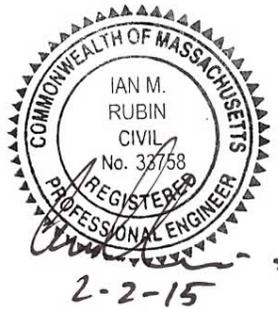


DRAINAGE REPORT

FOR

**“JAIME’S WAY”
456 MASSACHUSETTS AVENUE
ACTON, MA**



February 2, 2015

Prepared for:
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1. DRAINAGE REPORT

1.1 Introduction

The purpose of these calculations is to show that with development there is no increase in peak runoff when comparing pre- vs. post-conditions.

1.2 Site Description

This land at 456 Massachusetts Avenue, Acton is currently a single family lot with a typical colonial house, a paved driveway and a septic system in the front yard. The septic system is a raised system. The rear of the lot is mostly wooded, with an isolated wetland towards the south-easterly corner of the property. Most of the land slopes to the rear of the lot, the high point being the back side of the septic system. The lot is about 1.76 Acres, or 76,830 sq. ft., of land.

With development, the existing lot is being subdivided in three lots. Lot 1 will have the existing house relocated. The two lots in the rear are proposed with new houses. A common driveway, with a turnaround suitable for an Acton fire-truck, is proposed serving all three lots. The existing house has a drive-under garage. In the design of lot one, the location of the raised septic system is to be lowered a couple of feet as well as further removal of soils to accommodate the drive-under garage. Most of the cut is moved to the back of the lot to provide leveled back yards for the houses on lots 2 and 3. These houses have walk-out basements.

In the drainage design, to allow for the decrease in wooded area, increase in lawn, and increase in impervious surfaces (common driveway, roofs and walkways in the front yards), a retention pond is proposed as well as one dry-well for house on lot 2.

The soils as referenced in National Resource Conservation Commission (NRCS) are Udorthents-Urban land complex and Charlton-Hollis-Rock outcrop complex. The Udorthents section, which is towards the front of the property, is designed as a C-soil (hydrological soil group) and the Charlton-Hollis section is designed as a B-soil. (In the referenced material from NRCS the Charlton-Hollis soils are classified as an A-soil. However, the soils are described as sandy loam. And for infiltration rate as classified by Rawls Rates, this is a B-soil.) Similarly, the infiltration rate for the dry-well and the retention pond, the rate used is 1.02 in/hr (see Rawls Rates). For the Udorthents, the soils are assumed to be C-soils, which is relatively conservative considering that with development, the catchment area towards the rear of the lot is increased with additional C-soils.

1.3 Comparison of Pre- and Post-Development Areas

On the site as a whole, comparing pre-development to post-development, here are the areas in percentages:

Current Conditions

Woods	70.6%
Lawn	19.2%
House	2.1%
Walkway	0.4%
Driveway	4.5%
Wetlands	3.3%

Proposed Conditions

Woods	28.4%
Lawn	50.4%
Houses	7.2%
Walkways	1.1%
Driveways	9.8%
Wetlands	3.3%

1.4 Methods of Calculations

Calculations are based upon standard methodologies set forth in U.S. Soil Conservation Service TR-55 and TR-20 and performed by *HydroCAD Software*. More specifically, the rainfall is based upon a design storm in 24 hours, and a Type III Rainfall. The size of storm is as follows:

<u>Storm Event</u>	<u>24-hr Precipitation</u>
100-yr	6.6"
10-yr	4.5"
2-yr	3.2"

As in standard practice, the Antecedent Moisture Content (AMC) is assumed normal in the calculations, that being AMC 2.

Formulae Used:

Time of Concentration, T_c , is calculated by summing different travel times, T_t , for each consecutive different type of flow from runoff. The types of flow in the design considered are as follows:

TR-55 Sheet Flow,

$$T_t = 0.007(nL)^{0.8} / (P_2^{0.5} \cdot S^{0.4})$$

where:

- T_t = Travel time [hours]
- n = Manning's coefficient for sheet flow (See table)
- L = Flow length [feet]
- P_2 = 2-year, 24-hour rainfall [inches]
- S = Land slope (along flow path) [ft/ft]

TR-55 Shallow Concentrated Flow,

$$T_t = L/V \text{ and } V = K_v \cdot S^{1/2}$$

where:

V = Average velocity

K_v = Velocity factor

S = Land slope (along flow path) [rise/run]

and Channel Flow which is calculated using Manning's Equation.

The minimum Time of Concentration for a subcatchment is taken as 0.1 hrs as defined in TR-55.

The **amount of runoff** for a given storm event is determined by the SCS Runoff Equation is:

$$Q = (P - 0.2S)^2 / (P + 0.8S) \text{ and } S = 1000 / CN - 10,$$

where:

Q = Precipitation excess (runoff) [inches or mm]

P = Cumulative precipitation [inches or mm]

S = Potential maximum retention [inches]

CN = Curve number (TR-55)

1.5 Drainage Subcatchment Areas

There are three subcatchments: Subcatchments 1 and 2 drain towards the front of the lot, while subcatchment 3 drains towards the rear of the lot. With development, subcatchment 3 is divided into two sections: 3a and 3b. Subcatchment 3a drains through the retention basin while 3b drains directly to the design point for subcatchment 3.

Here are the areas tabulated:

Pre-development Conditions

		SUB 1	SUB 2	SUB 3	TOTALS
SOILS B	Lawn	0	0	9621	9621
	House	0	0	1635	1635
	Walkway	0	0	270	270
	Pavement	0	0	2352	2352
	Woods	0	0	46587	46587
	Wetlands	0	0	2497	2497
	TOTAL	0	0	62962	62962
SOILS C	Lawn	2529	2599	0	5128
	Pavement	1085	0	0	1085
	Woods	2784	4871	0	7655
	TOTAL	6398	7470	0	13868
TOTAL		6398	7470	62962	76830

Post-development Conditions

		SUB 1	SUB 2	SUB 3a	SUB 3b	TOTALS
SOILS B	Lawn	0	0	16580	16392	32972
	House	0	0	2284	1946	4230
	Walkway	0	0	384	270	654
	Pavement	0	0	4276	1723	5999
	Woods	0	0	1298	15312	16610
	Wetlands	0	0	0	2497	2497
	TOTAL	0	0	24822	38140	62962
SOILS C	Lawn	1527	2296	1747	167	5737
	House	0	0	1297	0	1297
	Walkway		46	110	0	156
	Pavement	1003	0	502	0	1505
	Woods	1644	3351	0	178	5173
	TOTAL	4174	5693	3656	345	13868
	TOTAL		4174	5693	28478	38485

1.6 Runoff Tabulated Results

		Pre	Post	Pre	Post	Pre	Post
		2 yr		10 yr		100 yr	
Sub 1	Flow (cfs)	0.21	0.17	0.39	0.30	0.71	0.54
	Vol. (af)	0.016	0.011	0.028	0.019	0.050	0.034
Sub 2	Flow (cfs)	0.19	0.17	0.38	0.34	0.72	0.64
	Vol. (af)	0.014	0.011	0.027	0.021	0.051	0.040
Sub 3	Flow (cfs)	0.71	0.56	1.97	1.38	4.50	4.42
	Vol. (af)	0.067	0.046	0.152	0.148	0.325	0.347

1.7 Conclusion

The calculations show that the rate of runoff is reduced with development and volume of runoff is reduced in all cases except for subcatchment 3 in a 100-yr storm event where there's a slight increase.

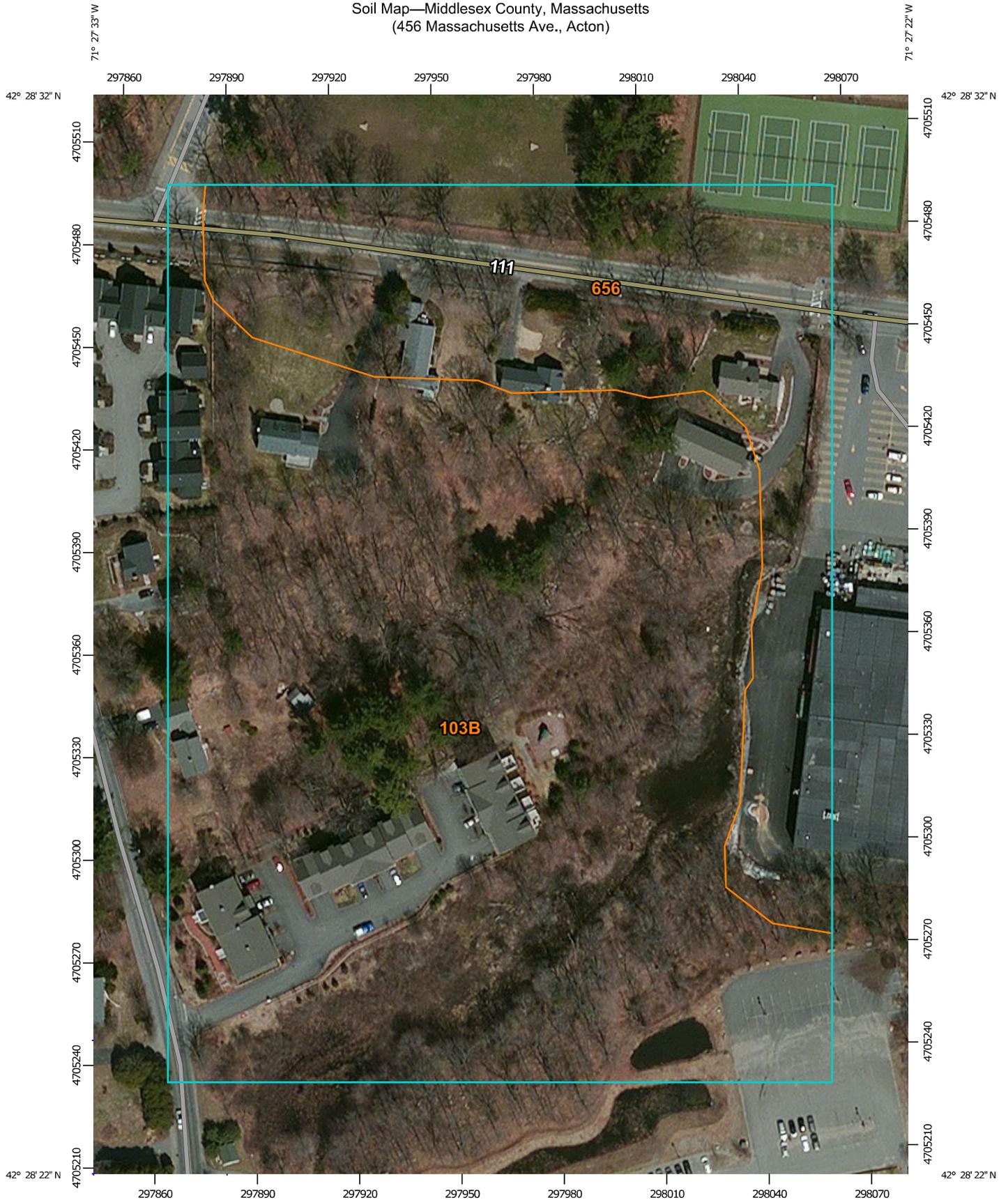
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**APPENDIX 2.1
NRCS SOIL MAP**

Jaime's Way
Project Report
February 2,2015

Soil Map—Middlesex County, Massachusetts
(456 Massachusetts Ave., Acton)



Map Scale: 1:1,540 if printed on A portrait (8.5" x 11") sheet.



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

MAP LEGEND

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

Soils

Soil Rating Polygons

A 
 A/D 
 B 
 B/D 
 C 
 C/D 
 D 
 Not rated or not available 

Soil Rating Lines

A 
 A/D 
 B 
 B/D 
 C 
 C/D 
 D 
 Not rated or not available 

Soil Rating Points

A 
 A/D 
 B 
 B/D 

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: Mar 30, 2011—May 1, 2011

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

MAP INFORMATION

C 
 C/D 
 D 
 Not rated or not available 

Water Features
 Streams and Canals

Transportation
 Rails 
 Interstate Highways 
 US Routes 
 Major Roads 
 Local Roads 

Background
 Aerial Photography

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	9.1	72.1%
656	Udorthents-Urban land complex		3.5	27.9%
Totals for Area of Interest			12.7	100.0%

Description

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

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

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

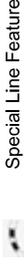
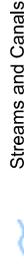
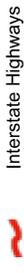
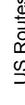
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soil Map Unit Polygons	 Stony Spot
 Soil Map Unit Lines	 Very Stony Spot
 Soil Map Unit Points	 Wet Spot
 Special Point Features	 Other
 Blowout	 Special Line Features
 Borrow Pit	Water Features
 Clay Spot	 Streams and Canals
 Closed Depression	Transportation
 Gravel Pit	 Rails
 Gravelly Spot	 Interstate Highways
 Landfill	 US Routes
 Lava Flow	 Major Roads
 Marsh or swamp	 Local Roads
 Mine or Quarry	Background
 Miscellaneous Water	 Aerial Photography
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

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.

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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: Mar 30, 2011—May 1, 2011

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.

Middlesex County, Massachusetts

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

Map Unit Setting

National map unit symbol: 98yc
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 50 percent
Hollis and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: A

Description of Hollis

Setting

Landform: Hills, ridges

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam

H2 - 2 to 14 inches: fine sandy loam

H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 8 to 20 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Description of Rock Outcrop

Setting

Landform: Ledges

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Head slope

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 2 percent

Landform: Hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Head slope

Down-slope shape: Convex

Across-slope shape: Convex

Woodbridge

Percent of map unit: 2 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, toeslope, summit

Landform position (three-dimensional): Head slope, base slope, nose slope

Down-slope shape: Linear

Across-slope shape: Concave

Scituate

Percent of map unit: 2 percent

Landform: Depressions, hillslopes

Landform position (two-dimensional): Toeslope, summit

Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Linear

Across-slope shape: Concave

Narragansett

Percent of map unit: 2 percent

Landform: Hills, ridges

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Convex

Unnamed

Percent of map unit: 1 percent

Montauk

Percent of map unit: 1 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Head slope, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts

Survey Area Data: Version 14, Sep 19, 2014

APPENDIX 2.2
DRAINAGE CALCULATIONS



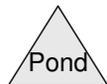
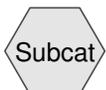
Rear Sub



Front Left Sub



Front Right Sub



Existing Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
2,529	74	>75% Grass cover, Good, HSG C
* 1,085	98	Driveway, HSG C
2,784	73	Woods, Fair, HSG C
6,398	78	Weighted Average
5,313		83.04% Pervious Area
1,085		16.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.19 cfs @ 12.10 hrs, Volume= 0.014 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
2,599	74	>75% Grass cover, Good, HSG C
4,871	73	Woods, Fair, HSG C
7,470	73	Weighted Average
7,470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 3S: Rear Sub

Runoff = 0.71 cfs @ 12.11 hrs, Volume= 0.067 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Existing Conditions r1*Type III 24-hr 2 yr Rainfall=3.20"*

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Area (sf)	CN	Description
9,621	61	>75% Grass cover, Good, HSG B
1,635	98	Roofs, HSG B
* 270	98	Walkway, HSG B
* 2,352	98	Driveway, HSG B
46,587	60	Woods, Fair, HSG B
* 2,497	98	Wetlands
62,962	64	Weighted Average
56,208		89.27% Pervious Area
6,754		10.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Existing Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
2,529	74	>75% Grass cover, Good, HSG C
* 1,085	98	Driveway, HSG C
2,784	73	Woods, Fair, HSG C
6,398	78	Weighted Average
5,313		83.04% Pervious Area
1,085		16.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
2,599	74	>75% Grass cover, Good, HSG C
4,871	73	Woods, Fair, HSG C
7,470	73	Weighted Average
7,470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 3S: Rear Sub

Runoff = 1.97 cfs @ 12.10 hrs, Volume= 0.152 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Existing Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Area (sf)	CN	Description
9,621	61	>75% Grass cover, Good, HSG B
1,635	98	Roofs, HSG B
* 270	98	Walkway, HSG B
* 2,352	98	Driveway, HSG B
46,587	60	Woods, Fair, HSG B
* 2,497	98	Wetlands
62,962	64	Weighted Average
56,208		89.27% Pervious Area
6,754		10.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Existing Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,529	74	>75% Grass cover, Good, HSG C
* 1,085	98	Driveway, HSG C
2,784	73	Woods, Fair, HSG C
6,398	78	Weighted Average
5,313		83.04% Pervious Area
1,085		16.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.051 af, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,599	74	>75% Grass cover, Good, HSG C
4,871	73	Woods, Fair, HSG C
7,470	73	Weighted Average
7,470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min

Summary for Subcatchment 3S: Rear Sub

Runoff = 4.50 cfs @ 12.09 hrs, Volume= 0.325 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Existing Conditions r1*Type III 24-hr 100 yr Rainfall=6.60"*

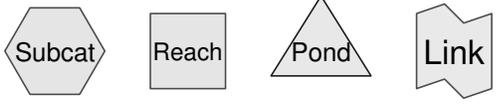
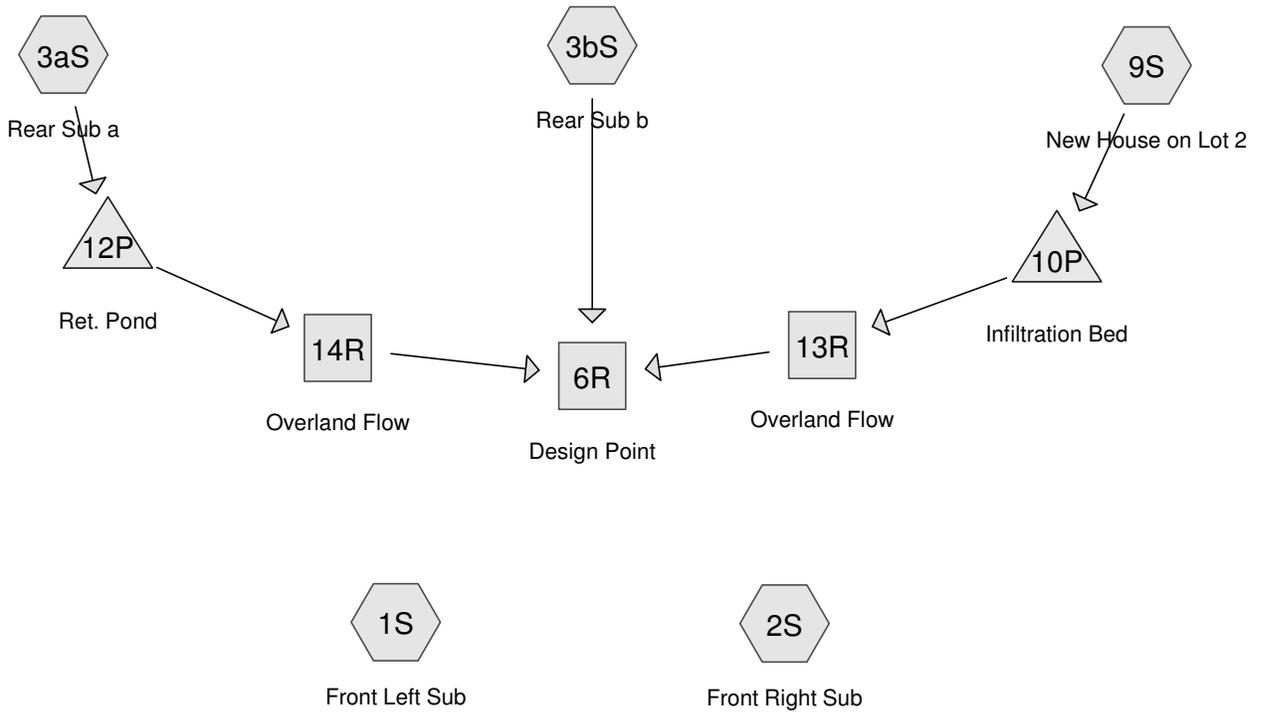
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Area (sf)	CN	Description
9,621	61	>75% Grass cover, Good, HSG B
1,635	98	Roofs, HSG B
* 270	98	Walkway, HSG B
* 2,352	98	Driveway, HSG B
46,587	60	Woods, Fair, HSG B
* 2,497	98	Wetlands
62,962	64	Weighted Average
56,208		89.27% Pervious Area
6,754		10.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 0.1 hr. min



Routing Diagram for Proposed Conditions r1
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Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.17 cfs @ 12.04 hrs, Volume= 0.011 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
1,527	74	>75% Grass cover, Good, HSG C
1,003	98	Paved parking, HSG C
1,644	73	Woods, Fair, HSG C
4,174	79	Weighted Average
3,171		75.97% Pervious Area
1,003		24.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	25	0.0600	0.20		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.1	25	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
0.1	25	0.0400	4.06		Shallow Concentrated Flow, Shallow Concentrated Paved Kv= 20.3 fps
0.1	25	0.0364	3.07		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.4	100	Total			

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.17 cfs @ 12.05 hrs, Volume= 0.011 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
2,296	74	>75% Grass cover, Good, HSG C
3,351	73	Woods, Fair, HSG C
* 46	98	Walkway, HSG C
5,693	74	Weighted Average
5,647		99.19% Pervious Area
46		0.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.0	12	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.7	37	Total			

Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Summary for Subcatchment 3aS: Rear Sub a

Runoff = 0.71 cfs @ 12.10 hrs, Volume= 0.054 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
16,580	61	>75% Grass cover, Good, HSG B
1,747	74	>75% Grass cover, Good, HSG C
* 2,284	98	Unconnected roofs, HSG B
1,297	98	Unconnected roofs, HSG C
* 384	98	Unconnected walkways, HSG B
* 110	98	Unconnected walkway, HSG C
* 4,276	98	Drive, HSG B
* 502	98	Drive, HSG C
1,298	60	Woods, Fair, HSG B
28,478	73	Weighted Average
19,625		68.91% Pervious Area
8,853		31.09% Impervious Area
4,075		46.03% Unconnected

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

Summary for Subcatchment 3bS: Rear Sub b

Runoff = 0.46 cfs @ 12.11 hrs, Volume= 0.042 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
16,392	61	>75% Grass cover, Good, HSG B
167	74	>75% Grass cover, Good, HSG C
* 270	98	Walkway, HSG B
15,312	60	Woods, Fair, HSG B
178	73	Woods, Fair, HSG C
* 2,497	98	Wetlands
* 0	98	Unconnected roofs, HSG A
* 1,723	98	Drive, HSG A
36,539	65	Weighted Average
32,049		87.71% Pervious Area
4,490		12.29% Impervious Area

Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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

Summary for Reach 6R: Design Point

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

Inflow Area = 1.537 ac, 22.83% Impervious, Inflow Depth = 0.36" for 2 yr event
Inflow = 0.56 cfs @ 12.11 hrs, Volume= 0.046 af
Outflow = 0.56 cfs @ 12.11 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 9S: New House on Lot 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.17 cfs @ 12.01 hrs, Volume= 0.011 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
1,946	98	Roofs, HSG A
1,946		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.95		Sheet Flow, Sheet Smooth surfaces n= 0.011 P2= 3.20"
0.3	100	0.0200	5.25	1.05	Channel Flow, Gutter Flow Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.4	120	Total			

Summary for Pond 10P: Infiltration Bed

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 2.97" for 2 yr event
Inflow = 0.17 cfs @ 12.01 hrs, Volume= 0.011 af
Outflow = 0.13 cfs @ 12.04 hrs, Volume= 0.011 af, Atten= 20%, Lag= 2.2 min
Discarded = 0.01 cfs @ 11.05 hrs, Volume= 0.008 af
Primary = 0.12 cfs @ 12.04 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 227.38' @ 12.04 hrs Surf.Area= 262 sf Storage= 68 cf

Plug-Flow detention time= 19.7 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 19.7 min (770.9 - 751.2)

Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Volume	Invert	Avail.Storage	Storage Description
#1A	226.80'	198 cf	11.25'W x 23.25'L x 2.54'H Field A 665 cf Overall - 169 cf Embedded = 496 cf x 40.0% Voids
#2A	227.30'	169 cf	Cultec R-150XLHD x 6 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		367 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	227.17'	6.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#2	Discarded	226.80'	0.01 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.01 cfs @ 11.05 hrs HW=226.83' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.12 cfs @ 12.04 hrs HW=227.38' (Free Discharge)

↳ **1=Orifice/Grate** (Orifice Controls 0.12 cfs @ 1.56 fps)

Summary for Pond 12P: Ret. Pond

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 0.98" for 2 yr event
 Inflow = 0.71 cfs @ 12.10 hrs, Volume= 0.054 af
 Outflow = 0.01 cfs @ 22.22 hrs, Volume= 0.031 af, Atten= 98%, Lag= 607.5 min
 Discarded = 0.01 cfs @ 11.51 hrs, Volume= 0.030 af
 Primary = 0.00 cfs @ 22.22 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.20' @ 22.22 hrs Surf.Area= 1,572 sf Storage= 1,844 cf

Plug-Flow detention time= 1,028.5 min calculated for 0.031 af (58% of inflow)
 Center-of-Mass det. time= 904.4 min (1,769.8 - 865.4)

Volume	Invert	Avail.Storage	Storage Description
#1	227.00'	3,347 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
227.00	402	0	0
228.00	634	518	518
230.00	2,195	2,829	3,347

Device	Routing	Invert	Outlet Devices
#1	Primary	229.20'	5.0' long Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	227.00'	0.01 cfs Exfiltration at all elevations

Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Discarded OutFlow Max=0.01 cfs @ 11.51 hrs HW=227.03' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 22.22 hrs HW=229.20' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.12 fps)

Summary for Reach 13R: Overland Flow

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 0.90" for 2 yr event
Inflow = 0.12 cfs @ 12.04 hrs, Volume= 0.003 af
Outflow = 0.11 cfs @ 12.14 hrs, Volume= 0.003 af, Atten= 10%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.59 fps, Min. Travel Time= 3.5 min

Avg. Velocity = 0.21 fps, Avg. Travel Time= 9.7 min

Peak Storage= 23 cf @ 12.08 hrs

Average Depth at Peak Storage= 0.01'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 5.69 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0720 '/'

Inlet Invert= 227.00', Outlet Invert= 218.00'

Summary for Reach 14R: Overland Flow

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 0.01" for 2 yr event
Inflow = 0.00 cfs @ 22.22 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 22.61 hrs, Volume= 0.001 af, Atten= 2%, Lag= 23.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.17 fps, Min. Travel Time= 12.0 min

Avg. Velocity = 0.15 fps, Avg. Travel Time= 13.6 min

Peak Storage= 3 cf @ 22.40 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 6.29 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0880 '/'

Inlet Invert= 229.00', Outlet Invert= 218.00'

Proposed Conditions r1

Type III 24-hr 2 yr Rainfall=3.20"

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Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.30 cfs @ 12.04 hrs, Volume= 0.019 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
1,527	74	>75% Grass cover, Good, HSG C
1,003	98	Paved parking, HSG C
1,644	73	Woods, Fair, HSG C
4,174	79	Weighted Average
3,171		75.97% Pervious Area
1,003		24.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	25	0.0600	0.20		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.1	25	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
0.1	25	0.0400	4.06		Shallow Concentrated Flow, Shallow Concentrated Paved Kv= 20.3 fps
0.1	25	0.0364	3.07		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.4	100	Total			

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.34 cfs @ 12.04 hrs, Volume= 0.021 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
2,296	74	>75% Grass cover, Good, HSG C
3,351	73	Woods, Fair, HSG C
* 46	98	Walkway, HSG C
5,693	74	Weighted Average
5,647		99.19% Pervious Area
46		0.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.0	12	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.7	37	Total			

Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Summary for Subcatchment 3aS: Rear Sub a

Runoff = 1.43 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
16,580	61	>75% Grass cover, Good, HSG B
1,747	74	>75% Grass cover, Good, HSG C
* 2,284	98	Unconnected roofs, HSG B
1,297	98	Unconnected roofs, HSG C
* 384	98	Unconnected walkways, HSG B
* 110	98	Unconnected walkway, HSG C
* 4,276	98	Drive, HSG B
* 502	98	Drive, HSG C
1,298	60	Woods, Fair, HSG B
28,478	73	Weighted Average
19,625		68.91% Pervious Area
8,853		31.09% Impervious Area
4,075		46.03% Unconnected

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

Summary for Subcatchment 3bS: Rear Sub b

Runoff = 1.21 cfs @ 12.10 hrs, Volume= 0.093 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
16,392	61	>75% Grass cover, Good, HSG B
167	74	>75% Grass cover, Good, HSG C
* 270	98	Walkway, HSG B
15,312	60	Woods, Fair, HSG B
178	73	Woods, Fair, HSG C
* 2,497	98	Wetlands
* 0	98	Unconnected roofs, HSG A
* 1,723	98	Drive, HSG A
36,539	65	Weighted Average
32,049		87.71% Pervious Area
4,490		12.29% Impervious Area

Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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

Summary for Reach 6R: Design Point

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

Inflow Area = 1.537 ac, 22.83% Impervious, Inflow Depth = 1.16" for 10 yr event
 Inflow = 1.38 cfs @ 12.10 hrs, Volume= 0.148 af
 Outflow = 1.38 cfs @ 12.10 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 9S: New House on Lot 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.24 cfs @ 12.01 hrs, Volume= 0.016 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
1,946	98	Roofs, HSG A
1,946		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.95		Sheet Flow, Sheet Smooth surfaces n= 0.011 P2= 3.20"
0.3	100	0.0200	5.25	1.05	Channel Flow, Gutter Flow Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.4	120	Total			

Summary for Pond 10P: Infiltration Bed

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 4.26" for 10 yr event
 Inflow = 0.24 cfs @ 12.01 hrs, Volume= 0.016 af
 Outflow = 0.20 cfs @ 12.04 hrs, Volume= 0.016 af, Atten= 17%, Lag= 1.9 min
 Discarded = 0.01 cfs @ 10.18 hrs, Volume= 0.010 af
 Primary = 0.19 cfs @ 12.04 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 227.44' @ 12.04 hrs Surf.Area= 262 sf Storage= 79 cf

Plug-Flow detention time= 19.5 min calculated for 0.016 af (100% of inflow)
 Center-of-Mass det. time= 19.5 min (764.2 - 744.6)

Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Volume	Invert	Avail.Storage	Storage Description
#1A	226.80'	198 cf	11.25'W x 23.25'L x 2.54'H Field A 665 cf Overall - 169 cf Embedded = 496 cf x 40.0% Voids
#2A	227.30'	169 cf	Cultec R-150XLHD x 6 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		367 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	227.17'	6.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#2	Discarded	226.80'	0.01 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.01 cfs @ 10.18 hrs HW=226.83' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.19 cfs @ 12.04 hrs HW=227.44' (Free Discharge)

↳ **1=Orifice/Grate** (Orifice Controls 0.19 cfs @ 1.76 fps)

Summary for Pond 12P: Ret. Pond

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 1.90" for 10 yr event
 Inflow = 1.43 cfs @ 12.09 hrs, Volume= 0.103 af
 Outflow = 0.34 cfs @ 12.52 hrs, Volume= 0.081 af, Atten= 76%, Lag= 25.8 min
 Discarded = 0.01 cfs @ 10.46 hrs, Volume= 0.031 af
 Primary = 0.33 cfs @ 12.52 hrs, Volume= 0.049 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.29' @ 12.52 hrs Surf.Area= 1,639 sf Storage= 1,982 cf

Plug-Flow detention time= 478.5 min calculated for 0.081 af (78% of inflow)
 Center-of-Mass det. time= 394.3 min (1,239.7 - 845.4)

Volume	Invert	Avail.Storage	Storage Description
#1	227.00'	3,347 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
227.00	402	0	0
228.00	634	518	518
230.00	2,195	2,829	3,347

Device	Routing	Invert	Outlet Devices
#1	Primary	229.20'	5.0' long Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	227.00'	0.01 cfs Exfiltration at all elevations

Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Discarded OutFlow Max=0.01 cfs @ 10.46 hrs HW=227.03' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.52 hrs HW=229.29' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Weir Controls 0.33 cfs @ 0.74 fps)

Summary for Reach 13R: Overland Flow

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 1.65" for 10 yr event
Inflow = 0.19 cfs @ 12.04 hrs, Volume= 0.006 af
Outflow = 0.17 cfs @ 12.12 hrs, Volume= 0.006 af, Atten= 7%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.71 fps, Min. Travel Time= 2.9 min

Avg. Velocity = 0.23 fps, Avg. Travel Time= 8.9 min

Peak Storage= 31 cf @ 12.07 hrs

Average Depth at Peak Storage= 0.01'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 5.69 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0720 '/'

Inlet Invert= 227.00', Outlet Invert= 218.00'

Summary for Reach 14R: Overland Flow

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 0.91" for 10 yr event
Inflow = 0.33 cfs @ 12.52 hrs, Volume= 0.049 af
Outflow = 0.32 cfs @ 12.58 hrs, Volume= 0.049 af, Atten= 2%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.96 fps, Min. Travel Time= 2.2 min

Avg. Velocity = 0.39 fps, Avg. Travel Time= 5.4 min

Peak Storage= 42 cf @ 12.55 hrs

Average Depth at Peak Storage= 0.02'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 6.29 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0880 '/'

Inlet Invert= 229.00', Outlet Invert= 218.00'

Proposed Conditions r1

Type III 24-hr 10 yr Rainfall=4.50"

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Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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Summary for Subcatchment 1S: Front Left Sub

Runoff = 0.54 cfs @ 12.04 hrs, Volume= 0.034 af, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
1,527	74	>75% Grass cover, Good, HSG C
1,003	98	Paved parking, HSG C
1,644	73	Woods, Fair, HSG C
4,174	79	Weighted Average
3,171		75.97% Pervious Area
1,003		24.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	25	0.0600	0.20		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.1	25	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
0.1	25	0.0400	4.06		Shallow Concentrated Flow, Shallow Concentrated Paved Kv= 20.3 fps
0.1	25	0.0364	3.07		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.4	100	Total			

Summary for Subcatchment 2S: Front Right Sub

Runoff = 0.64 cfs @ 12.04 hrs, Volume= 0.040 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,296	74	>75% Grass cover, Good, HSG C
3,351	73	Woods, Fair, HSG C
* 46	98	Walkway, HSG C
5,693	74	Weighted Average
5,647		99.19% Pervious Area
46		0.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.0	12	0.1200	5.58		Shallow Concentrated Flow, Shallow Concentrated Unpaved Kv= 16.1 fps
2.7	37	Total			

Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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Summary for Subcatchment 3aS: Rear Sub a

Runoff = 2.76 cfs @ 12.09 hrs, Volume= 0.196 af, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
16,580	61	>75% Grass cover, Good, HSG B
1,747	74	>75% Grass cover, Good, HSG C
* 2,284	98	Unconnected roofs, HSG B
1,297	98	Unconnected roofs, HSG C
* 384	98	Unconnected walkways, HSG B
* 110	98	Unconnected walkway, HSG C
* 4,276	98	Drive, HSG B
* 502	98	Drive, HSG C
1,298	60	Woods, Fair, HSG B
28,478	73	Weighted Average
19,625		68.91% Pervious Area
8,853		31.09% Impervious Area
4,075		46.03% Unconnected

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

Summary for Subcatchment 3bS: Rear Sub b

Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.195 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
16,392	61	>75% Grass cover, Good, HSG B
167	74	>75% Grass cover, Good, HSG C
* 270	98	Walkway, HSG B
15,312	60	Woods, Fair, HSG B
178	73	Woods, Fair, HSG C
* 2,497	98	Wetlands
* 0	98	Unconnected roofs, HSG A
* 1,723	98	Drive, HSG A
36,539	65	Weighted Average
32,049		87.71% Pervious Area
4,490		12.29% Impervious Area

Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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

Summary for Reach 6R: Design Point

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

Inflow Area = 1.537 ac, 22.83% Impervious, Inflow Depth = 2.71" for 100 yr event
Inflow = 4.42 cfs @ 12.15 hrs, Volume= 0.347 af
Outflow = 4.42 cfs @ 12.15 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 9S: New House on Lot 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.35 cfs @ 12.01 hrs, Volume= 0.024 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
1,946	98	Roofs, HSG A
1,946		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.95		Sheet Flow, Sheet Smooth surfaces n= 0.011 P2= 3.20"
0.3	100	0.0200	5.25	1.05	Channel Flow, Gutter Flow Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.4	120	Total			

Summary for Pond 10P: Infiltration Bed

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 6.36" for 100 yr event
Inflow = 0.35 cfs @ 12.01 hrs, Volume= 0.024 af
Outflow = 0.30 cfs @ 12.03 hrs, Volume= 0.024 af, Atten= 15%, Lag= 1.7 min
Discarded = 0.01 cfs @ 8.86 hrs, Volume= 0.012 af
Primary = 0.29 cfs @ 12.03 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 227.51' @ 12.03 hrs Surf.Area= 262 sf Storage= 94 cf

Plug-Flow detention time= 19.4 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 19.4 min (758.0 - 738.6)

Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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Volume	Invert	Avail.Storage	Storage Description
#1A	226.80'	198 cf	11.25'W x 23.25'L x 2.54'H Field A 665 cf Overall - 169 cf Embedded = 496 cf x 40.0% Voids
#2A	227.30'	169 cf	Cultec R-150XLHD x 6 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		367 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	227.17'	6.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#2	Discarded	226.80'	0.01 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.01 cfs @ 8.86 hrs HW=226.83' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.29 cfs @ 12.03 hrs HW=227.51' (Free Discharge)

↳ **1=Orifice/Grate** (Orifice Controls 0.29 cfs @ 1.99 fps)

Summary for Pond 12P: Ret. Pond

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 3.59" for 100 yr event
 Inflow = 2.76 cfs @ 12.09 hrs, Volume= 0.196 af
 Outflow = 2.18 cfs @ 12.15 hrs, Volume= 0.173 af, Atten= 21%, Lag= 3.8 min
 Discarded = 0.01 cfs @ 9.02 hrs, Volume= 0.033 af
 Primary = 2.17 cfs @ 12.15 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.51' @ 12.15 hrs Surf.Area= 1,811 sf Storage= 2,362 cf

Plug-Flow detention time= 245.3 min calculated for 0.173 af (88% of inflow)
 Center-of-Mass det. time= 191.2 min (1,018.0 - 826.8)

Volume	Invert	Avail.Storage	Storage Description
#1	227.00'	3,347 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
227.00	402	0	0
228.00	634	518	518
230.00	2,195	2,829	3,347

Device	Routing	Invert	Outlet Devices
#1	Primary	229.20'	5.0' long Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	227.00'	0.01 cfs Exfiltration at all elevations

Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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Discarded OutFlow Max=0.01 cfs @ 9.02 hrs HW=227.03' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.16 cfs @ 12.15 hrs HW=229.51' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Weir Controls 2.16 cfs @ 1.40 fps)

Summary for Reach 13R: Overland Flow

Inflow Area = 0.045 ac, 100.00% Impervious, Inflow Depth = 3.09" for 100 yr event
Inflow = 0.29 cfs @ 12.03 hrs, Volume= 0.012 af
Outflow = 0.27 cfs @ 12.10 hrs, Volume= 0.012 af, Atten= 5%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.85 fps, Min. Travel Time= 2.5 min

Avg. Velocity = 0.25 fps, Avg. Travel Time= 8.3 min

Peak Storage= 40 cf @ 12.06 hrs

Average Depth at Peak Storage= 0.02'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 5.69 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0720 '/'

Inlet Invert= 227.00', Outlet Invert= 218.00'



Summary for Reach 14R: Overland Flow

Inflow Area = 0.654 ac, 31.09% Impervious, Inflow Depth = 2.58" for 100 yr event
Inflow = 2.17 cfs @ 12.15 hrs, Volume= 0.140 af
Outflow = 2.15 cfs @ 12.18 hrs, Volume= 0.140 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 2.05 fps, Min. Travel Time= 1.0 min

Avg. Velocity = 0.53 fps, Avg. Travel Time= 3.9 min

Peak Storage= 131 cf @ 12.16 hrs

Average Depth at Peak Storage= 0.05'

Bank-Full Depth= 0.10' Flow Area= 2.0 sf, Capacity= 6.29 cfs

20.00' x 0.10' deep channel, n= 0.030

Length= 125.0' Slope= 0.0880 '/'

Inlet Invert= 229.00', Outlet Invert= 218.00'

Proposed Conditions r1

Type III 24-hr 100 yr Rainfall=6.60"

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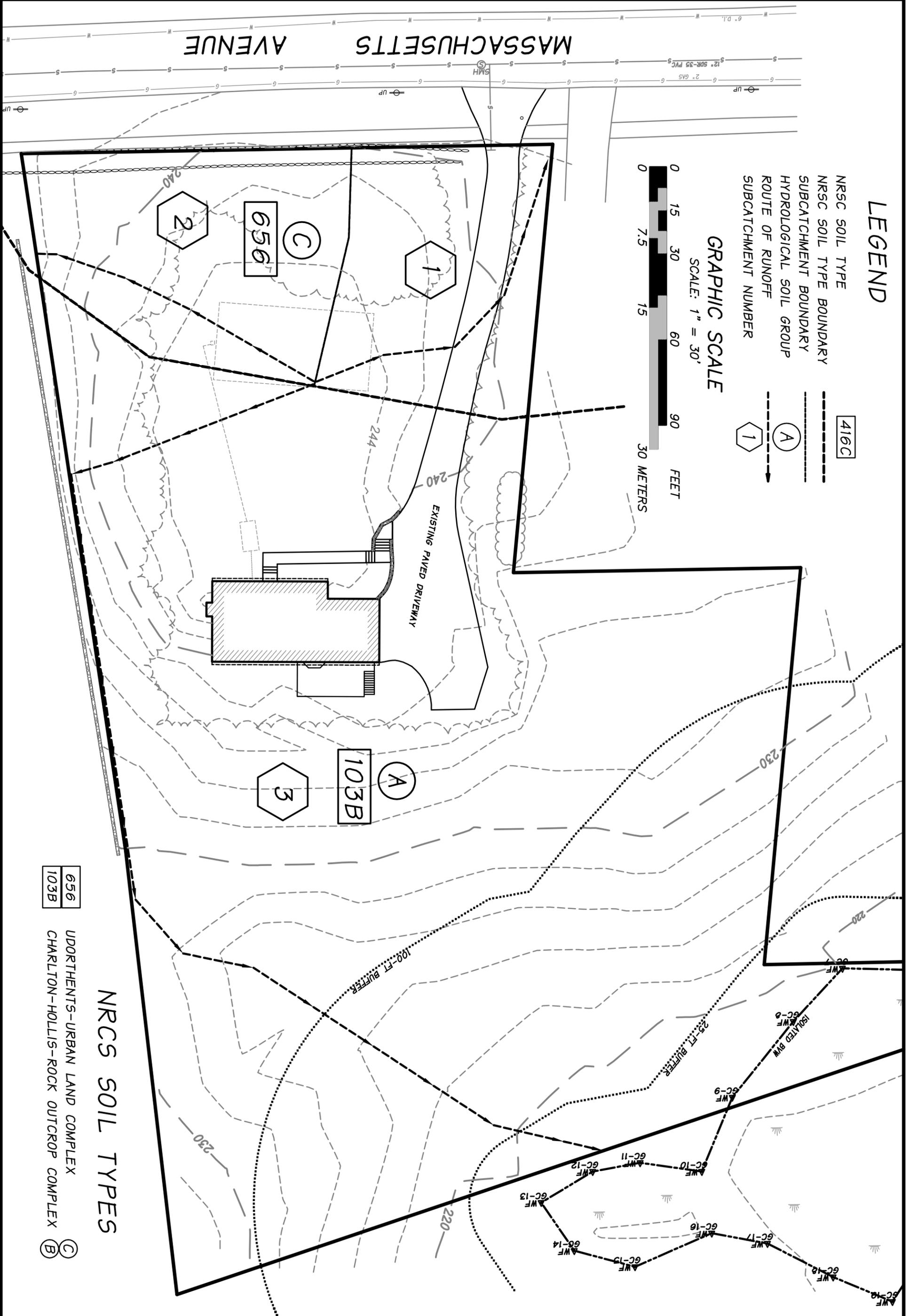


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**APPENDIX 2.3
DRAINAGE SKETCHES**

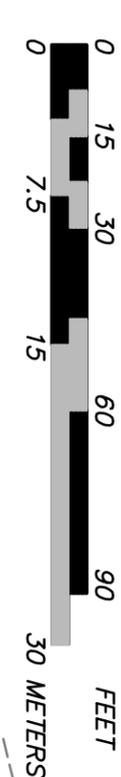
Jaime's Way
Project Report
February 2,2015



LEGEND

- NRSC SOIL TYPE [416C]
- NRSC SOIL TYPE BOUNDARY
- SUBCATCHMENT BOUNDARY
- HYDROLOGICAL SOIL GROUP
- ROUTE OF RUNOFF
- SUBCATCHMENT NUMBER

GRAPHIC SCALE
SCALE: 1" = 30'



NRCS SOIL TYPES

- [656] UDORTHENTS-URBAN LAND COMPLEX
- [103B] CHARLTON-HOLLIS-ROCK OUTCROP COMPLEX
- [C] [B]

#	DATE	REVISION	COMMENT

DATE: 02/02/15

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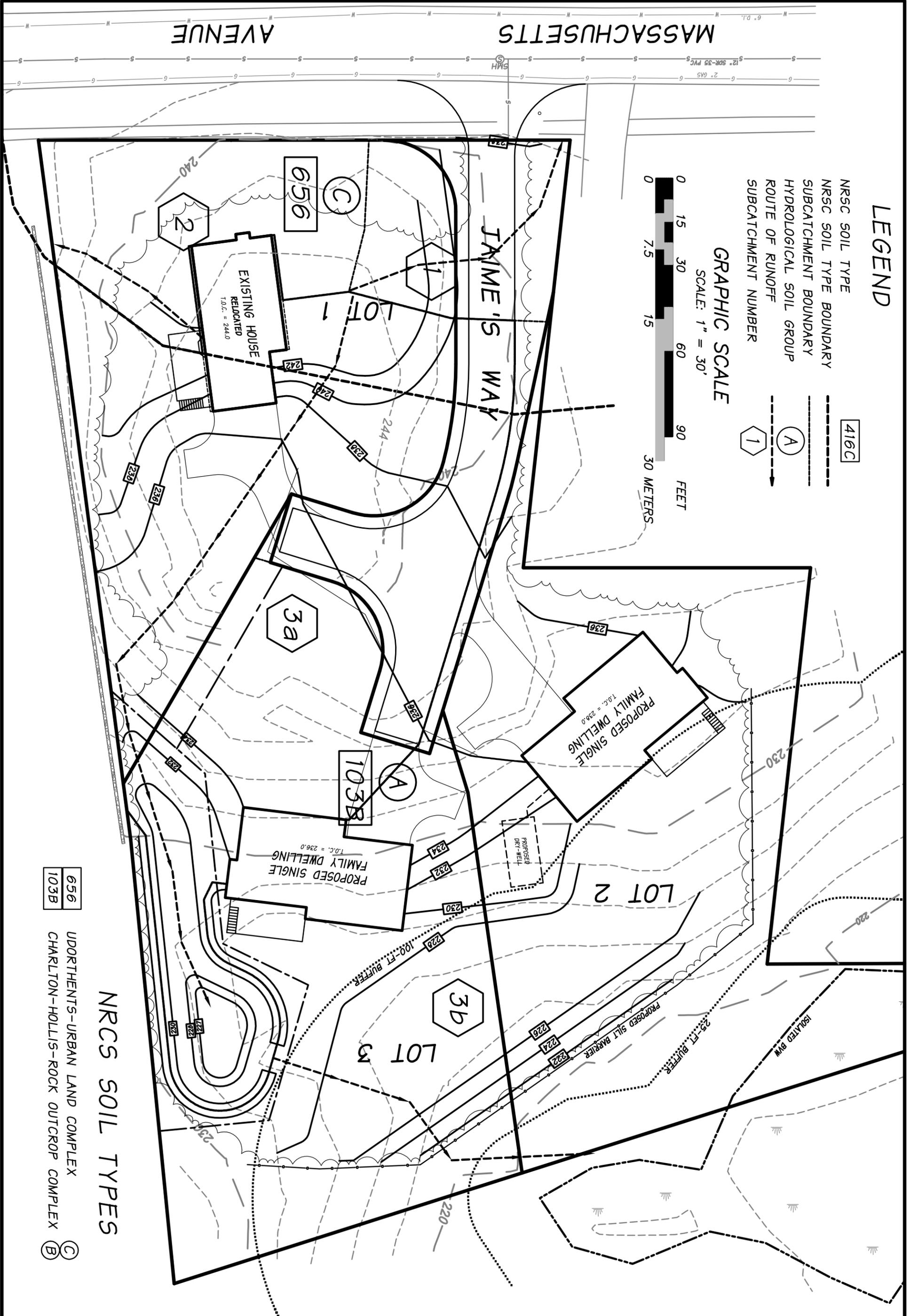
TITLE:
EXISTING DRAINAGE CALCULATIONS
456 MASSACHUSETTS AVENUE
ACTON, MASSACHUSETTS

CLIENT:
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54 GRISTMILL RD.
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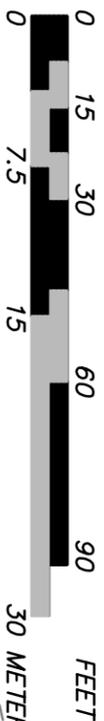


LEGEND

- NRSC SOIL TYPE [416C]
- NRSC SOIL TYPE BOUNDARY - - - - -
- SUBCATCHMENT BOUNDARY - - - - -
- HYDROLOGICAL SOIL GROUP (A)
- ROUTE OF RUNOFF (1)
- SUBCATCHMENT NUMBER (1)

GRAPHIC SCALE

SCALE: 1" = 30'



NRCS SOIL TYPES

- [656]
- [103B]

UDORTHENTS-URBAN LAND COMPLEX
CHARLTON-HOLLIS-ROCK OUTCROP COMPLEX

- (C)
- (B)

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TITLE:

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DATE: 02/02/15

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D2

SHEET 2 OF 2

2087 5108

STORMWATER SYSTEM OPERATION & MAINTENANCE

**Jaime's Way, 456 Massachusetts Avenue,
Acton MA**



**Prepared for:
Keenan and Son, LLP
54 Gristmill Rd.,
Littleton, MA**

**Prepared by:
Markey & Rubin, Inc.
360 Massachusetts Ave.
Acton, MA**

February 2, 2015

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- .1 Responsibility

B. Maintenance Program

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 - .1.2 Illicit Discharges
 - .1.3 Retention Pond
 - .1.4 Dry Well
- .2 Winter Maintenance Program
- .3 Fertilizer Selection and Use
 - .3.1 Fertilizer Selection
 - .3.2 Fertilizer Storage
 - .3.3 Fertilizer Application

C. Appendices

**Appendix A – Stormwater Management System Maintenance Program
Summary Checklist**

**Appendix B – Stormwater Management System Operation and Maintenance
Forms**

A.0 Introduction

In general, stormwater runoff from developed areas contains a number of contaminants which can have an adverse impact on receiving waters. The installation of stormwater management systems that are properly designed, installed and maintained can significantly reduce the point and non-point discharges from developed areas.

The stormwater management system can protect and enhance the stormwater runoff water quality through the removal of sediments and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventative maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, prohibitions on the use of pesticides and maintenance of designated waste and recycling areas.

This long-term Stormwater Management System Operations and Maintenance (O&M) Manual, filed with the Town of Acton, shall be implemented at Jaime's Way to ensure that the stormwater management system functions as designed. The Owner possesses the primary responsibility for overseeing and implementing the O&M plan and assigning a property manager who will be responsible for the proper operation and maintenance of the stormwater structures.

In case of the transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M plan.

Included in this manual is an overall site plan which identifies the locations of the key components of the stormwater management system.

A.1 Responsibility

The purpose of the Stormwater Operations and Maintenance Manual is to ensure the inspection of the system, removal of accumulated sediments, oils and debris, and implementation of corrective action and record keeping activities. The ongoing responsibility is the Owner, its successors and assignees. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Responsibility for Operation and Maintenance

Name: Keenan and Son, LLP
Address: 54 Gristmill Road
City, State: Littleton, Massachusetts
Contact: Sean Keenan
Email: sawitbuildit@gmail.com

These documents shall be signed by owner below:

“I have read these documents and shall be responsible for their implementation:

Signed_____ Date_____”

In the event that the responsible party changes, these records shall be changed accordingly and signed by new party in charge.

B.0 Maintenance Program

The Owner shall conduct the Operation and Maintenance program set forth in this document. The Owner will ensure that inspections timely and accurate and that cleaning and maintenance are performed in accordance with the recommended frequency for each stormwater component.

B.1 Inspection and Maintenance Frequency and Corrective Measures

The following areas, facilities and measures will be inspected by the Owner maintained as specified below. Identified deficiencies will be corrected. Accumulated sediments and debris will be properly handled and disposed of off-site, in accordance with local, state and federal guidelines and regulations.

B.1.1 Routine Maintenance Tasks

- Routine maintenance of lawns, gardens, and other landscaped areas shall occur as necessary to maintain the property in a neat and orderly fashion. Clippings and/or mulch shall not be washed into the drainage infrastructure.
- Maintenance of the Stormwater Management System shall be in accordance with the Operations and Maintenance Checklist below.
- Snow shall be stored on the site in designated areas.
- Good housekeeping – all areas should be kept free of trash and debris. Any storage of materials and waste products shall be inside or under cover. Fertilizers, herbicides and pesticides, if stored on site, shall be stored properly contained and under cover. Storage of salt or deicing chemicals, if any, shall be on impervious area, covered and protected from runoff.

B.1.2 Illicit Discharges

During construction, and all illicit connections from the property shall be cut and capped. The proposed site stormwater management system shall be checked for signs of illicit discharge during regular operation and maintenance activities. This will include but not be limited to checking for connections other than stormwater to the drainage system. Should connections other than stormwater be found, they will be immediately removed.

B.1.3 Retention Pond

Retention Pond requires regular inspection and maintenance to ensure no accumulation of silt, or any other foreign material. Other materials, leaves or twigs, dead vegetation need removal on a regular basis. Discharge rip-rap weir requires attention ensuring effectiveness. Vegetation within and surrounding pond requires cutting and upkeep ensuring no erosion and stability of slopes. Grass clippings must be removed.

Retention pond should be inspected immediately after site construction ensuring vegetation and land forms are well established for long term stability. Once in normal service, the system should be inspected bi-annually until full confidence of the site stability is recognized. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

Also, runoff to the retention pond from roadways, roofs and surrounding land should be inspected after construction to ensure that the whole subcatchment area for the runoff is as designed, in both stability and land shape. Once in operation, the subcatchment areas shall remain essentially in their original formation, and shall be in the inspection schedule in an ongoing manner.

B.1.4 Dry Well

Regular inspection and maintenance is essential to assure a properly functioning dry well infiltration system. Inspection is accomplished through the inspection ports. These inspection ports allow inspection to be accomplished from the surface without the need for confined space entry. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding three (3) inches, cleanout is required.

The system should be initially inspected immediately after the completion of the site's construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter and stormwater system. Inspection and maintenance, if necessary should be performed prior to the contractor passing responsibility over to the site's owner. Once in normal service, the system should be inspected biannually until an understanding of the site's characteristics is developed. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

B.2 Winter Maintenance Program

Ensure structures are not blocked by ice, snow, debris or trash during winter months. Snow storage locations must be designated and drainage from melting well understood to ensure no scouring or erosion. All locations must be outside of the 100-foot wetland buffer zone.

B.3 Fertilizer Selection and Use

The goal of fertilizer use should be to enhance the ground cover of the facility, yet not result in adverse water quality impacts. The following guidelines are recommended.

B.3.1 Fertilizer Selection

The selection of fertilizer should be based upon site-specific requirements. Recommendations for the fertilizer will be made upon completion of the project and actual tests of the soil mix. The benefit of the use of a soil mix

is the ability of the soil to absorb and store nutrients for subsequent plant growth better than a sandy loam.

It is recommended that the soil be re-sampled every three (3) years and the plan adjusted accordingly.

In locations considered a sensitive natural area only slow-release organic low phosphorus fertilizers should be used in any landscaped areas to limit the amount of nutrients that could enter the stormwater management system.

B.3.2 Fertilizer Storage

Fertilizer should be stored in a weatherproof area with containers protected from damage. Fertilizer from any damaged containers should be placed in appropriate weatherproof containers.

B.3.3 Fertilizer Application

Fertilizer should be applied with appropriate mechanical equipment properly calibrated to meet the recommended application rates of the soil tests and manufacturer. The Owner or his agents should instruct personnel on the use of equipment and the proper measurement of the fertilizer.

Personnel assigned to application should be instructed that over-application of fertilizer is adverse to the landscaped areas and environment. Fertilizer should not be applied to steep slopes, saturated ground, during periods of precipitation, or immediately prior to major rain events.

Appendix A

**Stormwater Management System
Maintenance Program Summary Checklist**

Stormwater Management System Maintenance Program Summary Checklist					
Item	Commentary	Frequency			
		Monthly	Quarterly	Semi-Annual	Annual
Retention Ponds	Inspect monthly for first six months; inspect for sediment accumulation quarterly of first year - annually thereafter; inspect immediately after spills		X	X	
Dry Well	Inspect for accumulated sediment immediately after construction; inspect semi-annually thereafter			X	

Appendix B

Stormwater Management System Operation and Maintenance Forms

