Middlesex Savings Bank - Acton Branch
Project Sitework Cost Estimate

Land Disturbance - Stormwater Bond Cost Estimate

	DESCRIPTION	QTY	UNIT	COST/UNIT	TOTAL COST	COMMENTS
ITEM 1 - EROSION CONTROL						
1	Erosion Control (minimum amount)	1	EACH	$10,000.00	$10,000.00	
	SUBTOTAL EROSION CONROL - ITEM 1				**$10,000.00**	
ITEM 2 - STORMWATER MANAGEMENT SYSTEM						
1	Catch Basin w/ Frame & Grate	5	EACH	$5,000.00	$25,000.00	RS Means G3030 210 5860
2	Drain Manhole w/ Frame & Cover	3	EACH	$5,000.00	$15,000.00	RS Means G3030 210 5861
3	Outlet Control Structure w/ Frame & Cover	2	EACH	$5,000.00	$10,000.00	RS Means G3030 210 5862
4	Stormwater Treatment Unit w/ Frame & Cover	3	EACH	$6,400.00	$19,200.00	Price from Manufacturer
5	Recharger #1	1	EACH	$25,000.00	$25,000.00	Price from Manufacturer
6	Recharger #2	1	EACH	$18,000.00	$18,000.00	Price from Manufacturer
7	8" HDPE Pipe	550	LF	$25.15	$13,832.50	RS Means G3020 112 1500
8	6" HDPE Pipe	75	LF	$21.60	$1,620.00	RS Means G3020 112 1450
	SUBTOTAL STORMWATER MANAGEMENT SYSTEM - ITEM 2				**$127,652.50**	
ITEM 3 - SANITARY SEWER						
1	6" SDR-35 PVC	50	LF	$23.35	$1,167.50	RS Means G3020 112 1750
2	Locate Existing Sewer Stub	1	EACH	$2,500.00	$2,500.00	Estimated Cost
	SUBTOTAL SANITARY SEWER - ITEM 3				**$3,667.50**	
ITEM 4 - GAS SERVICE						
1	Gas Service	85	LF	$26.75	$2,273.75	RS Means G3060 112 2060
	SUBTOTAL GAS SERVICE - ITEM 4				**$2,273.75**	
ITEM 5 - DOMESTIC WATER SERVICE						
1	1" Type K Copper Water Service Pipe	55	LF	$13.25	$728.75	RS Means 33 11 13.45 2200
2	Curb Box and Valve	1	EACH	$116.00	$116.00	RS Means 33 11 13.45 7180
3	Locate Existing Water Service Stub	1	EACH	$2,500.00	$2,500.00	Estimated Cost
	SUBTOTAL DOMESTIC WATER SERVICE - ITEM 5				**$3,344.75**	
	SUBTOTAL FOR PAGE 1				**$146,938.50**	

	DESCRIPTION	QTY	UNIT	COST/UNIT	TOTAL COST	COMMENTS
ITEM 6 - SITE POWER AND LIGHTING						
1	Site Power	1	EACH	$5,000.00	$5,000.00	Estimated Cost
2	Site Lighting	6	EACH	$7,000.00	$42,000.00	Estimated Cost
	SUBTOTAL SITE POWER AND LIGHTING - ITEM 6				**$47,000.00**	
ITEM 7 - SITE SURFACE FEATURES						
1	1.5" Top Course Pavement	1,600	SY	$14.58	$23,328.00	RS Means 32 12 16.13 0420
2	2.5" Binder Course Pavement	1,600	SY	$8.14	$13,024.00	RS Means 32 12 16.13 0080
3	12" Base Material	1,600	SY	$18.98	$30,368.00	RS Means 32 11 23.23 0304
4	Pavement Markings - parking stall striping, handicap symbols, arrows, etc.	1	EACH	$2,000.00	$2,000.00	Estimated Cost
5	Site Signs	1	EACH	$1,500.00	$1,500.00	Estimated Cost
6	Cape Cod Berm	950	LF	$3.20	$3,040.00	RS Means 32 16 33.33 0150
7	Vertical Granite Curb	260	LF	$32.00	$8,320.00	RS Means 32 16.13.43 1100
8	Concrete Sidewalk	190	LF	$34.85	$6,621.50	RS Means G2030 120 1960
9	Concrete Pad (dumpster)	1	EACH	$3,000.00	$3,000.00	Estimated Cost
10	Dumpster Enclosure Fence	35	LF	$29.00	$1,015.00	RS Means 32 31 29.10 1260
	and Swing Gate	1	EACH	$300.00	$300.00	
11	Bituminous Sidewalk	190	LF	$19.00	$3,610.00	RS Means G2030 110 2560
	SUBTOTAL SITE SURFACE FEATURES - ITEM 7				**$96,126.50**	
ITEM 8 - SITE DEMOLITION						
1	Pavement Demo	2,415	SY	$9.60	$23,184.00	RS Means 02 41 13.17 5050
2	Bituminous Curb Demo	680	LF	$3.63	$2,468.40	RS Means 02 41 13.17 6300
3	Granite Curb Demo	70	LF	$5.30	$371.00	RS Means 02 41 13.17 6200
4	Sewer & Drainage Pipe Demo	285	LF	$6.40	$1,824.00	RS Means 02 41 13.38 1800
5	Sewer & Drainage Structure Demo	3	EACH	$250.00	$750.00	RS Means 02 41 13.42 0400
6	Drainage Infiltration Basin Demo	750	LF	$9.60	$7,200.00	RS Means 02 41 13.38 1900
7	Water Service Demo	80	LF	$2.55	$204.00	RS Means 02 41 13.38 2300
8	Gas Service Demo	110	LF	$16.10	$1,771.00	RS Means 02 41 13.38 1000
9	Building Demolition	1	EACH	$45,000.00	$45,000.00	Estimated Cost
	SUBTOTAL SITE SURFACE FEATURES - ITEM 7				**$82,772.40**	

SUBTOTAL FOR PAGE 2 $225,898.90

ITEM 9 - SITE LANDSCAPING

1	Site Landscaping	1	EACH	$75,000.00	$75,000.00	From Landscape Architect

SUBTOTAL SITE LANDSCAPING - ITEM 9 **$75,000.00**

SUBTOTAL FOR PAGE 3 **$75,000.00**

SUBTOTAL FOR PAGE 1	**$146,938.50**
SUBTOTAL FOR PAGE 2	**$225,898.90**
SUBTOTAL FOR PAGE 3	**$75,000.00**
OVERALL SUBTOTAL	**$447,837.40**
10% CONTINGENCY	**$44,783.74**
GRAND TOTAL	**$492,621.14**

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Framingham, MA 01701
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STORMWATER MANAGEMENT DESIGN AND RUNOFF CALCULATIONS REPORT

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

Report Prepared for:
Middlesex Savings Bank
120 Flanders Road Mail Stop W1C-2
Westborough, MA 01581

Report Prepared by:
DGT Associates – Project Civil Engineer
1071 Worcester Road
Framingham, MA 01701
508-879-0030

October 11, 2019

TABLE OF CONTENTS

APPENDICIES

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Framingham, MA 01701
508.879.0030
www.dgtassociates.com

SECTION 1

Stormwater Management Report
Narrative and Summary

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
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MIDDLESEX SAVINGS BANK – ACTON BRANCH
STORMWATER MANAGEMENT
NARRATIVE SUMMARY

This report contains the hydrologic computations and design information relative to the existing and proposed stormwater runoff conditions for the Middlesex Savings Bank Project and associated site improvements at #279 & #285 Main Street in Acton, MA. It includes information on the stormwater management system design, assessment of stormwater impacts and compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Regulations and the Town of Acton Stormwater Management and Erosion & Sediment Control Regulations (Chapter X) for the proposed project.

Existing Property Description

The subject property is 44,008 square feet (1.01 acres) in area and is located at #279 and #285 Main Street (Route 27). The site is located in the Kelley's Corner (KC) zoning district and is within the Town's Groundwater Protection District Zone 4. The site is presently developed with a one-story retail building with a paved parking lot and two curb cuts to allow for access to the site from Main Street. The westerly perimeter of the site is vegetated with grass, brush and a few trees. The easterly perimeter is open to the abutter with a retaining wall on the abutting property. The rear of the property is open grass with some mature trees on either side of the lot and abuts Massachusetts Avenue (Route 111).

The site is relatively flat in the front and around the building, including the existing parking lot area. South of the parking lot and building, the site slopes down to Mass Ave. There are no jurisdictional Wetland Resource Areas located on the site or that extend onto the site.

The existing building roof flows uncontrolled onto the surrounding paved areas. The front parking area and easterly curb cut sheet flow uncontrolled out to Main Street. The parking lot area drains to a catch basin behind the existing building. The catch basin that picks up some of the parking lot area and a portion of the existing roof drains to an existing underground infiltration system which was installed after permitting in 2003. The overflow for the existing infiltration system is to an underground infiltration trench that spans the length of the rear of the property. It is our understanding that this trench acts like a level spreader for the overflow. Other than the existing catch basin and underground infiltration system, there is no other formal treatment of the stormwater runoff.

Soils and Groundwater

The NRCS classifies the soils at the site as being in the Udorthents-Urban Land Complex soil series. The parent material consists of loamy alluvium and/or sandy glaciofluvial deposits. Soils directly north of the subject site are classified as the Charlton-Hollis Rock Outcrop soil series. The parent material of this soil series consists of friable loamy eolian deposits over friable loamy basal

till. The natural drainage class is well drained. These soils fall within Hydrologic Soil Group (HSG) A.

The estimated seasonal high groundwater (ESHGW) elevations and soil test information used for the design of Recharger #1 and Recharger #2 are based on record information obtained from the Town of Acton and others as listed below:

- ESHGW elevations used and shown on the design plans are from the original design plans for the stormwater system design for #279 Main Street. Said plan is by Stamski and McNary, Inc. as revised through September 12, 2003. ESHGW was indicated at 60 inches below original existing grade. The referenced plan set was accompanied by a Site Plan Special Permit Application by Stamski and McNary, Inc. dated May 28, 2003. Within this report, soil test data indicated loamy sand and the infiltration rate used for this original design was 2.41 in/hr.
- The Town of Acton Health Department also provided soil test pit data for #289 Main Street (direct abutter) by Bohler Engineering from July 18, 1996 which indicated loamy sand in the C Layer.

Soil testing has not been performed for the current proposed drainage system as Middlesex Savings Bank does not have full ownership of the subject property at this time. As soon as Middlesex Savings Bank takes full ownership of the property, soil testing will be performed for the current stormwater management design. All soil test information and any revisions to the current design, if necessary, will be provided to the Town of Acton.

See additional information contained in Appendix 1 of this report.

Project Description

The project consists of demolishing the existing building and constructing a new Middlesex Savings Bank building with a drive-up window and ATM on the back side of the building. The building will be located on the westerly side of the site and approximately 33 feet from the front property line. Additional site improvements include new parking areas, walkways, landscaping, utilities, site lighting and handicapped accessibility. The project is also proposing two new bituminous walkways to abutting properties in accordance with the Kelley's Corner design standards. Stormwater management features include the installation of five on-site catch basins, three proprietary hydrodynamic separators and two underground infiltration systems. Overflow from the two new infiltration systems will be to the existing stone trench in the rear of the property. Construction period erosion and sedimentation controls are to be installed prior to any site disturbance and are to be maintained during construction. This project is a redevelopment project. There is a reduction in impervious area of 7,824 square feet (13.1% decrease).

Stormwater Management Objectives

For organizational purposes, descriptions and calculations for the various components of the stormwater management system are contained in Section 2 of this report. The hydrologic and flood routing computer modeling calculations for the existing and proposed conditions are included in Section 3 and Section 4 of this report, respectively. The watershed modeling was

performed using computer software "HydroCAD" version 10.0 by Applied Microcomputer Systems.

The hydrologic model uses design points to compare the existing conditions to proposed conditions. The results of the hydrologic analysis for the existing and proposed conditions to all four design points (2, 10, 25 and 100-year storm events) are summarized in the tables below. In accordance with the Town of Acton's Chapter X Regulations, precipitation values for each storm event are based on the most current NOAA Atlas 14, Version 10. The four design points for this project are as follows:

Design Point #1 – Main Street
Design Point #2 – Massachusetts Avenue
Design Point #3 – Westerly Abutter
Design Point #4 – Easterly Abutter

The project as designed maintains the balance of the site hydrology; the drainage patterns of the existing site were generally kept the same under proposed conditions. The only difference is that the amount of uncontrolled runoff to Main Street and the easterly abutter have been greatly reduced and directed to the on-site infiltration systems. Overall, there is a reduction of peak flows and volumes to all four design points, with the exception of the 100-year volume of runoff to the westerly abutter. There is a very small increase in volume of runoff of 0.003 acre-feet, which equates to 978± gallons in the 100-year storm event. This is due to the amount of area flowing uncontrolled to this design point increasing by 1,517 square feet. This amount of runoff, in the 100-year storm event is considered de minimis. The results of the hydrologic analysis are summarized in the following tables below:

Design Point #1 - Main Street

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
2 Year	3.23 in	0.27	0.01	0.020	0.001
10 Year	5.01 in	0.44	0.03	0.033	0.002
25 Year	6.12 in	0.53	0.04	0.041	0.003
100 Year	7.83 in	0.69	0.06	0.053	0.004

Design Point #2 - Mass Ave

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
2 Year	3.23 in	0.00	0.00	0.000	0.000
10 Year	5.01 in	0.16	0.02	0.010	0.005
25 Year	6.12 in	0.71	0.59	0.043	0.037
100 Year	7.83 in	1.87	1.78	0.102	0.101

Design Point #3 - Westerly Abutter

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
2 Year	3.23 in	0.00	0.00	0.000	0.000
10 Year	5.01 in	0.00	0.00	0.000	0.001
25 Year	6.12 in	0.01	0.01	0.001	0.003
100 Year	7.83 in	0.02	0.05	0.003	0.006

Design Point #4 - Easterly Abutter

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
2 Year	3.23 in	0.44	0.00	0.030	0.000
10 Year	5.01 in	0.82	0.01	0.057	0.003
25 Year	6.12 in	1.06	0.04	0.074	0.006
100 Year	7.83 in	1.43	0.14	0.101	0.013

NET OVERALL FLOWS LEAVING THE SITE

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
2 Year	3.23 in	0.71	0.01	0.050	0.001
10 Year	5.01 in	1.25	0.04	0.100	0.011
25 Year	6.12 in	1.60	0.64	0.159	0.049
100 Year	7.83 in	2.89	1.94	0.259	0.124

Watershed Modeling and Best Management Practices Design

The hydrologic analysis of the existing conditions and proposed watershed is based on the nationally recognized watershed modeling techniques developed by the USDA, Soil Conservation Service (SCS). The techniques and runoff models are described in the following SCS publications:

- "Urban Hydrology for Small Watersheds, Technical Release Number 55", 1986 and Technical Release 20.
- National Engineering Handbook, Hydrology, Section 4, 1972.
- "A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Technical Release No. 149" 1973.
- "Hydrology Handbook for Conservation Commissions" March 2002, Mass. DEP.
- The watershed modeling was performed using computer software "HydroCAD" version 10.0 by Applied Microcomputer Systems, which is based on the publications referenced above.

- Best Management Practices were designed based on the guidance provided in the DEP "Stormwater Management Standards Handbook", February, 2008.

Erosion and Sediment Control During Construction

Included with the plans for this filing are Erosion and Sediment Control Plans and Details that show the practices to be implemented to protect abutting properties, including public roadways from sedimentation and the downstream stormwater system.

This project is not subject to the U.S. EPA's Construction General Permit under the NPDES Program. Therefore, a Stormwater Pollution Prevention Plan (SWPPP) and a Notice of Intent filing with the EPA are not required. The Erosion and Sediment Control Plans show the initial erosion controls, general BMPs and detailed information as to the responsibilities of the Contractor.

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SECTION 2

COMPLIANCE CALCULATIONS

Stormwater Standards Compliance Summary
MassDEP "Checklist for Stormwater Report"
Illicit Discharge Statement
Standard 3 – Recharge Calculations / Drawdown Time Calculations / Water Balance Calculations
Standard 4 – Water Quality & TSS Removal Calculations
Rational Method Pipe Calculations
Earth Removal Calculations

for

Middlesex Savings Bank – Acton Branch
279 & 285 Main Street
Acton, MA 01720

STORMWATER STANDARDS COMPLIANCE SUMMARY

Middlesex Savings Bank – Acton Branch
Acton, MA

Standard 1: (Untreated Discharges)

There are no new stormwater conveyances proposed that discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Prior to discharge, stormwater runoff is directed to pretreatment and treatment BMPs as required.

Standard 2: (Peak Rate Control and Flood Protection)

In looking at the total amount of runoff leaving the subject property (for all four design points combined), there will be no increase in peak rate of discharge and volumes up to and including the 100-year storm event. There is a very minor increase in peak flow and volume to Design Point #3 (Westerly Abutter) that occurs for only the 100-year storm event (an increase in peak flow of 0.03 cfs and an increase in volume of 0.003 acre-feet = approximately 978 gallons). However, this increase in peak flow and volume to not have a detrimental impact to the westerly abutter and is only during the 100-year storm event.

The computations have been made for the 2, 10, 25, and 100-year storms. The computations for the peak rates of runoff and volumes are contained in Section 3 and Section 4 of this report. See the information and summary tables contained in the narrative section.

Standard 3: (Recharge to Groundwater)

To meet the current DEP Stormwater Regulations, Standard 3 requires that a minimum 0.60, 0.35, 0.25 & 0.10 inches of runoff from the impervious surfaces must be recharged to the ground for hydrologic soil groups (HSG) A, B, C, & D respectively. The subject site is within HSG A.

This project is proposing two (2) underground recharger systems with associated deep sump hooded catch basins and proprietary treatment units.

The project is considered a redevelopment project. There is a net decrease in impervious area of 7,824 square feet. Therefore, the minimum required recharge volume is only to the maximum extent practicable. However, the project meets the standard of new construction as the minimum required recharge volume is computed to be 1,024 cubic feet. The proposed infiltration BMPs result in a total recharge volume of 2,634 cubic feet. The proposed infiltration BMP's all drain within 72 hours.

Detailed calculations demonstrating compliance with this standard are included at the end of this section.

Standard 4: (80% TSS Removal)

This project incorporates several stormwater pretreatment and treatment BMP's. Runoff from paved surfaces is routed through pretreatment BMP's (deep sump catch basins, proprietary stormwater treatment units) and subsurface recharge treatment BMP's. Non-contaminated runoff (roof areas) is routed directly to the subsurface infiltration systems.

Per the MassDEP Stormwater Regulations, the Water Quality Volume (WQV) is 1.0 inches for the subject site due to the presence of soils with a rapid infiltration rate (greater than 2.4 inches/hour).

Per Section 3.4.6.4.1 of the Town of Acton Stormwater Management and Erosion & Sediment Control Regulations, the proposed stormwater management system must retain the volume of runoff equivalent to, or greater than, 0.8 inches as the subject site is in Zone 4 of the Groundwater Protection Area. Calculations demonstrating compliance with Section 3.4.6.4.1 are included in this section.

Design calculations for each treatment train and TSS Removal Calculation Worksheets are included in this section.

In compliance with Standard 4, a Long-Term Pollution Prevention Plan is included in Appendix 2 and the Stormwater Operation and Maintenance Plan is included in Appendix 3.

Standard 5: (Land Use with Higher Potential Pollutant Load)

The commercial use for this site (bank) is not a use with a higher potential pollutant load.

Standard 6: (Critical Areas)

Not applicable. Stormwater does not discharge near or to a Critical Area (such as a Zone II, Interim Wellhead Protection Areas, Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Reservoir Waters or Cold-Water Fisheries).

Standard 7: (Redevelopment)

This project is considered a redevelopment project as there is a net decrease in impervious area of 7,824 square feet. The project proposes to bring all of the paved surfaces into full compliance to meet the standards for new construction. These detailed calculations are included in this section.

Standard 8: (Erosion, Sediment Control)

Erosion and sediment control BMPs are included in the Erosion and Sediment Control Plan prepared for the initial project setup and includes detailed information regarding the responsibilities for the Contractor in managing the site in compliance with applicable permits.

This project is not subject to the NPDES Phase II requirements for construction sites. Coverage under the NPDES Construction General Permit not required.

Standard 9: (Operation & Maintenance)

A Long Term Pollution Prevention Pollution Prevention Plan (LTPPP) for the general management of the site is included in Appendix 2 of this Stormwater Report. An Operation and Maintenance Plan for the stormwater system is also included in Appendix 3.

Standard 10: (Illicit Discharges)

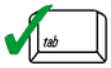
The proposed design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed. No illicit discharges are known to exist. An Illicit Discharge Statement is included in Section 2 of this Report.

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

Bert E Cor 10/11/19

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): Subsurface Rechargers

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.

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

September 30, 2019

25487

MassDEP Central Regional Office – Worcester
8 New Bond Street
Worcester, MA 01606

RE: Illicit Discharge Compliance Statement

In accordance with Standard 10 of the Massachusetts Stormwater Regulations, the following statements are made regarding the proposed site development for the Middlesex Savings Bank – Acton Branch Project at 279 and 285 Main Street in Acton, MA:

- The proposed site development design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed.

Please feel free to contact me if you have any questions.

Sincerely yours,
DGT Associates

Bert E. Corey

Bert E. Corey, P.E.
Engineering Group Manager

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

Standard 3

Recharge Calculations / Drawdown Time Calculations / Water Balance Calculations

and

Standard 4

Water Quality & TSS Removal Calculations

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www.dgtassociates.com

Stormwater Calculations – Recharge – Standard 3

Middlesex Savings Bank – Acton Branch – Acton, MA

Proposed Impervious Area	= 20,473 sf
Existing Impervious Area	= 28,297 sf
Decrease in Impervious Area	= 7,824 sf

Soils HSG: A → Recharge = 0.60 inches of runoff

Minimum Required Recharge:
(20,473 sf)(0.60 in ÷ 12) = 1,024 ft^3

- All recharge facilities are designed for at least 1.0 inch capture volume to meet the Water Quality Volume (WQV) requirements, in accordance with the Massachusetts Stormwater Regulations.

- All recharge facilities are also designed to detain 0.8 inches over the contributing impervious area in accordance with Section 3.4.6.4.1 of the Town of Acton's Chapter X Regulations.

- All recharger facilities are also designed in compliance with Section 3.4.7 Water Balance Calculations of the Town of Acton's Chapter X Regulations.

Using the capture area adjustment (65% Rule), the basins can be credited to provide recharge for a larger area. The maximum allowable ratio = 1 ft^2 ÷ 0.65 = 1.53

Total impervious area to recharge:

Recharger #1

P-2a Subcatchment impervious area	= 8,781 ft^2
P-2b Subcatchment impervious area	= 1,858 ft^2
P-3b Subcatchment impervious area	= 3,466 ft^2
P-8 Subcatchment impervious area	= 0 ft^2
TOTAL	= 14,105 ft^2

Recharger #2

P-1 Subcatchment impervious area	= 4,134 ft^2
P-3a Subcatchment impervious area	= 1,358 ft^2
TOTAL	= 5,492 ft^2

Total Impervious Area to Recharge = 19,597 ft^2

20,473 / 19,597 = 1.04

Adjusted Minimum Required Recharger Volume = 1,024 ft^3 x 1.04 = 1,065 ft^3

Design Capture Volume (below overflow weir) for Recharger #1 = 2,001 ft^3

Design Capture Volume (below overflow weir) for Recharger #2 = 633 ft^3

Total Provided Recharge Volume = 2,001 ft^3 + 633 ft^3 = 2,634 ft^3

2,634 ft^3 > 1,065 ft^3 ← This project meets the MassDEP Regulation Standard for new construction.

The above calculations also demonstrate compliance with the requirements of Section 3.4.7 Water Balance Calculations of the Town of Acton's Chapter X Regulations.

Recharge Basin Sizing Calculations – Static Method

Recharger #1:
Contributing Impervious Area = 14,105 ft^2
Minimum Capture Volume = 14,105 ft^2 x (0.8 in/12) = 941 ft^3 (Town of Acton Requirement)

Volume below weir = 2,001 ft^3

2,001 ft^3 > 941 ft^3 ← okay

Recharger #2:
Contributing Impervious Area = 5,492 ft^2
Minimum Capture Volume = 5,492 ft^2 x (0.8 in/12) = 367 ft^3 (Town of Acton Requirement)

Volume below weir = 633 ft^3

633 ft^3 > 367 ft^3 ← okay

The above sizing calculations demonstrate compliance with the requirements of the Section 3.4.6.4.1 of the Town of Acton's Chapter X Regulations.

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Stormwater Calculations – Drawdown Time

Middlesex Savings Bank – Acton Branch – Acton, MA

Recharger #1:
Contributing Impervious Area = 14,105 ft^2
Recharger #1 Bottom Area = 1,908 ft^2
Water Quality Volume = 14,105 ft^2 x (1.0 in/12) = 1,176 ft^3
Provided Capture Volume = 2,001 ft^3

$Time_{drawdown}$ = Rv ÷ (K)(Bottom Area)
$Time_{drawdown}$ = 2,001 ft^3 ÷ (2.41 in/hr)(1,908 ft^2)(1 ft / 12 in.)
$Time_{drawdown}$ = 5.2 hours

5.2 hours < 72 hours ← okay

Recharger #2:
Contributing Impervious Area = 5,492 ft^2
Recharger #2 Bottom Area = 1,118 ft^2
Water Quality Volume = 5,492 ft^2 x (1.0 in/12) = 458 ft^3
Provided Capture Volume = 633 ft^3

$Time_{drawdown}$ = Rv ÷ (K)(Bottom Area)
$Time_{drawdown}$ = 633 ft^3 ÷ (2.41 in/hr)(1,118 ft^2)(1 ft / 12 in.)
$Time_{drawdown}$ = 2.8 hours

2.8 hours < 72 hours ← okay

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

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

Location: **279 & 285 Main Street in Acton, MA**

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Hooded CB	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Unit	**0.50**	**0.75**	**0.375**	**0.375**
Infiltration Basin	**0.80**	**0.375**	**0.30**	**0.075**

Total TSS Removal = **92.5%**

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

Project: **Middlesex Savings Bank**

Prepared By: **DGT Associates**

Date: **2019-09-30**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Project: Middlesex Savings Bank
Location: Acton, MA
Prepared For: DGT Associates

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
STU #1	0.20	0.0003150	5.0	0.083	1.00	795.00	0.25
STU #2	0.04	0.0000612	5.0	0.083	1.00	795.00	0.05
STU #3	0.09	0.0001483	5.0	0.083	1.00	795.00	0.12

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

MIDDLESEX SAVINGS BANK
ACTON, MA

Area	**0.20 ac**	Unit Site Designation	**STU #1**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**5 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.01	0.01	9.1
0.08	7.7%	37.0%	0.01	0.01	7.4
0.10	8.6%	45.6%	0.02	0.02	8.2
0.12	6.3%	51.9%	0.02	0.02	6.0
0.14	4.7%	56.5%	0.03	0.03	4.5
0.16	4.6%	61.2%	0.03	0.03	4.4
0.18	3.5%	64.7%	0.03	0.03	3.4
0.20	4.3%	69.1%	0.04	0.04	4.1
0.25	8.0%	77.1%	0.05	0.05	7.5
0.30	5.6%	82.7%	0.05	0.05	5.2
0.35	4.4%	87.0%	0.06	0.06	4.1
0.40	2.5%	89.5%	0.07	0.07	2.3
0.45	2.5%	92.1%	0.08	0.08	2.3
0.50	1.4%	93.5%	0.09	0.09	1.3
0.75	5.0%	98.5%	0.14	0.14	4.4
1.00	1.0%	99.5%	0.18	0.18	0.9
1.50	0.0%	99.5%	0.27	0.27	0.0
2.00	0.0%	99.5%	0.36	0.36	0.0
3.00	0.5%	100.0%	0.54	0.54	0.3
					94.7
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**88.2%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

MIDDLESEX SAVINGS BANK
ACTON, MA

Area	**0.04 ac**	Unit Site Designation	**STU #2**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**5 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.00	0.00	9.4
0.06	9.4%	29.3%	0.00	0.00	9.2
0.08	7.7%	37.0%	0.00	0.00	7.5
0.10	8.6%	45.6%	0.00	0.00	8.3
0.12	6.3%	51.9%	0.00	0.00	6.1
0.14	4.7%	56.5%	0.00	0.00	4.5
0.16	4.6%	61.2%	0.01	0.01	4.5
0.18	3.5%	64.7%	0.01	0.01	3.4
0.20	4.3%	69.1%	0.01	0.01	4.2
0.25	8.0%	77.1%	0.01	0.01	7.7
0.30	5.6%	82.7%	0.01	0.01	5.4
0.35	4.4%	87.0%	0.01	0.01	4.2
0.40	2.5%	89.5%	0.01	0.01	2.4
0.45	2.5%	92.1%	0.02	0.02	2.4
0.50	1.4%	93.5%	0.02	0.02	1.3
0.75	5.0%	98.5%	0.03	0.03	4.8
1.00	1.0%	99.5%	0.04	0.04	1.0
1.50	0.0%	99.5%	0.05	0.05	0.0
2.00	0.0%	99.5%	0.07	0.07	0.0
3.00	0.5%	100.0%	0.11	0.11	0.4
					96.7
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**90.3%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

MIDDLESEX SAVINGS BANK
ACTON, MA

Area	**0.09 ac**	Unit Site Designation	**STU #3**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**5 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.00	0.00	9.4
0.06	9.4%	29.3%	0.01	0.01	9.2
0.08	7.7%	37.0%	0.01	0.01	7.5
0.10	8.6%	45.6%	0.01	0.01	8.3
0.12	6.3%	51.9%	0.01	0.01	6.1
0.14	4.7%	56.5%	0.01	0.01	4.5
0.16	4.6%	61.2%	0.01	0.01	4.5
0.18	3.5%	64.7%	0.02	0.02	3.4
0.20	4.3%	69.1%	0.02	0.02	4.2
0.25	8.0%	77.1%	0.02	0.02	7.7
0.30	5.6%	82.7%	0.03	0.03	5.3
0.35	4.4%	87.0%	0.03	0.03	4.2
0.40	2.5%	89.5%	0.03	0.03	2.4
0.45	2.5%	92.1%	0.04	0.04	2.4
0.50	1.4%	93.5%	0.04	0.04	1.3
0.75	5.0%	98.5%	0.06	0.06	4.7
1.00	1.0%	99.5%	0.09	0.09	0.9
1.50	0.0%	99.5%	0.13	0.13	0.0
2.00	0.0%	99.5%	0.17	0.17	0.0
3.00	0.5%	100.0%	0.26	0.26	0.4
					96.0
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**89.6%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

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Framingham, MA 01701
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Rational Method Pipe Calculations

The following pages include rational method flow calculations (Q=CiA) for the new drainage system and Manning calculations for flow capacity of the pipes in the new drainage system.
Flows are for the 25-Year Storm Event.

Pipe Calculations

To CB #1	area(sf)	=	792	c-factor				
	paved	=	792	* 0.90	=	713		
	landscaped	=	0	* 0.20	=	0		
						713		
	weighted C =	0.90		tc < 5min	I=	6.12	in/hr	
	A =	0.02	acres	Q25 = CiA		**0.11**	**cfs**	
To CB #2	area(sf)	=	10,081	c-factor				
	paved	=	7,989	* 0.90	=	7190		
	landscaped	=	2,092	* 0.20	=	418		
						7609		
	weighted C =	0.75		tc < 5min	I=	6.12	in/hr	
	A =	0.23	acres	Q25 = CiA		**1.06**	**cfs**	
To CB #3	area(sf)	=	2,223	c-factor				
	paved	=	1,705	* 0.90	=	1535		
	landscaped	=	518	* 0.20	=	104		
						1638		
	weighted C =	0.74		tc < 5min	I=	6.12	in/hr	
	A =	0.05	acres	Q25 = CiA		**0.23**	**cfs**	
To CB #4	area(sf)	=	7,470	c-factor				
	paved	=	4,134	* 0.90	=	3721		
	landscaped	=	3,336	* 0.20	=	667		
						4388		
	weighted C =	0.59		tc < 5min	I=	6.12	in/hr	
	A =	0.17	acres	Q25 = CiA		**0.61**	**cfs**	
To CB #5	area(sf)	=	1,895	c-factor				
	paved	=	0	* 0.90	=	0		
	landscaped	=	1,895	* 0.20	=	379		
						379		
	weighted C =	0.20		tc < 5min	I=	6.12	in/hr	
	A =	0.04	acres	Q25 = CiA		**0.05**	**cfs**	

Pipe Calculations

CB #1 to STU #1					L= 134'
Size	8	in. HDPE			
Slope	0.008	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	3.10				
Q=VA	**1.08**	**(CAPACITY)**			
Q25=	0.11	(Q=CiA)			

CB #2 to STU #1					L= 12'
Size	8	in. HDPE			
Slope	0.017	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.53				
Q=VA	**1.58**	**(CAPACITY)**			
Q25=	1.06	(Q=CiA)			

STU #1 to RECHARGER #1					L= 8'
Size	8	in. HDPE			
Slope	0.014	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.11				
Q=VA	**1.43**	**(CAPACITY)**			
Q25=	1.17	(Q=CiA)			

CB #3 to STU #2					L= 5'
Size	8	in. HDPE			
Slope	0.02	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.91				
Q=VA	**1.71**	**(CAPACITY)**			
Q25=	0.23	(Q=CiA)			

STU #2 to OCS #1					L= 29'
Size	8	in. HDPE			
Slope	0.005	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	2.45				
Q=VA	**0.86**	**(CAPACITY)**			
Q25=	0.23	(Q=CiA)			

OCS #1 to DMH #3					L= 17'
Size	8	in. HDPE			
Slope	0.014	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.11				
Q=VA	**1.43**	**(CAPACITY)**			
Q25=	0.23	(Q=CiA)			

DMH #3 to RECHARGER #1					L= 7'
Size	8	in. HDPE			
Slope	0.014	ft./ft.			
Manning's coef. n=	0.012				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.45				
Q=VA	**1.55**	**(CAPACITY)**			
Q25=	0.28	(Q=CiA)			

CB #5 to DMH #3					L= 164'
Size	8	in. HDPE			
Slope	0.004	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	2.20				
Q=VA	**0.77**	**(CAPACITY)**			
Q25=	0.05	(Q=CiA)			

Pipe Calculations

OCS #1 to DMH #2					L= 22'
Size	8	in. HDPE			
Slope	0.009	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	3.29				
Q=VA	**1.15**	**(CAPACITY)**			
Q25=	0.72	(HydroCAD)			

CB #4 to STU #3					L= 5'
Size	8	in. HDPE			
Slope	0.02	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.91				
Q=VA	**1.71**	**(CAPACITY)**			
Q25=	0.61	(Q=CiA)			

STU #3 to OCS #2					L= 5'
Size	8	in. HDPE			
Slope	0.02	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.91				
Q=VA	**1.71**	**(CAPACITY)**			
Q25=	0.61	(Q=CiA)			

OCS #2 to RECHARGER #2					L= 3'
Size	8	in. HDPE			
Slope	0.02	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	4.91				
Q=VA	**1.71**	**(CAPACITY)**			
Q25=	0.61	(Q=CiA)			

OCS #2 to DMH #1					L= 34'
Size	8	in. HDPE			
Slope	0.008	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	3.10				
Q=VA	**1.08**	**(CAPACITY)**			
Q25=	0.29	(HydroCAD)			

DMH #1 to DMH #2					L= 105'
Size	8	in. HDPE			
Slope	0.004	ft./ft.			
Manning's coef. n=	0.013				
Area	50.27	$in.^2$	or	0.35	$ft.^2$
Perimeter	25.13	in.		2.09	ft.
R=A/P	0.167	ft.			
$V=1.49/n(R)^{2/3}(S)^{1/2}$	2.20				
Q=VA	**0.77**	**(CAPACITY)**			
Q25=	0.29	(HydroCAD)			

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

Earth Removal Calculations

Per Section 3.4.8 of the
Town of Acton Stormwater Management and Erosion & Sediment Control Regulations

Volumes calculated using Carlson Civil Suite 2019 with AutoCAD utilizing the existing condition topographic survey data and the proposed conditions grading data. The following pages include the Carlson printout of the computer tabulations of the volumes by triangulation between the two surfaces. In summary:

Cut Volume:	163.05 CY
Fill Volume:	903.56 CY
NET FILL:	740.51 CY

Pavement for parking lot and driveways	14,400 sf x 0.33 ft / 27 =	176 CY pavement
Pavement for bituminous walkways:	920 sf x 0.33 ft / 27 =	11 CY pavement
Gravel under bituminous pavements:	15,320 sf x 0.83 ft / 27 =	471 CY gravel base
Concrete for walkways:	1,100 sf x 0.42 ft / 27 =	17 CY concrete
		675 CY total

Therefore, there is approximately 66± CY of miscellaneous material to be brought onto the site to achieve the final grades for the site.

Volumes by Triangulation (Prisms) Thu Sep 26 15:32:43 2019
Existing Surface: G:\Carlson Jobs\25487\DTM\EC-2019-0612.tin
Final Surface: G:\Carlson Jobs\25487\DTM\25487-PROPOSED 2019-09-26.tin

Area Name: PROPOSED LIMIT

Cut volume: 4,402.3 C.F., 163.05 C.Y.
Fill volume: 24,396.1 C.F., 903.56 C.Y.

Area in Cut : 6,841.0 S.F., 0.16 Acres
Area in Fill: 19,446.8 S.F., 0.45 Acres
Total inclusion area: 26,288.6 S.F., 0.60 Acres

Average Cut Depth: 0.64 feet
Average Fill Depth: 1.25 feet
Cut to Fill ratio: 0.18
Import Volume: 740.5 C.Y.
Elevation Change To Reach Balance: -0.761
Volume Change Per .1 ft: 97.4 C.Y.

Cut (C.Y.) / Area (acres): 270.17
Fill (C.Y.) / Area (acres): 1497.19

Max Cut: 2.722 at 668928.345,2998300.052
Max Fill: 3.019 at 668963.758,2998178.723

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

SECTION 3

Existing Conditions Stormwater Model showing Stormwater Flows and Flood Routing Computations using HydroCAD version 10.00

Existing Conditions Watershed Map: WSD-EX

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

MASSACHUSETTS COORDINATE SYSTEM (NAD83)

LEGEND

- WATERSHED BOUNDARY
- E-1 — EXISTING CONDITIONS SUBCATCHMENT DESIGNATION
- DP-1 — REACH DESIGNATION
- R-1 — POND DESIGNATION

ASSESSOR'S PARCEL F3-105
#421 MASSACHUSETTS AVENUE
N/F
421 MASSACHUSETTS AVENUE, LLC
BK. 50508 PG. 351

TOTAL AREA OF LOCUS PARCELS
44,008 S.F.±
(1.010 ACRES±)

DP-1
DESIGN POINT #1
"Main Street"

DP-2
DESIGN POINT #2
"Mass Ave"

DP-3
DESIGN POINT #3
"Westerly Abutter"

DP-4
DESIGN POINT #4
"Easterly Abutter"

MAIN STREET / ROUTE 27

MASSACHUSETTS AVENUE / ROUTE 111

#285 MAIN STREET

BENCH MARK 1:
CUT SPIKE 2.7' UP IN UTILITY POLE #83
ELEV. = 204.68 NAVD 1988

BENCH MARK 2:
CUT SPIKE 1.0' UP IN UTILITY POLE #31-107
ELEV. = 219.52 NAVD 1988

BENCH MARK 3:
CHISELED SQUARE ON CONC. SIDEWALK
ELEV. = 218.41 NAVD 1988

BENCH MARK 4:
CHISELED SQUARE ON CONCRETE SIDEWALK
ELEV. = 212.27 NAVD 1988

ASSESSOR'S PARCEL F3-95
#289 MAIN STREET
N/F
BLUE HILLS FUELS, LLC
BK. 66629 PG. 460

ASSESSOR'S PARCEL F3-108
#403-409 MASSACHUSETTS AVENUE
N/F
NAGOG KNOLL, LLC
BK. 51219 PG. 319

SCALE: 1" = 20'

DGT Associates
Surveying & Engineering
Framingham
Boston • Worcester
1071 Worcester Road
Framingham, MA 01701
508-879-0030
www.DGTassociates.com

NO.	APP	DATE	DESCRIPTION

DATE: SEPTEMBER 30, 2019

SCALE: 1" = 20'

DRAFTED:	CHECKED:	APPROVED:
KMR	BEC	BEC

PROJECT TITLE:

MIDDLESEX SAVINGS BANK

279 & 285 MAIN STREET
ACTON, MASSACHUSETTS 01720

SHEET TITLE:

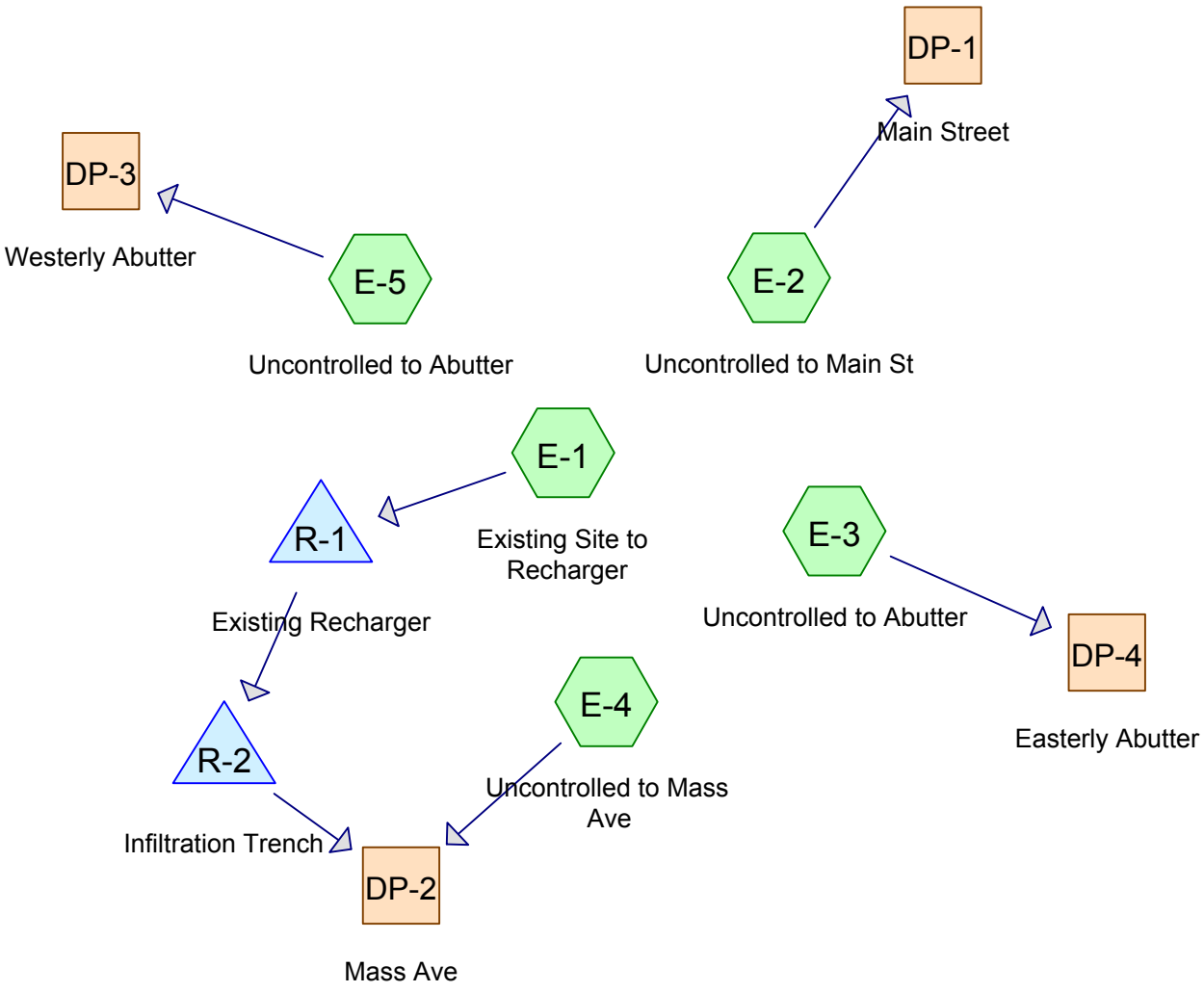
EXISTING CONDITIONS WATERSHED MAP

SHEET: 1 OF 1

PROJECT NO.: 25487

WSD-EX

G:\Carlson Jobs\25487\Correspondence\To Client\2019-09-30 Watershed Maps\25487 – Watershed Maps.dwg



Subcat Reach Pond Link

Routing Diagram for 25487 - Existing Conditions Model
Prepared by Schofield Brothers LLC, Printed 9/30/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.390	39	>75% Grass cover, Good, HSG A (E-1, E-2, E-3, E-4, E-5)
0.491	98	Paved parking, HSG A (E-1, E-2, E-3)
0.159	98	Roofs, HSG A (E-1, E-3)
1.040	**76**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing Site to Recharger Runoff Area=23,938 sf 74.35% Impervious Runoff Depth=1.63"
Tc=5.0 min CN=83 Runoff=1.09 cfs 0.075 af

Subcatchment E-2: Uncontrolled to Main St Runoff Area=3,793 sf 96.36% Impervious Runoff Depth=2.78"
Tc=5.0 min CN=96 Runoff=0.27 cfs 0.020 af

Subcatchment E-3: Uncontrolled to Abutter Runoff Area=8,748 sf 78.22% Impervious Runoff Depth=1.78"
Tc=5.0 min CN=85 Runoff=0.44 cfs 0.030 af

Subcatchment E-4: Uncontrolled to Mass Ave Runoff Area=7,608 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment E-5: Uncontrolled to Abutter Runoff Area=1,208 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach DP-1: Main Street Inflow=0.27 cfs 0.020 af
Outflow=0.27 cfs 0.020 af

Reach DP-2: Mass Ave Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: Westerly Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Easterly Abutter Inflow=0.44 cfs 0.030 af
Outflow=0.44 cfs 0.030 af

Pond R-1: Existing Recharger Peak Elev=212.76' Storage=1,072 cf Inflow=1.09 cfs 0.075 af
Discarded=0.14 cfs 0.075 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.075 af

Pond R-2: Infiltration Trench Peak Elev=210.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.040 ac Runoff Volume = 0.125 af Average Runoff Depth = 1.44"
37.53% Pervious = 0.390 ac 62.47% Impervious = 0.650 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing Site to Recharger Runoff Area=23,938 sf 74.35% Impervious Runoff Depth=3.18"
Tc=5.0 min CN=83 Runoff=2.12 cfs 0.146 af

Subcatchment E-2: Uncontrolled to Main St Runoff Area=3,793 sf 96.36% Impervious Runoff Depth=4.54"
Tc=5.0 min CN=96 Runoff=0.44 cfs 0.033 af

Subcatchment E-3: Uncontrolled to Abutter Runoff Area=8,748 sf 78.22% Impervious Runoff Depth=3.38"
Tc=5.0 min CN=85 Runoff=0.82 cfs 0.057 af

Subcatchment E-4: Uncontrolled to Mass Ave Runoff Area=7,608 sf 0.00% Impervious Runoff Depth=0.20"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.003 af

Subcatchment E-5: Uncontrolled to Abutter Runoff Area=1,208 sf 0.00% Impervious Runoff Depth=0.20"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach DP-1: Main Street Inflow=0.44 cfs 0.033 af
Outflow=0.44 cfs 0.033 af

Reach DP-2: Mass Ave Inflow=0.16 cfs 0.010 af
Outflow=0.16 cfs 0.010 af

Reach DP-3: Westerly Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Easterly Abutter Inflow=0.82 cfs 0.057 af
Outflow=0.82 cfs 0.057 af

Pond R-1: Existing Recharger Peak Elev=213.42' Storage=2,198 cf Inflow=2.12 cfs 0.146 af
Discarded=0.14 cfs 0.129 af Primary=0.47 cfs 0.017 af Outflow=0.61 cfs 0.146 af

Pond R-2: Infiltration Trench Peak Elev=212.00' Storage=385 cf Inflow=0.47 cfs 0.017 af
Discarded=0.02 cfs 0.009 af Primary=0.15 cfs 0.007 af Outflow=0.17 cfs 0.017 af

Total Runoff Area = 1.040 ac Runoff Volume = 0.239 af Average Runoff Depth = 2.75"
37.53% Pervious = 0.390 ac 62.47% Impervious = 0.650 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing Site to Recharger Runoff Area=23,938 sf 74.35% Impervious Runoff Depth=4.20"
Tc=5.0 min CN=83 Runoff=2.77 cfs 0.192 af

Subcatchment E-2: Uncontrolled to Main St Runoff Area=3,793 sf 96.36% Impervious Runoff Depth=5.65"
Tc=5.0 min CN=96 Runoff=0.53 cfs 0.041 af

Subcatchment E-3: Uncontrolled to Abutter Runoff Area=8,748 sf 78.22% Impervious Runoff Depth=4.42"
Tc=5.0 min CN=85 Runoff=1.06 cfs 0.074 af

Subcatchment E-4: Uncontrolled to Mass Ave Runoff Area=7,608 sf 0.00% Impervious Runoff Depth=0.48"
Tc=5.0 min CN=39 Runoff=0.03 cfs 0.007 af

Subcatchment E-5: Uncontrolled to Abutter Runoff Area=1,208 sf 0.00% Impervious Runoff Depth=0.48"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.001 af

Reach DP-1: Main Street Inflow=0.53 cfs 0.041 af
Outflow=0.53 cfs 0.041 af

Reach DP-2: Mass Ave Inflow=0.71 cfs 0.043 af
Outflow=0.71 cfs 0.043 af

Reach DP-3: Westerly Abutter Inflow=0.01 cfs 0.001 af
Outflow=0.01 cfs 0.001 af

Reach DP-4: Easterly Abutter Inflow=1.06 cfs 0.074 af
Outflow=1.06 cfs 0.074 af

Pond R-1: Existing Recharger Peak Elev=213.53' Storage=2,334 cf Inflow=2.77 cfs 0.192 af
Discarded=0.14 cfs 0.146 af Primary=1.28 cfs 0.046 af Outflow=1.42 cfs 0.192 af

Pond R-2: Infiltration Trench Peak Elev=212.02' Storage=702 cf Inflow=1.28 cfs 0.046 af
Discarded=0.02 cfs 0.011 af Primary=0.68 cfs 0.036 af Outflow=0.70 cfs 0.046 af

Total Runoff Area = 1.040 ac Runoff Volume = 0.315 af Average Runoff Depth = 3.64"
37.53% Pervious = 0.390 ac 62.47% Impervious = 0.650 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing Site to Recharger Runoff Area=23,938 sf 74.35% Impervious Runoff Depth=5.82"
Tc=5.0 min CN=83 Runoff=3.78 cfs 0.266 af

Subcatchment E-2: Uncontrolled to Main St Runoff Area=3,793 sf 96.36% Impervious Runoff Depth=7.35"
Tc=5.0 min CN=96 Runoff=0.69 cfs 0.053 af

Subcatchment E-3: Uncontrolled to Abutter Runoff Area=8,748 sf 78.22% Impervious Runoff Depth=6.05"
Tc=5.0 min CN=85 Runoff=1.43 cfs 0.101 af

Subcatchment E-4: Uncontrolled to Mass Ave Runoff Area=7,608 sf 0.00% Impervious Runoff Depth=1.09"
Tc=5.0 min CN=39 Runoff=0.15 cfs 0.016 af

Subcatchment E-5: Uncontrolled to Abutter Runoff Area=1,208 sf 0.00% Impervious Runoff Depth=1.09"
Tc=5.0 min CN=39 Runoff=0.02 cfs 0.003 af

Reach DP-1: Main Street Inflow=0.69 cfs 0.053 af
Outflow=0.69 cfs 0.053 af

Reach DP-2: Mass Ave Inflow=1.87 cfs 0.102 af
Outflow=1.87 cfs 0.102 af

Reach DP-3: Westerly Abutter Inflow=0.02 cfs 0.003 af
Outflow=0.02 cfs 0.003 af

Reach DP-4: Easterly Abutter Inflow=1.43 cfs 0.101 af
Outflow=1.43 cfs 0.101 af

Pond R-1: Existing Recharger Peak Elev=213.73' Storage=2,531 cf Inflow=3.78 cfs 0.266 af
Discarded=0.14 cfs 0.168 af Primary=3.27 cfs 0.098 af Outflow=3.41 cfs 0.266 af

Pond R-2: Infiltration Trench Peak Elev=212.04' Storage=1,102 cf Inflow=3.27 cfs 0.098 af
Discarded=0.02 cfs 0.012 af Primary=1.77 cfs 0.086 af Outflow=1.79 cfs 0.098 af

Total Runoff Area = 1.040 ac Runoff Volume = 0.439 af Average Runoff Depth = 5.07"
37.53% Pervious = 0.390 ac 62.47% Impervious = 0.650 ac

Summary for Subcatchment E-1: Existing Site to Recharger

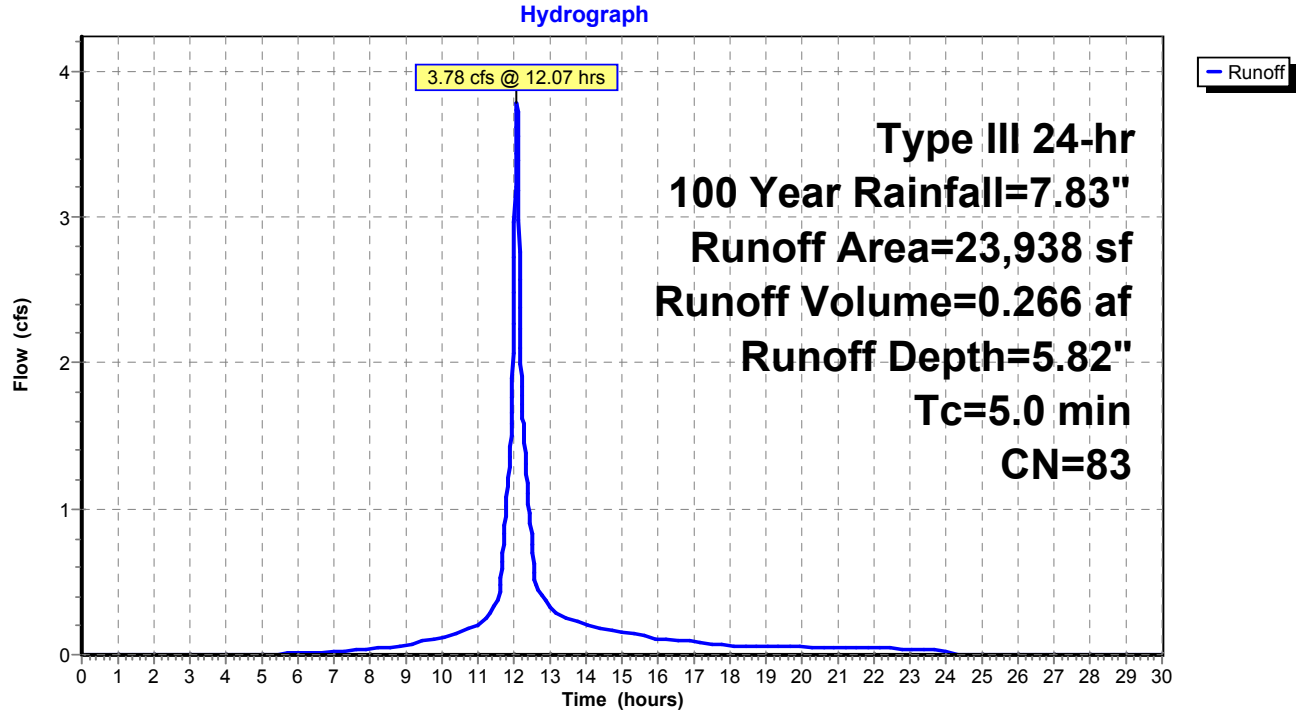
Runoff = 3.78 cfs @ 12.07 hrs, Volume= 0.266 af, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
14,618	98	Paved parking, HSG A
3,181	98	Roofs, HSG A
6,139	39	>75% Grass cover, Good, HSG A
23,938	83	Weighted Average
6,139		25.65% Pervious Area
17,799		74.35% Impervious Area

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

Subcatchment E-1: Existing Site to Recharger



Summary for Subcatchment E-2: Uncontrolled to Main St

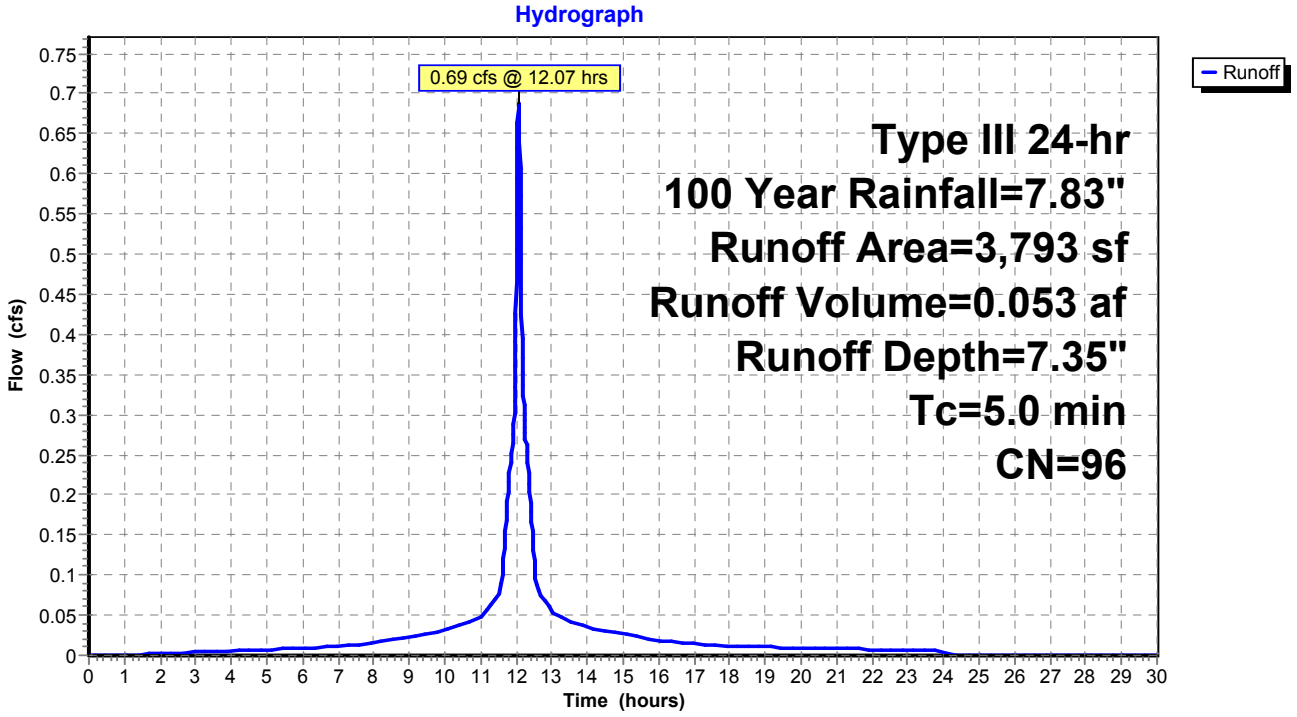
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 0.053 af, Depth= 7.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
3,655	98	Paved parking, HSG A
138	39	>75% Grass cover, Good, HSG A
3,793	96	Weighted Average
138		3.64% Pervious Area
3,655		96.36% Impervious Area

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

Subcatchment E-2: Uncontrolled to Main St



Summary for Subcatchment E-3: Uncontrolled to Abutter

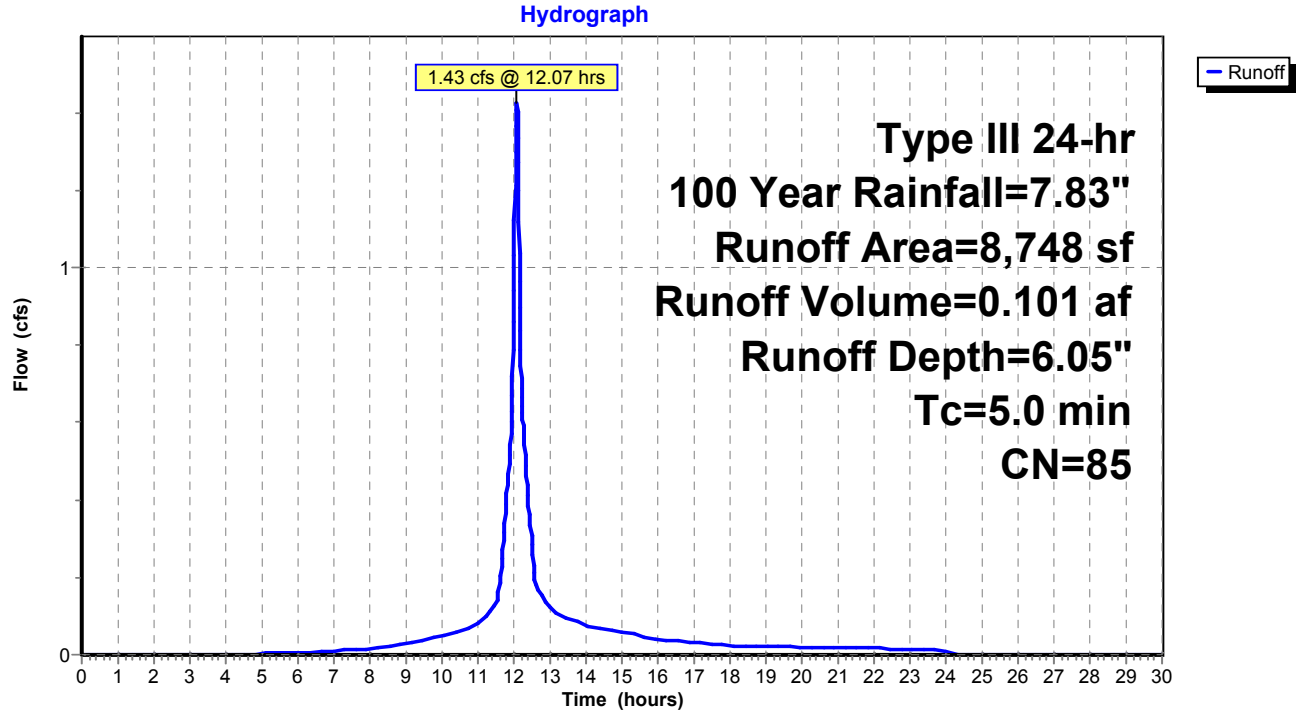
Runoff = 1.43 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
3,108	98	Paved parking, HSG A
3,735	98	Roofs, HSG A
1,905	39	>75% Grass cover, Good, HSG A
8,748	85	Weighted Average
1,905		21.78% Pervious Area
6,843		78.22% Impervious Area

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

Subcatchment E-3: Uncontrolled to Abutter



Summary for Subcatchment E-4: Uncontrolled to Mass Ave

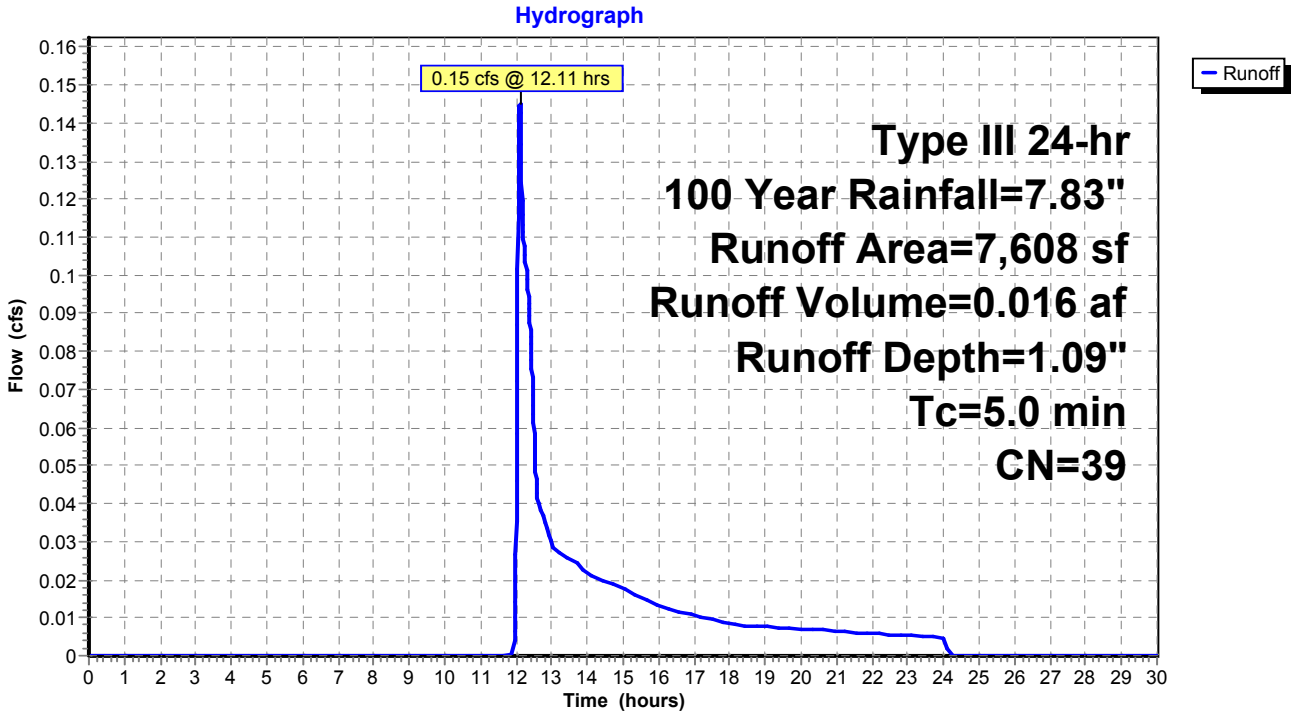
Runoff = 0.15 cfs @ 12.11 hrs, Volume= 0.016 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
7,608	39	>75% Grass cover, Good, HSG A
7,608		100.00% Pervious Area

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

Subcatchment E-4: Uncontrolled to Mass Ave



Summary for Subcatchment E-5: Uncontrolled to Abutter

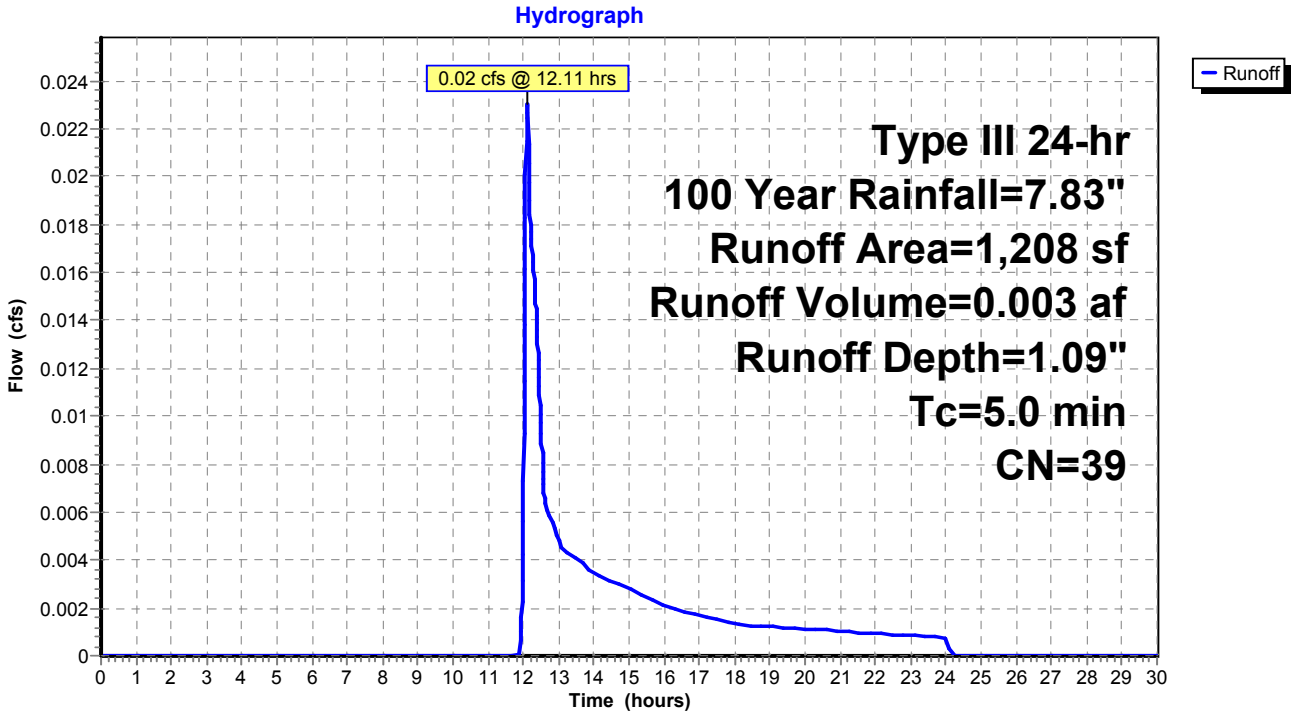
Runoff = 0.02 cfs @ 12.11 hrs, Volume= 0.003 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
1,208	39	>75% Grass cover, Good, HSG A
1,208		100.00% Pervious Area

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

Subcatchment E-5: Uncontrolled to Abutter

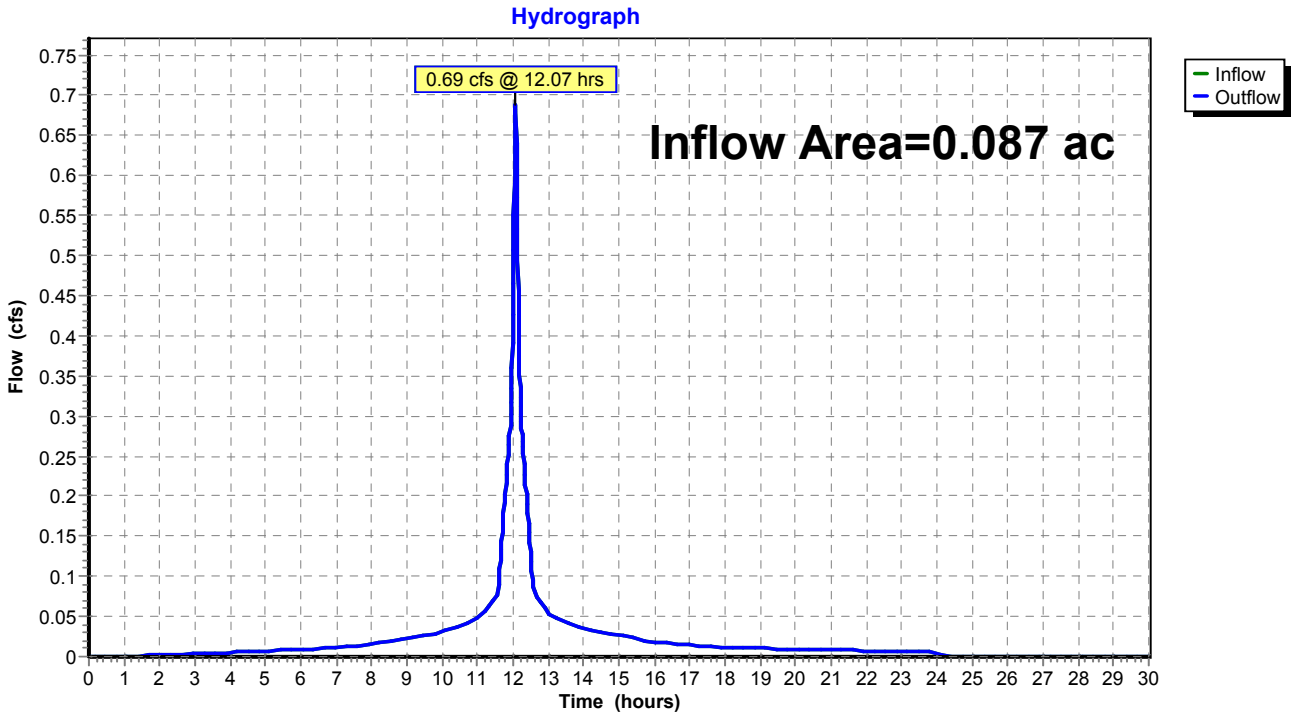


Summary for Reach DP-1: Main Street

Inflow Area = 0.087 ac, 96.36% Impervious, Inflow Depth = 7.35" for 100 Year event
Inflow = 0.69 cfs @ 12.07 hrs, Volume= 0.053 af
Outflow = 0.69 cfs @ 12.07 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-1: Main Street

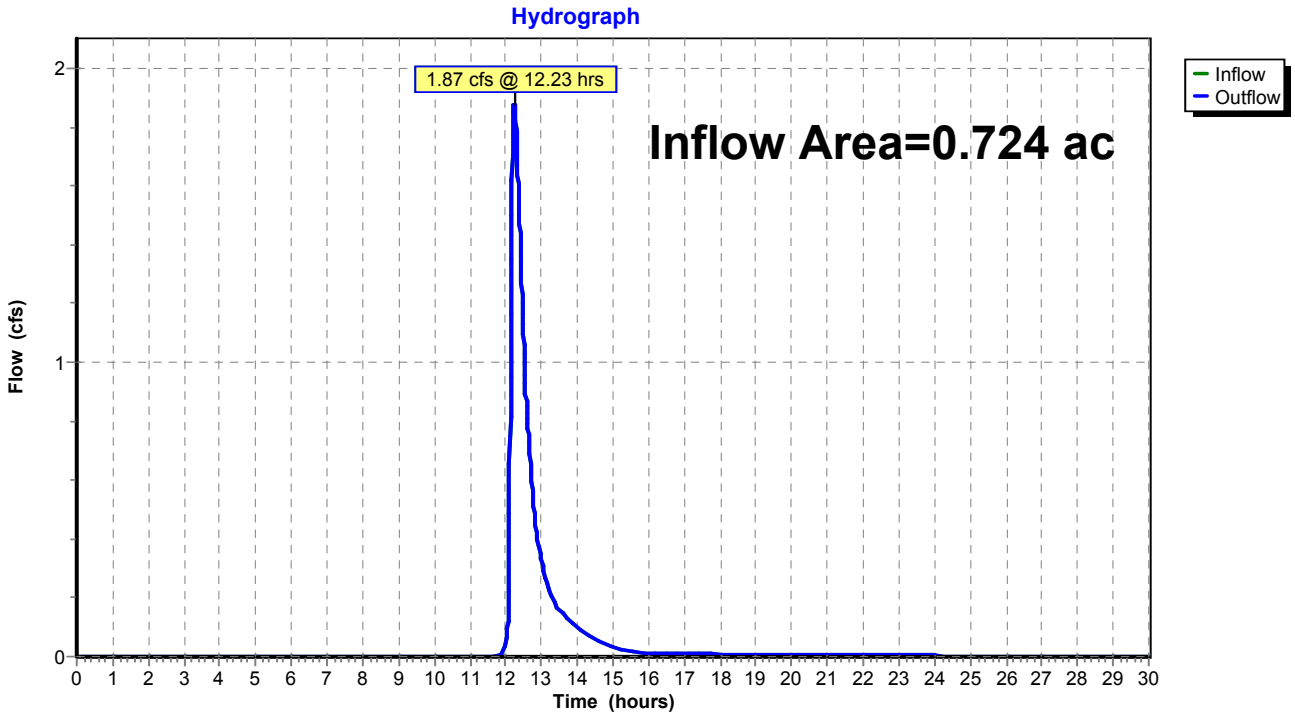


Summary for Reach DP-2: Mass Ave

Inflow Area = 0.724 ac, 56.42% Impervious, Inflow Depth = 1.69" for 100 Year event
Inflow = 1.87 cfs @ 12.23 hrs, Volume= 0.102 af
Outflow = 1.87 cfs @ 12.23 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-2: Mass Ave

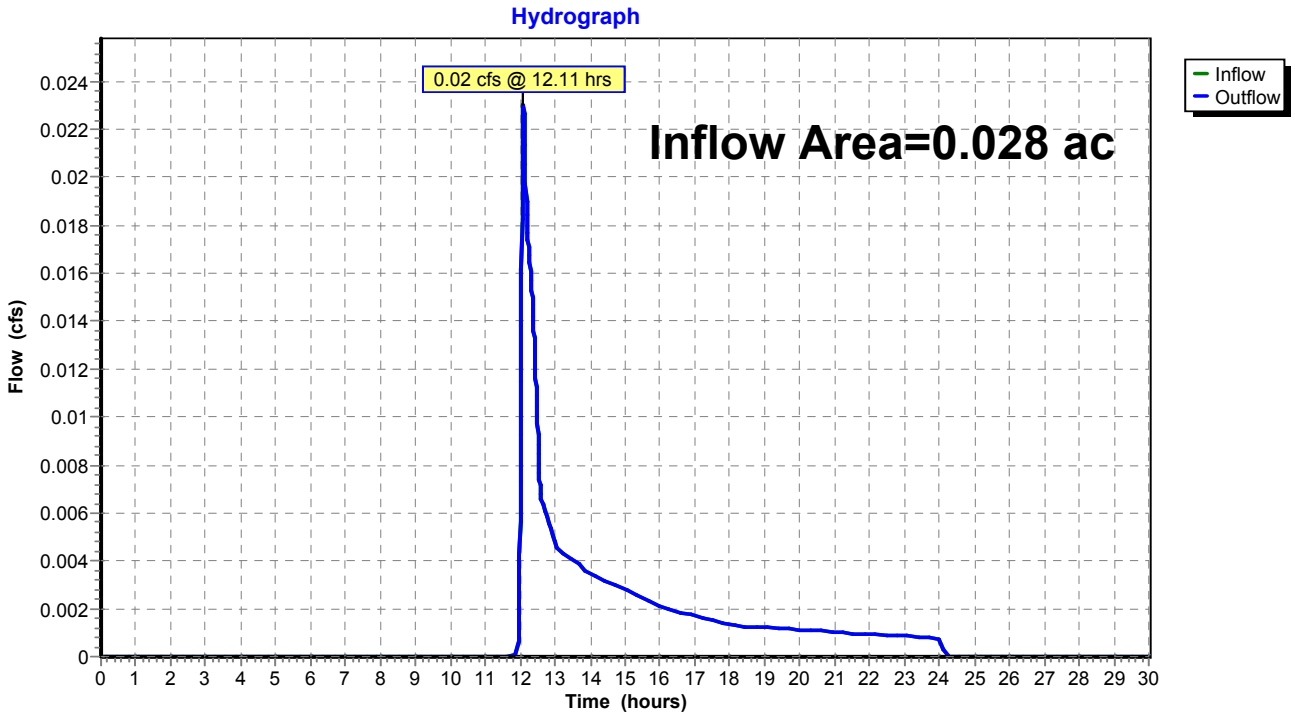


Summary for Reach DP-3: Westerly Abutter

Inflow Area = 0.028 ac, 0.00% Impervious, Inflow Depth = 1.09" for 100 Year event
Inflow = 0.02 cfs @ 12.11 hrs, Volume= 0.003 af
Outflow = 0.02 cfs @ 12.11 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-3: Westerly Abutter

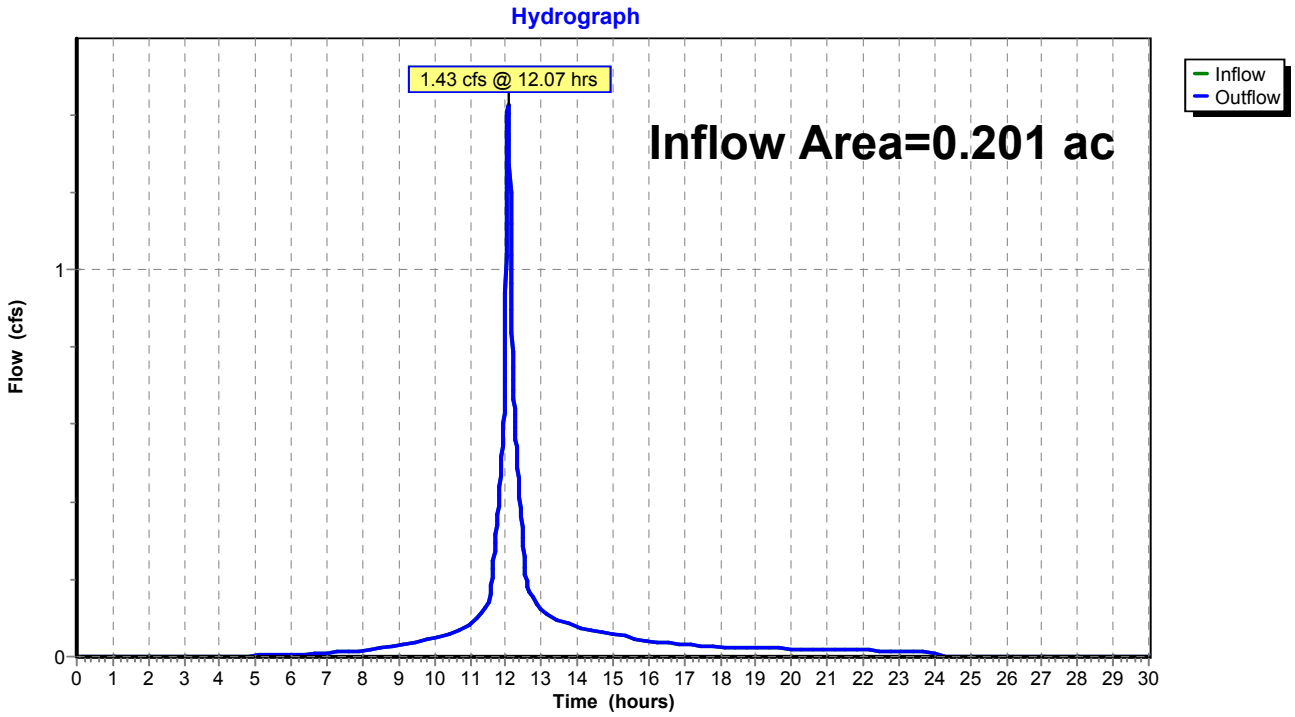


Summary for Reach DP-4: Easterly Abutter

Inflow Area = 0.201 ac, 78.22% Impervious, Inflow Depth = 6.05" for 100 Year event
Inflow = 1.43 cfs @ 12.07 hrs, Volume= 0.101 af
Outflow = 1.43 cfs @ 12.07 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-4: Easterly Abutter



Summary for Pond R-1: Existing Recharger

Inflow Area = 0.550 ac, 74.35% Impervious, Inflow Depth = 5.82" for 100 Year event
Inflow = 3.78 cfs @ 12.07 hrs, Volume= 0.266 af
Outflow = 3.41 cfs @ 12.11 hrs, Volume= 0.266 af, Atten= 10%, Lag= 2.2 min
Discarded = 0.14 cfs @ 10.29 hrs, Volume= 0.168 af
Primary = 3.27 cfs @ 12.11 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 213.73' @ 12.11 hrs Surf.Area= 2,422 sf Storage= 2,531 cf
Flood Elev= 214.20' Surf.Area= 2,422 sf Storage= 2,974 cf

Plug-Flow detention time=91.2 min calculated for 0.266 af (100% of inflow)
Center-of-Mass det. time=91.2 min (886.6 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	212.10'	1,382 cf	**36.00'W x 67.28'L x 2.08'H Field A** 5,046 cf Overall - 1,592 cf Embedded = 3,454 cf x 40.0% Voids
#2A	212.35'	1,592 cf	**ADS_StormTech RC-310 +Cap** x 108 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Rows of 9 Chambers
		2,974 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	211.70'	**12.0" Round Culvert** L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 211.70' / 211.00' S= 0.0097 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	213.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	212.10'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.14 cfs @ 10.29 hrs HW=212.12' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=3.27 cfs @ 12.11 hrs HW=213.73' (Free Discharge)
↑—**1=Culvert** (Passes 3.27 cfs of 4.27 cfs potential flow)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.27 cfs @ 1.92 fps)

Pond R-1: Existing Recharger - Chamber Wizard Field A

ChamberModel = ADS_StormTech RC-310+Cap (ADS StormTech® RC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

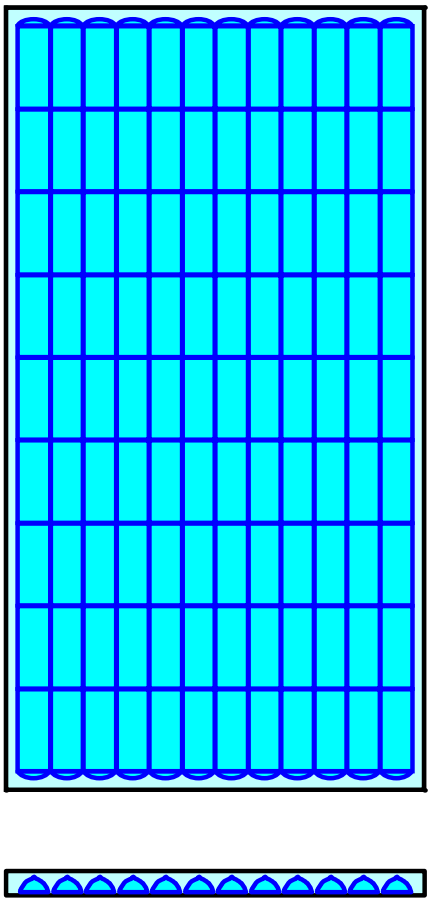
9 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 65.28' Row Length +12.0" End Stone x 2 = 67.28' Base Length
12 Rows x 34.0" Wide + 12.0" Side Stone x 2 = 36.00' Base Width
3.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.08' Field Height

108 Chambers x 14.7 cf = 1,592.1 cf Chamber Storage

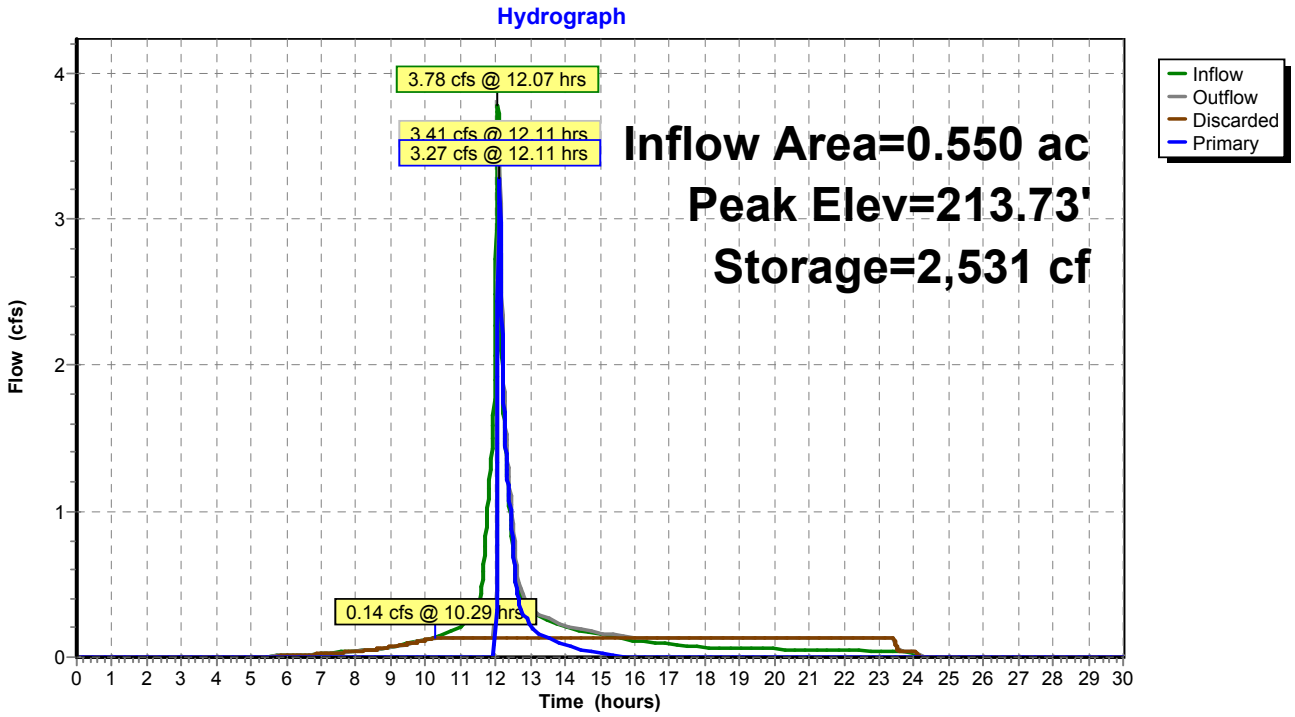
5,046.0 cf Field - 1,592.1 cf Chambers = 3,453.9 cf Stone x 40.0% Voids = 1,381.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,973.7 cf = 0.068 af
Overall Storage Efficiency = 58.9%
Overall System Size = 67.28' x 36.00' x 2.08'

108 Chambers
186.9 cy Field
127.9 cy Stone



Pond R-1: Existing Recharger



Summary for Pond R-2: Infiltration Trench

Inflow Area = 0.550 ac, 74.35% Impervious, Inflow Depth = 2.15" for 100 Year event
Inflow = 3.27 cfs @ 12.11 hrs, Volume= 0.098 af
Outflow = 1.79 cfs @ 12.23 hrs, Volume= 0.098 af, Atten= 45%, Lag= 7.5 min
Discarded = 0.02 cfs @ 12.03 hrs, Volume= 0.012 af
Primary = 1.77 cfs @ 12.23 hrs, Volume= 0.086 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 212.04' @ 12.23 hrs Surf.Area= 353 sf Storage= 1,102 cf

Plug-Flow detention time=30.7 min calculated for 0.098 af (100% of inflow)
Center-of-Mass det. time=30.7 min (783.9 - 753.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	210.00'	274 cf	**3.92'W x 90.00'L x 2.00'H Field A** 705 cf Overall - 21 cf Embedded = 684 cf x 40.0% Voids
#2A	211.00'	21 cf	**CPP single-wall 6"** x 4 Inside #1 Inside= 6.0"W x 6.0"H => 0.24 sf x 20.00'L = 4.8 cf Outside= 7.0"W x 7.0"H => 0.24 sf x 20.00'L = 4.8 cf Row Length Adjustment= +7.00' x 0.24 sf x 1 rows
#3	212.00'	10,000 cf	**Custom Stage Data** Listed below -Impervious
		10,295 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	0	0
212.50	10,000	10,000

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**90.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	210.00'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.02 cfs @ 12.03 hrs HW=210.05' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.71 cfs @ 12.23 hrs HW=212.04' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.71 cfs @ 0.47 fps)

Pond R-2: Infiltration Trench - Chamber Wizard Field A

ChamberModel = CPP single-wall 6" (Single-wallcorrugatedHDPE pipe)
Inside= 6.0"W x 6.0"H => 0.24 sf x 20.00'L = 4.8 cf
Outside= 7.0"W x 7.0"H => 0.24 sf x 20.00'L = 4.8 cf
Row Length Adjustment= +7.00' x 0.24 sf x 1 rows

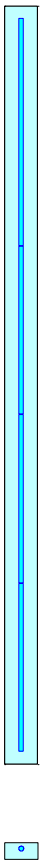
4 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 87.00' Row Length +18.0" End Stone x 2 = 90.00' Base Length
1 Rows x 7.0" Wide + 20.0" Side Stone x 2 = 3.92' Base Width
12.0" Base + 7.0" Chamber Height + 5.0" Cover = 2.00' Field Height

4 Chambers x 4.8 cf +7.00' Row Adjustment x 0.24 sf x 1 Rows = 21.1 cf Chamber Storage

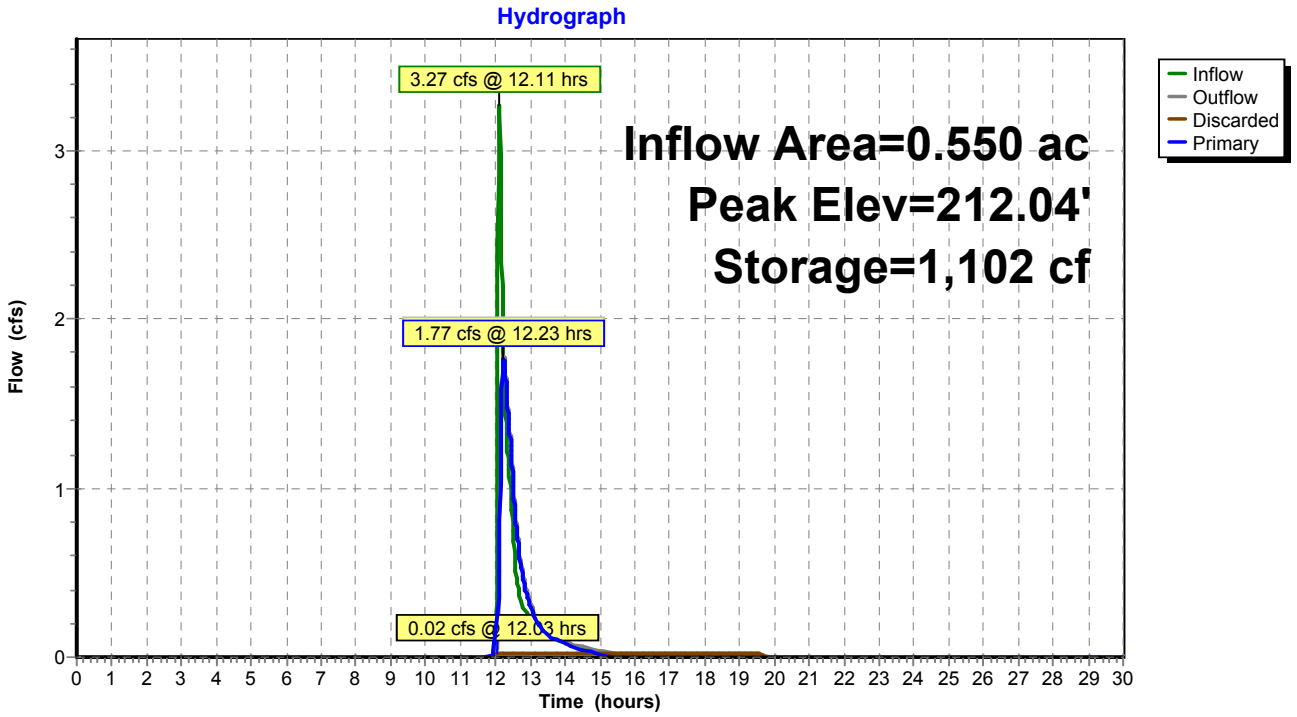
705.0 cf Field - 21.1 cf Chambers = 683.9 cf Stone x 40.0% Voids = 273.6 cf Stone Storage

Chamber Storage + Stone Storage = 294.7 cf = 0.007 af
Overall Storage Efficiency = 41.8%
Overall System Size = 90.00' x 3.92' x 2.00'

4 Chambers
26.1 cy Field
25.3 cy Stone



Pond R-2: Infiltration Trench



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Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
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SECTION 4

Proposed Conditions Stormwater Model showing Stormwater Flows and Flood Routing Computations using HydroCAD version 10.00

Proposed Conditions Watershed Map: WSD-PR

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

MASSACHUSETTS COORDINATE SYSTEM (NAD83)

LEGEND

- WATERSHED BOUNDARY
- P-1 — PROPOSED CONDITIONS SUBCATCHMENT DESIGNATION
- DP-1 — REACH DESIGNATION
- R-1 — POND DESIGNATION

ASSESSOR'S PARCEL F3-105
#421 MASSACHUSETTS AVENUE
N/F
421 MASSACHUSETTS AVENUE, LLC
BK. 50508 PG. 351

TOTAL AREA OF LOCUS PARCELS
44,008 S.F.±
(1.010 ACRES±)

BENCH MARK 1:
CUT SPIKE 2.7" UP IN UTILITY POLE #83
ELEV. = 204.68 NAVD 1988

BENCH MARK 2:
CUT SPIKE 1.0" UP IN UTILITY POLE #31-107
ELEV. = 219.52 NAVD 1988

BENCH MARK 3:
CHISELED SQUARE ON CONC. SIDEWALK
ELEV. = 218.41 NAVD 1988

BENCH MARK 4:
CHISELED SQUARE ON CONCRETE SIDEWALK
ELEV. = 212.27 NAVD 1988

DP-1 — DESIGN POINT #1 "Main Street"
DP-2 — DESIGN POINT #2 "Mass Ave"
DP-3 — DESIGN POINT #3 "Westerly Abutter"
DP-4 — DESIGN POINT #4 "Easterly Abutter"

P-1, P-2a, P-2b, P-3a, P-3b, P-4, P-5, P-6, P-7, P-8

MIDDLESEX SAVINGS BANK
ACTON BRANCH
3,800 SF±

MAIN STREET / ROUTE 27

MASSACHUSETTS AVENUE / ROUTE 111

ASSESSOR'S PARCEL F3-95
#289 MAIN STREET
N/F
BLUE HILLS FUELS, LLC
BK. 66629 PG. 460

ASSESSOR'S PARCEL F3-108
#403-409 MASSACHUSETTS AVENUE
N/F
NAGOG KNOLL, LLC
BK. 51219 PG. 319

20 0 10 20 40 80
SCALE: 1" = 20'

DGT Associates
Surveying & Engineering
Framingham
Boston • Worcester
1071 Worcester Road
Framingham, MA 01701
508-879-0030
www.DGTassociates.com

NO.	APP	DATE	DESCRIPTION

DATE: SEPTEMBER 30, 2019

SCALE: 1" = 20'

DRAFTED:	CHECKED:	APPROVED:
KMR	BEC	BEC

PROJECT TITLE:

MIDDLESEX SAVINGS BANK

279 & 285 MAIN STREET
ACTON, MASSACHUSETTS 01720

SHEET TITLE:

PROPOSED CONDITIONS WATERSHED MAP

SHEET: 1 OF 1

PROJECT NO.: 25487

WSD-PR

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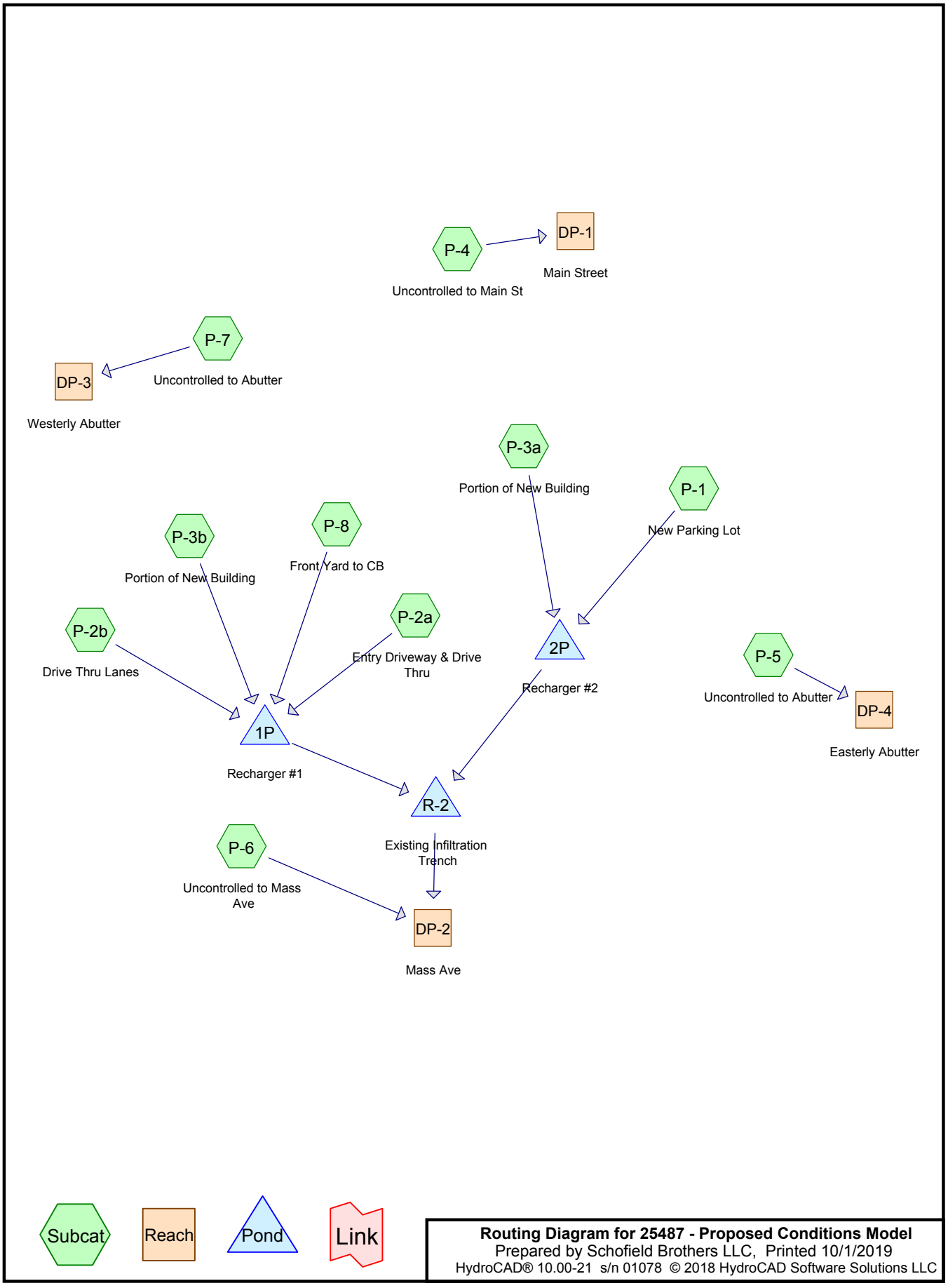


Routing Diagram for 25487 - Proposed Conditions Model
Prepared by Schofield Brothers LLC, Printed 10/1/2019
HydroCAD® 10.00-21 s/n 01078 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.569	39	>75% Grass cover, Good, HSG A (P-1, P-2a, P-2b, P-4, P-5, P-6, P-7, P-8)
0.359	98	Paved parking, HSG A (P-1, P-2a, P-2b, P-4, P-5, P-6)
0.111	98	Roofs, HSG A (P-3a, P-3b)
1.039	**66**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: New Parking Lot Runoff Area=7,494 sf 55.16% Impervious Runoff Depth=0.95"
Tc=5.0 min CN=72 Runoff=0.18 cfs 0.014 af

Subcatchment P-2a: Entry Driveway & Drive Runoff Area=10,844 sf 80.98% Impervious Runoff Depth=1.94"
Tc=5.0 min CN=87 Runoff=0.59 cfs 0.040 af

Subcatchment P-2b: Drive Thru Lanes Runoff Area=2,376 sf 78.20% Impervious Runoff Depth=1.78"
Tc=5.0 min CN=85 Runoff=0.12 cfs 0.008 af

Subcatchment P-3a: Portion of New Building Runoff Area=1,358 sf 100.00% Impervious Runoff Depth=3.00"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment P-3b: Portion of New Building Runoff Area=3,466 sf 100.00% Impervious Runoff Depth=3.00"
Tc=5.0 min CN=98 Runoff=0.26 cfs 0.020 af

Subcatchment P-4: Uncontrolled to Main St Runoff Area=534 sf 50.00% Impervious Runoff Depth=0.80"
Tc=5.0 min CN=69 Runoff=0.01 cfs 0.001 af

Subcatchment P-5: Uncontrolled to Abutter Runoff Area=5,083 sf 5.06% Impervious Runoff Depth=0.02"
Tc=5.0 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment P-6: Uncontrolled to Mass Ave Runoff Area=9,661 sf 3.64% Impervious Runoff Depth=0.01"
Tc=5.0 min CN=41 Runoff=0.00 cfs 0.000 af

Subcatchment P-7: Uncontrolled to Abutter Runoff Area=2,725 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment P-8: Front Yard to CB Runoff Area=1,730 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach DP-1: Main Street Inflow=0.01 cfs 0.001 af
Outflow=0.01 cfs 0.001 af

Reach DP-2: Mass Ave Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: Westerly Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Easterly Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Recharger #1 Peak Elev=213.03' Storage=1,007 cf Inflow=0.96 cfs 0.068 af
Discarded=0.11 cfs 0.068 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.068 af

Pond 2P: Recharger #2 Peak Elev=212.57' Storage=206 cf Inflow=0.28 cfs 0.021 af
Discarded=0.06 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.021 af

Pond R-2: Existing Infiltration Trench Peak Elev=210.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.039 ac Runoff Volume = 0.091 af Average Runoff Depth = 1.05"
54.78% Pervious = 0.569 ac 45.22% Impervious = 0.470 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: New Parking Lot Runoff Area=7,494 sf 55.16% Impervious Runoff Depth=2.21"
Tc=5.0 min CN=72 Runoff=0.46 cfs 0.032 af

Subcatchment P-2a: Entry Driveway & Drive Runoff Area=10,844 sf 80.98% Impervious Runoff Depth=3.58"
Tc=5.0 min CN=87 Runoff=1.06 cfs 0.074 af

Subcatchment P-2b: Drive Thru Lanes Runoff Area=2,376 sf 78.20% Impervious Runoff Depth=3.38"
Tc=5.0 min CN=85 Runoff=0.22 cfs 0.015 af

Subcatchment P-3a: Portion of New Building Runoff Area=1,358 sf 100.00% Impervious Runoff Depth=4.77"
Tc=5.0 min CN=98 Runoff=0.16 cfs 0.012 af

Subcatchment P-3b: Portion of New Building Runoff Area=3,466 sf 100.00% Impervious Runoff Depth=4.77"
Tc=5.0 min CN=98 Runoff=0.40 cfs 0.032 af

Subcatchment P-4: Uncontrolled to Main St Runoff Area=534 sf 50.00% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=69 Runoff=0.03 cfs 0.002 af

Subcatchment P-5: Uncontrolled to Abutter Runoff Area=5,083 sf 5.06% Impervious Runoff Depth=0.31"
Tc=5.0 min CN=42 Runoff=0.01 cfs 0.003 af

Subcatchment P-6: Uncontrolled to Mass Ave Runoff Area=9,661 sf 3.64% Impervious Runoff Depth=0.28"
Tc=5.0 min CN=41 Runoff=0.02 cfs 0.005 af

Subcatchment P-7: Uncontrolled to Abutter Runoff Area=2,725 sf 0.00% Impervious Runoff Depth=0.20"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment P-8: Front Yard to CB Runoff Area=1,730 sf 0.00% Impervious Runoff Depth=0.20"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.001 af

Reach DP-1: Main Street Inflow=0.03 cfs 0.002 af
Outflow=0.03 cfs 0.002 af

Reach DP-2: Mass Ave Inflow=0.02 cfs 0.005 af
Outflow=0.02 cfs 0.005 af

Reach DP-3: Westerly Abutter Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-4: Easterly Abutter Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Pond 1P: Recharger #1 Peak Elev=213.96' Storage=2,043 cf Inflow=1.69 cfs 0.122 af
Discarded=0.11 cfs 0.116 af Primary=0.15 cfs 0.005 af Outflow=0.25 cfs 0.122 af

Pond 2P: Recharger #2 Peak Elev=213.12' Storage=646 cf Inflow=0.61 cfs 0.044 af
Discarded=0.06 cfs 0.043 af Primary=0.03 cfs 0.001 af Outflow=0.09 cfs 0.044 af

Pond R-2: Existing Infiltration Trench Peak Elev=211.30' Storage=190 cf Inflow=0.17 cfs 0.006 af
Discarded=0.02 cfs 0.006 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.006 af

Total Runoff Area = 1.039 ac Runoff Volume = 0.177 af Average Runoff Depth = 2.04"
54.78% Pervious = 0.569 ac 45.22% Impervious = 0.470 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: New Parking Lot Runoff Area=7,494 sf 55.16% Impervious Runoff Depth=3.09"
Tc=5.0 min CN=72 Runoff=0.65 cfs 0.044 af

Subcatchment P-2a: Entry Driveway & Drive Runoff Area=10,844 sf 80.98% Impervious Runoff Depth=4.63"
Tc=5.0 min CN=87 Runoff=1.36 cfs 0.096 af

Subcatchment P-2b: Drive Thru Lanes Runoff Area=2,376 sf 78.20% Impervious Runoff Depth=4.42"
Tc=5.0 min CN=85 Runoff=0.29 cfs 0.020 af

Subcatchment P-3a: Portion of New Building Runoff Area=1,358 sf 100.00% Impervious Runoff Depth=5.88"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af

Subcatchment P-3b: Portion of New Building Runoff Area=3,466 sf 100.00% Impervious Runoff Depth=5.88"
Tc=5.0 min CN=98 Runoff=0.49 cfs 0.039 af

Subcatchment P-4: Uncontrolled to Main St Runoff Area=534 sf 50.00% Impervious Runoff Depth=2.81"
Tc=5.0 min CN=69 Runoff=0.04 cfs 0.003 af

Subcatchment P-5: Uncontrolled to Abutter Runoff Area=5,083 sf 5.06% Impervious Runoff Depth=0.66"
Tc=5.0 min CN=42 Runoff=0.04 cfs 0.006 af

Subcatchment P-6: Uncontrolled to Mass Ave Runoff Area=9,661 sf 3.64% Impervious Runoff Depth=0.60"
Tc=5.0 min CN=41 Runoff=0.06 cfs 0.011 af

Subcatchment P-7: Uncontrolled to Abutter Runoff Area=2,725 sf 0.00% Impervious Runoff Depth=0.48"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.003 af

Subcatchment P-8: Front Yard to CB Runoff Area=1,730 sf 0.00% Impervious Runoff Depth=0.48"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.002 af

Reach DP-1: Main Street Inflow=0.04 cfs 0.003 af
Outflow=0.04 cfs 0.003 af

Reach DP-2: Mass Ave Inflow=0.59 cfs 0.037 af
Outflow=0.59 cfs 0.037 af

Reach DP-3: Westerly Abutter Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Reach DP-4: Easterly Abutter Inflow=0.04 cfs 0.006 af
Outflow=0.04 cfs 0.006 af

Pond 1P: Recharger #1 Peak Elev=214.07' Storage=2,130 cf Inflow=2.14 cfs 0.157 af
Discarded=0.11 cfs 0.130 af Primary=0.78 cfs 0.027 af Outflow=0.89 cfs 0.157 af

Pond 2P: Recharger #2 Peak Elev=213.19' Storage=701 cf Inflow=0.84 cfs 0.060 af
Discarded=0.06 cfs 0.050 af Primary=0.29 cfs 0.009 af Outflow=0.35 cfs 0.060 af

Pond R-2: Existing Infiltration Trench Peak Elev=212.02' Storage=625 cf Inflow=1.07 cfs 0.036 af
Discarded=0.02 cfs 0.010 af Primary=0.55 cfs 0.026 af Outflow=0.57 cfs 0.036 af

Total Runoff Area = 1.039 ac Runoff Volume = 0.239 af Average Runoff Depth = 2.76"
54.78% Pervious = 0.569 ac 45.22% Impervious = 0.470 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: New Parking Lot Runoff Area=7,494 sf 55.16% Impervious Runoff Depth=4.55"
Tc=5.0 min CN=72 Runoff=0.95 cfs 0.065 af

Subcatchment P-2a: Entry Driveway & Drive Runoff Area=10,844 sf 80.98% Impervious Runoff Depth=6.28"
Tc=5.0 min CN=87 Runoff=1.82 cfs 0.130 af

Subcatchment P-2b: Drive Thru Lanes Runoff Area=2,376 sf 78.20% Impervious Runoff Depth=6.05"
Tc=5.0 min CN=85 Runoff=0.39 cfs 0.027 af

Subcatchment P-3a: Portion of New Building Runoff Area=1,358 sf 100.00% Impervious Runoff Depth=7.59"
Tc=5.0 min CN=98 Runoff=0.25 cfs 0.020 af

Subcatchment P-3b: Portion of New Building Runoff Area=3,466 sf 100.00% Impervious Runoff Depth=7.59"
Tc=5.0 min CN=98 Runoff=0.63 cfs 0.050 af

Subcatchment P-4: Uncontrolled to Main St Runoff Area=534 sf 50.00% Impervious Runoff Depth=4.21"
Tc=5.0 min CN=69 Runoff=0.06 cfs 0.004 af

Subcatchment P-5: Uncontrolled to Abutter Runoff Area=5,083 sf 5.06% Impervious Runoff Depth=1.36"
Tc=5.0 min CN=42 Runoff=0.14 cfs 0.013 af

Subcatchment P-6: Uncontrolled to Mass Ave Runoff Area=9,661 sf 3.64% Impervious Runoff Depth=1.27"
Tc=5.0 min CN=41 Runoff=0.24 cfs 0.023 af

Subcatchment P-7: Uncontrolled to Abutter Runoff Area=2,725 sf 0.00% Impervious Runoff Depth=1.09"
Tc=5.0 min CN=39 Runoff=0.05 cfs 0.006 af

Subcatchment P-8: Front Yard to CB Runoff Area=1,730 sf 0.00% Impervious Runoff Depth=1.09"
Tc=5.0 min CN=39 Runoff=0.03 cfs 0.004 af

Reach DP-1: Main Street Inflow=0.06 cfs 0.004 af
Outflow=0.06 cfs 0.004 af

Reach DP-2: Mass Ave Inflow=1.78 cfs 0.101 af
Outflow=1.78 cfs 0.101 af

Reach DP-3: Westerly Abutter Inflow=0.05 cfs 0.006 af
Outflow=0.05 cfs 0.006 af

Reach DP-4: Easterly Abutter Inflow=0.14 cfs 0.013 af
Outflow=0.14 cfs 0.013 af

Pond 1P: Recharger #1 Peak Elev=214.24' Storage=2,260 cf Inflow=2.86 cfs 0.212 af
Discarded=0.11 cfs 0.147 af Primary=2.31 cfs 0.065 af Outflow=2.41 cfs 0.212 af

Pond 2P: Recharger #2 Peak Elev=213.28' Storage=773 cf Inflow=1.20 cfs 0.085 af
Discarded=0.06 cfs 0.060 af Primary=0.88 cfs 0.025 af Outflow=0.94 cfs 0.085 af

Pond R-2: Existing Infiltration Trench Peak Elev=212.04' Storage=1,055 cf Inflow=3.17 cfs 0.090 af
Discarded=0.02 cfs 0.012 af Primary=1.63 cfs 0.078 af Outflow=1.65 cfs 0.090 af

Total Runoff Area = 1.039 ac Runoff Volume = 0.343 af Average Runoff Depth = 3.96"
54.78% Pervious = 0.569 ac 45.22% Impervious = 0.470 ac

Summary for Subcatchment P-1: New Parking Lot

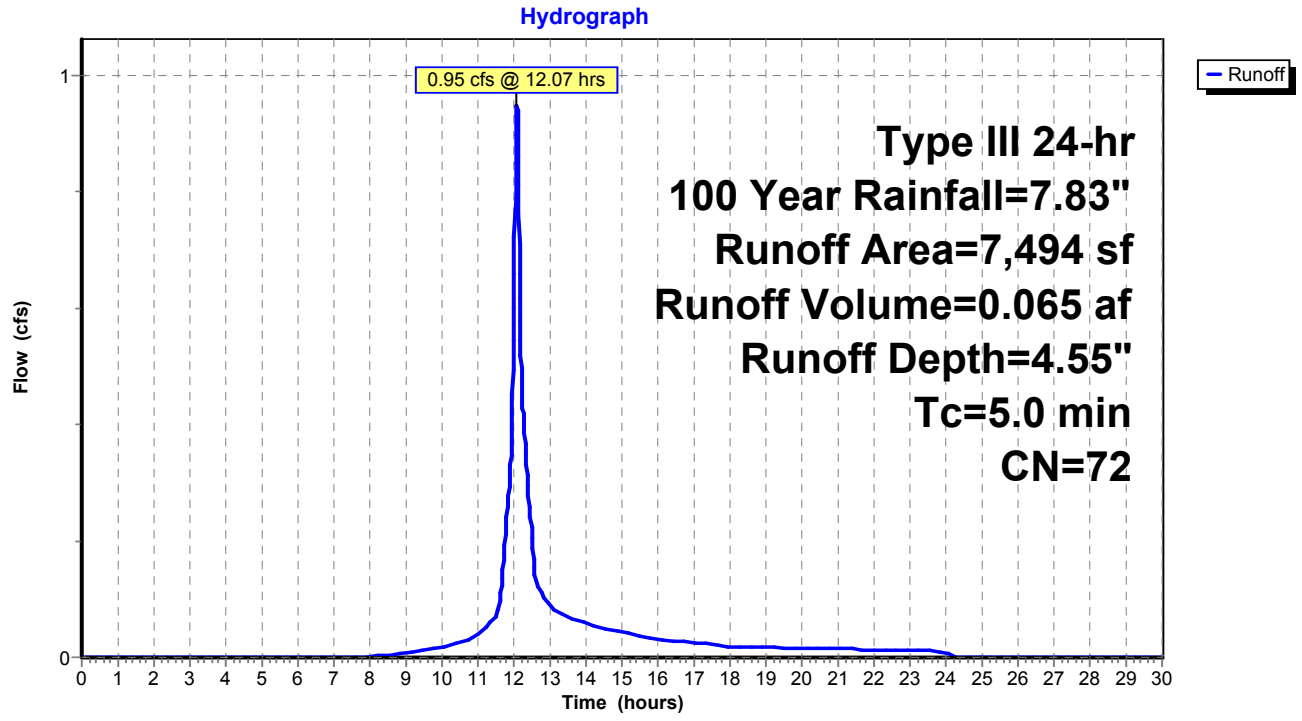
Runoff = 0.95 cfs @ 12.07 hrs, Volume= 0.065 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
4,134	98	Paved parking, HSG A
3,360	39	>75% Grass cover, Good, HSG A
7,494	72	Weighted Average
3,360		44.84% Pervious Area
4,134		55.16% Impervious Area

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

Subcatchment P-1: New Parking Lot



Summary for Subcatchment P-2a: Entry Driveway & Drive Thru

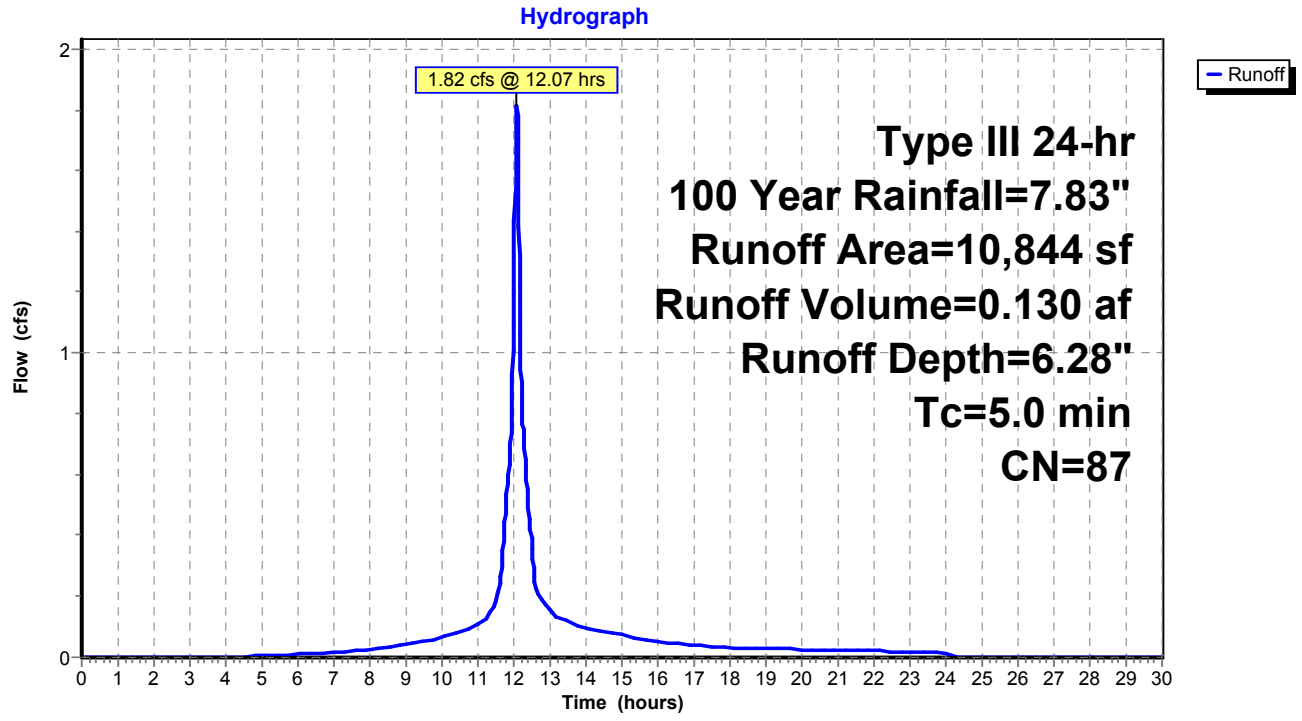
Runoff = 1.82 cfs @ 12.07 hrs, Volume= 0.130 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
8,781	98	Paved parking, HSG A
2,063	39	>75% Grass cover, Good, HSG A
10,844	87	Weighted Average
2,063		19.02% Pervious Area
8,781		80.98% Impervious Area

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

Subcatchment P-2a: Entry Driveway & Drive Thru



Summary for Subcatchment P-2b: Drive Thru Lanes

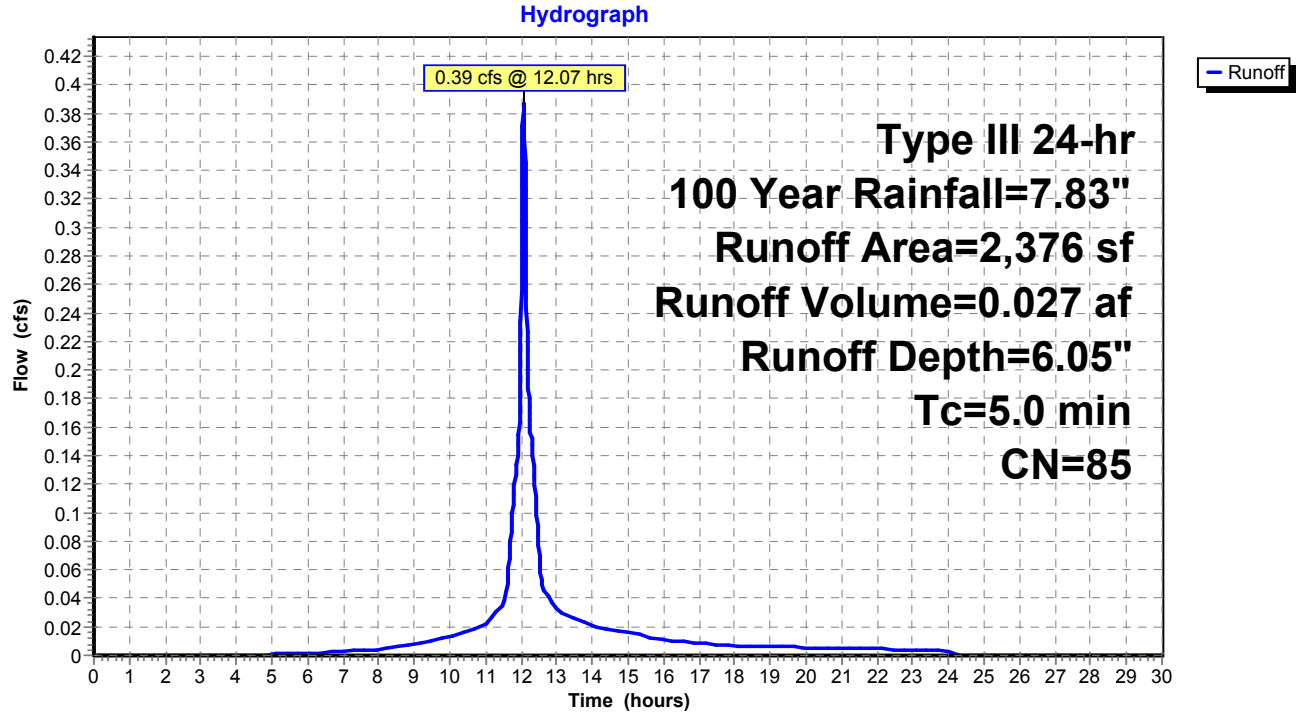
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.027 af, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
1,858	98	Paved parking, HSG A
518	39	>75% Grass cover, Good, HSG A
2,376	85	Weighted Average
518		21.80% Pervious Area
1,858		78.20% Impervious Area

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

Subcatchment P-2b: Drive Thru Lanes



Summary for Subcatchment P-3a: Portion of New Building

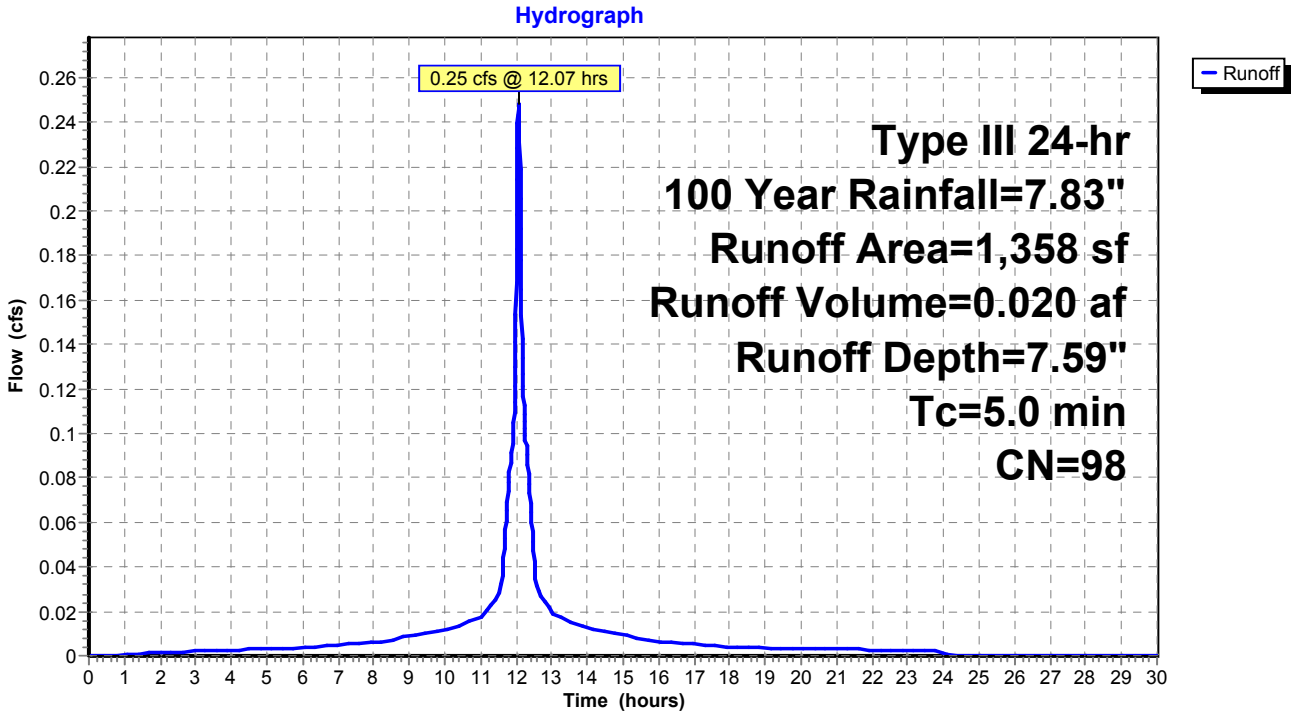
Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.020 af, Depth= 7.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
1,358	98	Roofs, HSG A
1,358		100.00% Impervious Area

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

Subcatchment P-3a: Portion of New Building



Summary for Subcatchment P-3b: Portion of New Building

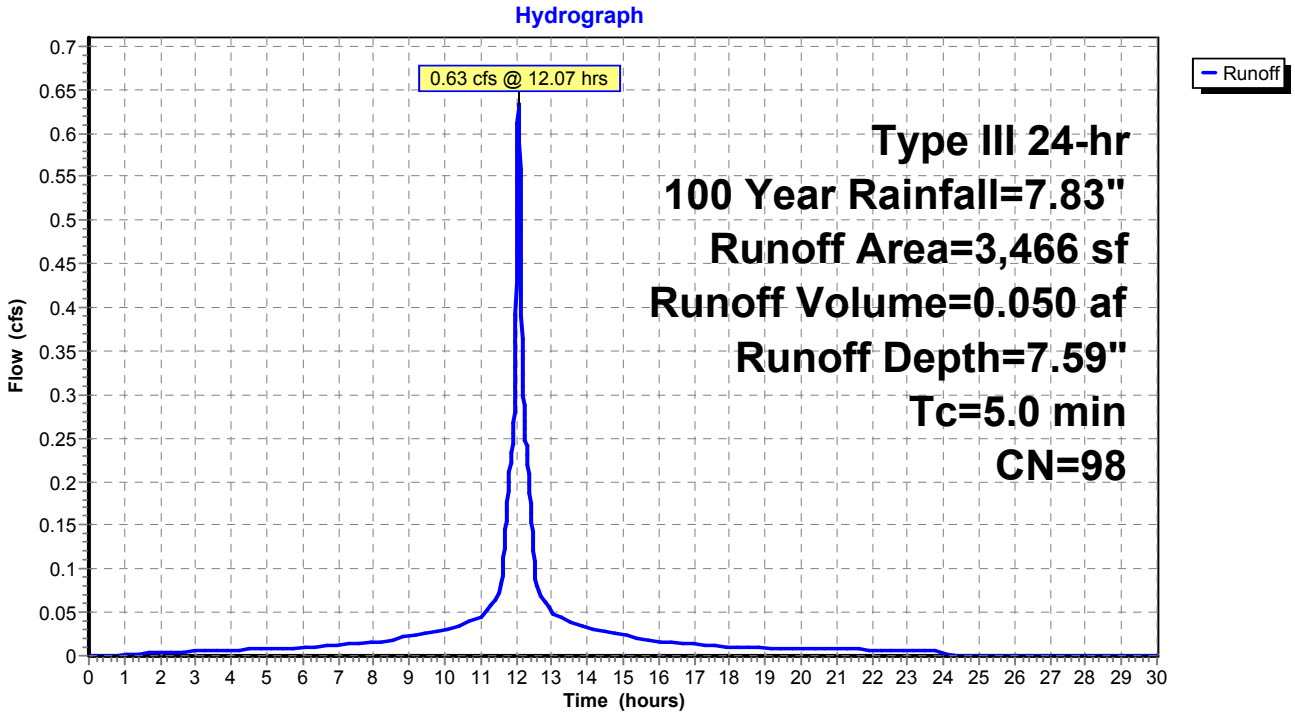
Runoff = 0.63 cfs @ 12.07 hrs, Volume= 0.050 af, Depth= 7.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
3,466	98	Roofs, HSG A
3,466		100.00% Impervious Area

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

Subcatchment P-3b: Portion of New Building



Summary for Subcatchment P-4: Uncontrolled to Main St

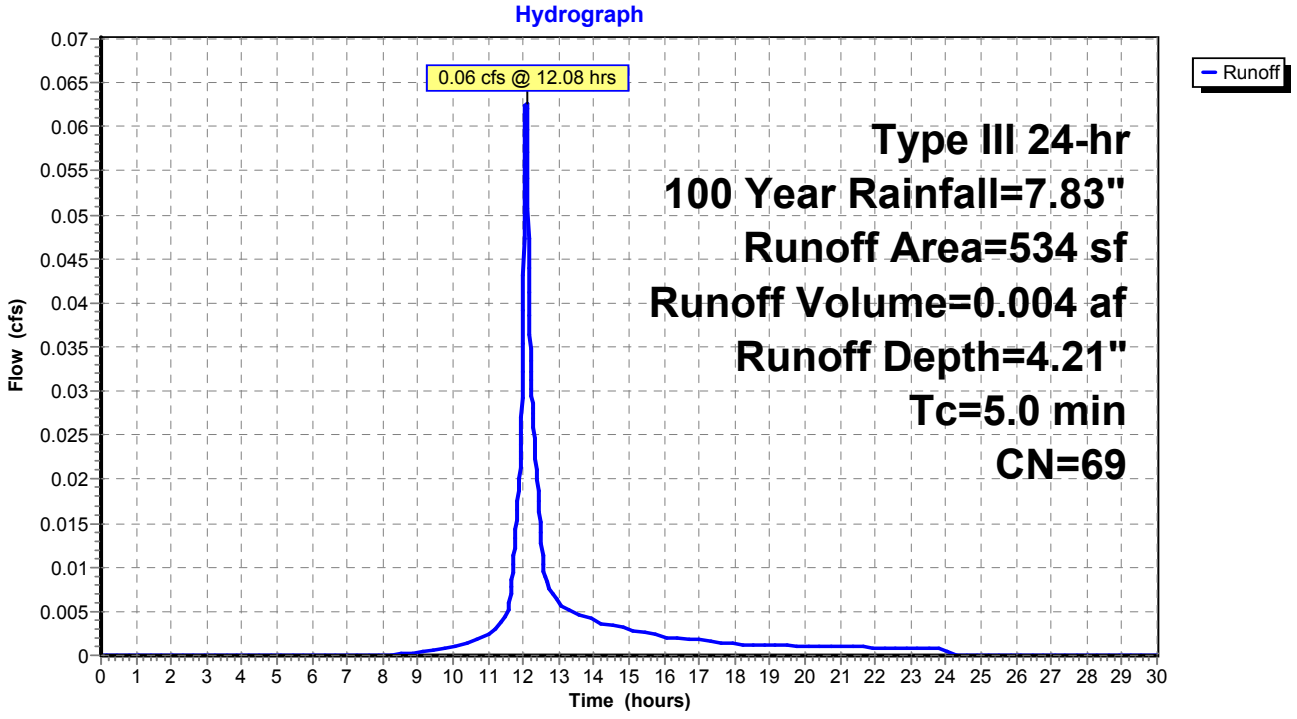
Runoff = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
267	98	Paved parking, HSG A
267	39	>75% Grass cover, Good, HSG A
534	69	Weighted Average
267		50.00% Pervious Area
267		50.00% Impervious Area

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

Subcatchment P-4: Uncontrolled to Main St



Summary for Subcatchment P-5: Uncontrolled to Abutter

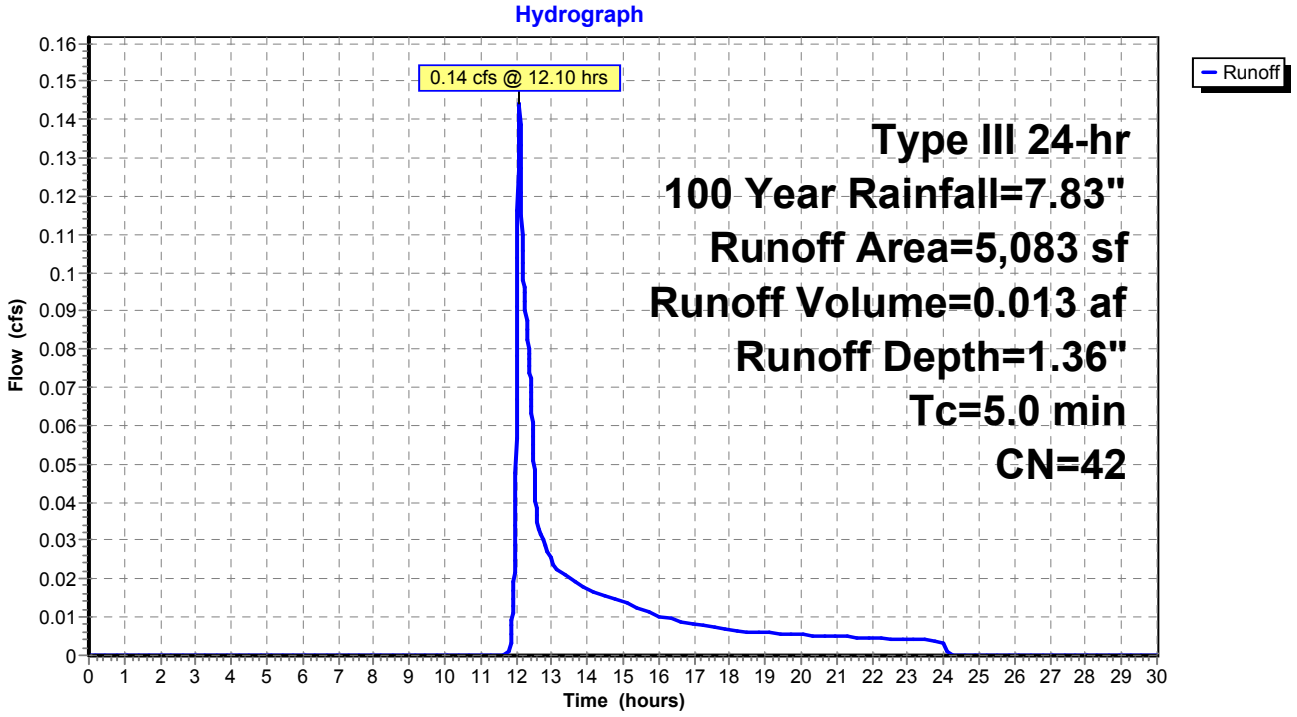
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.013 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
257	98	Paved parking, HSG A
4,826	39	>75% Grass cover, Good, HSG A
5,083	42	Weighted Average
4,826		94.94% Pervious Area
257		5.06% Impervious Area

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

Subcatchment P-5: Uncontrolled to Abutter



Summary for Subcatchment P-6: Uncontrolled to Mass Ave

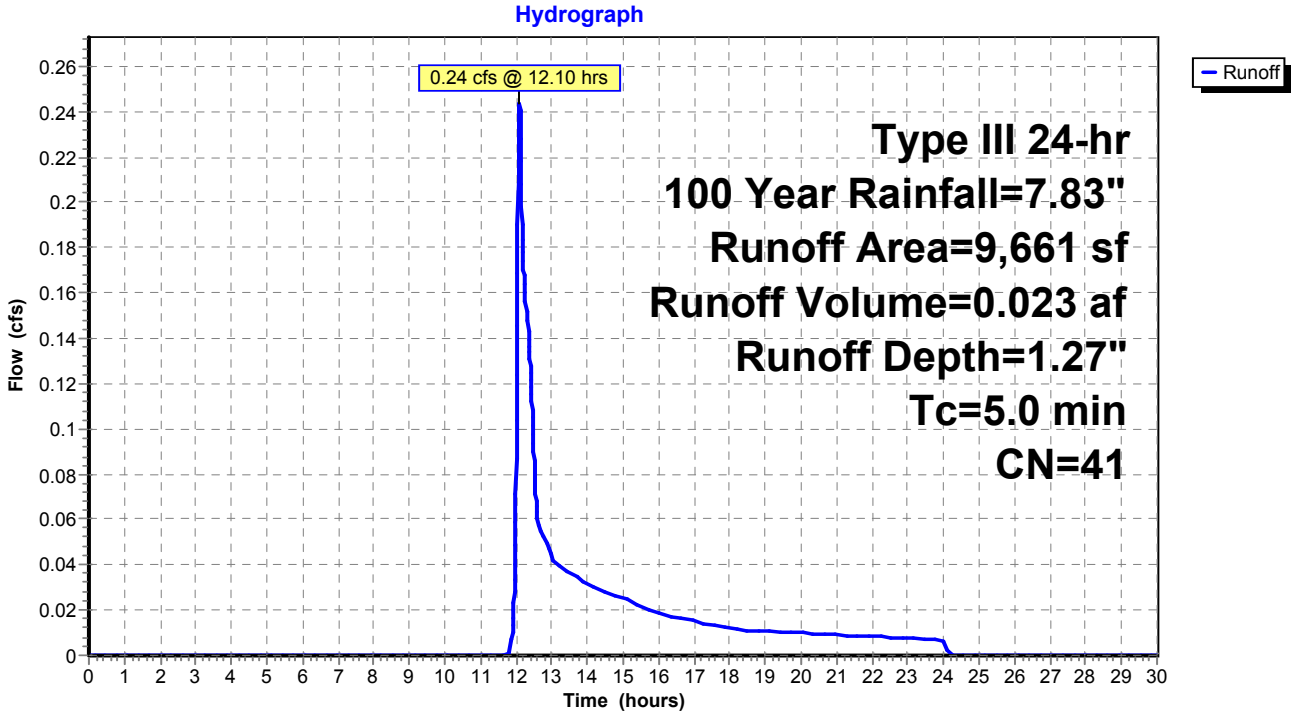
Runoff = 0.24 cfs @ 12.10 hrs, Volume= 0.023 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
352	98	Paved parking, HSG A
9,309	39	>75% Grass cover, Good, HSG A
9,661	41	Weighted Average
9,309		96.36% Pervious Area
352		3.64% Impervious Area

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

Subcatchment P-6: Uncontrolled to Mass Ave



Summary for Subcatchment P-7: Uncontrolled to Abutter

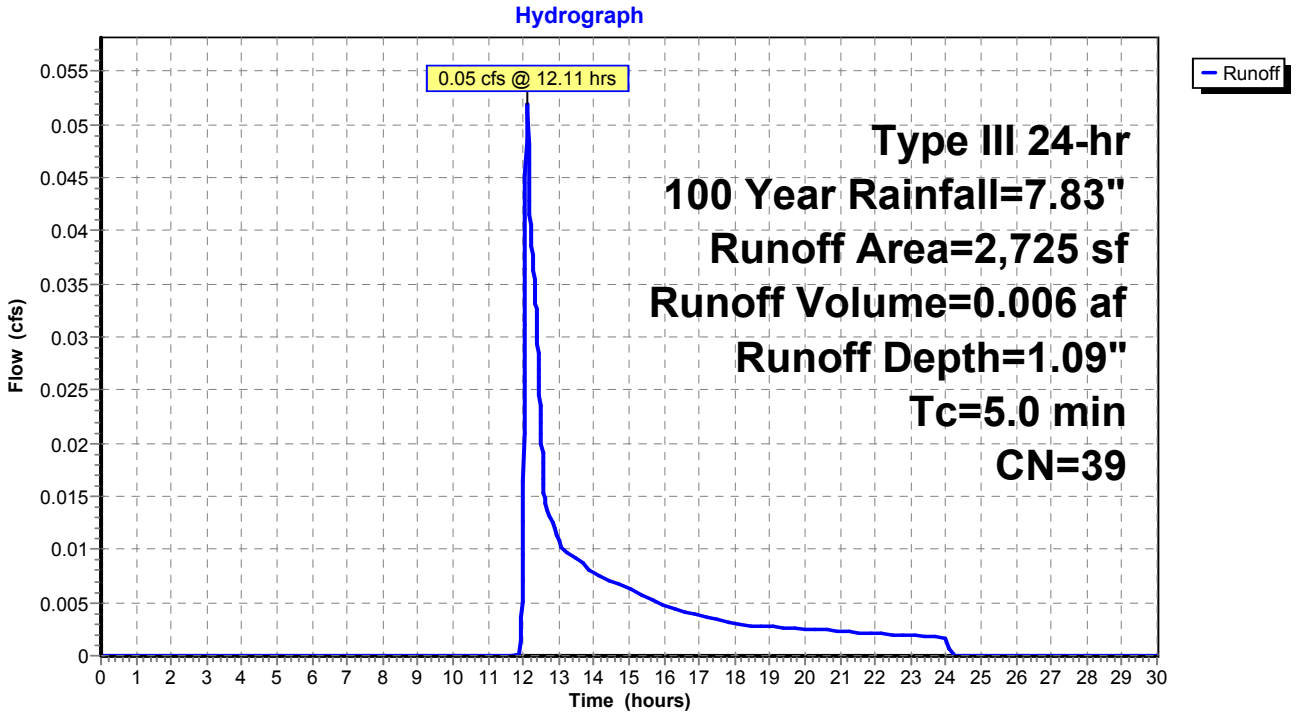
Runoff = 0.05 cfs @ 12.11 hrs, Volume= 0.006 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
2,725	39	>75% Grass cover, Good, HSG A
2,725		100.00% Pervious Area

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

Subcatchment P-7: Uncontrolled to Abutter



Summary for Subcatchment P-8: Front Yard to CB

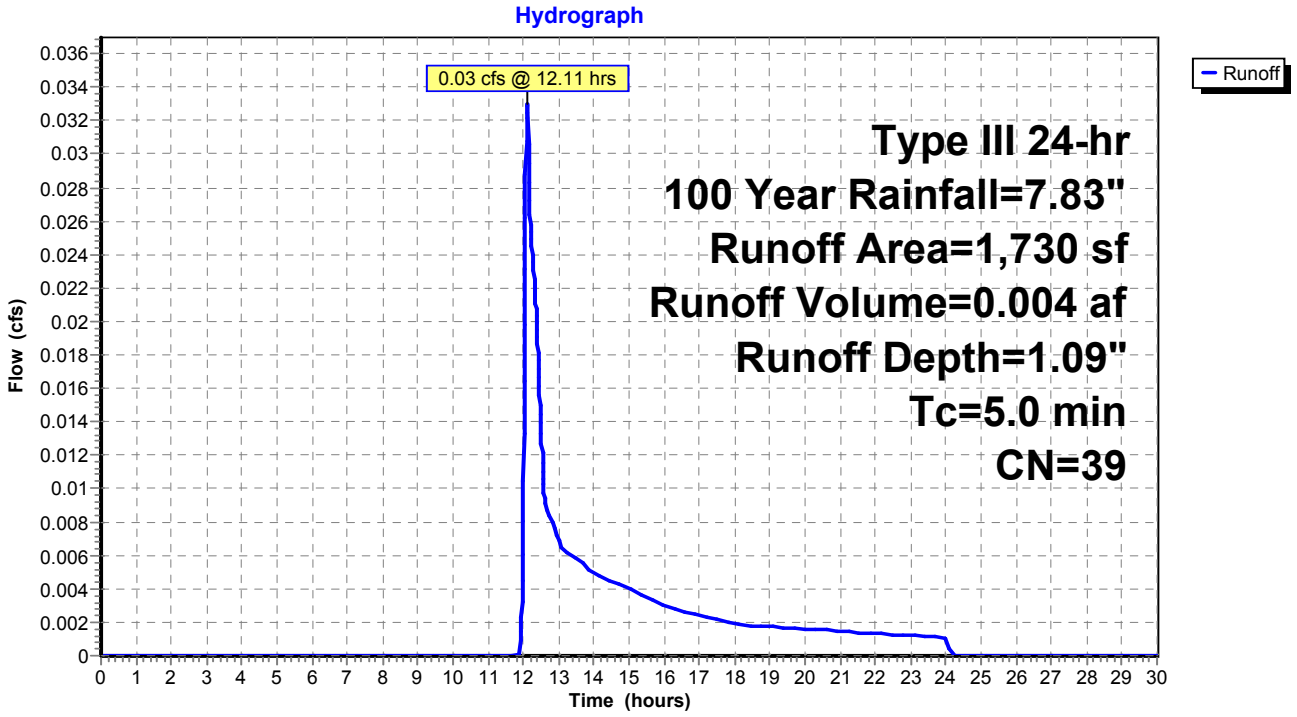
Runoff = 0.03 cfs @ 12.11 hrs, Volume= 0.004 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
1,730	39	>75% Grass cover, Good, HSG A
1,730		100.00% Pervious Area

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

Subcatchment P-8: Front Yard to CB

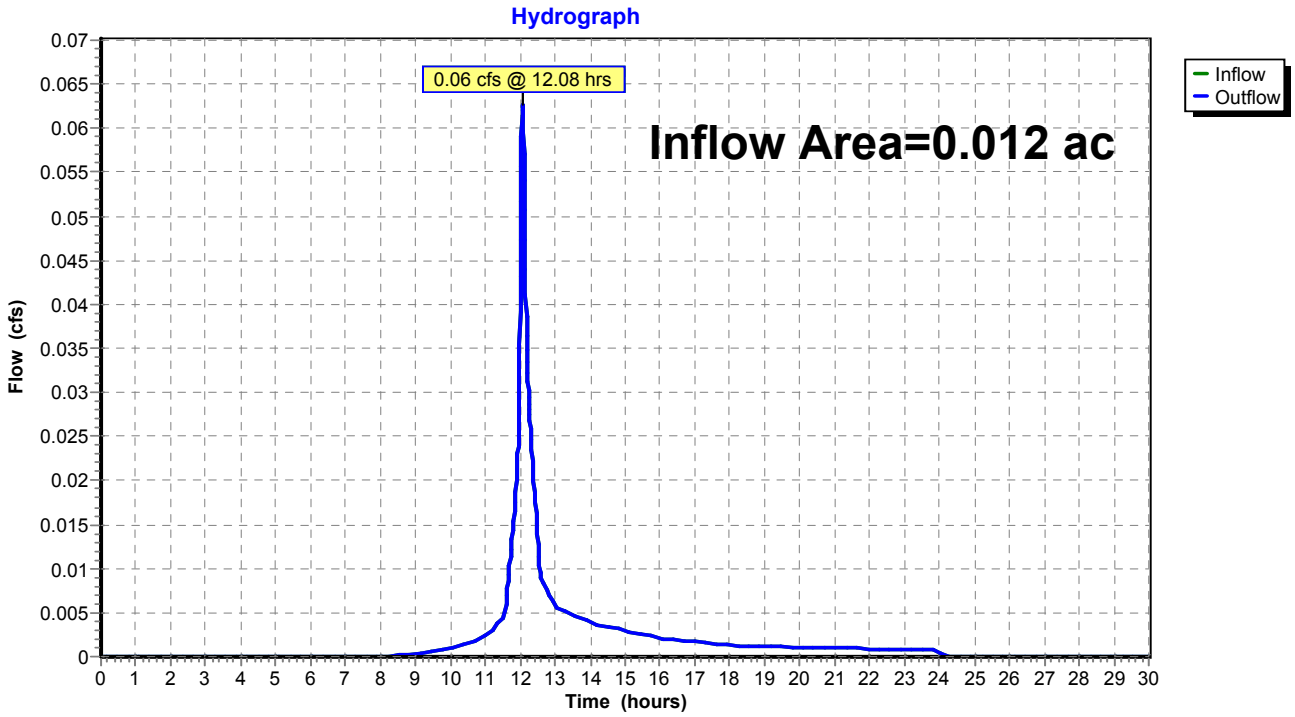


Summary for Reach DP-1: Main Street

Inflow Area = 0.012 ac, 50.00% Impervious, Inflow Depth = 4.21" for 100 Year event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-1: Main Street

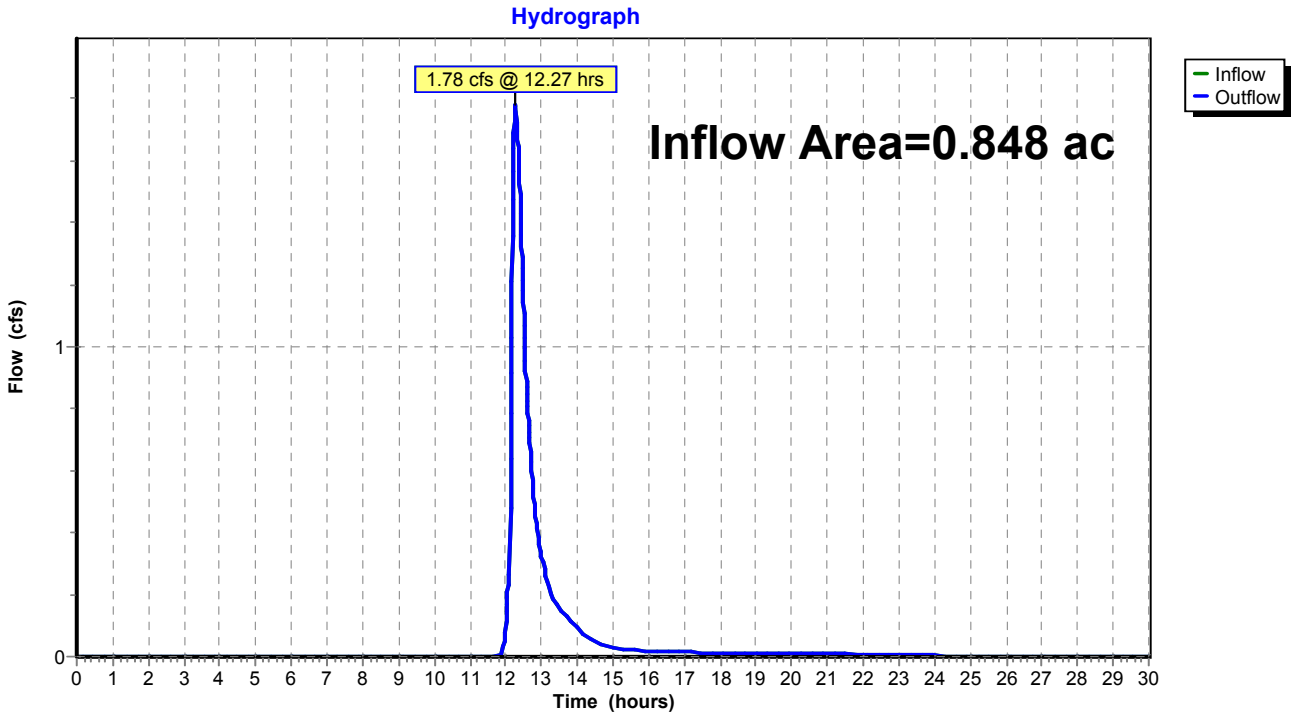


Summary for Reach DP-2: Mass Ave

Inflow Area = 0.848 ac, 54.02% Impervious, Inflow Depth = 1.43" for 100 Year event
Inflow = 1.78 cfs @ 12.27 hrs, Volume= 0.101 af
Outflow = 1.78 cfs @ 12.27 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-2: Mass Ave

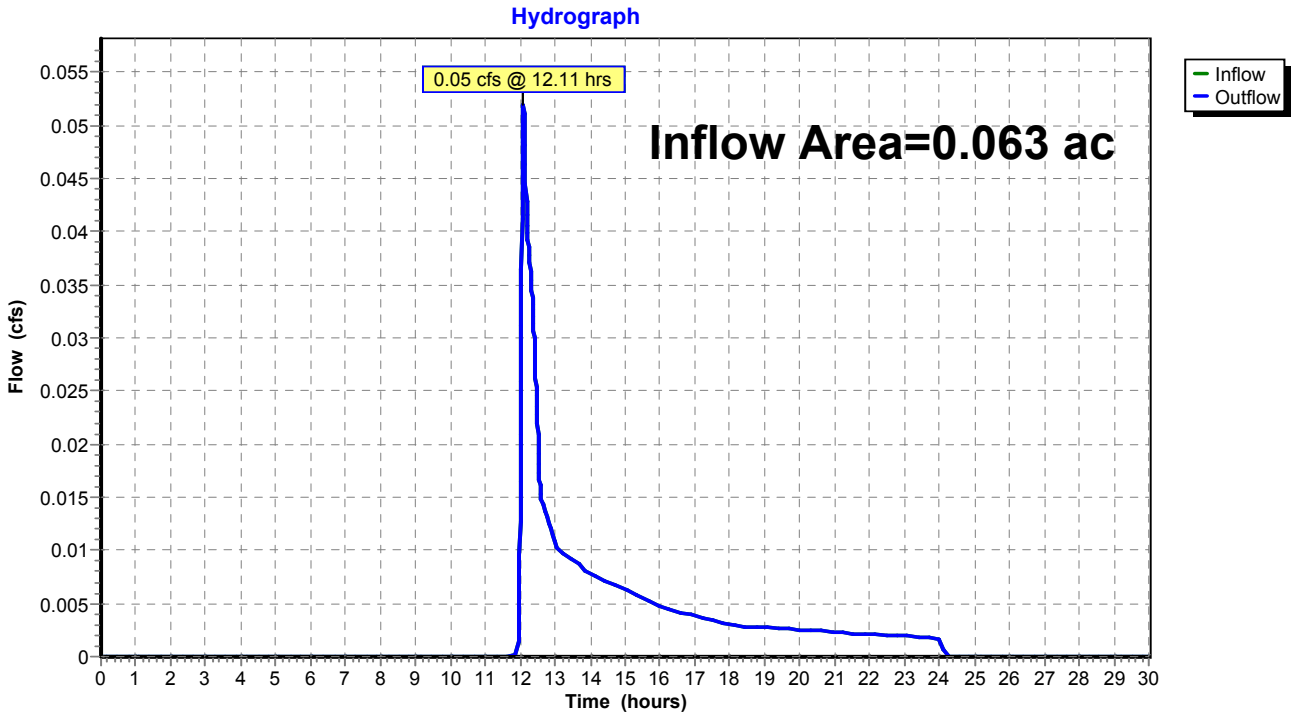


Summary for Reach DP-3: Westerly Abutter

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 1.09" for 100 Year event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.05 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-3: Westerly Abutter

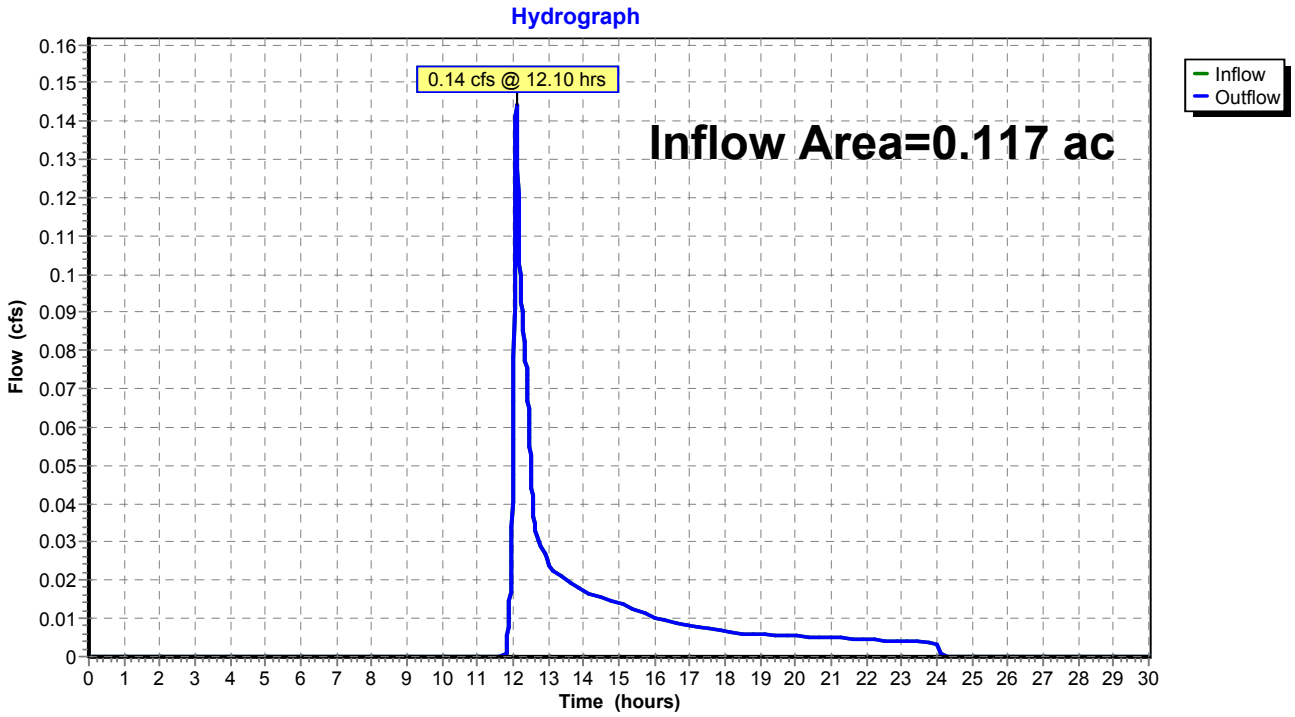


Summary for Reach DP-4: Easterly Abutter

Inflow Area = 0.117 ac, 5.06% Impervious, Inflow Depth = 1.36" for 100 Year event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.013 af
Outflow = 0.14 cfs @ 12.10 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-4: Easterly Abutter



Summary for Pond 1P: Recharger #1

Inflow Area = 0.423 ac, 76.59% Impervious, Inflow Depth = 6.01" for 100 Year event
Inflow = 2.86 cfs @ 12.07 hrs, Volume= 0.212 af
Outflow = 2.41 cfs @ 12.12 hrs, Volume= 0.212 af, Atten= 16%, Lag= 2.9 min
Discarded = 0.11 cfs @ 10.02 hrs, Volume= 0.147 af
Primary = 2.31 cfs @ 12.12 hrs, Volume= 0.065 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 214.24' @ 12.12 hrs Surf.Area= 1,895 sf Storage= 2,260 cf
Flood Elev= 214.40' Surf.Area= 1,895 sf Storage= 2,380 cf

Plug-Flow detention time=119.4 min calculated for 0.212 af (100% of inflow)
Center-of-Mass det. time=119.4 min (896.6 - 777.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	212.10'	1,344 cf	**28.17'W x 67.28'L x 2.33'H Field A**
			4,422 cf Overall - 1,061 cf Embedded = 3,360 cf x 40.0% Voids
#2A	212.60'	1,061 cf	**ADS_StormTech SC-310 +Cap** x 72 Inside #1
			Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
			Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
			8 Rows of 9 Chambers
		2,406 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**10.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 212.00' / 211.80' S= 0.0050 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	213.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	212.10'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 10.02 hrs HW=212.12' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=2.30 cfs @ 12.12 hrs HW=214.24' (Free Discharge)
└**1=Culvert** (Passes 2.30 cfs of 3.15 cfs potential flow)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.30 cfs @ 1.69 fps)

Pond 1P: Recharger #1 - Chamber Wizard Field A

ChamberModel = ADS_StormTech SC-310+Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

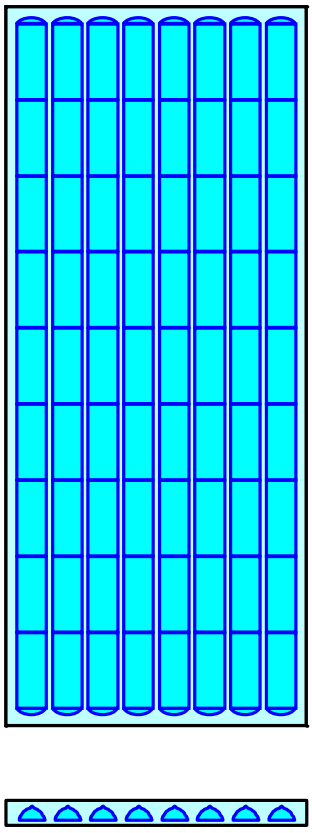
9 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 65.28' Row Length +12.0" End Stone x 2 = 67.28' Base Length
8 Rows x 34.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 28.17' Base Width
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

72 Chambers x 14.7 cf = 1,061.4 cf Chamber Storage

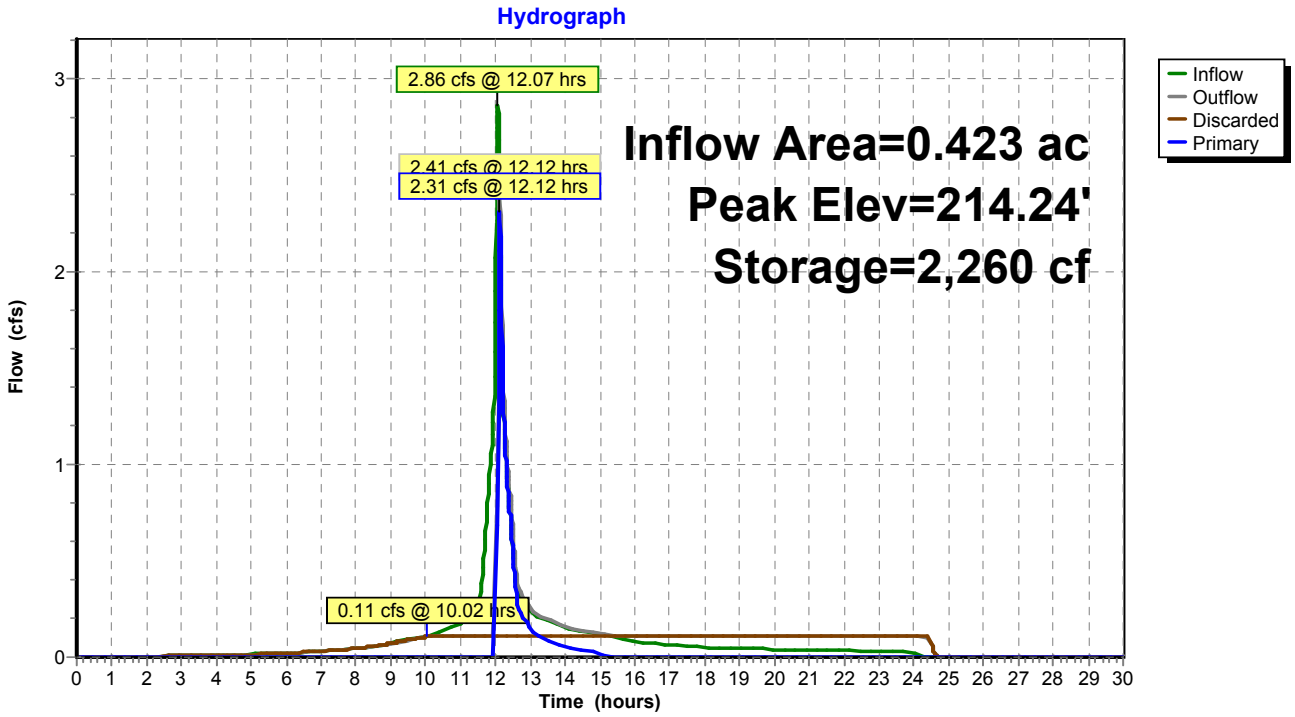
4,421.8 cf Field - 1,061.4 cf Chambers = 3,360.4 cf Stone x 40.0% Voids = 1,344.1 cf Stone Storage

Chamber Storage + Stone Storage = 2,405.6 cf = 0.055 af
Overall Storage Efficiency = 54.4%
Overall System Size = 67.28' x 28.17' x 2.33'

72 Chambers
163.8 cy Field
124.5 cy Stone



Pond 1P: Recharger #1



Summary for Pond 2P: Recharger #2

Inflow Area = 0.203 ac, 62.04% Impervious, Inflow Depth = 5.01" for 100 Year event
Inflow = 1.20 cfs @ 12.07 hrs, Volume= 0.085 af
Outflow = 0.94 cfs @ 12.13 hrs, Volume= 0.085 af, Atten= 21%, Lag= 3.6 min
Discarded = 0.06 cfs @ 11.15 hrs, Volume= 0.060 af
Primary = 0.88 cfs @ 12.13 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 213.28' @ 12.13 hrs Surf.Area= 1,104 sf Storage= 773 cf
Flood Elev= 214.40' Surf.Area= 1,104 sf Storage= 1,369 cf

Plug-Flow detention time=65.2 min calculated for 0.085 af (100% of inflow)
Center-of-Mass det. time=65.2 min (867.2 - 802.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	212.10'	794 cf	**34.83'W x 31.68'L x 2.33'H Field A** 2,575 cf Overall - 590 cf Embedded = 1,985 cf x 40.0% Voids
#2A	212.60'	590 cf	**ADS_StormTech SC-310 +Cap** x 40 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 10 Rows of 4 Chambers
		1,384 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	212.50'	**10.0" Round Culvert** L= 34.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 212.50' / 212.30' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	213.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	212.10'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.15 hrs HW=212.12' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.88 cfs @ 12.13 hrs HW=213.28' (Free Discharge)
↑—**1=Culvert** (Passes 0.88 cfs of 1.29 cfs potential flow)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.88 cfs @ 1.20 fps)

Pond 2P: Recharger #2 - Chamber Wizard Field A

ChamberModel = ADS_StormTech SC-310+Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

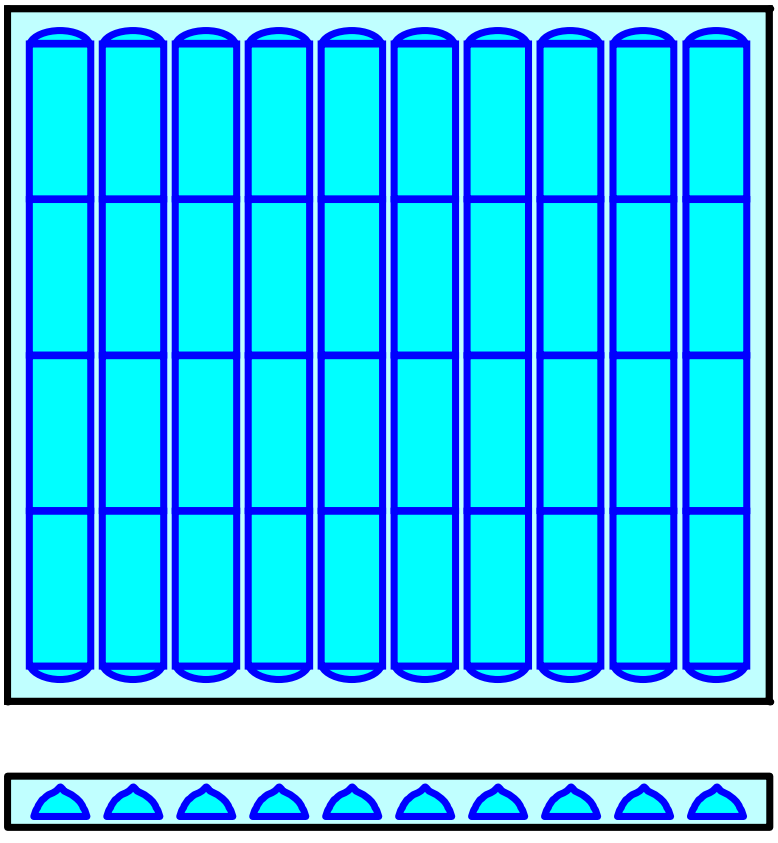
4 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 29.68' Row Length +12.0" End Stone x 2 = 31.68' Base Length
10 Rows x 34.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.83' Base Width
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

40 Chambers x 14.7 cf = 589.7 cf Chamber Storage

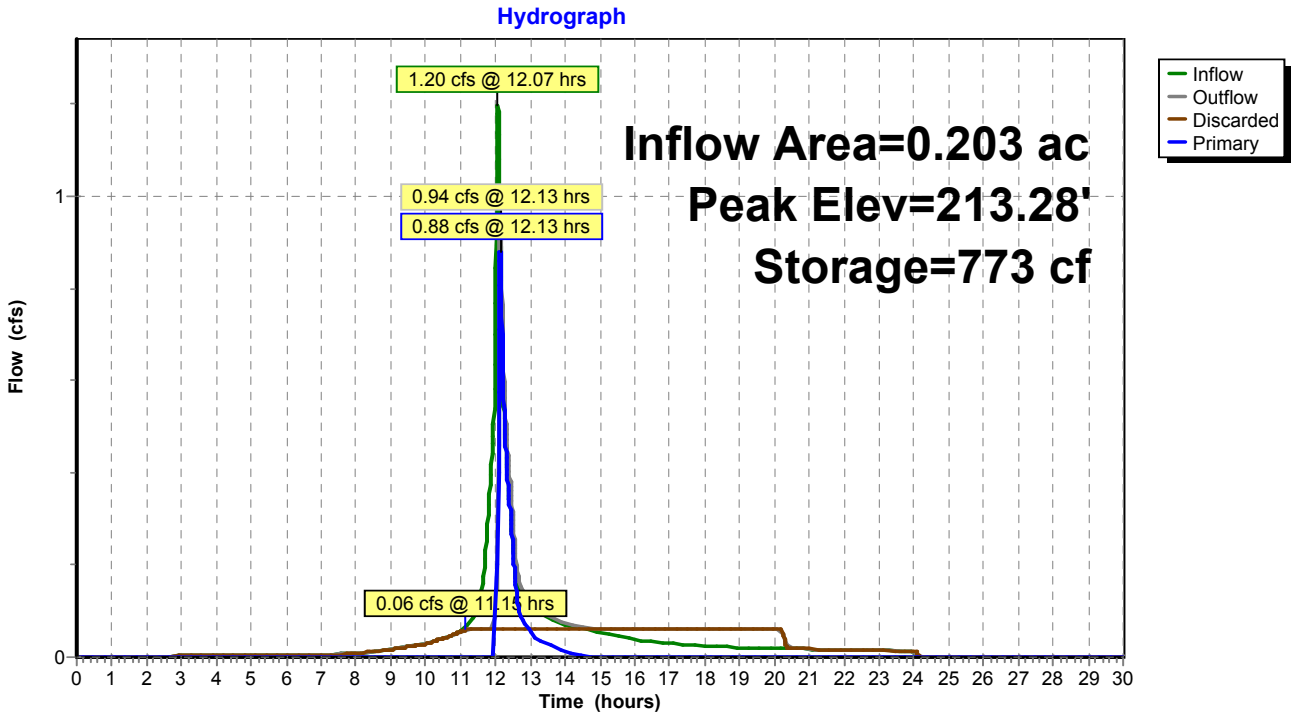
2,574.9 cf Field - 589.7 cf Chambers = 1,985.2 cf Stone x 40.0% Voids = 794.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,383.8 cf = 0.032 af
Overall Storage Efficiency = 53.7%
Overall System Size = 31.68' x 34.83' x 2.33'

40 Chambers
95.4 cy Field
73.5 cy Stone



Pond 2P: Recharger #2



Summary for Pond R-2: Existing Infiltration Trench

Inflow Area = 0.626 ac, 71.87% Impervious, Inflow Depth = 1.72" for 100 Year event
Inflow = 3.17 cfs @ 12.12 hrs, Volume= 0.090 af
Outflow = 1.65 cfs @ 12.27 hrs, Volume= 0.090 af, Atten= 48%, Lag= 8.8 min
Discarded = 0.02 cfs @ 12.07 hrs, Volume= 0.012 af
Primary = 1.63 cfs @ 12.27 hrs, Volume= 0.078 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 212.04' @ 12.27 hrs Surf.Area= 353 sf Storage= 1,055 cf

Plug-Flow detention time=31.2 min calculated for 0.090 af (100% of inflow)
Center-of-Mass det. time=31.3 min (782.6 - 751.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	210.00'	274 cf	**3.92'W x 90.00'L x 2.00'H Field A** 705 cf Overall - 21 cf Embedded = 684 cf x 40.0% Voids
#2A	211.00'	21 cf	**CPP single-wall 6"** x 4 Inside #1 Inside= 6.0"W x 6.0"H => 0.24 sf x 20.00'L = 4.8 cf Outside= 7.0"W x 7.0"H => 0.24 sf x 20.00'L = 4.8 cf Row Length Adjustment= +7.00' x 0.24 sf x 1 rows
#3	212.00'	10,000 cf	**Custom Stage Data** Listed below -Impervious
		10,295 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	0	0
212.50	10,000	10,000

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**90.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	210.00'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.02 cfs @ 12.07 hrs HW=210.14' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.56 cfs @ 12.27 hrs HW=212.04' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.56 cfs @ 0.46 fps)

Pond R-2: Existing Infiltration Trench - Chamber Wizard Field A

ChamberModel = CPP single-wall 6" (Single-wall corrugated HDPE pipe)
Inside= 6.0"W x 6.0"H => 0.24 sf x 20.00'L = 4.8 cf
Outside= 7.0"W x 7.0"H => 0.24 sf x 20.00'L = 4.8 cf
Row Length Adjustment= +7.00' x 0.24 sf x 1 rows

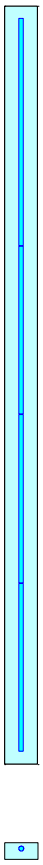
4 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 87.00' Row Length +18.0" End Stone x 2 = 90.00' Base Length
1 Rows x 7.0" Wide + 20.0" Side Stone x 2 = 3.92' Base Width
12.0" Base + 7.0" Chamber Height + 5.0" Cover = 2.00' Field Height

4 Chambers x 4.8 cf +7.00' Row Adjustment x 0.24 sf x 1 Rows = 21.1 cf Chamber Storage

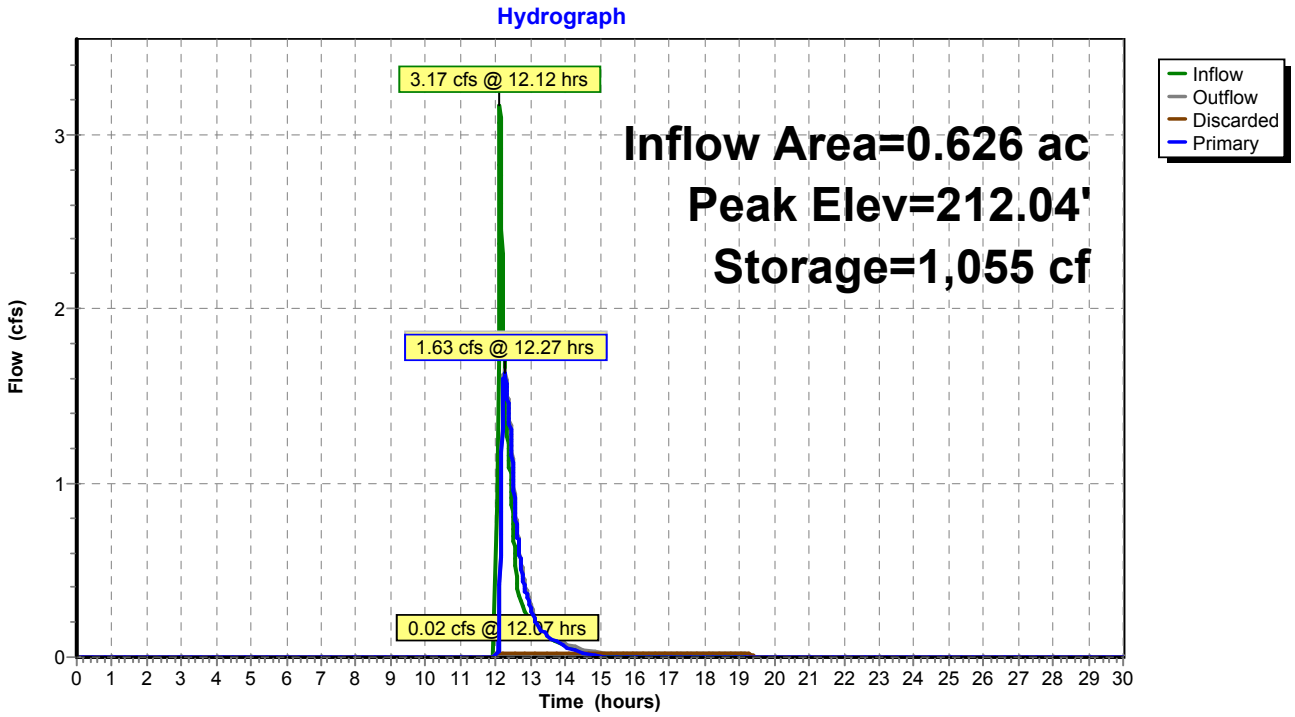
705.0 cf Field - 21.1 cf Chambers = 683.9 cf Stone x 40.0% Voids = 273.6 cf Stone Storage

Chamber Storage + Stone Storage = 294.7 cf = 0.007 af
Overall Storage Efficiency = 41.8%
Overall System Size = 90.00' x 3.92' x 2.00'

4 Chambers
26.1 cy Field
25.3 cy Stone



Pond R-2: Existing Infiltration Trench



DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

APPENDIX 1

Soils Data

Soils Summary by DGT Associates

Natural Resource Conservation Service Soils Information

for

Middlesex Savings Bank – Acton Branch
279 & 285 Main Street
Acton, MA 01720

DGT Associates
Surveying & Engineering

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Framingham, MA 01701
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SOILS SUMMARY

- Natural Resource Conservation Service Soils Mapping:
  The NRCS classifies the soils at the site as being in the Udorthents-Urban Land Complex soil series. The parent material consists of loamy alluvium and/or sandy glaciofluvial deposits. Soils directly north of the subject site are classified as the Charlton-Hollis Rock Outcrop soil series. The parent material of this soil series consists of friable loamy eolian deposits over friable loamy basal till. The natural drainage class is well drained.

- The estimated seasonal high groundwater (ESHGW) elevations and soil test information used for the design of Recharger #1 and Recharger #2 are based on record information obtained from the Town of Acton and others as listed below:

    - ESHGW elevations used and shown on the design plans are from the original design plans for the stormwater system design for #279 Main Street. Said plan is by Stamski and McNary, Inc. as revised through September 12, 2003. ESHGW was indicated at 60 inches below original existing grade. The referenced plan set was accompanied by a Site Plan Special Permit Application by Stamski and McNary, Inc. dated May 28, 2003. Within this report, soil test data indicated loamy sand and the infiltration rate used for this original design was 2.41 in/hr.

    - The Town of Acton Health Department also provided soil test pit data for #289 Main Street (direct abutter) by Bohler Engineering from July 18, 1996 which indicated loamy sand in the C Layer.

- Soil testing has not been performed for the current proposed drainage system as Middlesex Savings Bank does not have full ownership of the subject property at this time. As soon as Middlesex Savings Bank takes full ownership of the property, soil testing will be performed for the current stormwater management design. All soil test information and any revisions to the current design, if necessary, will be provided to the Town of Acton.

Soil Map—Middlesex County, Massachusetts

Map Scale: 1:4,200 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

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
51A	Swansea muck, 0 to 1 percent slopes	1.3	1.5%
52A	Freetown muck, 0 to 1 percent slopes	0.0	0.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	0.0	0.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	14.8	17.9%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	4.1	5.0%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	0.3	0.4%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	8.4	10.1%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	0.0	0.0%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	14.2	17.1%
656	Udorthents-Urban land complex	39.8	48.0%
Totals for Area of Interest		**83.0**	**100.0%**

Map Unit Description (Brief, Generated)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, provide information on the composition of map units and properties of their components.

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

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description (Brief, Generated)

Middlesex County, Massachusetts

Map Unit: 51A—Swansea muck, 0 to 1 percent slopes

Component: Swansea (80%)

The Swansea component makes up 80 percent of the map unit. Slopes are 0 to 1 percent. This component is on swamps on outwash plains. The parent material consists of highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is rarely flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 65 percent. Nonirrigated land capability classification is 8w. This soil meets hydric criteria.

Component: Freetown (10%)

Generated brief soil descriptions are created for major soil components. The Freetown soil is a minor component.

Component: Scarboro (5%)

Generated brief soil descriptions are created for major soil components. The Scarboro soil is a minor component.

Component: Whitman (5%)

Generated brief soil descriptions are created for major soil components. The Whitman soil is a minor component.

Map Unit: 52A—Freetown muck, 0 to 1 percent slopes

Component: Freetown (85%)

The Freetown component makes up 85 percent of the map unit. Slopes are 0 to 1 percent. This component is on depressions on alluvial plains, depressions on uplands. The parent material consists of highly decomposed organic material. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is rarely flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 82 percent. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Component: Scarboro (5%)

Generated brief soil descriptions are created for major soil components. The Scarboro soil is a minor component.

Component: Swansea (5%)

Generated brief soil descriptions are created for major soil components. The Swansea soil is a minor component.

Component: Whitman (5%)

Generated brief soil descriptions are created for major soil components. The Whitman soil is a minor component.

Map Unit: 73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

Component: Whitman, extremely stony (81%)

The Whitman, extremely stony component makes up 81 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions on glaciated uplands. The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, densic material, is 7 to 38 inches (depth from the mineral surface is 7 to 30 inches). The natural drainage class is very poorly drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, September, October, November, December. Organic matter content in the surface horizon is about 95 percent. Nonirrigated land capability classification is 7s. This soil meets hydric criteria.

Component: Ridgebury, extremely stony (10%)

Generated brief soil descriptions are created for major soil components. The Ridgebury soil is a minor component.

Component: Scarboro (5%)

Generated brief soil descriptions are created for major soil components. The Scarboro soil is a minor component.

Component: Swansea (3%)

Generated brief soil descriptions are created for major soil components. The Swansea soil is a minor component.

Component: Woodbridge, extremely stony (1%)

Generated brief soil descriptions are created for major soil components. The Woodbridge soil is a minor component.

Map Unit: 103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Component: Charlton (50%)

The Charlton component makes up 50 percent of the map unit. Slopes are 3 to 8 percent. This component is on drumlins on uplands, ground moraines on uplands. The parent material consists of friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Hollis (25%)

The Hollis component makes up 25 percent of the map unit. Slopes are 3 to 8 percent. This component is on ridges on uplands, hills on uplands. The parent material consists of friable, shallow loamy basal till over granite and gneiss. Depth to a root restrictive layer, bedrock, lithic, is 8 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Narragansett (2%)

Generated brief soil descriptions are created for major soil components. The Narragansett soil is a minor component.

Component: Scituate (2%)

Generated brief soil descriptions are created for major soil components. The Scituate soil is a minor component.

Component: Canton (2%)

Generated brief soil descriptions are created for major soil components. The Canton soil is a minor component.

Component: Woodbridge (2%)

Generated brief soil descriptions are created for major soil components. The Woodbridge soil is a minor component.

Component: Montauk (1%)

Generated brief soil descriptions are created for major soil components. The Montauk soil is a minor component.

Component: Unnamed (1%)

Generated brief soil descriptions are created for major soil components. The Unnamed soil is a minor component.

Map Unit: 307C—Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony

Component: Paxton, extremely stony (85%)

The Paxton, extremely stony component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills on uplands. The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, densic material, is 20 to 43 inches (depth from the mineral surface is 20 to 39 inches). The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 26 inches (depth from the mineral surface is 24 inches) during January, February, March, April, November, December. Organic matter content in the surface horizon is about 95 percent. Below this thin organic horizon the organic matter content is about 10 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Charlton, extremely stony (8%)

Generated brief soil descriptions are created for major soil components. The Charlton soil is a minor component.

Component: Woodbridge, extremely stony (6%)

Generated brief soil descriptions are created for major soil components. The Woodbridge soil is a minor component.

Component: Ridgebury, extremely stony (1%)

Generated brief soil descriptions are created for major soil components. The Ridgebury soil is a minor component.

Map Unit: 312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Component: Woodbridge, extremely stony (82%)

The Woodbridge, extremely stony component makes up 82 percent of the map unit. Slopes are 0 to 8 percent. This component is on hills on uplands. The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, densic material, is 20 to 43 inches (depth from the mineral surface is 20 to 39 inches). The natural drainage class is moderately well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 20 inches (depth from the mineral surface is 18 inches) during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 95 percent. Below this thin organic horizon the organic matter content is about 7 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Paxton, extremely stony (10%)

Generated brief soil descriptions are created for major soil components. The Paxton soil is a minor component.

Component: Ridgebury, extremely stony (8%)

Generated brief soil descriptions are created for major soil components. The Ridgebury soil is a minor component.

Map Unit: 317B—Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony

Component: Scituate (85%)

The Scituate component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. This component is on hillslopes on uplands, depressions on uplands. The parent material consists of friable loamy eolian deposits over dense sandy lodgment till derived from granite and gneiss. Depth to a root restrictive layer, densic material, is 18 to 33 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 20 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Ridgebury (5%)

Generated brief soil descriptions are created for major soil components. The Ridgebury soil is a minor component.

Component: Montauk (5%)

Generated brief soil descriptions are created for major soil components. The Montauk soil is a minor component.

Component: Woodbridge (5%)

Generated brief soil descriptions are created for major soil components. The Woodbridge soil is a minor component.

Map Unit: 416B—Narragansett silt loam, 3 to 8 percent slopes, very stony

Component: Narragansett (80%)

The Narragansett component makes up 80 percent of the map unit. Slopes are 3 to 8 percent. This component is on ground moraines on uplands. The parent material consists of friable loamy eolian deposits and/or friable silty eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock. Depth to a root restrictive layer, strongly contrasting textural stratification, is 18 to 35 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Below this thin organic horizon the organic matter content is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Haven (10%)

Generated brief soil descriptions are created for major soil components. The Haven soil is a minor component.

Component: Canton (5%)

Generated brief soil descriptions are created for major soil components. The Canton soil is a minor component.

Component: Scituate (5%)

Generated brief soil descriptions are created for major soil components. The Scituate soil is a minor component.

Map Unit: 623C—Woodbridge-Urban land complex, 3 to 15 percent slopes

Component: Woodbridge (58%)

The Woodbridge component makes up 58 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands. The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, densic material, is 20 to 39 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Component: Urban land (28%)

Generated brief soil descriptions are created for major soil components. The Urban land is a miscellaneous area.

Component: Paxton (9%)

Generated brief soil descriptions are created for major soil components. The Paxton soil is a minor component.

Component: Ridgebury (5%)

Generated brief soil descriptions are created for major soil components. The Ridgebury soil is a minor component.

Map Unit: 656—Udorthents-Urban land complex

Component: Urban land (40%)

Generated brief soil descriptions are created for major soil components. The Urban land is a miscellaneous area.

Component: Udorthents (40%)

The Udorthents component makes up 40 percent of the map unit. Slopes are 0 to 15 percent. This component is on railroad beds, fills, sanitary landfills, leveled land. The parent material consists of loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till. Depth to a root restrictive layer is greater than 60 inches. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. This soil does not meet hydric criteria.

Component: Canton (10%)

Generated brief soil descriptions are created for major soil components. The Canton soil is a minor component.

Component: Merrimac (5%)

Generated brief soil descriptions are created for major soil components. The Merrimac soil is a minor component.

Component: Paxton (5%)

Generated brief soil descriptions are created for major soil components. The Paxton soil is a minor component.

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Hydrologic Soil Group and Surface Runoff–Middlesex County, Massachusetts			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
51A—Swansea muck, 0 to 1 percent slopes			
Swansea	80	Negligible	B/D

Hydrologic Soil Group and Surface Runoff–Middlesex County, Massachusetts			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
52A—Freetown muck, 0 to 1 percent slopes			
Freetown	85	Negligible	B/D
73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony			
Whitman, extremely stony	81	Negligible	D
103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes			
Charlton	50	—	A
Hollis	25	—	D
Rock outcrop	15	—	—
307C—Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony			
Paxton, extremely stony	85	Medium	C
312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony			
Woodbridge, extremely stony	82	Medium	C/D
317B—Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony			
Scituate	85	—	D
416B—Narragansett silt loam, 3 to 8 percent slopes, very stony			
Narragansett	80	—	A
623C—Woodbridge-Urban land complex, 3 to 15 percent slopes			
Woodbridge	58	Very high	C/D
Urban land	28	Very high	D
656—Udorthents-Urban land complex			
Udorthents	40	—	—
Urban land	40	—	—

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

APPENDIX 2

Long-Term Pollution Prevention Plan with Attachments

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
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Long-Term Pollution Prevention Plan

Attachment 1
MassDEP Snow Disposal Guidance

Attachment 2
Snow Disposal Exhibit Plan

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

DGT Job No.: 25487

Long-Term Pollution Prevention Plan September 30, 2019
Middlesex Savings Bank – Acton Branch
Acton, MA

TABLE OF CONTENTS

INTRODUCTION

This document is a Long-Term Pollution Prevention Plan (LTPPP) prepared by DGT Associates for anticipated property management and use relative to the Proposed Middlesex Savings Bank – Acton Branch project in Acton, Massachusetts. The plan has been prepared for the Middlesex Savings Bank to provide the detailed information on practices for pollution prevention and source control to be implemented at the property following construction.

This document has been prepared in accordance with the requirements of the Stormwater Regulations issued by the Massachusetts Department of Environmental Protection (MassDEP), effective January 2, 2008. The document is intended to comply as part of Standard 4 and 9, as well as the Town's Stormwater Management Regulations.

The property owner will implement this Long-Term Pollution Prevention Plan and proactively conduct operations at the site in an environmentally responsible manner.

Compliance with this Long-Term Pollution Prevention Plan does not in any way dismiss the owner from compliance with other applicable Federal, State or local laws.

LONG-TERM POLLUTION PREVENTION PLAN - IMPLEMENTATION

The owner is responsible for the implementation of the Long-Term Pollution Prevention Plan and will re-evaluate and amend this Long-Term Pollution Prevention Plan whenever an improvement or modification to operations can be implemented.

AVAILABILITY OF PLAN DOCUMENTS

The owner shall maintain a copy of the Long-Term Pollution Prevention Plan and related inspection reports, amendments, etc. at their offices. Copies will be made available for review to authorized personnel of the Acton Engineering Department, and other authorized public officials upon request.

1.0 LONG-TERM POLLUTION PREVENTION PLAN RESPONSIBILITIES

1.01 RESPONSIBLE PARTY AND CONTACT INFORMATION

At the completion of the project, the site will be the responsibility of the owner/applicant.

Presently, the responsible party for the implementation of the Long-Term Pollution Prevention Plan is:

Middlesex Savings Bank
120 Flanders Road, Mail Stop W1C-2
Westborough, MA 01581

1.02 RESPONSIBILTIES FOR IMPLEMENTATION

The following responsibilities for the implementation of the Long-Term Pollution Prevention Plan are as follows:

- Oversee property management activities on the site.
- Oversee inspection, monitoring, and reporting compliance.
- Ensure property management contracts include both this Long-Term Pollution Prevention Plan as well as the Stormwater Operations and Maintenance Plan, and any other requirements issued by the Acton Engineering Department to assure compliance with this Long-Term Pollution Prevent Plan and the Operations and Maintenance Plan.
- Provide training, if necessary, to those responsible for the inspection, monitoring, and maintenance of the site.
- Identify other potential pollutant sources or deficiencies in the BMP's (Best Management Practices) and amend the Long-Term Pollution Prevention Plan as appropriate to address those issues.

2.0 PROJECT DESCRIPTION

2.01 EXISTING SITE DESCRIPTION

The existing site is located on 1.01 acres of land in the Kelley's Corner area of Acton on Main Street. The site is currently a retail establishment (Quill and Press). A majority of the existing site is the existing building and loading dock/driveway and associated parking lot area with two (2) existing curb cuts to Main Street. The rear of the lot is open/grass that slopes down to Massachusetts Avenue. The site is bounded to the north by Main Street (Route 27) and bounded to the south by Massachusetts Avenue (Route 111). The site is bounded by other commercial properties to the east and west.

2.02 PROPOSED PROJECT

The proposed project includes the following:

- Construction of a Middlesex Bank building towards the front of the site.
- Construction of new drive aisles and parking areas, including drive-through lanes.

- Construction of a new landscaped areas.
- Construction of a new Stormwater Management System for the new site modifications.
- Associated grading, walkways, site lighting, handicapped accessibility, utilities and appurtenances.

The new stormwater management system is designed to assure that the runoff peak flows after development will be the same or less than the existing conditions and will meet the water quality treatment and groundwater recharge requirements per the Massachusetts Stormwater Regulations and the Town of Acton requirements. This is to assure that there will be no impact to the downstream drainage systems or abutters. Maintenance requirements for the stormwater management features is included in the Stormwater Operations and Maintenance Plan (Appendix 3).

3.0 PRACTICES FOR SOURCE CONTROL AND POLLUTION PREVENTION

3.01 Good Housekeeping:
Good housekeeping procedures to reduce the possibility of accidental releases and to reduce safety hazards will include but not be limited to the following:

- Proper handling and storage of solid wastes,
- Proper handling, storage and inventory of household chemicals, and
- Prompt cleanup and removal of de minimus releases.
- The owner of the facility will contract for solid waste disposal and recycling.

3.02 Storage and Proper Disposal of Hazardous Chemicals:
The owner/staff should be aware of not only the potential hazards of various chemicals to the human body but also to the environment. Employees need to be instructed on the proper disposal of hazardous waste and should use the Town programs such as Hazardous Waste Days for the disposal of various chemicals, including automobile fluids, paints, solvents, cleaners, etc.

3.03 Vehicle Washing:
The washing of personal or commercial vehicles is not allowed on the subject property. Employees should assess the integrity of vehicle fluid systems for personal vehicles that could leak significant materials on the property and into the storm drainage system. The owner will inspect the parking areas on a routine (monthly) basis and be observant at all times to look for evidence of leaks from vehicles and notify the vehicle owner to repair the leaks.

3.04 Routine Inspections and Maintenance of Stormwater BMP's:
Detailed information regarding stormwater BMPs, including descriptions and maintenance requirements is contained in the Stormwater Operations and Maintenance Plan (Appendix 3).

3.05 Spill Prevention and Response:
The owner will implement release response procedures for releases of significant materials such as fuels, oils, or chemical materials onto the ground or other area that could reasonably be expected to discharge to surface or groundwater.

Reportable quantities will immediately be reported to the applicable Federal, State and local agencies as required by law.

3.06 Maintenance of Lawns, Fields and other Landscaped Areas:
The landscape design minimizes the need for fertilizers, herbicides and pesticides. The property owner may consult with lawn care professionals to develop a comprehensive plan for landscape maintenance, which will include timing and application amounts of various lawn chemicals, maintenance plantings and lawn repairs and disposal of leaves and trimmings.

3.07 Storage of Fertilizers, Herbicides, and Pesticides:
The storage of these chemicals is not allowed on the subject property.

3.08 Pet Waste Management:
The owner should require and implement "pooper-scooper" requirements for pets on the property to maintain the property free of pet waste.

3.09 Solid Waste Management:
All waste materials are to be stored in securely lidded dumpster(s) or other secure containers as applicable to the material. Said dumpsters and containers will be monitored by the owner and emptied by a licensed waste disposal contractor on a regular basis.

3.10 Snow Disposal and Use of Deicing Chemicals:
The qualified contractor selected for snow plowing and deicing shall be made fully aware of the requirements of this section. During typical snow plowing operations, snow shall be pushed to the back edge of the parking area. Two areas designated for snow stockpiling are located at the south end of the site. If severe conditions result in the designated areas being full, the snow shall be removed from the site and properly disposed.

Small amounts deicing materials such as sand and salt to handle individual walkways can be stored on site under cover and on an impervious surface or in proper containers within the buildings. Alternatives to sodium chloride

(commonly used salt) such as sand or calcium chloride, and reduced applications, should be considered. The snow shall be removed from the site and properly disposed of in accordance with the MassDEP Snow Disposal Guidance. (See Attachment 1)

Care must be taken to avoid damage of structures and landscaping.

3.11 Stormwater System:
All routine maintenance of the new Stormwater System shall be in accordance with the Stormwater Operations and Maintenance Plan contained within Appendix 3.

4.0 INSPECTIONS AND REPORT PREPARATION

The owner shall maintain inspection and maintenance logs of the maintenance and repair of the site for items as contained in this Long-Term Pollution Prevention Plan and Stormwater Operation and Maintenance Plan. Generally, forms need to be completed when inspections, maintenance and repairs are performed and typically on a monthly basis. In conjunction with the Long-Term Pollution Prevention Plan, the requirements of the Stormwater Operations and Maintenance Plan shall be implemented, and the owner will oversee the inspections and preparation of the required inspection reports for compliance with that document. Forms for this purpose are contained in Appendix 3.

5.0 COORDINATION WITH OTHER PERMITS AND REQUIREMENTS

This project will be subject to a permit issued by the Town of Acton and other agencies. Certain conditions of those approvals affecting the long-term management of the property shall be considered part of this Long-Term Pollution Prevention Plan. The owner shall become familiar with those documents and perform their work in compliance thereto.

Attachment 1

MassDEP SNOW DISPOSAL GUIDANCE

Snow Disposal Guidance

Effective Date: March 8, 2001

Guideline No. BRPG01-01

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: BRP Snow Disposal Guideline BRPG97-1 issued 12/19/97, and all previous snow disposal guidance

Approved by: Glenn Haas, Assistant Commissioner for Resource Protection

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are acceptable to the Department of Environmental Protection, Bureau of Resource Protection.

APPLICABILITY: These Guidelines are issued by the Bureau of Resource Protection on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to public agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While we are all aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything we do on the land has the potential to impact our water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas away from water resources and wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris which can be removed in the springtime. The following areas should be avoided:

- Avoid dumping of snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Do not dump snow within a Zone II or Interim Wellhead Protection Area (IWPA) of a public water supply well or within 75 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater (see the next page for information on ordering maps from MassGIS showing the locations of aquifers, Zone II's, and IWPAs in your community).
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Site Selection Procedures

a. It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:
b. Estimate how much snow disposal capacity is needed for the season so that an adequate number of disposal sites can be selected and prepared.

c. Identify sites that could potentially be used for snow disposal such as municipal open space (e.g., parking lots or parks).
d. Sites located in upland locations that are not likely to impact sensitive environmental resources should be selected first.
e. If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

MassGIS Maps of Open Space and Water Resources

If local maps do not show the information you need to select appropriate snow disposal sites, you may order maps from MassGIS (Massachusetts Geographic Information System) which show publicly owned open spaces and approximate locations of sensitive environmental resources (locations should be field-verified where possible). Different coverages or map themes depicting sensitive environmental resources are available from MassGIS on the map you order. At a minimum, you should order the Priority Resources Map. The Priority Resources Map includes aquifers, public water supplies, MassDEP-approved Zone II's, Interim Wellhead Protection Areas, Wetlands, Open Space, Areas of Critical Environmental Concern, NHESP Wetlands Habitats, MassDEP Permitted Solid Waste facilities, Surface Water Protection areas (Zone A's) and base map features. The cost of this map is $25.00. Other coverages or map themes you may consider, depending on the location of your city or town, include Outstanding Resource Waters and MassDEP Eelgrass Resources. These are available at $25.00 each, with each map theme being depicted on a separate map. Maps should be ordered from MassGIS . Maps may also be ordered by fax at 617-626-1249 (order form available from the MassGIS web site) or mail. For further information, contact MassGIS at 617-626-1189.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- To filter pollutants out of the meltwater, a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent waterbodies.
- Debris should be cleared from the site prior to using the site for snow disposal.
- Debris should be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.

3. EMERGENCY SNOW DISPOSAL

As mentioned earlier, it is important to estimate the amount of snow disposal capacity you will need so that an adequate number of upland disposal sites can be selected and prepared.

If despite your planning, upland disposal sites have been exhausted, snow may be disposed of near waterbodies. A vegetated buffer of at least 50 feet should still be maintained between the site and the waterbody in these situations. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, disposal of snow that is not obviously contaminated with road salt, sand, and other pollutants may be allowed in certain waterbodies under certain conditions. In these dire situations, notify your Conservation Commission and the appropriate MassDEP Regional Service Center before disposing of snow in a waterbody.

Use the following guidelines in these emergency situations:

- Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
- Do not dispose of snow in saltmarshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
- Do not dispose of snow where trucks may cause shoreline damage or erosion.
- Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

FOR MORE INFORMATION

If you need more information, contact one of MassDEP's Regional Service Centers:

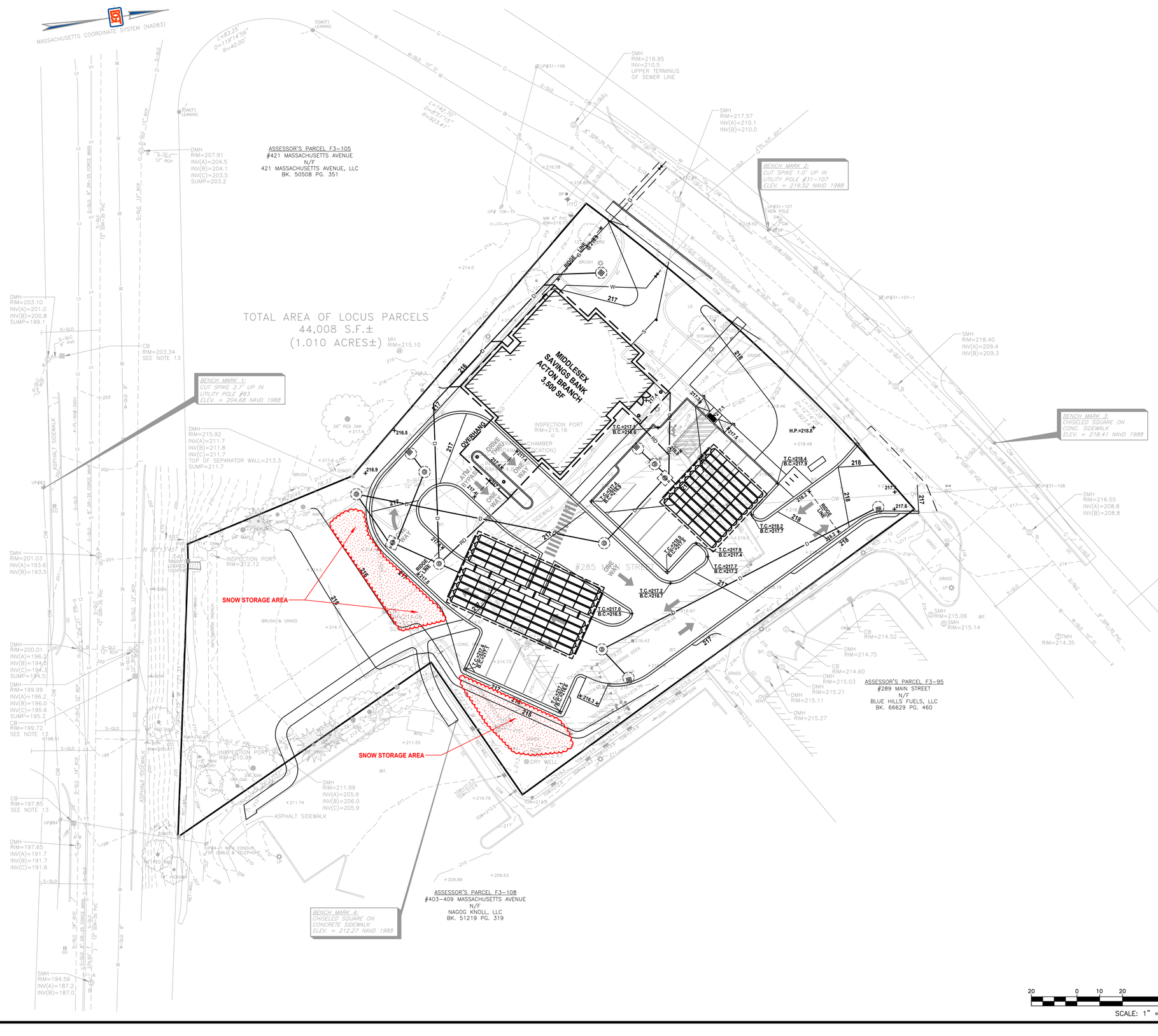
Northeast Regional Office, Wilmington, 978-694-3200
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-792-7683
Western Regional Office, Springfield, 413-755-2214

or

Call Thomas Maguire of DEP's Bureau of Resource Protection in Boston at 617-292-5602.

Attachment 2

SNOW DISPOSAL EXHIBIT PLAN



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1071 Worcester Road
Framingham, MA 01701
508-879-0030

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NO.	APP	DATE	DESCRIPTION

DATE: **SEPTEMBER 30, 2019**

SCALE: **1" = 20'**

DRAFTED:	CHECKED:	APPROVED:
KMR	**BEC**	**BEC**

PROJECT TITLE:

MIDDLESEX SAVINGS BANK ACTON BRANCH

279 & 285 MAIN STREET
ACTON, MASSACHUSETTS 01720

SHEET TITLE:

SNOW STORAGE EXHIBIT PLAN

SHEET: **1 OF 1**

PROJECT NO.: **25487**

SNOW-1

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Framingham, MA 01701
508.879.0030
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APPENDIX 3

Stormwater Operations and Maintenance Plan

for

Middlesex Savings Bank – Acton Branch

279 & 285 Main Street
Acton, MA 01720

DGT Associates
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Framingham, MA 01701
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Stormwater Operations and Maintenance Plan

Operation and Maintenance Manual
Inspection Forms
Stormwater System Maintenance Record
Proprietary Systems Operation and Maintenance Guides

for

Middlesex Savings Bank – Acton Branch
279 & 285 Main Street
Acton, MA 01720

DGT Job No.: 25487

STORMWATER MANAGEMENT SYSTEM

OPERATION AND MAINTENANCE PLAN

Middlesex Savings Bank – Acton Branch
#279 & #285 Main Street in Acton, MA

INTRODUCTION

The proposed Stormwater Management System for the proposed Middlesex Savings Bank at #279 & #285 Main Street in Acton, MA contains several "Stormwater Best Management Practices" (BMP's) that have been designed to protect the environment from stormwater related impacts to surface waters and groundwater. Stormwater Best Management Practices are defined as structural devices that temporarily store and treat urban stormwater runoff to reduce flooding, remove pollutants, and provide other amenities for the protection of surface and groundwater resources and the general environment.

As with any treatment system, it must be inspected and maintained on a regular basis in order for the system to function properly as designed. Good maintenance practices help ensure that the stormwater BMP's are in proper working order when they are needed to perform under storm conditions and will maximize the useful life of the structures. BMP's that are not properly maintained soon become less effective and may lead to costly repairs to bring the BMP's back to a good condition. Proper maintenance also helps avoid failures of the systems and resulting environmental damage or long-term degradation of valuable natural resource areas.

This manual has been prepared for the operation and maintenance of the stormwater management system at #279 & #285 Main Street in Acton, MA.

At the completion of the project, the site will be the responsibility of the property owner.

Routine inspections and some of the routine maintenance tasks may be performed by the owner. Outside contractors may be hired for some items such as the removal of trapped sediment in the deep sump catch basins or infiltration system, or for some non-routine repairs.

This manual is intended to be used as the management document for the system. It contains specific plans of the components of the stormwater management system, descriptions of the purpose and function of each component, inspection and maintenance requirements and check lists and report forms for record keeping. The manual also contains background information, descriptions of environmental concerns and information necessary for an understanding of the reasons for the proper management of the stormwater management system.

The first step in the process of implementing the operation and maintenance requirements needs to include the following:

1. Formalization of the agreements and understandings between the Town of Acton and the proponent.
2. Training of Personnel
3. Administration Tasks: Budget Planning, Resource Allocation, etc.
4. Preparation of an as-built plan or site map that shows the location of all the stormwater BMP's for inclusion in this manual.

MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

Following construction of the Stormwater Management System, the Operation and Maintenance Plan must be implemented for the system to remain in compliance with the Stormwater Management Standards and Town of Acton requirements.

STORMWATER BEST MANAGEMENT PRACTICES (BMP's)

The Stormwater BMP's designed into the project include the following:

STORMWATER BMP's	# Units
Deep Sump Catch Basins	5
Stormwater Treatment Units	3
Underground Infiltration Systems (Recharger #1, #2)	2

The following pages describe the inspection, routine maintenance and non routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the Stormwater Management Standards Handbook, Volume 1, 2, 3, February 2008, MassDEP.

The details of the operation and maintenance for each BMP are contained in Part 2 of this Manual. The design plans should be referred to for the layout of the Stormwater Management System.

STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE

The stormwater management system designed and constructed for #279 & #285 Main Street in Acton, MA is a passive system that does not require any operational procedures to be followed during a storm event to operate as intended. There are no valves to turn, weirs to set, pumps to be turned on, or other manual activity required. What is necessary to assure that the system functions properly is the performance of regular inspections and maintenance tasks. The Operation and Maintenance requirements for this system involve the following:

Inspections	A process by which you can evaluate if the BMP's are in acceptable condition and are still effective.

Maintenance	Tasks required for the upkeep and repair of the BMP's to keep them in good working order. This is broken down into routine maintenance tasks, and non-routine maintenance and repairs.
Record Keeping	Documentation of the Inspections and Maintenance that has been performed. This is important and useful for: 1.) Proving that the tasks are performed. 2.) Use in scheduling and planning of repairs and maintenance. 3.) Documenting possible future problems and recommending corrective measures. 4.) Planning manpower and equipment needs and for O&M Budget Preparation. 5.) Making adjustments to the O&M Plan where warranted for the stormwater system to function as intended.

The inspection and maintenance requirements for each stormwater BMP are based on the recommendations contained in the MassDEP Stormwater Management Handbook, Volume Two, Chapter 2, Structural BMP Specifications…; February 2008. It is recommended that the procedures described for each BMP be followed strictly for the first two years of operation. During that initial two-year period, the observations and experience gained from monitoring this stormwater management system will provide the information necessary to adjust the O&M procedures for the most efficient management of the system. Adjustment of the Operation and Maintenance Procedures will require the approval from the Town of Acton.

Note that the descriptions of the maintenance requirements include the basic items needed or required for the tasks. The inspectors and maintenance personnel must also be made aware of other work-related safety precautions and regulations such as OSHA confined space rules, traffic safety, protective clothing, and safety equipment that must be utilized in the performance of the prescribed tasks.

INSPECTION AND MAINTENANCE REQUIREMENTS FOR BMP's

DEEP SUMP CATCH BASINS

DESCRIPTION AND FUNCTION

These structures are modified catch basins that collect stormwater from small drainage areas with added features to enhance the capture of gas, oils, grease, trash, floating debris, and sediment over that of conventional catch basins and stormwater inlets. The inlet of the deep sump catch basin is a cast iron grate over the precast concrete structure. The sump is over-sized to a minimum depth of 4 feet below the elevation of the outlet pipe invert to enhance trapping of sediment. The outlet pipe includes a "Snout" or "Eliminator" which is a hooded outlet cover that keeps floating hydrocarbons and other floating debris in the structure chamber until they settle with the sediment or is removed by a pumper as part of the routine cleaning.

The deep sump catch basins are not efficient enough to provide effective pollutant removal alone but are an improvement over conventional catch basins and are effective as a pretreatment device for other stormwater BMP's as they are being used in this case.

INSPECTIONS

The deep sump catch basins should be inspected at least four times per year and at the end of the foliage and snow removal seasons. For a full inspection, remove the grate and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, hydrocarbons should be removed immediately. Measure the amount of sediment that has collected. Pipe outlets should be clear of debris. To be effective, the 4-foot deep sump must be watertight to maintain a permanent pool to the outlet pipe invert. If the water level is below the outlet pipe, closer inspection for possible leaks is warranted. Note that a water level somewhat below the outlet level is normal during extended periods with no precipitation due to evaporation and minor expected seepage.

ROUTINE MAINTENANCE

Initially, the deep sump catch basins should be cleaned a minimum of four times a year and additionally if necessary based on the results of the monthly inspection. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet grate and outlet tee and pipe. Sediment should be removed from the deep sump catch basin if the measurement of the sediment is over one foot in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing the outlet snout and/or pipe
- Filling cracks in the concrete
- Patching of mortar and brick.
- Resetting of inlet grates

MAINTENANCE EQUIPMENT

- Hand tools for opening grates
- Measuring stick
- Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
- Vacuum pumping truck (for sediment removal)

STORMWATER TREATMENT UNITS

INSPECTIONS

The unit(s) should be inspected on a bi-monthly basis and after major storm events for the first year. Remove the cover and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gasoline, it should be removed immediately. Measure the amount of sediment that has collected using a measuring stick or "Sludge Judge" measuring tube. Pipe inlets and outlets should be clear of debris. After the first year, the number of inspections may be reduced based on the experience during the first year monitoring but not less than 2 times per year. Two of the inspections must include one at the end of the foliage season and one at the end of the snow season.

ROUTINE MAINTENANCE

The units should be cleaned a minimum of two times during the first year or when the sediment level reaches 75% of the capacity of the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated, per the manufacturer's maintenance specifications. A copy of the CDS Technologies Inspection and Maintenance Guide is provided attached to the end of this section. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet pipes. The removal of hydrocarbons must be performed by a hazardous waste disposal contractor. Removal of the sediment is by a standard vacuum truck.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet or outlet pipes.
Filling cracks in the concrete
Resetting of covers.

MAINTENANCE EQUIPMENT

Hand tools for opening covers
Measuring stick or "Sludge Judge".
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Contracted vacuum pumping truck (for sediment removal)

UNDERGROUND INFILTRATION SYSTEMS

DESCRIPTION AND FUNCTION

The underground infiltration systems consist of HDPE half-moon style chambers surrounded by washed stone and filter fabric. The infiltration systems receive uncontaminated roof runoff directly.

Each system is constructed in a natural, permeable soil suitable for infiltrating. Overflows are provided once the storage volume is exceeded. Manholes/observation ports are at finished grade and will be used for access.

The purpose of the infiltration systems is to the recharge the groundwater.

INSPECTIONS

The infiltration systems should be inspected after every major storm for the first few months. After this time period it may be inspected once each year and should preferably be done two to three days after a significant storm event. The inspection should examine whether the chamber is draining properly following storms. The underground infiltration system should drain within a few hours following the end of a storm up to a maximum of 72 hours. Due to the good infiltrative capacity of the natural soil in the area of the infiltration system, water should not remain ponded within the system for an extended time period. Pipe inlets and outlets should be clear of debris and there should be no significant accumulation of sediment in the chambers. The annual inspection of the infiltration system should include removal of all the manhole covers/observation ports to view the interior of the chamber. Sediment buildup within the system is not expected for many years. If significant accumulation of sediment occurs, most will be near the inlet pipe(s) to the underground chamber and can be removed by hand or vacuum pumper. A significant accumulation of sediment may indicate a problem with soil migrating into the system from the surrounding soil indicating a failure of the filter fabric protection or a pipe problem in the pipe leading into the basin.

ROUTINE MAINTENANCE

Clearing debris from the inlet and outlet pipes if found during an inspection.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing the inlet pipes
- Filling cracks in the concrete
- Resetting of covers
- Removal of significant accumulation of sediment from the chambers that affects the infiltration capacity.

MAINTENANCE EQUIPMENT

Hand tools for opening covers, flash light.
Equipment as may be necessary to comply with OSHA confined space requirements.

STORMWATER MANAGEMENT SYSTEM

INSPECTION AND MAINTENANCE FORMS

CONTENTS:

DEEP SUMP CATCH BASINS

Routine Inspection Checklist - Inspected monthly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
CB #1						
CB #2						
CB #3						
CB #4						
CB #5						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

STORMWATER TREATMENT UNITS

Routine Inspection Checklist - Inspected semi-annually Date _____

	Structural Integrity	Sediment Depth	Hydrocarbons*	Inlet/Outlet Pipe	Floating Debris	Comments
STU #1						
STU #2						
STU #3						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

INFILTRATION SYSTEMS

Routine Inspection Checklist - Inspected annually two to three days after a rainfall. Date _____

	Draining Properly	Sediment	Structural Integrity	Pipe Inlet/Outlet	Debris	Comments
Recharger #1						
Recharger #2						

MIDDLESEX SAVINGS BANK – ACTON BRANCH
STORMWATER SYSTEM MAINTENANCE RECORD

Date of Maintenance: _____ Performed By:_____

Maintenance / repair tasks were performed on the following on-site BMP structures:

Stormwater Structure Work Performed._____

Other Comments:

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CDS TECHNOLOGIES

Maintenance

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

Inspection

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

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

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

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

Cleaning

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

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

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

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

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

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

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

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

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

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