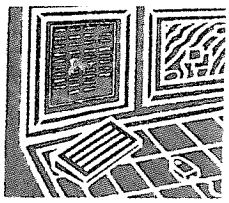
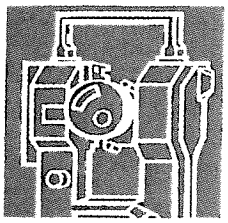
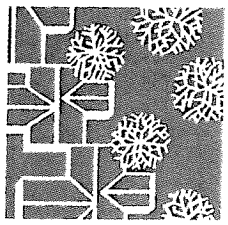






24749

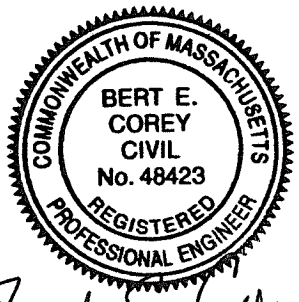
STORMWATER REPORT

for

#270 COCHITUATE ROAD
Framingham, Massachusetts

Applicant:
Avidia Bank
42 Main Street
Hudson, MA 01749

Prepared by:
Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
(508) 879-0030



8/7/15

August 7, 2015

SCHOFIELD BROTHERS
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APPENDICES

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SECTION 1

STORMWATER MANAGEMENT REPORT

NARRATIVE AND SUMMARY

SECTION 1
STORMWATER NARRATIVE

This report contains the hydrologic computations and design information relative to the existing and proposed stormwater runoff conditions for #270 Cochituate Road in Framingham, MA. It also includes information on the proposed stormwater management system design.

Existing Site Description

The subject property is 1.2 acres in area and is located in the M-1 zoning district and the Regional Center Overlay district. The site is presently developed with a one-story restaurant building and a paved parking lot. The perimeter of the site is vegetated with grass cover and has several mature trees along the west and north property line. Access is provided off the west bound lane of Cochituate Road.

The site is relatively flat with slopes that are generally less than 2%. There are no jurisdictional Wetland Resource Areas located on the site or extend onto the site.

The site drains to several catch basins located in the paved parking lot. The catch basin system connects to a drain manhole in Cochituate Road. This drain is used as the Design Point to compare existing and proposed stormwater runoff conditions from the site to the town drainage system.

Other than the catch basin sumps, there is no formal treatment of the stormwater runoff from the paved parking lot. We are not aware of any recharge facilities on the site.

Soils and Groundwater

According to the USDA Natural Resource Conservation Service Soils Mapping, the on-site soils are classified as "Urban land." To the north and west of the site, the soil is classified as Woodbridge – Urban land complex." Woodbridge soil consists of moderately well drained soil (surface layers) on glacial till uplands. The substratum soil is a firm glacial till with a slow to very slow permeability. The depth to seasonal high groundwater ranges from 1.5 to 2.5 feet. The Urban component consists of areas where the original soil has been cut away or covered by fill and replaced with impervious surfaces.

Woodbridge soil is classified as Hydrologic Soil Group (HSG) "C."

As part of a 21E assessment, on-site borings (SB-6, SB-7) performed by Fay, Spofford & Thorndike (FST) on May 5, 201512/23/03 showed the presence of loamy sand in the substratum with water between 6 and 7 feet below the surface.

NRCS soil data and results of the FST soil borings are included in Appendix 1.

Project Description

The project consists of demolishing the existing building and constructing an Avidia Bank building with a drive-up window in the central portion of the site. Additional site improvements include new parking areas, walkways, landscaping, utilities, site lighting, and handicapped accessibility improvements within the site. Stormwater management features will include the installation of four on-site catch basins and two infiltration systems. Construction period erosion and sedimentation controls are to be installed prior to any site disturbance and are to be maintained during construction.

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 existing and proposed conditions are included in Section 3 and Section 4 of this report, respectively.

The project as designed maintains the balance of the site hydrology; the drainage patterns of the existing site were kept the same under proposed conditions to the extent possible. Overall, there is a reduction of peak flows and volume under proposed conditions. In addition, four deep sump catch basins provide some TSS removal and two rechargers provide infiltration. Collectively, the proposed development improves the hydrologic conditions of the site.

The hydrologic model uses a design point (connection to the town drainage system) to compare stormwater conditions for the existing site and the proposed site. The results of the hydrologic analysis for existing and proposed conditions to this design points for the 1, 2, 10, 25 and 100 year storms are summarized in the following table, which is also located in Section 2.

TABLE 1 - Existing vs. Proposed Peak Flows and Volumes at the Cochituate Road Drainage System

		DP (Cochituate Road)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	2.87	2.31	0.202	0.164
2 year	3.2 in	3.85	3.35	0.276	0.233
10 year	4.6 in	5.80	5.32	0.425	0.377
25 year	5.4 in	6.89	6.43	0.510	0.461
100 year	6.6 in	8.53	8.08	0.640	0.588

The following BMP's are proposed:

- Four deep sump catch basins with hoods to collect stormwater runoff from the parking areas and to provide pretreatment prior to entering the town drainage system.
- Two infiltration systems to recharge the groundwater. In both cases, the infiltration systems are low profile concrete galleys due to the estimated seasonal high groundwater table.

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.

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SECTION 2

Stormwater Standards Summary
Illicit Discharge Statement

SECTION 2
STORMWATER STANDARDS SUMMARY

MassDEP Stormwater Standards:

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 to the public drainage system, stormwater runoff from paved surfaces is treated with deep sump catch basins. Roof runoff is treated with a subsurface infiltration system.

Standard 2: (Peak rate control and flood protection)

The proposed project reduces the amount of impervious cover. As demonstrated with the hydrologic model, the change in surface cover from pavement to grass/landscaped area affects the peak flow generated by the site. There is a reduction in peak flow to the Town of Framingham drainage system for the 1, 2, 10, 25, and 100-year 24-hour storm events. The results of the hydrologic analysis are in Table 1.

TABLE 1 - Existing vs. Proposed Peak Flows and Volumes at the Cochituate Road Drainage System

		DP (Cochituate Road)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
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2 year	3.2 in	3.85	3.35	0.276	0.233
10 year	4.6 in	5.80	5.32	0.425	0.377
25 year	5.4 in	6.89	6.43	0.510	0.461
100 year	6.6 in	8.53	8.08	0.640	0.588

Standard 3: (Recharge to Groundwater)

The 1.2 acre site is presently 87.6% impervious (45,964 square feet of impervious surface). Under proposed conditions, the site will be 72.5% impervious (38,083 square feet of impervious surface. This represents a 17.2% reduction in impervious area and is an improvement of existing conditions.

Two recharger units are proposed for roof runoff. Rather than discharge roof runoff to the surface (present condition), the runoff is directed to two subsurface recharger units. Roof runoff is considered clean and does not require pretreatment. One recharger is located on each side of the building to collect adjacent roof areas and to decentralize recharge. The rechargers consist of underground concrete leaching chambers surrounded with stone. An overflow pipe connects the recharger to the town drainage system.

The capture volume provided by Recharger #1 is 135 cubic feet and the capture volume provided by Recharger #2 is 180 cubic feet. Combined, they provide 315 cubic feet of recharge volume, or approximately inch of runoff over the building roof area.

Both rechargers will drain in approximately 3 hours. (6"/2.41 in/hr)

Standard 4: (80% TSS Removal)

The existing parking lot catch basins are an in-line configuration and receive flow from not only the immediate parking area but also from off-site drainage collection systems. This is not a preferable configuration because stormwater flowing through these structures can flush the contents of the catch basins.

It is proposed that three of the in-line catch basins structures be converted to drain manholes and three deep sump catch basins are installed in an off-line configuration. In this configuration, off-site stormwater will continue to flow through the drainage system, but will not affect the performance of the proposed catch basins in the parking area behind the bank building. Deep sump catch basins provide 25% TSS removal.

A Long-Term Pollution Prevention Plan, including a Stormwater Operation and Maintenance Plan, is included in Appendix 2.

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

Not Applicable. The proposed development does not have a high-intensity-use parking lot.

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 Resource Waters, or Cold-Water Fisheries).

Standard 7: (Redevelopment)

This project type is considered redevelopment. The project was deliberately designed to reduce the area of impervious cover on the site. This reduction favorably reduced peak flows and volumes that ultimately contribute to the public drainage system in Cochituate Road for all storm events. Based on limited area and groundwater, two relatively shallow rechargers are proposed to provide recharge at the site. To address water quality, three of the five on-line catch basins are proposed to be converted to drain manholes with three new adjacent deep sump catch basins.

Standard 8: (Erosion, Sediment Control)

This project is subject to the NPDES Phase II requirements for construction sites and will require a Stormwater Pollution Prevention Plan (SWPPP). The project plans include erosion and sediment control requirements and perimeter sediment control installations for the initial project setup and are to be maintained throughout construction.

Standard 9: (Operation & Maintenance)

A Long Term Pollution Prevention Pollution Prevention Plan (LTPPP) is included as Appendix 2 of this Stormwater Report. An Operation and Maintenance Plan for the stormwater system is included as part of the LTPPP.

Standard 10: (Illicit Discharges)

The proposed building design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed. An Illicit Discharge Statement is attached.

SCHOFIELD BROTHERS
Engineering • Surveying • Planning • GIS

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Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

August 7, 2015

24749

Town of Framingham
Department of Public Works
100 Western Avenue
Framingham, MA 01701

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 at #270 Cochituate Road in Framingham, MA:

- The proposed site development design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed.
- Sewage generated from the proposed dwellings will enter the Framingham public sewer.
- The design of the proposed stormwater system includes no proposed illicit discharges and no illicit discharge connections.
- A Long Term Pollution Prevention Plan for the stormwater system has been included with the Site Plan package.

Please feel free to contact me if you have any questions

Sincerely yours,
Schofield Brothers LLC

Bert E. Corey, P.E.
Senior Engineer

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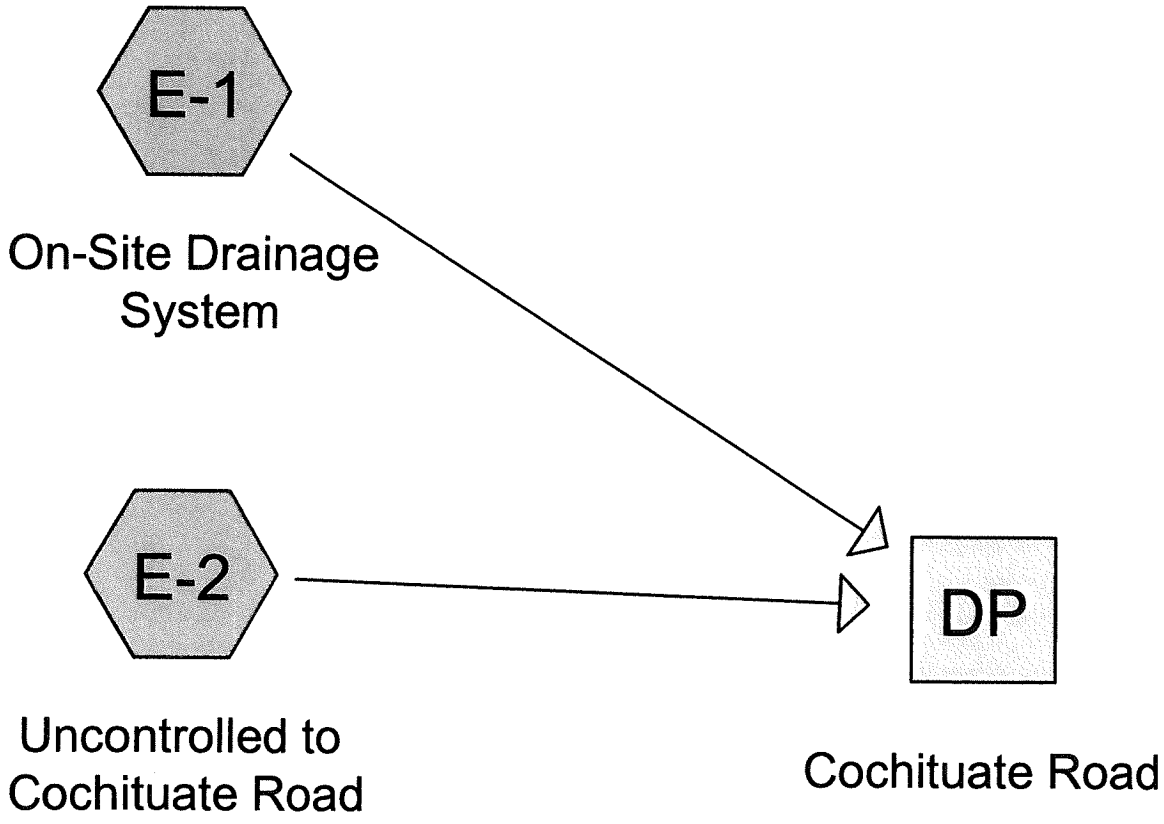
SECTION 3

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



Subcat Reach Pond Link

Routing Diagram for 24749-Existing Conditions Watershed Model
Prepared by Microsoft, Printed 8/10/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.080	79	50-75% Grass cover, Fair, HSG C Off-Site (E-1)
0.091	79	50-75% Grass cover, Fair, HSG C On-Site (E-1, E-2)
0.042	86	<50% Grass cover, Poor, HSG C On-Site (E-1, E-2)
0.049	74	>75% Grass cover, Good, HSG C Off-Site (E-1, E-2)
0.029	98	Paved parking, HSG C (E-2)
0.001	98	Paved parking, HSG C Off-Site (E-1)
0.792	98	Paved parking, HSG C Pavement (E-1)
0.061	98	Paved parking, HSG C Walkway (E-1)
0.161	98	Roofs, HSG C Building (E-1)
1.307	**94**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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: On-Site Drainage Runoff Area=54,563 sf 81.08% Impervious Runoff Depth>1.87"
Tc=5.0 min CN=94 Runoff=2.77 cfs 0.195 af

Subcatchment E-2: Uncontrolled to Runoff Area=2,368 sf 53.25% Impervious Runoff Depth>1.61"
Tc=5.0 min CN=91 Runoff=0.11 cfs 0.007 af

Reach DP: Cochituate Road Inflow=2.87 cfs 0.202 af
Outflow=2.87 cfs 0.202 af

Total Runoff Area = 1.307 ac Runoff Volume = 0.202 af Average Runoff Depth = 1.86"
20.08% Pervious = 0.262 ac 79.92% Impervious = 1.044 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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: On-Site Drainage Runoff Area=54,563 sf 81.08% Impervious Runoff Depth>2.54"
Tc=5.0 min CN=94 Runoff=3.71 cfs 0.265 af

Subcatchment E-2: Uncontrolled to Runoff Area=2,368 sf 53.25% Impervious Runoff Depth>2.26"
Tc=5.0 min CN=91 Runoff=0.15 cfs 0.010 af

Reach DP: Cochituate Road Inflow=3.85 cfs 0.276 af
Outflow=3.85 cfs 0.276 af

Total Runoff Area = 1.307 ac Runoff Volume = 0.276 af Average Runoff Depth = 2.53"
20.08% Pervious = 0.262 ac 79.92% Impervious = 1.044 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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: On-Site Drainage Runoff Area=54,563 sf 81.08% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=94 Runoff=5.57 cfs 0.408 af

Subcatchment E-2: Uncontrolled to Runoff Area=2,368 sf 53.25% Impervious Runoff Depth>3.59"
Tc=5.0 min CN=91 Runoff=0.23 cfs 0.016 af

Reach DP: Cochituate Road Inflow=5.80 cfs 0.425 af
Outflow=5.80 cfs 0.425 af

Total Runoff Area = 1.307 ac Runoff Volume = 0.425 af Average Runoff Depth = 3.90"
20.08% Pervious = 0.262 ac 79.92% Impervious = 1.044 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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: On-Site Drainage Runoff Area=54,563 sf 81.08% Impervious Runoff Depth>4.70"
Tc=5.0 min CN=94 Runoff=6.62 cfs 0.491 af

Subcatchment E-2: Uncontrolled to Runoff Area=2,368 sf 53.25% Impervious Runoff Depth>4.37"
Tc=5.0 min CN=91 Runoff=0.27 cfs 0.020 af

Reach DP: Cochituate Road Inflow=6.89 cfs 0.510 af
Outflow=6.89 cfs 0.510 af

Total Runoff Area = 1.307 ac Runoff Volume = 0.510 af Average Runoff Depth = 4.69"
20.08% Pervious = 0.262 ac 79.92% Impervious = 1.044 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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: On-Site Drainage Runoff Area=54,563 sf 81.08% Impervious Runoff Depth>5.89"
Tc=5.0 min CN=94 Runoff=8.19 cfs 0.615 af

Subcatchment E-2: Uncontrolled to Runoff Area=2,368 sf 53.25% Impervious Runoff Depth>5.54"
Tc=5.0 min CN=91 Runoff=0.34 cfs 0.025 af

Reach DP: Cochituate Road Inflow=8.53 cfs 0.640 af
Outflow=8.53 cfs 0.640 af

Total Runoff Area = 1.307 ac Runoff Volume = 0.640 af Average Runoff Depth = 5.87"
20.08% Pervious = 0.262 ac 79.92% Impervious = 1.044 ac

Summary for Subcatchment E-1: On-Site Drainage System

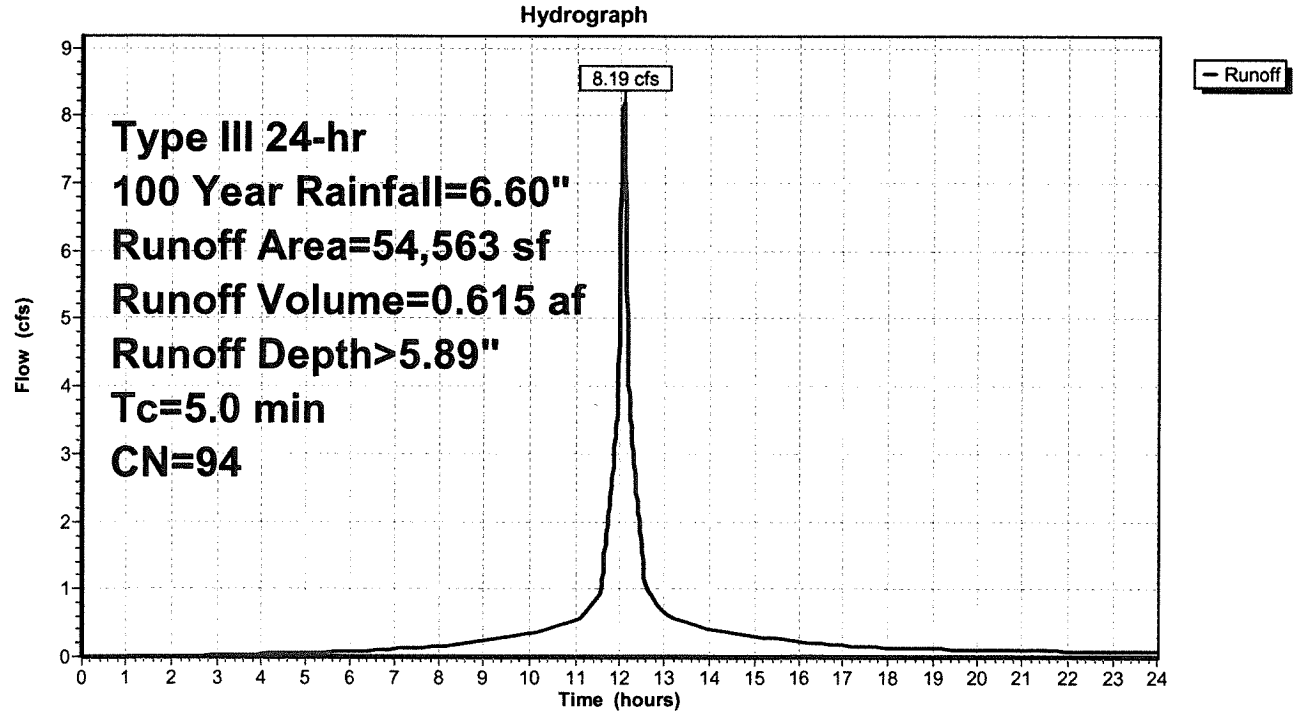
Runoff = 8.19 cfs @ 12.07 hrs, Volume= 0.615 af, Depth> 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

	Area (sf)	CN	Description
*	34,509	98	Paved parking, HSG C Pavement
*	2,670	98	Paved parking, HSG C Walkway
*	7,022	98	Roofs, HSG C Building
*	1,146	86	<50% Grass cover, Poor, HSG C On-Site
*	3,650	79	50-75% Grass cover, Fair, HSG C On-Site
*	36	98	Paved parking, HSG C Off-Site
*	2,045	74	>75% Grass cover, Good, HSG C Off-Site
*	3,485	79	50-75% Grass cover, Fair, HSG C Off-Site
	54,563	94	Weighted Average
	10,326		18.92% Pervious Area
	44,237		81.08% Impervious Area

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

Subcatchment E-1: On-Site Drainage System



Summary for Subcatchment E-2: Uncontrolled to Cochituate Road

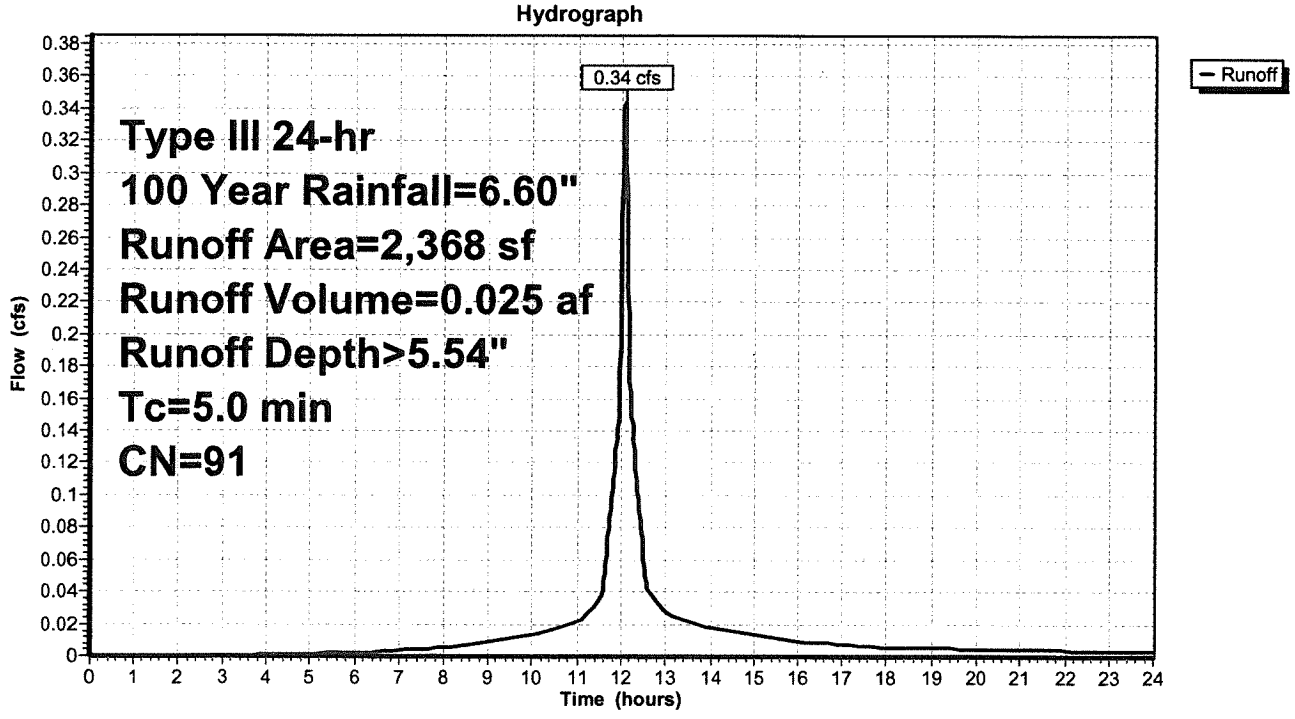
Runoff = 0.34 cfs @ 12.07 hrs, Volume= 0.025 af, Depth> 5.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

	Area (sf)	CN	Description
	1,261	98	Paved parking, HSG C
*	314	79	50-75% Grass cover, Fair, HSG C On-Site
*	695	86	<50% Grass cover, Poor, HSG C On-Site
*	98	74	>75% Grass cover, Good, HSG C Off-Site
	2,368	91	Weighted Average
	1,107		46.75% Pervious Area
	1,261		53.25% Impervious Area

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

Subcatchment E-2: Uncontrolled to Cochituate Road

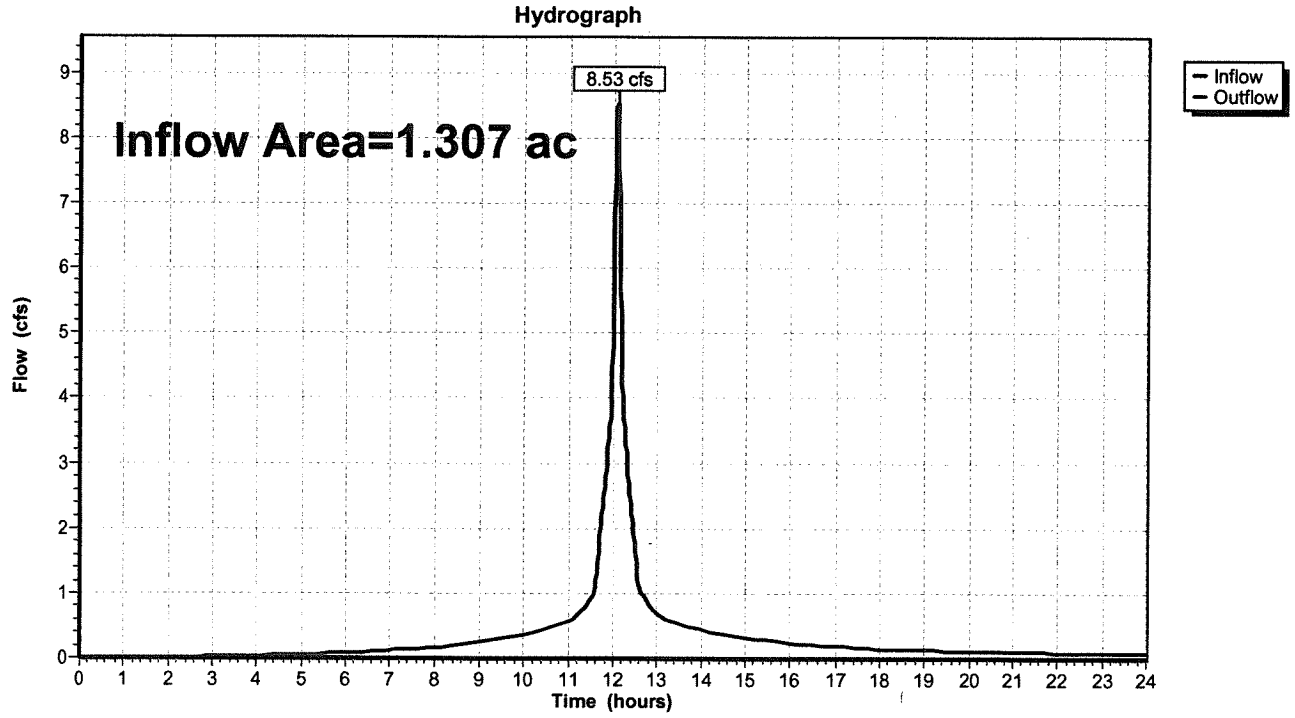


Summary for Reach DP: Cochituate Road

Inflow Area = 1.307 ac, 79.92% Impervious, Inflow Depth > 5.87" for 100 Year event
Inflow = 8.53 cfs @ 12.07 hrs, Volume= 0.640 af
Outflow = 8.53 cfs @ 12.07 hrs, Volume= 0.640 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP: Cochituate Road



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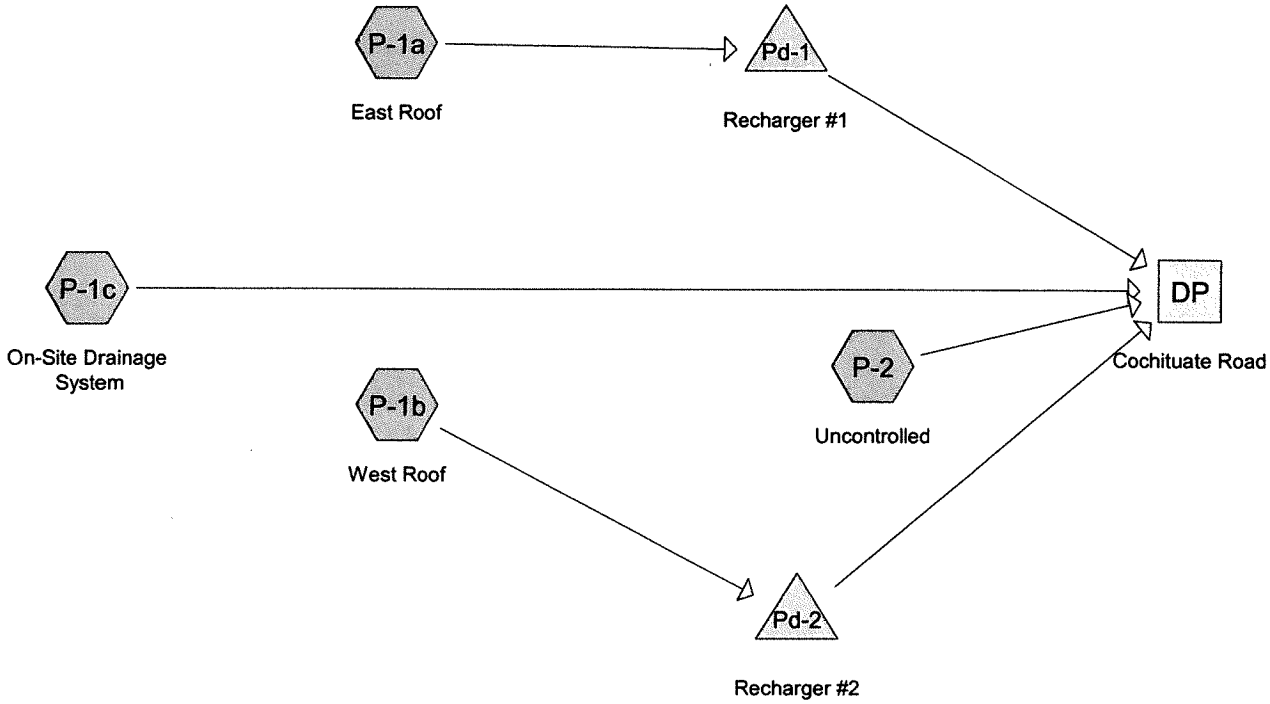
SECTION 4

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



Subcat Reach Pond Link

Routing Diagram for 24749-Proposed Conditions Watershed Model
Prepared by Microsoft, Printed 8/10/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.080	79	50-75% Grass cover, Fair, HSG C Off-Site (P-1c)
0.114	79	50-75% Grass cover, Fair, HSG C On-Site (P-1c)
0.029	74	>75% Grass cover, Good, HSG C Off-Site (P-1c, P-2)
0.205	74	>75% Grass cover, Good, HSG C On-Site (P-1c, P-2)
0.001	98	Paved parking, HSG C Off-Site (P-1c)
0.676	98	Paved parking, HSG C Pavement (P-1c, P-2)
0.093	98	Paved parking, HSG C Walkway (P-1c, P-2)
0.097	98	Roofs, HSG C (P-1a, P-1b)
0.009	98	Roofs, HSG C Building (P-1c)
1.304	**91**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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-1a: East Roof Runoff Area=1,447 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment P-1b: West Roof Runoff Area=2,780 sf 100.00% Impervious Runoff Depth>2.27"
Tc=5.0 min CN=98 Runoff=0.16 cfs 0.012 af

Subcatchment P-1c: On-Site Drainage Runoff Area=50,908 sf 65.20% Impervious Runoff Depth>1.53"
Tc=5.0 min CN=90 Runoff=2.17 cfs 0.149 af

Subcatchment P-2: Uncontrolled Runoff Area=1,682 sf 43.46% Impervious Runoff Depth>1.11"
Tc=5.0 min CN=84 Runoff=0.05 cfs 0.004 af

Reach DP: Cochituate Road Inflow=2.31 cfs 0.164 af
Outflow=2.31 cfs 0.164 af

Pond Pd-1: Recharger #1 Peak Elev=97.09' Storage=150 cf Inflow=0.08 cfs 0.006 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.03 cfs 0.003 af

Pond Pd-2: Recharger #2 Peak Elev=97.19' Storage=230 cf Inflow=0.16 cfs 0.012 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.12 cfs 0.008 af

Total Runoff Area = 1.304 ac Runoff Volume = 0.171 af Average Runoff Depth = 1.57"
32.85% Pervious = 0.428 ac 67.15% Impervious = 0.876 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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-1a: East Roof Runoff Area=1,447 sf 100.00% Impervious Runoff Depth>2.97"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment P-1b: West Roof Runoff Area=2,780 sf 100.00% Impervious Runoff Depth>2.97"
Tc=5.0 min CN=98 Runoff=0.21 cfs 0.016 af

Subcatchment P-1c: On-Site Drainage Runoff Area=50,908 sf 65.20% Impervious Runoff Depth>2.17"
Tc=5.0 min CN=90 Runoff=3.05 cfs 0.211 af

Subcatchment P-2: Uncontrolled Runoff Area=1,682 sf 43.46% Impervious Runoff Depth>1.68"
Tc=5.0 min CN=84 Runoff=0.08 cfs 0.005 af

Reach DP: Cochituate Road Inflow=3.35 cfs 0.233 af
Outflow=3.35 cfs 0.233 af

Pond Pd-1: Recharger #1 Peak Elev=97.16' Storage=161 cf Inflow=0.11 cfs 0.008 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.09 cfs 0.005 af

Pond Pd-2: Recharger #2 Peak Elev=97.23' Storage=242 cf Inflow=0.21 cfs 0.016 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.18 cfs 0.012 af

Total Runoff Area = 1.304 ac Runoff Volume = 0.240 af Average Runoff Depth = 2.21"
32.85% Pervious = 0.428 ac 67.15% Impervious = 0.876 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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-1a: East Roof Runoff Area=1,447 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=0.15 cfs 0.012 af

Subcatchment P-1b: West Roof Runoff Area=2,780 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=0.30 cfs 0.023 af

Subcatchment P-1c: On-Site Drainage Runoff Area=50,908 sf 65.20% Impervious Runoff Depth>3.49"
Tc=5.0 min CN=90 Runoff=4.81 cfs 0.340 af

Subcatchment P-2: Uncontrolled Runoff Area=1,682 sf 43.46% Impervious Runoff Depth>2.90"
Tc=5.0 min CN=84 Runoff=0.14 cfs 0.009 af

Reach DP: Cochituate Road Inflow=5.32 cfs 0.377 af
Outflow=5.32 cfs 0.377 af

Pond Pd-1: Recharger #1 Peak Elev=97.21' Storage=169 cf Inflow=0.15 cfs 0.012 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.14 cfs 0.009 af

Pond Pd-2: Recharger #2 Peak Elev=97.29' Storage=257 cf Inflow=0.30 cfs 0.023 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.26 cfs 0.019 af

Total Runoff Area = 1.304 ac Runoff Volume = 0.384 af Average Runoff Depth = 3.54"
32.85% Pervious = 0.428 ac 67.15% Impervious = 0.876 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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-1a: East Roof Runoff Area=1,447 sf 100.00% Impervious Runoff Depth>5.16"
Tc=5.0 min CN=98 Runoff=0.18 cfs 0.014 af

Subcatchment P-1b: West Roof Runoff Area=2,780 sf 100.00% Impervious Runoff Depth>5.16"
Tc=5.0 min CN=98 Runoff=0.35 cfs 0.027 af

Subcatchment P-1c: On-Site Drainage Runoff Area=50,908 sf 65.20% Impervious Runoff Depth>4.26"
Tc=5.0 min CN=90 Runoff=5.81 cfs 0.415 af

Subcatchment P-2: Uncontrolled Runoff Area=1,682 sf 43.46% Impervious Runoff Depth>3.64"
Tc=5.0 min CN=84 Runoff=0.17 cfs 0.012 af

Reach DP: Cochituate Road Inflow=6.43 cfs 0.461 af
Outflow=6.43 cfs 0.461 af

Pond Pd-1: Recharger #1 Peak Elev=97.23' Storage=173 cf Inflow=0.18 cfs 0.014 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.17 cfs 0.011 af

Pond Pd-2: Recharger #2 Peak Elev=97.32' Storage=265 cf Inflow=0.35 cfs 0.027 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.31 cfs 0.023 af

Total Runoff Area = 1.304 ac Runoff Volume = 0.468 af Average Runoff Depth = 4.31"
32.85% Pervious = 0.428 ac 67.15% Impervious = 0.876 ac

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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-1a: East Roof Runoff Area=1,447 sf 100.00% Impervious Runoff Depth>6.36"
Tc=5.0 min CN=98 Runoff=0.22 cfs 0.018 af

Subcatchment P-1b: West Roof Runoff Area=2,780 sf 100.00% Impervious Runoff Depth>6.36"
Tc=5.0 min CN=98 Runoff=0.43 cfs 0.034 af

Subcatchment P-1c: On-Site Drainage Runoff Area=50,908 sf 65.20% Impervious Runoff Depth>5.43"
Tc=5.0 min CN=90 Runoff=7.30 cfs 0.529 af

Subcatchment P-2: Uncontrolled Runoff Area=1,682 sf 43.46% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=84 Runoff=0.22 cfs 0.015 af

Reach DP: Cochituate Road Inflow=8.08 cfs 0.588 af
Outflow=8.08 cfs 0.588 af

Pond Pd-1: Recharger #1 Peak Elev=97.25' Storage=177 cf Inflow=0.22 cfs 0.018 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.21 cfs 0.014 af

Pond Pd-2: Recharger #2 Peak Elev=97.36' Storage=276 cf Inflow=0.43 cfs 0.034 af
8.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=0.39 cfs 0.029 af

Total Runoff Area = 1.304 ac Runoff Volume = 0.595 af Average Runoff Depth = 5.48"
32.85% Pervious = 0.428 ac 67.15% Impervious = 0.876 ac

Summary for Subcatchment P-1a: East Roof

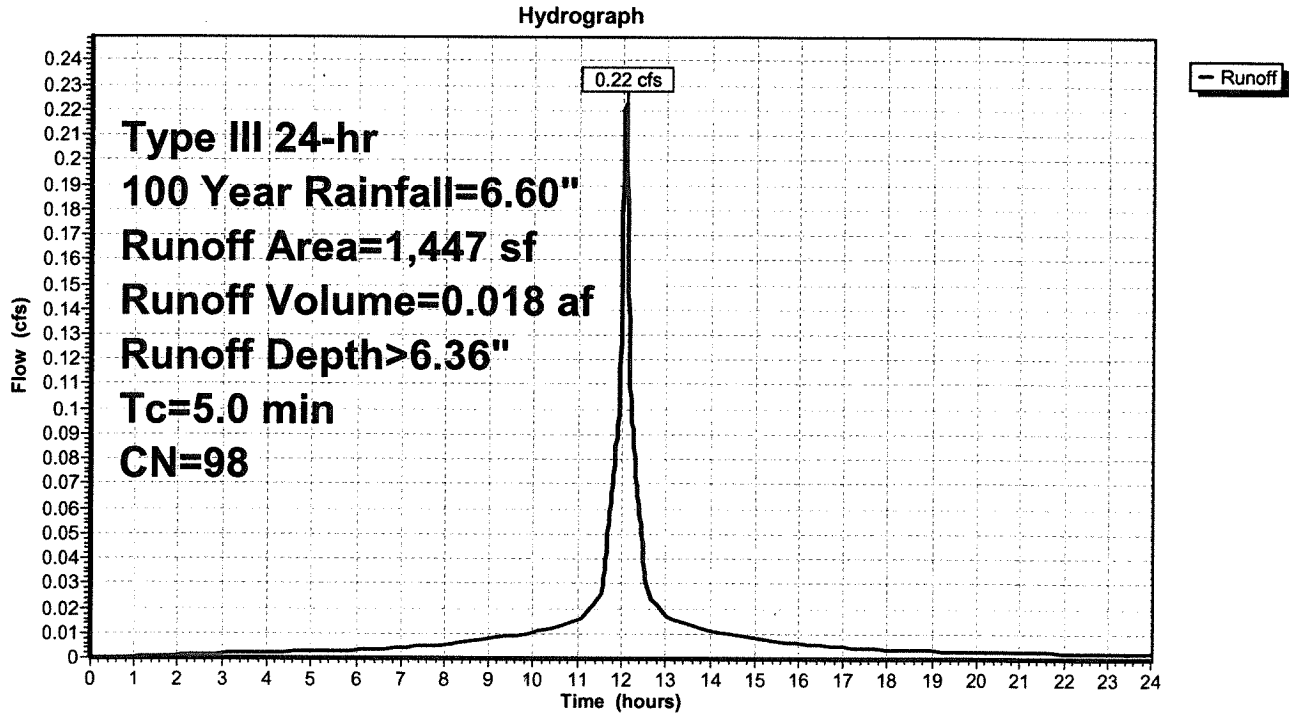
Runoff = 0.22 cfs @ 12.07 hrs, Volume= 0.018 af, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

Area (sf)	CN	Description
1,447	98	Roofs, HSG C
1,447		100.00% Impervious Area

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

Subcatchment P-1a: East Roof



Summary for Subcatchment P-1b: West Roof

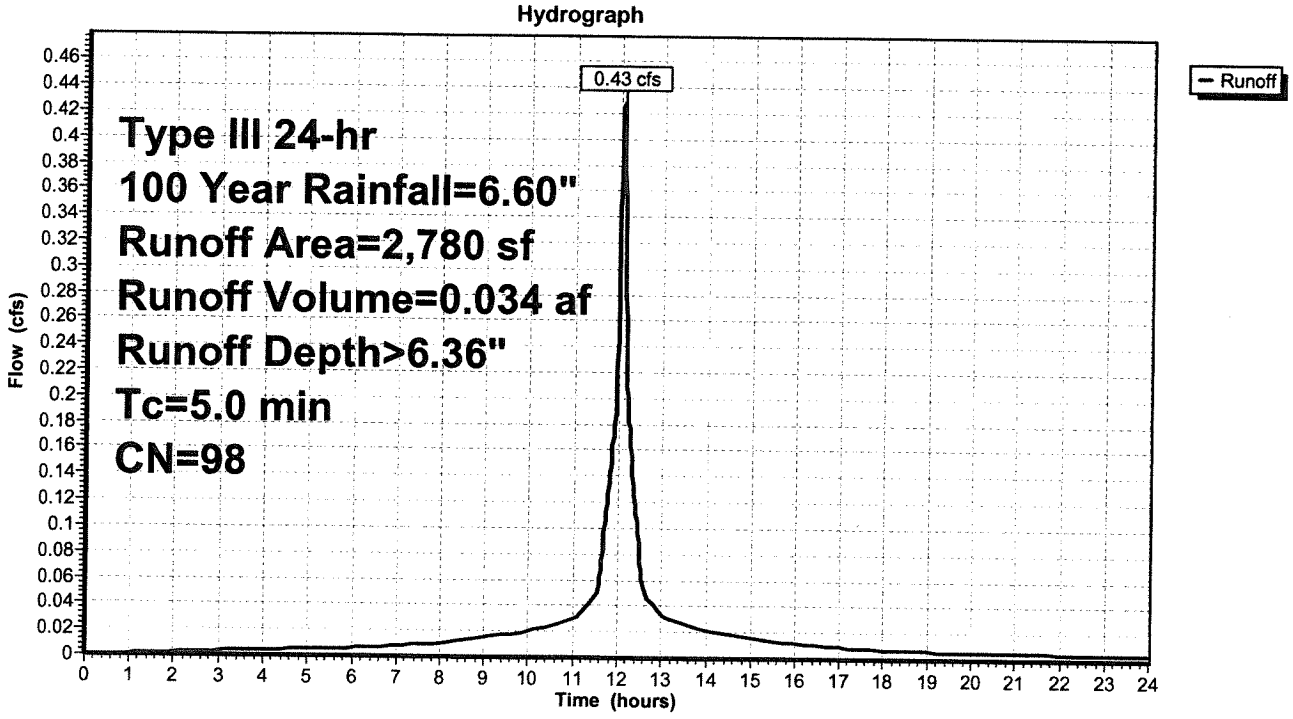
Runoff = 0.43 cfs @ 12.07 hrs, Volume= 0.034 af, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

Area (sf)	CN	Description
2,780	98	Roofs, HSG C
2,780		100.00% Impervious Area

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

Subcatchment P-1b: West Roof



Summary for Subcatchment P-1c: On-Site Drainage System

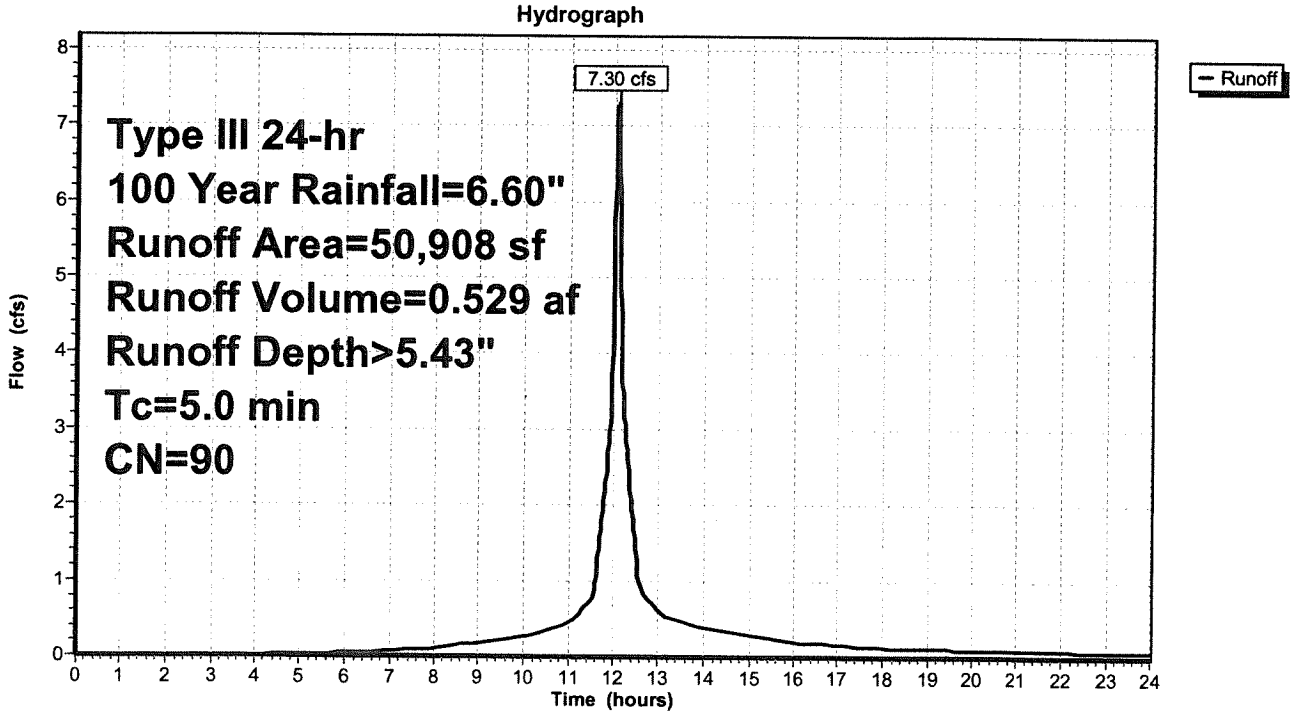
Runoff = 7.30 cfs @ 12.07 hrs, Volume= 0.529 af, Depth> 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

	Area (sf)	CN	Description
*	28,833	98	Paved parking, HSG C Pavement
*	3,945	98	Paved parking, HSG C Walkway
*	380	98	Roofs, HSG C Building
*	8,097	74	>75% Grass cover, Good, HSG C On-Site
*	4,956	79	50-75% Grass cover, Fair, HSG C On-Site
*	36	98	Paved parking, HSG C Off-Site
*	1,176	74	>75% Grass cover, Good, HSG C Off-Site
*	3,485	79	50-75% Grass cover, Fair, HSG C Off-Site
	50,908	90	Weighted Average
	17,714		34.80% Pervious Area
	33,194		65.20% Impervious Area

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

Subcatchment P-1c: On-Site Drainage System



Summary for Subcatchment P-2: Uncontrolled

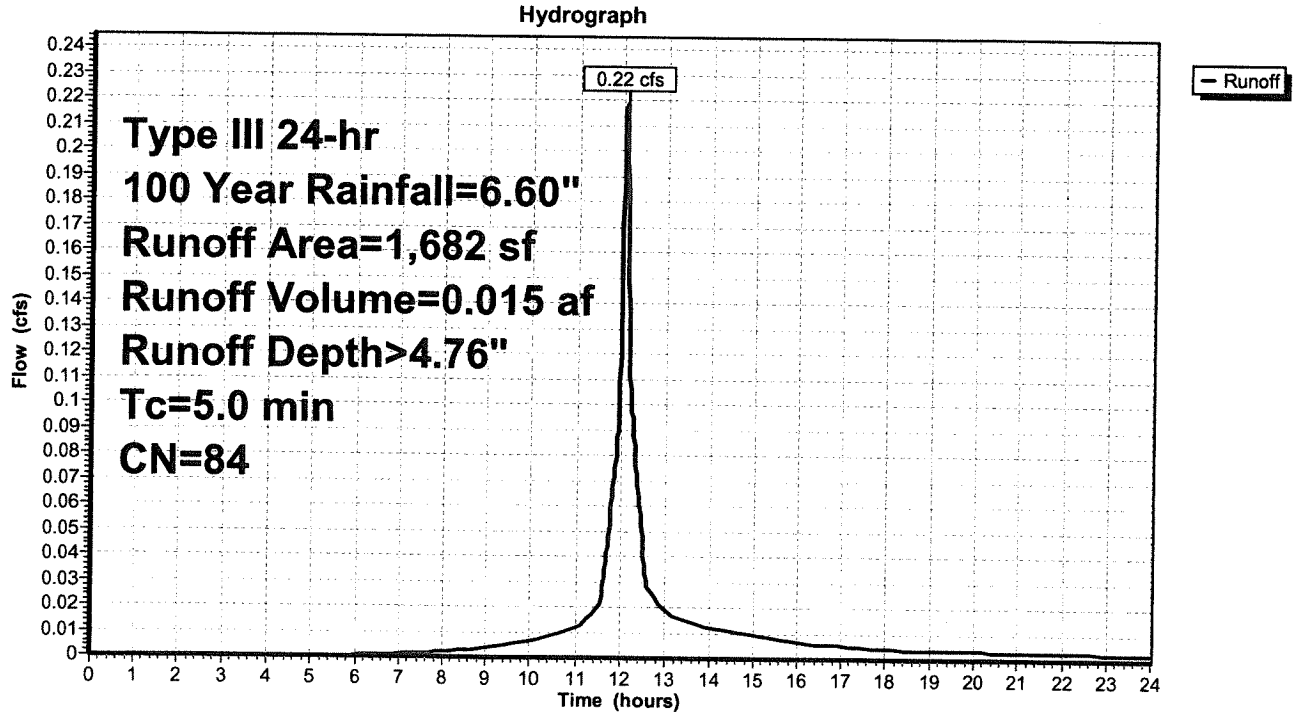
Runoff = 0.22 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=6.60"

	Area (sf)	CN	Description
*	608	98	Paved parking, HSG C Pavement
*	853	74	>75% Grass cover, Good, HSG C On-Site
*	123	98	Paved parking, HSG C Walkway
*	98	74	>75% Grass cover, Good, HSG C Off-Site
	1,682	84	Weighted Average
	951		56.54% Pervious Area
	731		43.46% Impervious Area

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

Subcatchment P-2: Uncontrolled

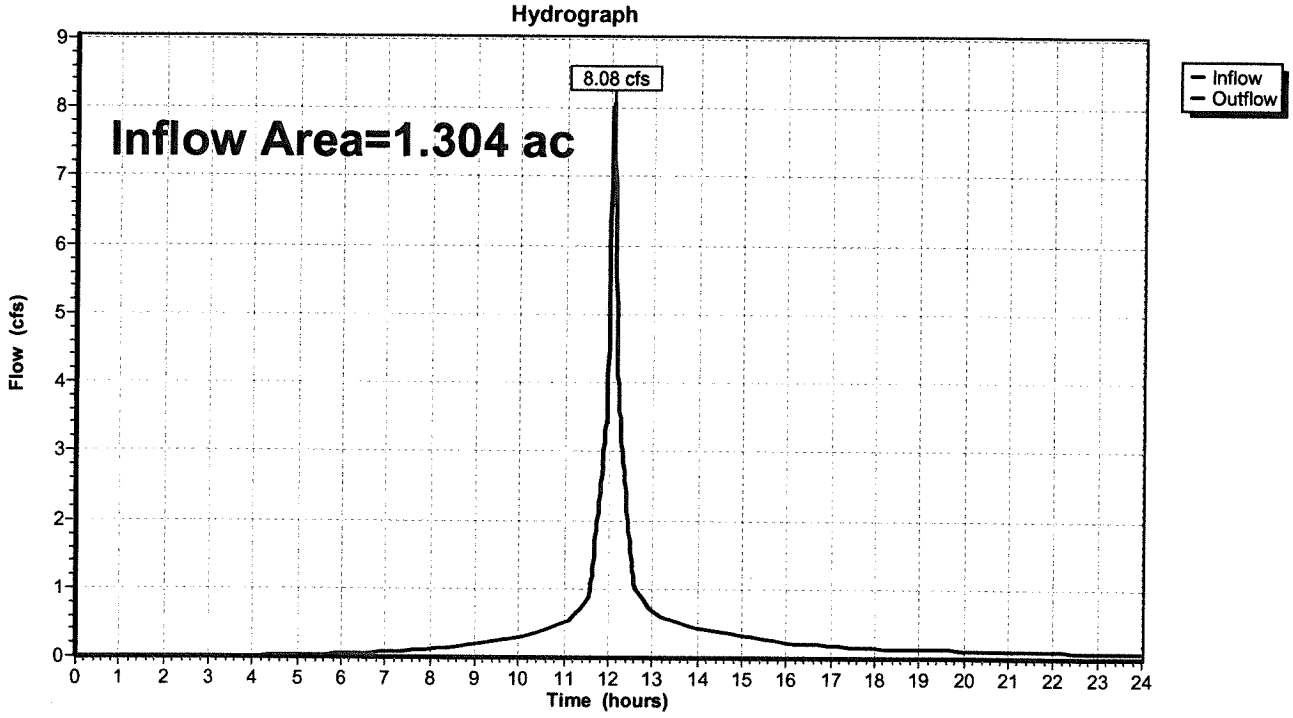


Summary for Reach DP: Cochituate Road

Inflow Area = 1.304 ac, 67.15% Impervious, Inflow Depth > 5.41" for 100 Year event
Inflow = 8.08 cfs @ 12.07 hrs, Volume= 0.588 af
Outflow = 8.08 cfs @ 12.07 hrs, Volume= 0.588 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP: Cochituate Road



Summary for Pond Pd-1: Recharger #1

Inflow Area = 0.033 ac,100.00% Impervious, Inflow Depth > 6.36" for 100 Year event
Inflow = 0.22 cfs @ 12.07 hrs, Volume= 0.018 af
Outflow = 0.21 cfs @ 12.10 hrs, Volume= 0.014 af, Atten= 7%, Lag= 1.8 min
Primary = 0.21 cfs @ 12.10 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 97.25' @ 12.10 hrs Surf.Area= 252 sf Storage= 177 cf

Plug-Flow detention time= 142.3 min calculated for 0.014 af (82% of inflow)
Center-of-Mass det. time= 69.7 min (812.0 - 742.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.00'	125 cf	**6.00'W x 42.00'L x 2.50'H Field A** 630 cf Overall - 317 cf Embedded = 313 cf x 40.0% Voids
#2A	96.50'	227 cf	**Galley 4x8x2** x 5 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf
		352 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	97.00'	**8.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.00' / 96.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.21 cfs @ 12.10 hrs HW=97.25' (Free Discharge)
1=Culvert (Inlet Controls 0.21 cfs @ 1.71 fps)

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

Chamber Model = Galley 4x8x2 (Concrete Galley, UCPI 24" Low Profile Galley or equivalent)
Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf
Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf

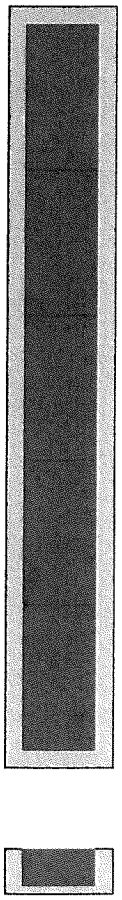
5 Chambers/Row x 8.00' Long = 40.00' Row Length +12.0" End Stone x 2 = 42.00' Base Length
1 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 6.00' Base Width
6.0" Base + 24.0" Chamber Height = 2.50' Field Height

5 Chambers x 45.3 cf = 226.5 cf Chamber Storage
5 Chambers x 63.4 cf = 316.8 cf Displacement

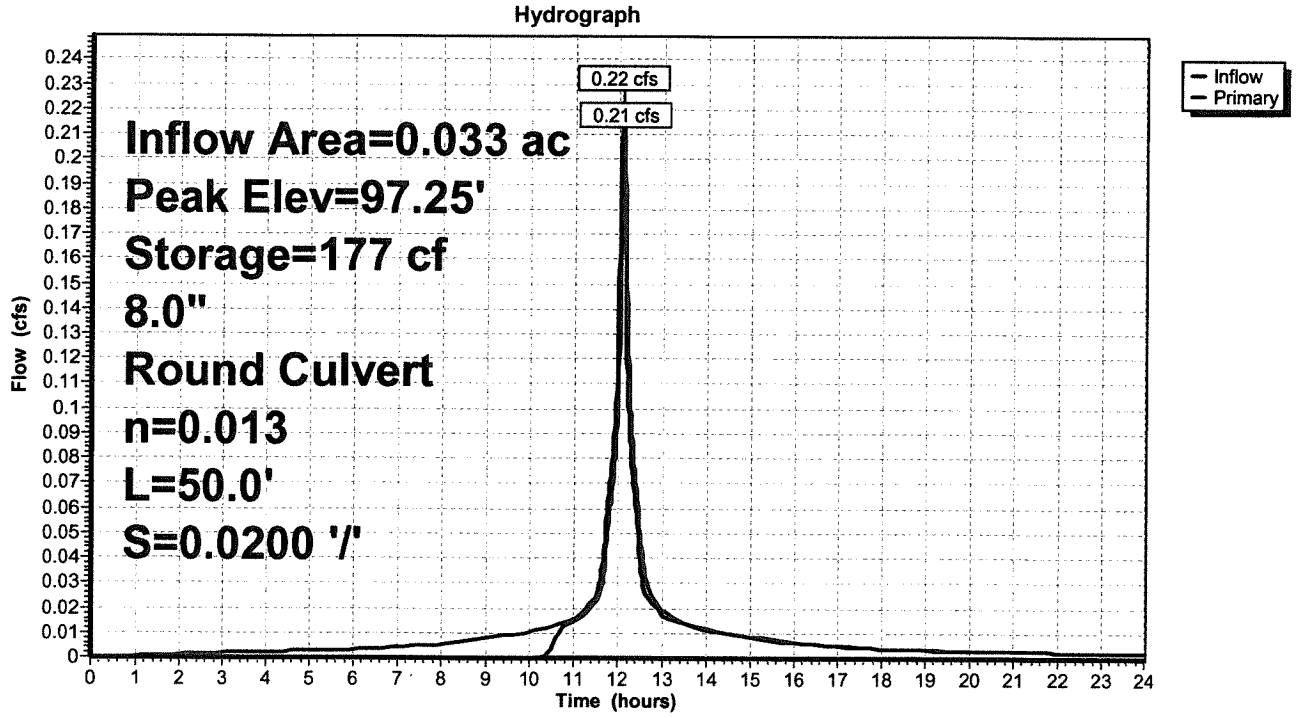
630.0 cf Field - 316.8 cf Chambers = 313.2 cf Stone x 40.0% Voids = 125.3 cf Stone Storage

Chamber Storage + Stone Storage = 351.8 cf = 0.008 af
Overall Storage Efficiency = 55.8%

5 Chambers
23.3 cy Field
11.6 cy Stone



Pond Pd-1: Recharger #1



Summary for Pond Pd-2: Recharger #2

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth > 6.36" for 100 Year event
Inflow = 0.43 cfs @ 12.07 hrs, Volume= 0.034 af
Outflow = 0.39 cfs @ 12.10 hrs, Volume= 0.029 af, Atten= 9%, Lag= 2.1 min
Primary = 0.39 cfs @ 12.10 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 97.36' @ 12.10 hrs Surf.Area= 364 sf Storage= 276 cf

Plug-Flow detention time= 116.7 min calculated for 0.029 af (87% of inflow)
Center-of-Mass det. time= 57.9 min (800.3 - 742.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.10'	136 cf	**14.00'W x 26.00'L x 2.50'H Field A** 910 cf Overall - 570 cf Embedded = 340 cf x 40.0% Voids
#2A	96.60'	408 cf	**Galley 4x8x2** x 9 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf 3 Rows of 3 Chambers
		544 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	97.00'	**8.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.00' / 96.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.39 cfs @ 12.10 hrs HW=97.36' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.39 cfs @ 2.04 fps)

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

Chamber Model = Galley 4x8x2 (Concrete Galley, UCPI 24" Low Profile Galley or equivalent)
Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf
Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf

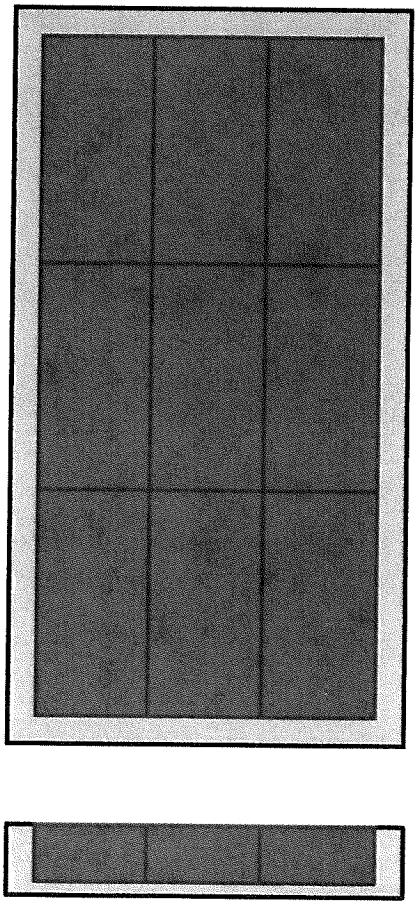
3 Chambers/Row x 8.00' Long = 24.00' Row Length +12.0" End Stone x 2 = 26.00' Base Length
3 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 24.0" Chamber Height = 2.50' Field Height

9 Chambers x 45.3 cf = 407.7 cf Chamber Storage
9 Chambers x 63.4 cf = 570.2 cf Displacement

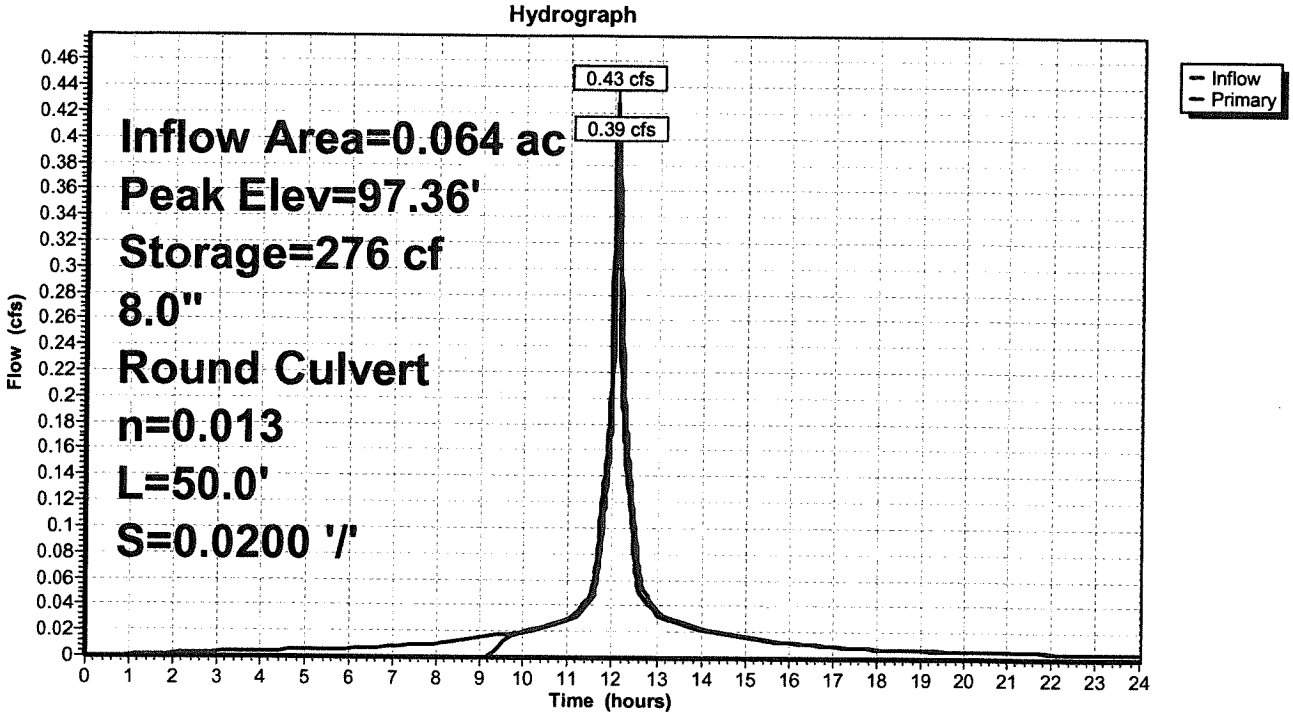
910.0 cf Field - 570.2 cf Chambers = 339.8 cf Stone x 40.0% Voids = 135.9 cf Stone Storage

Chamber Storage + Stone Storage = 543.6 cf = 0.012 af
Overall Storage Efficiency = 59.7%

9 Chambers
33.7 cy Field
12.6 cy Stone



Pond Pd-2: Recharger #2



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APPENDIX 1

NRCS soils information for Middlesex County and soil data from Fay, Spofford & Thorndike as part of a 21E Assessment on May 5, 2015.

Soil Map—Middlesex County, Massachusetts
(Avidia Bank)

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

7/24/2015
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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: http://websoilsurvey.nrcs.usda.gov
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 14, Sep 19, 2014

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.

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Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
33B	Raypol silt loam, 0 to 5 percent slopes	2.0	4.9%
340D	Broadbrook very fine sandy loam, 8 to 25 percent slopes	2.3	5.9%
602	Urban land	24.9	62.8%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	0.1	0.2%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	10.4	26.2%
Totals for Area of Interest		**39.7**	**100.0%**

Map Unit Description

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, can be used to determine the composition and properties of a unit.

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

Soils that have profiles that are almost alike make up a *soil series.* All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

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

Report—Map Unit Description

Middlesex County, Massachusetts

33B—Raypol silt loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: vqnf
Elevation: 50 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Raypol

Setting

Landform: Depressions, terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy glaciolacustrine deposits over loose sandy and gravelly glaciofluvial deposits derived from igneous and sedimentary rock

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 19 inches: silt loam
H3 - 19 to 48 inches: very gravelly loamy sand
H4 - 48 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D

Minor Components

Wareham

Percent of map unit: 8 percent
Landform: Depressions, deltas, terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave

Raynham

Percent of map unit: 8 percent

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

Birdsall

Percent of map unit: 2 percent
Landform: Depressions, flats
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave

Tisbury

Percent of map unit: 2 percent
Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave

340D—Broadbrook very fine sandy loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: vr1t
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Broadbrook

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable silty eolian deposits over dense loamy lodgment till derived from gneiss

Typical profile

H1 - 0 to 2 inches: moderately decomposed plant material
H2 - 2 to 10 inches: very fine sandy loam
H3 - 10 to 20 inches: gravelly very fine sandy loam

H4 - 20 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 20 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Minor Components

Narragansett

Percent of map unit: 7 percent
Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Paxton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex

Rainbow

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope
Landform position (three-dimensional): Nose slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Udorthents, wet substratum

Percent of map unit: 5 percent

Udorthents, loamy

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

622C—Paxton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: vqsg
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 40 percent
Paxton and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over dense loamy lodgment till derived from granite and gneiss

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 13 inches: fine sandy loam
H3 - 13 to 22 inches: sandy loam
H4 - 22 to 26 inches: sandy loam
H5 - 26 to 65 inches: fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Charlton

Percent of map unit: 10 percent
Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex

Woodbridge

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope, shoulder
Landform position (three-dimensional): Base slope, nose slope
Down-slope shape: Concave

Across-slope shape: Concave

Montauk

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex

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

Map Unit Setting

National map unit symbol: vqsj
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge and similar soils: 40 percent
Urban land: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Description of Woodbridge

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable loamy eolian deposits over dense loamy lodgment till derived from granite and gneiss

Typical profile

H1 - 0 to 2 inches: moderately decomposed plant material
H2 - 2 to 4 inches: fine sandy loam
H3 - 4 to 30 inches: fine sandy loam
H4 - 30 to 65 inches: fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex

Scituate

Percent of map unit: 7 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Linear
Across-slope shape: Concave

Ridgebury

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 14, Sep 19, 2014

FST

PROJECT

PROJECT NUMBER

SUBJECT SB-1 + SB-2 (INDOORS)

SHEET NUMBER

DATE 5/5/15

COMPUTED BY

CHECKED BY

	DEPTH	RECOVERY	PID	DESCRIPTION	
SB-1 10:30	0 - 3	15"	Ø	Top 1" - GRAVEL 1"-13" - BRN FC SAND, TRACE GRAVEL BOT 2" - TAN CF SAND, TRACE GRAVEL	
10:45	3 - 6	21"	0.1 Ø	TOP 10" BRN CF SAND, SOME F GRAVEL BOT 10" TN-BRN SILTY SAND, TRACE GRAVEL	WATER @ 4
11:00	6 - 8' REFUSAL	11"	Ø	TN BRN SILTY SAND w/ FINE GRAVEL TRACE C GRAVEL	
SB-2 11:05	0-3	18"	Ø	BRN MF SAND, SOME C SAND TRACE GRAVEL	
11:30	3-6	20"	1.6	BRN CF SAND, LITTLE SILT, SOME M GRAVEL	WATER 4'
11:40	6-7 REFUSAL	3"	2.2	SAME	
DS-3 12:20 MW-1 SCREEN 14-4 DRY SAND	0-5	26"	22.6 2.0	2" ASPHALT 12" BRN SILTY MF SAND TRACE GRAVEL BOT 12" BRN SILTY MF SAND, SOME GRAV + C SAND	
12:30	5-10	15"	4.4	BRN CF SAND w/ SILT, SOME GRAVEL	WATER @ 6.5
13:00	10-15	43"	0.6 Ø	0-15" GRAVELLY CF SAND, TRACE SILT 15-43" SILTY C SAND, TRACE F GRAVEL	
SB-4 MW-2 ~~0-5~~ SCREEN 14-4 14:00	5-10	30"	Ø Ø	6" BRN MF SAND LITTLE SILT + GRAV 24" DK BRN CF SAND w/ GRAVEL, TRACE SILT	WATER 6.7
14:30	10-15	50"	8.4 10.8	TOP 24" CM SAND AND F GRAV - BRN BOT TAN-GRAY FE SILTY SAND	

FST

PROJECT

PROJECT NUMBER

SUBJECT

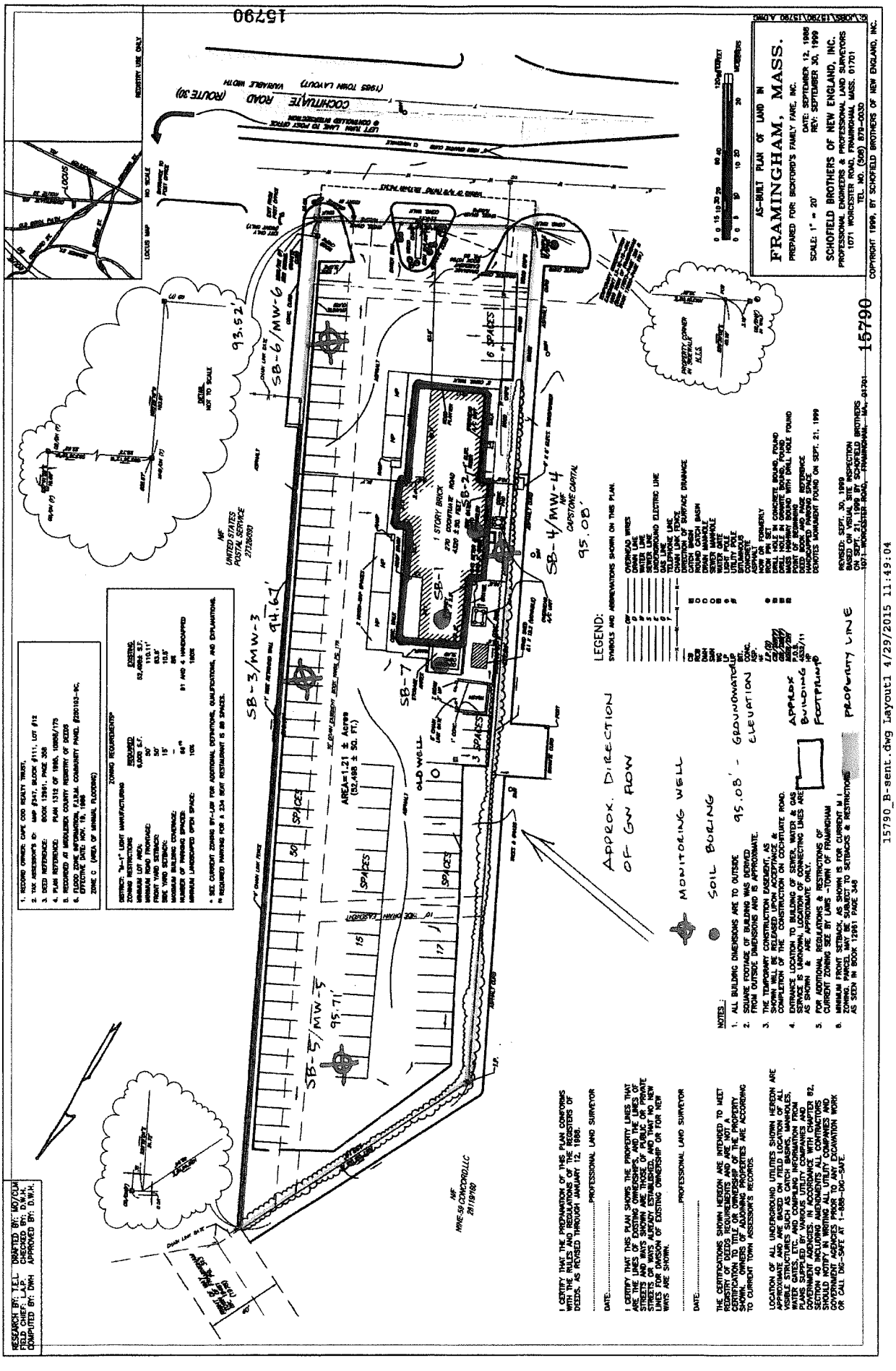
SHEET NUMBER

DATE 5/6/15

COMPUTED BY LA

CHECKED BY

	DEPTH	REC.	PID	DESC.
SB-5 0900 MW-3 SCREEN 14-4'	0-5	31	T 2.7 B 3.6	6" ASPHALT 0-11" TAN SILTY MF SAND, LITTLE MC GRAVEL 11-17" TAN CM SAND SOME FC GRAVEL 17-31 PALE TAN/GRAY/BLACK MF SAND w/ SILT + CSAND, LITTLE GRAVEL
0915	5-10	28"	2.3	BRN-TN SILTY MF SAND SOME GRAVEL → SILTY F SAND @ BOT 6" W/ LITTLE GRAVEL WATER @ 6-7
0930	10-15	22"	0	TAN SILTY F SAND, LITTLE GRAVEL
SB-6 0900 MW-4 SCREEN 11-6'	0-5	21"	14.8	TAN MF SAND, SOME F GRAVEL, ~~LITTLE~~ TRACE CSAND BOT 3" MF SAND, SOME SILT, TRACE GRAVEL
0915	5-10	32	T 18.5 B 17.0	TOP 20" MF SAND, SOME FC GRAVEL TRACE CSAND BOT 12" TAN F SILTY SAND, SOME FN GRAVEL WATER @ 6-7
0930	10-11 REFUSAL	7" ON BRK.	13.8	SAME
SB-7 1000	0-5	12"	T 4.9 B 3.0	4" ASPHALT TOP 6" ~~LT~~ TAN CF SAND BOT 6" BRN CF SAND, LITTLE GRAVEL
1015	5-10	18"	T 11.2 B 15.9	TOP 2" SAME 12" CM SAND, w/ F GRAVEL, LITTLE FSAND + SILT (TN) LAST 4" TAN SILTY MF SAND WATER @ 6-7
1030	10-15	22	5.6	SAME


AS-BUILT PLAN OF LAND IN
FRAMINGHAM, MASS.
PREPARED FOR: SICKFORD'S FAMILY FARE, INC.
SCALE: 1" = 20' DATE: SEPTEMBER 12, 1998
REV: SEPTEMBER 30, 1999
SCHOFIELD BROTHERS OF NEW ENGLAND, INC.
PROFESSIONAL ENGINEERS & PROFESSIONAL LAND SURVEYORS
1071 WORCESTER ROAD, FRAMINGHAM, MASS. 01701
TEL. NO. (508) 875-2330
COPYRIGHT 1998, BY SCHOFIELD BROTHERS OF NEW ENGLAND, INC.
15790
COCHITUATE ROAD (ROUTE 30)
VARIABLE WIDTH
(1985 TOWN LAYOUT)
LOCUS MAP
NO SCALE
REGISTRY USE ONLY
1. RECORD OWNER: CAPE COD REALTY TRUST.
2. TAX ASSESSOR'S ID: MAP 23-01, BLOCK 0111, LOT 012
3. DEED REFERENCE: BOOK 12961, PAGE 358
4. PLAN REFERENCE: PLAN 1312 OF 1985, 1095B/175
5. RECORDED AT MIDDLESEX COUNTY REGISTRY OF DEEDS
6. FLOOD ZONE INFORMATION, F.I.R.M. COMMUNITY PANEL #250183-0C, EFFECTIVE DATE: NOV. 15, 1985
ZONE C (AREA OF MINIMAL FLOODING)
ZONING REQUIREMENTS
DISTRICT: "A-1" LIGHT MANUFACTURING
ZONING RESTRICTIONS
REQUIRED
EXISTING
MINIMUM LOT AREA: 60,000 S.F. 52,466± S.F.
MINIMUM ROAD FRONTAGE: 50' 110.11'
FRONT YARD SETBACK: 50' 63.5'
SIDE YARD SETBACK: 15' 15.8'
MAXIMUM BUILDING COVERAGE: 30% 25.6%
NUMBER OF PARKING SPACES: 64* 81 AND 4 HANDICAPPED
MINIMUM LANDSCAPED OPEN SPACE: 10% 180%
* SEE CURRENT ZONING BY-LAW FOR ADDITIONAL DEFINITIONS, QUALIFICATIONS, AND EXPLANATIONS.
** REQUIRED PARKING FOR A 234 SEAT RESTAURANT IS 80 SPACES.
RESEARCH BY: T.E.L. DRAFTED BY: MO'/DLM
FIELD CHIEF: L.A.P. CHECKED BY: D.M.H.
COMPUTED BY: DMH APPROVED BY: D.M.H.
I CERTIFY THAT THE PREPARATION OF THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS, AS REVISED THROUGH JANUARY 12, 1988.
.....PROFESSIONAL LAND SURVEYOR
DATE:.....
I CERTIFY THAT THIS PLAN SHOWS THE PROPERTY LINES THAT ARE THE LINES OF EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES ARE SHOWN DIVIDING ANY EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.
.....PROFESSIONAL LAND SURVEYOR
DATE:.....
THE CERTIFICATIONS SHOWN HEREON ARE INTENDED TO MEET REGISTRY OF DEEDS REQUIREMENTS AND ARE NOT A CERTIFICATION TO TITLE OR OWNERSHIP OF THE PROPERTY SHOWN. OWNERS OF ADJOINING PROPERTIES ARE ACCORDING TO CURRENT TOWN ASSESSOR'S RECORDS.
LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND HAVE BEEN COMPILED FROM ON-SITE LOCATION OF ALL VISIBLE STRUCTURES SUCH AS CATCH BASINS, MANHOLES, WATER GATES, ETC. AND COMPILING INFORMATION FROM PLANS SUPPLIED BY VARIOUS UTILITY COMPANIES AND GOVERNMENT AGENCIES. IN ACCORDANCE WITH CHAPTER 82, SECTION 40 INCLUDING AMENDMENTS ALL CONTRACTORS SHOULD NOTIFY IN WRITING ALL UTILITY COMPANIES AND GOVERNMENT AGENCIES PRIOR TO ANY EXCAVATION WORK OR CALL DIG-SAFE AT 1-888-DIG-SAFE.
LEGEND:
SYMBOLS AND ABBREVIATIONS SHOWN ON THIS PLAN.
OVERHEAD WIRES
DRAIN LINE
WATER LINE
GAS LINE
UNDERGROUND ELECTRIC LINE
CHAIN LINK FENCE
DIRECTION OF SURFACE DRAINAGE
CATCH BASIN
RECESSED GRATE
DRAIN MANHOLE
SEWER MANHOLE
HYDRANT
LIGHT POLE
UTILITY POLE
CONCRETE
ASPHALT
IRON PIN SET
IRON PIN FOUND (TYPICAL)
DRILL HOLE IN CONCRETE BOUND, FOUND
DRILL HOLE IN GRANITE BOUND, FOUND
MAG NAIL WITH SHINER IN DRILL HOLE FOUND
POINT OF BEGINNING
HANDICAPPED PARKING SPACE
DENOTES MONUMENT FOUND ON SEPT. 21, 1999
MONITORING WELL
SOIL BORING
95.08' - GROUNDWATER ELEVATION
APPROX. DIRECTION OF GW FLOW
AREA=1.21 ± Acres (52,488 ± SQ. FT.)
APPROX. BUILDING FOOTPRINT
PROPERTY LINE
NOTES:
1. ALL BUILDING DIMENSIONS ARE TO OUTSIDE FACE OF BUILDING.
2. SQUARE FOOTAGE OF BUILDING WAS DERIVED FROM OUTSIDE DIMENSIONS AND IS APPROXIMATE.
3. THE TEMPORARY CONSTRUCTION EASEMENT, AS SHOWN WILL BE RELEASED UPON ACCEPTANCE & COMPLETION OF THE CONSTRUCTION ON COCHITUATE ROAD.
4. ENTRANCE LOCATION TO BUILDING OF SEWER, WATER & GAS SERVICES IS APPROXIMATE. EXISTING LOCATIONS ARE AS SHOWN & ARE APPROXIMATE ONLY.
5. FOR ADDITIONAL REGULATIONS & RESTRICTIONS OF CURRENT ZONING SEE BY LAWS -TOWN OF FRAMINGHAM
6. MINIMUM FRONT SETBACK, AS SHOWN IS FOR CURRENT M-1 ZONING. PARCEL MAY BE SUBJECT TO SETBACKS & RESTRICTIONS AS SEEN IN BOOK 12961 PAGE 348
REVISED: SEPT. 30, 1999
BASED ON VISUAL SITE INSPECTION ON SEPT. 21, 1998 BY SCHOFIELD BROTHERS
1071 WORCESTER ROAD, FRAMINGHAM, MA. 01701
15790
SB-1
SB-2
SB-3/MW-3
SB-4/MW-4
SB-5/MW-5
SB-6/MW-6
SB-7
OLD WELL
1 STORY BRICK
FIN. FLOOR ELEV. 429.58
BASEMENT FLOOR ELEV. 420.58
93.52'
94.67'
95.71'
95.08'
6 SPACES
3 SPACES
50 SPACES
15
17
UNITED STATES POSTAL SERVICE 27736090
CAPSTONE CAPITAL
NIKE-59 CONCORD LLC 28119190
PROPERTY CORNER MISSING N.S.R.
15790_B-sent.dwg layout1 4/29/2015 11:49:04

24749

APPENDIX 2

Long Term Pollution Prevention Plan with Attachments

Attachment 1
MassDEP Snow Disposal Guidance

Attachment 2
Stormwater Operation and Maintenance Plan

LONG-TERM POLLUTION PREVENTION PLAN

1.0 INTRODUCTION

This document is a Long-Term Pollution Prevention Plan (PPP) prepared by Schofield Brothers LLC for anticipated property management and use relative to the proposed Avidia Bank at 270 Cochituate Road in Framingham, Massachusetts. This plan has been prepared 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 February, 2008. The document is intended to comply as part of Standard 4 of the submittal requirements.

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, property manager or occupants of the development from compliance with other applicable Federal, State or local laws.

1.1 LONG-TERM POLLUTION PREVENTION PLAN

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

1.2 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 the Town of Framingham, and other authorized public officials upon request.

2.0 LONG-TERM POLLUTION PREVENTION PLAN RESPONSIBILITIES

2.1 RESPONSIBLE PARTY AND CONTACT INFORMATION

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

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

Avidia Bank
42 Main Street
Hudson, MA 01749

2.2 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 this Long-Term Pollution Prevention Plan as well as the Stormwater Operations and Maintenance Plan, and any other requirements issued by the Framingham Department of Public Works.
- 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 and amend the Long-Term Pollution Prevention Plan as appropriate to address those issues.

3.0 PROJECT DESCRIPTION

3.1 SITE DESCRIPTION

The project includes the demolition of an existing restaurant building, construction of a new Avidia Bank building, construction of a new parking area and installation of new sewer, drainage, water, gas and electric services.

The stormwater management system is designed to assure that the peak runoff flows after development will be less than the existing conditions up to the 100-year design storm event. Maintenance of the stormwater management features is included in the Stormwater Operations and Maintenance Manual in Appendix 2.

3.2 Total Maximum Daily Load (TMDL)

There are no TMDL's within the project area.

4.0 PRACTICES FOR SOURCE CONTROL AND POLLUTION PREVENTION

4.1 Good Housekeeping

The owner should follow good housekeeping procedures to reduce the possibility of accidental releases and to reduce safety hazards, which 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.

4.2 Storage and Proper Disposal of Hazardous Chemicals

The owner should be aware of not only the potential hazards of various chemicals to the human body but also to the environment. The owner shall be aware of procedures to properly dispose of hazardous chemicals.

4.3 Vehicle Washing

The washing of personal or commercial vehicles is not allowed on the subject property.

4.4 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 Manual in Attachment 3.

4.5 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.

4.6 Maintenance of Lawns, Gardens, 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.

4.7 Storage of Fertilizers, Herbicides, and Pesticides

The storage of these chemicals is not allowed on the subject property.

4.8 Pet Waste Management

The property should be aware of the "pooper-scooper" laws for pets.

4.9 Solid Waste Management

All waste materials should be collected and stored in securely lidded dumpster or other secure containers as applicable to the material. Said dumpster and containers will be monitored and emptied by a licensed waste disposal contractor on a regular basis.

4.10 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. An area designated for snow stockpiling is located at the far north 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.

5.0 INSPECTIONS AND REPORT PREPARATION

In conjunction with the Long-Term Pollution Prevention Plan, the requirements of the Stormwater Operations and Maintenance Manual, in Appendix 2, shall be implemented and the owner will oversee the inspections and preparation of the required inspection reports for compliance with that document.

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ATTACHMENT 1

MassDEP Snow Disposal Guidance

MassDEP
Massachusetts Department of Environmental Protection

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 via the Internet at http://www.mass.gov/mgis. 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

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ATTACHMENT 2

Stormwater Operation and Maintenance Plan

STORMWATER MANAGEMENT SYSTEM
OPERATION & MAINTENANCE PLAN

INTRODUCTION

The proposed Stormwater Management System for the proposed Avidia Bank at #270 Cochituate Road in Framingham, MA contains several "Stormwater Best Management Practices" (BMP's) that have been designed to protect the environment from stormwater related impacts to surface waters, groundwater, and wetland resource areas. 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 insure 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 #270 Cochituate Road in Framingham, 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 steps 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 Framingham 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.

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	4
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 #270 Cochituate Road in Framingham, 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 Framingham.

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" 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 water tight 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)

UNDERGROUND INFILTRATION SYSTEMS

DESCRIPTION AND FUNCTION

The underground infiltration systems consist of precast concrete units 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.

DEEP SUMP CATCH BASINS

Routine Inspection Checklist - Inspected Quarterly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
CB #1						
CB #2						
CB #3						
CB #4						
CB #5 (Existing)						
CB #6 (Existing)						

* 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

SUBSURFACE INFILTRATION (RECHARGER) SYSTEMs

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

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

AVIDIA BANK
AT
#270 COCHITUATE ROAD IN FRAMINGHAM, MA
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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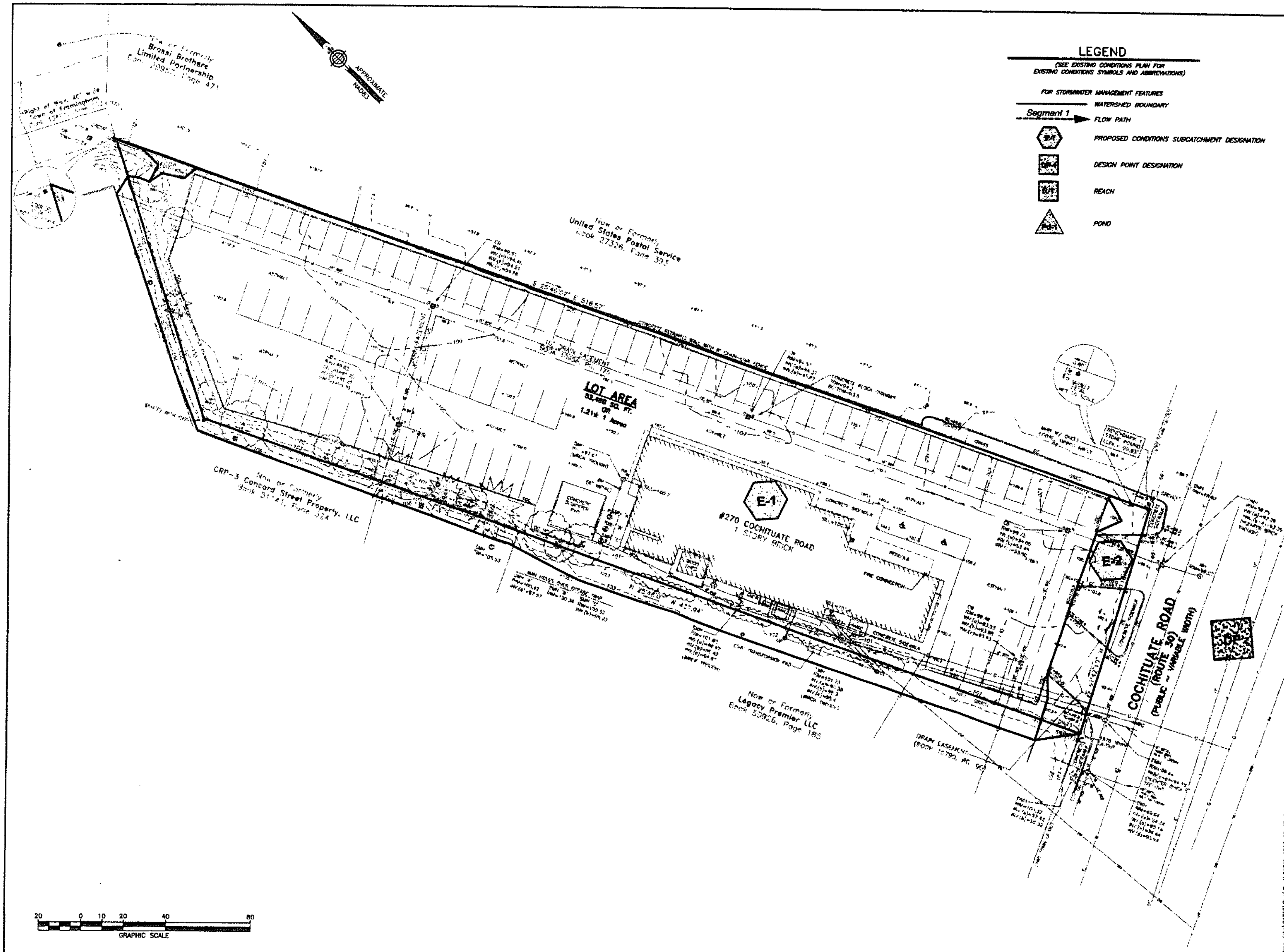
APPENDIX 3

Existing Conditions Watershed Map, WS-EX



PERMIT SITE PLAN

270 COCHITUATE ROAD
FRAMINGHAM, MASSACHUSETTS 01701

ASSESSORS: MAP 347, BLOCK 111, LOT 12

PREPARED FOR:

AVIDIA BANK

C/O

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NO.	APP	DATE	DESCRIPTION

DATE: AUGUST 7, 2015

SCALE: AS SHOWN

DRAFTED:	CHECKED:	APPROVED:
KMB/JAL	BEC	BEC

EXISTING CONDITIONS WATERSHED PLAN

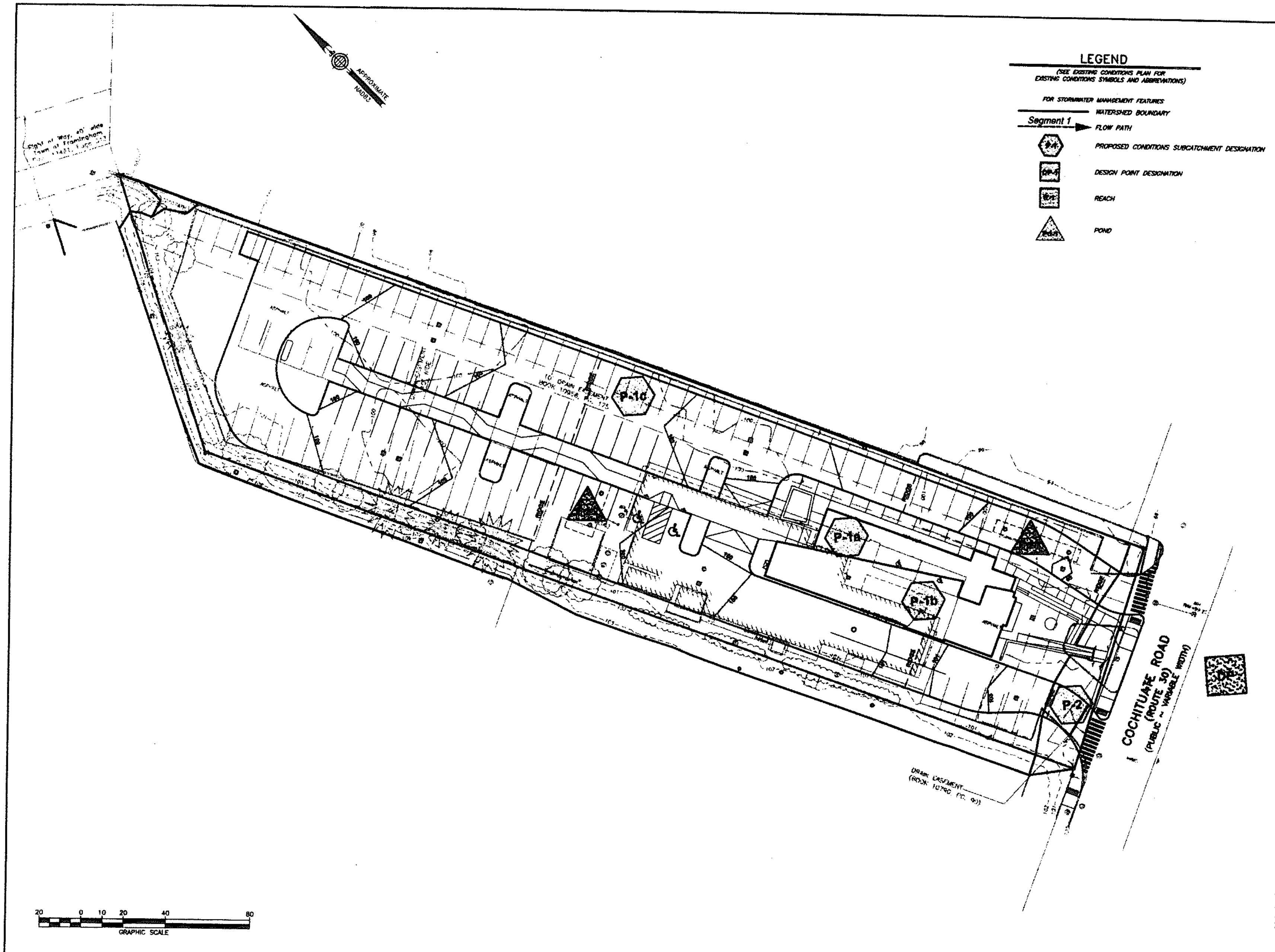
SHEET: 1 OF 2

PROJECT NO.: 24749

WSD-EX

APPENDIX 4

Proposed Conditions Watershed Map, WS-PR



PERMIT SITE PLAN

270 COCHITUATE ROAD
FRAMINGHAM, MASSACHUSETTS 01701

ASSESSORS: MAP 247, BLOCK 111, LOT 12

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NO.	APP	DATE	DESCRIPTION

DATE: AUGUST 7, 2015

SCALE: AS SHOWN

DRAFTED:	CHECKED:	APPROVED:
KMR/JAL	SEC	SEC

PROPOSED CONDITIONS WATERSHED PLAN

SHEET: 2 OF 2

PROJECT NO.: 24749

WSD-PR