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By Mattie VandenBoom at 3:19 pm, May 29, 2024

DRAINAGE REPORT

For

EVERYBODY MATTERS

30 Winfield Street
City of Worcester, Massachusetts
Worcester County

Prepared by:

BOHLER
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Southborough, MA 01772
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COMMONWEALTH OF MASSACHUSETTS
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BOHLER

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Bohler Job #W191051

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APPENDICIES

I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the development of a proposed South Middlesex Opportunity Council (SMOC) residence located at 30 Winfield Street in the City of Worcester, Massachusetts. The site, which contains approximately 0.31 acres of land, contains an existing grass covered lot with some gravely areas.

The proposed project includes the construction of a new 3,595 square feet (SF) freestanding SMOC residence along with new paved parking areas, landscaping, and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions as a result of the proposed development illustrated within the accompanying Proposed Site Plan Documents prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods.

On-Site Soil Information

The entirety of the soils at the site are mapped as Urban Land. Based off the soil testing results presented in the Report of Geotechnical Investigation prepared by Whitestone Associates, Inc, the site was modeled with Hydraulic Soil Group (HSG) A. Refer to **Appendix C** for additional information.

Design Point Descriptions

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions.

Design Point #1 (DPE1) is an existing roadway located on the southerly side of the site (Winfield Street). Under existing conditions, this design point receives stormwater flows from approximately 0.31 acres of land, designated as watershed "E1". This watershed is comprised entirely of "fair" grass cover, as it is mostly grass with patches of gravel. This area has a calculated curve number of 49 and a calculated time of concentration of 6 minutes.

A summary of the existing and proposed conditions peak runoff rates for the 2-, 10-, 25- and 100-year storms can be found in **Table 1.1** below.

Table 1.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.02	0.00	**-0.02**	0.27	0.03	**-0.24**	0.61	0.13	**-0.58**	1.29	0.36	**-0.93**

**Flows are represented in cubic feet per second (cfs)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The site consists of approximately 0.31 acres of land located at 30 Winfield Street in the City of Worcester, Massachusetts. The current site contains a compacted gravel lot.

Existing Collection and Conveyance

The site drains to one area, the roadway to the south (Winfield Street). Slopes on the site range from 1%-20%, however, most of the site is a consistent 3% gravel lot. On-site elevations range from 494 feet at the northeast corner to 492 feet at the southerly edge.

Subcatchment E1 in total is 0.31 acres comprised entirely of "fair" grass cover This area flows overland from northeast to southwest across the site where it flows offsite.

For additional hydrologic information, refer to **Appendix D**.

III. PROPOSED SITE CONDITIONS

Proposed Development Site Conditions

The proposed project includes the construction of a new 3,595 SF freestanding SMOC residence along with new paved parking areas, landscaping, and associated utilities. A portion of the site, including some landscape areas and sidewalk areas, has been designed to drain overland to Winfield Street. The roof area runoff has been designed to be collected and conveyed through a series of roof drains that will route to the proposed underground infiltration system. The rest of the site's stormwater runoff, including the entirety of the proposed parking area, has been designed to be collected and conveyed by a proposed catch basin and routed through a series of pipes to the proposed underground infiltration system.

Proposed Development Collection and Conveyance

The proposed development has been divided into three (3) separate subcatchments has described below:

Subcatchment P1 consists of 0.13 acres of area consisting of grass cover and pavement cover. This area flows overland from northeast to southwest across the site where it flows offsite.

Subcatchment P2 consists of 0.09 acres of area consisting of paved parking area and grass cover. This area flows to a catch basin where it is collected and conveyed to the proposed underground infiltration system.

Subcatchment P3 consists of 0.09 acres of area consisting of roof area. This area is collected and conveyed by roof drains where it is routed to the proposed underground infiltration system.

For additional hydrologic information, refer to **Appendix E**.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in table 4.1 below for stormwater calculations is based on NOAA. Refer to **Appendix F** for more information.

Table 4.1: NOAA Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.77	5.91	7.63	10.50

Values derived from NOAA ATLAS on 05/22/2024

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that the majority of the proposed impervious areas (including the building roof and paved parking/driveway areas) shall be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 1.1** the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at Design Point DP1.

Standard #3: Recharge

The stormwater runoff from the project will be collected and diverted to a proposed underground infiltration system. The project as proposed will involve the creation of 7,346 square feet of new impervious area and is required to infiltrate 379 cubic feet of stormwater as defined in Stormwater Standard 3. The proposed infiltration basin will provide 799 cubic feet of volume below the lowest outlet for groundwater recharge. Refer to **Appendix F** of this report for calculations documenting required and provided recharge volumes.

The DEP Stormwater Standards require that the infiltration BMP drains completely within 72 hours of the end of the storm event. Calculations showing that the proposed infiltration basin will drain within 2.9 hours are included in **Appendix F** of this report.

A four (4) foot separation to estimated seasonal high groundwater is provided and a groundwater mounding analysis is not required.

Standard #4: Water Quality

Water quality treatment is provided via deep sump catch basin and an underground infiltration system. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will involve the creation of 7,346 square feet of new impervious area and is required to treat 632 cubic feet of water quality volume as defined in Stormwater Standard 4. The proposed infiltration basin provides 799 cubic feet of water quality volume below the lowest outlet for water quality treatment. Refer to **Appendix F** of this report for calculations documenting required and provided water quality volumes.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not applicable for this project.

Standard #6: Critical Areas

Not applicable for this project.

Standard #7: Redevelopment

Not Applicable for this project.

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

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix G** of this report. The O&M Plan outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties.

Standard #10: Prohibition of Illicit Discharges

The proposed project will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensation, etc.) and will not contain any illicit discharges from prohibited sources.

VI. SUMMARY

In summary, the proposed project results in a reduction of impervious area and in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. The pre-development versus post-development peak discharge rates comparisons are contained in **Table 5.1** of this report.

Table 5.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.02	0.00	**-0.02**	0.27	0.03	**-0.24**	0.61	0.13	**-0.58**	1.29	0.36	**-0.93**

**Flows are represented in cubic feet per second (cfs)*

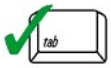
APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

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.

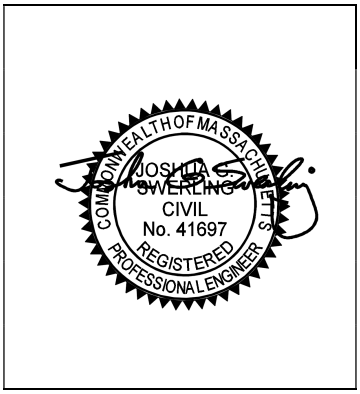
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



05/28/2024

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ 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): Underground Infiltration System

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.

APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*

USGS science for a changing world

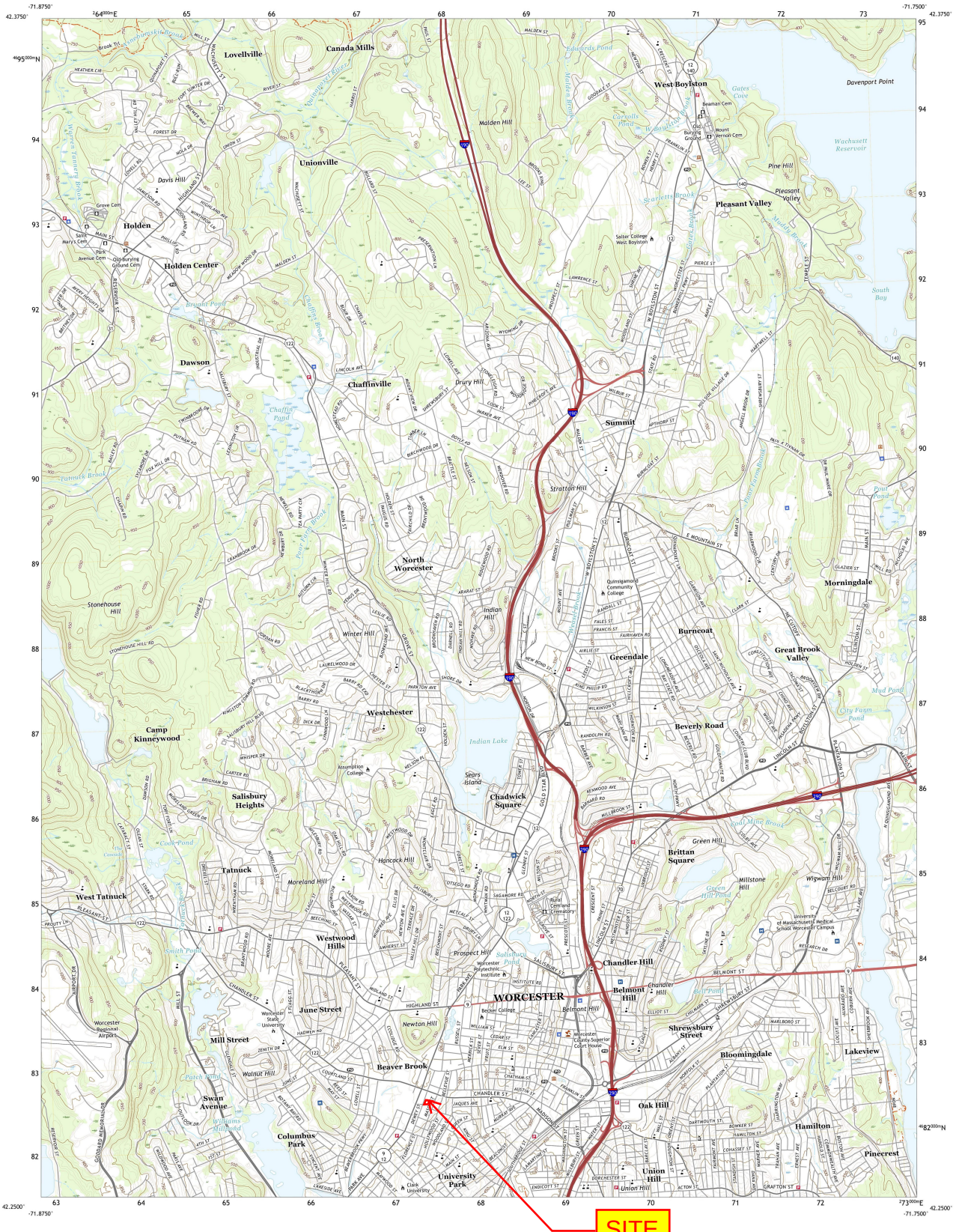
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

WORCESTER NORTH QUADRANGLE

MASSACHUSETTS - WORCESTER COUNTY

7.5-MINUTE SERIES



Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 19T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery.....NAIP, July 2016 - September 2016
Roads.....U.S. Census Bureau, 2018
Names.....GNIS, 1974 - 2018
Hydrography.....National Hydrography Dataset, 2004 - 2015
Contours.....National Elevation Dataset, 2012
Boundaries.....Multiple sources; see metadata file 2016 - 2017

Wetlands.....FWS National Wetlands Inventory 2008

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
0.5 0
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

ADJOINING QUADRANGLES

1 Wachusett Mountain
2 Sterling
3 Clinton
4 Paxton
5 Shrewsbury
6 Leicester
7 Worcester South
8 Grafton

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

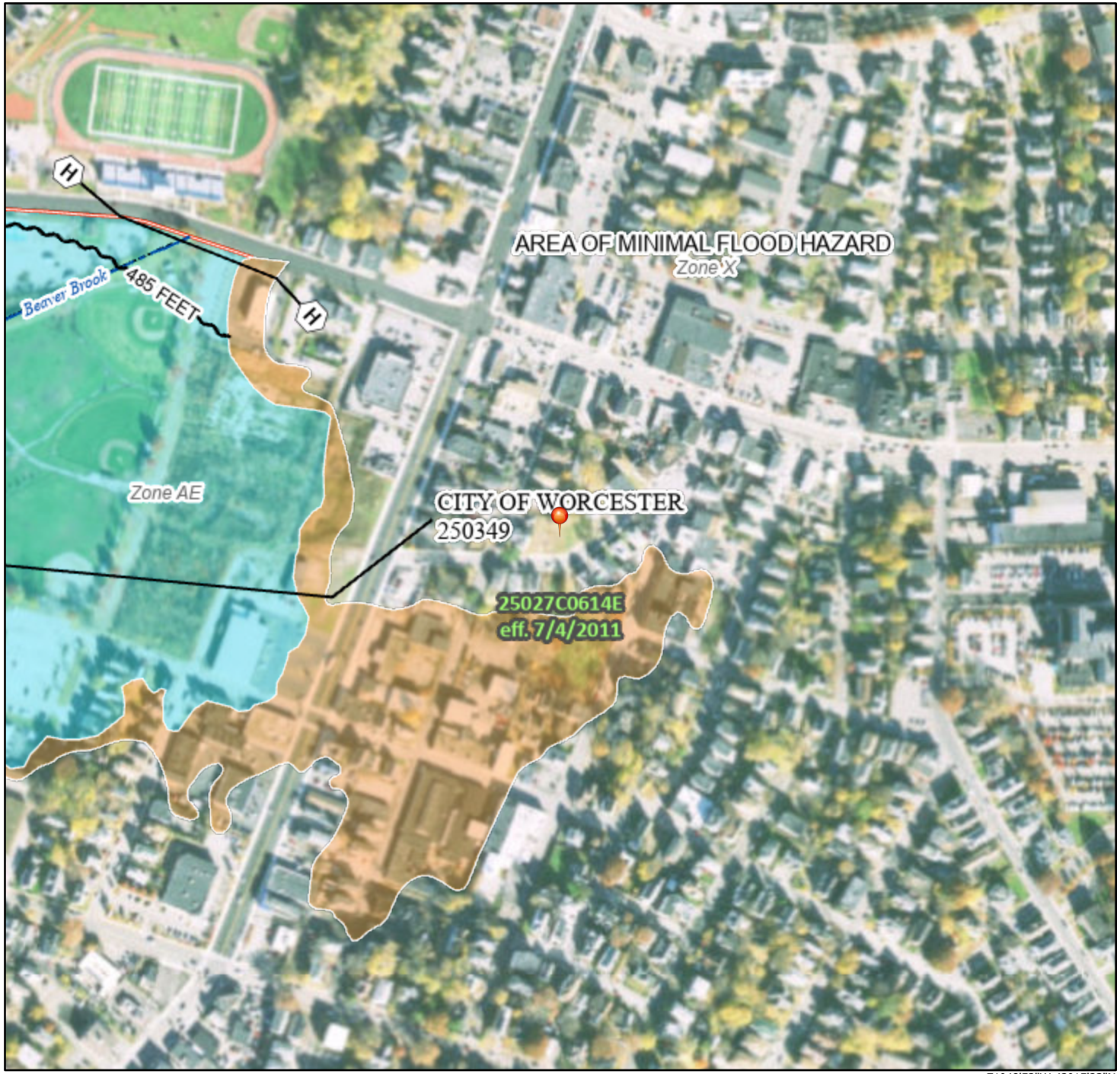
WORCESTER NORTH, MA
2021

NSN 7643013898982
NGA REF NO. USGSX24K98982

National Flood Hazard Layer FIRMette

FEMA

71°49'30"W 42°15'49"N



71°48'53"W 42°15'23"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

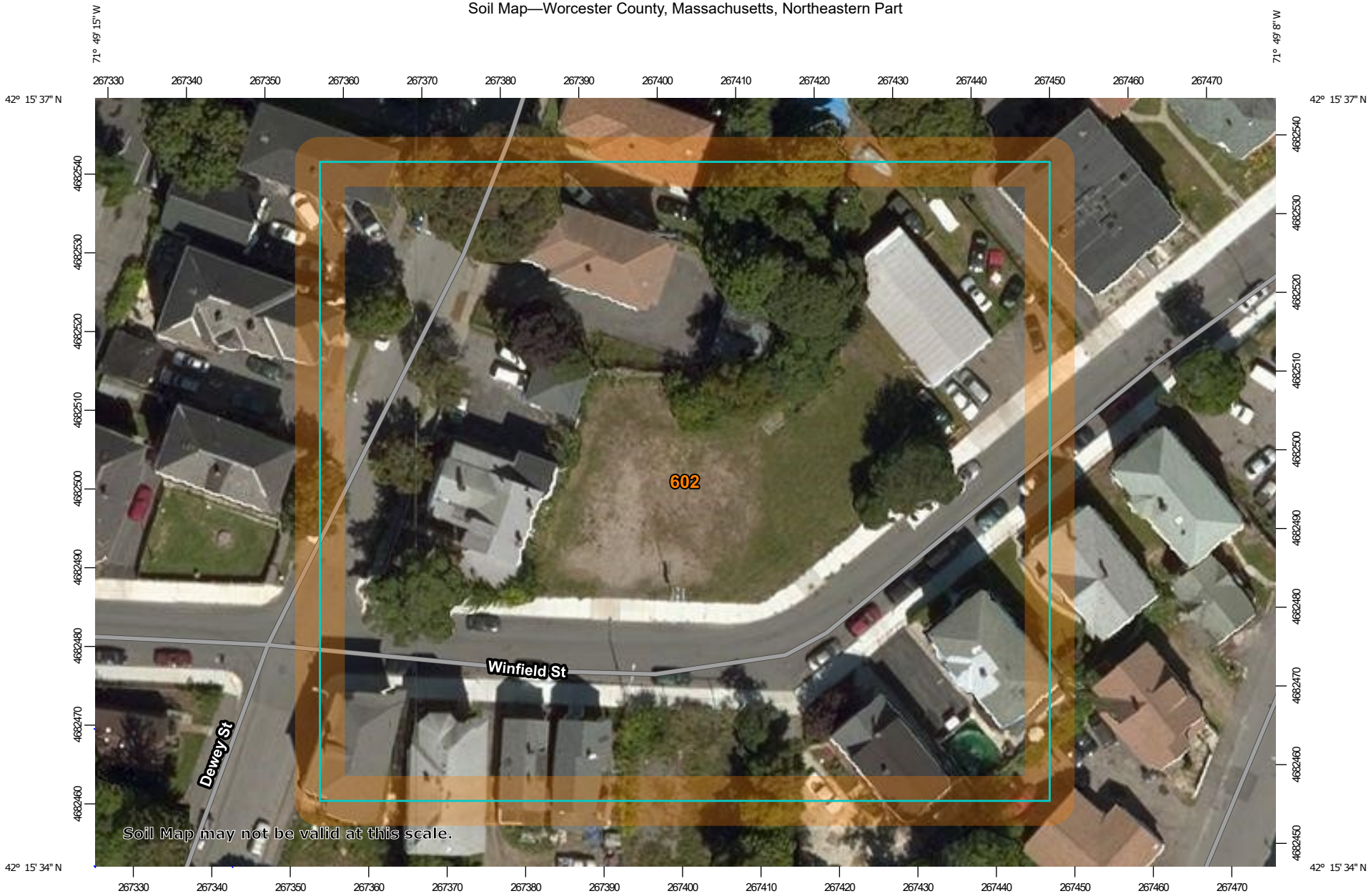
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/24/2024 at 3:04 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *SOIL TESTING RESULTS*



Map Scale: 1:688 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 30 60 120 180

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 14, Sep 13, 2019

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

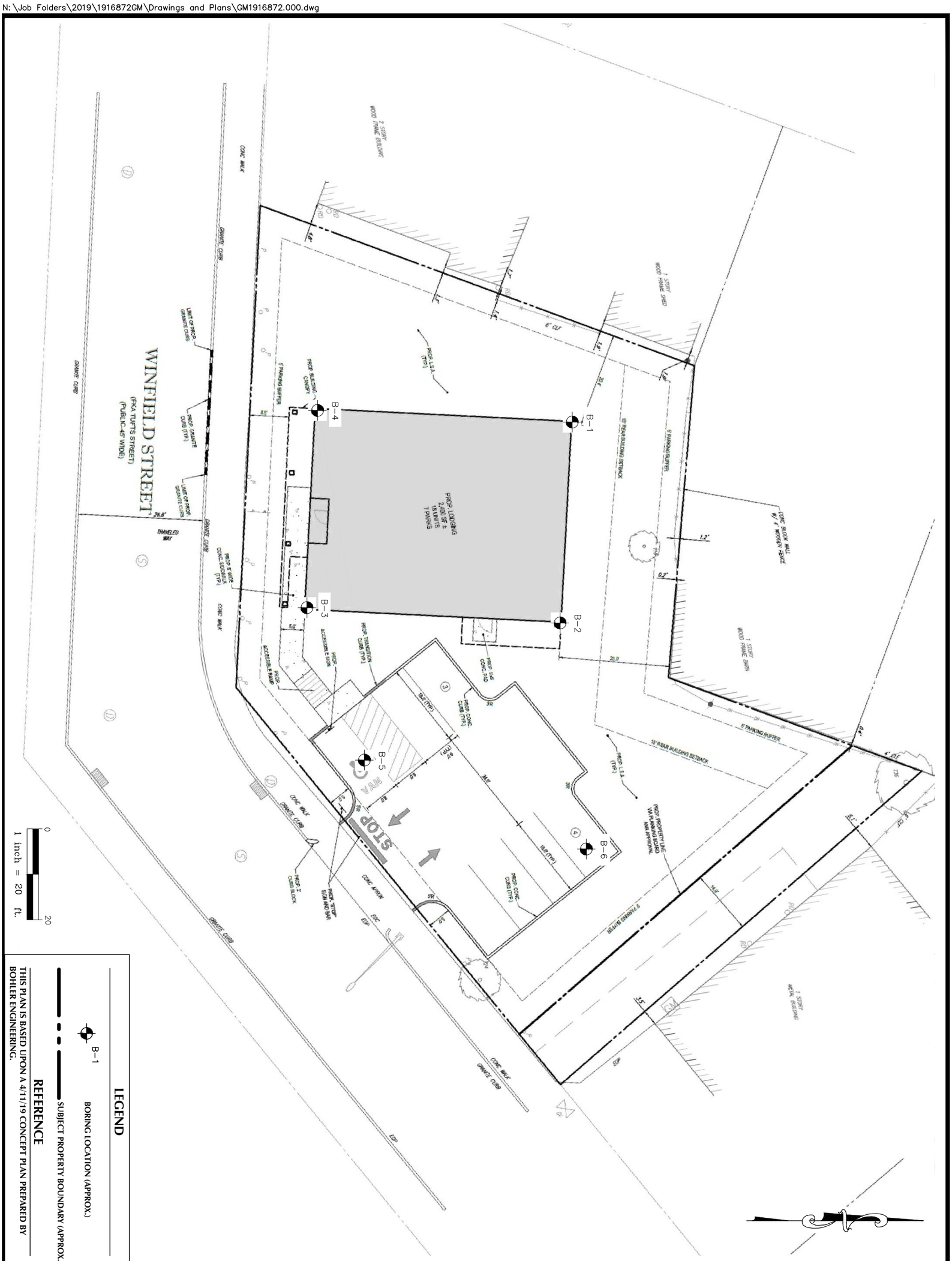
Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	1.9	100.0%
Totals for Area of Interest		**1.9**	**100.0%**

N:\Job Folders\2019\1916872GM\Drawings and Plans\GM1916872.000.dwg



1 inch = 20 ft.

0 20

LEGEND

B-1 BORING LOCATION (APPROX.)

SUBJECT PROPERTY BOUNDARY (APPROX.)

REFERENCE

THIS PLAN IS BASED UPON A 4/11/19 CONCEPT PLAN PREPARED BY BOHLER ENGINEERING.

PROJECT #:	GM1916872
DESIGNED BY:	MR
DATE:	1/8/20
SCALE:	1" = 20'
PROJ. MGR.:	RR
FIGURE:	1

DRAWING TITLE:
BORING LOCATION PLAN

CLIENT:
SOUTH MIDDLESEX OPPORTUNITY COUNCIL

PROJECT:
PROPOSED LODGING
30 WINFIELD STREET
MAP 6, LOT 21
WORCESTER, MASSACHUSETTS

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
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WHITESTONE ASSOCIATES, INC.

APPENDIX A
Records of Subsurface Exploration

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 493.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	17.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Building	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

Water Depth | Elevation (feet bgs) | (feet NAVD88)		Cave-In Depth | Elevation (feet bgs) | (feet NAVD88)	
During:	14.0 | 479.0		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1	X	5 - 5 - 4 - 3	8	9		EXISTING FILL		Brown, Loose, Silty Sand with Gravel (FILL)	
						2.0				
2 - 4	S-2	X	15 - 5 - 4 - 4	10	9				Brown, Loose, Poorly Graded Sand with Gravel (SP)	
						5.0				
5 - 7	S-3	X	9 - 6 - 7 - 7	12	13				As Above, Medium Dense (SP)	
7 - 9	S-4	X	4 - 2 - 4 - 4	17	6				As Above, Loose (SP)	
							GLACIO-FLUVIAL DEPOSIT			
						10.0				
10 - 12	S-5	X	4 - 3 - 3 - 4	14	6				As Above, Loose (SP)	
						11.5				
									Brown, Loose, Silty Sand (SM)	
						15.0				
15 - 17	S-6	X	9 - 9 - 10 - 10	14	19				Brown, Medium Dense, Silty Sand (SM)	
									Boring Log B-1 Terminated at a Depth of 17.0 Feet Below Ground Surface.	
						20.0				
						25.0			c	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 493.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	19.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Building	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

	Water Depth (feet bgs)	Elevation (feet NAVD88)	Cave-In Depth (feet bgs)	Elevation (feet NAVD88)
During:	14.5	478.5		
At Completion:	--	--	**At Completion:**	-- / --
24 Hours:	--	--	**24 Hours:**	-- / --

Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
						0.0			
							TS	6" Topsoil	
0 - 2	S-1	X	2 - 3 - 3 - 3	10	6		EXISTING FILL	Brown, Loose, Silty Sand with Gravel, Brick and Asphalt Fragments (FILL)	
2 - 4	S-2	X	1 - 2 - 1 - 2	14	3			Brown, Very Loose, Silty Sand with Gravel (FILL)	
						4.5			
						5.0			
5 - 7	S-3	X	4 - 5 - 4 - 5	18	9			Brown, Loose, Poorly Graded Sand with Gravel (SP)	
7 - 9	S-4	X	6 - 6 - 8 - 8	16	14			As Above, Medium Dense (SP)	
						10.0			
10 - 12	S-5	X	9 - 8 - 6 - 6	17	14		GLACIO-FLUVIAL DEPOSIT	As Above (SP)	
						15.0			
15 - 17	S-6	X	3 - 3 - 3 - 4	22	6			As Above, Loose (SP)	
17 - 19	S-7	X	4 - 3 - 5 - 4	23	8			As Above (SP)	
						18.8		Brown, Loose, Silty Sand (SM)	
						20.0		Boring Log B-2 Terminated at a Depth of 19.0 Feet Below Ground Surface.	
						25.0			

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 492.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	17.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Building	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

Water Depth | Elevation (feet bgs) | (feet NAVD88)		Cave-In Depth | Elevation (feet bgs) | (feet NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1	X	3 - 3 - 7 - 5	9	10		GLACIO-FLUVIAL DEPOSIT		Brown, Loose to Medium Dense, Poorly Graded Sand with Gravel (SP)	
2 - 4	S-2	X	6 - 8 - 12 - 19	12	20				As Above, Medium Dense (SP)	
						5.0				
5 - 7	S-3	X	9 - 5 - 4 - 4	12	9				As Above, Loose (SP)	
7 - 9	S-4	X	3 - 4 - 5 - 2	15	9				As Above (SP)	
						10.0				
10 - 12	S-5	X	4 - 4 - 4 - 3	18	8				As Above (SP)	
						11.5			Brown, Loose, Silty Sand with Gravel (SM)	
						15.0				
15 - 17	S-6	X	2 - 2 - 3 - 4	22	5				Brown, Loose, Silty Sand (SM)	
									Boring Log B-3 Terminated at a Depth of 17.0 Feet Below Ground Surface.	
						20.0				
						25.0			c	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Page 1 of 1

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 492.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	19.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Building	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

Water Depth | Elevation (feet bgs) | (feet NAVD88)		Cave-In Depth | Elevation (feet bgs) | (feet NAVD88)	
During:	14.5 | 477.5		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1	X	3 - 5 - 5 - 7	5	10				Brown, Medium Dense, Poorly Graded Sand with Gravel (SP)	
2 - 4	S-2	X	7 - 9 - 12 - 12	10	21				As Above (SP)	
						5.0				
5 - 7	S-3	X	10 - 6 - 4 - 4	14	10				As Above, Loose to Medium Dense (SP)	
7 - 9	S-4	X	3 - 4 - 4 - 4	15	8				As Above, Loose (SP)	
						10.0	GLACIO-FLUVIAL DEPOSIT			
10 - 12	S-5	X	2 - 2 - 2 - 2	17	4				As Above, Very Loose to Loose (SP)	
						11.5			Brown, Very Loose to Loose, Silty Sand with Gravel (SM)	
						15.0				
15 - 17	S-6	X	7 - 9 - 12 - 12	16	21				Brown, Medium Dense, Silty Sand (SM)	
17 - 19	S-7	X	15 - 20 - 20 - 21	20	41				As Above, Dense (SP)	
						20.0			Boring Log B-4 Terminated at a Depth of 19.0 Feet Below Ground Surface.	
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Page 1 of 1

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 492.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	9.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Parking	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

Water Depth | Elevation (feet bgs) | (feet NAVD88)		Cave-In Depth | Elevation (feet bgs) | (feet NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1		2 - 4 - 3 - 2	19	7		EXISTING FILL		Dark Brown, Loose, Silty Sand with Gravel, Brick and Asphalt Fragments (FILL)	
						2.5			Brown, Medium Dense, Silty Sand (FILL)	
2 - 4	S-2		5 - 10 - 11 - 14	12	21				Brown, Medium Dense, Poorly Graded Sand with Gravel (SP)	
						5.0				
5 - 7	S-3		9 - 8 - 5 - 6	14	13		GLACIO-FLUVIAL DEPOSIT		As Above (SP)	
7 - 9	S-4		5 - 5 - 4 - 4	13	9				As Above, Loose (SP)	
						10.0			Boring Log B-5 Terminated at a Depth of 9.0 Feet Below Ground Surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Page 1 of 1

Project:	Proposed Lodging	**WAI Project No.:**	GM1916872.000
Location:	30 Winfield Street, City and County of Worcester, Massachusetts	**Client:**	South Middlesex Opportunity Council
Surface Elevation:	± 493.0 feet above NAVD88	**Date Started:**	12/11/2019
Termination Depth:	9.0 feet bgs	**Date Completed:**	12/11/2019
Proposed Location:	Parking	**Logged By:**	DC
Drill / Test Method:	HSA / SPT	**Contractor:**	GG
		Equipment:	Geoprobe 6610DT

Water Depth | Elevation (feet bgs) | (feet NAVD88)		Cave-In Depth | Elevation (feet bgs) | (feet NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

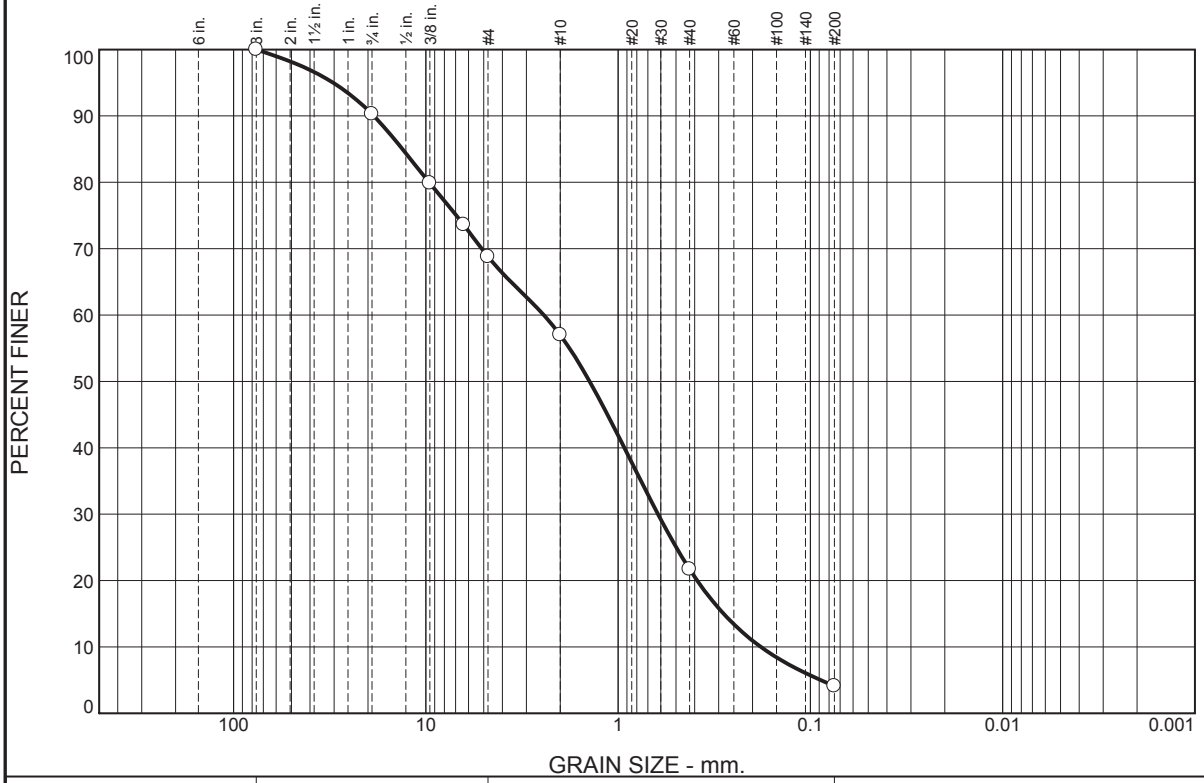
SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1	X	4 - 3 - 5 - 4	17	8		EXISTING FILL		Dark Brown, Loose, Silty Sand with Gravel, Brick and Asphalt Fragments (FILL)	
						2.5				
2 - 4	S-2	X	5 - 6 - 6 - 5	13	12		GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Poorly Graded Sand with Gravel (SP)	
						5.0				
5 - 7	S-3	X	8 - 7 - 5 - 3	15	12				As Above (SP)	
7 - 9	S-4	X	6 - 6 - 6 - 7	17	12				As Above (SP)	
						10.0			Boring Log B-6 Terminated at a Depth of 9.0 Feet Below Ground Surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.7	21.5	11.8	35.3	17.6	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0	100.0	
3/4"	90.3		
3/8"	79.8		
1/4"	73.6		
#4	68.8		
#10	57.0		
#40	21.7		
#200	4.1	0.0 - 15.0	

* Whitestone Structural Fill

Material Description

Poorly Graded Sand with Gravel

Atterberg Limits

PL= NP LL= NP PI= NV

Coefficients

D_{90}= 18.6488 D_{85}= 13.2174 D_{60}= 2.4350
D_{50}= 1.4065 D_{30}= 0.6199 D_{15}= 0.2826
D_{10}= 0.1810 C_u= 13.45 C_c= 0.87

Classification

USCS= SP AASHTO= A-1-b

Remarks

Moisture Content = 3.3%

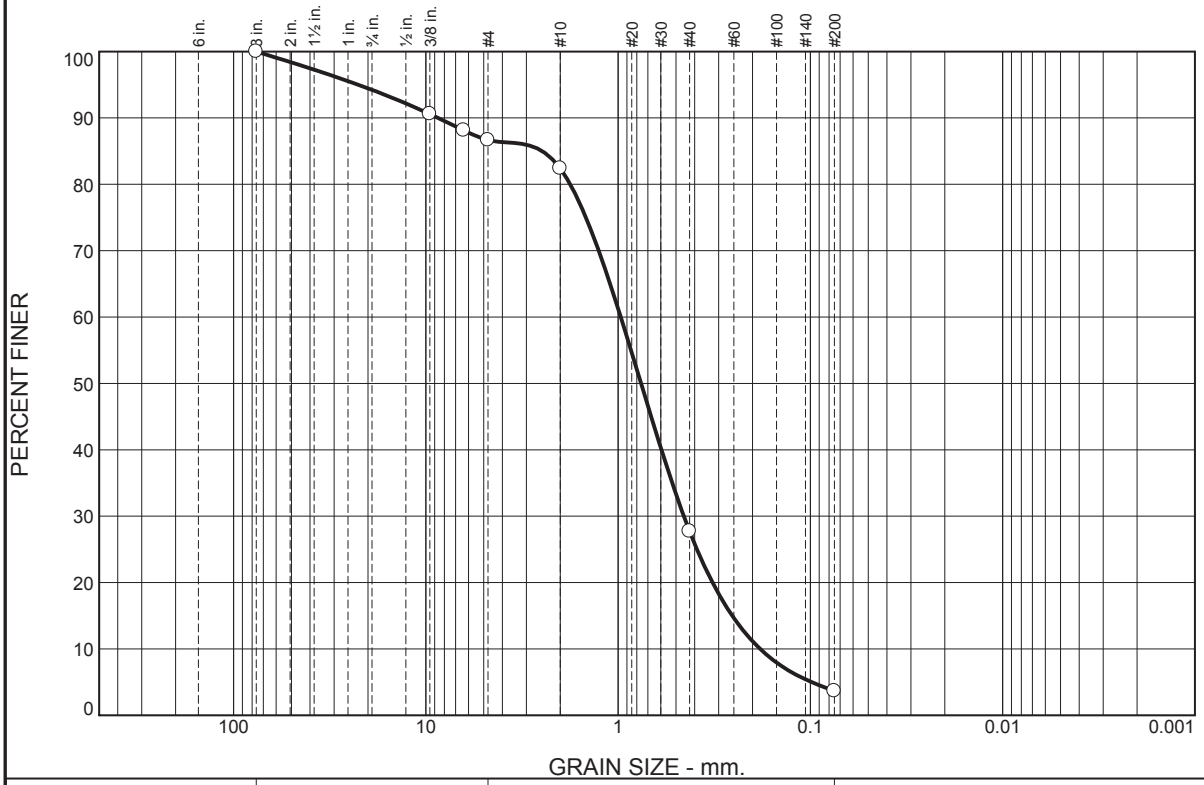
Location: Boring B-3
Sample Number: S-2 **Depth:** 2'-4' **Date:** 1/7/2020

WHITESTONE ASSOCIATES, INC.

Client: South Middlesex Opportunity Council
Project: Proposed Lodging, 30 Winfield Street
Worcester, Worcester County, Massachusetts
Project No: GM1916872.000 **Figure** S-2

Tested By: JM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.8	7.5	4.3	54.7	24.0	3.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0	100.0	
3/8"	90.6		
1/4"	88.1		
#4	86.7		
#10	82.4		
#40	27.7		
#200	3.7	0.0 - 15.0	

* Whitestone Structural Fill

Material Description

Poorly Graded Sand

Atterberg Limits

PL= NP LL= NP PI= NV

Coefficients

D_{90}= 8.6491 D_{85}= 2.4833 D_{60}= 0.9687
D_{50}= 0.7594 D_{30}= 0.4551 D_{15}= 0.2548
D_{10}= 0.1826 C_u= 5.31 C_c= 1.17

Classification

USCS= SP AASHTO= A-1-b

Remarks

Moisture Content = 5.6%

Location: Boring B-1
Sample Number: S-3 **Depth:** 5'-7' **Date:** 1/7/2020

WHITESTONE ASSOCIATES, INC.

Client: South Middlesex Opportunity Council
Project: Proposed Lodging, 30 Winfield Street
Worcester, Worcester County, Massachusetts
Project No: GM1916872.000 **Figure** S-1

Tested By: JM **Checked By:** RWM

WHITESTONE ASSOCIATES, INC.

APPENDIX C
Supplemental Information (USCS, Terms and Symbols)

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
Celebrating 25 Years 1994 – 2019

352 TURNPIKE ROAD
SUITE 320
SOUTHBOROUGH, MA 01772
508.485.0755
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT	
TRACE	1% TO 10%
LITTLE	10% TO 20%
SOME	20% TO 35%
AND	35% TO 50%

COMPACTNESS*
Sand and/or Gravel

	RELATIVE DENSITY
LOOSE	0% TO 40%
MEDIUM DENSE	40% TO 70%
DENSE	70% TO 90%
VERY DENSE	90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT	
VERY SOFT	LESS THAN 250
SOFT	250 TO 500
MEDIUM	500 TO 1000
STIFF	1000 TO 2000
VERY STIFF	2000 TO 4000
HARD	GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

Other Office Locations:

WARREN, NJ 908.668.7777
CHALFONT, PA 215.712.2700
ROCKY HILL, CT 860.726.7889
WALL, NJ 732.592.2101
STERLING, VA 703.464.5858
EVERGREEN, CO 303.670.6905

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
Celebrating 25 Years 1994 – 2019

352 TURNPIKE ROAD
SUITE 320
SOUTHBOROUGH, MA 01772
508.485.0755
whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N:	Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu:	Unconfined compressive strength, TSF.
Qp:	Penetrometer value, unconfined compressive strength, TSF.
Mc:	Moisture content, %.
LL:	Liquid limit, %.
PI:	Plasticity index, %.
δd:	Natural dry density, PCF.
▼:	Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE:	Not Encountered (Groundwater was not encountered).
SS:	Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST:	Shelby Tube - 3" O.D., except where noted.
AU:	Auger Sample.
OB:	Diamond Bit.
CB:	Carbide Bit
WS:	Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

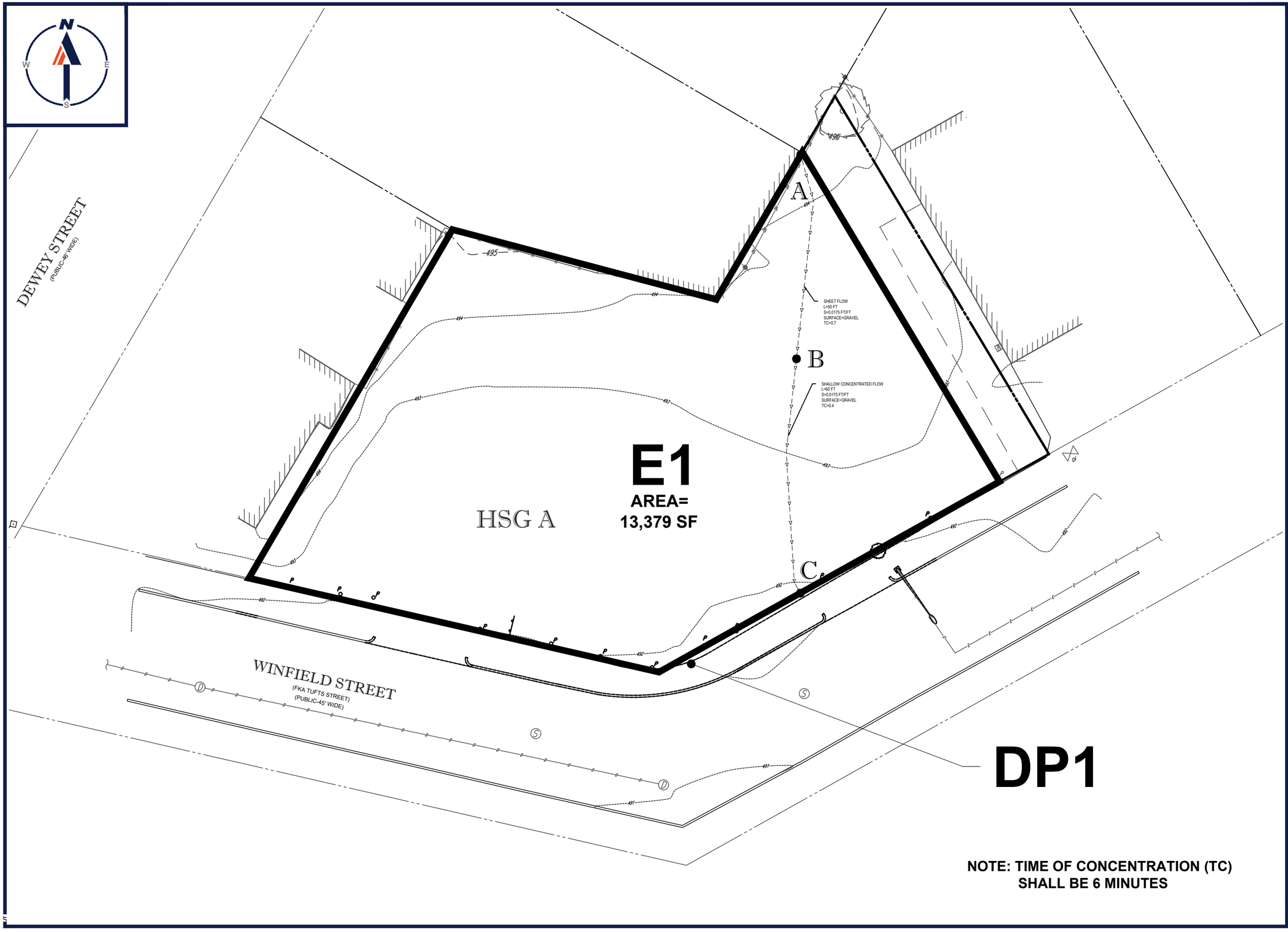
Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

WARREN, NJ	CHALFONT, PA	ROCKY HILL, CT	WALL, NJ	STERLING, VA	EVERGREEN, CO
908.668.7777	215.712.2700	860.726.7889	732.592.2101	703.464.5858	303.670.6905

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*



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LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	05/08/2020	PER DPW COMMENTS	NPD / RMM
2	11/11/2020	PER TEAM COMMENTS	NPD / RMM
3	06/14/2021	PER TEAM COMMENTS	NPD / RMM
4	07/12/2022	PER TEAM COMMENTS	AEF / RMM
5	01/30/2023	PER TEAM COMMENTS	NPD / RMM
6	12/15/2023	PER TEAM COMMENTS	NPD / RMM
7	05/24/2024	PER CITY COMMENTS	- / -

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PROJECT No.:	W191051
DRAWN BY:	CFD/NPD
CHECKED BY:	RMM
DATE:	04/28/2020
CAD I.D.:	W191051-CVL-7

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

SMOC
EVERYBODY MATTERS

PROPOSED DEVELOPMENT

30 WINFIELD STREET
WORCESTER COUNTY
CITY OF WORCESTER, MA
MAP #6, LOT #21

BOHLER
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

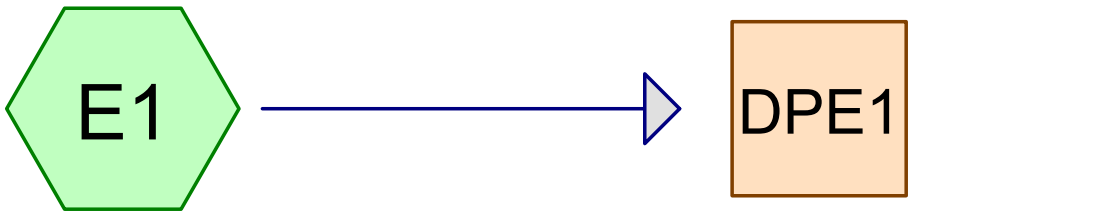
SHEET TITLE:

EXISTING CONDITIONS WATERSHED MAP

SHEET NUMBER:

WS-EX

REVISION 7 - 05/24/2024



E1 West Boylston Street

Subcat Reach Pond Link

Routing Diagram for W191051 Model
Prepared by Bohler Engineers, Printed 5/24/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr	Type III 24-hr		Default	24.00	1	3.77	2
2	10 yr	Type III 24-hr		Default	24.00	1	5.91	2
3	25 yr	Type III 24-hr		Default	24.00	1	7.63	2
4	100 yr	Type III 24-hr		Default	24.00	1	10.50	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.307	49	50-75% Grass cover, Fair, HSG A (E1)
0.307	**49**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.307	HSG A	E1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.307		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.307	0.000	0.000	0.000	0.000	0.307	50-75% Grass cover, Fair	E1
0.307	**0.000**	**0.000**	**0.000**	**0.000**	**0.307**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: E1 Runoff Area=13,379 sf 0.00% Impervious Runoff Depth>0.24"
Flow Length=110' Slope=0.0175 '/' Tc=6.0 min CN=49 Runoff=0.02 cfs 0.006 af

Reach DPE1: West Boylston Street Inflow=0.02 cfs 0.006 af
Outflow=0.02 cfs 0.006 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.006 af Average Runoff Depth = 0.24"
100.00% Pervious = 0.307 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: E1

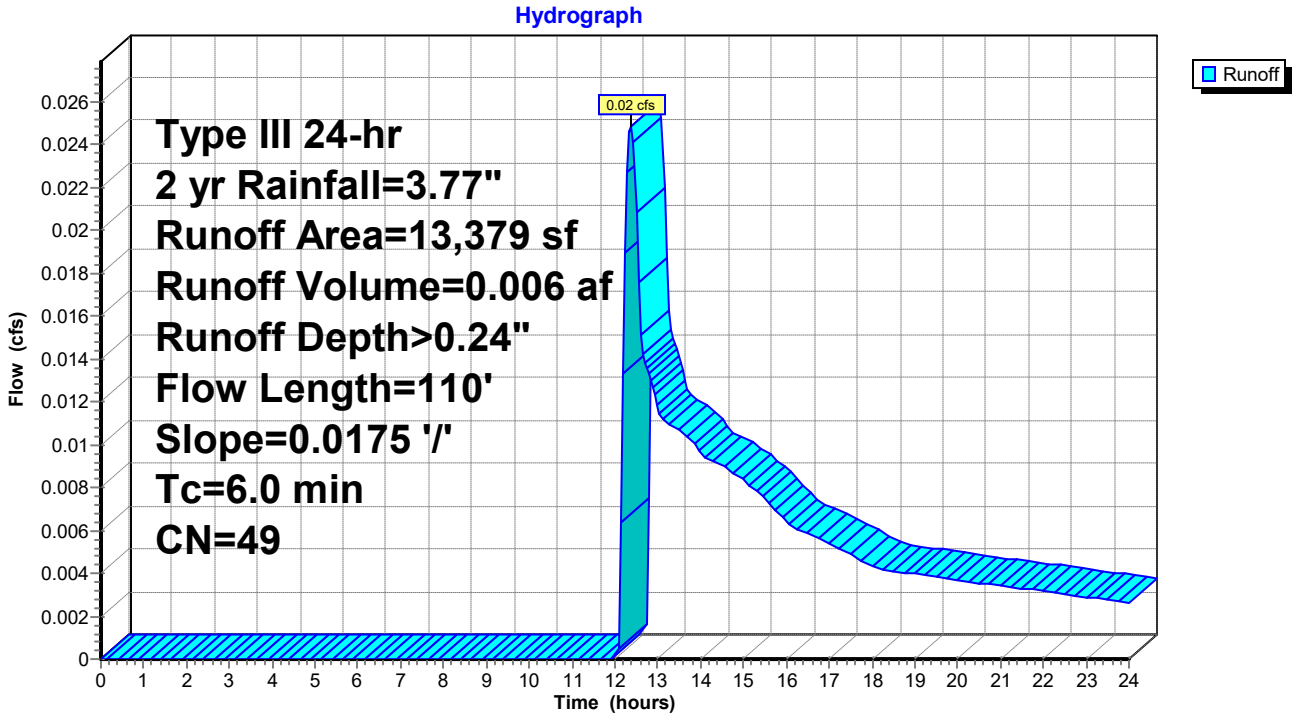
Runoff = 0.02 cfs @ 12.38 hrs, Volume= 0.006 af, Depth> 0.24"
Routed to Reach DPE1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.77"

Area (sf)	CN	Description
13,379	49	50-75% Grass cover, Fair, HSG A
13,379		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.1	110	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E1: E1



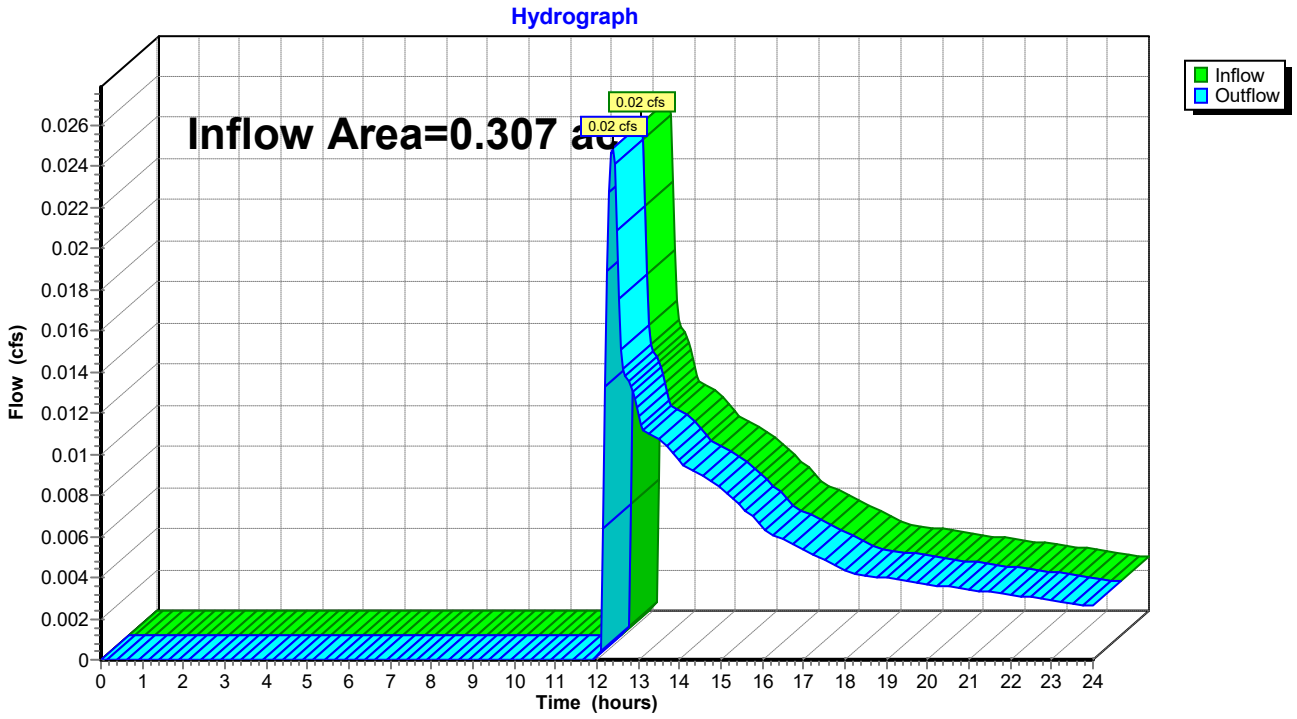
Summary for Reach DPE1: West Boylston Street

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

Inflow Area = 0.307 ac, 0.00% Impervious, Inflow Depth > 0.24" for 2 yr event
Inflow = 0.02 cfs @ 12.38 hrs, Volume= 0.006 af
Outflow = 0.02 cfs @ 12.38 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node PRE

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPE1: West Boylston Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: E1 Runoff Area=13,379 sf 0.00% Impervious Runoff Depth>1.03"
Flow Length=110' Slope=0.0175 '/' Tc=6.0 min CN=49 Runoff=0.27 cfs 0.026 af

Reach DPE1: West Boylston Street Inflow=0.27 cfs 0.026 af
Outflow=0.27 cfs 0.026 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.026 af Average Runoff Depth = 1.03"
100.00% Pervious = 0.307 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: E1

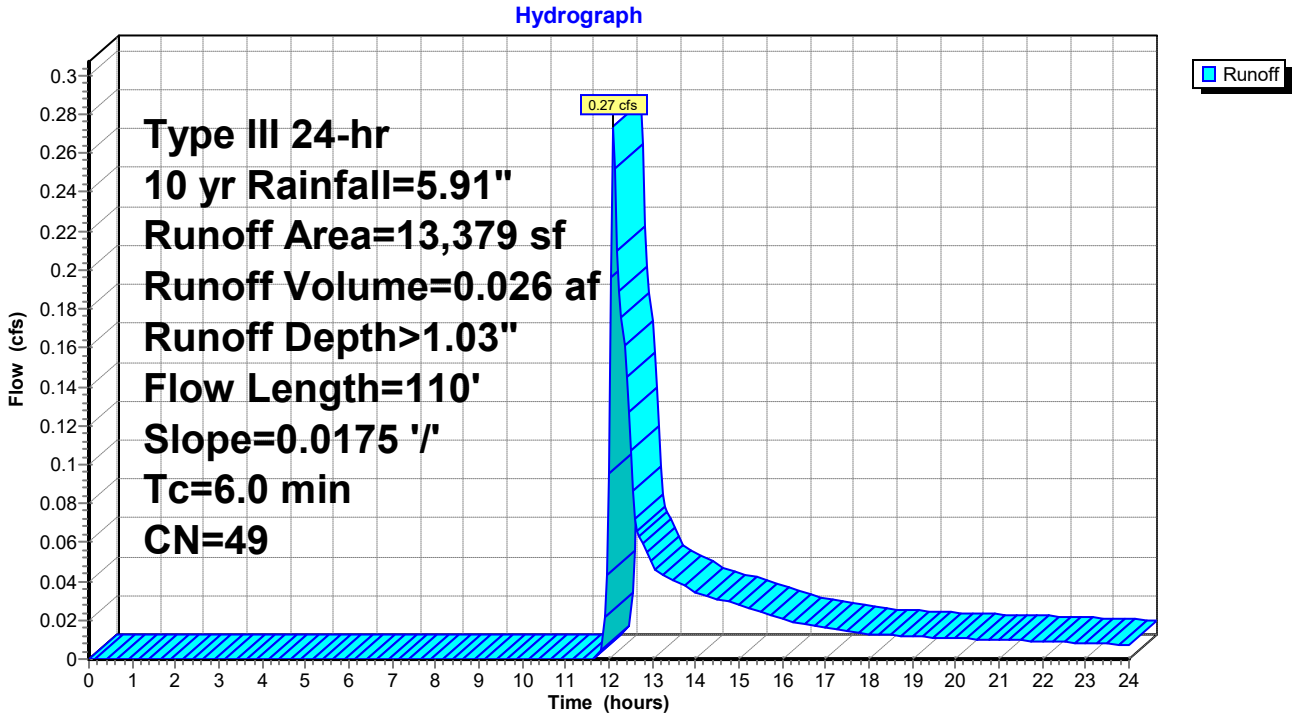
Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.026 af, Depth> 1.03"
Routed to Reach DPE1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.91"

Area (sf)	CN	Description
13,379	49	50-75% Grass cover, Fair, HSG A
13,379		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.1	110	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E1: E1



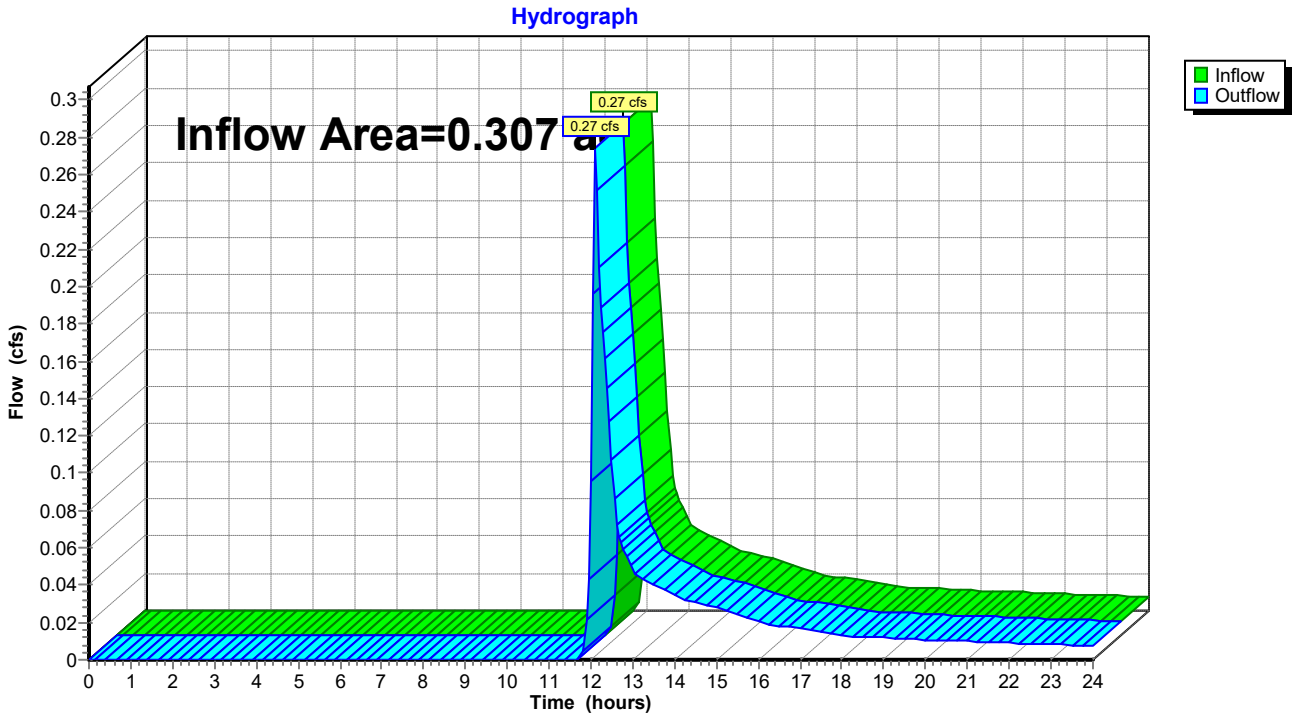
Summary for Reach DPE1: West Boylston Street

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

Inflow Area = 0.307 ac, 0.00% Impervious, Inflow Depth > 1.03" for 10 yr event
Inflow = 0.27 cfs @ 12.12 hrs, Volume= 0.026 af
Outflow = 0.27 cfs @ 12.12 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node PRE

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPE1: West Boylston Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: E1 Runoff Area=13,379 sf 0.00% Impervious Runoff Depth>1.93"
Flow Length=110' Slope=0.0175 '/' Tc=6.0 min CN=49 Runoff=0.61 cfs 0.049 af

Reach DPE1: West Boylston Street Inflow=0.61 cfs 0.049 af
Outflow=0.61 cfs 0.049 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.049 af Average Runoff Depth = 1.93"
100.00% Pervious = 0.307 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: E1

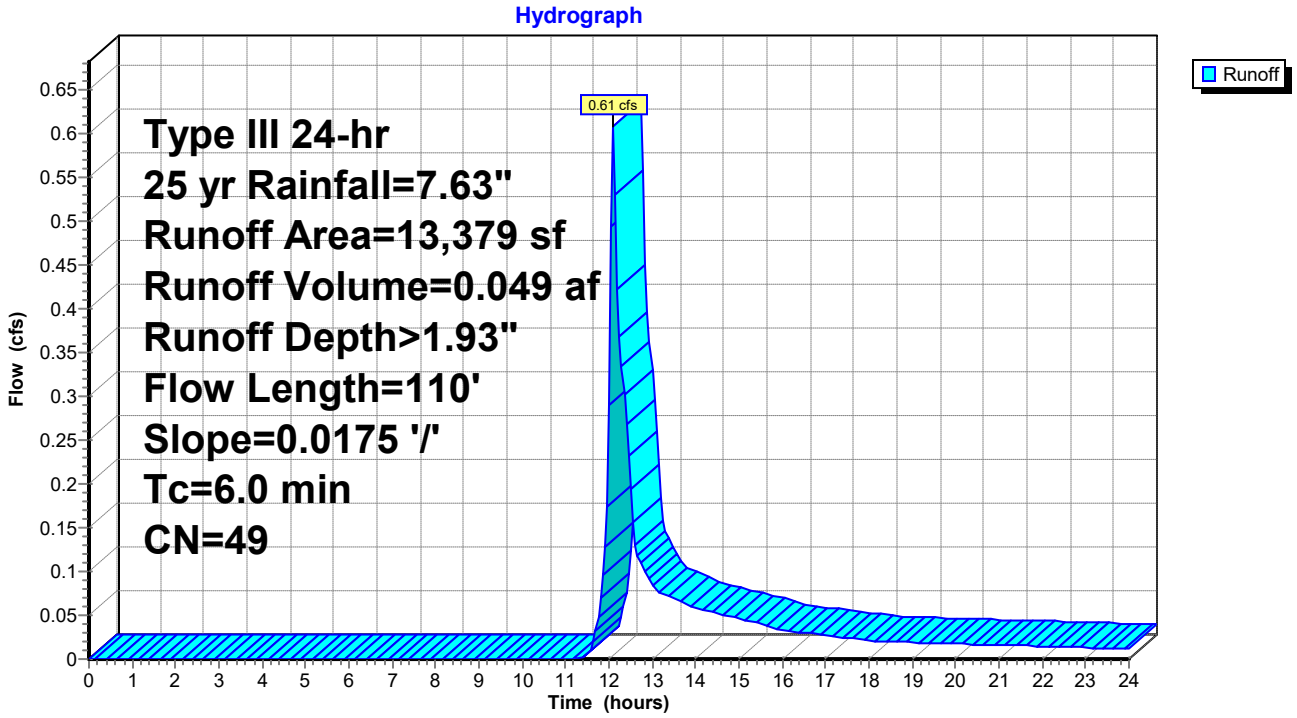
Runoff = 0.61 cfs @ 12.10 hrs, Volume= 0.049 af, Depth> 1.93"
Routed to Reach DPE1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=7.63"

Area (sf)	CN	Description
13,379	49	50-75% Grass cover, Fair, HSG A
13,379		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.1	110	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E1: E1



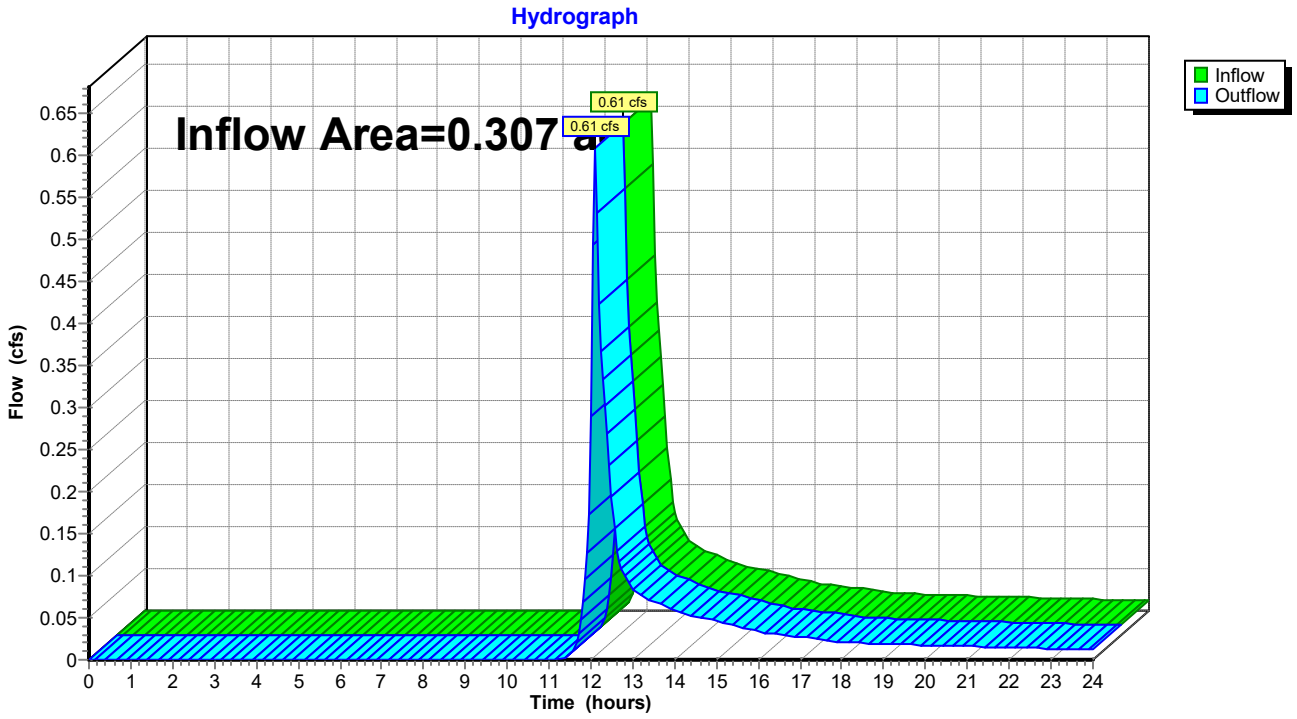
Summary for Reach DPE1: West Boylston Street

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

Inflow Area = 0.307 ac, 0.00% Impervious, Inflow Depth > 1.93" for 25 yr event
Inflow = 0.61 cfs @ 12.10 hrs, Volume= 0.049 af
Outflow = 0.61 cfs @ 12.10 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node PRE

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPE1: West Boylston Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: E1 Runoff Area=13,379 sf 0.00% Impervious Runoff Depth>3.76"
Flow Length=110' Slope=0.0175 '/' Tc=6.0 min CN=49 Runoff=1.29 cfs 0.096 af

Reach DPE1: West Boylston Street Inflow=1.29 cfs 0.096 af
Outflow=1.29 cfs 0.096 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.096 af Average Runoff Depth = 3.76"
100.00% Pervious = 0.307 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E1: E1

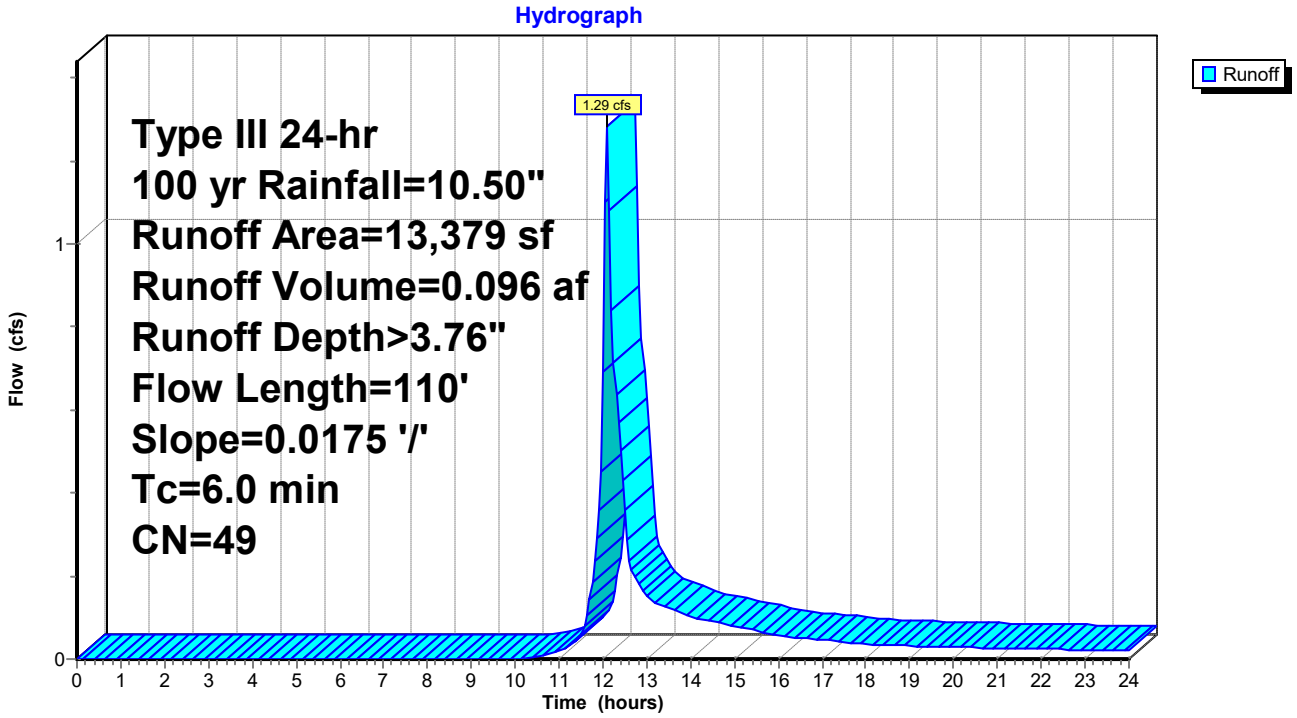
Runoff = 1.29 cfs @ 12.10 hrs, Volume= 0.096 af, Depth> 3.76"
Routed to Reach DPE1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=10.50"

Area (sf)	CN	Description
13,379	49	50-75% Grass cover, Fair, HSG A
13,379		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.1	110	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E1: E1



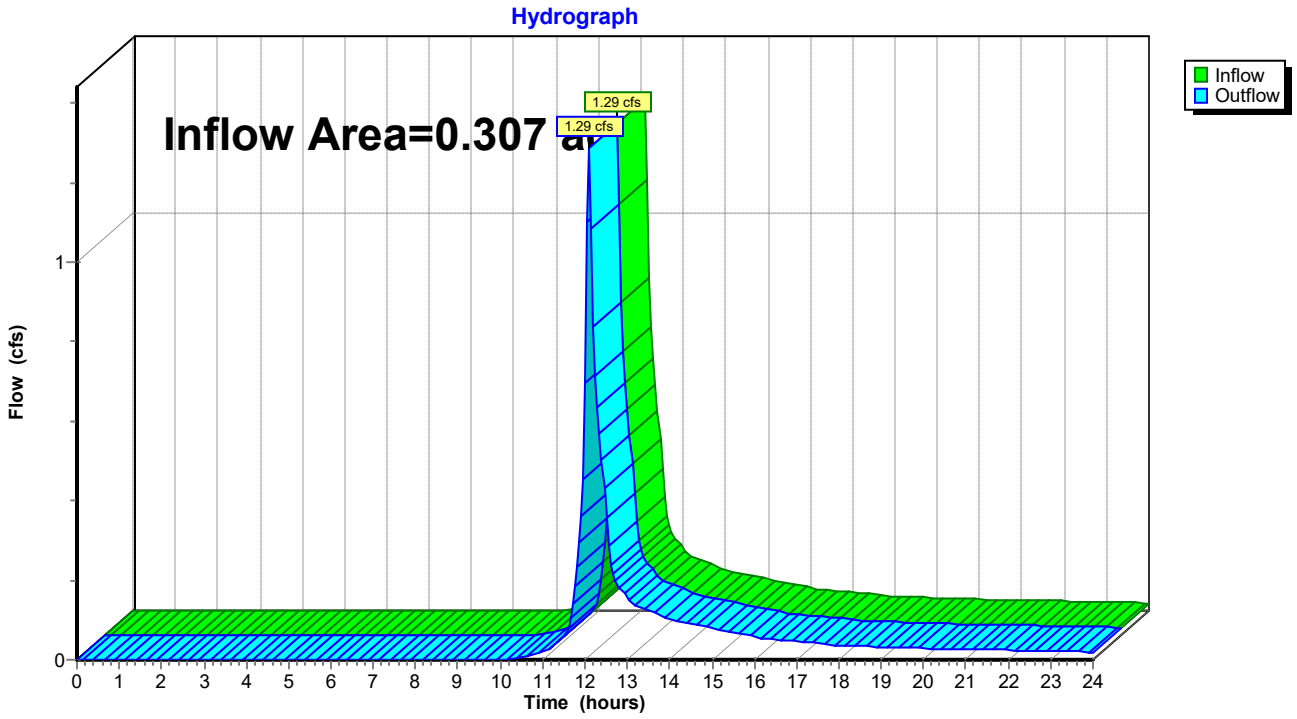
Summary for Reach DPE1: West Boylston Street

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

Inflow Area = 0.307 ac, 0.00% Impervious, Inflow Depth > 3.76" for 100 yr event
Inflow = 1.29 cfs @ 12.10 hrs, Volume= 0.096 af
Outflow = 1.29 cfs @ 12.10 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node PRE

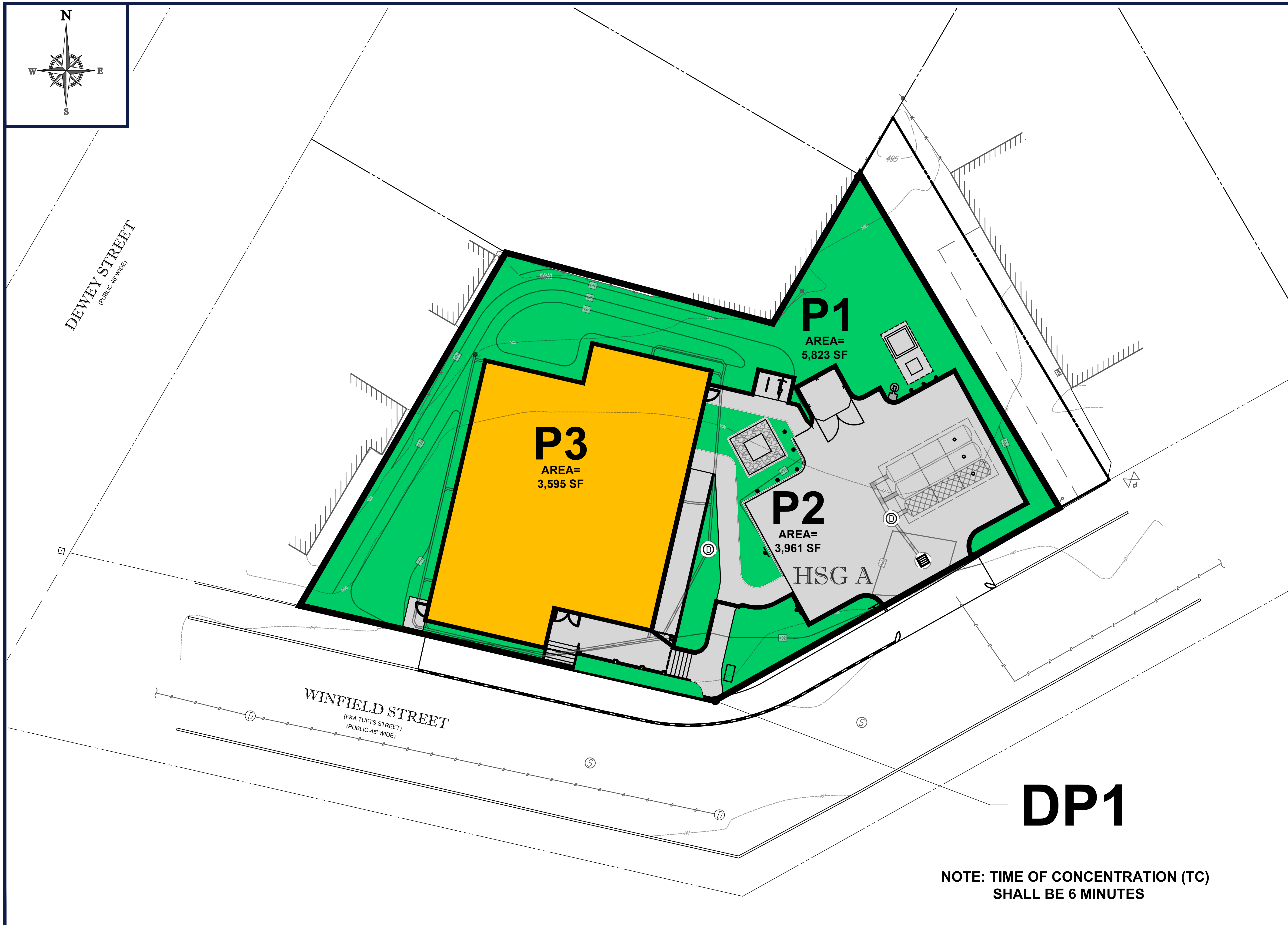
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPE1: West Boylston Street



APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*



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SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	05/08/2020	PER DPW COMMENTS	NPD / RMM
2	11/11/2020	PER TEAM COMMENTS	NPD / RMM
3	06/14/2021	PER TEAM COMMENTS	NPD / RMM
4	07/12/2022	PER TEAM COMMENTS	AGF / RMM
5	01/30/2023	PER TEAM COMMENTS	NPD / RMM
6	12/15/2023	PER TEAM COMMENTS	NPD / RMM
7	05/28/2024	PER CITY COMMENTS	JWT / ND/RM

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PROJECT No.: W191051
DRAWN BY: CFD/NPD
CHECKED BY: RMM
DATE: 04/28/2020
CAD I.D.: W191051-CVL-7

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

SMC
EVERYBODY MATTERS

PROPOSED DEVELOPMENT

30 WINFIELD STREET
WORCESTER COUNTY
CITY OF WORCESTER, MA
MAP #6, LOT #21

BOHLER
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

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MASSACHUSETTS No. 1217
RHODE ISLAND No. 419
NEW YORK No. 002359
NEW HAMPSHIRE No. 109
CONNECTICUT No. 1350
MAINE NO.4248

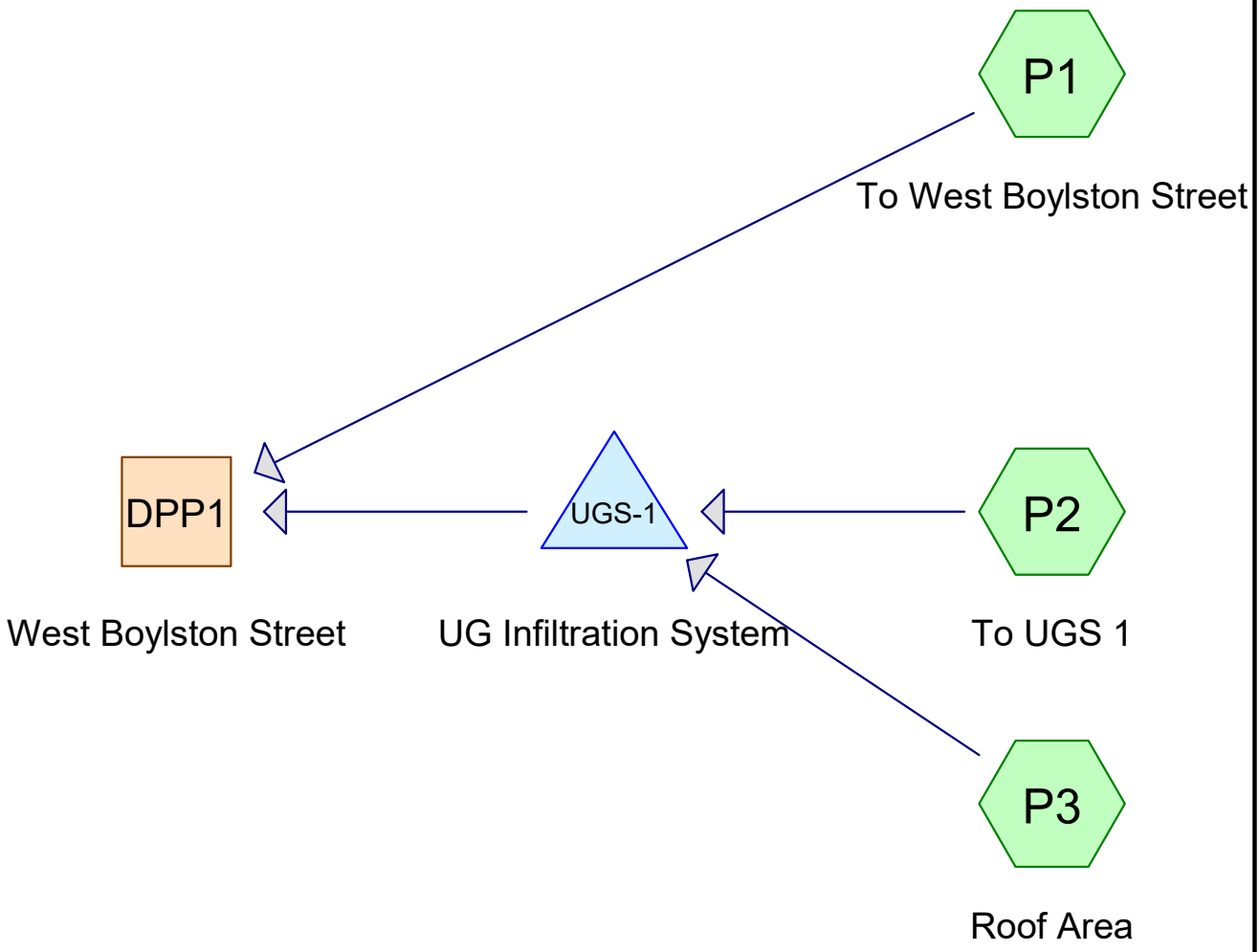
SHEET TITLE:

PROPOSED CONDITIONS WATERSHED MAP

SHEET NUMBER:

WS-PR

REVISION 7 - 05/28/2024



Subcat Reach Pond Link

Routing Diagram for W191051 Model
Prepared by Bohler Engineers, Printed 5/24/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr	Type III 24-hr		Default	24.00	1	3.77	2
2	10 yr	Type III 24-hr		Default	24.00	1	5.91	2
3	25 yr	Type III 24-hr		Default	24.00	1	7.63	2
4	100 yr	Type III 24-hr		Default	24.00	1	10.50	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.138	39	>75% Grass cover, Good, HSG A (P1, P2)
0.075	98	Paved parking, HSG A (P2)
0.083	98	Roofs, HSG A (P3)
0.011	98	Unconnected pavement, HSG A (P1)
0.307	**71**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.307	HSG A	P1, P2, P3
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.307		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.138	0.000	0.000	0.000	0.000	0.138	>75% Grass cover, Good	P1, P2
0.075	0.000	0.000	0.000	0.000	0.075	Paved parking	P2
0.083	0.000	0.000	0.000	0.000	0.083	Roofs	P3
0.011	0.000	0.000	0.000	0.000	0.011	Unconnected pavement	P1
0.307	**0.000**	**0.000**	**0.000**	**0.000**	**0.307**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To West Boylston Street Runoff Area=5,823 sf 8.24% Impervious Runoff Depth>0.05"
Flow Length=111' Tc=6.0 min UI Adjusted CN=41 Runoff=0.00 cfs 0.001 af

Subcatchment P2: To UGS 1 Runoff Area=3,961 sf 82.58% Impervious Runoff Depth>2.51"
Flow Length=111' Tc=6.0 min CN=88 Runoff=0.26 cfs 0.019 af

Subcatchment P3: Roof Area Runoff Area=3,595 sf 100.00% Impervious Runoff Depth>3.53"
Flow Length=111' Tc=6.0 min CN=98 Runoff=0.30 cfs 0.024 af

Reach DPP1: West Boylston Street Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond UGS-1: UG Infiltration System Peak Elev=487.00' Storage=0 cf Inflow=0.56 cfs 0.043 af
Discarded=0.56 cfs 0.043 af Primary=0.00 cfs 0.000 af Outflow=0.56 cfs 0.043 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.044 af Average Runoff Depth = 1.72"
45.09% Pervious = 0.138 ac 54.91% Impervious = 0.169 ac

Summary for Subcatchment P1: To West Boylston Street

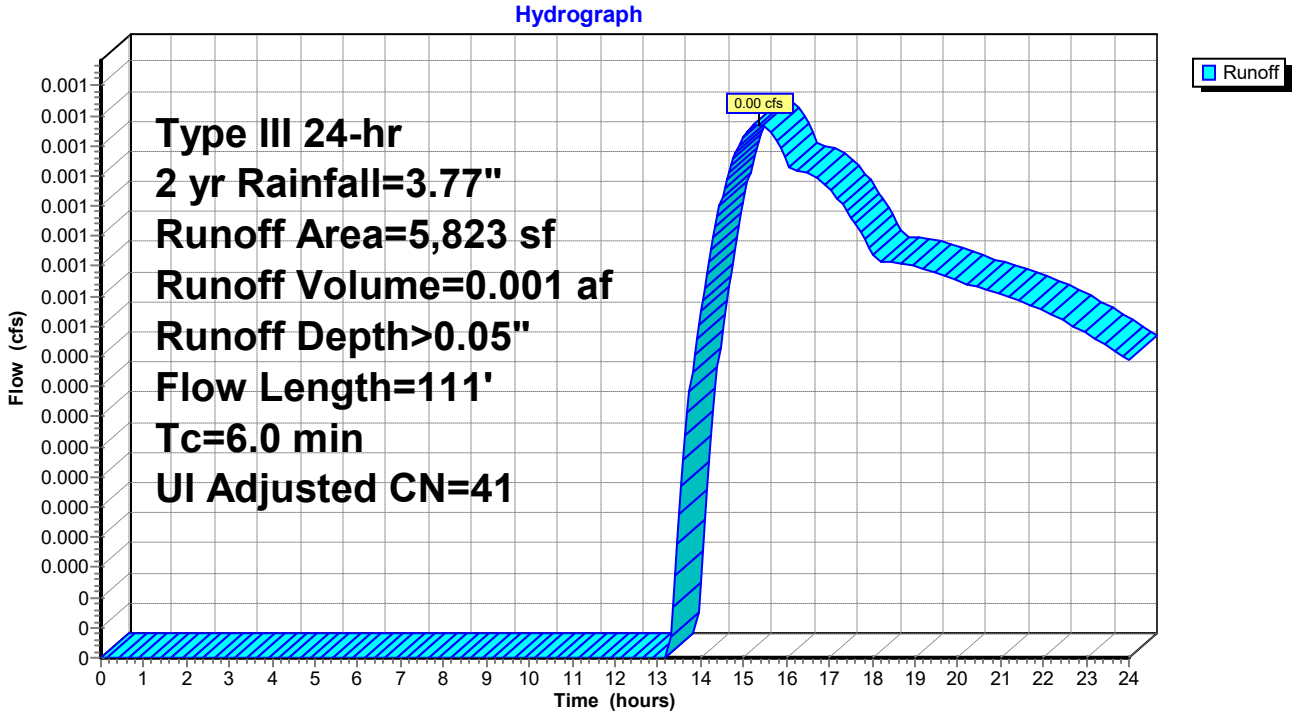
Runoff = 0.00 cfs @ 15.35 hrs, Volume= 0.001 af, Depth> 0.05"
Routed to Reach DPP1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.77"

Area (sf)	CN	Adj	Description
5,343	39		>75% Grass cover, Good, HSG A
480	98		Unconnected pavement, HSG A
5,823	44	41	Weighted Average, UI Adjusted
5,343			91.76% Pervious Area
480			8.24% Impervious Area
480			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: To West Boylston Street



Summary for Subcatchment P2: To UGS 1

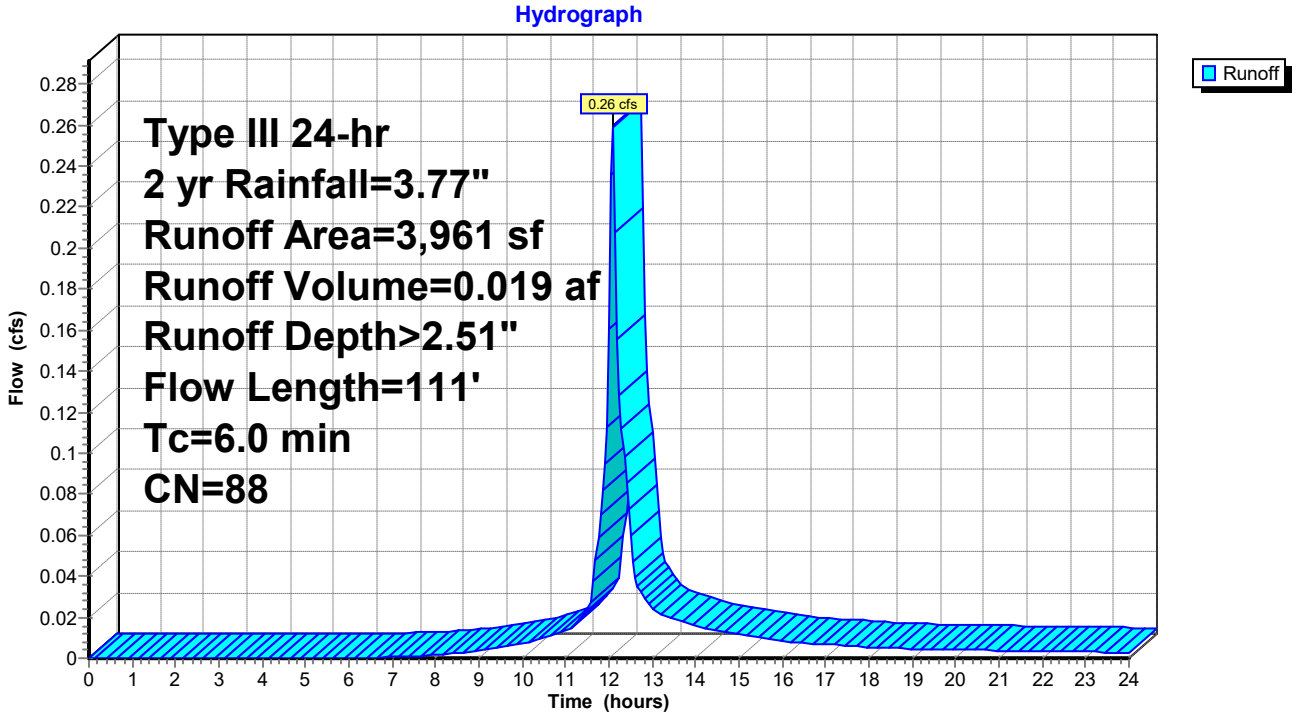
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 2.51"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.77"

Area (sf)	CN	Description
3,271	98	Paved parking, HSG A
690	39	>75% Grass cover, Good, HSG A
3,961	88	Weighted Average
690		17.42% Pervious Area
3,271		82.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: To UGS 1



Summary for Subcatchment P3: Roof Area

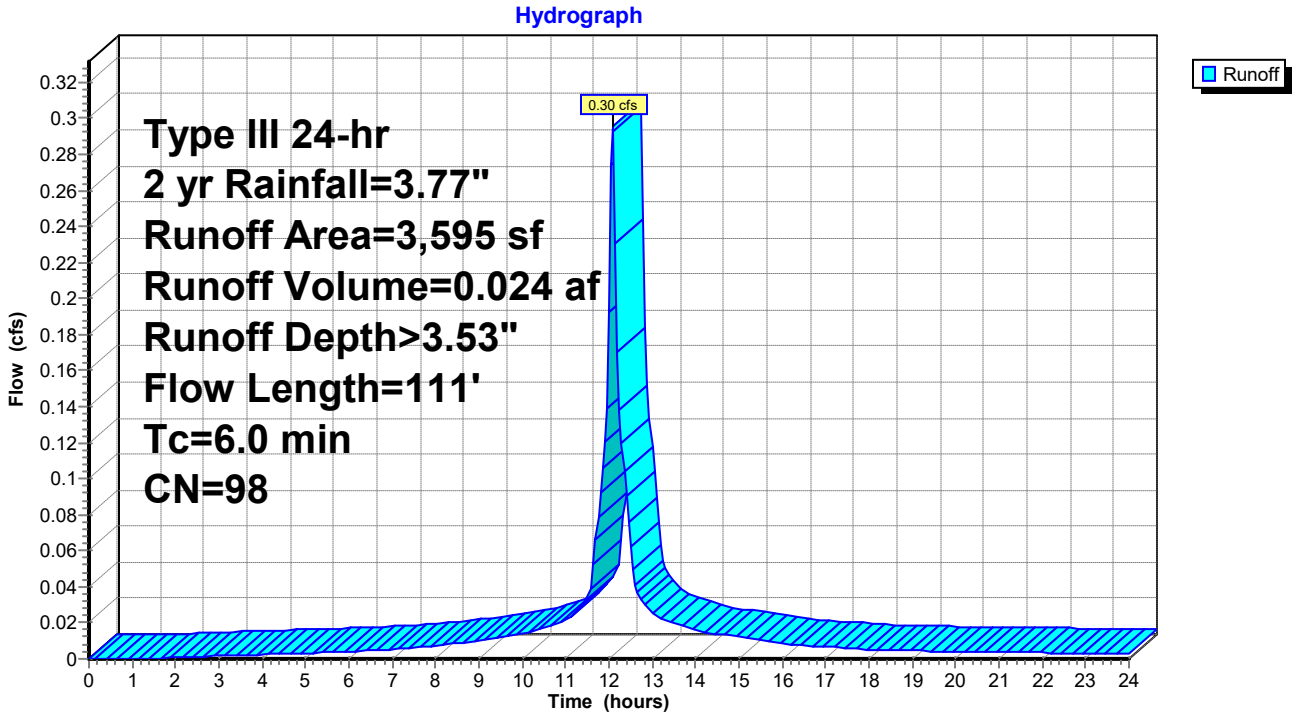
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 3.53"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.77"

Area (sf)	CN	Description
3,595	98	Roofs, HSG A
3,595		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Roof Area



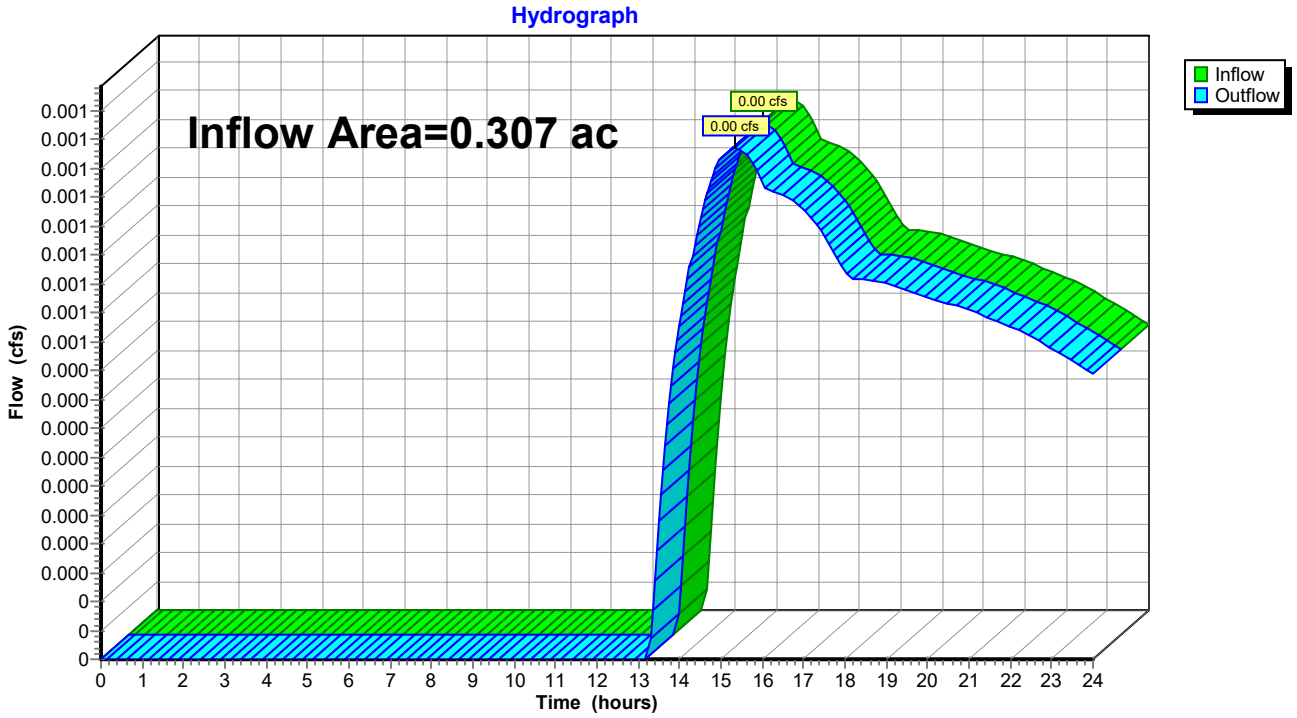
Summary for Reach DPP1: West Boylston Street

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

Inflow Area = 0.307 ac, 54.91% Impervious, Inflow Depth > 0.02" for 2 yr event
Inflow = 0.00 cfs @ 15.35 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 15.35 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPP1: West Boylston Street



Summary for Pond UGS-1: UG Infiltration System

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.173 ac, 90.87% Impervious, Inflow Depth > 3.00" for 2 yr event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.043 af
Outflow = 0.56 cfs @ 12.09 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.56 cfs @ 12.09 hrs, Volume= 0.043 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DPP1 : West Boylston Street

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 487.00' @ 12.09 hrs Surf.Area= 393 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (777.0 - 777.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.00'	385 cf	**15.75'W x 24.98'L x 3.50'H Field A** 1,377 cf Overall - 413 cf Embedded = 963 cf x 40.0% Voids
#2A	487.50'	413 cf	**ADS_StormTech SC-740 +Cap** x 9 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 9 Chambers in 3 Rows
		799 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.00'	**8.27 cfs Exfiltration at all elevations**
#2	Primary	491.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=8.27 cfs @ 12.09 hrs HW=487.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 8.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=487.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UGS-1: UG Infiltration System - 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

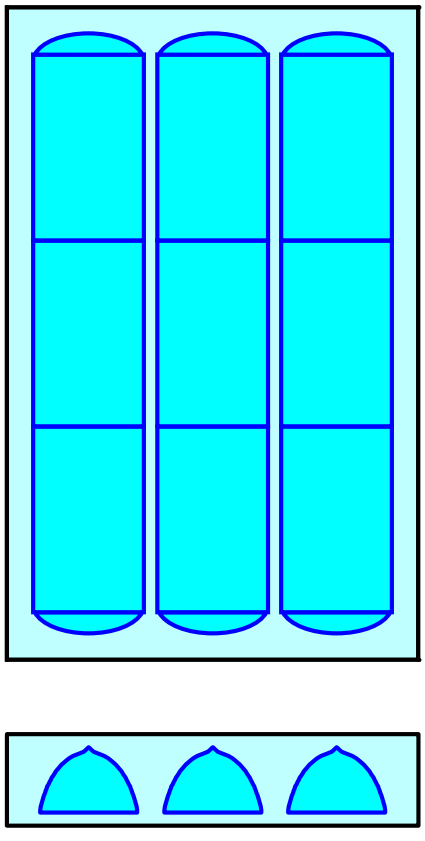
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +12.0" End Stone x 2 = 24.98' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

9 Chambers x 45.9 cf = 413.5 cf Chamber Storage

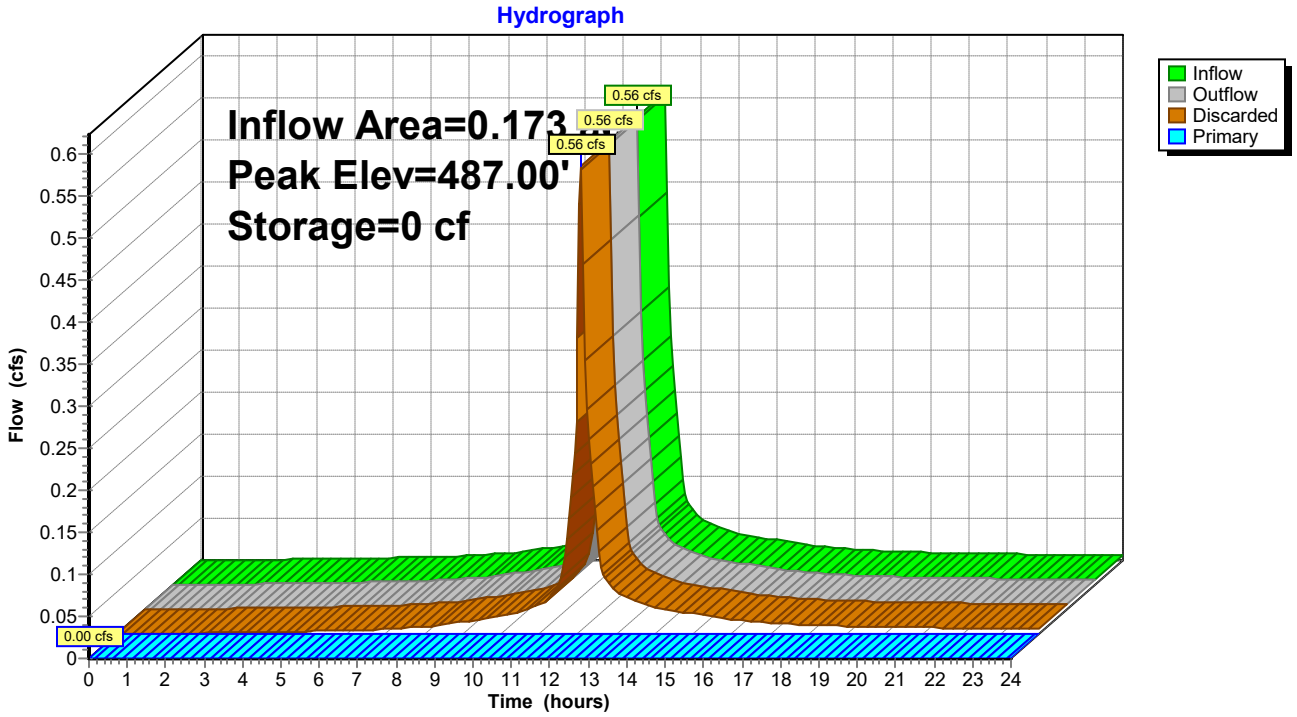
1,376.8 cf Field - 413.5 cf Chambers = 963.4 cf Stone x 40.0% Voids = 385.4 cf Stone Storage

Chamber Storage + Stone Storage = 798.8 cf = 0.018 af
Overall Storage Efficiency = 58.0%
Overall System Size = 24.98' x 15.75' x 3.50'

9 Chambers
51.0 cy Field
35.7 cy Stone



Pond UGS-1: UG Infiltration System



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To West Boylston Street Runoff Area=5,823 sf 8.24% Impervious Runoff Depth>0.53"
Flow Length=111' Tc=6.0 min UI Adjusted CN=41 Runoff=0.03 cfs 0.006 af

Subcatchment P2: To UGS 1 Runoff Area=3,961 sf 82.58% Impervious Runoff Depth>4.54"
Flow Length=111' Tc=6.0 min CN=88 Runoff=0.46 cfs 0.034 af

Subcatchment P3: Roof Area Runoff Area=3,595 sf 100.00% Impervious Runoff Depth>5.67"
Flow Length=111' Tc=6.0 min CN=98 Runoff=0.47 cfs 0.039 af

Reach DPP1: West Boylston Street Inflow=0.03 cfs 0.006 af
Outflow=0.03 cfs 0.006 af

Pond UGS-1: UG Infiltration System Peak Elev=487.01' Storage=1 cf Inflow=0.92 cfs 0.073 af
Discarded=0.92 cfs 0.073 af Primary=0.00 cfs 0.000 af Outflow=0.92 cfs 0.073 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.079 af Average Runoff Depth = 3.10"
45.09% Pervious = 0.138 ac 54.91% Impervious = 0.169 ac

Summary for Subcatchment P1: To West Boylston Street

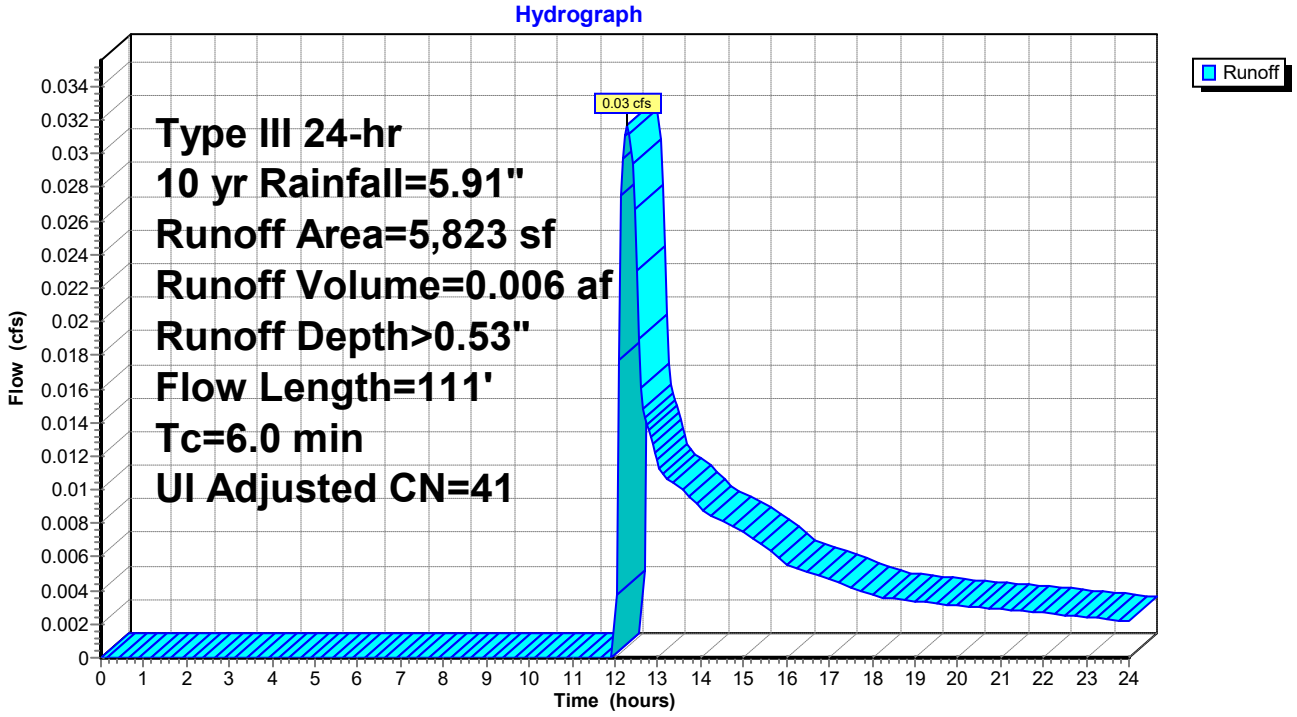
Runoff = 0.03 cfs @ 12.30 hrs, Volume= 0.006 af, Depth> 0.53"
Routed to Reach DPP1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.91"

Area (sf)	CN	Adj	Description
5,343	39		>75% Grass cover, Good, HSG A
480	98		Unconnected pavement, HSG A
5,823	44	41	Weighted Average, UI Adjusted
5,343			91.76% Pervious Area
480			8.24% Impervious Area
480			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: To West Boylston Street



Summary for Subcatchment P2: To UGS 1

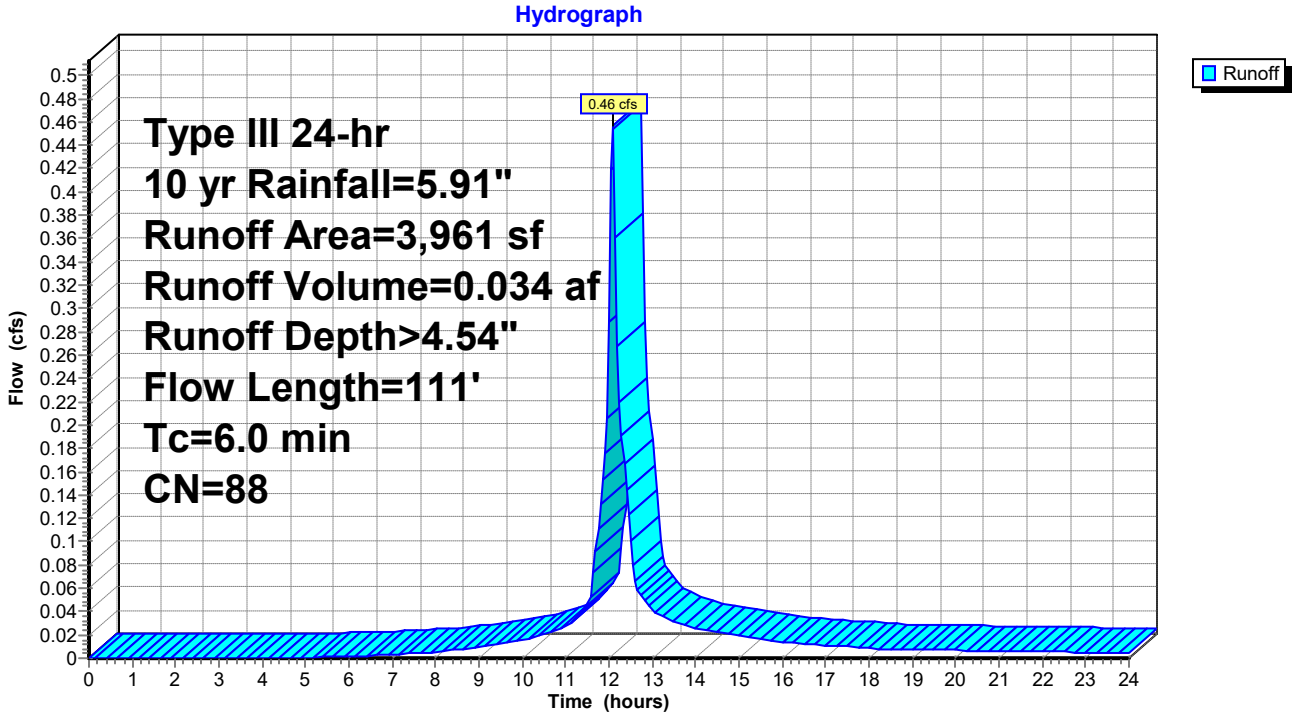
Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.034 af, Depth> 4.54"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.91"

Area (sf)	CN	Description
3,271	98	Paved parking, HSG A
690	39	>75% Grass cover, Good, HSG A
3,961	88	Weighted Average
690		17.42% Pervious Area
3,271		82.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: To UGS 1



Summary for Subcatchment P3: Roof Area

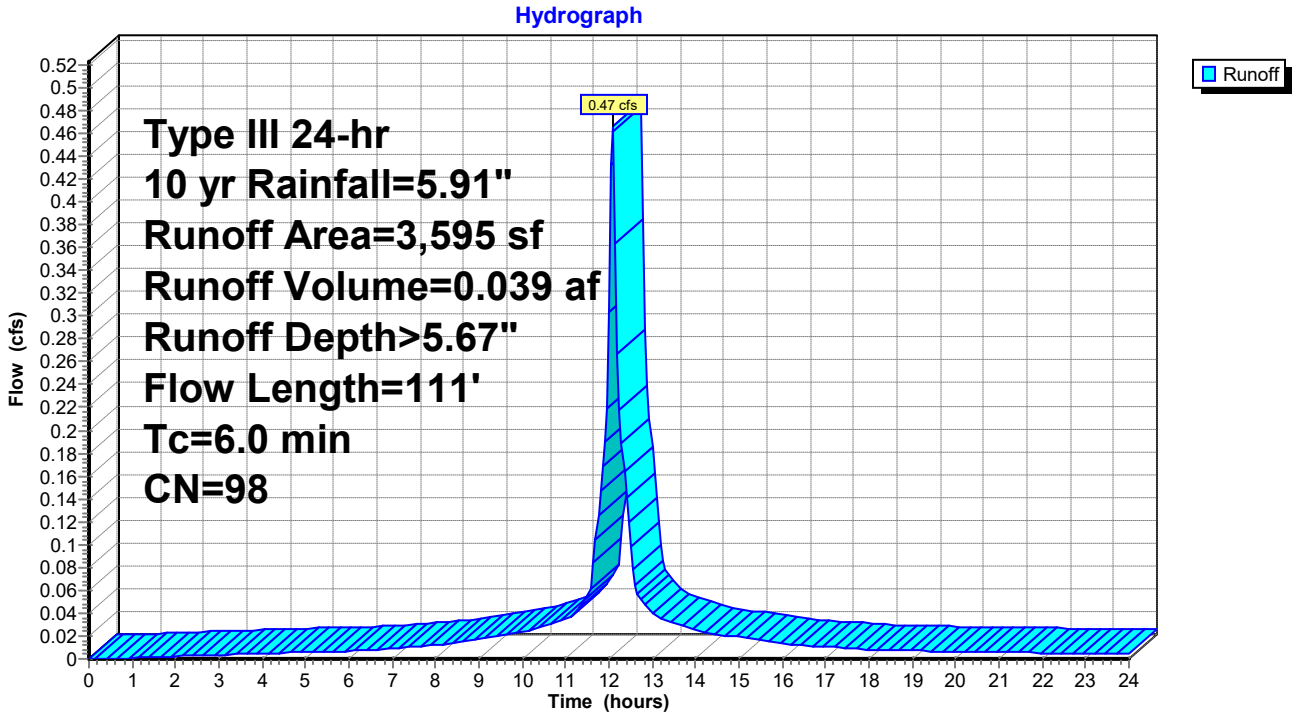
Runoff = 0.47 cfs @ 12.09 hrs, Volume= 0.039 af, Depth> 5.67"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.91"

Area (sf)	CN	Description
3,595	98	Roofs, HSG A
3,595		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Roof Area



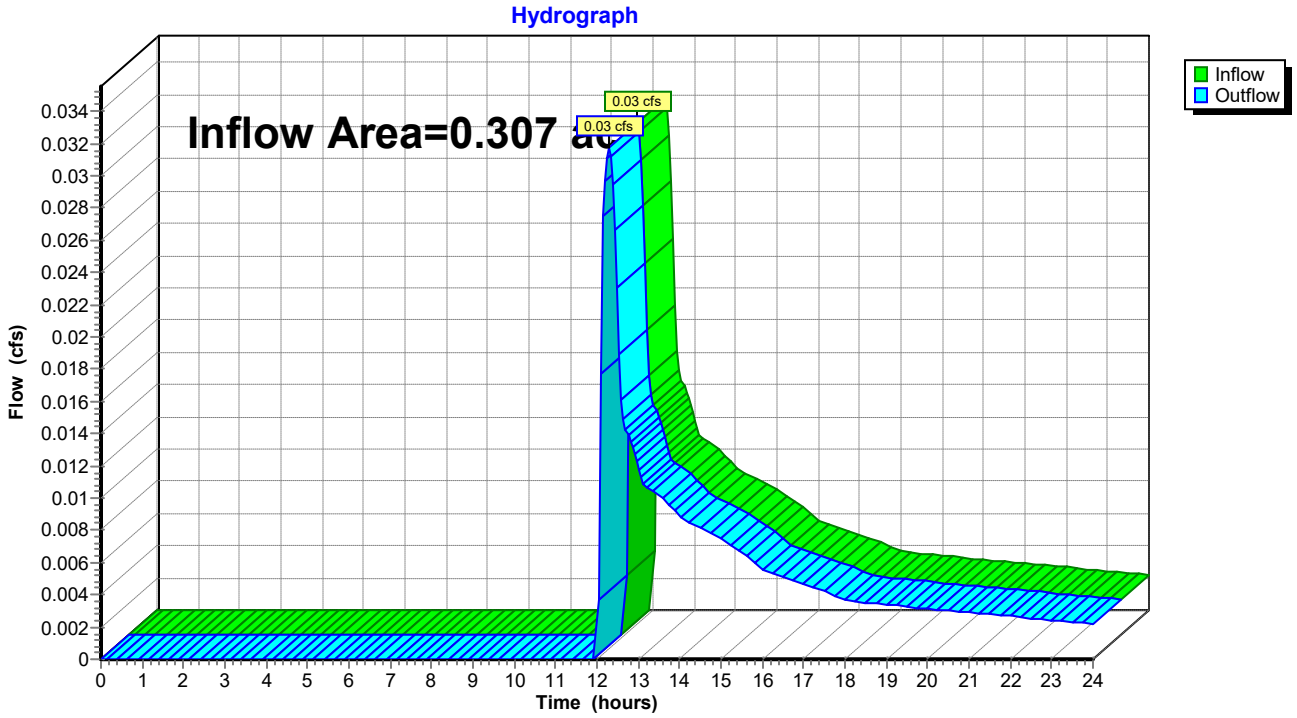
Summary for Reach DPP1: West Boylston Street

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

Inflow Area = 0.307 ac, 54.91% Impervious, Inflow Depth > 0.23" for 10 yr event
Inflow = 0.03 cfs @ 12.30 hrs, Volume= 0.006 af
Outflow = 0.03 cfs @ 12.30 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPP1: West Boylston Street



Summary for Pond UGS-1: UG Infiltration System

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.173 ac, 90.87% Impervious, Inflow Depth > 5.07" for 10 yr event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 0.073 af
Outflow = 0.92 cfs @ 12.09 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.92 cfs @ 12.09 hrs, Volume= 0.073 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DPP1 : West Boylston Street

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 487.01' @ 12.09 hrs Surf.Area= 393 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (766.8 - 766.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.00'	385 cf	**15.75'W x 24.98'L x 3.50'H Field A** 1,377 cf Overall - 413 cf Embedded = 963 cf x 40.0% Voids
#2A	487.50'	413 cf	**ADS_StormTech SC-740 +Cap** x 9 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 9 Chambers in 3 Rows
		799 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.00'	**8.27 cfs Exfiltration at all elevations**
#2	Primary	491.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=8.27 cfs @ 12.09 hrs HW=487.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 8.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=487.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UGS-1: UG Infiltration System - 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

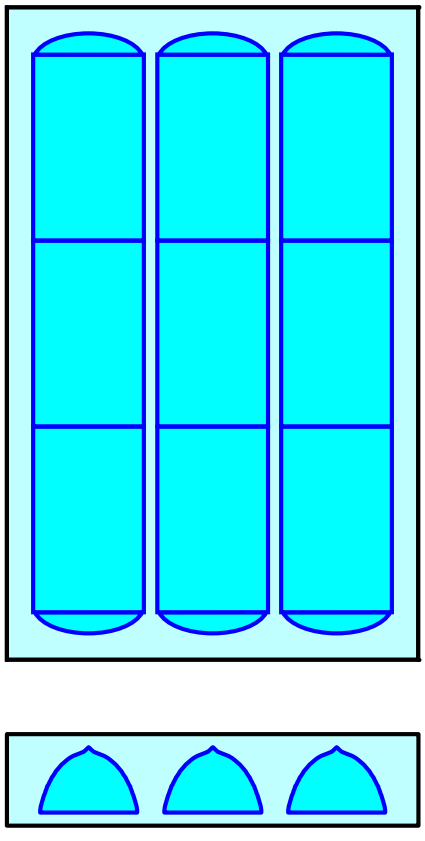
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +12.0" End Stone x 2 = 24.98' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

9 Chambers x 45.9 cf = 413.5 cf Chamber Storage

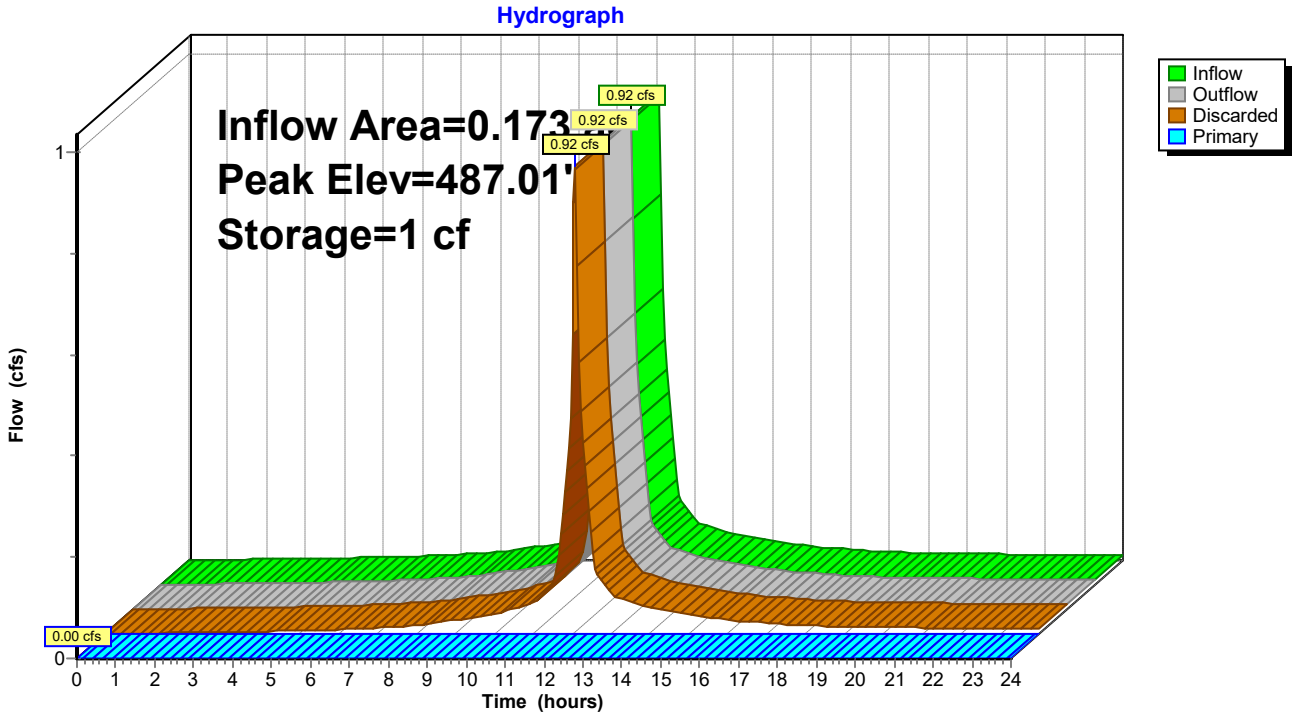
1,376.8 cf Field - 413.5 cf Chambers = 963.4 cf Stone x 40.0% Voids = 385.4 cf Stone Storage

Chamber Storage + Stone Storage = 798.8 cf = 0.018 af
Overall Storage Efficiency = 58.0%
Overall System Size = 24.98' x 15.75' x 3.50'

9 Chambers
51.0 cy Field
35.7 cy Stone



Pond UGS-1: UG Infiltration System



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To West Boylston Street Runoff Area=5,823 sf 8.24% Impervious Runoff Depth>1.18"
Flow Length=111' Tc=6.0 min UI Adjusted CN=41 Runoff=0.13 cfs 0.013 af

Subcatchment P2: To UGS 1 Runoff Area=3,961 sf 82.58% Impervious Runoff Depth>6.20"
Flow Length=111' Tc=6.0 min CN=88 Runoff=0.61 cfs 0.047 af

Subcatchment P3: Roof Area Runoff Area=3,595 sf 100.00% Impervious Runoff Depth>7.39"
Flow Length=111' Tc=6.0 min CN=98 Runoff=0.60 cfs 0.051 af

Reach DPP1: West Boylston Street Inflow=0.13 cfs 0.013 af
Outflow=0.13 cfs 0.013 af

Pond UGS-1: UG Infiltration System Peak Elev=487.01' Storage=1 cf Inflow=1.22 cfs 0.098 af
Discarded=1.22 cfs 0.098 af Primary=0.00 cfs 0.000 af Outflow=1.22 cfs 0.098 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.111 af Average Runoff Depth = 4.33"
45.09% Pervious = 0.138 ac 54.91% Impervious = 0.169 ac

Summary for Subcatchment P1: To West Boylston Street

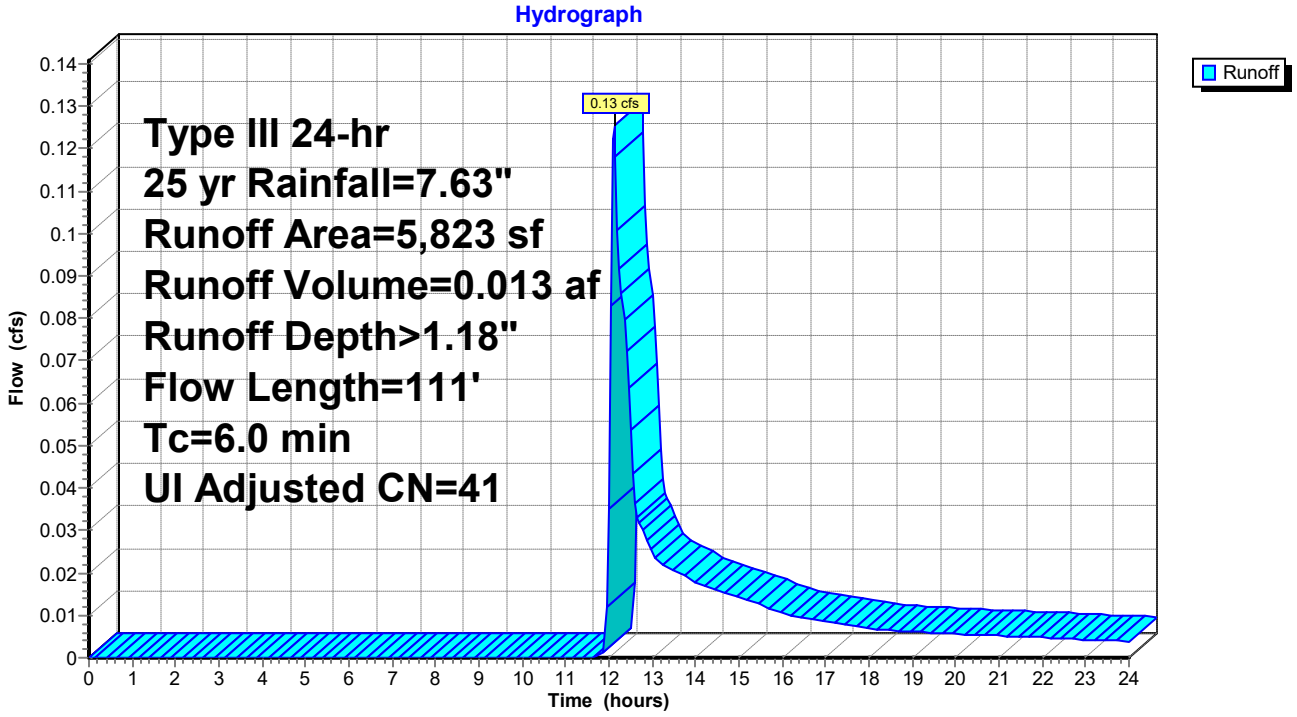
Runoff = 0.13 cfs @ 12.12 hrs, Volume= 0.013 af, Depth> 1.18"
Routed to Reach DPP1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=7.63"

Area (sf)	CN	Adj	Description
5,343	39		>75% Grass cover, Good, HSG A
480	98		Unconnected pavement, HSG A
5,823	44	41	Weighted Average, UI Adjusted
5,343			91.76% Pervious Area
480			8.24% Impervious Area
480			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: To West Boylston Street



Summary for Subcatchment P2: To UGS 1

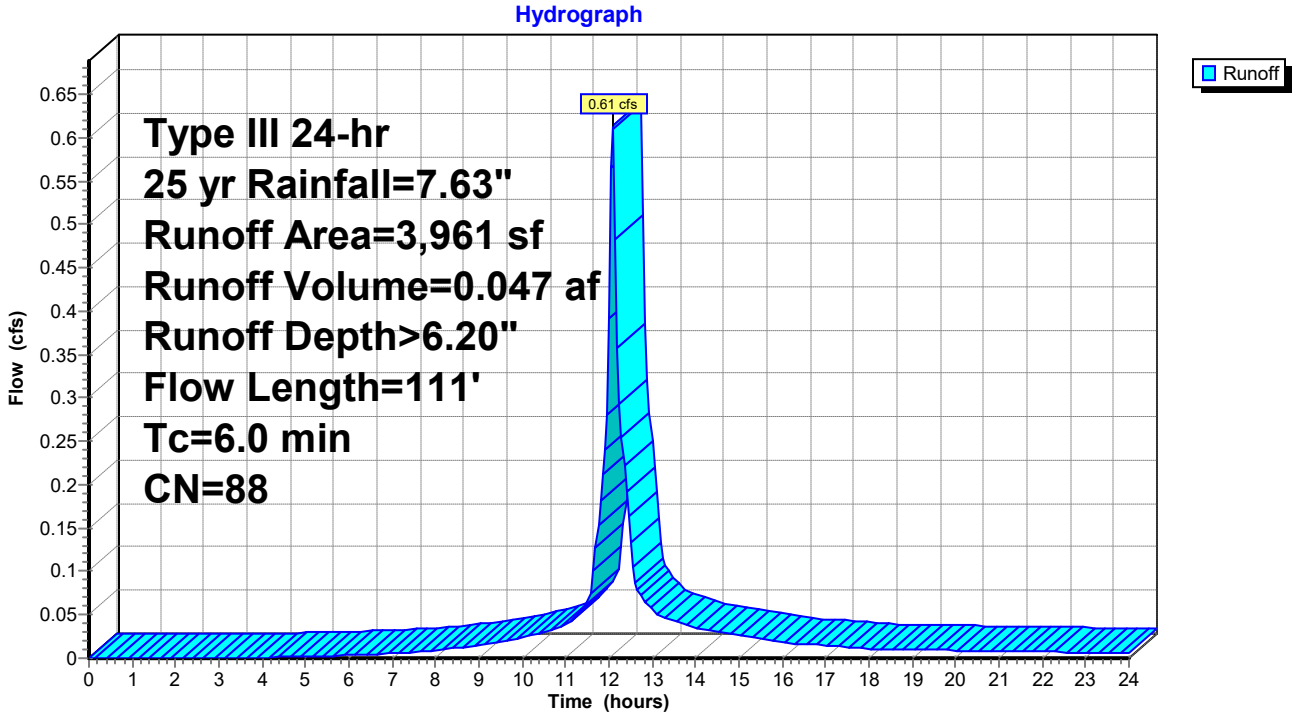
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 0.047 af, Depth> 6.20"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=7.63"

Area (sf)	CN	Description
3,271	98	Paved parking, HSG A
690	39	>75% Grass cover, Good, HSG A
3,961	88	Weighted Average
690		17.42% Pervious Area
3,271		82.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: To UGS 1



Summary for Subcatchment P3: Roof Area

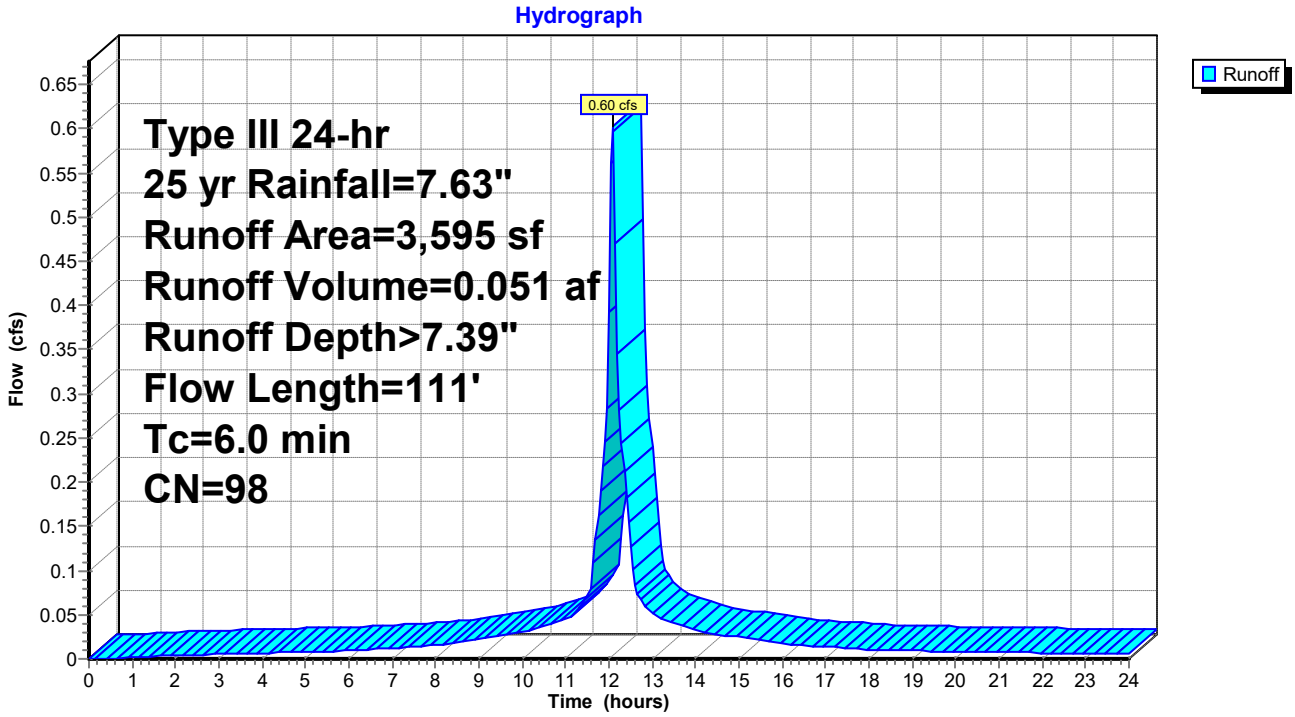
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.051 af, Depth> 7.39"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=7.63"

Area (sf)	CN	Description
3,595	98	Roofs, HSG A
3,595		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Roof Area



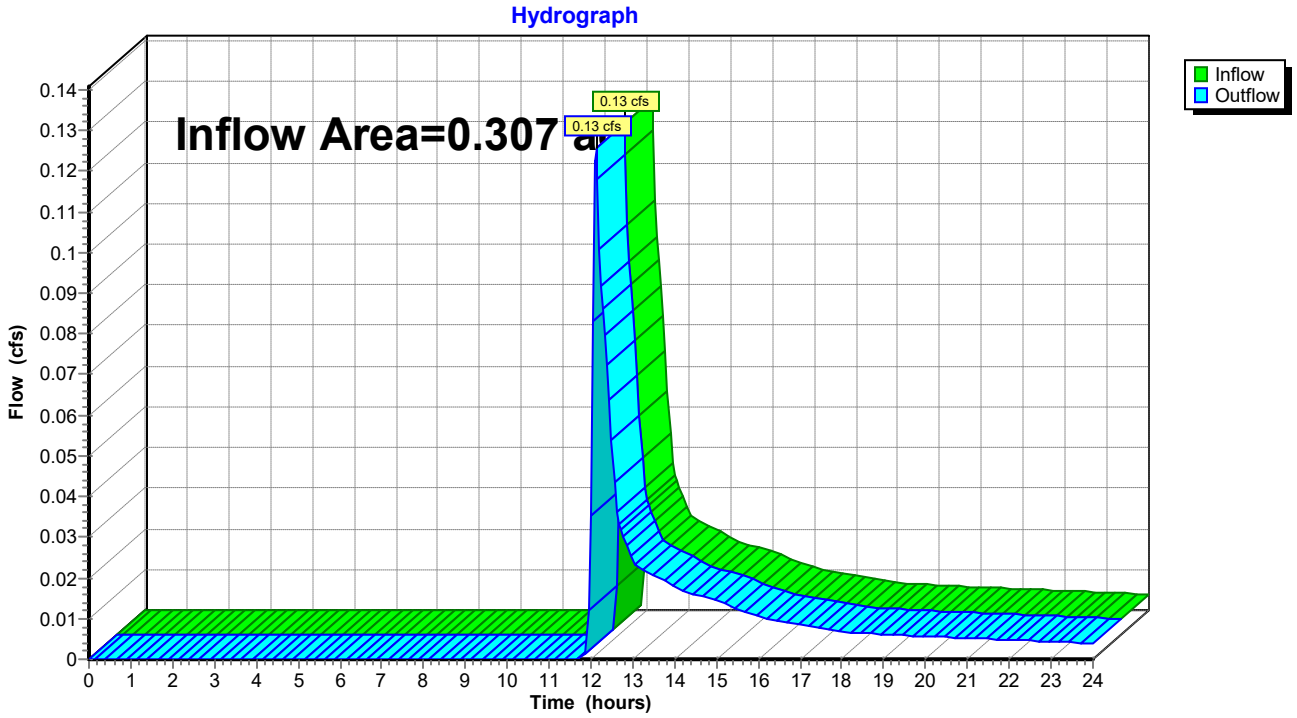
Summary for Reach DPP1: West Boylston Street

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

Inflow Area = 0.307 ac, 54.91% Impervious, Inflow Depth > 0.51" for 25 yr event
Inflow = 0.13 cfs @ 12.12 hrs, Volume= 0.013 af
Outflow = 0.13 cfs @ 12.12 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPP1: West Boylston Street



Summary for Pond UGS-1: UG Infiltration System

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.173 ac, 90.87% Impervious, Inflow Depth > 6.77" for 25 yr event
Inflow = 1.22 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 1.22 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Discarded = 1.22 cfs @ 12.09 hrs, Volume= 0.098 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DPP1 : West Boylston Street

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 487.01' @ 12.09 hrs Surf.Area= 393 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 0.098 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (761.5 - 761.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.00'	385 cf	**15.75'W x 24.98'L x 3.50'H Field A** 1,377 cf Overall - 413 cf Embedded = 963 cf x 40.0% Voids
#2A	487.50'	413 cf	**ADS_StormTech SC-740 +Cap** x 9 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 9 Chambers in 3 Rows
		799 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.00'	**8.27 cfs Exfiltration at all elevations**
#2	Primary	491.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=8.27 cfs @ 12.09 hrs HW=487.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 8.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=487.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UGS-1: UG Infiltration System - 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

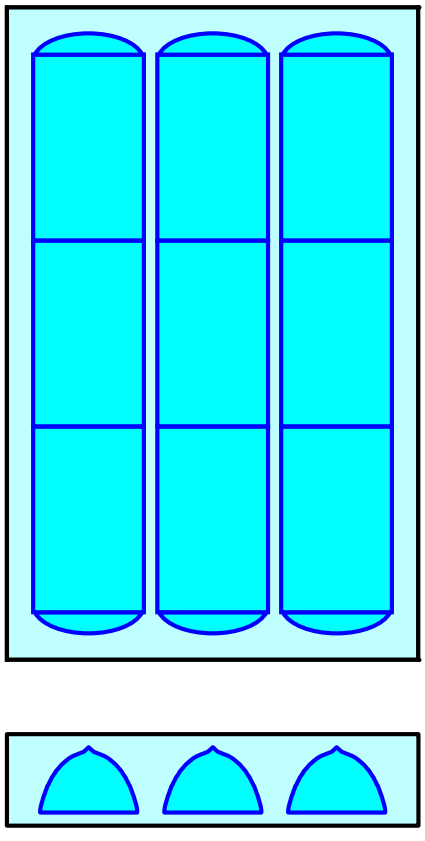
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +12.0" End Stone x 2 = 24.98' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

9 Chambers x 45.9 cf = 413.5 cf Chamber Storage

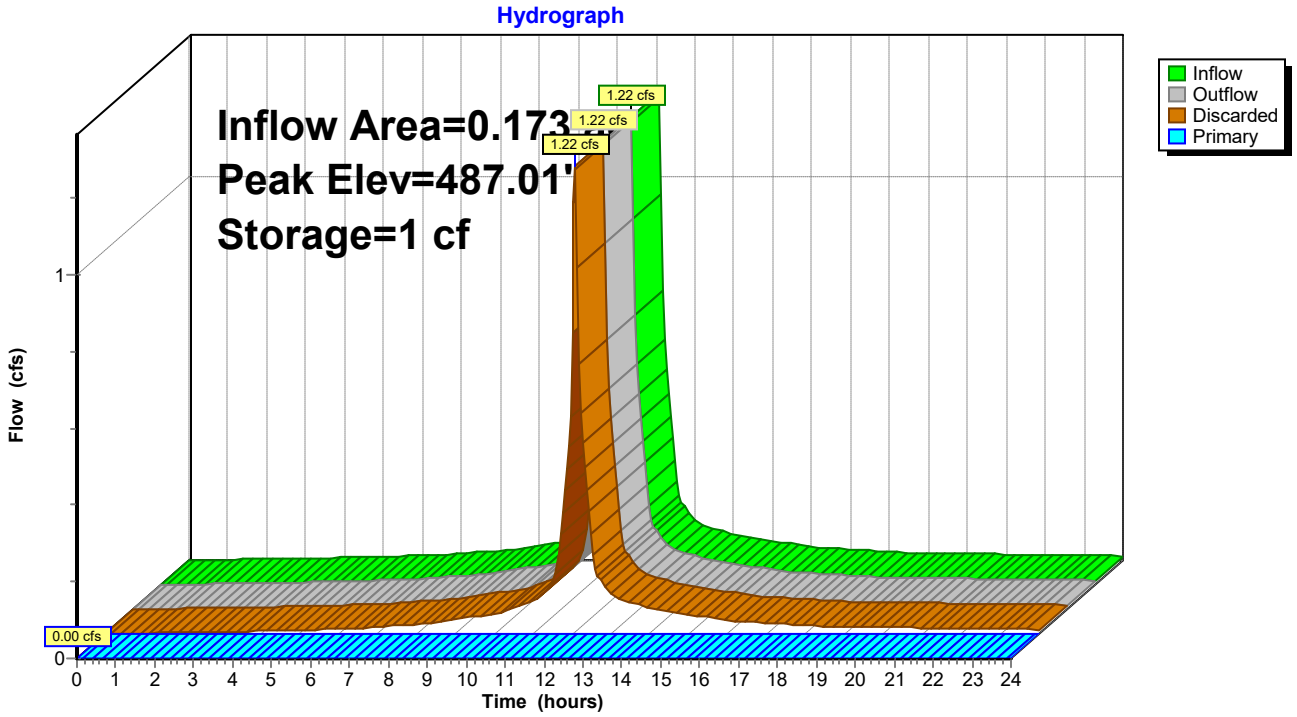
1,376.8 cf Field - 413.5 cf Chambers = 963.4 cf Stone x 40.0% Voids = 385.4 cf Stone Storage

Chamber Storage + Stone Storage = 798.8 cf = 0.018 af
Overall Storage Efficiency = 58.0%
Overall System Size = 24.98' x 15.75' x 3.50'

9 Chambers
51.0 cy Field
35.7 cy Stone



Pond UGS-1: UG Infiltration System



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To West Boylston Street Runoff Area=5,823 sf 8.24% Impervious Runoff Depth>2.64"
Flow Length=111' Tc=6.0 min UI Adjusted CN=41 Runoff=0.36 cfs 0.029 af

Subcatchment P2: To UGS 1 Runoff Area=3,961 sf 82.58% Impervious Runoff Depth>9.02"
Flow Length=111' Tc=6.0 min CN=88 Runoff=0.87 cfs 0.068 af

Subcatchment P3: Roof Area Runoff Area=3,595 sf 100.00% Impervious Runoff Depth>10.25"
Flow Length=111' Tc=6.0 min CN=98 Runoff=0.83 cfs 0.071 af

Reach DPP1: West Boylston Street Inflow=0.36 cfs 0.029 af
Outflow=0.36 cfs 0.029 af

Pond UGS-1: UG Infiltration System Peak Elev=487.01' Storage=1 cf Inflow=1.71 cfs 0.139 af
Discarded=1.71 cfs 0.139 af Primary=0.00 cfs 0.000 af Outflow=1.71 cfs 0.139 af

Total Runoff Area = 0.307 ac Runoff Volume = 0.168 af Average Runoff Depth = 6.57"
45.09% Pervious = 0.138 ac 54.91% Impervious = 0.169 ac

Summary for Subcatchment P1: To West Boylston Street

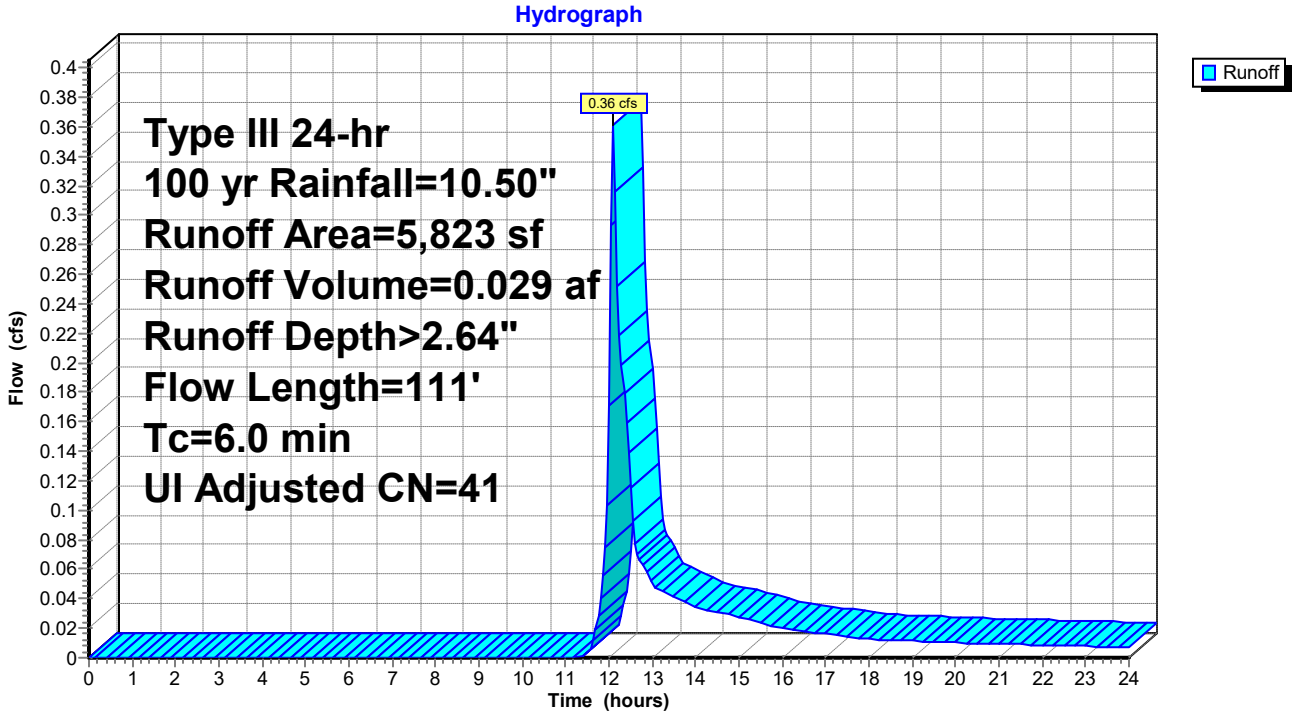
Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af, Depth> 2.64"
Routed to Reach DPP1 : West Boylston Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=10.50"

Area (sf)	CN	Adj	Description
5,343	39		>75% Grass cover, Good, HSG A
480	98		Unconnected pavement, HSG A
5,823	44	41	Weighted Average, UI Adjusted
5,343			91.76% Pervious Area
480			8.24% Impervious Area
480			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: To West Boylston Street



Summary for Subcatchment P2: To UGS 1

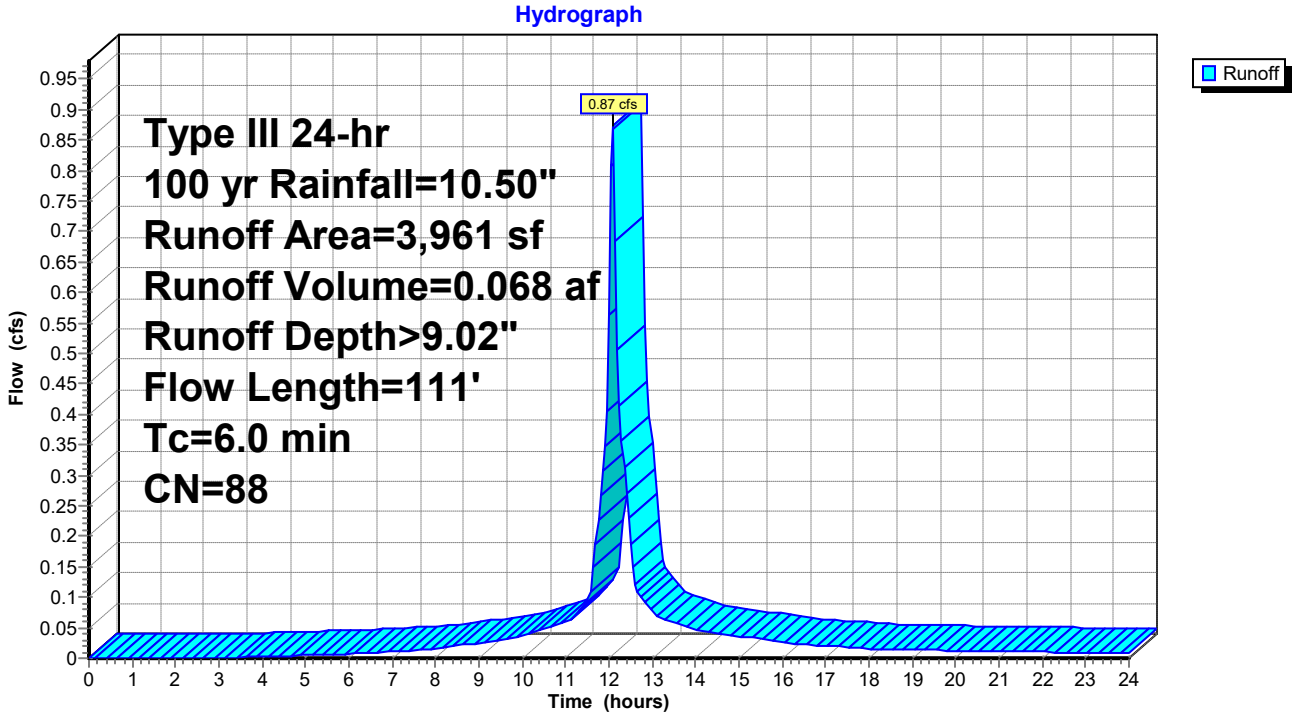
Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.068 af, Depth> 9.02"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=10.50"

Area (sf)	CN	Description
3,271	98	Paved parking, HSG A
690	39	>75% Grass cover, Good, HSG A
3,961	88	Weighted Average
690		17.42% Pervious Area
3,271		82.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: To UGS 1



Summary for Subcatchment P3: Roof Area

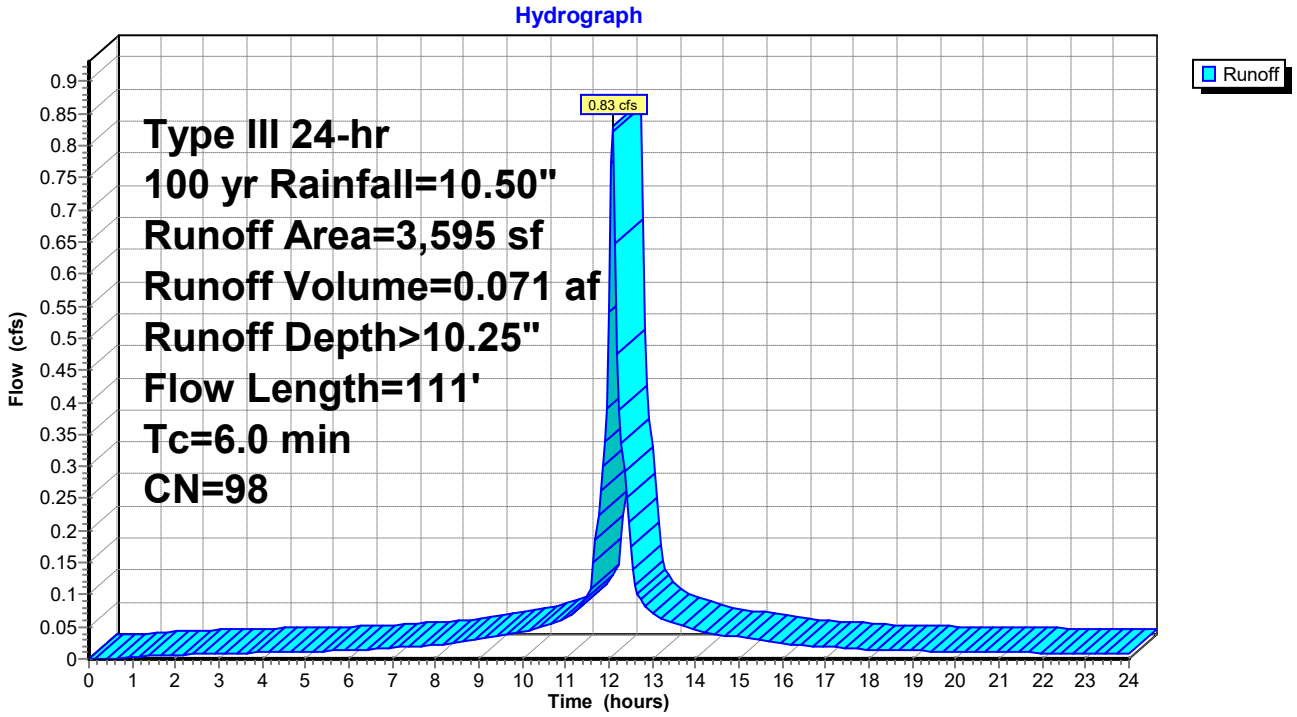
Runoff = 0.83 cfs @ 12.09 hrs, Volume= 0.071 af, Depth>10.25"
Routed to Pond UGS-1 : UG Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=10.50"

Area (sf)	CN	Description
3,595	98	Roofs, HSG A
3,595		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0175	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	9	0.0175	2.69		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	52	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.0	111	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Roof Area



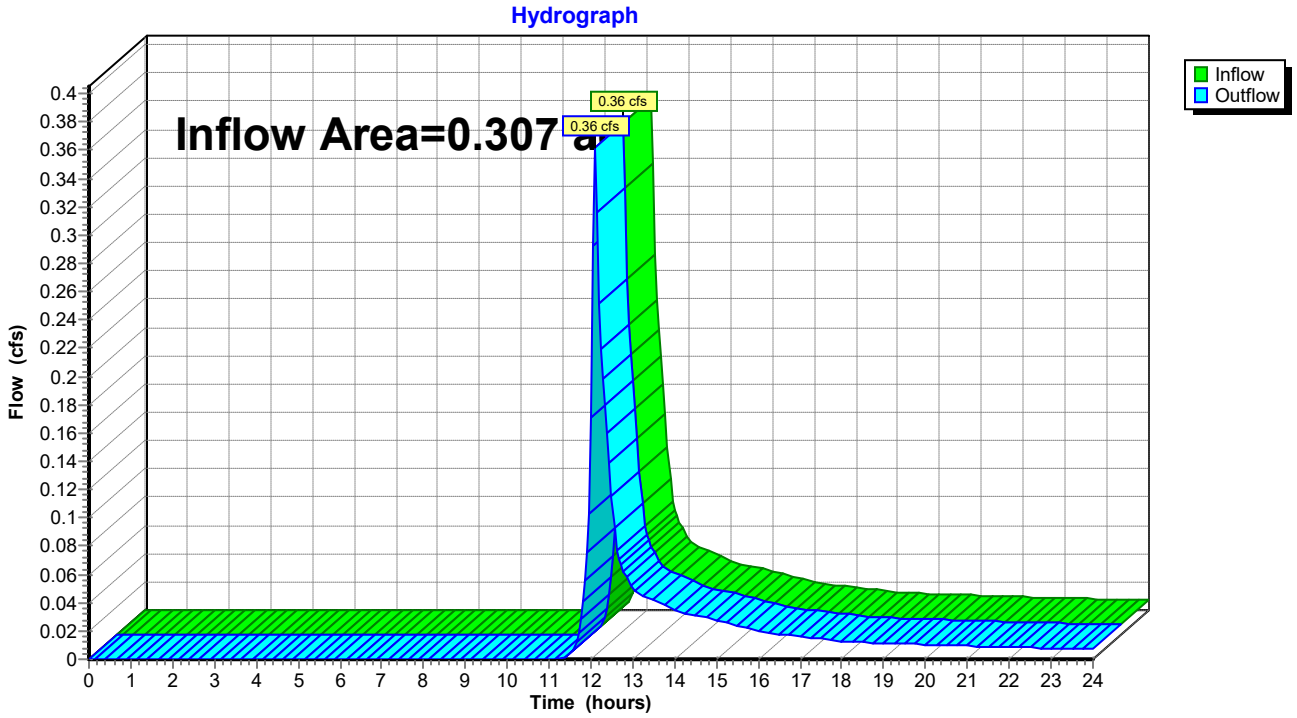
Summary for Reach DPP1: West Boylston Street

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

Inflow Area = 0.307 ac, 54.91% Impervious, Inflow Depth > 1.15" for 100 yr event
Inflow = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af
Outflow = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DPP1: West Boylston Street



Summary for Pond UGS-1: UG Infiltration System

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.173 ac, 90.87% Impervious, Inflow Depth > 9.61" for 100 yr event
Inflow = 1.71 cfs @ 12.09 hrs, Volume= 0.139 af
Outflow = 1.71 cfs @ 12.09 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Discarded = 1.71 cfs @ 12.09 hrs, Volume= 0.139 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DPP1 : West Boylston Street

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 487.01' @ 12.09 hrs Surf.Area= 393 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 0.139 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (755.3 - 755.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.00'	385 cf	**15.75'W x 24.98'L x 3.50'H Field A** 1,377 cf Overall - 413 cf Embedded = 963 cf x 40.0% Voids
#2A	487.50'	413 cf	**ADS_StormTech SC-740 +Cap** x 9 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 9 Chambers in 3 Rows
		799 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.00'	**8.27 cfs Exfiltration at all elevations**
#2	Primary	491.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=8.27 cfs @ 12.09 hrs HW=487.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 8.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=487.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond UGS-1: UG Infiltration System - 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

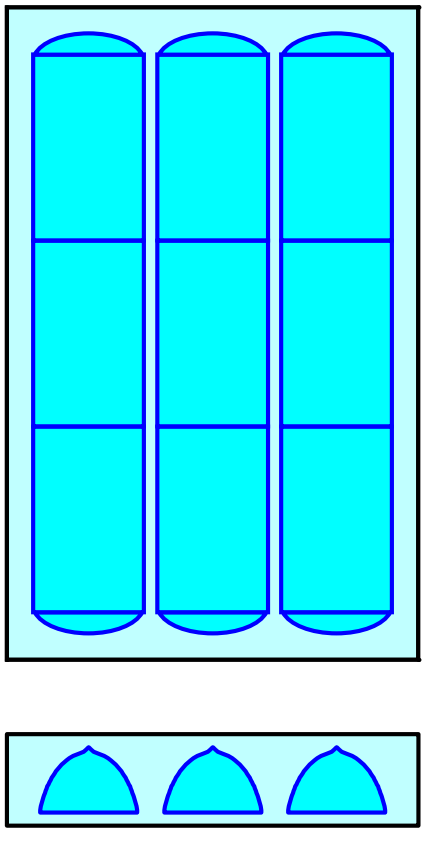
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +12.0" End Stone x 2 = 24.98' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

9 Chambers x 45.9 cf = 413.5 cf Chamber Storage

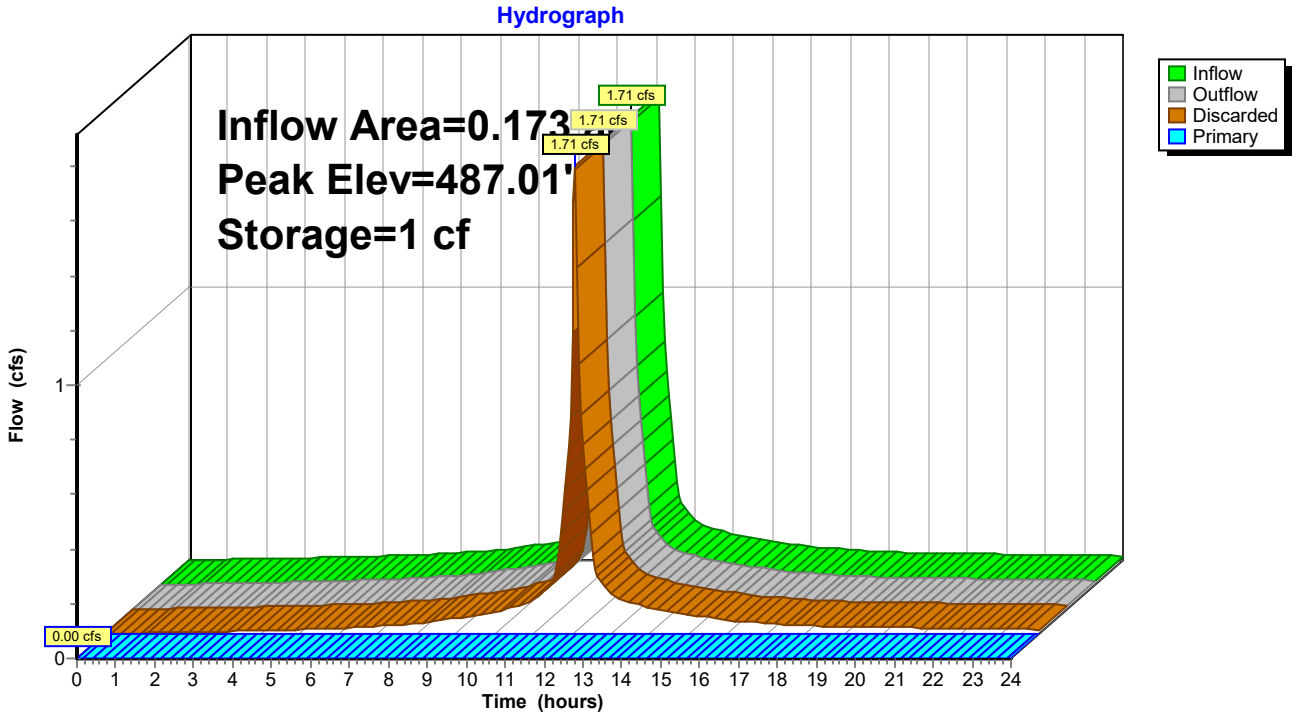
1,376.8 cf Field - 413.5 cf Chambers = 963.4 cf Stone x 40.0% Voids = 385.4 cf Stone Storage

Chamber Storage + Stone Storage = 798.8 cf = 0.018 af
Overall Storage Efficiency = 58.0%
Overall System Size = 24.98' x 15.75' x 3.50'

9 Chambers
51.0 cy Field
35.7 cy Stone



Pond UGS-1: UG Infiltration System



APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #3 – RECHARGE AND DRAWDOWN TIME*
- *MA STANDARD #4 – WATER QUALITY AND TSS REMOVAL*
- *NOAA RAINFALL DATA*
- *PIPE SIZING*

SMOC - Worcester, MA
30 Winfield Street
Worcester, MA
Bohler Job Number: W191051
May 24, 2024

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.60 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.174
Proposed Increase in Site Impervious Area (ac)	0.174
Recharge Volume Required (cf)	**379**
Required Recharge Volume - B Soils (0.35 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**
Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**
Required Recharge Volume - D Soils (0.10 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**
Total Recharge Volume Required (cf)	**379**
Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**0.000**
%Impervious Directed to Infiltration BMP	
Adjustment Factor	
Adjusted Total Recharge Volume Required (cf)	
Provided Recharge Volume*	
Underground Infiltration System	799
Total Recharge Volume Provided (cf)	**799**
	Input Required

*Volume provided below lowest outlet in cubic feet (cf)

Prepared By:
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

SMOC - Worcester, MA
30 Winfield Street
Worcester, MA
Bohler Job Number: W191051
May 24, 2024

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - Underground Infiltration System	
Volume below outlet pipe (Rv) (cf)	799
Soil Type	Sand - A
Infiltration rate (K)*	8.27
Bottom Area (sf)	393
Drawdown time (Hours)*	2.9

*Infiltration Rates taken from Rawls Table
**Drawdown time = Rv / (K) x (bottom area)

Prepared By:
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

SMOC - Worcester, MA
30 Winfield Street
Worcester, MA
Bohler Job Number: W191051
May 24, 2024

MA DEP Standard 4: Water Quality Volume Calculations

Water Quality Volume Required	
Water Quality Volume runoff (in.)*	1.0
Total Post Development Impervious Area (sf)	7,579
Required Water Quality Volume (cf)	632

*Water Quality volume runoff is equal to 0.5 or 1.0 inches of runoff times the total impervious area of the post development project site.

Water Quality Volume Provided*	
Underground Infiltration System	799
Total Provided Water Quality Volume (cf)	799

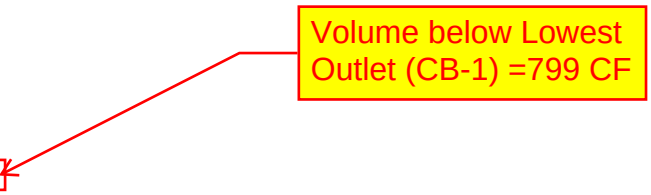
Provided greater than or Equal to Required

*Volume provided below lowest outlet pipe in cubic feet (cf)

Prepared By:
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Stage-Area-Storage for Pond UGS-1: UG Infiltration System

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
487.00	0	489.60	648
487.05	8	489.65	658
487.10	16	489.70	668
487.15	24	489.75	678
487.20	31	489.80	687
487.25	39	489.85	696
487.30	47	489.90	704
487.35	55	489.95	712
487.40	63	490.00	720
487.45	71	490.05	728
487.50	79	490.10	736
487.55	94	490.15	744
487.60	109	490.20	752
487.65	124	490.25	759
487.70	139	490.30	767
487.75	154	490.35	775
487.80	168	490.40	783
487.85	183	490.45	791
487.90	198	490.50	**799**
487.95	213	490.55	799
488.00	227	490.60	799
488.05	242	490.65	799
488.10	257	490.70	799
488.15	271	490.75	799
488.20	285	490.80	799
488.25	300	490.85	799
488.30	314	490.90	799
488.35	328	490.95	799
488.40	342	491.00	799
488.45	356	491.05	799
488.50	370	491.10	799
488.55	384	491.15	799
488.60	398	491.20	799
488.65	412	491.25	799
488.70	426	491.30	799
488.75	439	491.35	799
488.80	452	491.40	799
488.85	466	491.45	799
488.90	479	491.50	799
488.95	492	491.55	799
489.00	505	491.60	799
489.05	518	491.65	799
489.10	530	491.70	799
489.15	543	491.75	799
489.20	555	491.80	799
489.25	568	491.85	799
489.30	580	491.90	799
489.35	592	491.95	799
489.40	603	492.00	799
489.45	615		
489.50	626		
489.55	637		



TSS Removal Calculation Worksheet

Location: to UGS-1

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Catch Basin	0.25	1.00	0.25	0.75
Isolator Row	0.80	0.75	0.60	0.15

Total TSS Removal = 85%

Project: SMOC - Worcester
Prepared By: Bohler Engineering
Date: 5/24/2024

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

Prepared By:
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

NOAA Atlas 14, Volume 10, Version 3
Location name: Worcester, Massachusetts, USA*
Latitude: 42.26°, Longitude: -71.8199°
Elevation: 492 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.340** (0.273-0.419)	**0.400** (0.321-0.493)	**0.498** (0.398-0.616)	**0.579** (0.459-0.722)	**0.691** (0.527-0.903)	**0.776** (0.578-1.04)	**0.863** (0.619-1.20)	**0.957** (0.651-1.38)	**1.09** (0.708-1.63)	**1.19** (0.754-1.83)
10-min	**0.482** (0.387-0.594)	**0.567** (0.455-0.699)	**0.705** (0.563-0.874)	**0.820** (0.651-1.02)	**0.978** (0.747-1.28)	**1.10** (0.818-1.47)	**1.22** (0.877-1.70)	**1.36** (0.921-1.95)	**1.54** (1.00-2.31)	**1.69** (1.07-2.59)
15-min	**0.567** (0.456-0.699)	**0.667** (0.535-0.822)	**0.830** (0.663-1.03)	**0.965** (0.766-1.20)	**1.15** (0.879-1.50)	**1.29** (0.963-1.73)	**1.44** (1.03-2.00)	**1.60** (1.08-2.30)	**1.81** (1.18-2.72)	**1.98** (1.26-3.05)
30-min	**0.772** (0.620-0.951)	**0.908** (0.728-1.12)	**1.13** (0.903-1.40)	**1.32** (1.04-1.64)	**1.57** (1.20-2.05)	**1.76** (1.31-2.36)	**1.96** (1.41-2.73)	**2.18** (1.48-3.14)	**2.47** (1.61-3.71)	**2.71** (1.71-4.16)
60-min	**0.976** (0.784-1.20)	**1.15** (0.921-1.42)	**1.43** (1.14-1.77)	**1.67** (1.32-2.08)	**1.99** (1.52-2.60)	**2.23** (1.66-2.99)	**2.49** (1.78-3.46)	**2.76** (1.88-3.98)	**3.13** (2.04-4.70)	**3.43** (2.17-5.28)
2-hr	**1.24** (1.00-1.52)	**1.47** (1.18-1.80)	**1.84** (1.48-2.27)	**2.16** (1.72-2.67)	**2.58** (1.99-3.37)	**2.91** (2.18-3.89)	**3.25** (2.36-4.53)	**3.64** (2.48-5.21)	**4.21** (2.74-6.28)	**4.68** (2.97-7.15)
3-hr	**1.42** (1.15-1.73)	**1.69** (1.37-2.06)	**2.13** (1.72-2.61)	**2.50** (2.00-3.08)	**3.01** (2.32-3.91)	**3.38** (2.55-4.52)	**3.79** (2.77-5.29)	**4.26** (2.91-6.09)	**4.97** (3.25-7.40)	**5.57** (3.54-8.48)
6-hr	**1.77** (1.44-2.14)	**2.13** (1.73-2.58)	**2.71** (2.20-3.30)	**3.20** (2.58-3.92)	**3.87** (3.01-5.01)	**4.37** (3.32-5.81)	**4.90** (3.61-6.83)	**5.55** (3.80-7.88)	**6.53** (4.28-9.65)	**7.36** (4.70-11.1)
12-hr	**2.17** (1.78-2.61)	**2.64** (2.16-3.18)	**3.40** (2.78-4.12)	**4.04** (3.28-4.92)	**4.91** (3.84-6.32)	**5.55** (4.24-7.34)	**6.25** (4.63-8.66)	**7.09** (4.88-10.0)	**8.36** (5.50-12.3)	**9.45** (6.05-14.2)
24-hr	**2.57** (2.13-3.08)	**3.15** (2.60-3.77)	**4.10** (3.37-4.93)	**4.88** (3.99-5.91)	**5.96** (4.69-7.63)	**6.76** (5.20-8.89)	**7.63** (5.68-10.5)	**8.67** (5.99-12.2)	**10.3** (6.77-15.0)	**11.6** (7.47-17.4)
2-day	**2.95** (2.45-3.50)	**3.62** (3.01-4.31)	**4.73** (3.92-5.65)	**5.65** (4.64-6.79)	**6.91** (5.47-8.80)	**7.84** (6.07-10.3)	**8.86** (6.64-12.2)	**10.1** (7.01-14.1)	**12.0** (7.97-17.4)	**13.7** (8.83-20.3)
3-day	**3.21** (2.68-3.80)	**3.94** (3.29-4.67)	**5.13** (4.26-6.10)	**6.12** (5.05-7.33)	**7.48** (5.95-9.49)	**8.48** (6.59-11.1)	**9.58** (7.21-13.1)	**10.9** (7.60-15.2)	**13.0** (8.64-18.8)	**14.9** (9.58-21.9)
4-day	**3.44** (2.89-4.06)	**4.21** (3.52-4.97)	**5.46** (4.55-6.48)	**6.50** (5.38-7.76)	**7.93** (6.32-10.0)	**8.98** (6.99-11.7)	**10.1** (7.64-13.8)	**11.6** (8.04-16.0)	**13.8** (9.13-19.8)	**15.7** (10.1-23.0)
7-day	**4.11** (3.46-4.82)	**4.94** (4.16-5.81)	**6.31** (5.28-7.44)	**7.44** (6.19-8.84)	**9.00** (7.20-11.3)	**10.2** (7.92-13.1)	**11.4** (8.60-15.4)	**12.9** (9.02-17.8)	**15.2** (10.1-21.8)	**17.2** (11.1-25.2)
10-day	**4.77** (4.04-5.58)	**5.64** (4.77-6.61)	**7.07** (5.94-8.31)	**8.25** (6.89-9.77)	**9.88** (7.92-12.3)	**11.1** (8.67-14.2)	**12.4** (9.33-16.6)	**13.9** (9.76-19.1)	**16.2** (10.8-23.1)	**18.1** (11.8-26.4)
20-day	**6.82** (5.81-7.93)	**7.75** (6.59-9.01)	**9.26** (7.84-10.8)	**10.5** (8.84-12.4)	**12.2** (9.85-15.1)	**13.6** (10.6-17.1)	**14.9** (11.2-19.5)	**16.4** (11.5-22.2)	**18.4** (12.3-25.9)	**20.0** (13.0-28.9)
30-day	**8.54** (7.30-9.88)	**9.49** (8.10-11.0)	**11.1** (9.39-12.9)	**12.3** (10.4-14.5)	**14.1** (11.4-17.2)	**15.5** (12.1-19.4)	**16.9** (12.6-21.8)	**18.2** (12.9-24.6)	**20.0** (13.5-28.1)	**21.3** (13.9-30.8)
45-day	**10.7** (9.16-12.3)	**11.7** (9.99-13.5)	**13.3** (11.3-15.4)	**14.6** (12.4-17.1)	**16.5** (13.3-20.0)	**17.9** (14.0-22.2)	**19.3** (14.4-24.7)	**20.6** (14.6-27.6)	**22.1** (15.0-31.0)	**23.2** (15.1-33.3)
60-day	**12.4** (10.7-14.3)	**13.5** (11.6-15.5)	**15.1** (12.9-17.5)	**16.5** (14.0-19.2)	**18.4** (14.9-22.2)	**20.0** (15.7-24.6)	**21.4** (16.0-27.2)	**22.6** (16.1-30.2)	**24.0** (16.3-33.5)	**24.9** (16.4-35.7)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

SMOC - Worcester, MA
30 Winfield Street
Worcester, MA
Bohler Job Number: W191051
May 24, 2024

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**		**Design Period Intensity***		**7.63**	**in/hr**									
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Material	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
DMH-1	ICS-1	0.09	0.95	0.09	0.00	0.30	0.00	0.09	6	7.63	0.65	8	0.013	HDPE	0.012	1.49	4.28
CB-1	ICS-1	0.08	0.95	0.08	0.10	0.30	0.03	0.11	6	7.63	0.81	8	0.008	HDPE	0.012	1.17	3.35

*Rainfall intensity provided by TR55 Exhibit X-XX or Cornell University's NRCC Atlas of Precipitation Extremes for the North Eastern United States and Canada or NOAA Atlas 14, Volume 10, Version 2 on DATE

Prepared By:
Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

APPENDIX G: OPERATION AND MAINTENANCE

- *STORMWATER OPERATION AND MAINTENANCE PLAN*
- *INSPECTION REPORT*
- *INSPECTION AND MAINTENANCE LOG FORM*
- *LONG-TERM POLLUTION PREVENTION PLAN*
- *ILLICIT DISCHARGE STATEMENT*
- *SPILL PREVENTION*
- *BMP MAP*
- *ISOLATOR ROW O&M*

STORMWATER OPERATION AND MAINTENANCE PLAN

SMOC
30 Winfield Street
Worcester, MA 01610

RESPONSIBLE PARTY DURING CONSTRUCTION:

SMOC
30 Winfield Street
Worcester, MA 01610

RESPONSIBLE PARTY POST CONSTRUCTION:

SMOC
30 Winfield Street
Worcester, MA 01610

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit. Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Upon proper notice to the property owner, the Town/City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots and on-site driveways: Sweep at least four (4) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of off site in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $1,000/year [discuss with project manager prior to including budget values for any items]

2. Catch basins, yard drains, trench drains, manholes and piping: Inspect four (4) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned four (4) times per year. or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed and properly disposed of off site in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500/year per structure.

3. Underground Infiltration Basins: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: Cleaning - $1,000/year, Inspection - $200/year

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

SMOC
30 Winfield Street
Worcester, MA 01610

RESPONSIBLE PARTY:

SMOC
30 Winfield Street
Worcester, MA 01610

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Discharge Points/ Flared End Sections / Rip Rap:	
Infiltration Basin:	
Water Quality Units:	
Other:	

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins:
Discharge Points / Flared End Sections / Rip Rap:
Infiltration Basin:
Water Quality Units:
Other:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

SMOC
30 Winfield Street, Worcester, MA

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

SMOC
30 Winfield Street
Worcester, MA 01610

RESPONSIBLE PARTY DURING CONSTRUCTION:

SMOC
30 Winfield Street
Worcester, MA 01610

RESPONSIBLE PARTY POST CONSTRUCTION:

SMOC
30 Winfield Street
Worcester, MA 01610

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste (dumpsters).
- Sweeping of driveways a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner. Snow shall not be plowed, dumped and/or placed in forebays, infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

Discuss the Spill Prevention and Response Procedures

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

Duly Acknowledged:

_____

Name & Title

SPILL PREVENTION AND RESPONSE PROCEDURES (POST CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

SPILL PREVENTION CONTROL AND COUNTERMEASURE FORM

SMOC
30 Winfield Street
Worcester, MA 01610

Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Immediately notify The Worcester Fire Department (at **9-1-1**)

2. All measures must be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

3. Notify the Worcester Health Department at (508) 799-8531 and the Worcester Conservation Commission at (508) 799-1454.

4. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the City of Worcester Health Department and Conservation Commission.

Date of spill:_____ Time:_____ Reported By:_____

Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill:_____

_____

Measures Taken to Clean up Spill:_____

_____

Type of equipment: _____ Make: _____ Size:_____

License or S/N: _____

Location and Method of Disposal_____

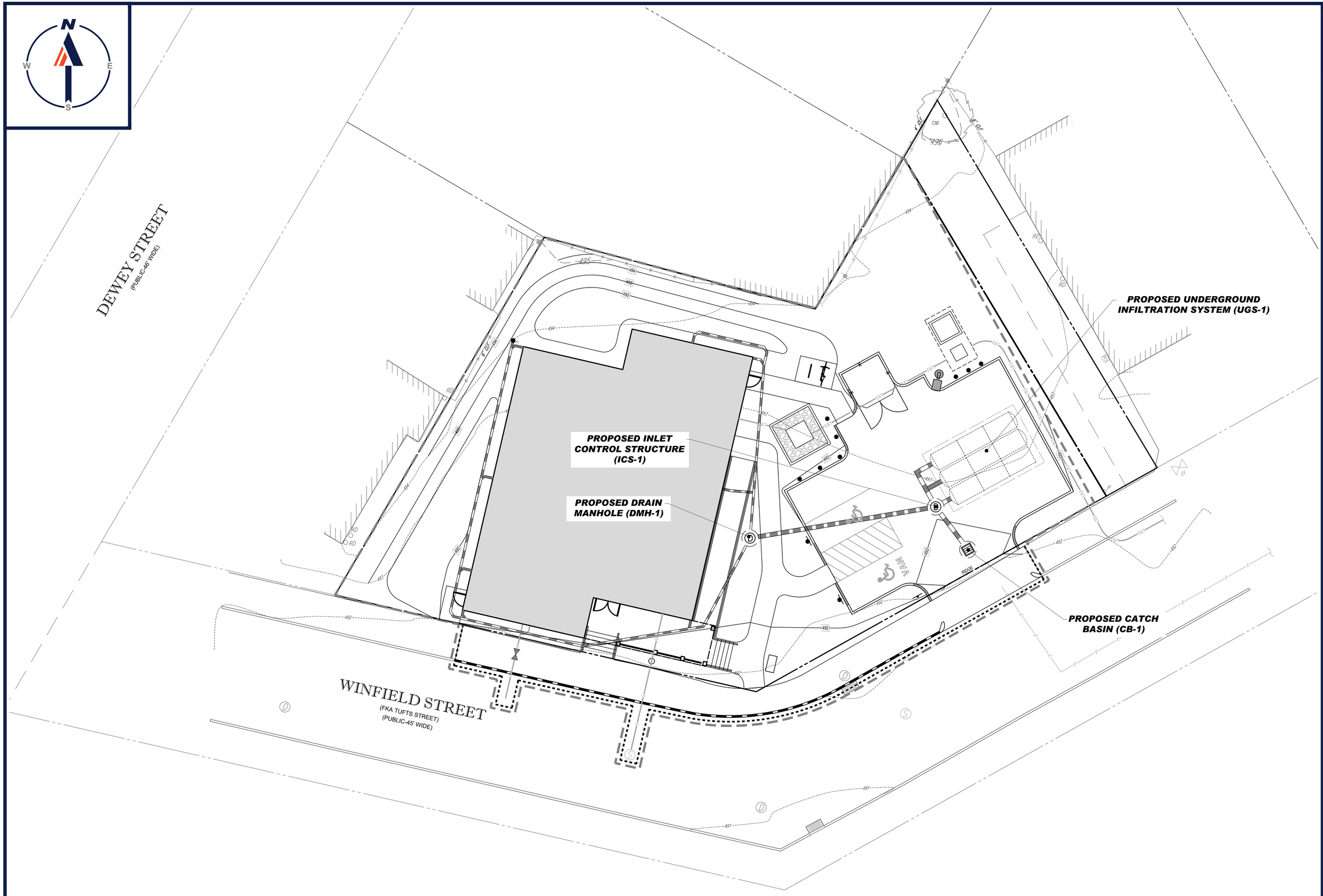
_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring:_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) EMERGENCY PHONE: 1-888-304-1133
- NATIONAL RESPONSE CENTER PHONE: (800) 424-8802
- U.S. ENVIRONMENTAL PROTECTION AGENCYPHONE: (888) 372-7341



P:\191W\191051\DRAWINGS\PLAN SETS\REV7\W191051-CVL-7----LAYOUT: BMP MAP

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	05/08/2020	PER DPW COMMENTS	NPD / RMM
2	11/11/2020	PER TEAM COMMENTS	NPD / RMM
3	06/14/2021	PER TEAM COMMENTS	NPD / RMM
4	07/12/2022	PER TEAM COMMENTS	AGF / RMM
5	01/30/2023	PER TEAM COMMENTS	NPD / RMM
6	12/15/2023	PER TEAM COMMENTS	NPD / RMM
7	05/24/2024	PER CITY COMMENTS	- / -

811 Know what's below. Call before you dig.

ALWAYS CALL 811

It's fast. It's free. It's the law.

ISSUED FOR PERMIT

THIS DRAWING IS INTENDED FOR MUNICIPAL AND/OR AGENCY REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	W191051
DRAWN BY:	CFD/NPD
CHECKED BY:	RMM
DATE:	04/28/2020
CAD I.D.:	W191051-CVL-7

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

SMOC EVERYBODY MATTERS

PROPOSED DEVELOPMENT

30 WINFIELD STREET
WORCESTER COUNTY
CITY OF WORCESTER, MA
MAP #6, LOT #21

BOHLER
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

SHEET TITLE:

BMP MAP

SHEET NUMBER:

BMP M

REVISION 7 - 05/24/2024

StormTech®

Detention • Retention • Water Quality

A division of ADS

Save Valuable Land and Protect Water Resources

Isolator® Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator® Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patented technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

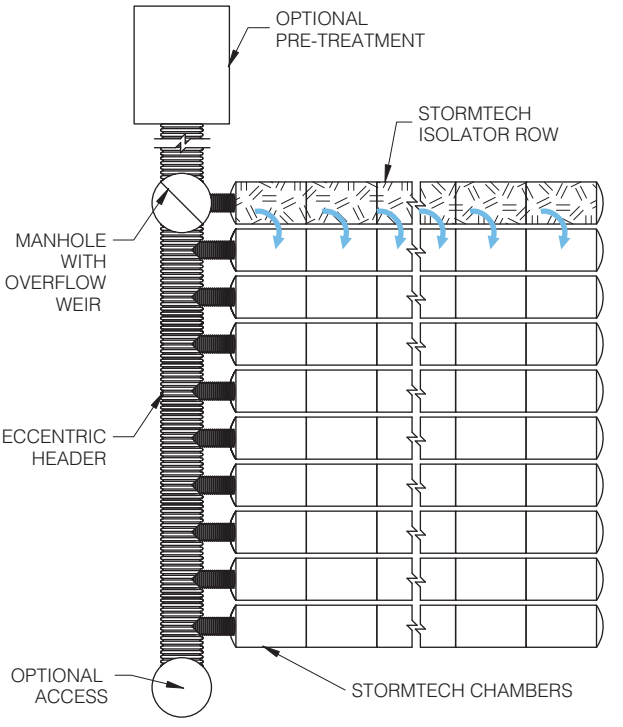
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.0 Isolator Row Inspection/Maintenance

2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

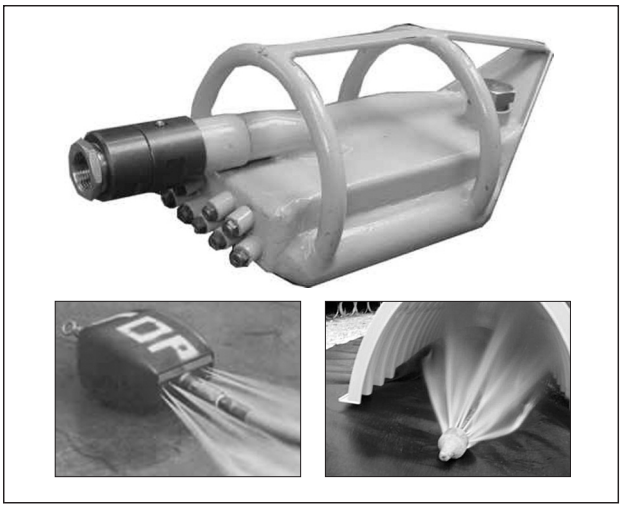
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

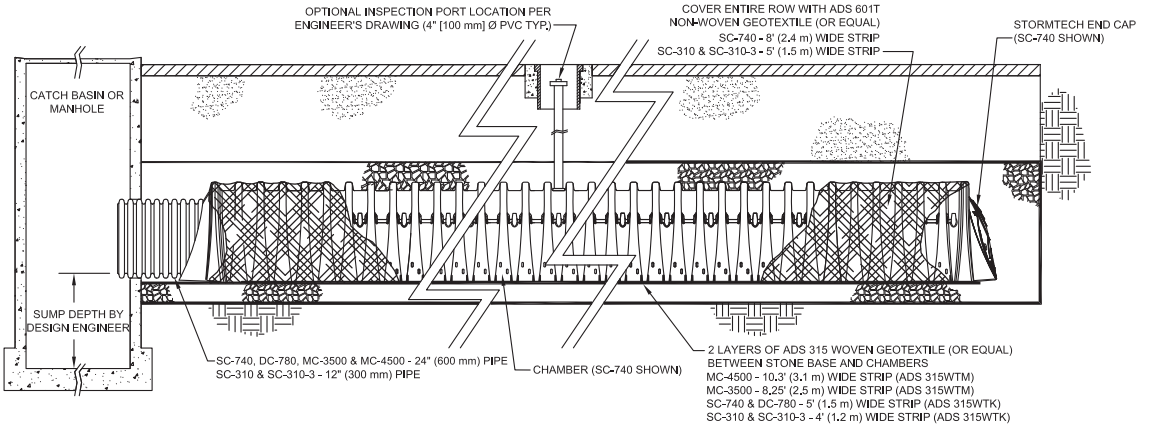
The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



NOTE: NON-WOVEN FABRIC IS ONLY REQUIRED OVER THE INLET PIPE CONNECTION INTO THE END CAP FOR DC-780, MC-3500 AND MC-4500 CHAMBER MODELS AND IS NOT REQUIRED OVER THE ENTIRE ISOLATOR ROW.

3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.

iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows

i. Remove cover from manhole at upstream end of Isolator Row

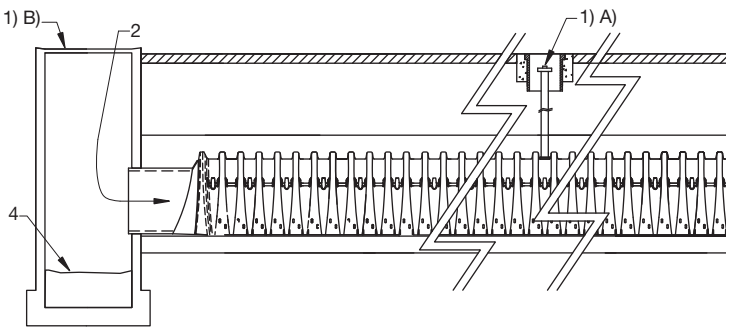
ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry

2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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