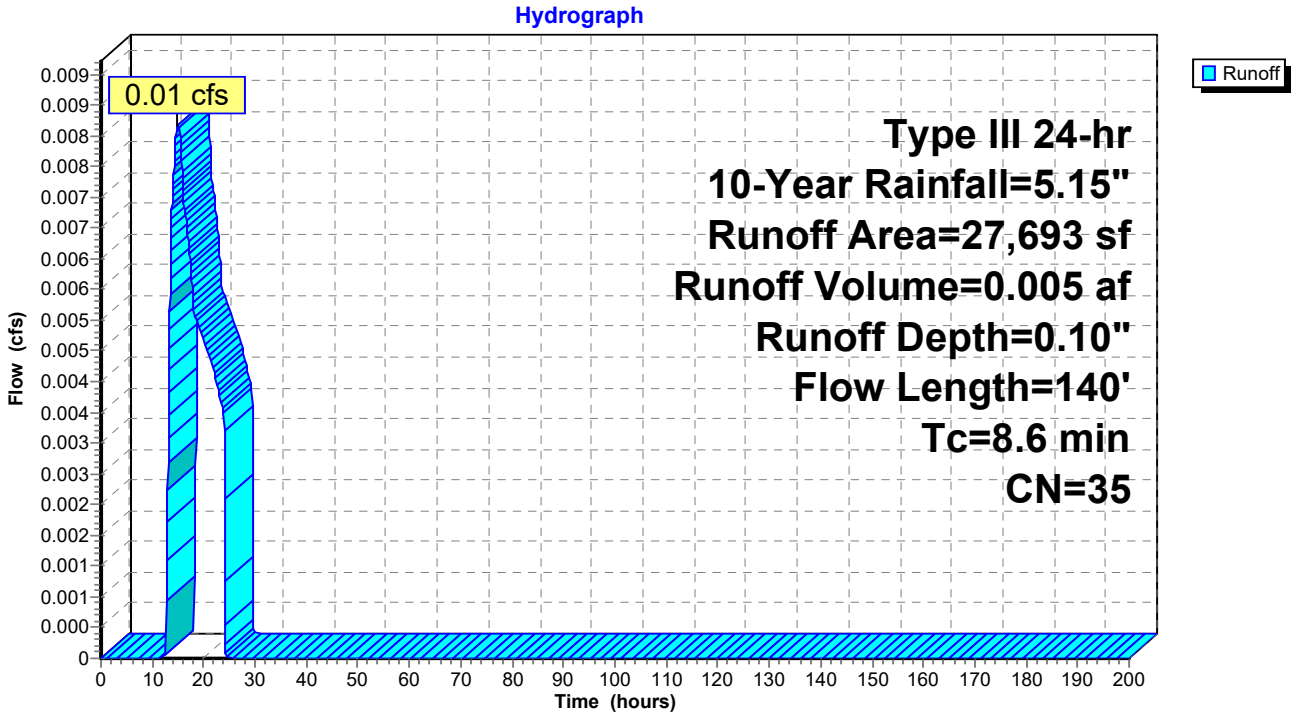
Runoff = 0.01 cfs @ 14.98 hrs, Volume= 0.005 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
	23,493	32	Woods/grass comb., Good, HSG A
*	4,200	55	rip rap, HSG A
	27,693	35	Weighted Average
	27,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.1	90	0.0800	1.41		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
8.6	140	Total			

Subcatchment P-2U: P-2U



Summary for Subcatchment P-3U: P-3U

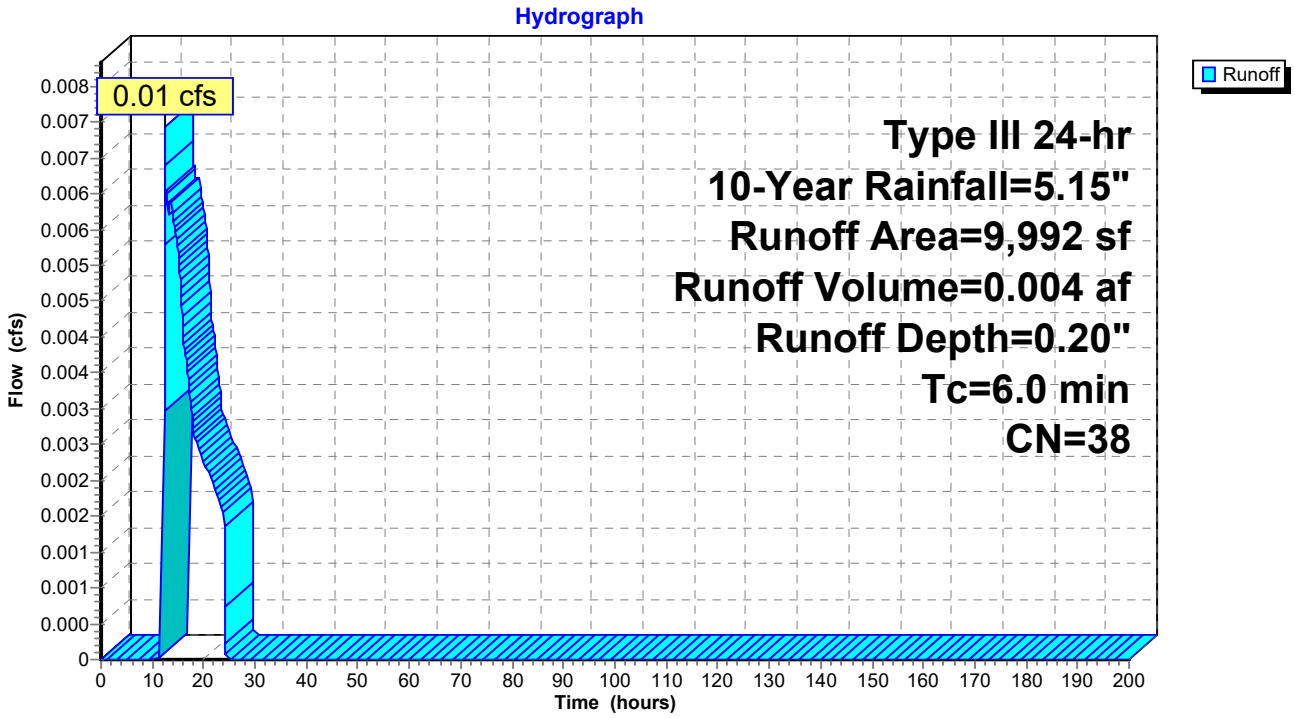
Runoff = 0.01 cfs @ 12.49 hrs, Volume= 0.004 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
	9,142	32	Woods/grass comb., Good, HSG A
*	850	98	ex house to remain
	9,992	38	Weighted Average
	9,142		91.49% Pervious Area
	850		8.51% Impervious Area

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

Subcatchment P-3U: P-3U

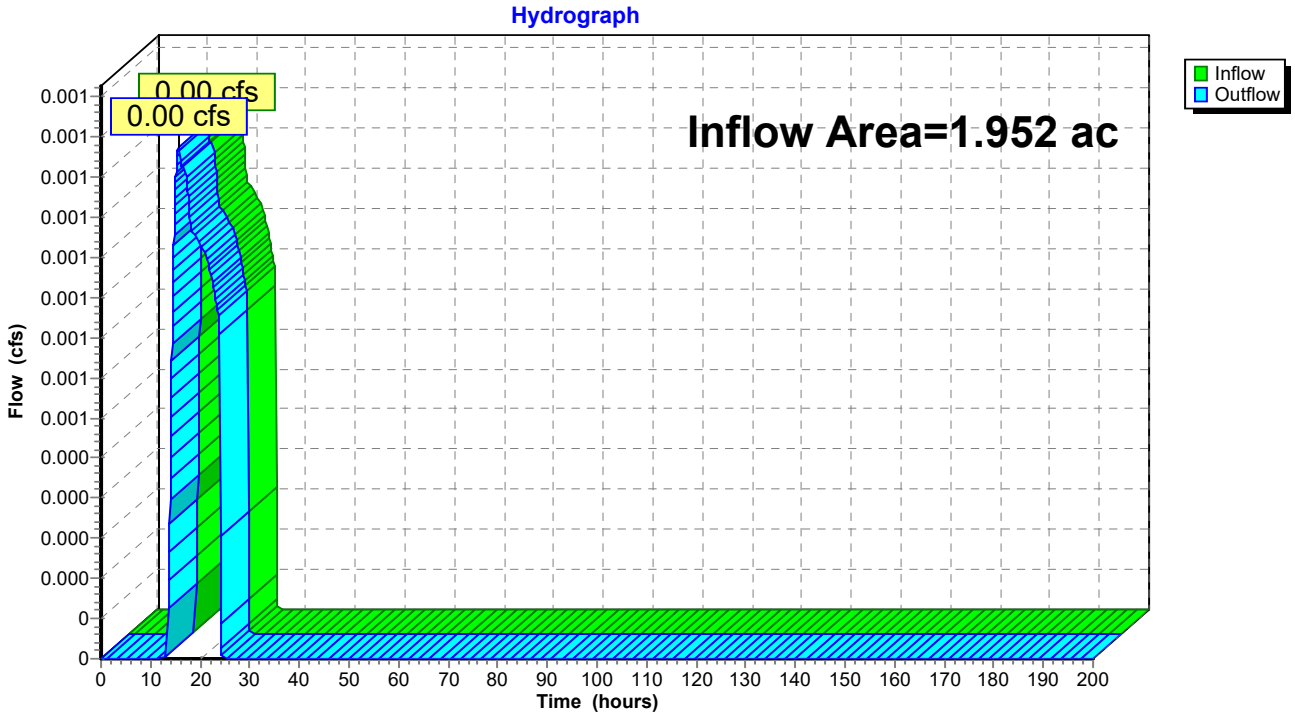


Summary for Reach 1: 1

Inflow Area = 1.952 ac, 23.26% Impervious, Inflow Depth = 0.01" for 10-Year event
Inflow = 0.00 cfs @ 15.61 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 15.61 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: 1

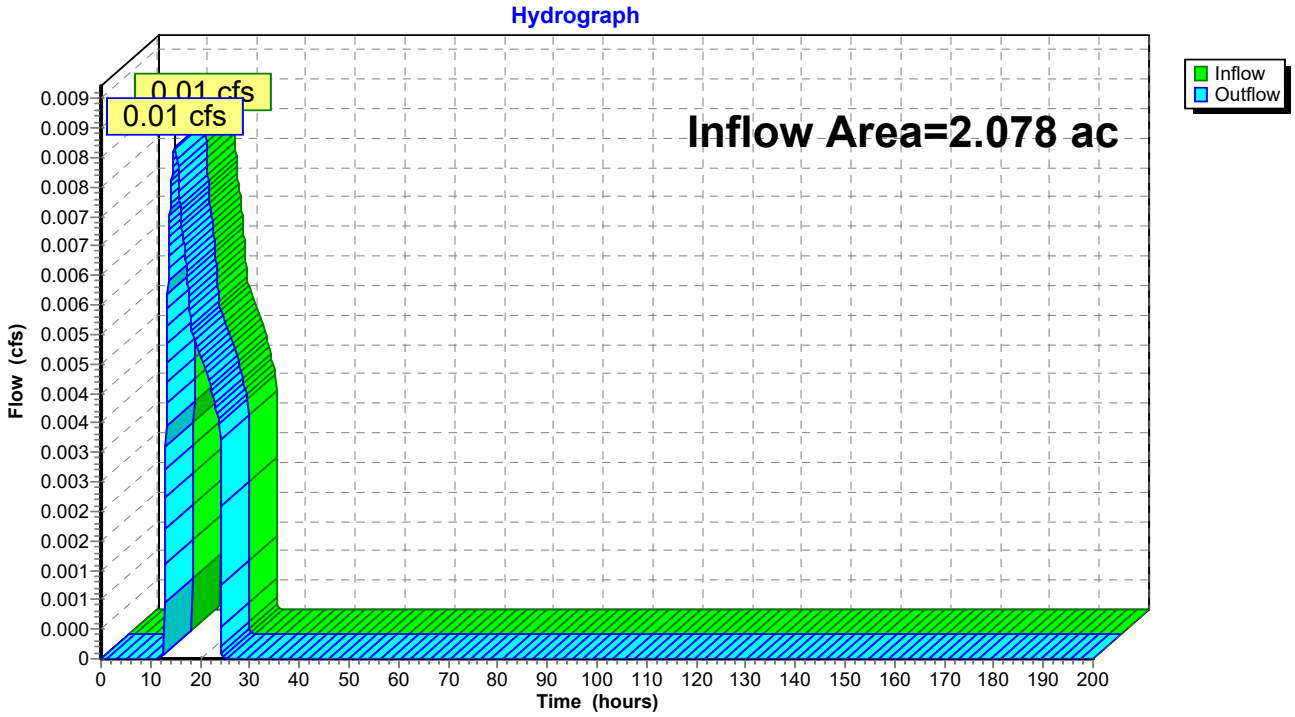


Summary for Reach 2: 2

Inflow Area = 2.078 ac, 20.28% Impervious, Inflow Depth = 0.03" for 10-Year event
Inflow = 0.01 cfs @ 14.98 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 14.98 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: 2

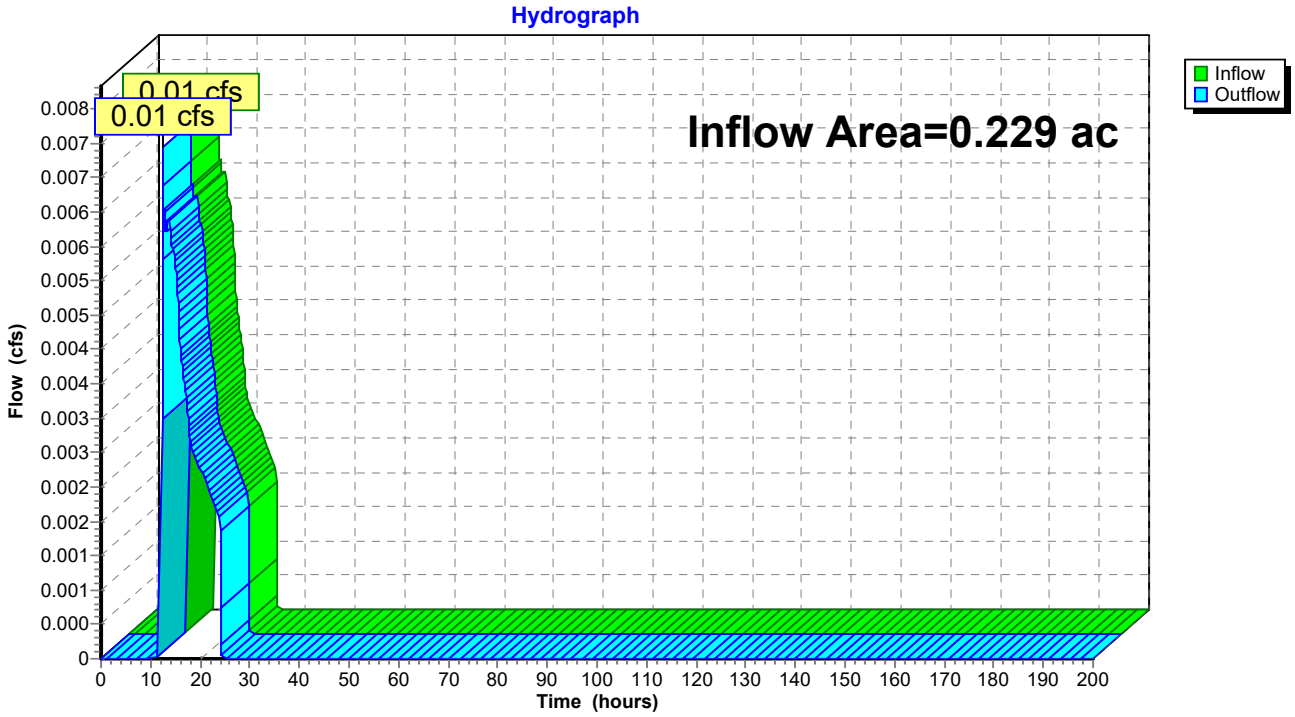


Summary for Reach 3: 3

Inflow Area = 0.229 ac, 8.51% Impervious, Inflow Depth = 0.20" for 10-Year event
Inflow = 0.01 cfs @ 12.49 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 12.49 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: 3



Summary for Pond UG 1: UG BAS 1

Inflow Area = 1.763 ac, 25.75% Impervious, Inflow Depth = 0.99" for 10-Year event
Inflow = 1.61 cfs @ 12.11 hrs, Volume= 0.146 af
Outflow = 0.20 cfs @ 12.00 hrs, Volume= 0.146 af, Atten= 88%, Lag= 0.0 min
Discarded = 0.20 cfs @ 12.00 hrs, Volume= 0.146 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 165.94' @ 13.84 hrs Surf.Area= 3,544 sf Storage= 1,999 cf

Plug-Flow detention time= 98.6 min calculated for 0.146 af (100% of inflow)
Center-of-Mass det. time= 98.5 min (992.2 - 893.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,197 cf	**58.50'W x 60.58'L x 3.50'H Field A** 12,403 cf Overall - 4,410 cf Embedded = 7,993 cf x 40.0% Voids
#2A	165.50'	4,410 cf	**ADS_StormTech SC-740 +Cap** x 96 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 96 Chambers in 12 Rows
		7,607 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Horizontal area**
#2	Device 3	167.96'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.78'	**12.0" Round RCP_Round 12"** L= 17.7' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.78' / 167.60' S= 0.0102 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.20 cfs @ 12.00 hrs HW=165.07' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 1: UG BAS 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

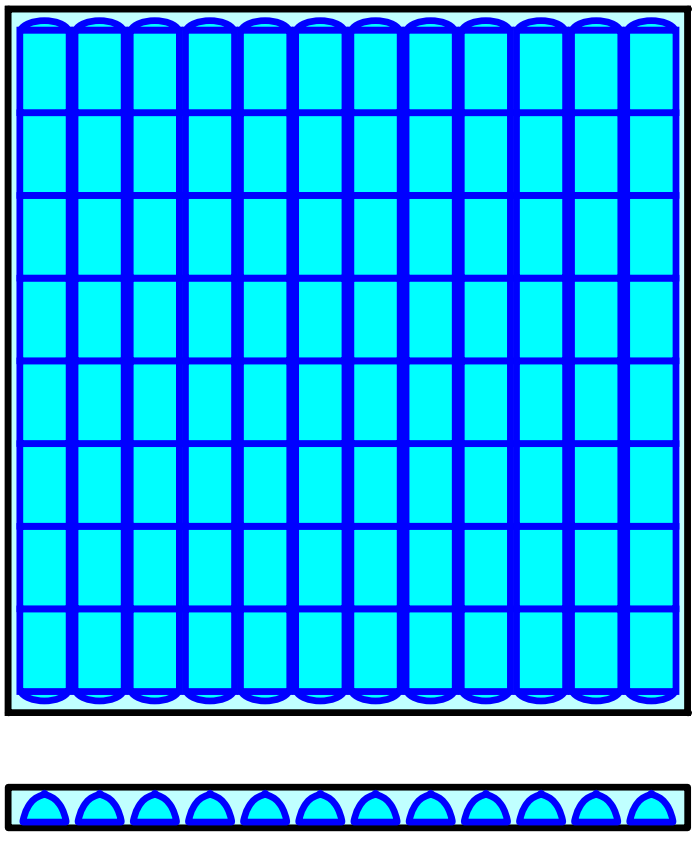
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 12.0" Side Stone x 2 = 58.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

96 Chambers x 45.9 cf = 4,410.2 cf Chamber Storage

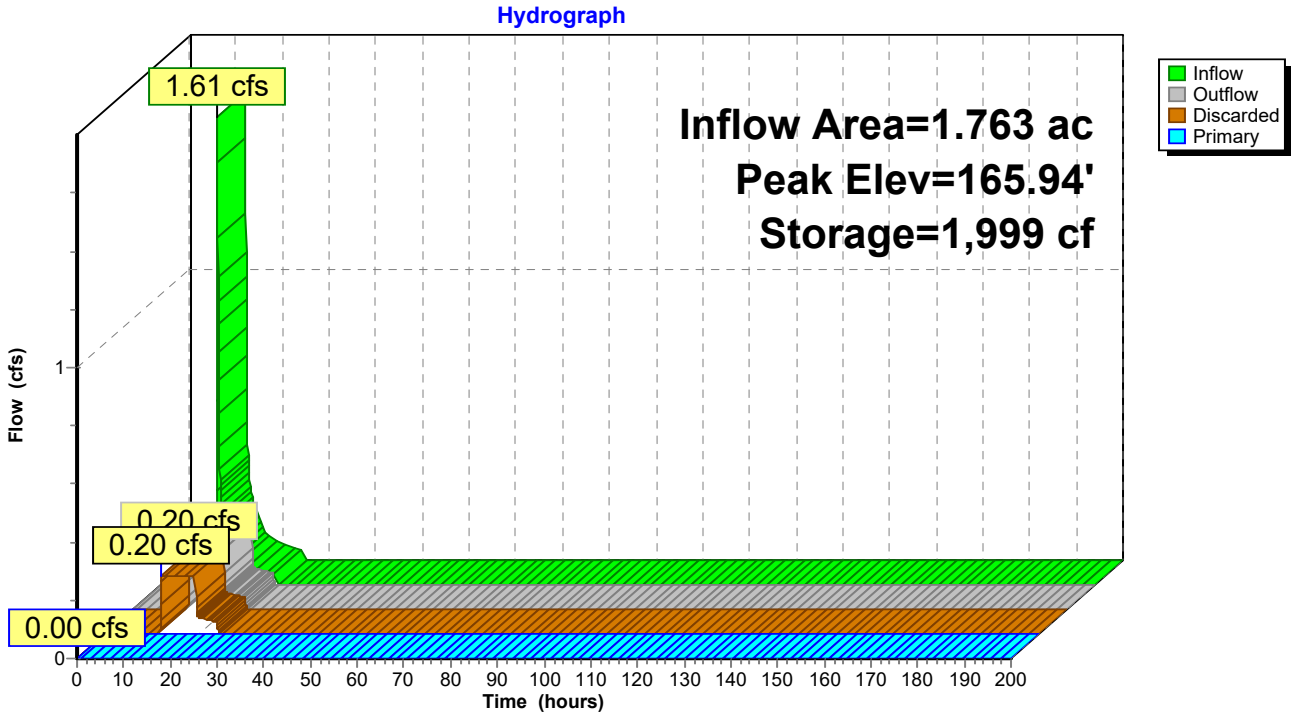
12,403.1 cf Field - 4,410.2 cf Chambers = 7,992.8 cf Stone x 40.0% Voids = 3,197.1 cf Stone Storage

Chamber Storage + Stone Storage = 7,607.4 cf = 0.175 af
Overall Storage Efficiency = 61.3%
Overall System Size = 60.58' x 58.50' x 3.50'

96 Chambers
459.4 cy Field
296.0 cy Stone



Pond UG 1: UG BAS 1



Summary for Pond UG 2: UG BAS 2

Inflow Area = 1.443 ac, 29.22% Impervious, Inflow Depth = 1.12" for 10-Year event
Inflow = 1.57 cfs @ 12.11 hrs, Volume= 0.135 af
Outflow = 0.14 cfs @ 14.71 hrs, Volume= 0.135 af, Atten= 91%, Lag= 155.9 min
Discarded = 0.14 cfs @ 14.71 hrs, Volume= 0.135 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 166.69' @ 14.71 hrs Surf.Area= 2,179 sf Storage= 2,290 cf

Plug-Flow detention time= 177.0 min calculated for 0.135 af (100% of inflow)
Center-of-Mass det. time= 177.0 min (1,063.2 - 886.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,357 cf	**80.08'W x 27.21'L x 5.67'H Field A** 12,348 cf Overall - 3,956 cf Embedded = 8,392 cf x 40.0% Voids
#2A	165.75'	3,956 cf	**ADS_StormTech MC-3500 d +Cap** x 33 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 33 Chambers in 11 Rows Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf
		7,313 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Device 3	170.20'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.14'	**12.0" Round RCP_Round 12"** L= 17.2' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.14' / 166.80' S= 0.0198 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.14 cfs @ 14.71 hrs HW=166.69' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 2: UG BAS 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

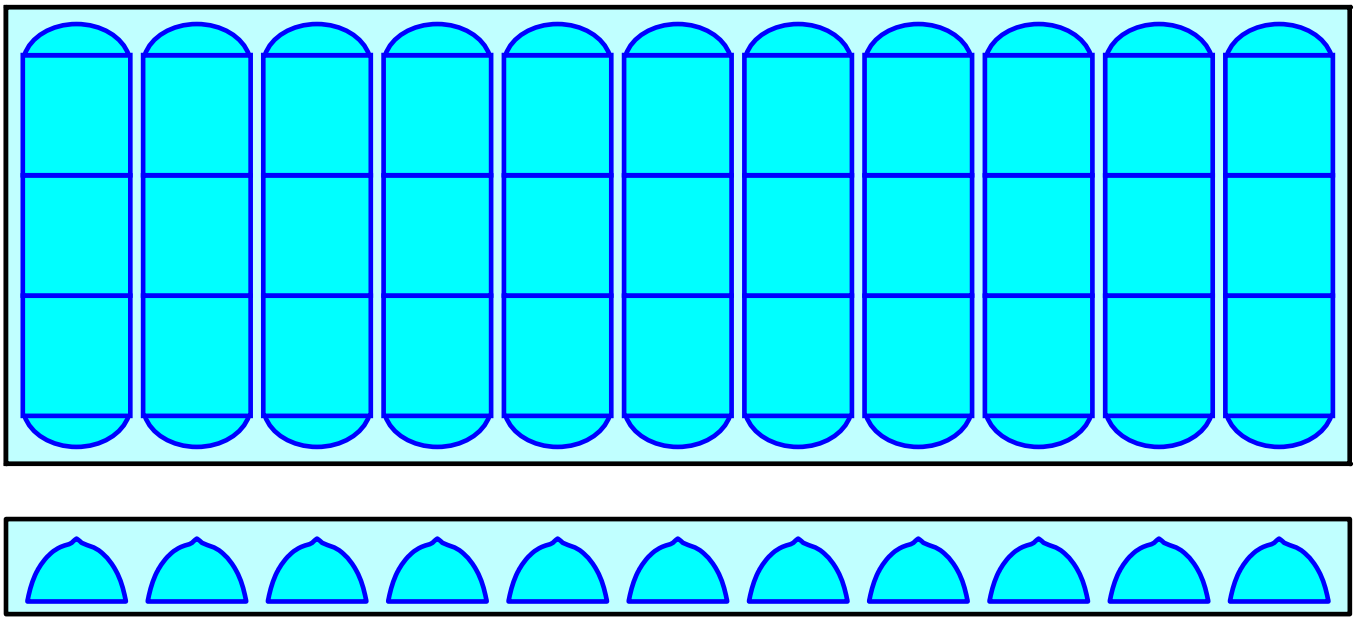
3 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 25.21' Row Length +12.0" End Stone x 2 = 27.21' Base Length
11 Rows x 77.0" Wide + 9.0" Spacing x 10 + 12.0" Side Stone x 2 = 80.08' Base Width
9.0" Base + 45.0" Chamber Height + 14.0" Cover = 5.67' Field Height

33 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 11 Rows = 3,956.2 cf Chamber Storage

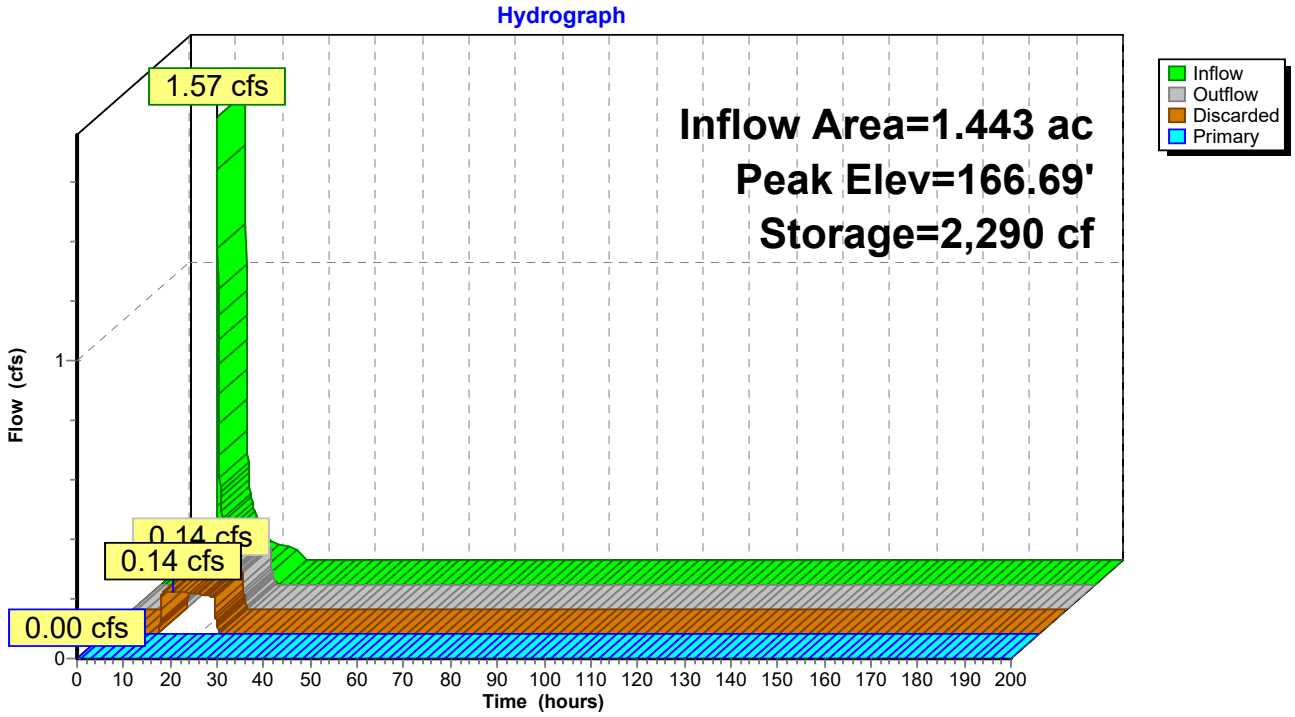
12,348.0 cf Field - 3,956.2 cf Chambers = 8,391.8 cf Stone x 40.0% Voids = 3,356.7 cf Stone Storage

Chamber Storage + Stone Storage = 7,312.9 cf = 0.168 af
Overall Storage Efficiency = 59.2%
Overall System Size = 27.21' x 80.08' x 5.67'

33 Chambers
457.3 cy Field
310.8 cy Stone



Pond UG 2: UG BAS 2



Summary for Subcatchment P-1: P-1

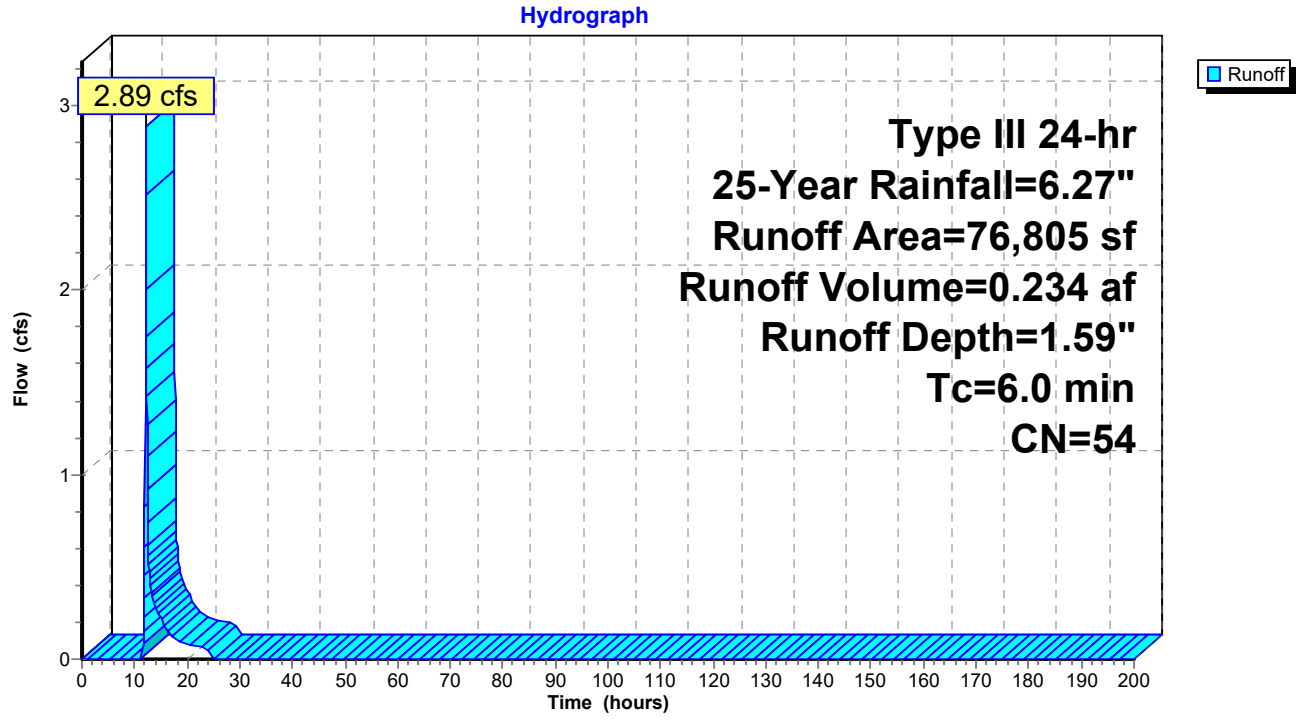
Runoff = 2.89 cfs @ 12.10 hrs, Volume= 0.234 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

	Area (sf)	CN	Description
*	2,640	98	2 driveways
	57,025	39	>75% Grass cover, Good, HSG A
*	9,000	98	4 houses
*	2,600	98	Massapoag road
*	2,930	98	exist offsite houses, HSG A
*	1,350	98	ex. offsite driveways, HSG A
*	1,260	98	POOL
	76,805	54	Weighted Average
	57,025		74.25% Pervious Area
	19,780		25.75% Impervious Area

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

Subcatchment P-1: P-1



Summary for Subcatchment P-1U: P-1U

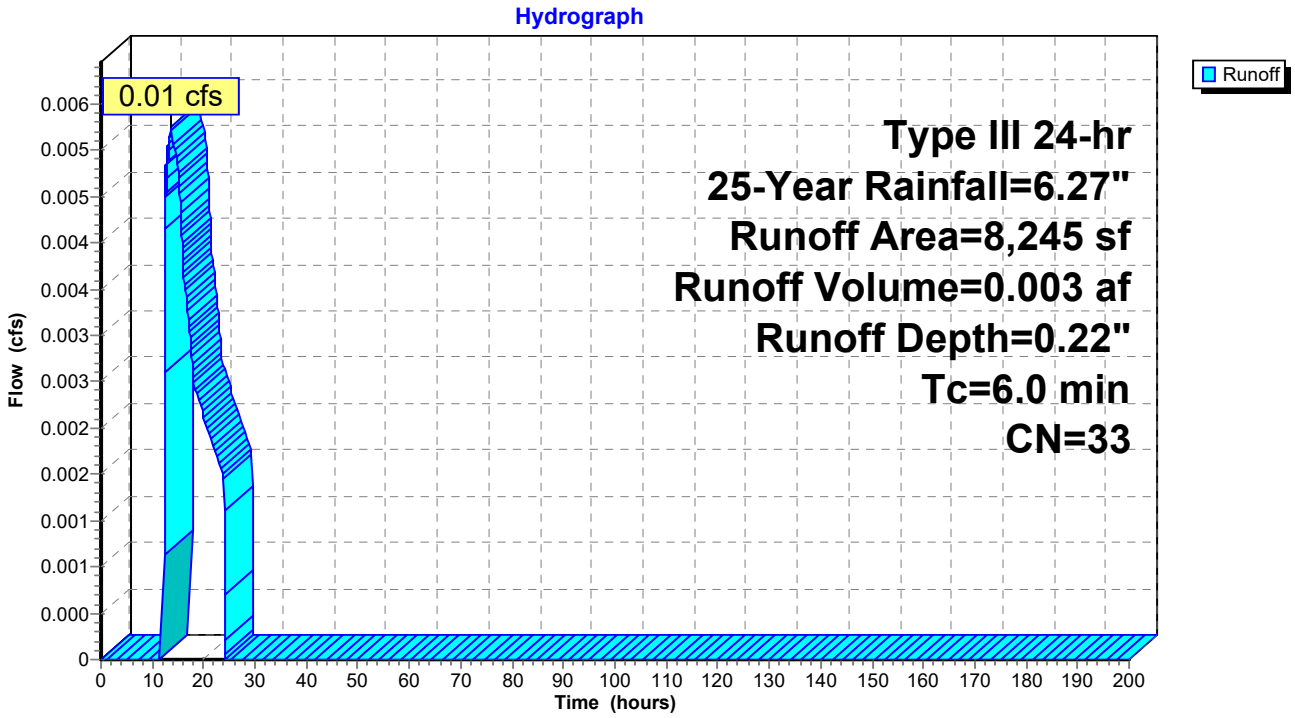
Runoff = 0.01 cfs @ 13.65 hrs, Volume= 0.003 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

	Area (sf)	CN	Description
	960	39	>75% Grass cover, Good, HSG A
	7,085	32	Woods/grass comb., Good, HSG A
*	200	55	rip rap
	8,245	33	Weighted Average
	8,245		100.00% Pervious Area

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

Subcatchment P-1U: P-1U



Summary for Subcatchment P-2: P-2

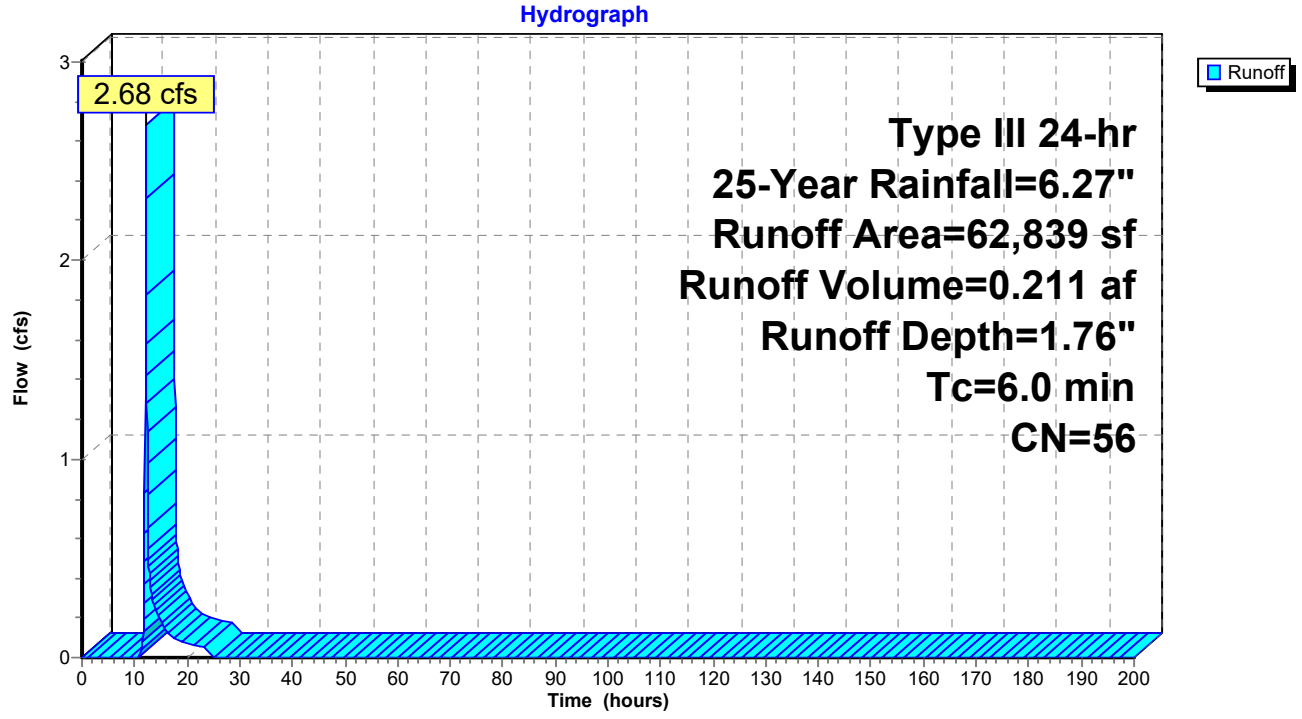
Runoff = 2.68 cfs @ 12.10 hrs, Volume= 0.211 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

	Area (sf)	CN	Description
*	4,960	98	5 driveways
	44,479	39	>75% Grass cover, Good, HSG A
*	8,900	98	Massapoag road
*	4,500	98	3 houses
	62,839	56	Weighted Average
	44,479		70.78% Pervious Area
	18,360		29.22% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-2U: P-2U

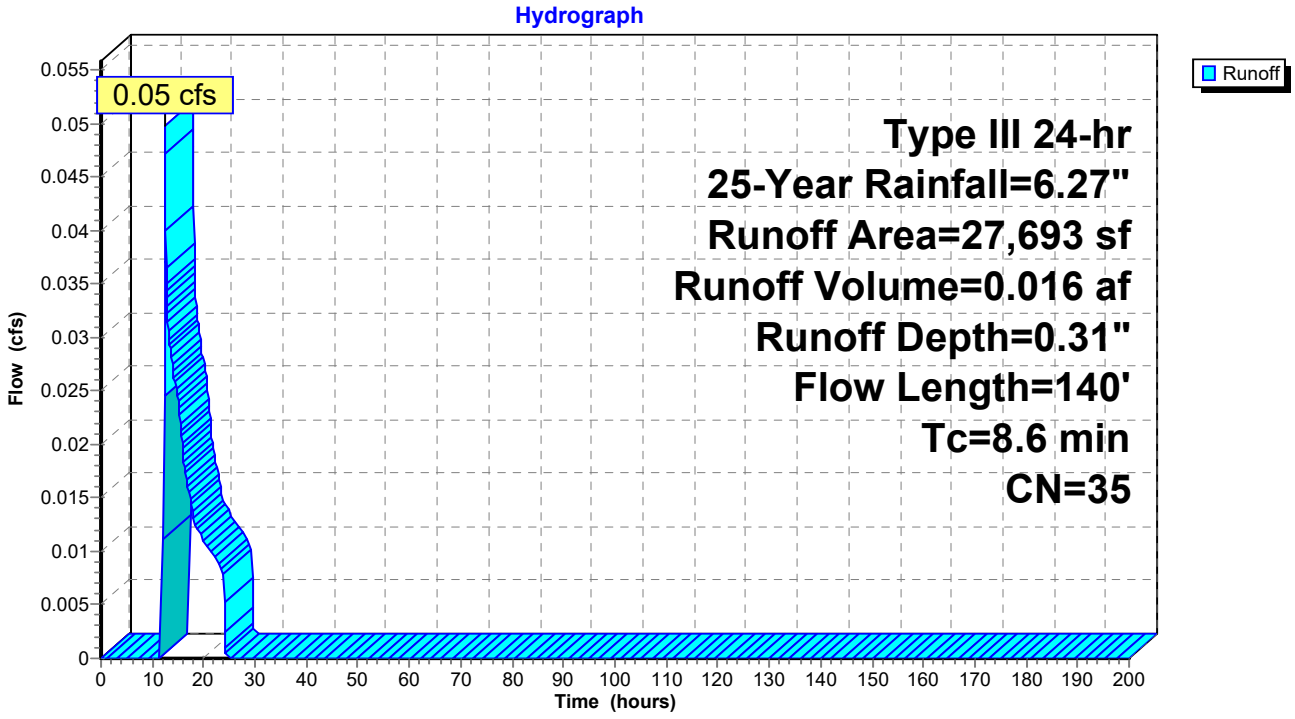
Runoff = 0.05 cfs @ 12.47 hrs, Volume= 0.016 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

	Area (sf)	CN	Description
	23,493	32	Woods/grass comb., Good, HSG A
*	4,200	55	rip rap, HSG A
	27,693	35	Weighted Average
	27,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.1	90	0.0800	1.41		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
8.6	140	Total			

Subcatchment P-2U: P-2U



Summary for Subcatchment P-3U: P-3U

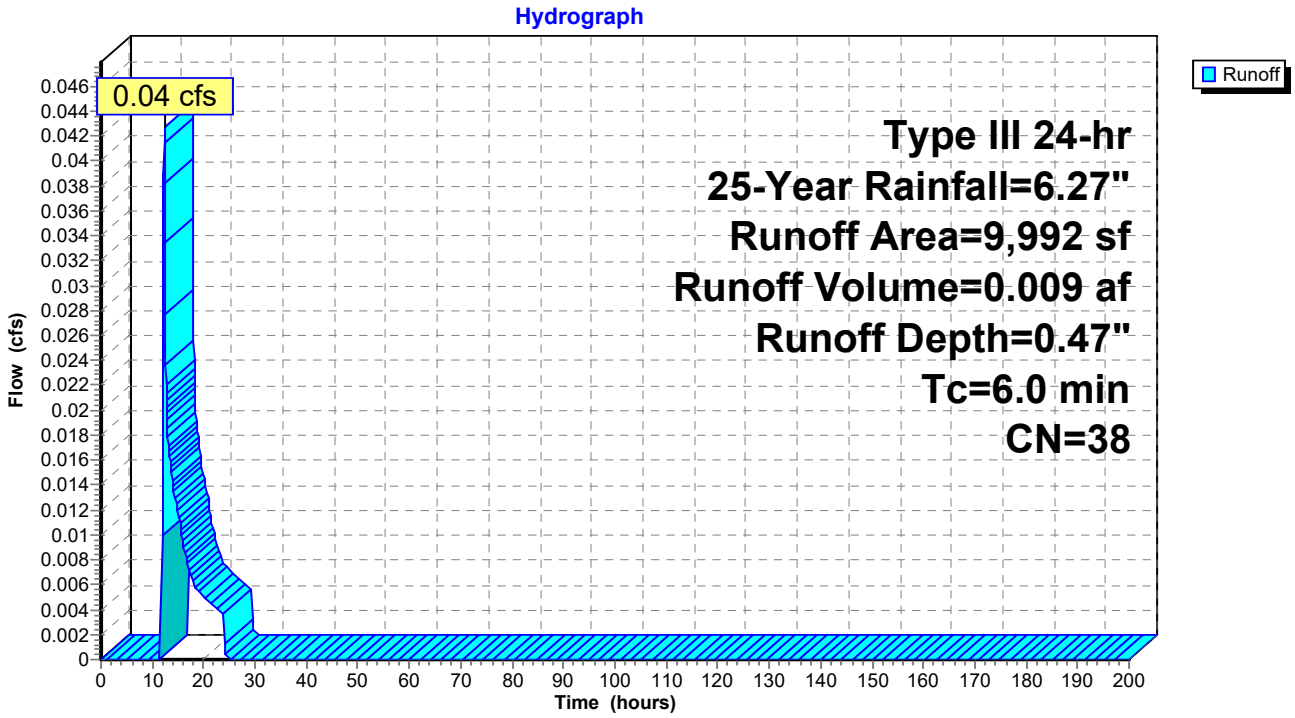
Runoff = 0.04 cfs @ 12.34 hrs, Volume= 0.009 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.27"

	Area (sf)	CN	Description
	9,142	32	Woods/grass comb., Good, HSG A
*	850	98	ex house to remain
	9,992	38	Weighted Average
	9,142		91.49% Pervious Area
	850		8.51% Impervious Area

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

Subcatchment P-3U: P-3U

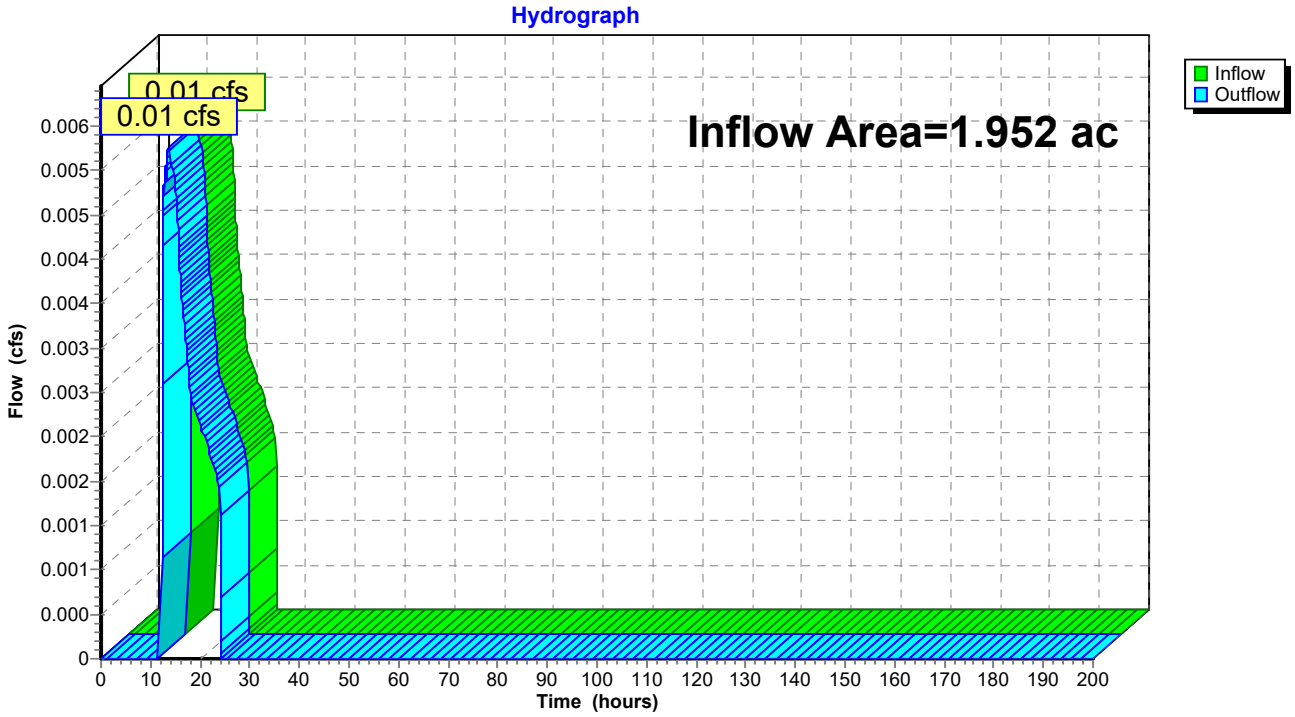


Summary for Reach 1: 1

Inflow Area = 1.952 ac, 23.26% Impervious, Inflow Depth = 0.02" for 25-Year event
Inflow = 0.01 cfs @ 13.65 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 13.65 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: 1

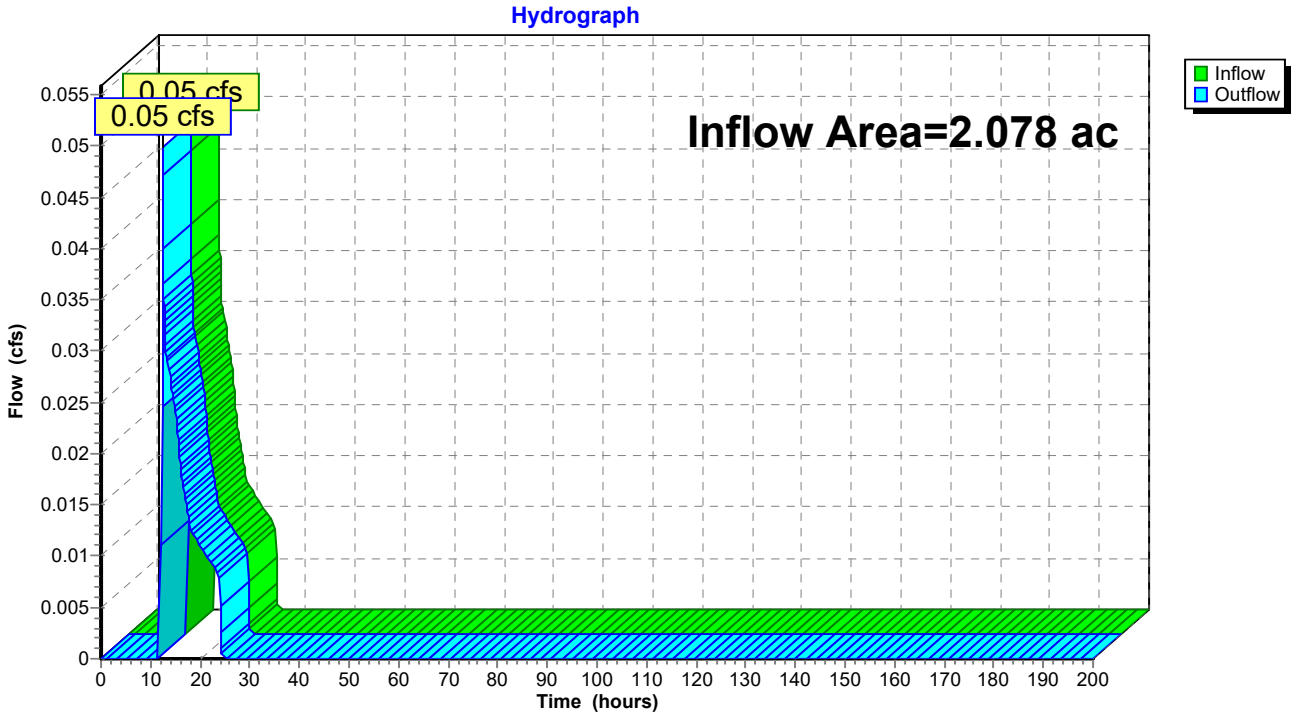


Summary for Reach 2: 2

Inflow Area = 2.078 ac, 20.28% Impervious, Inflow Depth = 0.09" for 25-Year event
Inflow = 0.05 cfs @ 12.47 hrs, Volume= 0.016 af
Outflow = 0.05 cfs @ 12.47 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: 2

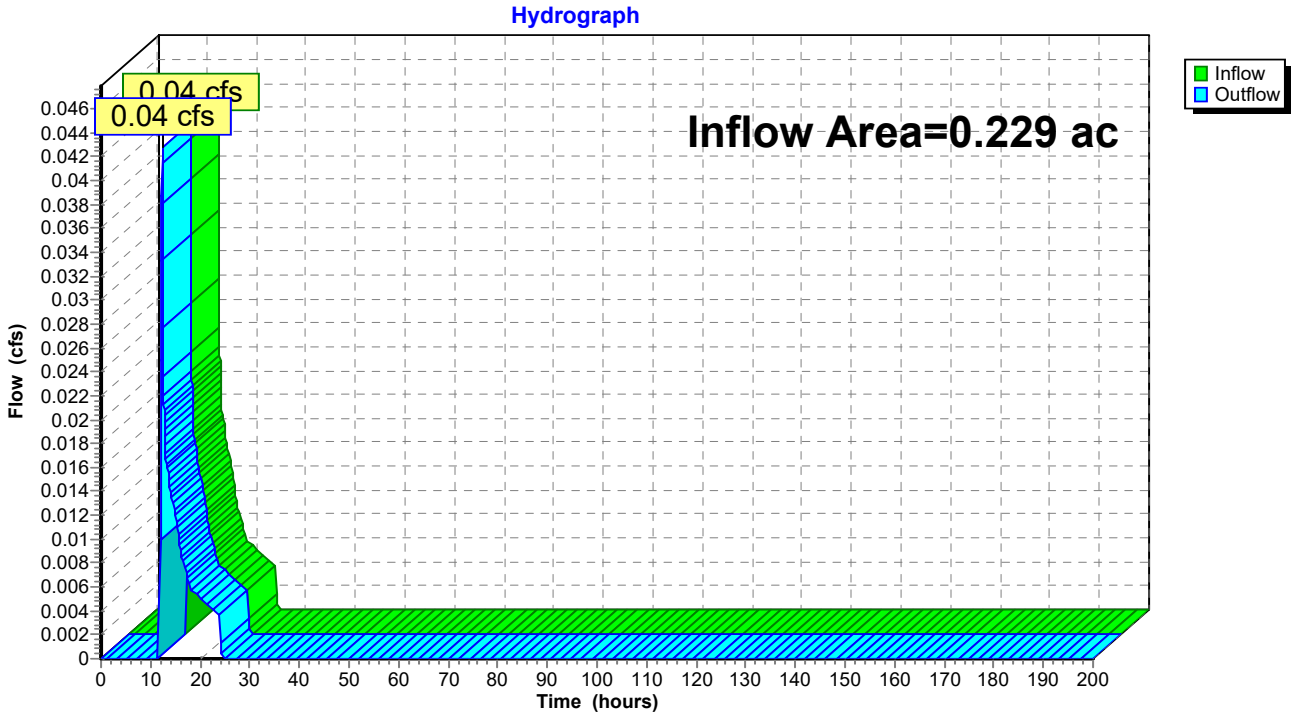


Summary for Reach 3: 3

Inflow Area = 0.229 ac, 8.51% Impervious, Inflow Depth = 0.47" for 25-Year event
Inflow = 0.04 cfs @ 12.34 hrs, Volume= 0.009 af
Outflow = 0.04 cfs @ 12.34 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: 3



Summary for Pond UG 1: UG BAS 1

Inflow Area = 1.763 ac, 25.75% Impervious, Inflow Depth = 1.59" for 25-Year event
Inflow = 2.89 cfs @ 12.10 hrs, Volume= 0.234 af
Outflow = 0.20 cfs @ 11.80 hrs, Volume= 0.234 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.20 cfs @ 11.80 hrs, Volume= 0.234 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 166.89' @ 15.36 hrs Surf.Area= 3,544 sf Storage= 4,591 cf

Plug-Flow detention time= 253.7 min calculated for 0.234 af (100% of inflow)
Center-of-Mass det. time= 253.7 min (1,130.5 - 876.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,197 cf	**58.50'W x 60.58'L x 3.50'H Field A** 12,403 cf Overall - 4,410 cf Embedded = 7,993 cf x 40.0% Voids
#2A	165.50'	4,410 cf	**ADS_StormTech SC-740 +Cap** x 96 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 96 Chambers in 12 Rows
		7,607 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Horizontal area**
#2	Device 3	167.96'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.78'	**12.0" Round RCP_Round 12"** L= 17.7' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.78' / 167.60' S= 0.0102 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.20 cfs @ 11.80 hrs HW=165.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 1: UG BAS 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

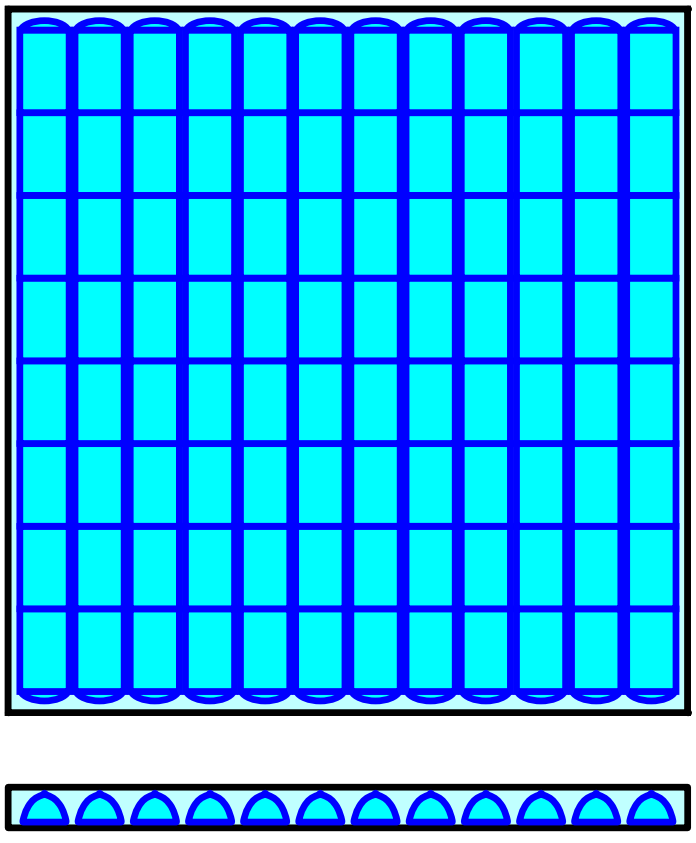
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 12.0" Side Stone x 2 = 58.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

96 Chambers x 45.9 cf = 4,410.2 cf Chamber Storage

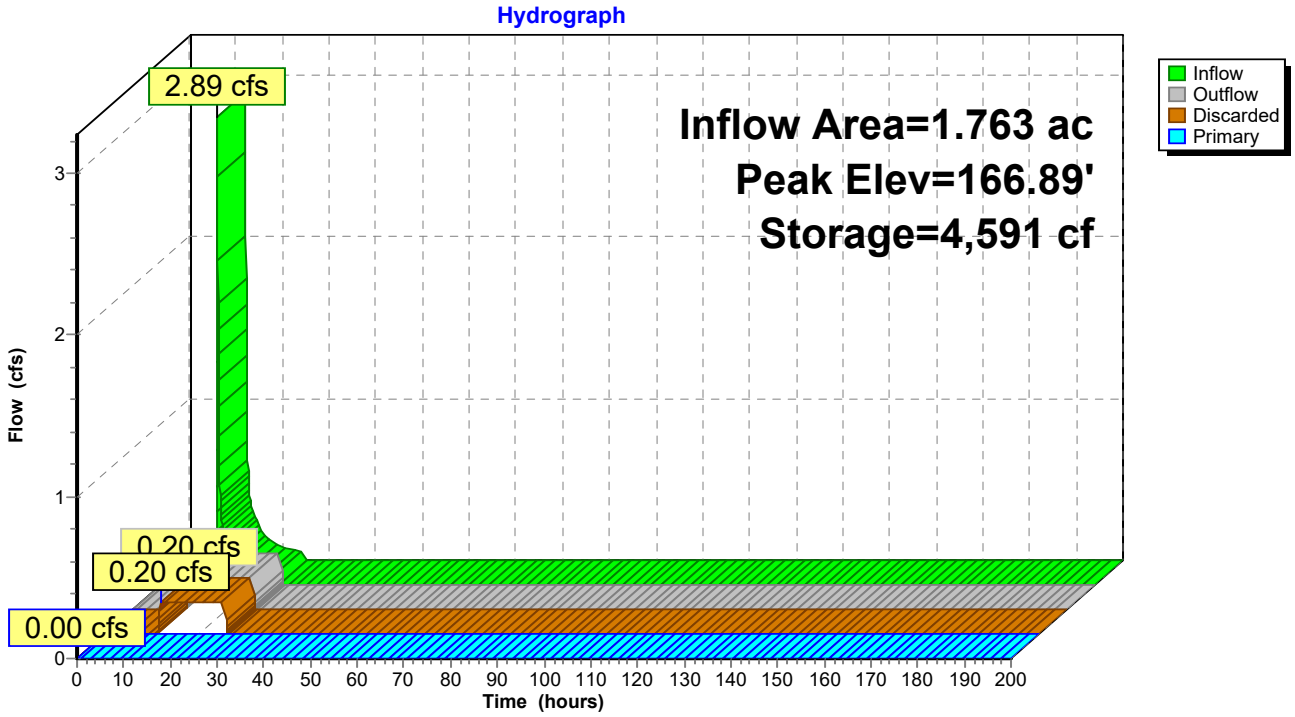
12,403.1 cf Field - 4,410.2 cf Chambers = 7,992.8 cf Stone x 40.0% Voids = 3,197.1 cf Stone Storage

Chamber Storage + Stone Storage = 7,607.4 cf = 0.175 af
Overall Storage Efficiency = 61.3%
Overall System Size = 60.58' x 58.50' x 3.50'

96 Chambers
459.4 cy Field
296.0 cy Stone



Pond UG 1: UG BAS 1



Summary for Pond UG 2: UG BAS 2

Inflow Area = 1.443 ac, 29.22% Impervious, Inflow Depth = 1.76" for 25-Year event
Inflow = 2.68 cfs @ 12.10 hrs, Volume= 0.211 af
Outflow = 0.16 cfs @ 15.62 hrs, Volume= 0.211 af, Atten= 94%, Lag= 211.1 min
Discarded = 0.16 cfs @ 15.62 hrs, Volume= 0.211 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 168.09' @ 15.62 hrs Surf.Area= 2,179 sf Storage= 4,567 cf

Plug-Flow detention time= 332.2 min calculated for 0.211 af (100% of inflow)
Center-of-Mass det. time= 332.2 min (1,203.1 - 870.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,357 cf	**80.08'W x 27.21'L x 5.67'H Field A** 12,348 cf Overall - 3,956 cf Embedded = 8,392 cf x 40.0% Voids
#2A	165.75'	3,956 cf	**ADS_StormTech MC-3500 d +Cap** x 33 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 33 Chambers in 11 Rows Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf
		7,313 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Device 3	170.20'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.14'	**12.0" Round RCP_Round 12"** L= 17.2' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.14' / 166.80' S= 0.0198 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.16 cfs @ 15.62 hrs HW=168.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.00' (Free Discharge)
↑—**3=RCP_Round 12"** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UG 2: UG BAS 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

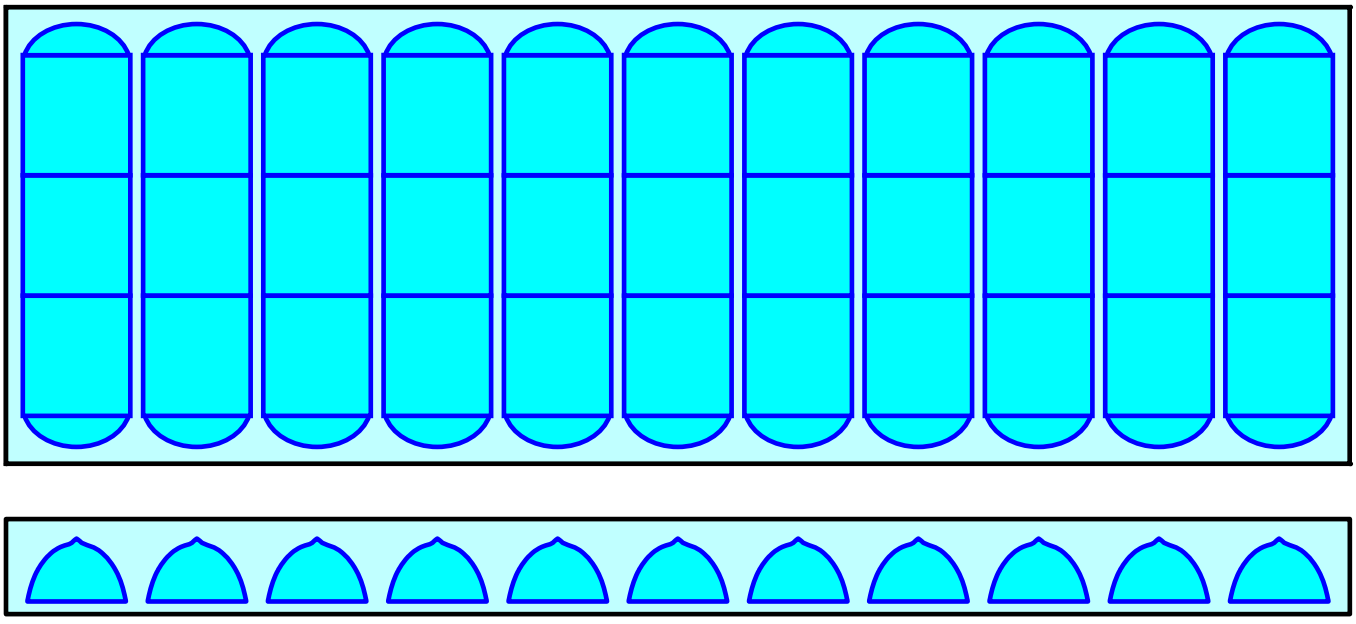
3 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 25.21' Row Length +12.0" End Stone x 2 = 27.21' Base Length
11 Rows x 77.0" Wide + 9.0" Spacing x 10 + 12.0" Side Stone x 2 = 80.08' Base Width
9.0" Base + 45.0" Chamber Height + 14.0" Cover = 5.67' Field Height

33 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 11 Rows = 3,956.2 cf Chamber Storage

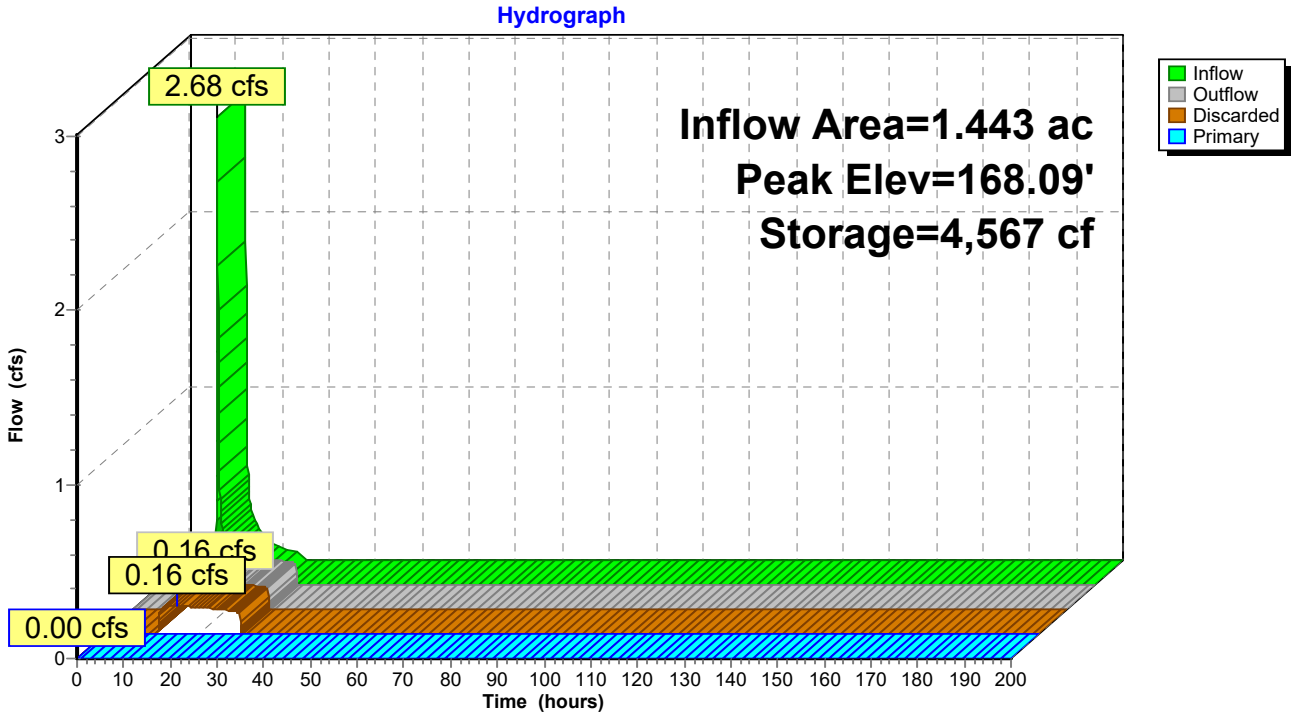
12,348.0 cf Field - 3,956.2 cf Chambers = 8,391.8 cf Stone x 40.0% Voids = 3,356.7 cf Stone Storage

Chamber Storage + Stone Storage = 7,312.9 cf = 0.168 af
Overall Storage Efficiency = 59.2%
Overall System Size = 27.21' x 80.08' x 5.67'

33 Chambers
457.3 cy Field
310.8 cy Stone



Pond UG 2: UG BAS 2



Summary for Subcatchment P-1: P-1

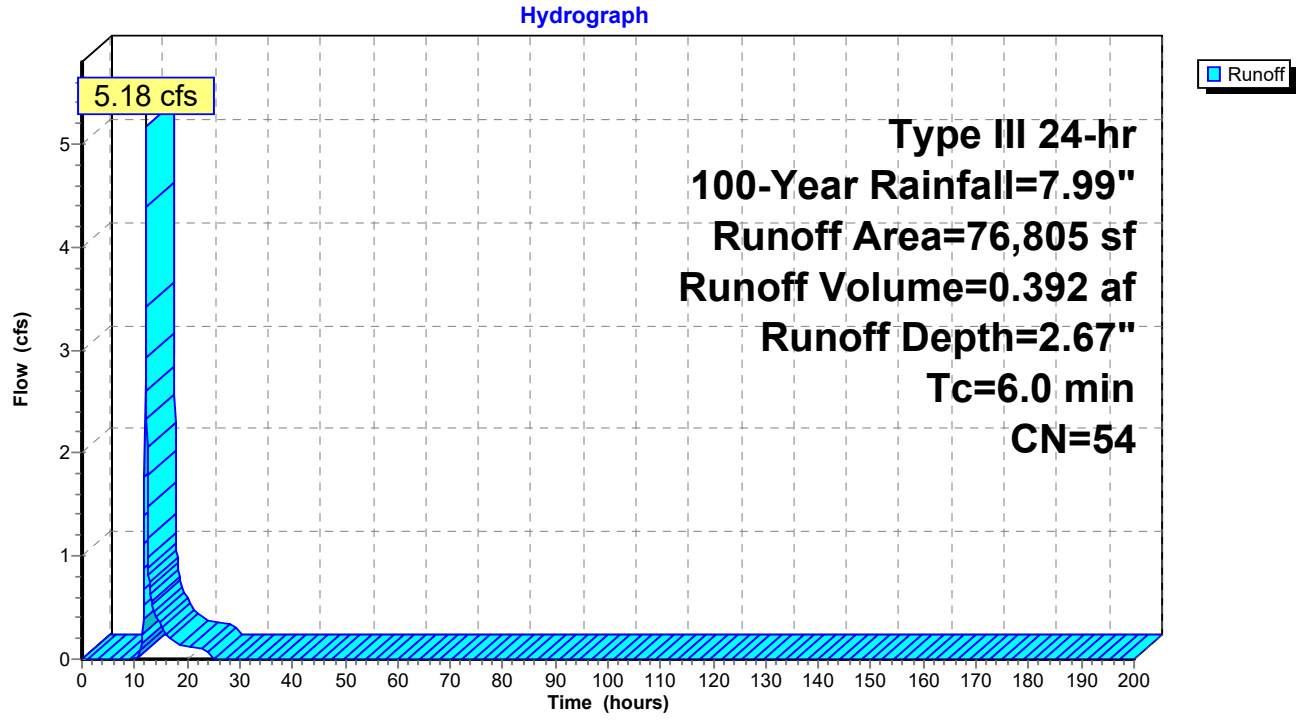
Runoff = 5.18 cfs @ 12.10 hrs, Volume= 0.392 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

	Area (sf)	CN	Description
*	2,640	98	2 driveways
	57,025	39	>75% Grass cover, Good, HSG A
*	9,000	98	4 houses
*	2,600	98	Massapoag road
*	2,930	98	exist offsite houses, HSG A
*	1,350	98	ex. offsite driveways, HSG A
*	1,260	98	POOL
	76,805	54	Weighted Average
	57,025		74.25% Pervious Area
	19,780		25.75% Impervious Area

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

Subcatchment P-1: P-1



Summary for Subcatchment P-1U: P-1U

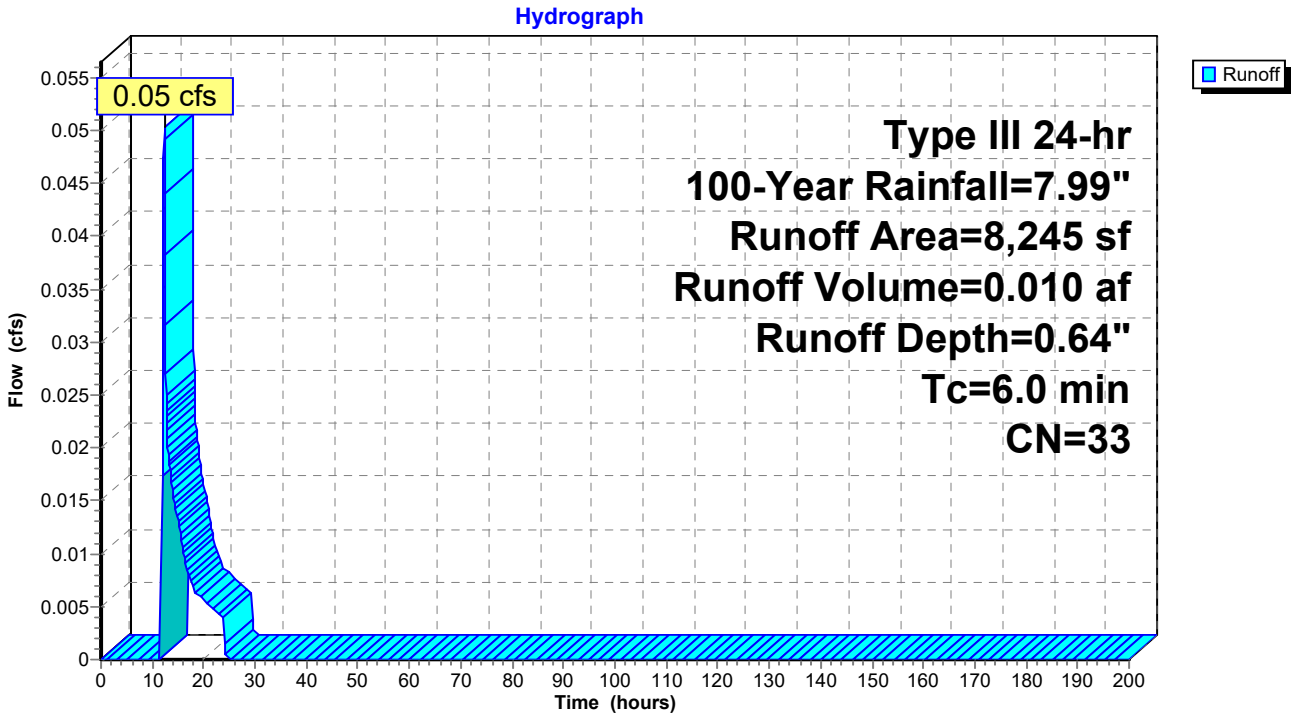
Runoff = 0.05 cfs @ 12.33 hrs, Volume= 0.010 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

	Area (sf)	CN	Description
	960	39	>75% Grass cover, Good, HSG A
	7,085	32	Woods/grass comb., Good, HSG A
*	200	55	rip rap
	8,245	33	Weighted Average
	8,245		100.00% Pervious Area

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

Subcatchment P-1U: P-1U



Summary for Subcatchment P-2: P-2

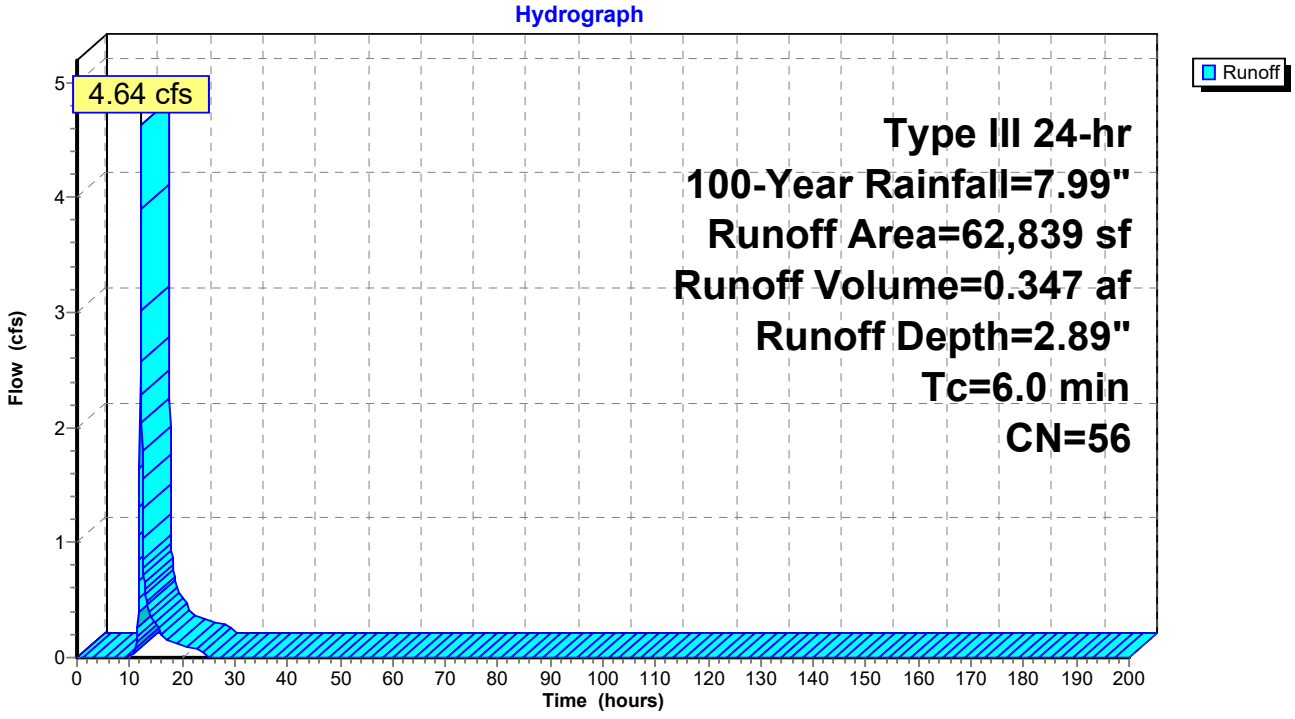
Runoff = 4.64 cfs @ 12.10 hrs, Volume= 0.347 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

	Area (sf)	CN	Description
*	4,960	98	5 driveways
	44,479	39	>75% Grass cover, Good, HSG A
*	8,900	98	Massapoag road
*	4,500	98	3 houses
	62,839	56	Weighted Average
	44,479		70.78% Pervious Area
	18,360		29.22% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-2U: P-2U

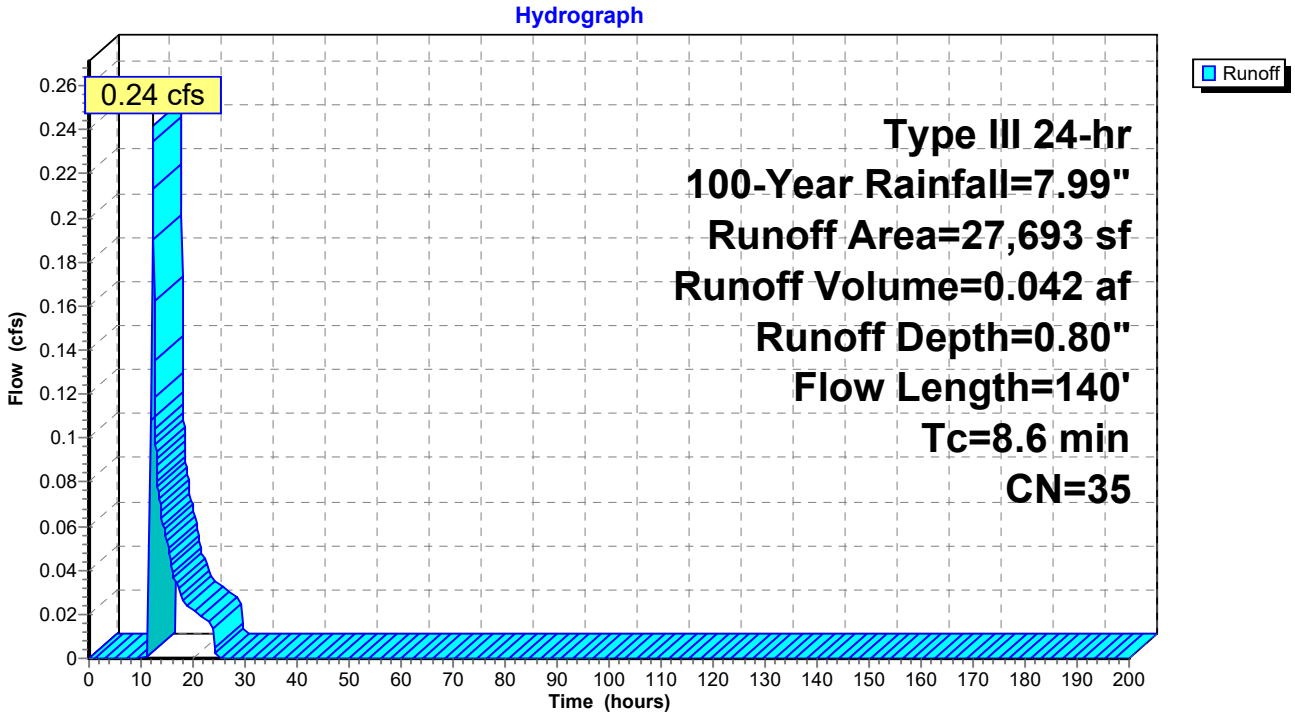
Runoff = 0.24 cfs @ 12.31 hrs, Volume= 0.042 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

	Area (sf)	CN	Description
	23,493	32	Woods/grass comb., Good, HSG A
*	4,200	55	rip rap, HSG A
	27,693	35	Weighted Average
	27,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.1	90	0.0800	1.41		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
8.6	140	Total			

Subcatchment P-2U: P-2U



Summary for Subcatchment P-3U: P-3U

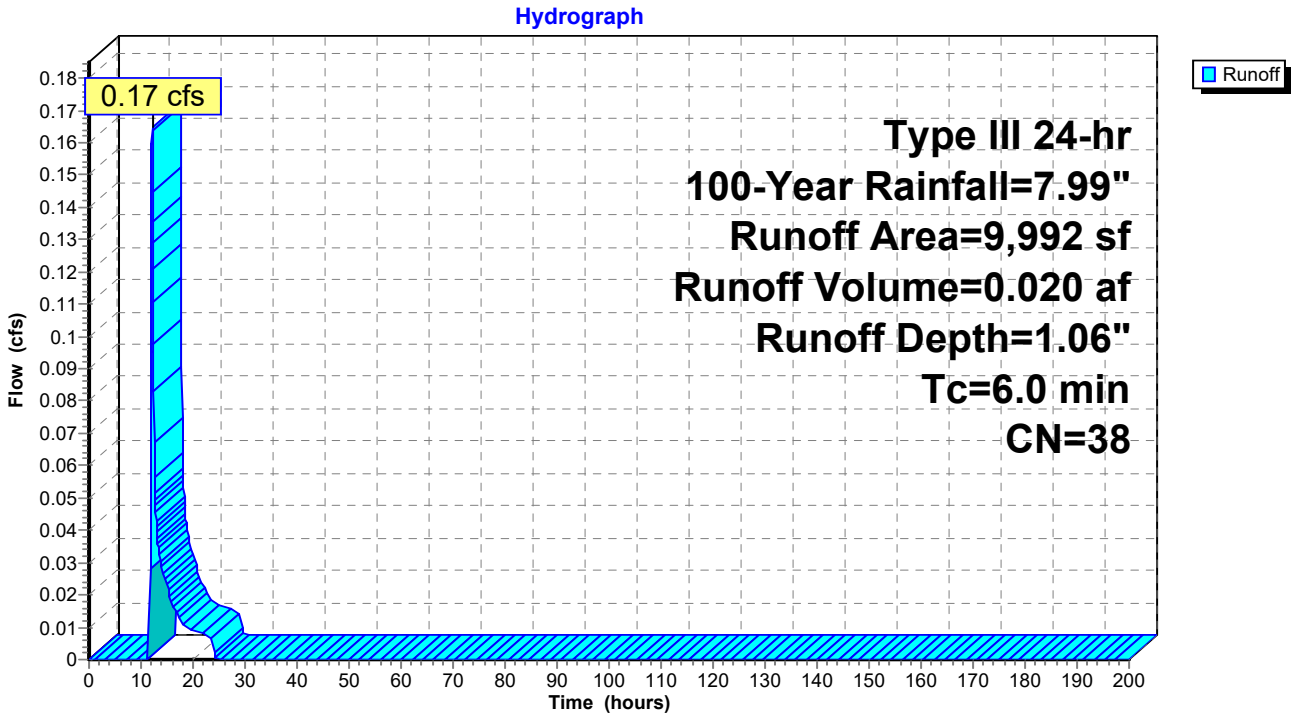
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.99"

	Area (sf)	CN	Description
	9,142	32	Woods/grass comb., Good, HSG A
*	850	98	ex house to remain
	9,992	38	Weighted Average
	9,142		91.49% Pervious Area
	850		8.51% Impervious Area

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

Subcatchment P-3U: P-3U

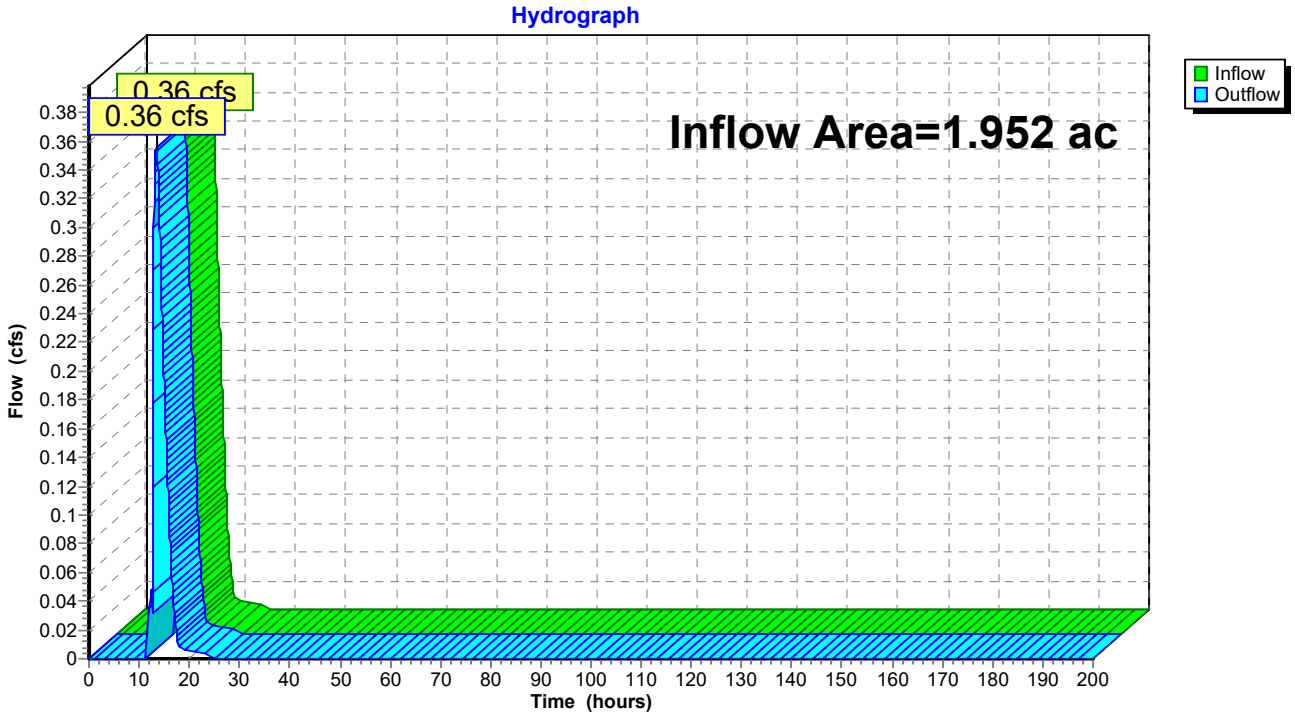


Summary for Reach 1: 1

Inflow Area = 1.952 ac, 23.26% Impervious, Inflow Depth = 0.48" for 100-Year event
Inflow = 0.36 cfs @ 13.36 hrs, Volume= 0.078 af
Outflow = 0.36 cfs @ 13.36 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 1: 1

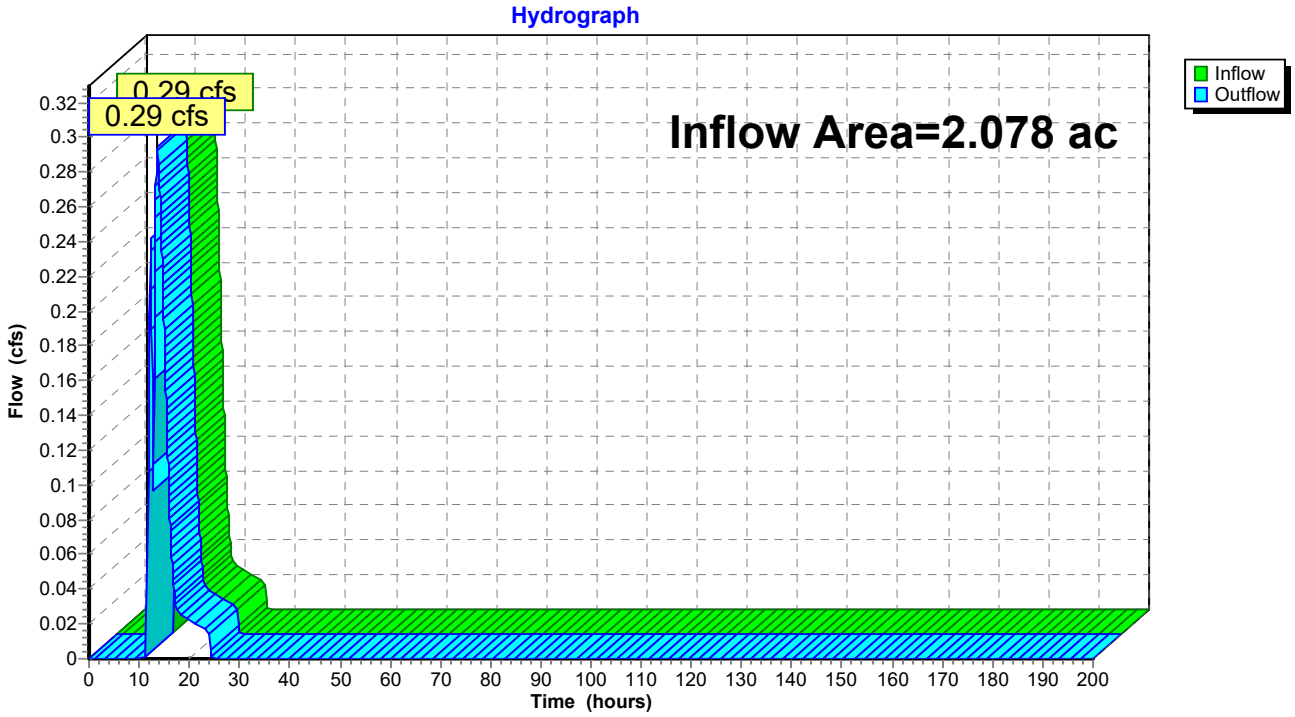


Summary for Reach 2: 2

Inflow Area = 2.078 ac, 20.28% Impervious, Inflow Depth = 0.48" for 100-Year event
Inflow = 0.29 cfs @ 13.65 hrs, Volume= 0.083 af
Outflow = 0.29 cfs @ 13.65 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 2: 2

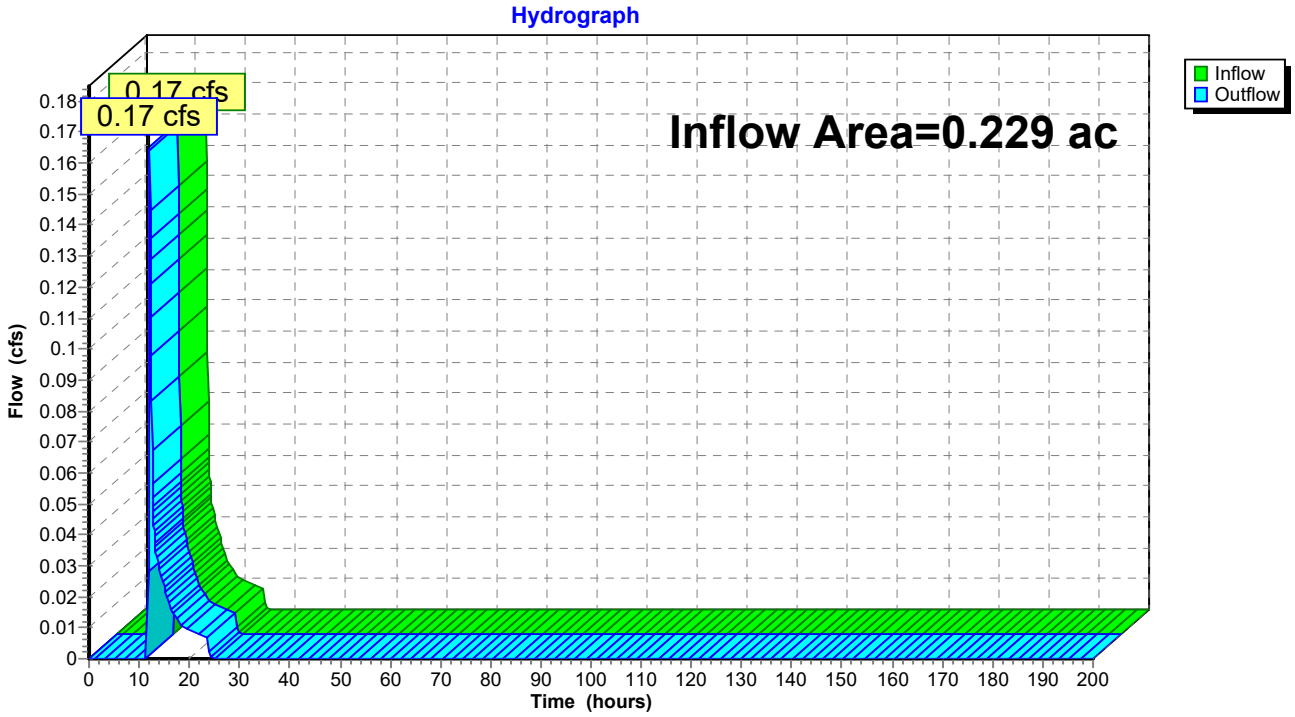


Summary for Reach 3: 3

Inflow Area = 0.229 ac, 8.51% Impervious, Inflow Depth = 1.06" for 100-Year event
Inflow = 0.17 cfs @ 12.13 hrs, Volume= 0.020 af
Outflow = 0.17 cfs @ 12.13 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Reach 3: 3



Summary for Pond UG 1: UG BAS 1

Inflow Area = 1.763 ac, 25.75% Impervious, Inflow Depth = 2.67" for 100-Year event
Inflow = 5.18 cfs @ 12.10 hrs, Volume= 0.392 af
Outflow = 0.54 cfs @ 13.37 hrs, Volume= 0.392 af, Atten= 90%, Lag= 76.2 min
Discarded = 0.20 cfs @ 11.60 hrs, Volume= 0.325 af
Primary = 0.34 cfs @ 13.37 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 168.43' @ 13.37 hrs Surf.Area= 3,544 sf Storage= 7,513 cf

Plug-Flow detention time= 337.1 min calculated for 0.392 af (100% of inflow)
Center-of-Mass det. time= 337.2 min (1,197.4 - 860.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,197 cf	**58.50'W x 60.58'L x 3.50'H Field A** 12,403 cf Overall - 4,410 cf Embedded = 7,993 cf x 40.0% Voids
#2A	165.50'	4,410 cf	**ADS_StormTech SC-740 +Cap** x 96 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 96 Chambers in 12 Rows
		7,607 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Horizontal area**
#2	Device 3	167.96'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.78'	**12.0" Round RCP_Round 12"** L= 17.7' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.78' / 167.60' S= 0.0102 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.20 cfs @ 11.60 hrs HW=165.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.34 cfs @ 13.37 hrs HW=168.43' (Free Discharge)
↑—**3=RCP_Round 12"** (Passes 0.34 cfs of 1.43 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.34 cfs @ 2.48 fps)

Pond UG 1: UG BAS 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

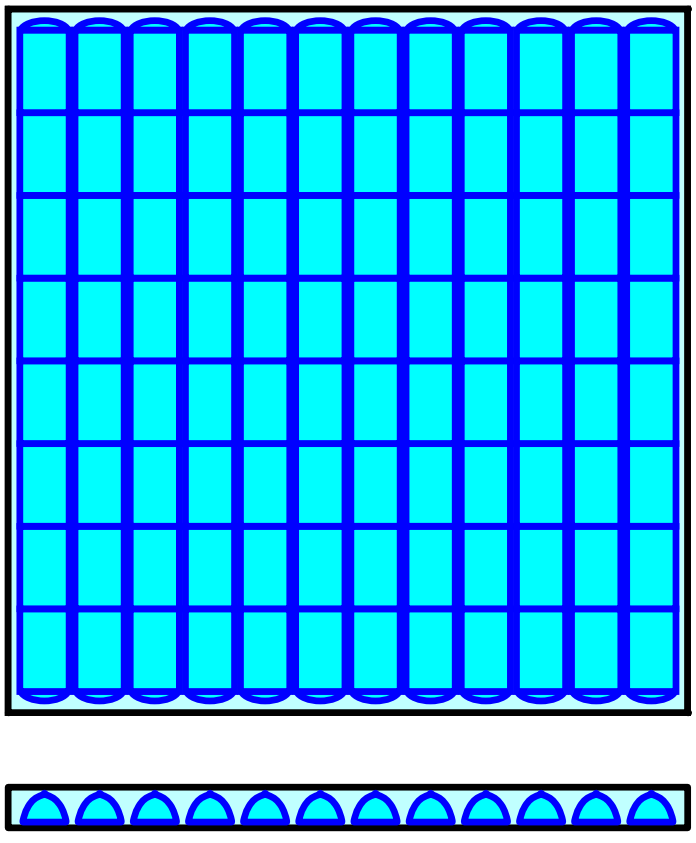
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 12.0" Side Stone x 2 = 58.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

96 Chambers x 45.9 cf = 4,410.2 cf Chamber Storage

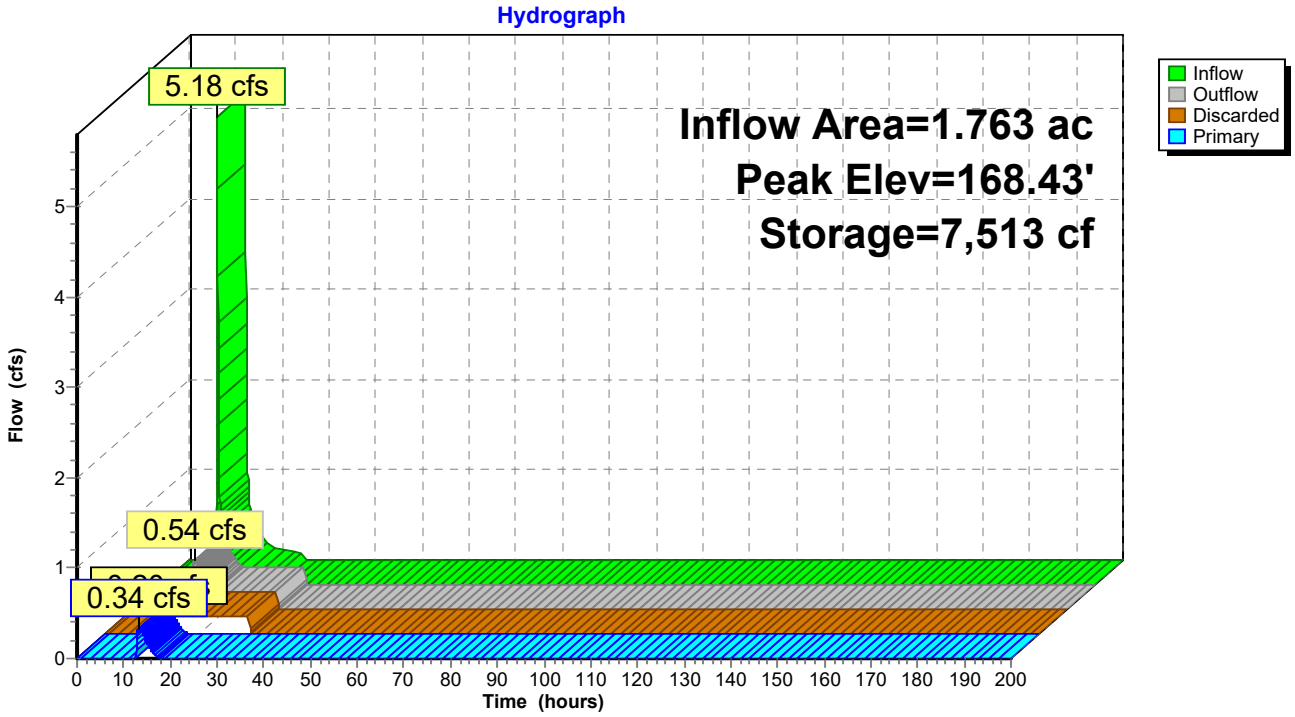
12,403.1 cf Field - 4,410.2 cf Chambers = 7,992.8 cf Stone x 40.0% Voids = 3,197.1 cf Stone Storage

Chamber Storage + Stone Storage = 7,607.4 cf = 0.175 af
Overall Storage Efficiency = 61.3%
Overall System Size = 60.58' x 58.50' x 3.50'

96 Chambers
459.4 cy Field
296.0 cy Stone



Pond UG 1: UG BAS 1



Summary for Pond UG 2: UG BAS 2

Inflow Area = 1.443 ac, 29.22% Impervious, Inflow Depth = 2.89" for 100-Year event
Inflow = 4.64 cfs @ 12.10 hrs, Volume= 0.347 af
Outflow = 0.41 cfs @ 13.71 hrs, Volume= 0.347 af, Atten= 91%, Lag= 96.6 min
Discarded = 0.19 cfs @ 13.71 hrs, Volume= 0.306 af
Primary = 0.22 cfs @ 13.71 hrs, Volume= 0.041 af

Routing by Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 170.65' @ 13.71 hrs Surf.Area= 2,179 sf Storage= 7,300 cf

Plug-Flow detention time= 405.9 min calculated for 0.347 af (100% of inflow)
Center-of-Mass det. time= 406.0 min (1,261.4 - 855.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.00'	3,357 cf	**80.08'W x 27.21'L x 5.67'H Field A** 12,348 cf Overall - 3,956 cf Embedded = 8,392 cf x 40.0% Voids
#2A	165.75'	3,956 cf	**ADS_StormTech MC-3500 d +Cap** x 33 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 33 Chambers in 11 Rows Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf
		7,313 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Device 3	170.20'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	167.14'	**12.0" Round RCP_Round 12"** L= 17.2' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 167.14' / 166.80' S= 0.0198 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.19 cfs @ 13.71 hrs HW=170.65' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.22 cfs @ 13.71 hrs HW=170.65' (Free Discharge)
↑—**3=RCP_Round 12"** (Passes 0.22 cfs of 8.52 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.22 cfs @ 2.57 fps)

Pond UG 2: UG BAS 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 11 rows = 327.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

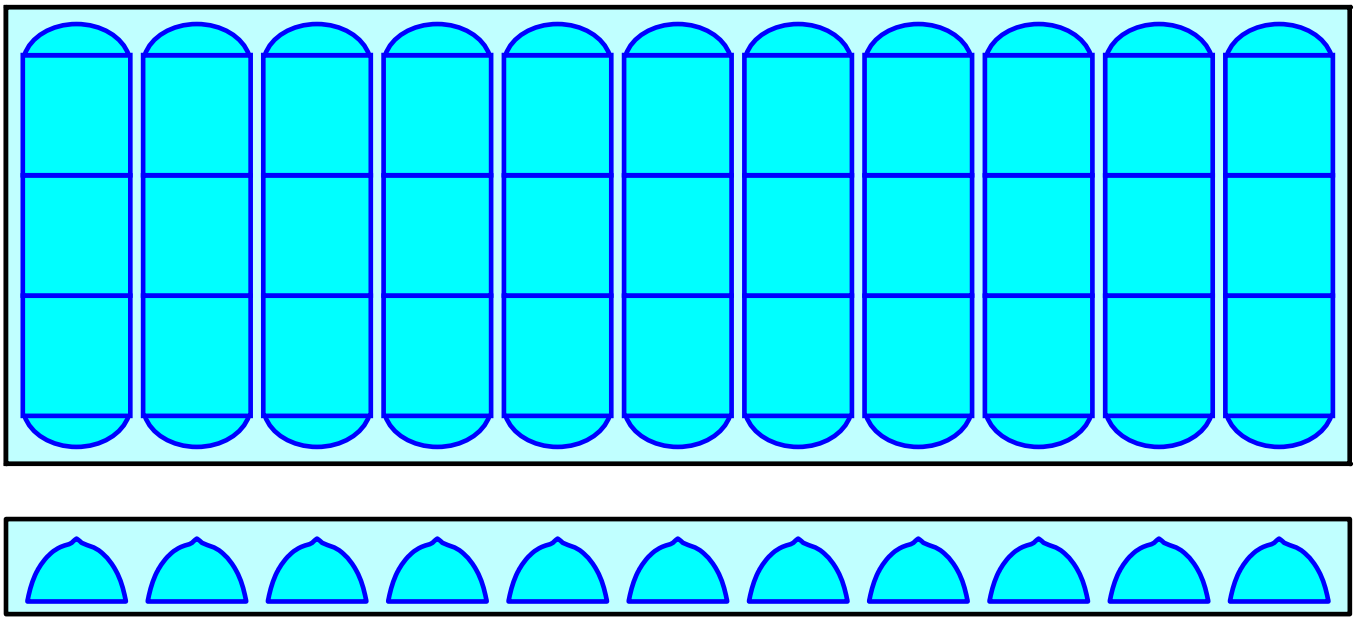
3 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 25.21' Row Length +12.0" End Stone x 2 = 27.21' Base Length
11 Rows x 77.0" Wide + 9.0" Spacing x 10 + 12.0" Side Stone x 2 = 80.08' Base Width
9.0" Base + 45.0" Chamber Height + 14.0" Cover = 5.67' Field Height

33 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 11 Rows = 3,956.2 cf Chamber Storage

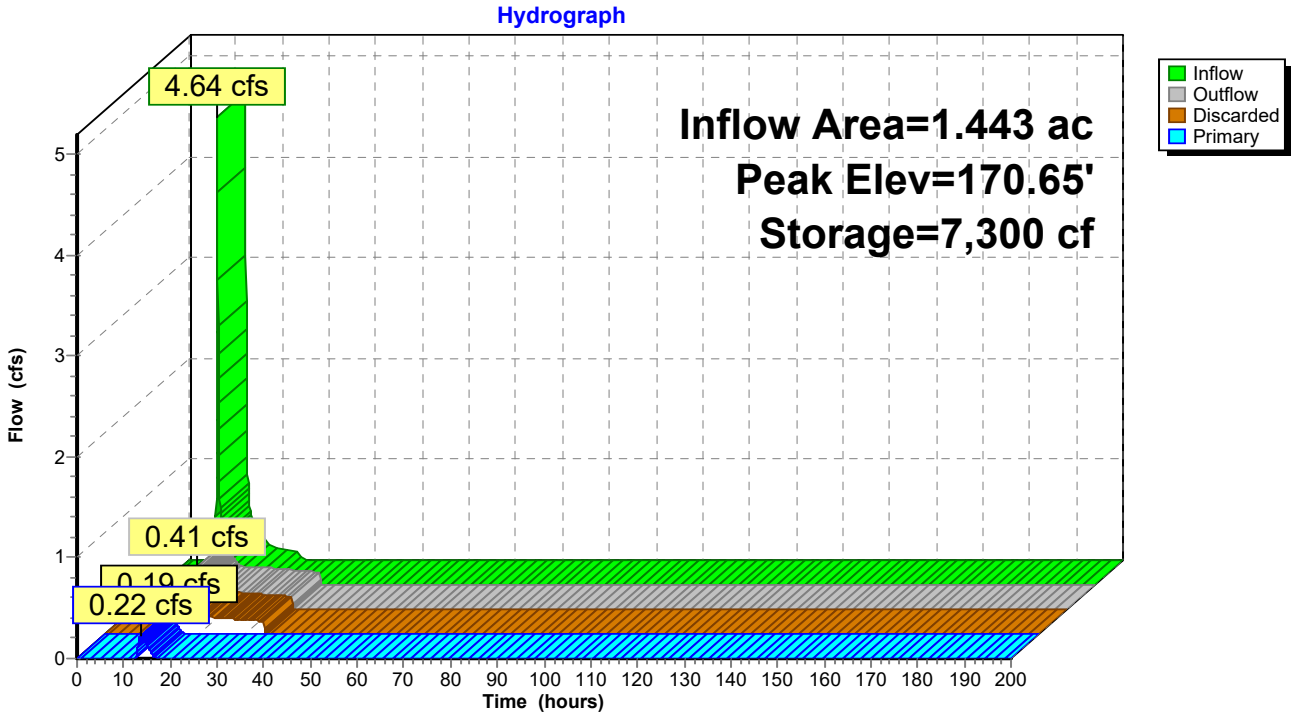
12,348.0 cf Field - 3,956.2 cf Chambers = 8,391.8 cf Stone x 40.0% Voids = 3,356.7 cf Stone Storage

Chamber Storage + Stone Storage = 7,312.9 cf = 0.168 af
Overall Storage Efficiency = 59.2%
Overall System Size = 27.21' x 80.08' x 5.67'

33 Chambers
457.3 cy Field
310.8 cy Stone



Pond UG 2: UG BAS 2



POINT OF DISCHARGE 1
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.00 cfs
25-YEAR STORM = 0.01 cfs
100-YEAR STORM =0.36 cfs

P-1U
AREA=8,245 SF
TC=6.0 MIN. (DIRECT ENTRY)
CN=33

P-2U
AREA=27,693 SF
TC=8.6 MIN.
CN=35

POINT OF DISCHARGE 2
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.01 cfs
25-YEAR STORM = 0.05 cfs
100-YEAR STORM = 0.29 cfs

BRAINTREE ASSESSORS REF: 1111-57

BRAINTREE ASSESSORS REF: 1112-25

P-2
AREA=62,839 SF
TC=6.0 MIN.
CN=56

P-1
AREA=76,805 SF
TC=6.0 MIN.
CN=54

POINT OF DISCHARGE 4
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.00 cfs
25-YEAR STORM = 0.00 cfs
100-YEAR STORM = 0.00 cfs

BRAINTREE ASSESSORS REF: 1115-06

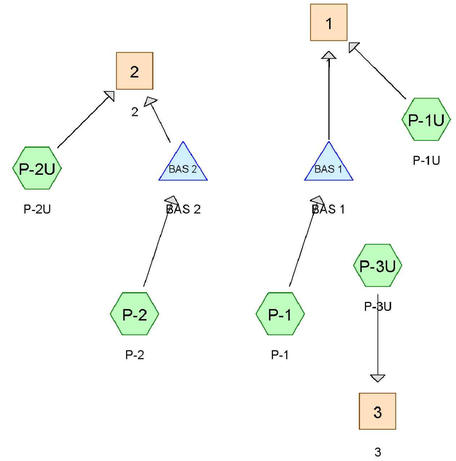
P-3U
AREA=9,992 SF
TC=6.0 MIN.(DIRECT ENTRY)
CN=30

POINT OF DISCHARGE 3
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 0.01 cfs
25-YEAR STORM = 0.04 cfs
100-YEAR STORM = 0.17 cfs

52 (HR-B/D)

424C (HRA)

Map unit symbol	Map unit name	Rating
52	Freetown muck, 0 to 1 percent slopes	B/D
424C	Canton fine sandy loam, 8 to 15 percent slopes, extremely bouldery	A



FOR REGISTRY USE ONLY

40 20 0 40 80

Date	Description	No.
2.11.22	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	5.
1.11.22	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	4.
11.19.21	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	3.
4.23.20	REVISED PER TOWN STAFF COMMENTS	2.
2.05.19	REVISED WETLAND FLAGS AND LOT	1.

Revisions

GABRIEL R. CROCKER CIVIL No. 47917 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
2-11-2022
GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

CROCKER DESIGN GROUP, LLC.
2 SHARP STREET, UNIT A
HINGHAM, MA 02043
P: 781-820-0416
MASSACHUSETTS

Project
DEFINITIVE SUBDIVISION PLAN
MASSAPOAG STREET
WEYMOUTH, MA

Prepared for
WEATHERVANE MASSAPOAG, LLC.
190 OLD DERBY STREET, SUITE 311
HINGHAM, MA 02043

Drawing Title
PROPOSED CONDITIONS WATERSHED ANALYSIS PLAN

APPROVAL UNDER THE SUBDIVISION CONTROL LAW
WEYMOUTH PLANNING BOARD
DATE:

PLANNING BOARD ENDORSEMENT DOES NOT IMPLY CONFORMANCE WITH TOWN OF WEYMOUTH ZONING BY-LAW.

Project No.	100-028
Date	12.20.2018
Scale	1"=40'
Drawn By	SZA
Approved By	GRC

Drawing No. **PW-1**

SECTION 4 – STORMWATER MANAGEMENT CALCS

4.1 RECHARGE CALCULATIONS

The Required Recharge Volume is computed using the equation provided in the 2008 Massachusetts Stormwater Handbook. The volume is computed as an equivalent depth of rainfall over the proposed impervious areas in accordance with a Target Depth Factor based on the soil classifications. The Calculations is as follows:

- Rv = F x impervious area (Equation 1) Volume 3, Ch 1, page 15
- *Rv = Required Recharge Volume*, expressed in cubic feet, cubic yards, or acre-feet
- *F* = Target Depth Factor associated with each Hydrologic Soil Group (HSG)
- *Impervious Area* = new pavement and new rooftop area
- *The Target Depth Factor "F" per Table 2.3.2, Volume 3, Chapter 1 for each soil classification is as follows:*
    - A soils = 0.60 inches
    - B soils = 0.35 inches
    - C soils = 0.25 inches
    - D soils = 0.10 inches

Based on the above formula, the required recharge volume for the site is as follows:

Recharge Within "A" Soils:

- Impervious Area = 33,890 SF
- 0.6 inches x 1/12 feet x 33,890 SF = 1,695 CUBIC FEET

TOTAL RECHARGE VOLUME REQUIRED = 1,632 CUBIC FEET

Capture Area Adjustment:

Not required. All impervious area associated with the overall development is conveyed to the recharge BMP's.

TOTAL RECHARGE VOLUME PROVIDED = 7,179 CUBIC FEET (see below)

Recharge Volume BMP Table

Infiltration BMP	***Infiltration Rate (in/hr) k***	***Storage (Recharge) Volume (c.f.) Rv***
BAS 1	*2.41*	*4,356*
BAS 2	*2.41*	*2,823*
Totals		***7,179***

The Storage Recharge volume numbers provided in the table above have been derived utilizing the HydroCAD output for stage storage. The following pages provide a copy of those printouts and the cumulative stage-storage up to the controlling invert elevation has been highlighted.

Conclusion:

The recharge provided by the proposed underground systems greatly exceeds the required recharge by 4.40 times. The project satisfies Standard 3 of the Massachusetts DEP Stormwater Regulations accordingly.

4.2 DRAWDOWN TIME

Below are the drawdown time calculations for the infiltration BMPs proposed on the site. The calculation uses estimated hydraulic conductivity values "*K"* in accordance with the Rawls Rates table. The formula below utilized the recommended formula per the MA Stormwater Handbook as follows:

- Drawdown Time = Rv / ((K/12)*Bottom Area)
- Rv = Storage Volume (cf)
- K – Saturated Hydraulic Conductivity per Rawls Rate Table
- Bottom Area = Area of Bottom of Proposed Recharge Structure

Below is a summary table of the drawdown calculations:

BASIN DRAWDOWN CALCULATIONS				
Infiltration BMP	***Infiltration Rate (in/hr) k***	***Storage (Recharge) Volume (c.f.) Rv***	***Bottom Area (s.f.)***	***Draw Down Time(hours)***
BAS 1	*2.41*	*4,356*	*3,544*	6.12
BAS 2	*2.41*	*2,829*	*2179*	6.46
Totals		***7,179***		**12.58**
k = saturated hydraulic conductivity (in/hr) *Rv = storage volume (c.f.)* *Bottom Area (s.f.)* *Volume 3, Chapter 1 of the MA Stormwater Handbook*				

Conclusion:

The calculations show that the infiltration BMP draws down in 12.58 hours which is less than the required 72 hours.

Stage-Area-Storage for Pond UG 1: UG BAS 1

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
165.00	**3,544**	0
165.05	3,544	71
165.10	3,544	142
165.15	3,544	213
165.20	3,544	283
165.25	3,544	354
165.30	3,544	425
165.35	3,544	496
165.40	3,544	567
165.45	3,544	638
165.50	3,544	709
165.55	3,544	856
165.60	3,544	1,003
165.65	3,544	1,150
165.70	3,544	1,296
165.75	3,544	1,442
165.80	3,544	1,588
165.85	3,544	1,733
165.90	3,544	1,877
165.95	3,544	2,021
166.00	3,544	2,165
166.05	3,544	2,307
166.10	3,544	2,449
166.15	3,544	2,591
166.20	3,544	2,732
166.25	3,544	2,872
166.30	3,544	3,011
166.35	3,544	3,150
166.40	3,544	3,287
166.45	3,544	3,424
166.50	3,544	3,560
166.55	3,544	3,696
166.60	3,544	3,830
166.65	3,544	3,963
166.70	3,544	4,095
166.75	3,544	4,226
166.80	3,544	4,356
166.85	3,544	4,485
166.90	3,544	4,613
166.95	3,544	4,739
167.00	3,544	4,864
167.05	3,544	4,988
167.10	3,544	5,111
167.15	3,544	5,231
167.20	3,544	5,350
167.25	3,544	5,468
167.30	3,544	5,583
167.35	3,544	5,696
167.40	3,544	5,808
167.45	3,544	5,917
167.50	3,544	6,024
167.55	3,544	6,129
167.60	3,544	6,231
167.65	3,544	6,329
167.70	3,544	6,423
167.75	3,544	6,512
167.80	3,544	6,596
167.85	3,544	6,676
167.90	3,544	6,752
167.95	3,544	6,827
168.00	3,544	6,899
168.05	3,544	6,970
168.10	3,544	7,040
168.15	3,544	7,111
168.20	3,544	7,182
168.25	3,544	7,253
168.30	3,544	7,324
168.35	3,544	7,395
168.40	3,544	7,466
168.45	3,544	7,536
168.50	3,544	**7,607**
168.55	3,544	7,607
168.60	3,544	7,607
168.65	3,544	7,607
168.70	3,544	7,607
168.75	3,544	7,607

Stage-Area-Storage for Pond UG 2: UG BAS 2

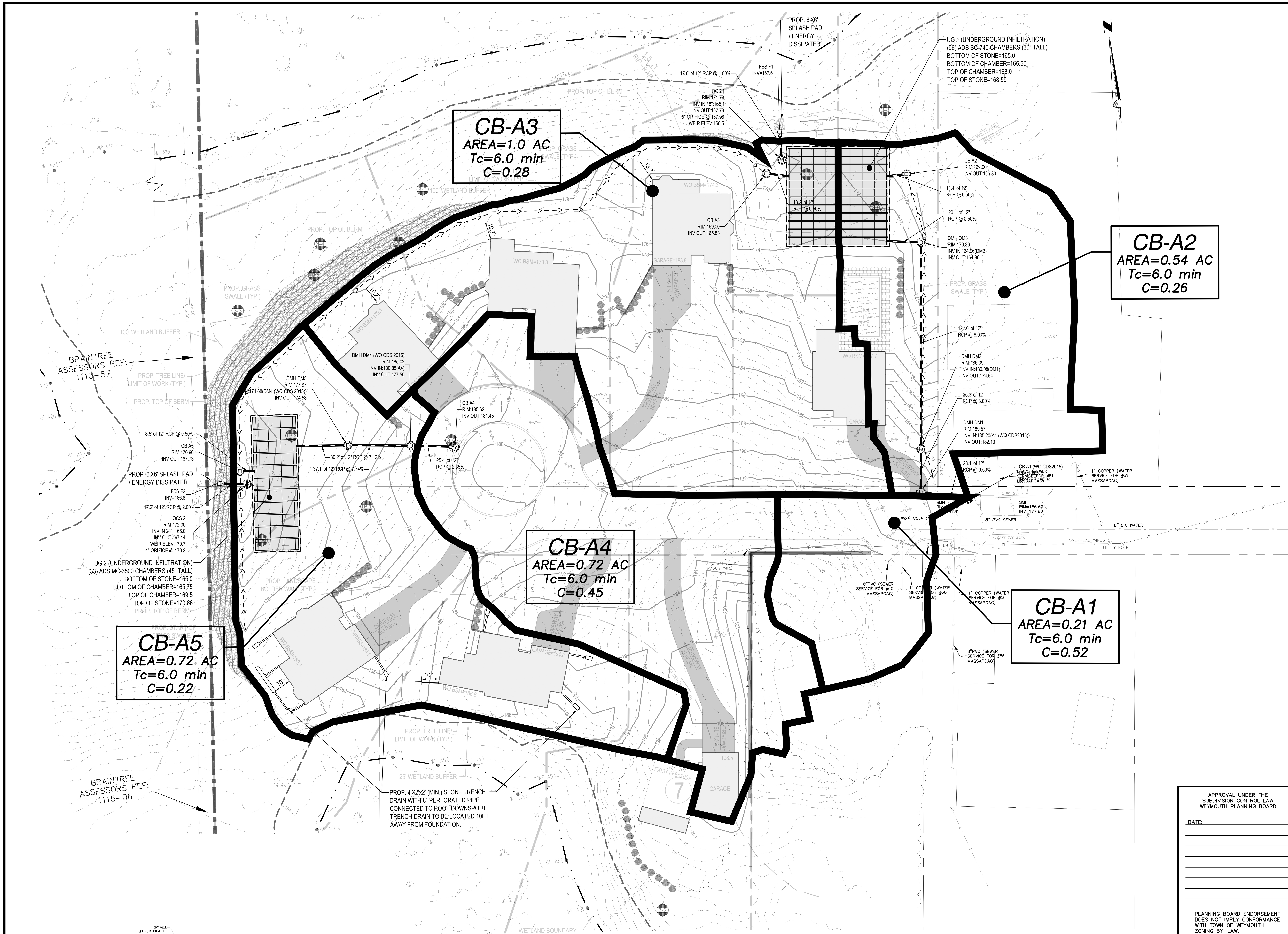
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
165.00	2,179	0
165.10	2,201	87
165.20	2,222	174
165.30	2,243	261
165.40	2,265	349
165.50	2,286	436
165.60	2,308	523
165.70	2,329	610
165.80	2,351	743
165.90	2,372	920
166.00	2,394	1,097
166.10	2,415	1,273
166.20	2,437	1,449
166.30	2,458	1,623
166.40	2,479	1,797
166.50	2,501	1,971
166.60	2,522	2,143
166.70	2,544	2,314
166.80	2,565	2,485
166.90	2,587	2,654
167.00	2,608	2,823
167.10	2,630	2,990
167.20	2,651	3,156
167.30	2,673	3,321
167.40	2,694	3,484
167.50	2,716	3,646
167.60	2,737	3,806
167.70	2,758	3,964
167.80	2,780	4,121
167.90	2,801	4,276
168.00	2,823	4,429
168.10	2,844	4,580
168.20	2,866	4,728
168.30	2,887	4,874
168.40	2,909	5,017
168.50	2,930	5,157
168.60	2,952	5,294
168.70	2,973	5,428
168.80	2,994	5,557
168.90	3,016	5,683
169.00	3,037	5,802
169.10	3,059	5,914
169.20	3,080	6,018
169.30	3,102	6,114
169.40	3,123	6,207
169.50	3,145	6,296
169.60	3,166	6,383
169.70	3,188	6,470
169.80	3,209	6,558
169.90	3,231	6,645
170.00	3,252	6,732
170.10	3,273	6,819
170.20	3,295	6,906
170.30	3,316	6,993
170.40	3,338	7,081
170.50	3,359	7,168
170.60	**3,381**	**7,255**

4.3 WATER QUALITY

This site qualifies for the treatment of 1.0" of Rainfall under the MA Stormwater Regulations because the wetland to the North of the project is tributary to Mill River which is and Outstanding Resource Water. Therefore, the wetland the project is discharging to qualifies as a Critical Area. A table has been provided below that provides the sizing of the CDS Water Quality Units.

Water Quality Unit Sizing Using Equivalent Flow from 1" Rainfall Depth

Basin	Tributary Area (acres)	Tributary Area (sq miles)	% Impervious	CN Value (Estimated)	WQV (Watershed Inches)	Tc (min)	qu (csm/in)	WQF = qu A Q (cfs)	Unit
CBA1- WQU	0.21	0.0003	37%	0.52	1.00	5	795	0.26	CDS2015
DMH DM4- WQU	0.72	0.0011	57%	0.45	1.00	5	795	0.89	CDS2015


CB-A3
AREA=1.0 AC
Tc=6.0 min
C=0.28
CB-A2
AREA=0.54 AC
Tc=6.0 min
C=0.26
CB-A4
AREA=0.72 AC
Tc=6.0 min
C=0.45
CB-A5
AREA=0.72 AC
Tc=6.0 min
C=0.22
CB-A1
AREA=0.21 AC
Tc=6.0 min
C=0.52
PROP. 6'X6' SPLASH PAD / ENERGY DISSIPATER
UG 1 (UNDERGROUND INFILTRATION)
(96) ADS SC-740 CHAMBERS (30" TALL)
BOTTOM OF STONE=165.0
BOTTOM OF CHAMBER=165.50
TOP OF CHAMBER=168.0
TOP OF STONE=168.50
FES F1
INV=167.6
17.8' of 12" RCP @ 1.00%
OCS 1
RIM:171.78
INV IN 18":165.1
INV OUT:167.78
5" ORIFICE @ 167.96
WEIR ELEV:168.5
CB A3
RIM:169.00
INV OUT:165.83
CB A2
RIM:169.00
INV OUT:165.83
11.4' of 12" RCP @ 0.50%
20.1' of 12" RCP @ 0.50%
DMH DM3
RIM:170.36
INV IN:164.96(DM2)
INV OUT:164.86
121.0' of 12" RCP @ 8.00%
DMH DM2
RIM:186.39
INV IN:180.08(DM1)
INV OUT:174.64
25.3' of 12" RCP @ 8.00%
DMH DM1
RIM:189.57
INV IN:185.20(A1 (WQ CDS2015))
INV OUT:182.10
28.1' of 12" RCP @ 0.50%
CB A1 (WQ CDS2015)
SMH
RIM=186.60
INV=177.80
8" PVC SEWER
8" D.I. WATER
1" COPPER (WATER SERVICE FOR #51 MASSAPOAG)
6"PVC (SEWER SERVICE FOR #60 MASSAPOAG)
1" COPPER (WATER SERVICE FOR #60 MASSAPOAG)
1" COPPER (WATER SERVICE FOR #56 MASSAPOAG)
6"PVC (SEWER SERVICE FOR #56 MASSAPOAG)
DMH DM4 (WQ CDS 2015)
RIM:185.02
INV IN:180.85(A4)
INV OUT:177.55
DMH DM5
RIM:177.87
INV IN:174.68(DM4 (WQ CDS 2015))
INV OUT:174.58
CB A4
RIM:185.62
INV OUT:181.45
30.2' of 12" RCP @ 7.12%
37.1' of 12" RCP @ 7.74%
25.4' of 12" RCP @ 2.35%
8.5' of 12" RCP @ 0.50%
CB A5
RIM:170.90
INV OUT:167.73
PROP. 6'X6' SPLASH PAD / ENERGY DISSIPATER
FES F2
INV=166.8
17.2' of 12" RCP @ 2.00%
OCS 2
RIM:172.00
INV IN 24": 166.0
INV OUT:167.14
WEIR ELEV:170.7
4" ORIFICE @ 170.2
UG 2 (UNDERGROUND INFILTRATION)
(33) ADS MC-3500 CHAMBERS (45" TALL)
BOTTOM OF STONE=165.0
BOTTOM OF CHAMBER=165.75
TOP OF CHAMBER=169.5
TOP OF STONE=170.66
BRAINTREE ASSESSORS REF: 1113-57
BRAINTREE ASSESSORS REF: 1115-06
PROP. 4'X2'x2' (MIN.) STONE TRENCH DRAIN WITH 8" PERFORATED PIPE CONNECTED TO ROOF DOWNSPOUT. TRENCH DRAIN TO BE LOCATED 10FT AWAY FROM FOUNDATION.
100' WETLAND BUFFER
25' WETLAND BUFFER
PROP. TOP OF BERM
PROP. GRASS SWALE (TYP.)
PROP. TREE LINE/ LIMIT OF WORK (TYP.)
WETLAND BOUNDARY
25 12.5 0 25 50
APPROVAL UNDER THE SUBDIVISION CONTROL LAW WEYMOUTH PLANNING BOARD
DATE:
PLANNING BOARD ENDORSEMENT DOES NOT IMPLY CONFORMANCE WITH TOWN OF WEYMOUTH ZONING BY-LAW.

FOR REGISTRY USE ONLY

Date	Description	No.
2.11.22	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	5.
1.11.22	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	4.
11.19.21	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	3.
4.23.20	REVISED PER TOWN STAFF COMMENTS	2.
2.05.19	REVISED WETLAND FLAGS AND LOT	1.

Revisions

2-11-2022
GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

COMMONWEALTH OF MASSACHUSETTS GABRIEL R. CROCKER CIVIL No. 47917 REGISTERED PROFESSIONAL ENGINEER

CROCKER DESIGN GROUP, LLC.
2 SHARP STREET, UNIT A
HINGHAM, MA 02043
P: 781-820-0416
MASSACHUSETTS

Project
DEFINITIVE SUBDIVISION PLAN
MASSAPOAG STREET
WEYMOUTH, MA

Prepared for
WEATHERVANE MASSAPOAG, LLC.
190 OLD DERBY STREET, SUITE 311
HINGHAM, MA 02043

Drawing Title
PROPOSED SUBCATCHMENT AREA PLAN

Project No. 100-028
Date 12.20.2018
Scale 1"=25'
Drawn By SZA
Approved By GRC
Drawing No. **PW-2**

particle re-suspension. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 20 inches in diameter.

2. The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills. The minimum storage capacity provided by the SWTD shall be in accordance with the volume listed in Table 1 below.

TABLE 1

CDS Model	Treatment Capacity (cfs)/(L/s)	Minimum Sump Storage Capacity (yd^3)/(m^3)	Minimum Oil Storage Capacity (gal)/(L)
CDS2015-G	0.7 (19.8)	0.5 (0.4)	70 (265)
CDS2015-4	0.7 (19.8)	0.5 (1.4)	70 (265)
CDS2015	0.7(19.8)	1.3 (1.0)	92 (348)
CDS2020	1.1 (31.2)	1.3 (1.0)	131 (496)
CDS2025	1.6 (45.3)	1.3 (1.0)	143 (541)
CDS3020	2.0 (56.6)	2.1 (1.6)	146 (552)
CDS3030	3.0 (85.0)	2.1 (1.6)	205 (776)
CDS3035	3.8 (106.2)	2.1 (1.6)	234 (885)
CDS4030	4.5 (127.4)	5.6 (4.3)	407 (1540)
CDS4040	6.0 (169.9)	5.6 (4.3)	492 (1862)
CDS4045	7.5 (212.4)	5.6 (4.3)	534 (2012)
CDS2020-D	1.1 (31.2)	1.3 (1.0)	131 (495)
CDS3020-D	2.0 (56.6)	2.1 (1.6)	146 (552)
CDS3030-D	3.0 (85.0)	2.1 (1.6)	205 (776)
CDS3035-D	3.8 (106.2)	2.1 (1.6)	234 (885)
CDS4030-D	4.5 (127.4)	4.3 (3.3)	328 (1241)
CDS4040-D	6.0 (169.9)	4.3 (3.3)	396 (1499)
CDS4045-D	7.5 (212.4)	4.3 (3.3)	430 (1627)
CDS5640-D	9.0 (254.9)	5.6 (4.3)	490 (1854)
CDS5653-D	14.0 (396.5)	5.6 (4.3)	599 (2267)
CDS5668-D	19.0 (538.1)	5.6 (4.3)	733 (2774)
CDS5678-D	25.0 (708.0)	5.6 (4.3)	814 (3081)
CDS3030-DV	3.0 (85.0)	2.1 (1.6)	205 (776)
CDS5042-DV	9.0 (254.9)	1.9 (1.5)	294 (1112)
CDS5050-DV	11.0 (311.5)	1.9 (1.5)	367 (1389)
CDS7070-DV	26.0 (736.3)	3.3 (2.5)	914 (3459)
CDS10060-DV	30.0 (849.6)	5.0 (3.8)	792 (2997)
CDS10080-DV	50.0 (1416.0)	5.0 (3.8)	1057 (4000)
CDS100100-DV	64.0 (1812.5)	5.0 (3.8)	1320 (4996)

D. Alternate Treatment Technologies and Sizing Criteria

The sizing criteria for treatment systems must conform to the recommended loading rate and 3rd party testing data requirements as mentioned below:

1. CDS Screening Systems – designed for full treatment of the runoff rate at a loading rate not to exceed the critical flow in the inlet, in order to achieve 80% TSS removal efficiency. (80% TSS removal based on a average particles size of 63 micron)
2. Vortex separation systems – designed for full treatment of the runoff rate at a loading rate not to exceeding 24 gpm/ft2, in order to achieve 80% TSS removal efficiency. The hydraulic capacity should not exceed a loading rate of 100 gpm/ft2 to prevent scouring of previously captured particles. 80% TSS removal based on a average particles size of 63 micron)
3. Gravity systems – designed for full treatment of the runoff rate at a loading rate not to exceeding 10 gpm/ft2, in order to achieve 80% TSS removal efficiency. The gravity units will not exceed luminar flow condition parameters in the treatment unit but will provide a bypass system to prevent turbulence from accruing in the system. (See "Stokes Law" for gravity settling requirements of particles. 80% TSS removal based on a average particles size of 63 micron)

Additionally, the performance of the unit must be evaluated by a third party and verified in a program that allows a more-or-less direct comparison to other technologies. Performance should be third party verified, and removal efficiencies across the spectrum of particle sizes reported, at a range of hydraulic loading rates varying over a range of at least 25 to 125% of the manufacturer's advertised 'water treatment' loading rate.

2.3 MANUFACTURER

The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a CDS® device manufactured by:

Contech Engineered Solutions
9025 Centre Pointe Dr., Suite 400
West Chester, OH 45069
(800) 338-1122

4.4 RIP RAP SPLASH PAD

Rip rap splash pads are designed to dissipate energy, prevent scour at the stormwater outlet, and minimize the potential for downstream erosion. A riprap splash pad was sized for each of the outlets of the drainage system. The calculations below are in accordance with the methodology of the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" produced by The Connecticut Council on Soil and Water Conservation.

Rip-Rap Outlet Sizing Calculations

	Q	Do	TW	La	W	d50	
	(cfs)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(in.)
FES F1	0.54	1.00	0.30	8.92	11.92	0.03	0.35
FES F2	0.41	1.00	0.30	8.70	11.70	0.02	0.24

Conclusion:

As identified above, the discharge points have been designed to accommodate and exceed the required minimum rip-rap stone sizing.

4.5 TSS REMOVAL

The project has been designed to comply with the required 80% TSS (minimum) removal per the Massachusetts Stormwater Regulations. Various combinations of stormwater BMPs including deep sump hooded catch basins, proprietary water quality units and an infiltration basin.

Please refer to the attached TSS calculation sheets that follow:

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: CB A1, WQU, UG-1

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
CDS Water Quality Unit	**0.80**	**0.75**	**0.60**	**0.15**
Underground Infiltration Chambers	**0.80**	**0.15**	**0.12**	**0.03**
	0.00	**0.03**	**0.00**	**0.00**
	0.00	**0.03**	**0.00**	**0.00**

Total TSS Removal = **97%**

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

Project: **Massapoag, Weymouth**

Prepared By: **SZA**

Date: **Revised 2/11/22**

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

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Massapoag**	Location:	SWALE BEHIND HOUSES	
By:	SZA	Date:	2.11.22	
Chk By:	GC	Date:	2.11.22	version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

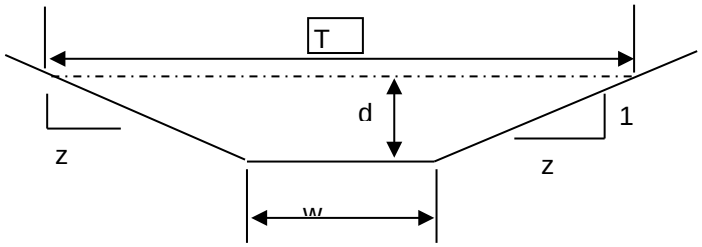
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT

z (sideslope)=	3
z (sideslope)=	3
b (btm width, ft)=	2
d (depth, ft)=	0.5
S (slope, ft/ft)	0.01
n_{low} =	0.05
n_{high} =	0.05

Clear Data Entry Cells

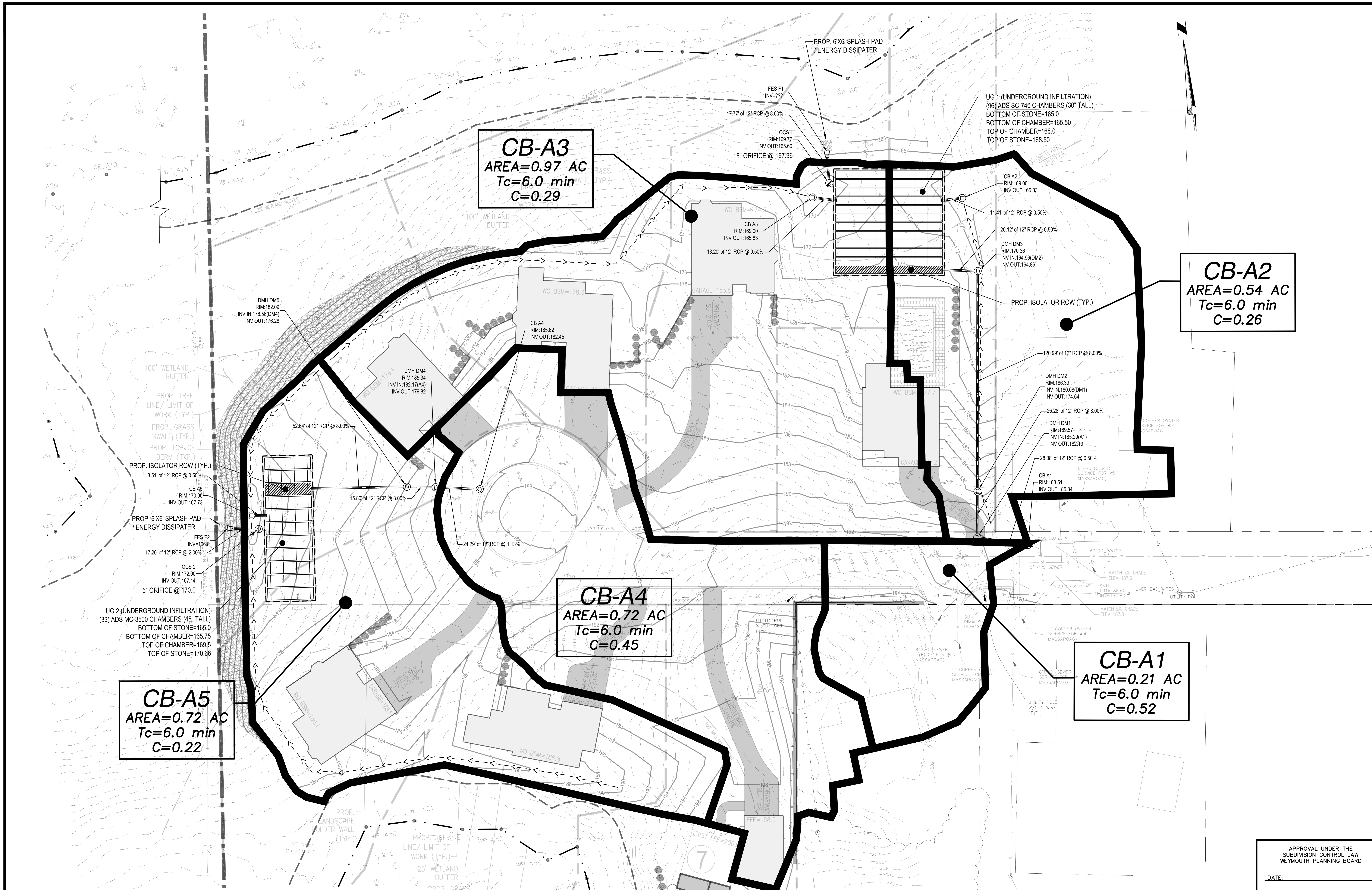
				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	1.75	5.16	0.34	1.4448772	2.52854	1.444877	2.52854	T =	5
								Dm =	0.350
				Sc low =	0.0539	Sc high =	0.0539		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0377	0.0701	0.0377	0.0701		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea



CB-A3
AREA=0.97 AC
Tc=6.0 min
C=0.29
CB-A2
AREA=0.54 AC
Tc=6.0 min
C=0.26
CB-A4
AREA=0.72 AC
Tc=6.0 min
C=0.45
CB-A1
AREA=0.21 AC
Tc=6.0 min
C=0.52
CB-A5
AREA=0.72 AC
Tc=6.0 min
C=0.22
PROP. 6'X6' SPLASH PAD / ENERGY DISSIPATER
FES F1
INV=???
17.77' of 12" RCP @ 8.00%
OCS 1
RIM:169.77
INV OUT:165.60
5" ORIFICE @ 167.96
UG 1 (UNDERGROUND INFILTRATION)
(96) ADS SC-740 CHAMBERS (30" TALL)
BOTTOM OF STONE=165.0
BOTTOM OF CHAMBER=165.50
TOP OF CHAMBER=168.0
TOP OF STONE=168.50
CB A2
RIM:169.00
INV OUT:165.83
11.41' of 12" RCP @ 0.50%
20.12' of 12" RCP @ 0.50%
DMH DM3
RIM:170.36
INV IN:164.96(DM2)
INV OUT:164.86
PROP. ISOLATOR ROW (TYP.)
120.99' of 12" RCP @ 8.00%
DMH DM2
RIM:186.39
INV IN:180.08(DM1)
INV OUT:174.64
25.28' of 12" RCP @ 8.00%
DMH DM1
RIM:189.57
INV IN:185.20(A1)
INV OUT:182.10
28.08' of 12" RCP @ 0.50%
CB A1
RIM:188.51
INV OUT:185.34
CB A3
RIM:169.00
INV OUT:165.83
13.20' of 12" RCP @ 0.50%
CB A4
RIM:185.62
INV OUT:182.45
DMH DM5
RIM:182.09
INV IN:178.56(DM4)
INV OUT:176.28
DMH DM4
RIM:185.34
INV IN:182.17(A4)
INV OUT:179.82
52.64' of 12" RCP @ 8.00%
15.80' of 12" RCP @ 8.00%
24.29' of 12" RCP @ 1.13%
PROP. ISOLATOR ROW (TYP.)
8.51' of 12" RCP @ 0.50%
CB A5
RIM:170.90
INV OUT:167.73
PROP. 6'X6' SPLASH PAD / ENERGY DISSIPATER
FES F2
INV=166.8
17.20' of 12" RCP @ 2.00%
OCS 2
RIM:172.00
INV OUT:167.14
5" ORIFICE @ 170.0
UG 2 (UNDERGROUND INFILTRATION)
(33) ADS MC-3500 CHAMBERS (45" TALL)
BOTTOM OF STONE=165.0
BOTTOM OF CHAMBER=165.75
TOP OF CHAMBER=169.5
TOP OF STONE=170.66
100' WETLAND BUFFER
PROP. TREE LINE/ LIMIT OF WORK (TYP.)
PROP. GRASS SWALE (TYP.)
25' WETLAND BUFFER
LOT AREA 29,941 S.F.

	TOTAL		GRASS AREA		PAVED AREA		TOTAL AREA	RUNOFF
CB	AREA (S.F.)	AREA (AC)	S.F.	AC	S.F.	ACRES	(ACRES)	COEFFICIENT
A1	9050.00	0.21	4335.00	0.10	4715.00	0.11	0.21	0.52
A2	23856.00	0.55	18956.00	0.44	4900.00	0.11	0.55	0.26
A3	42221.00	0.97	32121.00	0.74	10100.00	0.23	0.97	0.29
A4	31294.00	0.72	17752.00	0.41	13542.00	0.31	0.72	0.45
A5	31542.00	0.72	26677.00	0.61	4865.00	0.11	0.72	0.22

FOR REGISTRY USE ONLY

25 12.5 0 25 50

Date	Description	No.
1.11.22	REVISED PER DPW COMMENTS	3.
11.19.21	REV. PER CON. COMM. AND TOWN ENG. COMMENTS	3.
4.23.20	REVISED PER TOWN STAFF COMMENTS	2.
2.05.19	REVISED WETLAND FLAGS AND LOT	1.

Revisions

GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER
1-11-2022

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

CROCKER DESIGN GROUP, LLC.

2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-820-0416

MASSACHUSETTS

Project
DEFINITIVE SUBDIVISION PLAN
MASSAPOAG STREET
WEYMOUTH, MA

Prepared for
WEATHERVANE MASSAPOAG, LLC.
190 OLD DERBY STREET, SUITE 311
HINGHAM, MA 02043

APPROVAL UNDER THE SUBDIVISION CONTROL LAW WEYMOUTH PLANNING BOARD

DATE:

PLANNING BOARD ENDORSEMENT DOES NOT IMPLY CONFORMANCE WITH TOWN OF WEYMOUTH ZONING BY-LAW.

Drawing Title
PROPOSED SUBCATCHMENT AREA PLAN

Project No.	100-029	Drawing No.
Date	12.20.2018	PW-2
Scale	1"=25'	
Drawn By	SZA	
Approved By	GC	

SECTION 5 – LONG TERM OPERATION & MAINTENANCE

LONG-TERM STORMWATER OPERATION & MAINTENANCE PLAN
MASSAPOAG STREET – DEFINITIVE SUBDIVISION

12/21/2018
Revised 1/5/2022
Revised 2/11/2022

PROJECT OVERVIEW:

The proposed project consists of construction of a seven (7) lot residential subdivision. The project has been designed to comply with the Massachusetts Stormwater Management Regulations.

Appended to this document is a sample maintenance form and a chart describing the anticipated frequency of tasks.

OWNER AND RESPONSIBLE PARTY:

Applicant/Developer
Bristol Bros. Development Corp
190 Old Derby Street, Suite 311
Hingham, MA 02043

Bristol Bros. Development Corp. plans on creating a Homeowners Association which will include personnel who will be responsible for maintenance of the stormwater management system. For any service beyond their service ability, they subcontract to the appropriate vendors such as street sweeping and catch basin and water quality cleaning, etc.

CONSTRUCTION MANAGEMENT:

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* and any conditions of approval from the local conservation commission.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-equipment causes excessive compaction of the soils beneath the basin resulting in reduced infiltration capacity. At no time shall temporary infiltration areas or settling basins be

constructed in the vicinity of the proposed infiltration basins in order to prevent the soils from becoming clogged with sediment.

ON-GOING MAINTENANCE CONTRACT

The non-structural and structural approaches recommended below, as well as the required BMP maintenance, will be completed by Bristol Bros. Development Corp.'s contractor, JF Price Co. In Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

MAINTENANCE LOG

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available to the Town of Weymouth in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

STORMWATER BMP MAINTENANCE

The proposed stormwater management system has been designed with appropriate BMPs aimed at reducing the pollutants discharge based upon the intended use of the property. All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements; others are more involved. The Responsible Party must have all BMPs regularly inspected to ensure they are operating properly on an as needed basis, including during runoff events exceeding 0.5 inches of rainfall.

A description of the non-structural and structural approaches to be incorporated is indicated below. The following best management practices are proposed to be incorporated into the stormwater management design to reduce source runoff and improve stormwater runoff discharge quality. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

STRUCTURAL BMPs

Deep Sump Hooded Catch Basins/Yard Drains

On a regular basis the inlet pipe and outlet pipe shall be checked for debris and removed as necessary to ensure unobstructed flow of water. Inspections shall occur at least twice annually, once in the fall and then in the spring after the snow melts. Inspections shall verify the tees are secure and free flowing. Depth of sediment below water line. Basins are to be cleaned whenever sediment and hydrocarbons are observed. Basins shall be cleaned using a vacuum pump. All liquid shall be pumped from the sump of each basin at

least once per year. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Proprietary Water Quality Units

Hydrodynamic Separators shall be maintained in accordance with the manufacturer's recommendations. Refer to the enclosed "CDS Inspection and Maintenance Guide". Typically, a vacuum truck removes accumulated sediment and oil most efficiently. See maintenance documentation from the manufacturer. Inspection should occur at least twice annually, once in the fall and then in the spring after the snow melts. All sediment and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

Subsurface Infiltration System

The subsurface systems (Stormtech ADS SC-740 Chambers) have been designed with riser structures at grade to aid the removal of sediment and debris accumulating in the structure. Preventative maintenance shall be performed in accordance with manufacturer's instructions. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections.

Stone/Pipe Trenches

Inspect and remove debris every 6 months and after every major storm.

NON-STRUCTURAL BMPs

Pavement Sweeping

As street sweeping is a BMP under DEP guidelines, this non-structural BMP is an effective removal of Total Suspended Solids (TSS) in a comprehensive stormwater management program. Litter and debris is to be regularly picked up and removed from the pavement. Paved areas are to be swept a minimum of two times per year, at least once during April and again in September. This BMP is not needed to meet the 80% TSS removal requirement.

Pervious Areas and Slopes

Wherever possible, runoff from paved areas and snowmelt shall be directed over vegetated areas to promote settlement of suspended solids before entering a wetland or resource area. Steep pervious slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Slopes exceeding 2:1 shall be stabilized with rip-rap or other similar measures to minimize

the potential for future erosion. Irrigation system(s) shall be designed and maintained such that water is not applied to/or allowed to run off onto any impervious surfaces. Although overspray or runoff may be unavoidable during periods of high winds. In the event of accidental damage to system components or other unusual circumstances the system components shall be promptly corrected. Maximum of 1 inch of irrigation water will be applied to irrigated areas per week.

Conveyance Swale

Inspect conveyance swales the first few months after construction to make sure that there is no rilling or gullying and that vegetation in the channels is adequate. Thereafter, inspect the channel twice a year for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding and sediment accumulation. Regular maintenance tasks include mowing, fertilizing, liming, watering, prunin, weeding, and pest control. Mow at least once per year but do no cut the grass shorter than three to four inches. Keep grass height under 6 inches to maintain the design depth necessary to serve as a conveyance. Do not mow excessively, because it may increase the design flow velocity. Remove sediment and debris manually at least once per year. Reseed periodically to maintain the dense growth of grass vegetation.

Drainage Control Structures, Flared End Sections, Trash Racks, Riprap Pads, Swales, and/or Level Spreader Splash Pads

Basin control structures, flared end sections, trash racks, riprap pads and level spreader splash pads shall be inspected and any debris or growth surrounding or within these structures shall be removed. Any/all debris or vegetation encroaching on the control structures our outfall components shall be removed or appropriately trimmed back to maintain the designed control elevation and flow patterns/cross section without impediment. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

Fertilizers

Use of fertilizers shall follow the requirements of 330 CMR 31.0.

Waste Management

Solid waste and recycling will be contained in garbage cans maintained at each residence for routine and regular trash pickup. Waste deposition in the receptacles will be consistent with state and local regulations.

Snow Removal

There shall be no plowing of stockpiling of snow within any resource areas or buffers. Typically, a combination of plowing and/or snow blowing is utilized on the individual driveways and a snow blowing “bobcat” is used to clear the sidewalks. Deicing compounds must be stored or sheltered on impervious pads (i.e. in residential garages and the maintenance facility). Snow that is plowed from the paved driveway surfaces shall be plowed to the edges of the pavement. If capacity of these areas is exceeded, accumulated snow shall be removed.

Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.

Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.

Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.

Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.

Comments and actions taken — Describe any maintenance done and need for follow-up.

Stormwater BMP Inspection Matrix

Conventional & LID Best Management Practices	**Inspection & Maintenance Frequency**	**Erosion& Scour**	**Obstructions**	**Trash & Debris**	**Sediment Build-Up Removal**	**Vegetation Cover**	**Remove/Reset Filter Fabric & Stone As Required**	**Vac Truck Sediment & Contaminants**	**Remove/Reset Riprap as Required**
Catch Basins/Area & Yard Drains	Four times per year								
Pavement Sweeping	Four times per year								
Stone Trench	Twice-Annually (Spring and Fall)								
Subsurface Infiltration Chambers	Twice-Annually (Spring and Fall)								
Conveyance Swale	Twice-Annually (Spring and Fall)								
Proprietary Water Quality Separators	Twice-Annually (Spring and Fall)								
Outlets (FES, Rip Rap Pad, Level Spreaders)	Twice-Annually (Spring and Fall)								

CONTECH®
CONSTRUCTION PRODUCTS INC.

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

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

Inspection

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

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

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

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

Cleaning

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

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

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

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

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

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit contech-cpi.com or call 800.338.1122

CONTECH® CONSTRUCTION PRODUCTS INC.
800.925.5240
contechstormwater.com

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

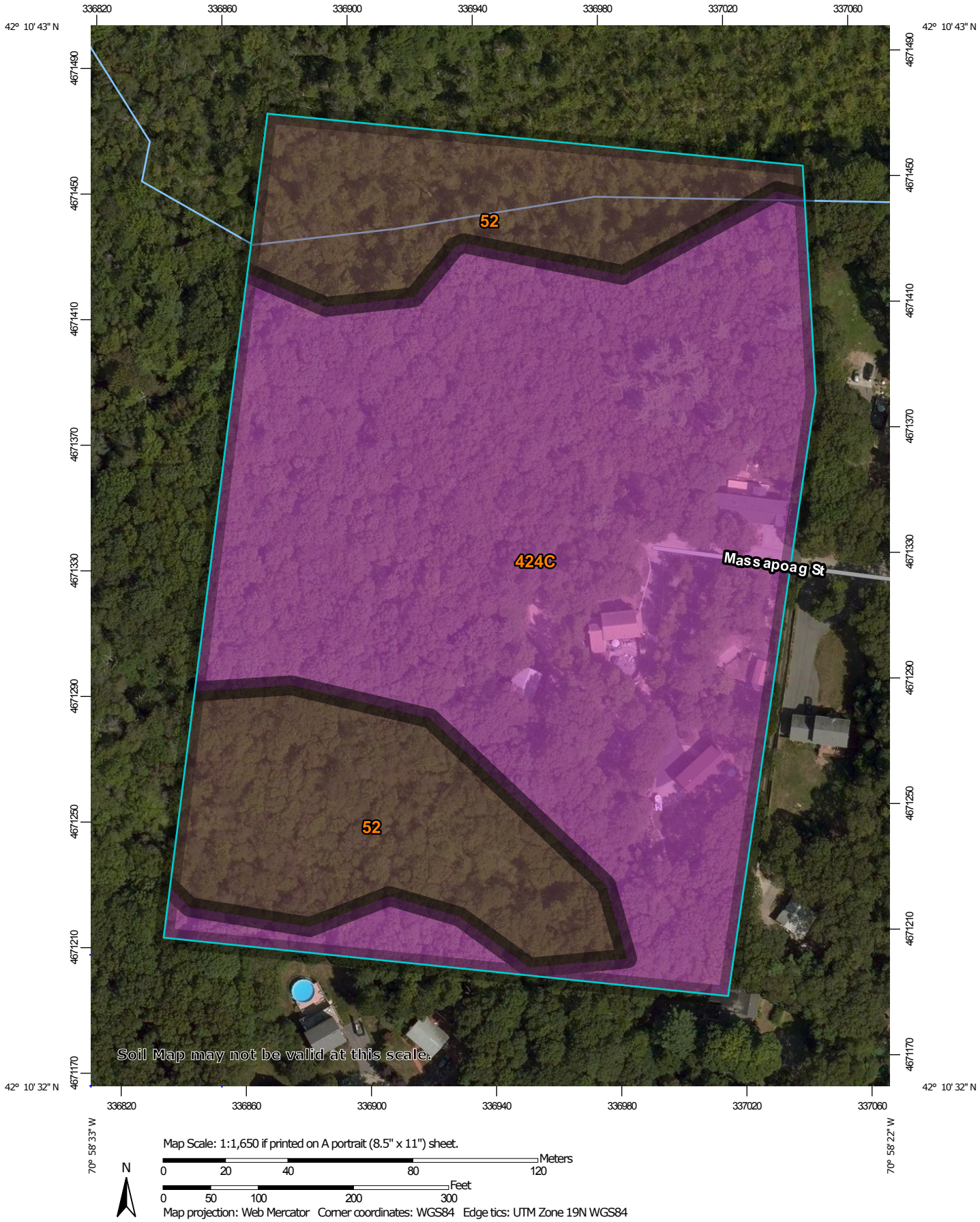
Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

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

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

SECTION 6 – SOILS TESTING DATA

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts



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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 13, Oct 6, 2017

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

Date(s) aerial images were photographed: Aug 26, 2014—Sep 4, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52	Freetown muck, 0 to 1 percent slopes	B/D	3.7	30.9%
424C	Canton fine sandy loam, 8 to 15 percent slopes, extremely bouldery	A	8.3	69.1%
Totals for Area of Interest			**12.0**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-9

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3'	A	10YR 2/2	—	—	—	Sandy Loam	Cl	Cl	Blocky	Soft	
3-20'	B	10YR 5/6	—	—	—	Sandy loam	Cl	Cl	Massive	Soft	
20'-40'	C	10YR 5/4	-	-	-	Loamy Sand	Cl	Cl	Massive	Loose	

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3"	A	10YR 2/2	—	—	—	Sandy loam	<1%	<1%	Blocky	Soft	
3-20"	B	10YR 5/6	—	—	—	Sandy loam	<1%	<1%	Massive	Soft	
20+90"	C	10YR 6/4	—	—	—	Loamy Sand	5%	2%	Massive	Loose	

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-8

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3"	A	10YR 2-2	—	—	—	Sandy Loam	—	1%	Blocky	Soft	
3"-18"	B	10YR 5/6	—	—	—	"	1%	2%	Massive	Soft	
18-81"	C	10YR 5/4	—	—	—	Loamy Sand	2%	5%	Massive	Loose	

Additional Notes:

Surface Boulders

Refusal @ 81"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS-3-6

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3	A	10YR 2/2	~~0-3~~	—	—	Sandy loam	—	1%	Blocky	Soft	
3-20"	B	10YR 5/1	—	—	—	Sandy loam	<1%	2%	Massive	Soft	
20"-24"	C	10YR 5/4	—	—	—	Sandy loam	1%	2%	Massive	Soft	

Additional Notes:

All Access has loose Surface Boulders

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3'	A	10YR 2/2	–	–	–	Sandy Loam	–	1%	Block	SoN	
3'-23'	B	10YR 5/6	–	–	–	Sandy loam	–	–	Massive	SoN	
23-67'	C	10YR 5/4	–	–	–	Sandy loam	2%	2%			

Additional Notes:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3"	A	10YR 2/2	—	—	—	Sandy loam	—	<1%	Blocky	Soft	
3"-18"	B	10YR 4/6	—	—	—	Sandy loam	<1%	<1%	Massive	Friable	
18"+36"	C	10YR 5/4	—	—	—	Sandy loam	10%	0%	Massive	Soft/Loose	

Additional Notes:

Refusal, large Bedrock/Ledge
water and mottling NOT observed

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3"	A	10YR 2/2	—	—	—	Sandy Loam	—	1%	Blocky	Soft	
3"-25"	B	10YR 4/6	—	—	—	Sandy Loam	<1%	<1%	Mass	Soft	
25"-88"	C1	10YR 5/4	36"	10YR 5/2	20%	Sandy Loam	2%	<1%	Massive	Firm	
51"-88" C2	C2	10YR 4/4	—	—	—	Loamy Sand	2%	2%	Mass	Loose	

Additional Notes:

water @ 56"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MS 3-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4"	A	10 YR 3/2	—	—	—	Sandy Loam	—	1%	Block	Soft	
4"-22"	B	10 YR 4/6	—	—	—	Sandy Loam	2%	5%	Block	Soft	
22"-110"	C	10 YR 5/4	—	—	—	Sandy loam	5%	10%	Massive	Soft	

Additional Notes:

No water observed @ 110"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

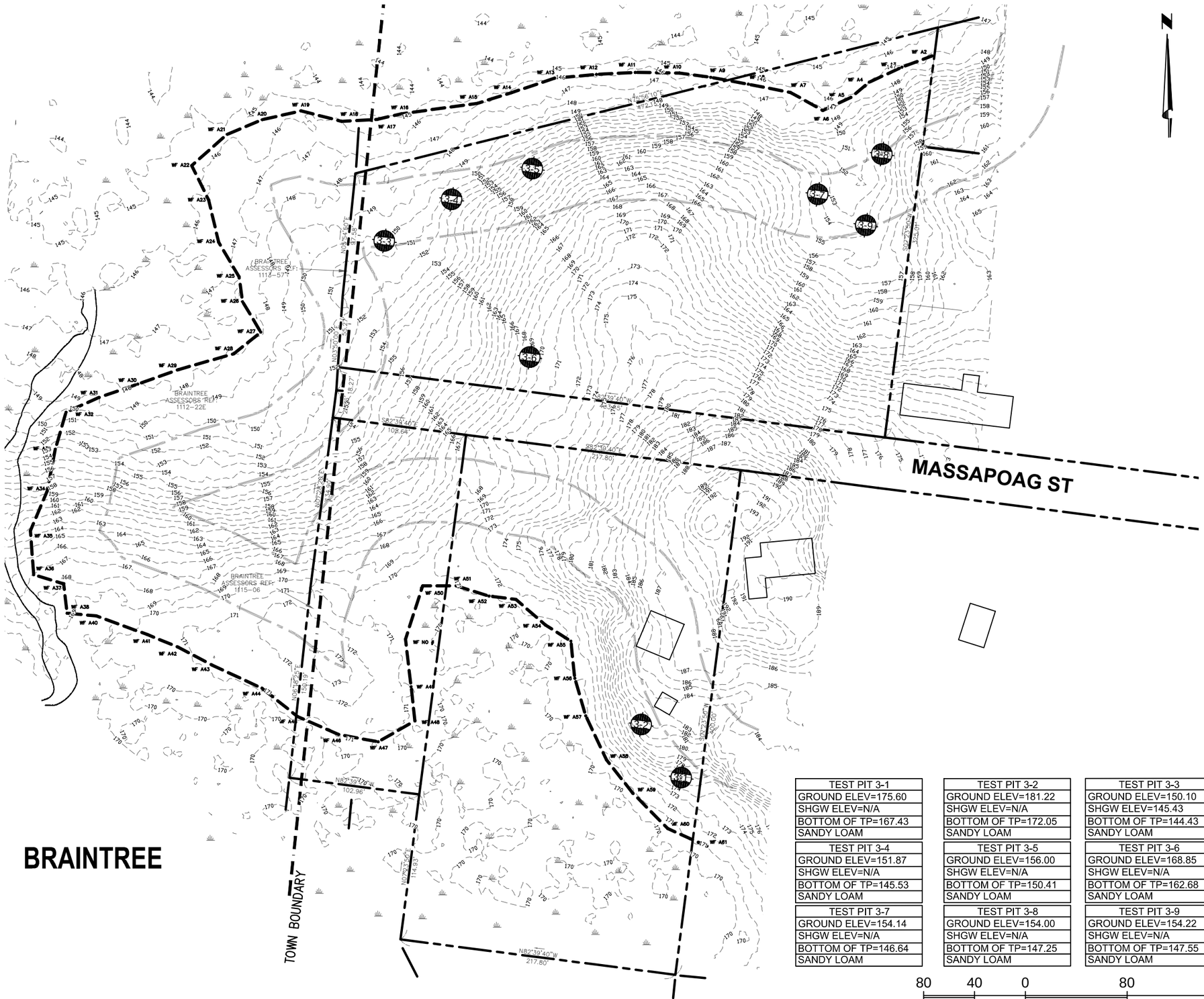
C. On-Site Review (continued)

Deep Observation Hole Number: MP 3-1

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-53"	A	10YR 3/2	-	—	-	Loamy Loam	10%	20%	Blocky	So √V	
53"-87"	B	10YR 4/1	—	—	—	Sand Loam	10%	20%	Blocky	So √V	
87-18"	C	10YR 5/1	-	—	—	Sandy Loam	5%	10%	Massive	So NV	

Additional Notes:

Looks Like Fill, Trash Deep in Profile
B and C appear Natural



TEST PIT 3-1
GROUND ELEV=175.60
SHGW ELEV=N/A
BOTTOM OF TP=167.43
SANDY LOAM

TEST PIT 3-2
GROUND ELEV=181.22
SHGW ELEV=N/A
BOTTOM OF TP=172.05
SANDY LOAM

TEST PIT 3-3
GROUND ELEV=150.10
SHGW ELEV=145.43
BOTTOM OF TP=144.43
SANDY LOAM

TEST PIT 3-4
GROUND ELEV=151.87
SHGW ELEV=N/A
BOTTOM OF TP=145.53
SANDY LOAM

TEST PIT 3-5
GROUND ELEV=156.00
SHGW ELEV=N/A
BOTTOM OF TP=150.41
SANDY LOAM

TEST PIT 3-6
GROUND ELEV=168.85
SHGW ELEV=N/A
BOTTOM OF TP=162.68
SANDY LOAM

TEST PIT 3-7
GROUND ELEV=154.14
SHGW ELEV=N/A
BOTTOM OF TP=146.64
SANDY LOAM

TEST PIT 3-8
GROUND ELEV=154.00
SHGW ELEV=N/A
BOTTOM OF TP=147.25
SANDY LOAM

TEST PIT 3-9
GROUND ELEV=154.22
SHGW ELEV=N/A
BOTTOM OF TP=147.55
SANDY LOAM

Date	Description	No.
	Revisions	

GABRIEL R. CROCKER
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MASSACHUSETTS MARYLAND FLORIDA RHODE ISLAND

Project

PRELIMINARY PLAN

MASSAPOAG ST.
WEYMOUTH, MA

Prepared for

BRISTOL BROS. DEVELOPMENT CORP.

190 OLD DERBY STREET, SUITE 311
HINGHAM, MA 02043

Drawing Title

TEST PIT PLAN

Project No.	100-029
Date	4.26.2018
Scale	1"=80'
Drawn By	SZA
Approved By	GC

Drawing No.

TP-1

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) | 12/28/21 (Date) | 8 AM (Time) | OVERCAST (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) | _____ Vegetation | _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) | _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ | _____ Landform | _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-12"	B	LS	10YR 5/6	-	-	-	-	-	MASSIVE	FRIABLE	
12"-126"	C	COARSE SAND	10YR 5/3	-	-	-	20-40%	-	SG	LOOSE	with fines & silts. 108" black layer about 3"
											water sweating @ 108"

Additional Notes: WATER OBSERVED AT 9'

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 (Hole #) | 12/28/21 (Date) | 10 AM (Time) | OVERCAST (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) | _____ Vegetation | _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) | _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ | _____ Landform | _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-64"	B	LS	10YR 5/6	-	-	-	-	-	MASSIVE	FRIABLE	
64"-126"	C	COARSE SAND	10YR 5/3	-	-	-	10%	-	SG	LOOSE	72" BLACK LAYER ABOUT 3" THICK
											WATER SWEATING/ WEEPING AT 6'

Additional Notes: WATER OBSERVED AT 6'

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 (Hole #) | 12/28/21 (Date) | 11 AM (Time) | OVERCAST (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) | _____ Vegetation | _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) | _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ | _____ Landform | _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-64"	B	LS	10YR 5/6	-	-	-	-	-	MASSIVE	FRIABLE	
64"-126"	C	COARSE SAND	10YR 5/3	-	-	-	10%	-	SG	LOOSE	72" BLACK LAYER ABOUT 3" THICK
											WATER SWEATING/ WEEPING AT 6'

Additional Notes: WATER OBSERVED AT 6'

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 (Hole #) | 12/28/21 (Date) | 3 PM (Time) | COLD SUNNY (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) | _____ Vegetation | _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) | _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ | _____ Landform | _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-2"	O/A	LOAM	10YR 2/2	-	-	-	-	-	MASSIVE	FRIABLE	
2"-24"	B	LS	10YR 5/6	-	-	-	-	-	MASSIVE	FRIABLE	
24"-132"	C	COARSE SAND	10YR 5/3	-	-	-	10%	-	SG	LOOSE	

Additional Notes: Soil was wet @11' didn't observe any water weeping in

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-5 (Hole #) | 12/28/21 (Date) | 4 PM (Time) | COLD SUNNY (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) | _____ Vegetation | _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) | _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ | _____ Landform | _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

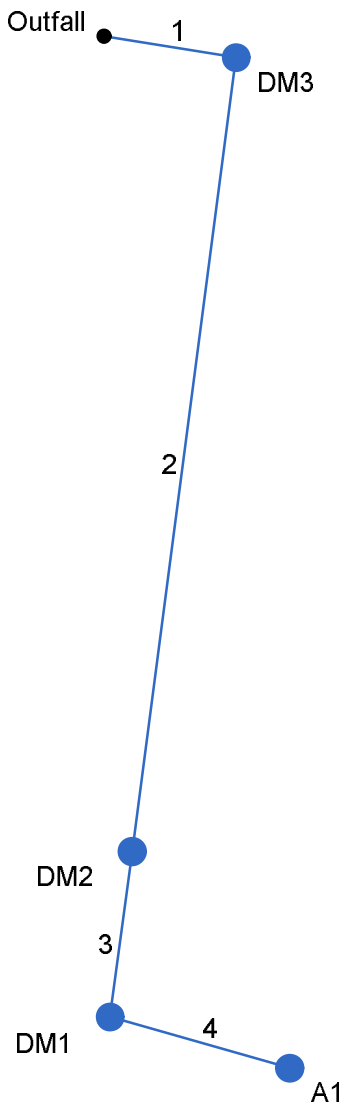
Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-18"	A	LOAM	10YR 2/2	-	-	-	-	-	MASSIVE	FRIABLE	
18"-24"	B	LS	10YR 5/6	-	-	-	-	-	MASSIVE	FRIABLE	
24"-72"	C	COARSE SAND	10YR 5/3	-	-	-	-	-	SG	LOOSE	WITH FINES & SILTS WATER AT 6'

Additional Notes: 6' WATER WEEPING IN, STANDING WATER AT 5'

SECTION 7 – HYDRAULIC PIPE SIZING

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK A.stm	Number of lines: 4	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

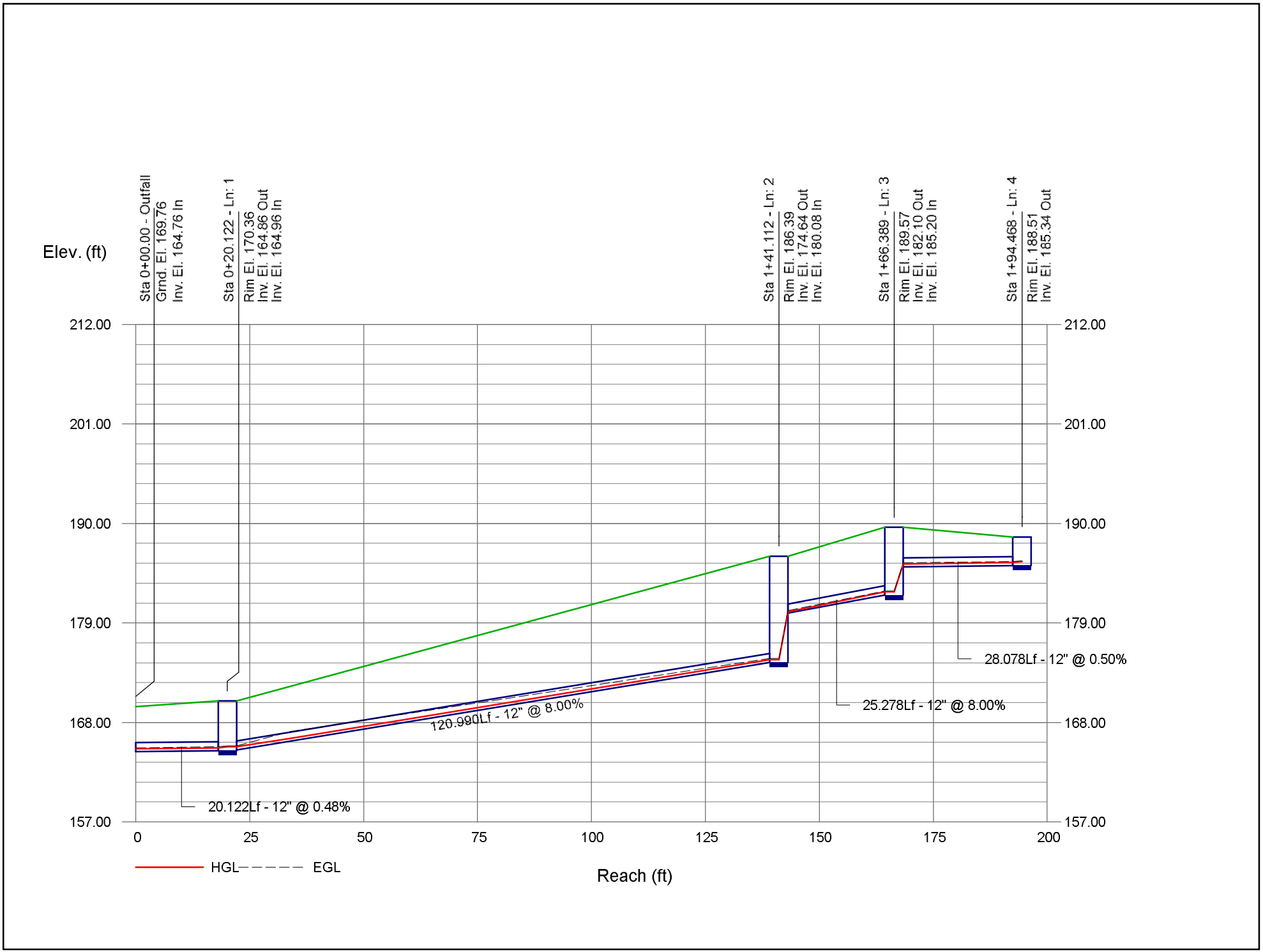
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.122	0.00	0.21	0.00	0.00	0.11	0.0	7.0	5.3	0.58	2.47	2.60	12	0.48	164.76	164.86	165.08	165.20	0.00	170.36	Pipe - (433)
2	1	120.990	0.00	0.21	0.00	0.00	0.11	0.0	6.3	5.5	0.60	10.07	2.68	12	8.00	164.96	174.64	165.29	174.96	170.36	186.39	Pipe - (461)
3	2	25.278	0.00	0.21	0.00	0.00	0.11	0.0	6.2	5.5	0.61	10.07	4.90	12	8.00	180.08	182.10	180.24	182.42	186.39	189.57	Pipe - (461) (2)
4	3	28.078	0.21	0.21	0.52	0.11	0.11	6.0	6.0	5.6	0.61	2.51	2.63	12	0.50	185.20	185.34	185.54	185.68	189.57	188.51	Pipe - (434)

Project File: NETWORK A.stm | Number of lines: 4 | Run Date: 1/6/2022

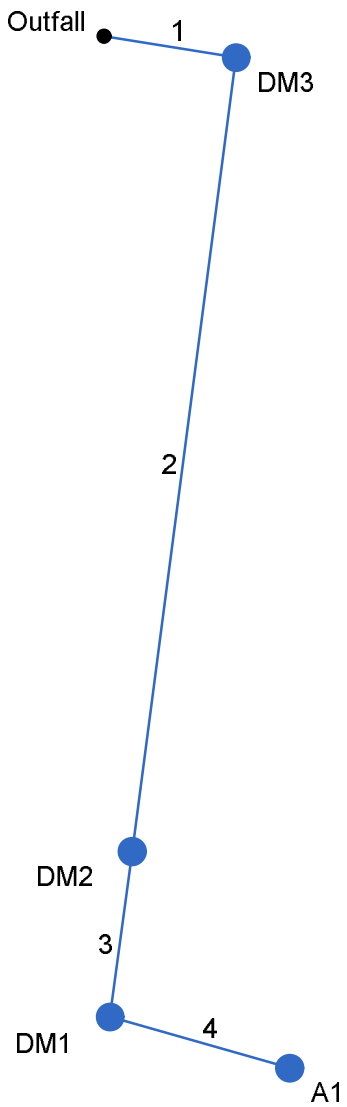
NOTES:Intensity = 59.21 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK A.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK A.stm	Number of lines: 4	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

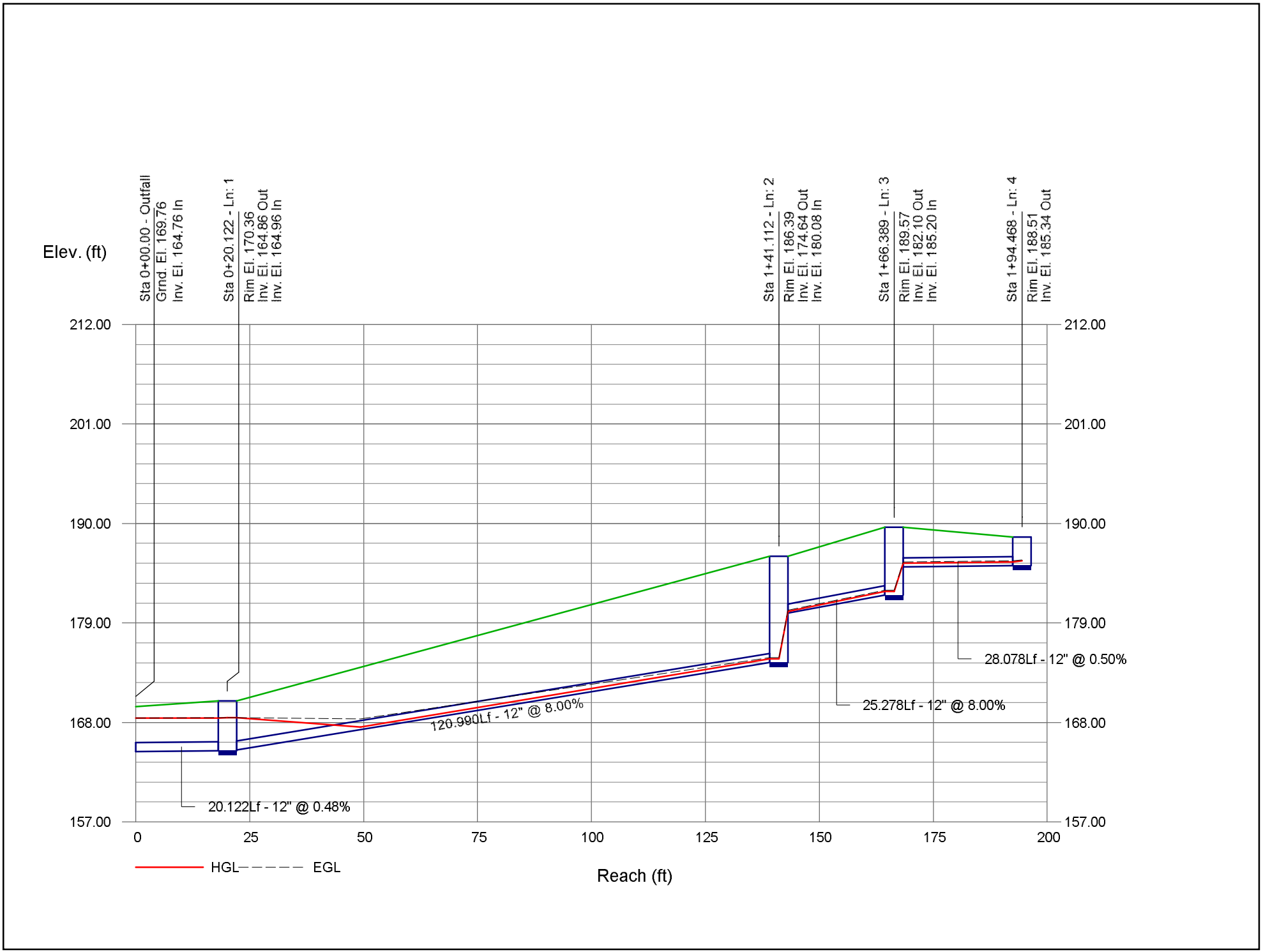
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.122	0.00	0.21	0.00	0.00	0.11	0.0	7.2	7.2	0.79	2.47	1.00	12	0.48	164.76	164.86	168.48	168.49	0.00	170.36	Pipe - (433)
2	1	120.990	0.00	0.21	0.00	0.00	0.11	0.0	6.2	7.5	0.82	10.07	2.02	12	8.00	164.96	174.64	168.51	175.01	170.36	186.39	Pipe - (461)
3	2	25.278	0.00	0.21	0.00	0.00	0.11	0.0	6.2	7.5	0.82	10.07	5.36	12	8.00	180.08	182.10	180.27	182.48	186.39	189.57	Pipe - (461) (2)
4	3	28.078	0.21	0.21	0.52	0.11	0.11	6.0	6.0	7.5	0.82	2.51	2.86	12	0.50	185.20	185.34	185.59	185.73	189.57	188.51	Pipe - (434)

Project File: NETWORK A.stm | Number of lines: 4 | Run Date: 1/6/2022

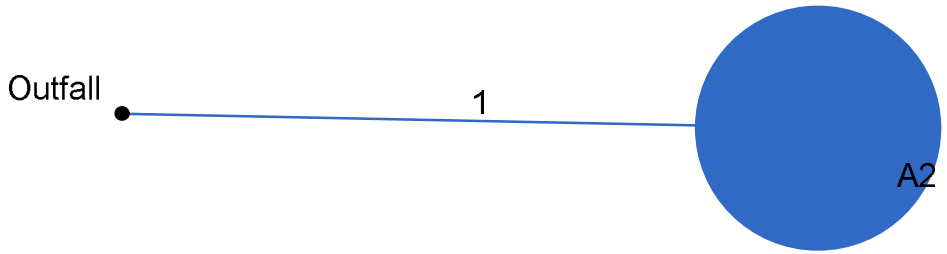
NOTES:Intensity = 197.93 / (Inlet time + 22.50) ^ 0.98 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK A.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK B.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.410	0.55	0.55	0.26	0.14	0.14	6.0	6.0	5.6	0.80	2.36	2.81	12	0.44	165.78	165.83	166.15	166.24	0.00	169.00	Pipe - (434) (1) (1)

Project File: NETWORK B.stm

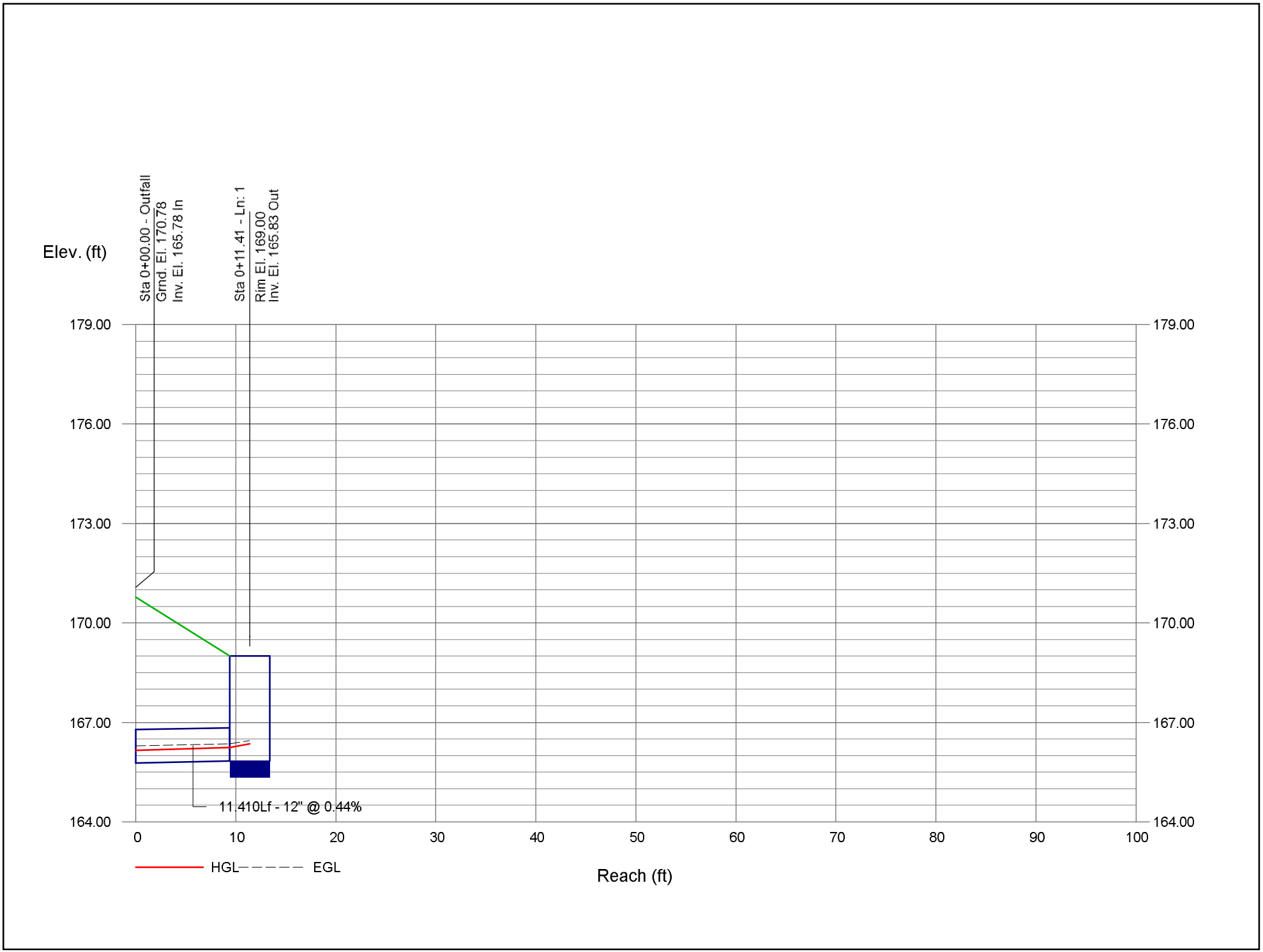
Number of lines: 1

Run Date: 1/6/2022

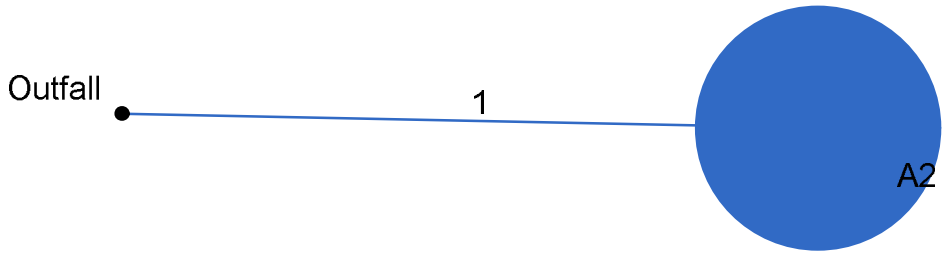
NOTES:Intensity = 59.21 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK B.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK B.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

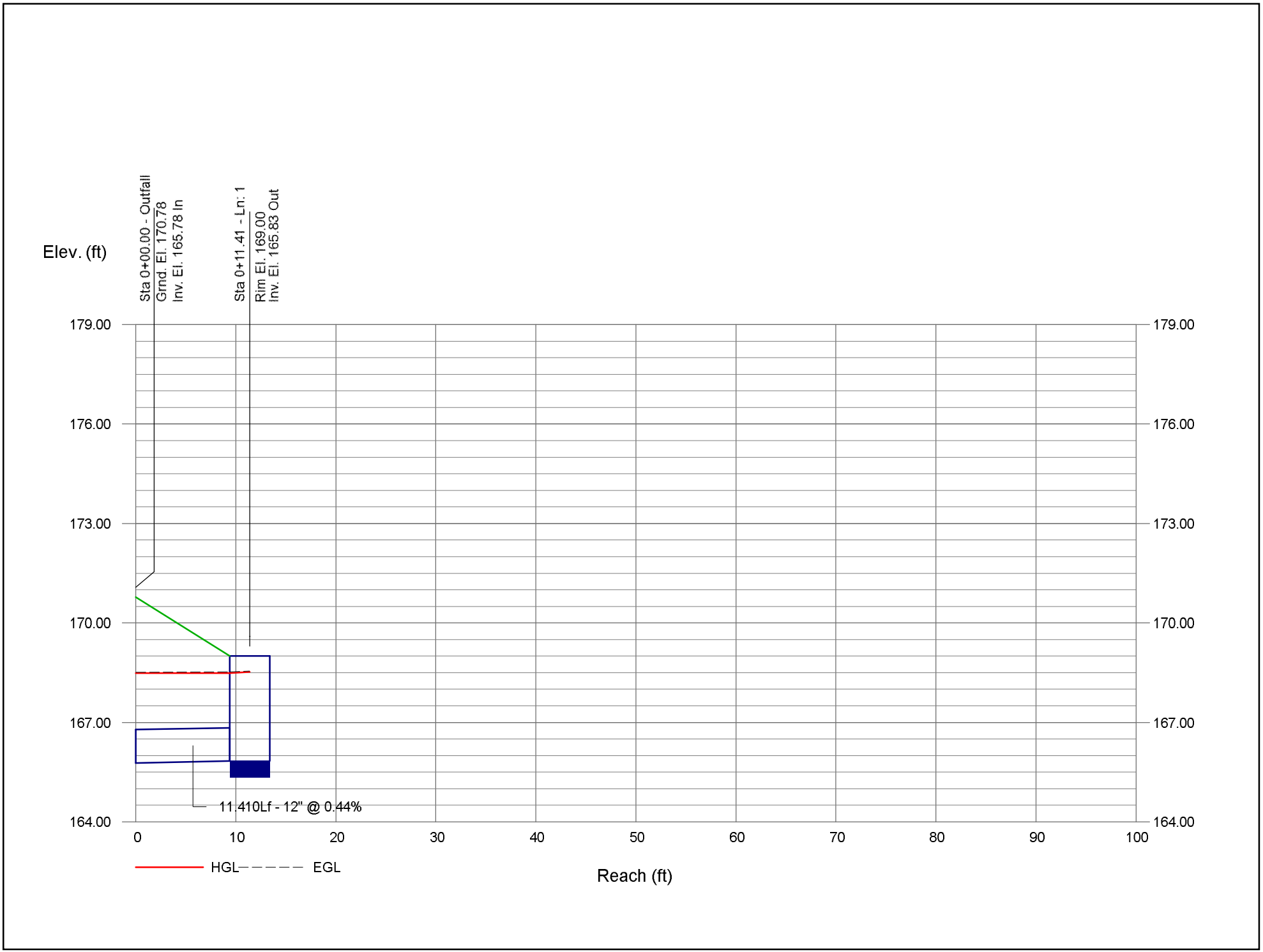
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.410	0.55	0.55	0.26	0.14	0.14	6.0	6.0	7.5	1.08	2.36	1.37	12	0.44	165.78	165.83	168.48	168.49	0.00	169.00	Pipe - (434) (1) (1)

Project File: NETWORK B.stm | Number of lines: 1 | Run Date: 1/6/2022

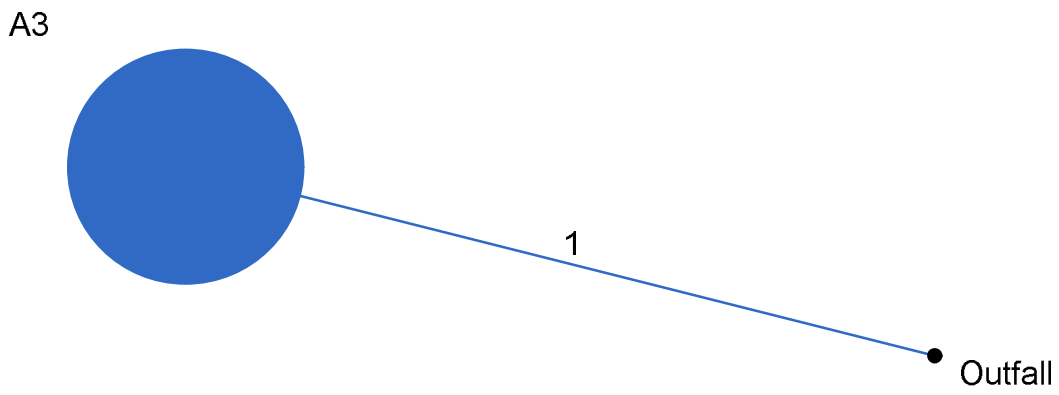
NOTES:Intensity = 197.93 / (Inlet time + 22.50) ^ 0.98 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK B.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK C.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

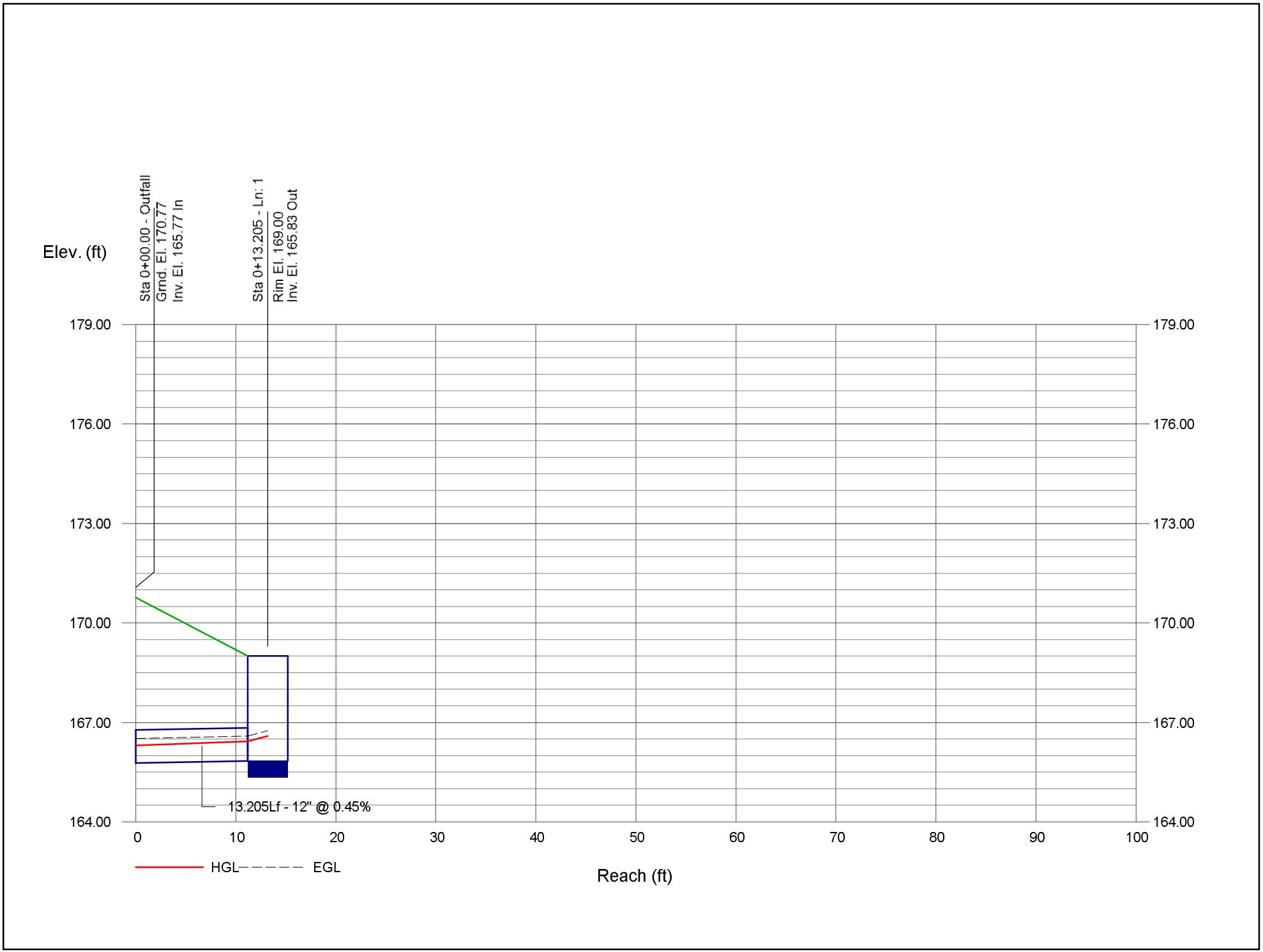
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	13.205	0.97	0.97	0.29	0.28	0.28	6.0	6.0	5.6	1.57	2.40	3.47	12	0.45	165.77	165.83	166.30	166.42	0.00	169.00	Pipe - (434) (1)

Project File: NETWORK C.stm | Number of lines: 1 | Run Date: 1/6/2022

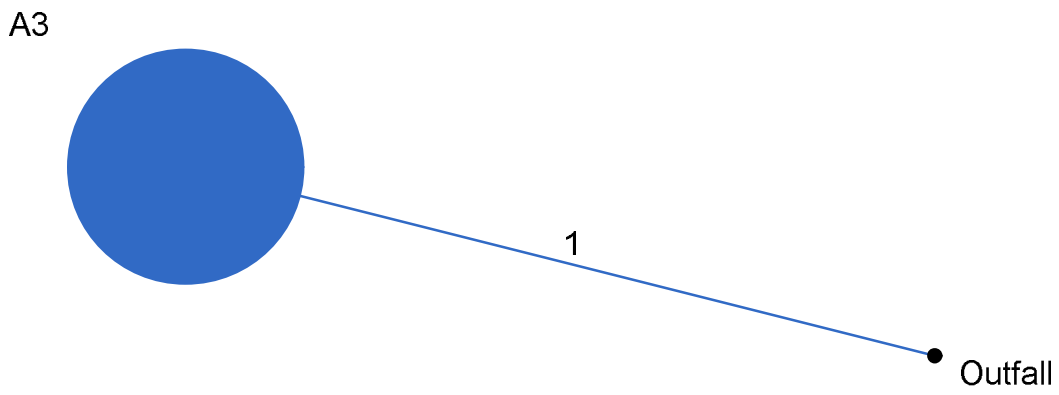
NOTES:Intensity = 59.21 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK C.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK C.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

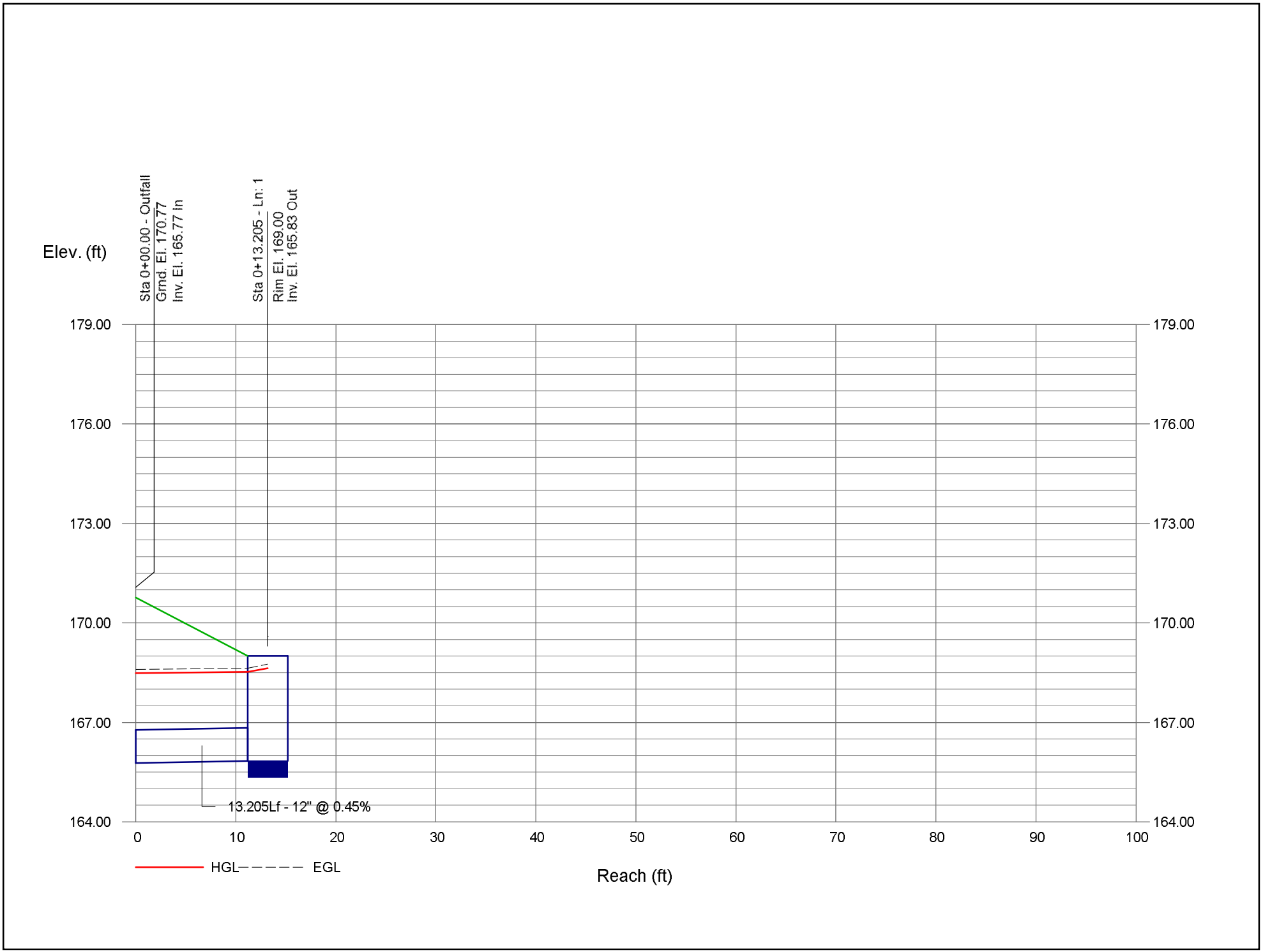
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	13.205	0.97	0.97	0.29	0.28	0.28	6.0	6.0	7.5	2.12	2.40	2.70	12	0.45	165.77	165.83	168.48	168.53	0.00	169.00	Pipe - (434) (1)

Project File: NETWORK C.stm | Number of lines: 1 | Run Date: 1/6/2022

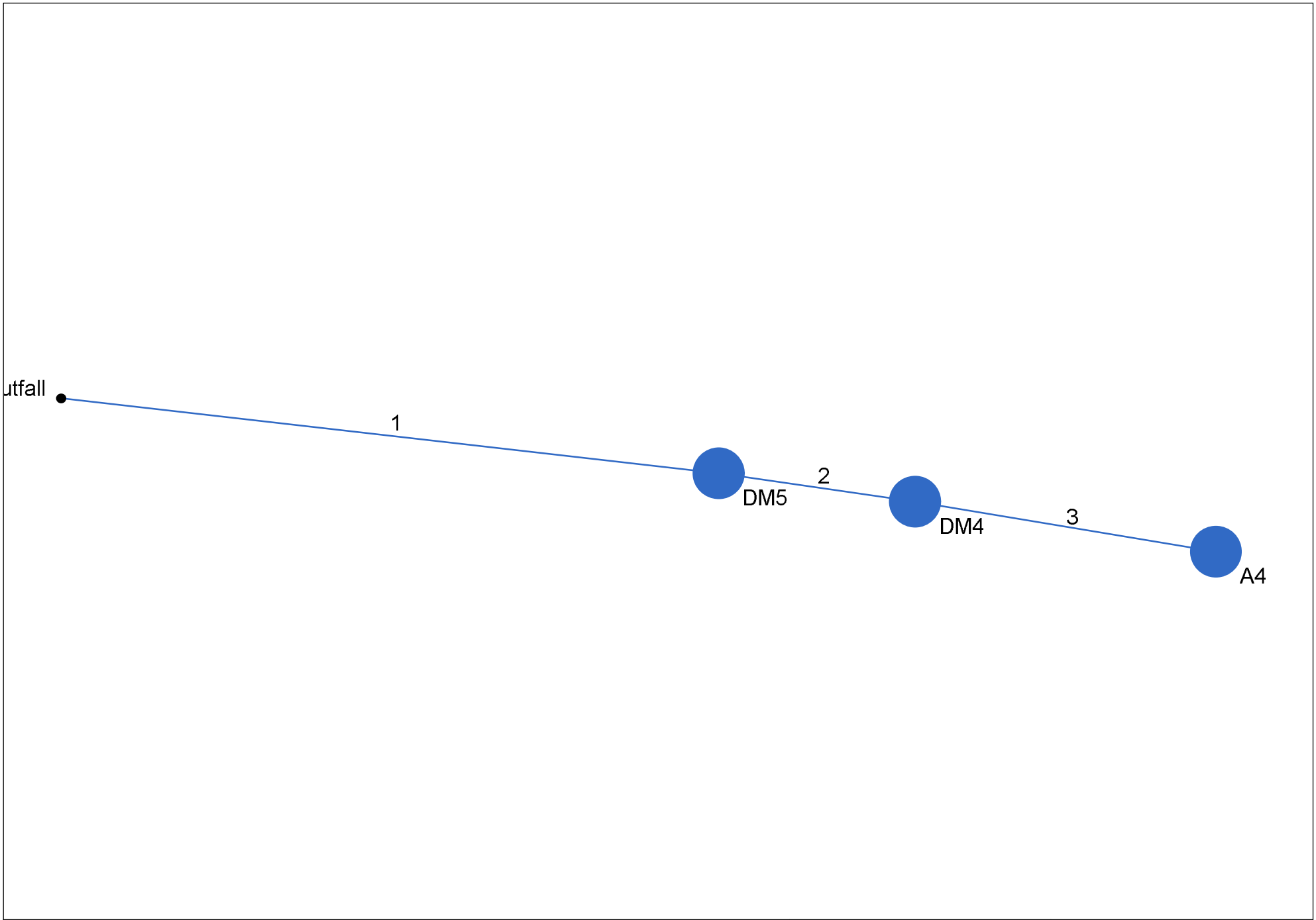
NOTES:Intensity = 197.93 / (Inlet time + 22.50) ^ 0.98 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK C.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK D.stm	Number of lines: 3	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	52.638	0.00	0.72	0.00	0.00	0.32	0.0	6.1	5.6	1.80	10.07	6.79	12	8.00	168.00	172.21	168.29	172.78	0.00	182.56	Pipe - (430) (1)
2	1	15.804	0.00	0.72	0.00	0.00	0.32	0.0	6.1	5.6	1.80	10.07	6.79	12	8.00	177.21	178.47	177.50	179.05	182.56	186.17	Pipe - (430) (1) (1)
3	2	24.292	0.72	0.72	0.45	0.32	0.32	6.0	6.0	5.6	1.81	3.82	4.35	12	1.15	182.17	182.45	182.65	183.02	186.17	185.62	Pipe - (418)

Project File: NETWORK D.stm

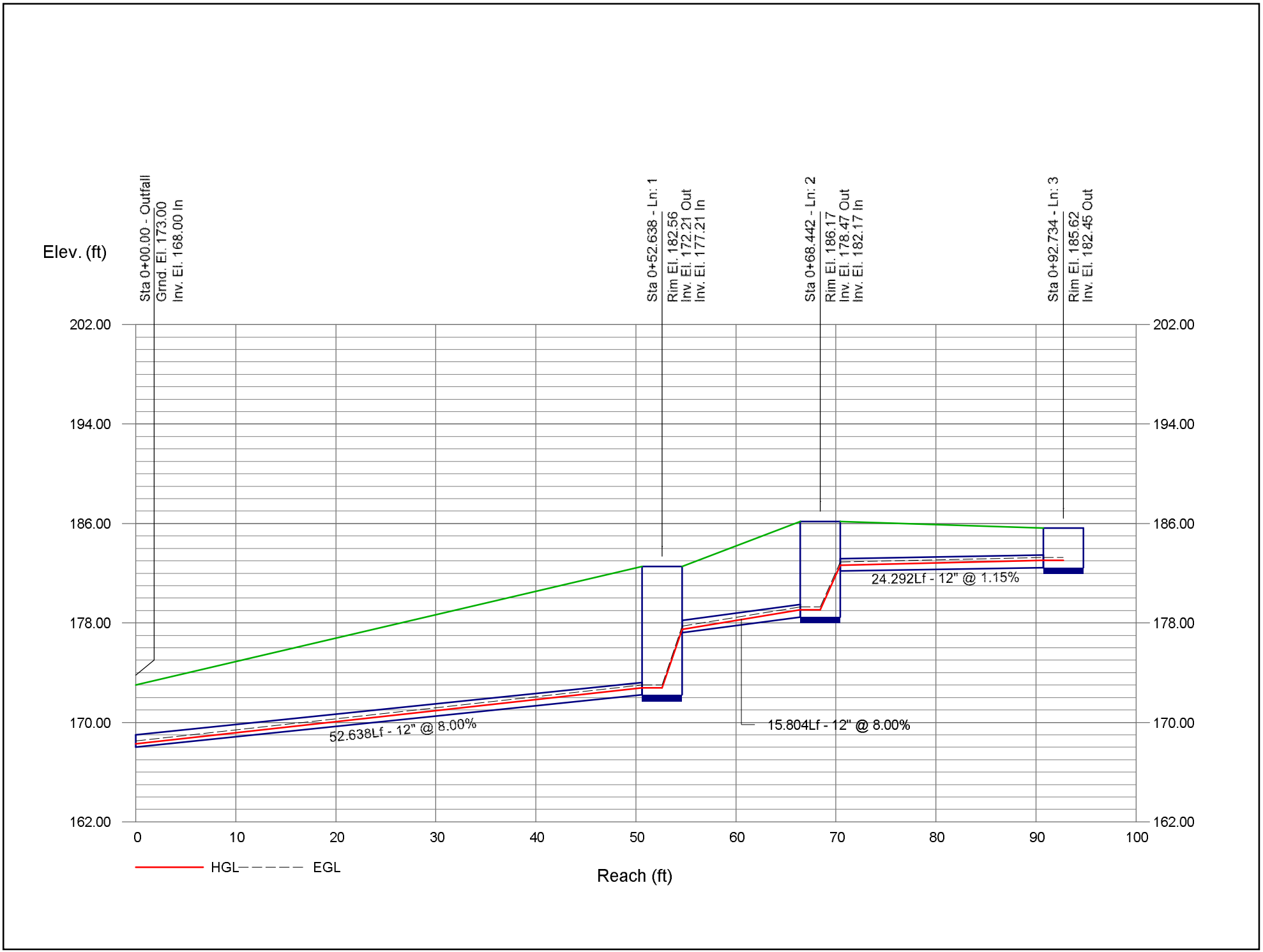
Number of lines: 3

Run Date: 1/6/2022

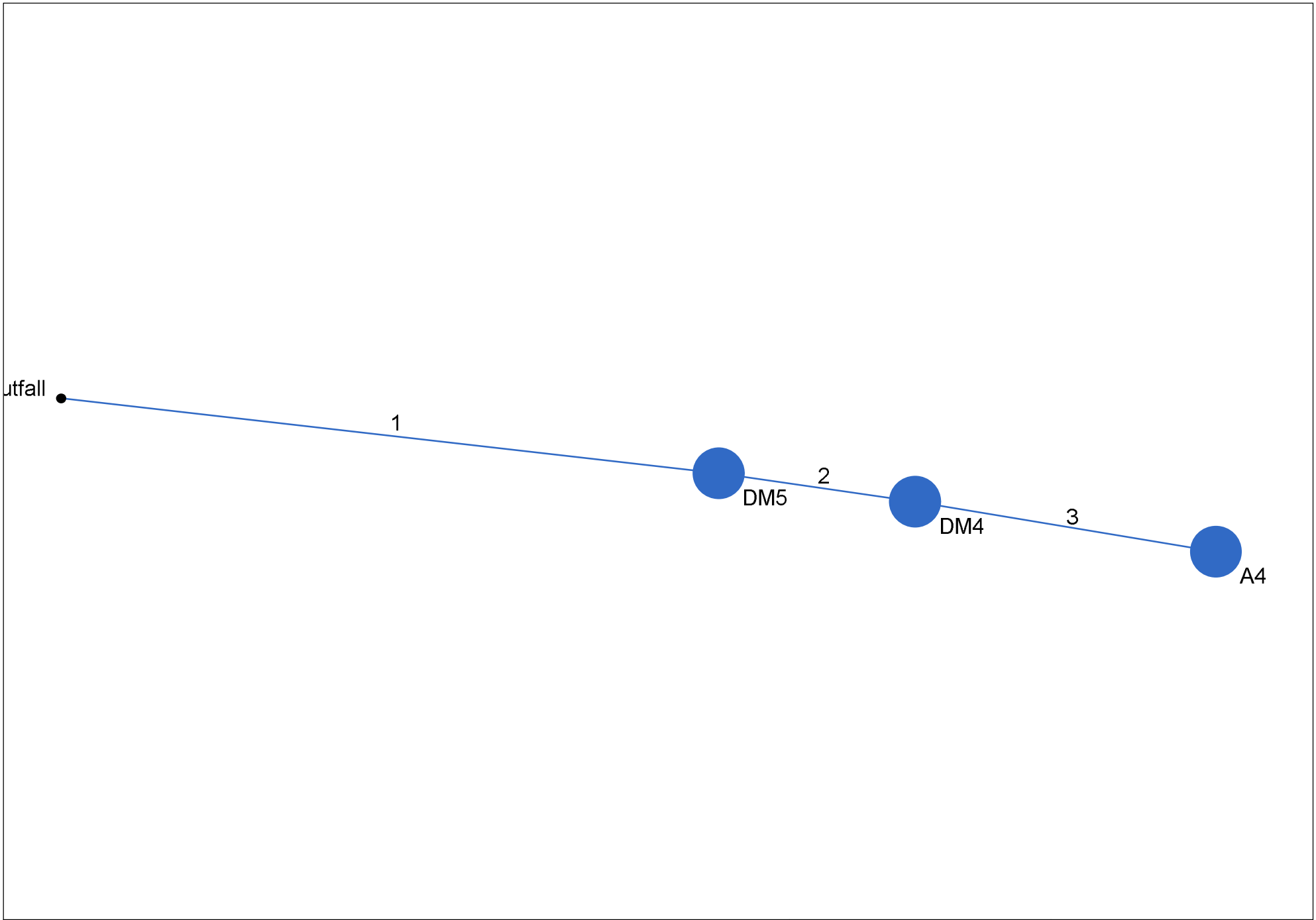
NOTES:Intensity = 59.21 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK D.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK D.stm	Number of lines: 3	Date: 1/6/2022

Storm Sewers v12.00

Storm Sewer Tabulation

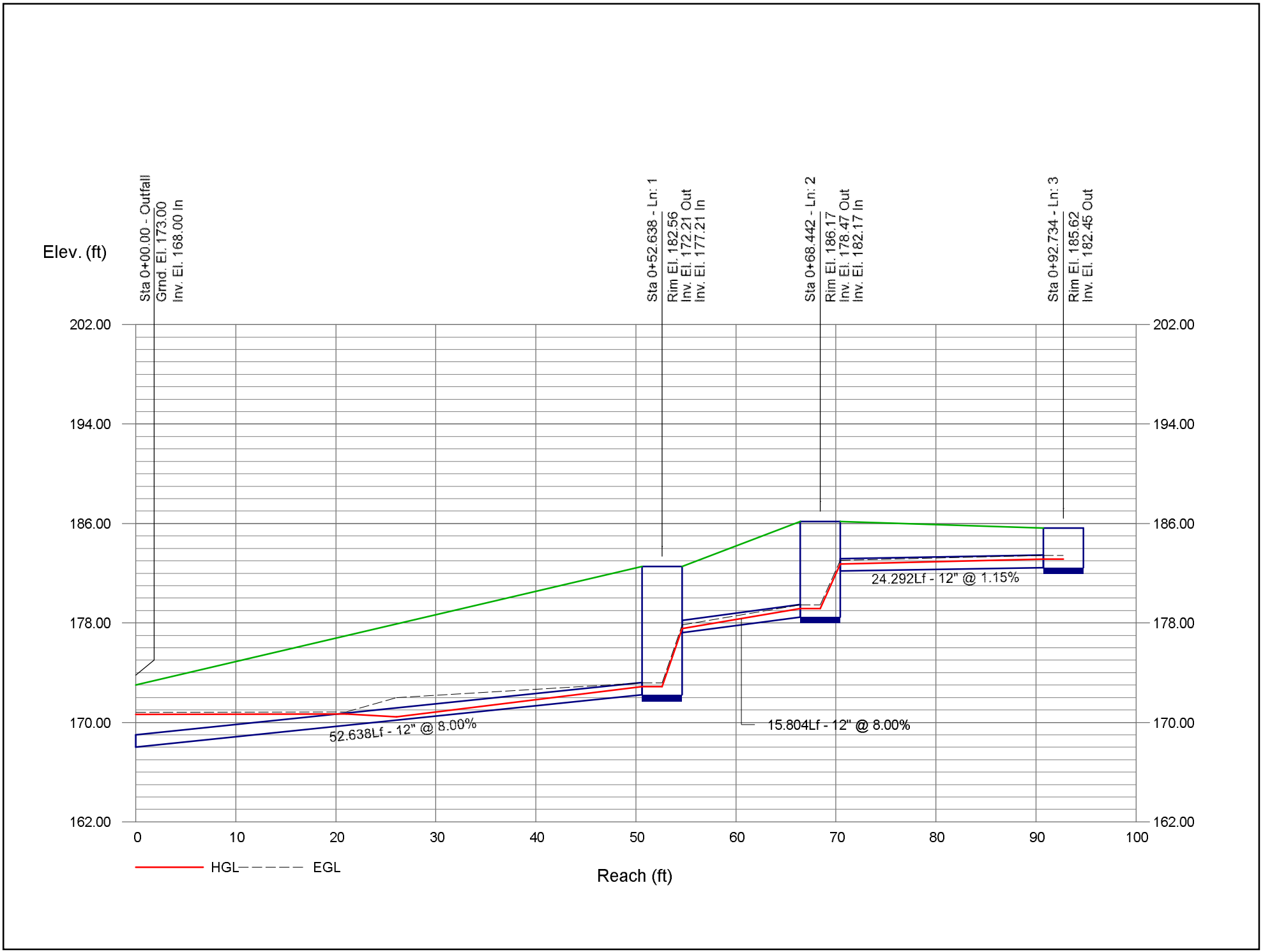
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	52.638	0.00	0.72	0.00	0.00	0.32	0.0	6.1	7.5	2.43	10.07	3.73	12	8.00	168.00	172.21	170.65	172.88	0.00	182.56	Pipe - (430) (1)
2	1	15.804	0.00	0.72	0.00	0.00	0.32	0.0	6.1	7.5	2.43	10.07	7.46	12	8.00	177.21	178.47	177.54	179.14	182.56	186.17	Pipe - (430) (1) (1)
3	2	24.292	0.72	0.72	0.45	0.32	0.32	6.0	6.0	7.5	2.44	3.82	4.77	12	1.15	182.17	182.45	182.75	183.12	186.17	185.62	Pipe - (418)

Project File: NETWORK D.stm | Number of lines: 3 | Run Date: 1/6/2022

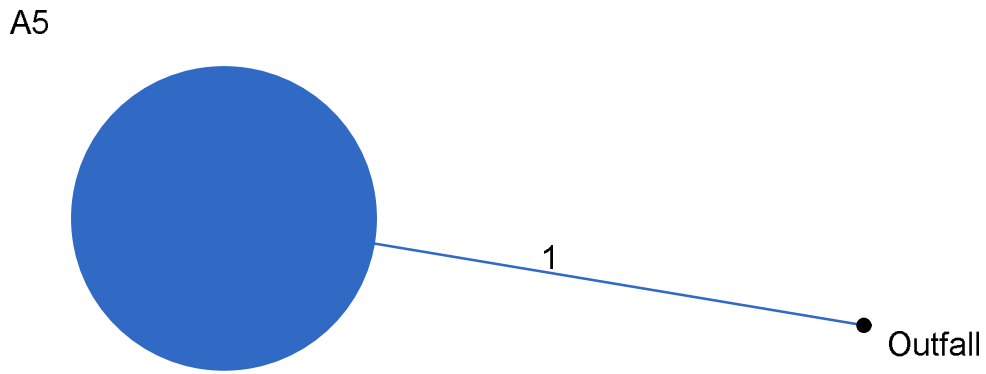
NOTES:Intensity = 197.93 / (Inlet time + 22.50) ^ 0.98 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK D.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK E.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	8.505	0.72	0.72	0.22	0.16	0.16	6.0	6.0	5.6	0.88	2.44	2.94	12	0.47	167.69	167.73	168.08	168.15	0.00	170.90	Pipe - (434) (1) (2)

Project File: NETWORK E.stm

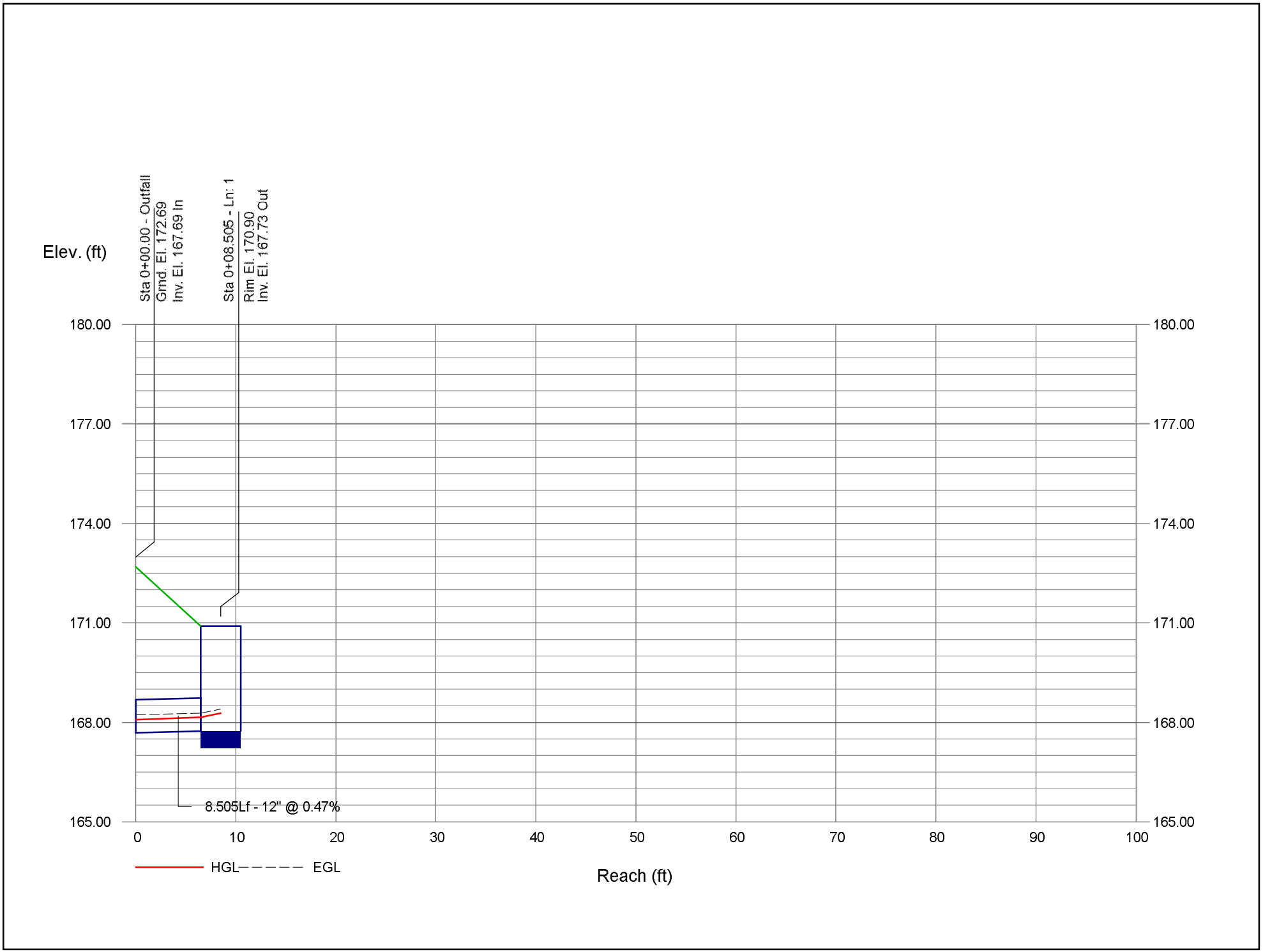
Number of lines: 1

Run Date: 1/6/2022

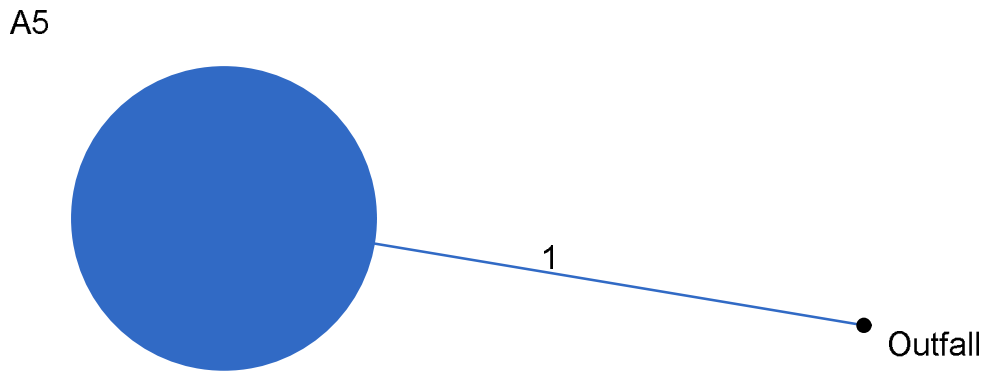
NOTES:Intensity = 59.21 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK E.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: NETWORK E.stm	Number of lines: 1	Date: 1/6/2022

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	8.505	0.72	0.72	0.22	0.16	0.16	6.0	6.0	7.5	1.19	2.44	1.52	12	0.47	167.69	167.73	170.65	170.66	0.00	170.90	Pipe - (434) (1) (2)

Project File: NETWORK E.stm

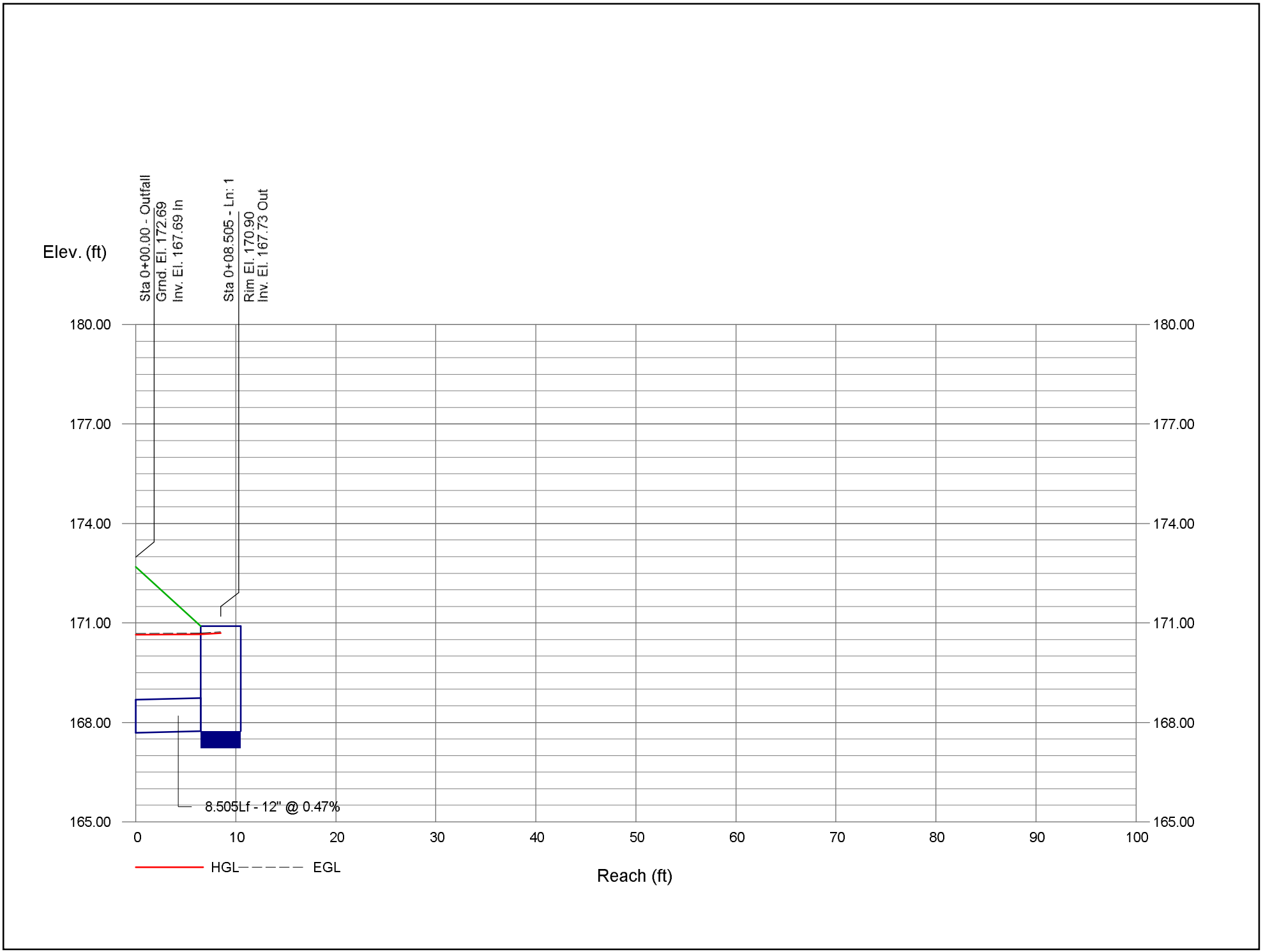
Number of lines: 1

Run Date: 1/6/2022

NOTES:Intensity = 197.93 / (Inlet time + 22.50) ^ 0.98 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: NETWORK E.stm



SECTION 8 – PROJECT PLANS
(Under Separate Cover)