



**STORMWATER MANAGEMENT REPORT**

**Residential Property  
53 Bel Air Road  
Hingham, MA 02043**

**PREPARED FOR:**

**53 Bel Air Road Realty Trust  
4 Otis Avenue  
Cohasset, Massachusetts 02025**

**PREPARED BY:**

**River Hawk Environmental, LLC.  
511 West Grove Street, Suite 301,  
Middleborough, Massachusetts 02346**

**March 31, 2025**



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## **1.0 INTRODUCTION**

River Hawk Environmental, LLC. (RHE) has prepared this Stormwater Management and Erosion Control (SWMEC) Plan to describe stormwater and erosion control measures to be implemented prior to, during, and after reconstruction of the proposed single-family dwelling located at 53 Bel Air Road, Hingham, MA (Subject Property). This SWMEC Plan has been prepared to meet the requirements of the Town of Hingham Stormwater By-Law.

### **1.1 Existing Conditions**

The Subject Property is currently developed with a single-family dwelling, paved bituminous concrete driveway, lawn, and associated utilities. Currently, stormwater either infiltrates into underlying soil, runs off onto adjoining properties, or drains into the adjacent wetland.

Based on a review of the Plymouth County Soil Survey published by the National Soil Conservation Services (NSCS), the soil at the Subject Property is classified as Broadbrook very fine sandy loam, Aquepts, and Ipswich-Pawcatuck-Matunuck complex (Hydrologic Soil Group C and D). Site specific assessment revealed that the topsoil and subsoil at the Subject Property are sandy loam (Hydrologic Soil Group C) with progressively coarse soil as depth increases.

### **1.2 Proposed Redevelopment**

The proposed work includes the complete demolition of the existing dwelling and driveway, and the reconstruction of a new single-family dwelling with an associated bituminous concrete driveway, landscaping, and utilities.

Stormwater Runoff from the roof of the proposed dwelling will be directed to a dry-well located on the eastern portion of the property.

Runoff from the remainder of the property will be directed to the southwest. This is consistent with the current drainage patterns for the Property.

## 2.0 COMPLIANCE WITH MASSDEP STORMWATER MANAGEMENT STANDARDS

This section of the report provides the requisite documentation that each of the Stormwater Management Standards are being met in accordance with Volume 3 of the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Manual.

### Standard 1 - No Untreated Discharges:

Standard 1 requires that there be no untreated storm discharges and that there be no erosion to wetlands. As shown on the site plans, there are no new untreated storm discharges and no proposed discharges to wetlands. As a result, none of the outfalls will be subject to erosion; therefore, Standard 1 will be met.

### Standard 2 - Peak Rate Attenuation:

Standard 2 requires stormwater management systems to be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. Standard 2 also requires that the impact of peak discharges from the 100-year 24-hour storm be evaluated.

The results of the storm water modeling are presented in Appendix A and summarized in the following Tables. The values presented represent the flow off-site.

### Stormwater Summary for 2 to 100-Year Design Storms - Summary Point 1 (Southwest of Site)

	Peak Rate Runoff Discharged Off-Site (2-year)	Peak Rate Runoff Discharged Off-Site (10-year)	Peak Rate Runoff Discharged Off-Site (100-year)
Pre-Development	0.70 cfs	1.38 cfs	2.53 cfs
Post-Development	0.56 cfs	1.15 cfs	2.33 cfs

The computer modeling output indicates the peak flows discharged off-site have been reduced for post-development conditions for the 2-year, 10-year, and 100-year design storms. The proposed redevelopment will provide a reduction in the peak rate of runoff versus the rate under existing conditions; therefore, Standard 2 will be met.

### Standard 3 - Stormwater Recharge:

The loss of annual recharge to groundwater will be eliminated at the Subject Property through the use of infiltration measures, low impact development techniques, stormwater best management practices, and good operation and maintenance.

**Recharge:**

Standard 3 requires at a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume “R” as determined in accordance with the Massachusetts Stormwater Handbook (MSH). The R associated with the redevelopment of the Subject Property was determined using the method prescribed in the Massachusetts Stormwater Handbook (MSH).

The soils at the Subject Property are classified as Hydrologic Soil Group C & D. All of the proposed work/impervious area is in locations classified as HSG C. The recharge volume for Hydrologic Soil Group is [Volume to Recharge] x [Total Impervious Area]. The recharge volume R is as follows:

Hydrologic Soil Group C: 4,872 s.f. x 0.35 inches = 142 cubic feet

The proposed dry-well has the capacity to capture and infiltrate 589 cubic feet.

589 cubic feet > 142 cubic feet

The calculations presented indicate the proposed stormwater BMPs have enough capacity to store and infiltrate the required recharge volume.

**Pretreatment:**

Stormwater runoff from the roof of the proposed dwelling will be discharged to the Dry Well. The roof runoff is considered “clean”, therefore pretreatment of the stormwater prior to discharge to the infiltration BMPs is not necessary.

### **Drawdown Period:**

Drawdown Period for the dry-well:

$$\text{Time}_{\text{drawdown}} = \text{Storage Volume} / [ (k = \text{infiltration rate}) * (\text{bottom area}) ]$$

$$\begin{aligned} \text{Storage Volume} &= \text{Dry-Well Volume} \\ &= \text{Chamber Storage} + \text{Stone Storage} \\ &= 589 \text{ cubic feet} \end{aligned}$$

$$\begin{aligned} \text{Bottom Area} &= \text{Dry-Well Area} \\ &= 274 \text{ square feet} \end{aligned}$$

$$\begin{aligned} \text{Time}_{\text{DryWell}} &= 589 \text{ cubic feet} / [ (1.02 \text{ inch/hr} * 274 \text{ s.f.}) ] \\ &= 589 \text{ cubic feet} / [ (0.085 \text{ ft/hr} * 274 \text{ s.f.}) ] \\ &= 25.29 \text{ hours} \end{aligned}$$

$$\text{Time}_{\text{DryWell}} = 25.29 \text{ hours} < 72 \text{ hours}$$

The calculations presented indicate that the infiltration BMPs will drawdown in less than 72 hours. Therefore, Standard 3 will be met.

### **Standard 4 - Water Quality:**

Standard 4 requires removal of 80% of total suspended solids (TSS) from the stormwater runoff. Stormwater runoff from the roof of the proposed dwelling will be discharged to the proposed dry-well. The roof runoff is considered “clean”; Standard 4 will, therefore, be met.

### **Standard 5 - Land And Uses With Higher Pollution Loads:**

The proposed development is not considered a land use with a higher pollution load; therefore, Standard 5 will be met.

### **Standard 6 - Critical Areas:**

The Subject Property does not discharge stormwater to Critical Areas; therefore, Standard 6 will be met.

### **Standard 7 - Redevelopment Project:**

Qualified redevelopment projects are allowed to only meet standards 1 through 6 to the “maximum extent practicable”. The proposed development does not qualify as a redevelopment project since it will result in a slight net increase in impervious area. Therefore, the Project is required to meet all of the Stormwater Management Standards.

### **Standard 8 - Construction Period Controls:**

Standard 8 requires the preparation and implementation of an erosion and sediment control program for the site construction phase. A Construction Phase Erosion and Sediment Control Plan has been developed and is included as Appendix B. The Construction Phase Erosion and Sediment Control Plan is in full compliance with Standard 8.

**Standard 9 - Long Term Operation and Maintenance Program:**

Standard 9 requires the preparation of an ongoing program to maintain the stormwater quality and quantity controls in optimal operating condition. Appendix C presents a Long Term Operation and Maintenance Program which is in full compliance with Standard 9, therefore, Standard 9 will be met.

**Standard 10 - Prohibition of Illicit Discharges:**

Standard 10 prohibits illicit discharges to Stormwater Management Systems. A final illicit discharge statement shall be provided when construction is complete.



**DRAINAGE CALCULATIONS**



**NOAA Atlas 14 Rainfall Data**

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**POINT PRECIPITATION FREQUENCY ESTIMATES**

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
<b>5-min</b>	<b>0.304</b> (0.240-0.381)	<b>0.377</b> (0.297-0.472)	<b>0.496</b> (0.390-0.624)	<b>0.594</b> (0.463-0.752)	<b>0.729</b> (0.551-0.977)	<b>0.830</b> (0.614-1.14)	<b>0.938</b> (0.676-1.35)	<b>1.07</b> (0.720-1.57)	<b>1.26</b> (0.818-1.93)	<b>1.43</b> (0.904-2.23)
<b>10-min</b>	<b>0.431</b> (0.340-0.539)	<b>0.534</b> (0.420-0.669)	<b>0.702</b> (0.551-0.883)	<b>0.841</b> (0.656-1.06)	<b>1.03</b> (0.780-1.38)	<b>1.18</b> (0.871-1.62)	<b>1.33</b> (0.958-1.92)	<b>1.51</b> (1.02-2.22)	<b>1.79</b> (1.16-2.73)	<b>2.02</b> (1.28-3.16)
<b>15-min</b>	<b>0.507</b> (0.400-0.635)	<b>0.628</b> (0.494-0.787)	<b>0.826</b> (0.648-1.04)	<b>0.989</b> (0.772-1.25)	<b>1.22</b> (0.918-1.63)	<b>1.38</b> (1.02-1.90)	<b>1.56</b> (1.13-2.25)	<b>1.78</b> (1.20-2.61)	<b>2.10</b> (1.36-3.21)	<b>2.38</b> (1.51-3.72)
<b>30-min</b>	<b>0.704</b> (0.555-0.881)	<b>0.872</b> (0.687-1.09)	<b>1.15</b> (0.900-1.44)	<b>1.37</b> (1.07-1.74)	<b>1.69</b> (1.28-2.26)	<b>1.92</b> (1.42-2.64)	<b>2.17</b> (1.57-3.13)	<b>2.47</b> (1.67-3.63)	<b>2.93</b> (1.90-4.48)	<b>3.32</b> (2.10-5.18)
<b>60-min</b>	<b>0.901</b> (0.710-1.13)	<b>1.12</b> (0.879-1.40)	<b>1.47</b> (1.15-1.85)	<b>1.76</b> (1.37-2.23)	<b>2.16</b> (1.63-2.90)	<b>2.46</b> (1.82-3.38)	<b>2.78</b> (2.01-4.01)	<b>3.17</b> (2.14-4.65)	<b>3.76</b> (2.44-5.74)	<b>4.26</b> (2.70-6.65)
<b>2-hr</b>	<b>1.14</b> (0.907-1.42)	<b>1.44</b> (1.14-1.79)	<b>1.92</b> (1.52-2.40)	<b>2.32</b> (1.82-2.92)	<b>2.87</b> (2.19-3.83)	<b>3.28</b> (2.45-4.49)	<b>3.72</b> (2.71-5.35)	<b>4.27</b> (2.89-6.21)	<b>5.10</b> (3.32-7.72)	<b>5.82</b> (3.70-9.00)
<b>3-hr</b>	<b>1.33</b> (1.06-1.64)	<b>1.67</b> (1.33-2.07)	<b>2.24</b> (1.77-2.78)	<b>2.70</b> (2.13-3.39)	<b>3.35</b> (2.56-4.44)	<b>3.83</b> (2.86-5.21)	<b>4.34</b> (3.17-6.21)	<b>4.98</b> (3.38-7.20)	<b>5.96</b> (3.89-8.96)	<b>6.81</b> (4.33-10.5)
<b>6-hr</b>	<b>1.74</b> (1.39-2.14)	<b>2.17</b> (1.74-2.67)	<b>2.87</b> (2.29-3.54)	<b>3.45</b> (2.73-4.29)	<b>4.24</b> (3.26-5.58)	<b>4.83</b> (3.64-6.52)	<b>5.47</b> (4.00-7.73)	<b>6.25</b> (4.26-8.95)	<b>7.44</b> (4.87-11.1)	<b>8.46</b> (5.40-12.8)
<b>12-hr</b>	<b>2.28</b> (1.84-2.78)	<b>2.78</b> (2.24-3.40)	<b>3.61</b> (2.90-4.43)	<b>4.29</b> (3.42-5.30)	<b>5.23</b> (4.04-6.81)	<b>5.93</b> (4.48-7.91)	<b>6.68</b> (4.90-9.31)	<b>7.58</b> (5.19-10.7)	<b>8.93</b> (5.86-13.1)	<b>10.1</b> (6.45-15.1)
<b>24-hr</b>	<b>2.77</b> (2.25-3.36)	<b>3.39</b> (2.75-4.12)	<b>4.40</b> (3.55-5.36)	<b>5.23</b> (4.20-6.42)	<b>6.38</b> (4.95-8.24)	<b>7.24</b> (5.50-9.57)	<b>8.16</b> (6.02-11.3)	<b>9.27</b> (6.37-13.0)	<b>11.0</b> (7.21-15.9)	<b>12.4</b> (7.95-18.4)
<b>2-day</b>	<b>3.13</b> (2.56-3.77)	<b>3.90</b> (3.19-4.71)	<b>5.17</b> (4.20-6.26)	<b>6.22</b> (5.03-7.58)	<b>7.66</b> (5.99-9.85)	<b>8.73</b> (6.68-11.5)	<b>9.89</b> (7.37-13.6)	<b>11.3</b> (7.83-15.7)	<b>13.6</b> (9.00-19.6)	<b>15.6</b> (10.0-22.8)
<b>3-day</b>	<b>3.42</b> (2.81-4.11)	<b>4.26</b> (3.49-5.12)	<b>5.63</b> (4.60-6.79)	<b>6.76</b> (5.48-8.20)	<b>8.32</b> (6.53-10.6)	<b>9.47</b> (7.28-12.4)	<b>10.7</b> (8.02-14.7)	<b>12.3</b> (8.51-17.0)	<b>14.8</b> (9.79-21.1)	<b>17.0</b> (10.9-24.7)
<b>4-day</b>	<b>3.71</b> (3.05-4.44)	<b>4.57</b> (3.76-5.48)	<b>5.99</b> (4.90-7.20)	<b>7.16</b> (5.82-8.66)	<b>8.78</b> (6.90-11.2)	<b>9.96</b> (7.67-13.0)	<b>11.3</b> (8.44-15.4)	<b>12.9</b> (8.94-17.7)	<b>15.5</b> (10.2-22.0)	<b>17.7</b> (11.4-25.6)
<b>7-day</b>	<b>4.51</b> (3.73-5.36)	<b>5.41</b> (4.47-6.44)	<b>6.88</b> (5.67-8.23)	<b>8.11</b> (6.63-9.75)	<b>9.79</b> (7.73-12.4)	<b>11.0</b> (8.52-14.3)	<b>12.4</b> (9.29-16.7)	<b>14.1</b> (9.78-19.1)	<b>16.6</b> (11.1-23.4)	<b>18.9</b> (12.2-27.1)
<b>10-day</b>	<b>5.24</b> (4.35-6.22)	<b>6.17</b> (5.12-7.33)	<b>7.69</b> (6.35-9.16)	<b>8.95</b> (7.34-10.7)	<b>10.7</b> (8.45-13.4)	<b>12.0</b> (9.25-15.3)	<b>13.4</b> (10.0-17.8)	<b>15.0</b> (10.5-20.3)	<b>17.6</b> (11.7-24.5)	<b>19.7</b> (12.8-28.1)
<b>20-day</b>	<b>7.35</b> (6.15-8.66)	<b>8.36</b> (6.98-9.86)	<b>10.0</b> (8.33-11.8)	<b>11.4</b> (9.40-13.5)	<b>13.3</b> (10.5-16.4)	<b>14.7</b> (11.4-18.5)	<b>16.2</b> (12.1-21.1)	<b>17.8</b> (12.5-23.8)	<b>20.2</b> (13.5-27.8)	<b>22.0</b> (14.4-31.0)
<b>30-day</b>	<b>9.09</b> (7.63-10.7)	<b>10.2</b> (8.52-11.9)	<b>11.9</b> (9.95-14.0)	<b>13.4</b> (11.1-15.8)	<b>15.4</b> (12.2-18.9)	<b>16.9</b> (13.1-21.1)	<b>18.5</b> (13.7-23.8)	<b>20.1</b> (14.2-26.6)	<b>22.3</b> (15.0-30.5)	<b>24.0</b> (15.6-33.5)
<b>45-day</b>	<b>11.3</b> (9.49-13.2)	<b>12.4</b> (10.4-14.5)	<b>14.3</b> (12.0-16.8)	<b>15.8</b> (13.2-18.7)	<b>18.0</b> (14.3-21.9)	<b>19.7</b> (15.2-24.3)	<b>21.3</b> (15.8-27.0)	<b>22.9</b> (16.2-30.1)	<b>24.9</b> (16.8-33.8)	<b>26.3</b> (17.2-36.5)
<b>60-day</b>	<b>13.1</b> (11.1-15.3)	<b>14.3</b> (12.1-16.7)	<b>16.3</b> (13.7-19.0)	<b>17.9</b> (14.9-21.0)	<b>20.1</b> (16.1-24.3)	<b>21.9</b> (17.0-26.9)	<b>23.6</b> (17.5-29.7)	<b>25.1</b> (17.8-32.9)	<b>27.0</b> (18.3-36.6)	<b>28.3</b> (18.5-39.1)

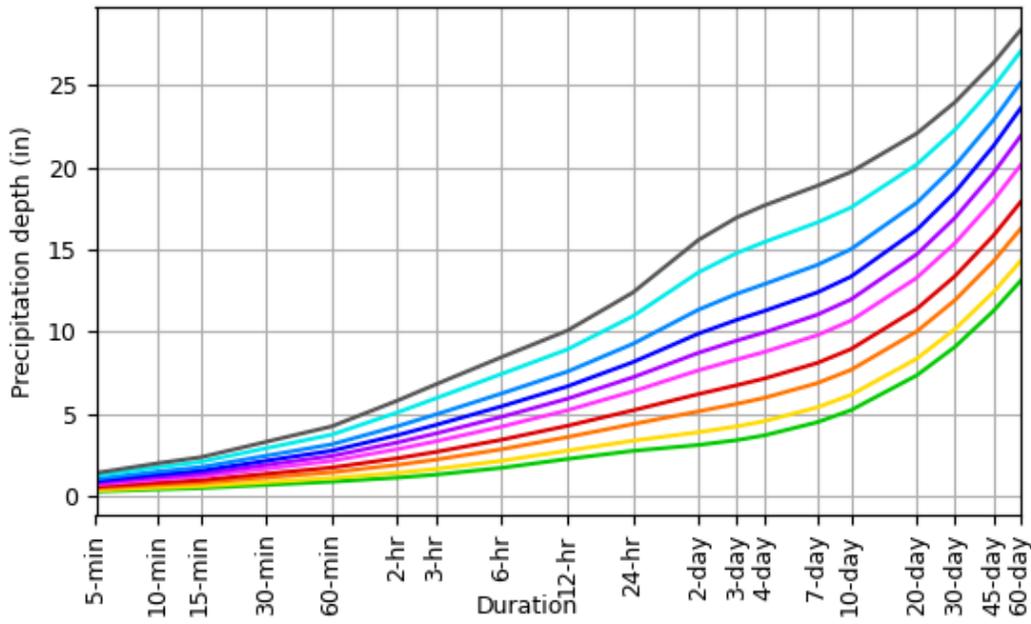
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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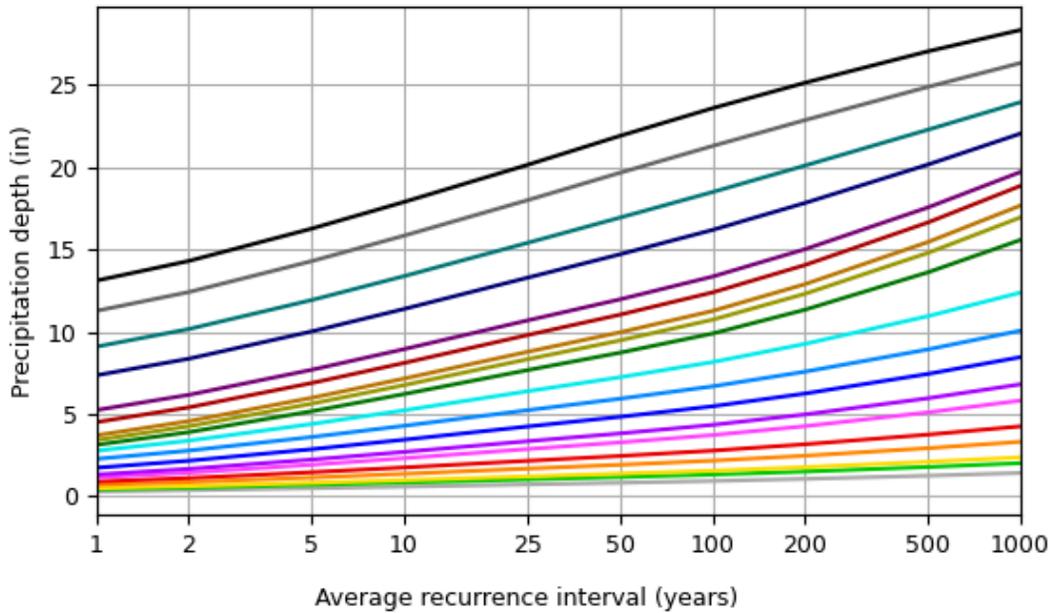
**PF graphical**

# PDS-based depth-duration-frequency (DDF) curves

Latitude: 42.2604°, Longitude: -70.9060°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

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## Maps & aerials

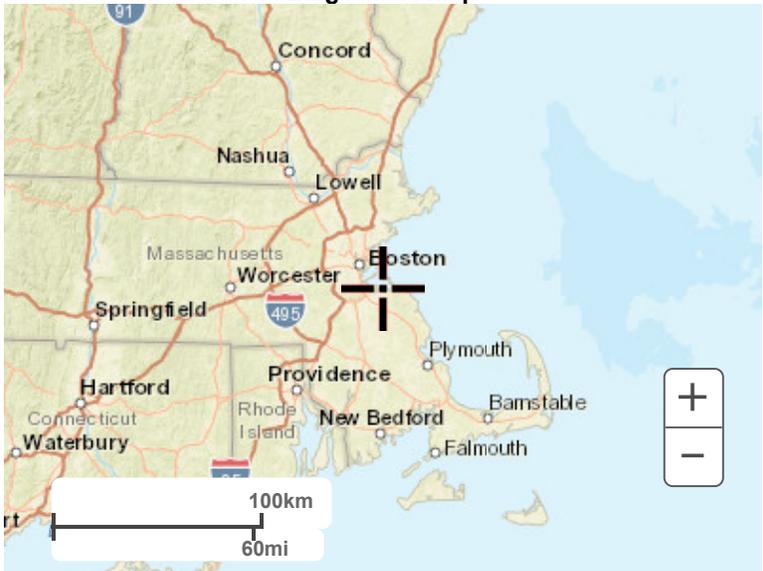
Small scale terrain



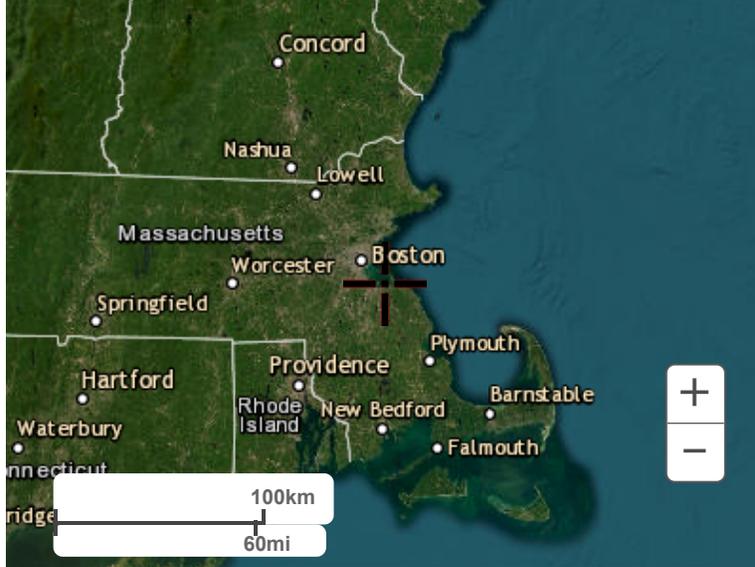
Large scale terrain



Large scale map



Large scale aerial



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**USDA SCS Soil Report**

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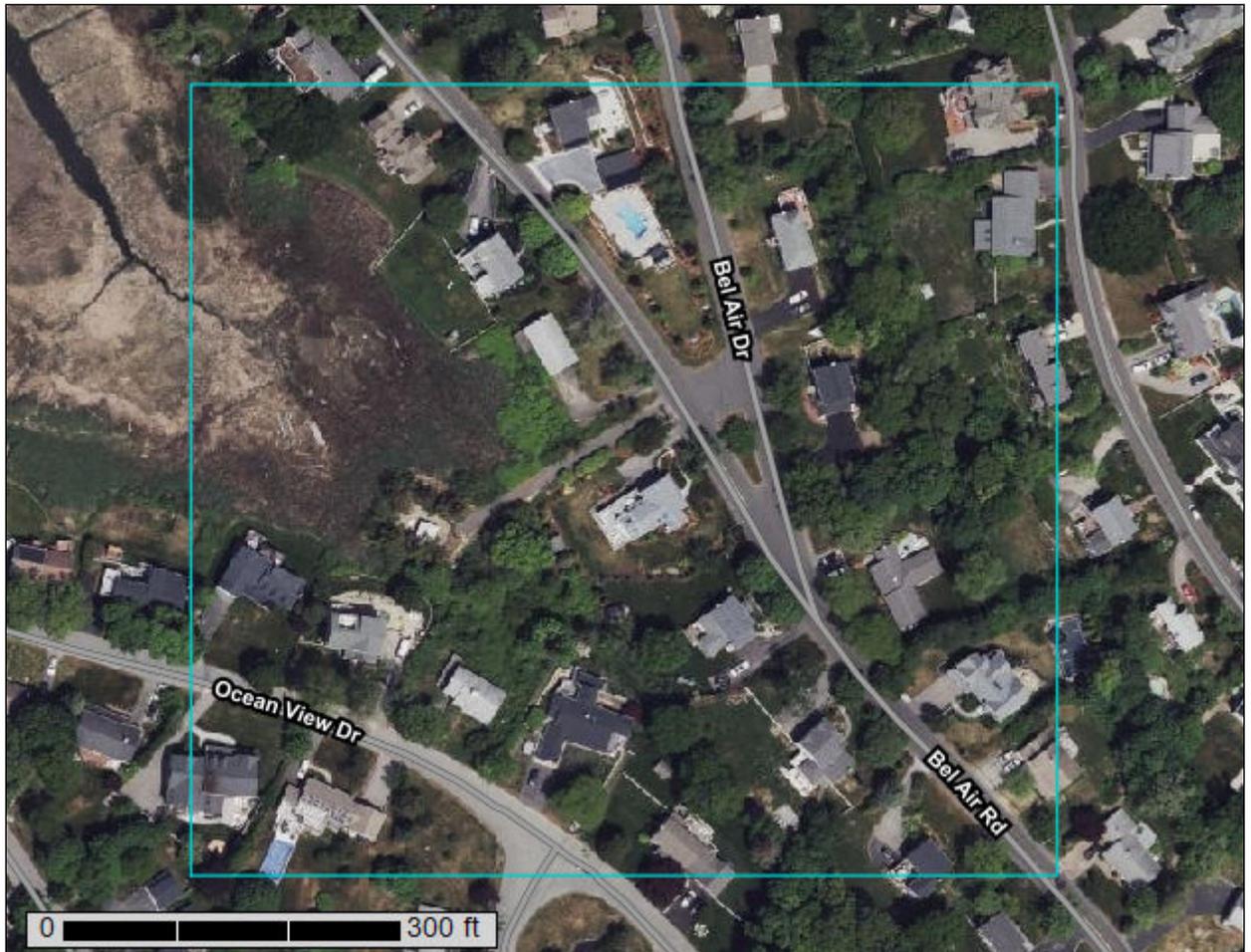
United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for Plymouth County, Massachusetts



# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

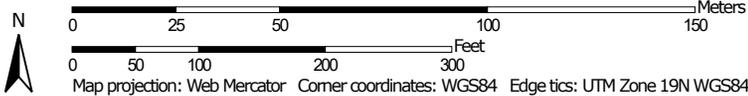
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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map



Map Scale: 1:1,810 if printed on A landscape (11" x 8.5") sheet.



### 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 1:12,000.

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

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

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

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

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

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

Soil Survey Area: Plymouth County, Massachusetts  
 Survey Area Data: Version 17, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	1.2	10.0%
110B	Canton-Chatfield-Rock outcrop complex, 0 to 8 percent slopes, very stony	0.0	0.0%
340B	Broadbrook very fine sandy loam, 3 to 8 percent slopes	7.1	57.0%
340C	Broadbrook very fine sandy loam, 8 to 15 percent slopes	2.7	21.7%
657A	Aquepts, 0 to 3 percent slopes	1.4	11.3%
<b>Totals for Area of Interest</b>		<b>12.4</b>	<b>100.0%</b>

## Map Unit Descriptions

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, 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

## Custom Soil Resource Report

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*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one 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.

## Plymouth County, Massachusetts

### 66A—Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded

#### Map Unit Setting

*National map unit symbol:* 2tyqm  
*Elevation:* 0 to 10 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 140 to 250 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Ipswich and similar soils:* 50 percent  
*Pawcatuck and similar soils:* 25 percent  
*Matunuck and similar soils:* 15 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Ipswich

##### Setting

*Landform:* Tidal marshes  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Partially- decomposed herbaceous organic material

##### Typical profile

*Oe - 0 to 42 inches:* mucky peat  
*Oa - 42 to 59 inches:* muck

##### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Very poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to very high (0.14 to 99.90 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* Very frequent  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 5 percent  
*Maximum salinity:* Nonsaline to strongly saline (1.0 to 112.0 mmhos/cm)  
*Sodium adsorption ratio, maximum:* 20.0  
*Available water supply, 0 to 60 inches:* Very high (about 26.6 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8w  
*Hydrologic Soil Group:* A/D  
*Ecological site:* R144AY001CT - Tidal Salt Low Marsh mesic very frequently flooded, R144AY002CT - Tidal Salt High Marsh mesic very frequently flooded  
*Hydric soil rating:* Yes

## Description of Pawcatuck

### Setting

*Landform:* Tidal marshes

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Partially- decomposed herbaceous organic material over sandy mineral material

### Typical profile

*Oe - 0 to 46 inches:* mucky peat

*Cg - 46 to 60 inches:* mucky sand

### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Very poorly drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to very high (0.14 to 99.90 in/hr)

*Depth to water table:* About 0 inches

*Frequency of flooding:* Very frequent

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 5 percent

*Maximum salinity:* Nonsaline to strongly saline (1.0 to 112.0 mmhos/cm)

*Sodium adsorption ratio, maximum:* 20.0

*Available water supply, 0 to 60 inches:* Very high (about 21.4 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8w

*Hydrologic Soil Group:* A/D

*Ecological site:* R144AY001CT - Tidal Salt Low Marsh mesic very frequently flooded, R144AY002CT - Tidal Salt High Marsh mesic very frequently flooded

*Hydric soil rating:* Yes

## Description of Matunuck

### Setting

*Landform:* Tidal marshes

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Partially- decomposed herbaceous organic material over glaciofluvial deposits and/or sandy marine deposits

### Typical profile

*Oe - 0 to 12 inches:* mucky peat

*Cg - 12 to 72 inches:* sand

### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Very poorly drained

*Runoff class:* Negligible

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*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to very high (0.14 to 99.90 in/hr)

*Depth to water table:* About 0 inches

*Frequency of flooding:* Very frequent

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 5 percent

*Maximum salinity:* Nonsaline to strongly saline (1.0 to 112.0 mmhos/cm)

*Sodium adsorption ratio, maximum:* 20.0

*Available water supply, 0 to 60 inches:* Moderate (about 8.2 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8w

*Hydrologic Soil Group:* A/D

*Ecological site:* R144AY001CT - Tidal Salt Low Marsh mesic very frequently flooded, R144AY002CT - Tidal Salt High Marsh mesic very frequently flooded

*Hydric soil rating:* Yes

### Minor Components

#### Succotash

*Percent of map unit:* 5 percent

*Landform:* Spits on back-barrier flats

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Hooksan

*Percent of map unit:* 5 percent

*Landform:* Dunes

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

## 110B—Canton-Chatfield-Rock outcrop complex, 0 to 8 percent slopes, very stony

### Map Unit Setting

*National map unit symbol:* 2w82f

*Elevation:* 0 to 260 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 140 to 240 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Canton, very stony, and similar soils: 40 percent*

*Chatfield, very stony, and similar soils: 25 percent*

*Rock outcrop: 20 percent*

*Minor components: 15 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Canton, Very Stony

#### Setting

*Landform: Moraines, hills, ridges*

*Landform position (two-dimensional): Summit, shoulder, backslope*

*Landform position (three-dimensional): Side slope, crest*

*Down-slope shape: Convex, linear*

*Across-slope shape: Convex*

*Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist*

#### Typical profile

*O<sub>i</sub> - 0 to 2 inches: slightly decomposed plant material*

*A - 2 to 5 inches: fine sandy loam*

*Bw<sub>1</sub> - 5 to 16 inches: fine sandy loam*

*Bw<sub>2</sub> - 16 to 22 inches: gravelly fine sandy loam*

*2C - 22 to 67 inches: gravelly loamy sand*

#### Properties and qualities

*Slope: 0 to 8 percent*

*Surface area covered with cobbles, stones or boulders: 1.6 percent*

*Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification*

*Drainage class: Well drained*

*Runoff class: Low*

*Capacity of the most limiting layer to transmit water (K<sub>sat</sub>): Moderately low to high (0.14 to 14.17 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)*

*Available water supply, 0 to 60 inches: Low (about 3.6 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 6s*

*Hydrologic Soil Group: B*

*Ecological site: F144AY034CT - Well Drained Till Uplands*

*Hydric soil rating: No*

### Description of Chatfield, Very Stony

#### Setting

*Landform: Ridges, hills*

*Landform position (two-dimensional): Summit, shoulder, backslope*

*Landform position (three-dimensional): Nose slope, side slope, crest*

*Down-slope shape: Convex*

*Across-slope shape: Linear, convex*

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*Parent material:* Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

### Typical profile

*O<sub>i</sub> - 0 to 1 inches:* slightly decomposed plant material  
*A - 1 to 2 inches:* fine sandy loam  
*B<sub>w</sub> - 2 to 30 inches:* gravelly fine sandy loam  
*2R - 30 to 40 inches:* bedrock

### Properties and qualities

*Slope:* 0 to 8 percent  
*Surface area covered with cobbles, stones or boulders:* 1.6 percent  
*Depth to restrictive feature:* 20 to 41 inches to lithic bedrock  
*Drainage class:* Well drained  
*Runoff class:* High  
*Capacity of the most limiting layer to transmit water (K<sub>sat</sub>):* Very low (0.00 to 0.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Low (about 4.3 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* B  
*Ecological site:* F144AY034CT - Well Drained Till Uplands  
*Hydric soil rating:* No

## Description of Rock Outcrop

### Setting

*Landform:* Ridges, hills  
*Parent material:* Igneous and metamorphic rock

### Typical profile

*R - 0 to 79 inches:* bedrock

### Properties and qualities

*Slope:* 0 to 8 percent  
*Depth to restrictive feature:* 0 inches to lithic bedrock  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (K<sub>sat</sub>):* Very low (0.00 to 0.00 in/hr)  
*Available water supply, 0 to 60 inches:* Very low (about 0.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8  
*Hydric soil rating:* No

## Minor Components

### Newfields, very stony

*Percent of map unit:* 10 percent  
*Landform:* Ground moraines, hills, moraines  
*Landform position (two-dimensional):* Footslope

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*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Hydric soil rating:* No

### **Hollis, very stony**

*Percent of map unit:* 5 percent  
*Landform:* Ridges, hills  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope, crest  
*Down-slope shape:* Convex  
*Across-slope shape:* Linear, convex  
*Hydric soil rating:* No

## **340B—Broadbrook very fine sandy loam, 3 to 8 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 9y4f  
*Elevation:* 50 to 400 feet  
*Mean annual precipitation:* 41 to 54 inches  
*Mean annual air temperature:* 43 to 54 degrees F  
*Frost-free period:* 145 to 240 days  
*Farmland classification:* All areas are prime farmland

### **Map Unit Composition**

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

### **Description of Broadbrook**

#### **Setting**

*Landform:* Till plains, hills, drumlins  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Coarse-loamy eolian deposits over coarse-loamy lodgment till

#### **Typical profile**

*O<sub>i</sub> - 0 to 2 inches:* slightly decomposed plant material  
*O<sub>e</sub> - 2 to 4 inches:* moderately decomposed plant material  
*A - 4 to 6 inches:* very fine sandy loam  
*B<sub>w1</sub> - 6 to 18 inches:* very fine sandy loam  
*B<sub>w2</sub> - 18 to 30 inches:* very fine sandy loam  
*2C<sub>d1</sub> - 30 to 44 inches:* gravelly fine sandy loam  
*2C<sub>d2</sub> - 44 to 63 inches:* gravelly sandy loam

## Custom Soil Resource Report

### Properties and qualities

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* 20 to 39 inches to densic material  
*Drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 0.20 in/hr)  
*Depth to water table:* About 18 to 30 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 4.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* C  
*Ecological site:* F144AY007CT - Well Drained Dense Till Uplands  
*Hydric soil rating:* No

### Minor Components

#### Canton

*Percent of map unit:* 5 percent  
*Landform:* Hills, till plains, ridges  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Paxton

*Percent of map unit:* 5 percent  
*Landform:* Hills, ground moraines, drumlins, till plains  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Montauk

*Percent of map unit:* 5 percent  
*Landform:* Till plains, ground moraines, drumlins  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Woodbridge

*Percent of map unit:* 5 percent  
*Landform:* Till plains, hills, drumlins  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* No

## 340C—Broadbrook very fine sandy loam, 8 to 15 percent slopes

### Map Unit Setting

*National map unit symbol:* 9y4b

*Elevation:* 50 to 400 feet

*Mean annual precipitation:* 41 to 54 inches

*Mean annual air temperature:* 43 to 54 degrees F

*Frost-free period:* 145 to 240 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Broadbrook and similar soils:* 80 percent

*Minor components:* 20 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Broadbrook

#### Setting

*Landform:* Till plains, hills, drumlins

*Landform position (two-dimensional):* Shoulder, backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Parent material:* Coarse-loamy eolian deposits over coarse-loamy lodgment till

#### Typical profile

*O<sub>i</sub> - 0 to 2 inches:* slightly decomposed plant material

*O<sub>e</sub> - 2 to 4 inches:* moderately decomposed plant material

*A - 4 to 6 inches:* very fine sandy loam

*B<sub>w1</sub> - 6 to 18 inches:* very fine sandy loam

*B<sub>w2</sub> - 18 to 30 inches:* very fine sandy loam

*2C<sub>d1</sub> - 30 to 44 inches:* gravelly fine sandy loam

*2C<sub>d2</sub> - 44 to 63 inches:* gravelly sandy loam

#### Properties and qualities

*Slope:* 8 to 15 percent

*Depth to restrictive feature:* 20 to 39 inches to densic material

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (K<sub>sat</sub>):* Very low to moderately high (0.00 to 0.20 in/hr)

*Depth to water table:* About 18 to 30 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Low (about 4.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* C

## Custom Soil Resource Report

*Ecological site:* F144AY007CT - Well Drained Dense Till Uplands  
*Hydric soil rating:* No

### Minor Components

#### Canton

*Percent of map unit:* 5 percent  
*Landform:* Till plains, ridges, hills  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Paxton

*Percent of map unit:* 5 percent  
*Landform:* Hills, ground moraines, drumlins, till plains  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Montauk

*Percent of map unit:* 5 percent  
*Landform:* Till plains, ground moraines, drumlins  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### Woodbridge

*Percent of map unit:* 5 percent  
*Landform:* Drumlins, till plains, hills  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Hydric soil rating:* No

## 657A—Aquepts, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* bd0z  
*Elevation:* 0 to 390 feet  
*Mean annual precipitation:* 41 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**

*Aquepts and similar soils: 80 percent*

*Minor components: 20 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Aquepts**

**Setting**

*Landform position (two-dimensional): Toeslope*

*Landform position (three-dimensional): Tread*

*Down-slope shape: Linear*

*Across-slope shape: Concave*

*Parent material: Coarse-loamy human transported material over sandy and gravelly glaciofluvial deposits*

**Typical profile**

*^A - 0 to 4 inches: very fine sandy loam*

*^BA - 4 to 17 inches: very fine sandy loam*

*^Cg - 17 to 42 inches: very fine sandy loam*

*2Oa - 42 to 47 inches: muck*

*3Cg - 47 to 65 inches: loamy sand*

**Properties and qualities**

*Slope: 0 to 3 percent*

*Depth to restrictive feature: More than 80 inches*

*Drainage class: Poorly drained*

*Runoff class: Very low*

*Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)*

*Depth to water table: About 0 to 4 inches*

*Frequency of flooding: None*

*Frequency of ponding: Occasional*

*Available water supply, 0 to 60 inches: Moderate (about 7.9 inches)*

**Interpretive groups**

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 4w*

*Hydrologic Soil Group: D*

*Hydric soil rating: Yes*

**Minor Components**

**Udorthents, loamy**

*Percent of map unit: 10 percent*

*Landform position (three-dimensional): Tread*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Hydric soil rating: No*

**Udorthents, wet substratum**

*Percent of map unit: 10 percent*

*Landform position (two-dimensional): Footslope*

*Landform position (three-dimensional): Tread*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Hydric soil rating: No*

## Custom Soil Resource Report

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- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)



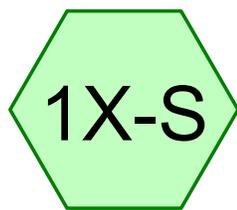
**PRE-DEVELOPMENT**

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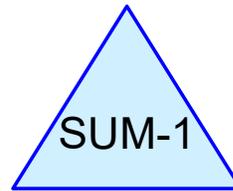




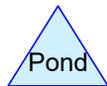
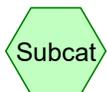




Site



SUM-1



**Routing Diagram for Exist. Conditions**

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Page 2

### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,305	74	>75% Grass cover, Good, HSG C (1X-S)
2,502	70	Brush, Fair, HSG C (1X-S)
2,877	77	Brush, Fair, HSG D (1X-S)
3,133	98	Paved parking, HSG C (1X-S)
1,322	98	Roofs, HSG C (1X-S)
<b>18,139</b>	<b>80</b>	<b>TOTAL AREA</b>

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### Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
15,262	HSG C	1X-S
2,877	HSG D	1X-S
0	Other	
<b>18,139</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	8,305	0	0	8,305	>75% Grass cover, Good
0	0	2,502	2,877	0	5,379	Brush, Fair
0	0	3,133	0	0	3,133	Paved parking
0	0	1,322	0	0	1,322	Roofs
<b>0</b>	<b>0</b>	<b>15,262</b>	<b>2,877</b>	<b>0</b>	<b>18,139</b>	<b>TOTAL AREA</b>

**Exist. Conditions**

Type III 24-hr 2-YEAR Rainfall=3.39"

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Page 5

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1X-S: Site**

Runoff Area=18,139 sf 24.56% Impervious Runoff Depth>1.65"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=0.70 cfs 2,494 cf

**Pond SUM-1: SUM-1**

Inflow=0.70 cfs 2,494 cf  
Primary=0.70 cfs 2,494 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 2,494 cf Average Runoff Depth = 1.65"**  
**75.44% Pervious = 13,684 sf 24.56% Impervious = 4,455 sf**

**Exist. Conditions**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Subcatchment 1X-S: Site**

Runoff = 0.70 cfs @ 12.11 hrs, Volume= 2,494 cf, Depth> 1.65"

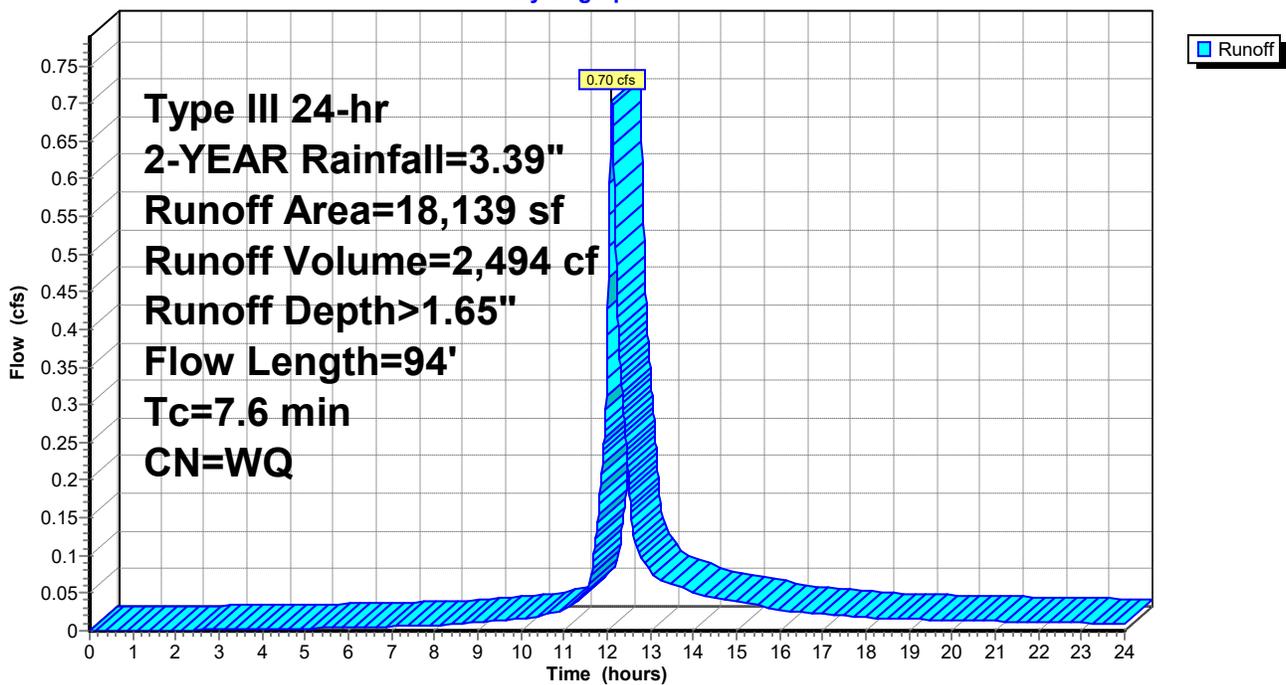
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YEAR Rainfall=3.39"

Area (sf)	CN	Description
3,133	98	Paved parking, HSG C
1,322	98	Roofs, HSG C
8,305	74	>75% Grass cover, Good, HSG C
2,502	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
18,139		Weighted Average
13,684		75.44% Pervious Area
4,455		24.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1X-S: Site**

Hydrograph



**Exist. Conditions**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Pond SUM-1: SUM-1**

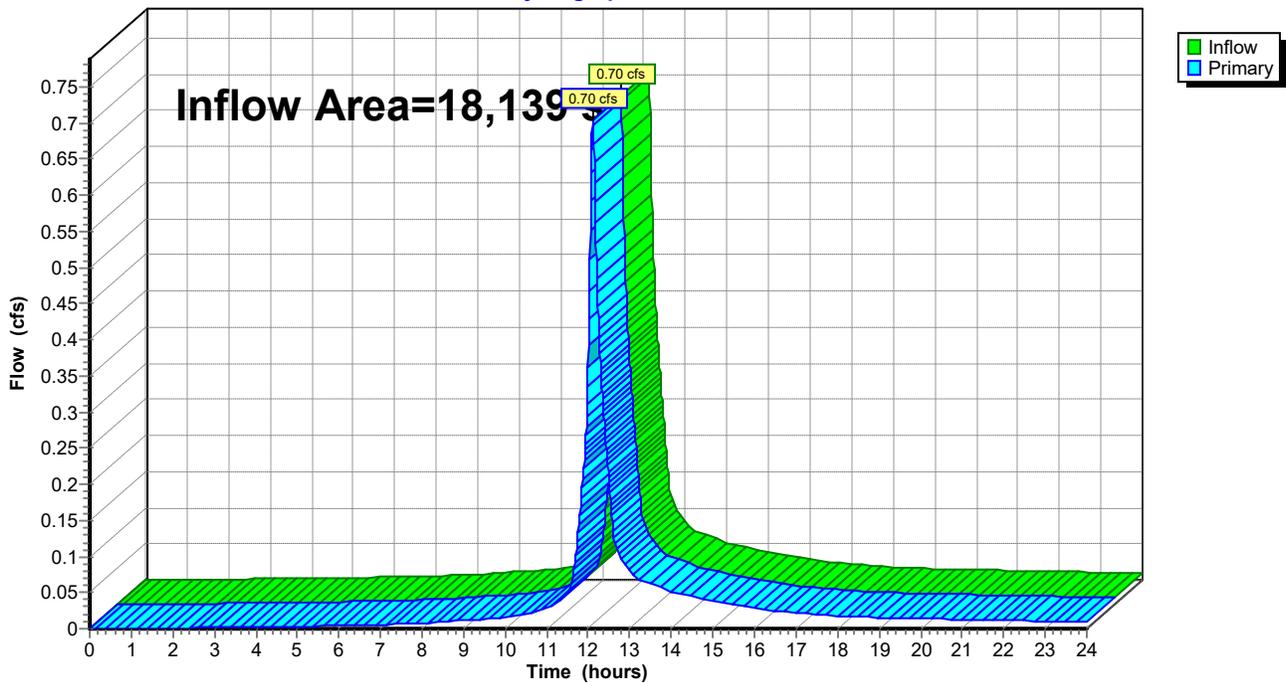
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 18,139 sf, 24.56% Impervious, Inflow Depth > 1.65" for 2-YEAR event  
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 2,494 cf  
Primary = 0.70 cfs @ 12.11 hrs, Volume= 2,494 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph



**Exist. Conditions**

Type III 24-hr 10-YEAR Rainfall=5.23"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1X-S: Site**

Runoff Area=18,139 sf 24.56% Impervious Runoff Depth>3.14"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=1.38 cfs 4,747 cf

**Pond SUM-1: SUM-1**

Inflow=1.38 cfs 4,747 cf  
Primary=1.38 cfs 4,747 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 4,747 cf Average Runoff Depth = 3.14"**  
**75.44% Pervious = 13,684 sf 24.56% Impervious = 4,455 sf**

**Exist. Conditions**

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Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Subcatchment 1X-S: Site**

Runoff = 1.38 cfs @ 12.11 hrs, Volume= 4,747 cf, Depth> 3.14"

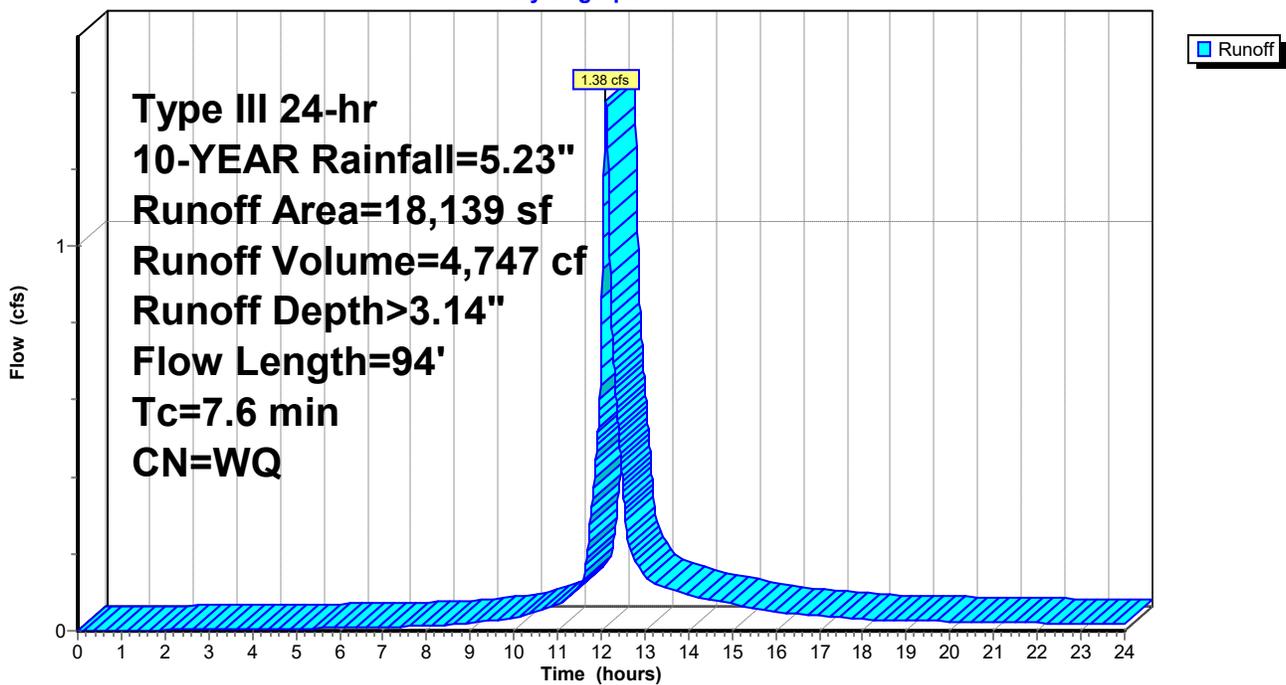
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YEAR Rainfall=5.23"

Area (sf)	CN	Description
3,133	98	Paved parking, HSG C
1,322	98	Roofs, HSG C
8,305	74	>75% Grass cover, Good, HSG C
2,502	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
18,139		Weighted Average
13,684		75.44% Pervious Area
4,455		24.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1X-S: Site**

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Pond SUM-1: SUM-1**

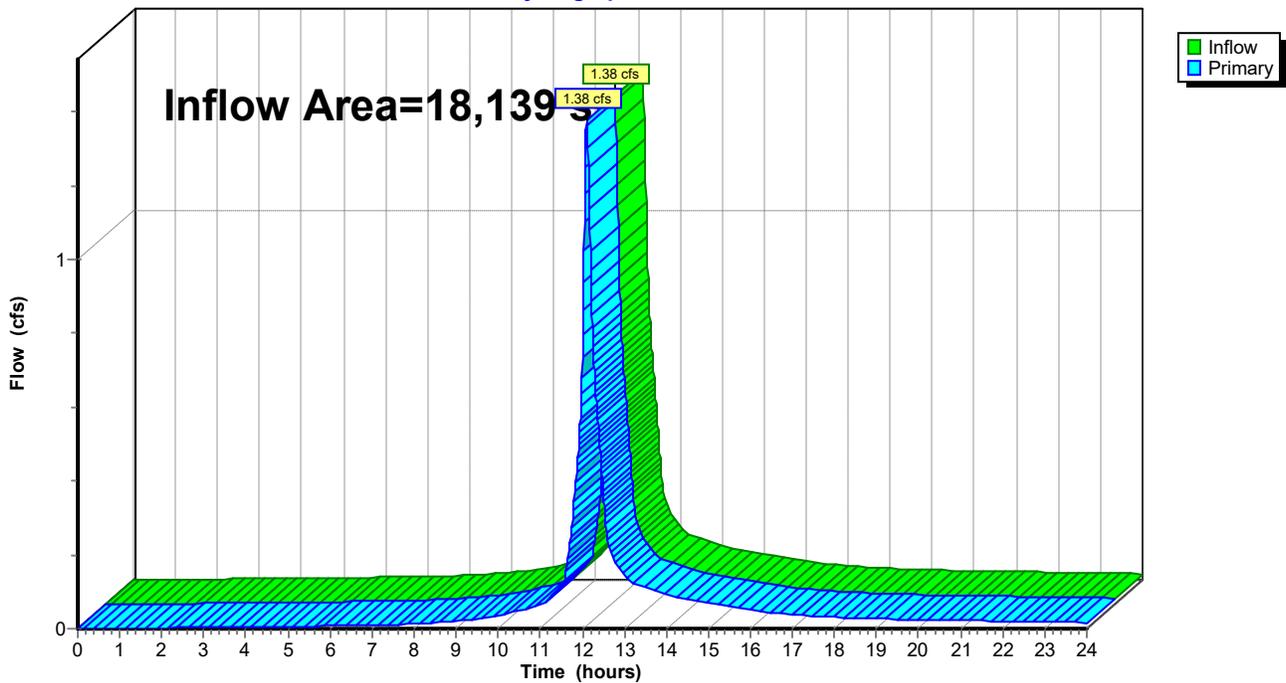
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 18,139 sf, 24.56% Impervious, Inflow Depth > 3.14" for 10-YEAR event  
Inflow = 1.38 cfs @ 12.11 hrs, Volume= 4,747 cf  
Primary = 1.38 cfs @ 12.11 hrs, Volume= 4,747 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph



**Exist. Conditions**

Type III 24-hr 100-YEAR Rainfall=8.16"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1X-S: Site**

Runoff Area=18,139 sf 24.56% Impervious Runoff Depth>5.75"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=2.53 cfs 8,697 cf

**Pond SUM-1: SUM-1**

Inflow=2.53 cfs 8,697 cf  
Primary=2.53 cfs 8,697 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 8,697 cf Average Runoff Depth = 5.75"**  
**75.44% Pervious = 13,684 sf 24.56% Impervious = 4,455 sf**

**Exist. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Summary for Subcatchment 1X-S: Site**

Runoff = 2.53 cfs @ 12.11 hrs, Volume= 8,697 cf, Depth> 5.75"

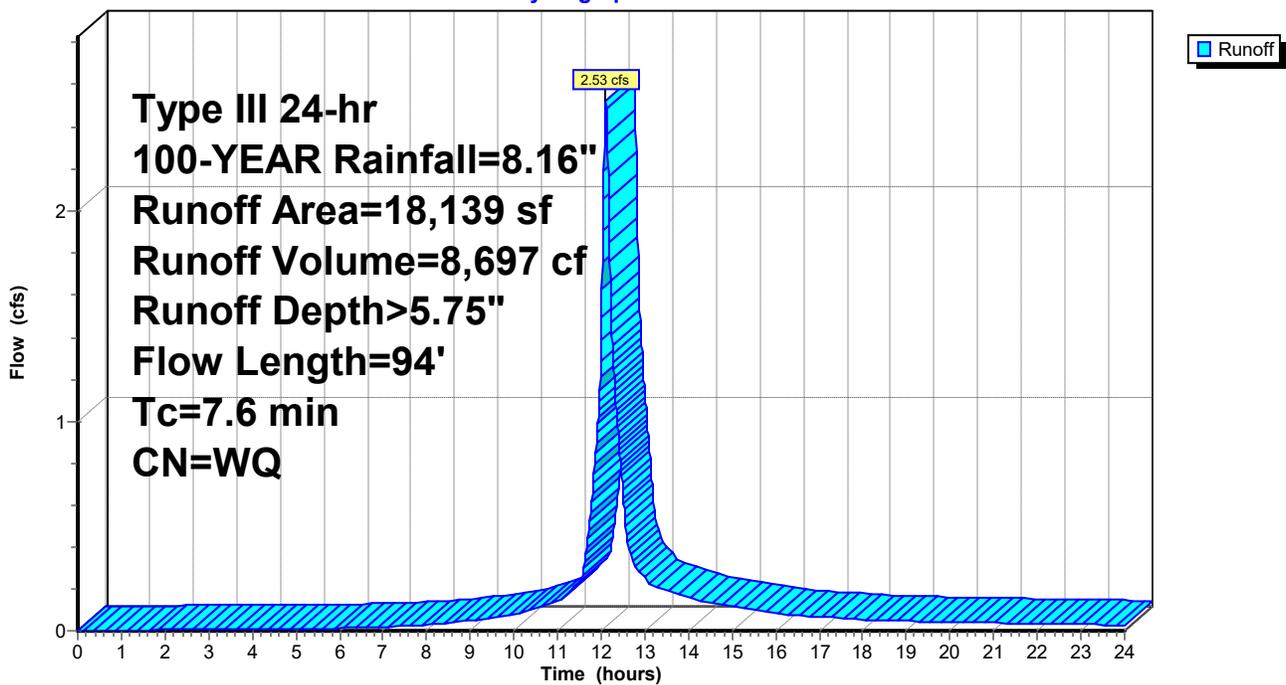
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YEAR Rainfall=8.16"

Area (sf)	CN	Description
3,133	98	Paved parking, HSG C
1,322	98	Roofs, HSG C
8,305	74	>75% Grass cover, Good, HSG C
2,502	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
18,139		Weighted Average
13,684		75.44% Pervious Area
4,455		24.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1X-S: Site**

Hydrograph



**Exist. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Summary for Pond SUM-1: SUM-1**

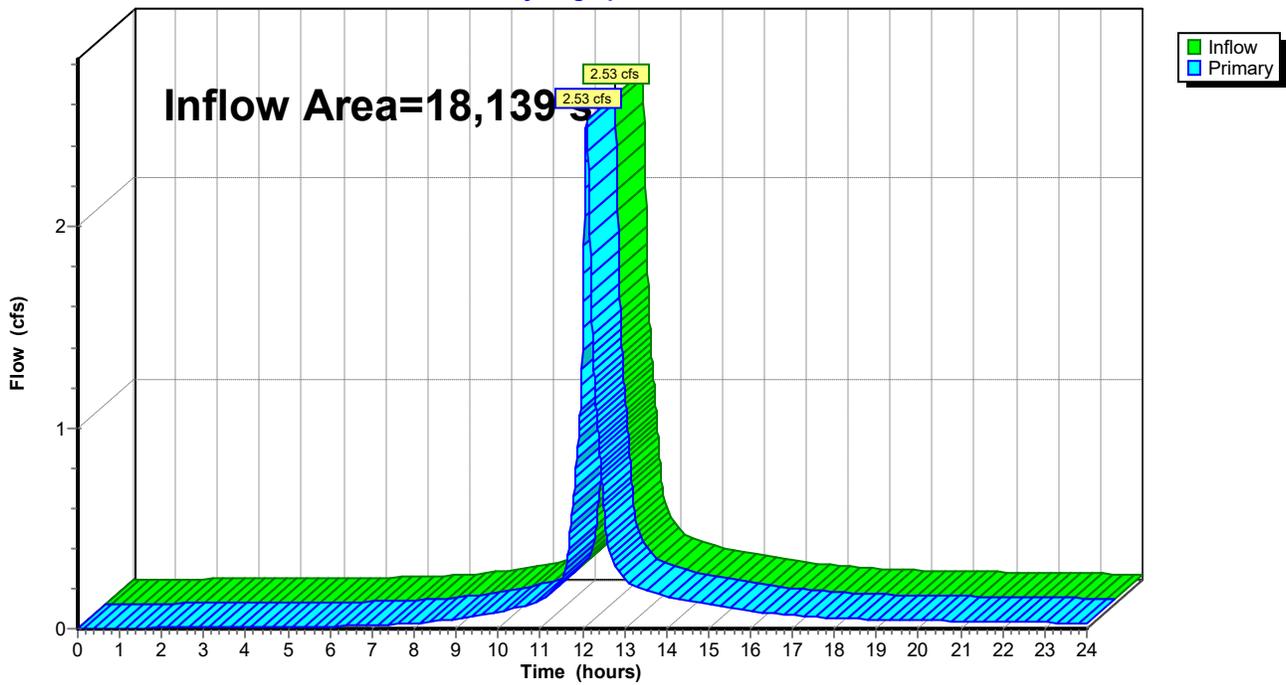
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Inflow Area = 18,139 sf, 24.56% Impervious, Inflow Depth > 5.75" for 100-YEAR event  
Inflow = 2.53 cfs @ 12.11 hrs, Volume= 8,697 cf  
Primary = 2.53 cfs @ 12.11 hrs, Volume= 8,697 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph

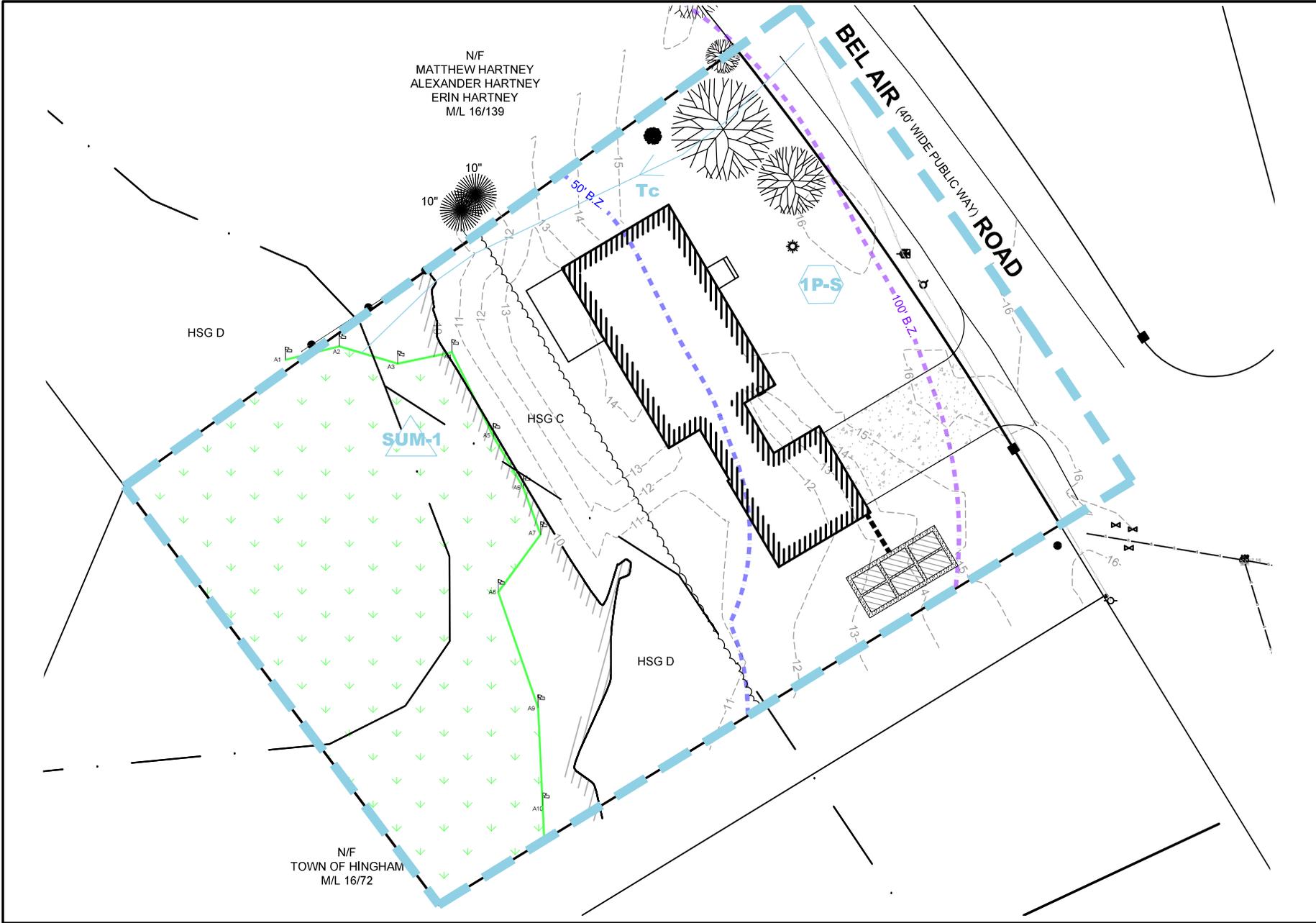




**POST-DEVELOPMENT**

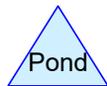
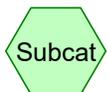
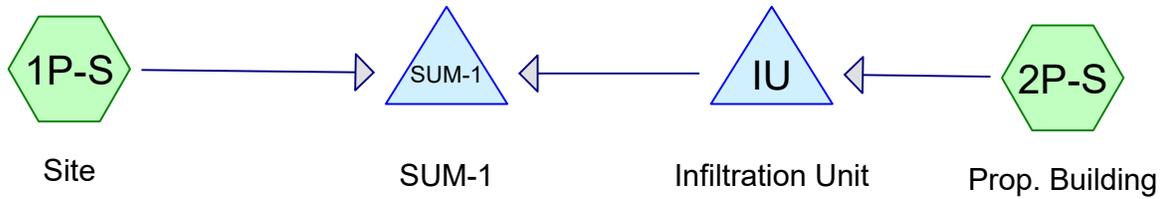
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PROJECT NO. 003742041		DATE APR. 15, 2024	SCALE AS SHOWN	PROJECT TITLE	DATE	BY	APP.	
53 BEL AIR ROAD HINGHAM, MA		PROP. SUBCATCHMENT			PS1.1			
 <b>RiverHawk</b> <b>ENVIRONMENTAL</b> CIVIL ENGINEERING & ENVIRONMENTAL CONSULTING 511 WEST GROVE STREET, SUITE 301, MIDDLEBOROUGH, MA 02448 781-454-4638 www.riverhawkllc.com		DETERMINED BY: ASB/BCD/ML CHECKED BY: JDE/ML APPROVED BY: BSB/ML		02/13/2025 			OWNER/APPLICANT CHRIS MCKENNA 4 OTIS AVENUE COHASSET, MA 02025	





**Routing Diagram for Prop. Conditions**

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## Prop. Conditions

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Page 2

### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,577	74	>75% Grass cover, Good, HSG C (1P-S)
1,813	70	Brush, Fair, HSG C (1P-S)
2,877	77	Brush, Fair, HSG D (1P-S)
2,575	98	Paved parking, HSG C (1P-S)
2,266	98	Roofs, HSG C (2P-S)
31	98	Unconnected pavement, HSG C (1P-S)
<b>18,139</b>	<b>81</b>	<b>TOTAL AREA</b>

# Prop. Conditions

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## Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
15,262	HSG C	1P-S, 2P-S
2,877	HSG D	1P-S
0	Other	
<b>18,139</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	8,577	0	0	8,577	>75% Grass cover, Good
0	0	1,813	2,877	0	4,690	Brush, Fair
0	0	2,575	0	0	2,575	Paved parking
0	0	2,266	0	0	2,266	Roofs
0	0	31	0	0	31	Unconnected pavement
<b>0</b>	<b>0</b>	<b>15,262</b>	<b>2,877</b>	<b>0</b>	<b>18,139</b>	<b>TOTAL AREA</b>

**Prop. Conditions**

Type III 24-hr 2-YEAR Rainfall=3.39"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1P-S: Site**

Runoff Area=15,873 sf 16.42% Impervious Runoff Depth>1.50"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=0.56 cfs 1,980 cf

**Subcatchment 2P-S: Prop. Building**

Runoff Area=2,266 sf 100.00% Impervious Runoff Depth>3.15"  
Tc=6.0 min CN=WQ Runoff=0.17 cfs 596 cf

**Pond IU: Infiltration Unit**

Peak Elev=14.39' Storage=172 cf Inflow=0.17 cfs 596 cf  
Discarded=0.01 cfs 403 cf Primary=0.10 cfs 173 cf Outflow=0.10 cfs 576 cf

**Pond SUM-1: SUM-1**

Inflow=0.63 cfs 2,154 cf  
Primary=0.63 cfs 2,154 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 2,576 cf Average Runoff Depth = 1.70"**  
**73.14% Pervious = 13,267 sf 26.86% Impervious = 4,872 sf**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Subcatchment 1P-S: Site**

Runoff = 0.56 cfs @ 12.11 hrs, Volume= 1,980 cf, Depth> 1.50"

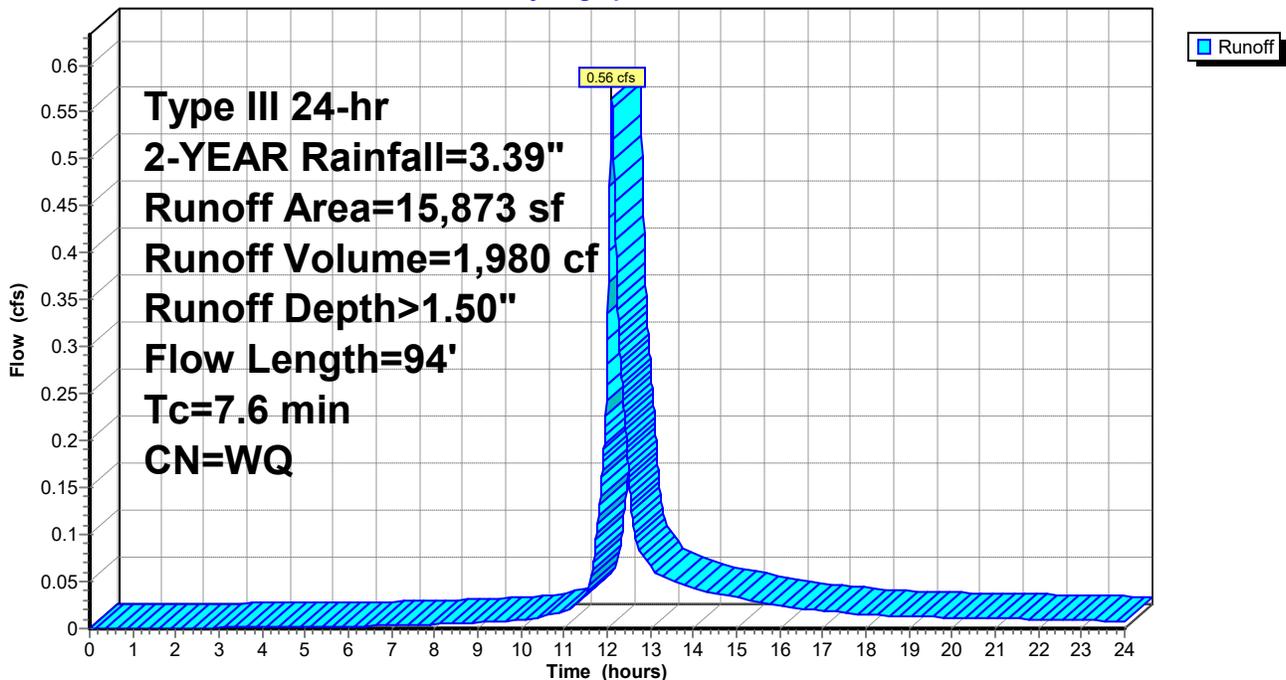
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YEAR Rainfall=3.39"

Area (sf)	CN	Description
2,575	98	Paved parking, HSG C
0	98	Roofs, HSG C
8,577	74	>75% Grass cover, Good, HSG C
1,813	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
31	98	Unconnected pavement, HSG C
15,873		Weighted Average
13,267		83.58% Pervious Area
2,606		16.42% Impervious Area
31		1.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1P-S: Site**

Hydrograph



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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Subcatchment 2P-S: Prop. Building**

Runoff = 0.17 cfs @ 12.08 hrs, Volume= 596 cf, Depth> 3.15"

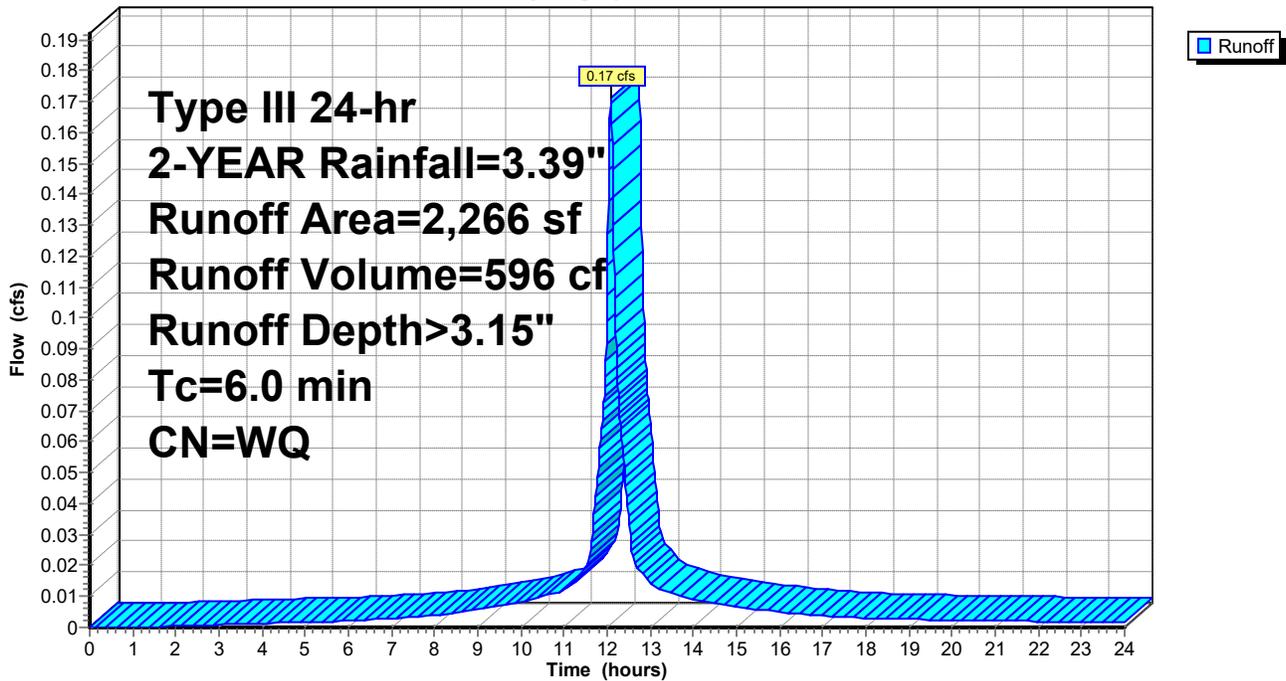
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YEAR Rainfall=3.39"

Area (sf)	CN	Description
0	98	Paved parking, HSG C
2,266	98	Roofs, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
2,266		Weighted Average
2,266		100.00% Impervious Area

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

**Subcatchment 2P-S: Prop. Building**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Pond IU: Infiltration Unit**

Inflow Area = 2,266 sf, 100.00% Impervious, Inflow Depth > 3.15" for 2-YEAR event  
 Inflow = 0.17 cfs @ 12.08 hrs, Volume= 596 cf  
 Outflow = 0.10 cfs @ 12.18 hrs, Volume= 576 cf, Atten= 39%, Lag= 6.1 min  
 Discarded = 0.01 cfs @ 9.44 hrs, Volume= 403 cf  
 Primary = 0.10 cfs @ 12.18 hrs, Volume= 173 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 14.39' @ 12.18 hrs Surf.Area= 274 sf Storage= 172 cf

Plug-Flow detention time= 131.3 min calculated for 576 cf (97% of inflow)  
 Center-of-Mass det. time= 110.9 min ( 865.5 - 754.6 )

Volume	Invert	Avail.Storage	Storage Description
#1A	13.50'	181 cf	<b>11.17'W x 24.50'L x 2.88'H Field A</b> 787 cf Overall - 335 cf Embedded = 451 cf x 40.0% Voids
#2A	13.67'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		516 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	<b>1.020 in/hr Exfiltration over Surface area</b>
#2	Primary	14.20'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Discarded OutFlow** Max=0.01 cfs @ 9.44 hrs HW=13.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.10 cfs @ 12.18 hrs HW=14.39' (Free Discharge)  
 ↑2=Orifice/Grate (Orifice Controls 0.10 cfs @ 1.47 fps)

**Prop. Conditions**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Pond IU: Infiltration Unit - Chamber Wizard Field A**

**Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)**

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

3 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 22.50' Row Length +12.0" End Stone x 2 = 24.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width

2.0" Base + 30.5" Chamber Height + 2.0" Cover = 2.88' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 335.3 cf Chamber Storage

786.6 cf Field - 335.3 cf Chambers = 451.3 cf Stone x 40.0% Voids = 180.5 cf Stone Storage

Chamber Storage + Stone Storage = 515.8 cf = 0.012 af

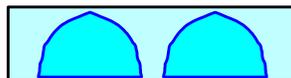
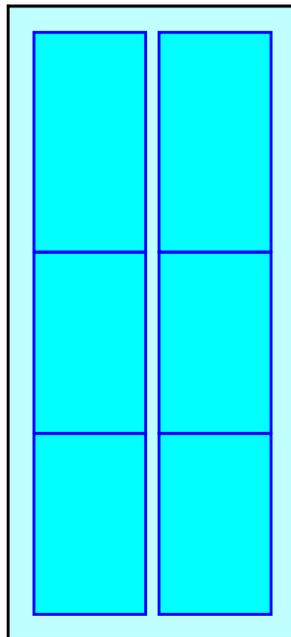
Overall Storage Efficiency = 65.6%

Overall System Size = 24.50' x 11.17' x 2.88'

6 Chambers

29.1 cy Field

16.7 cy Stone



**Prop. Conditions**

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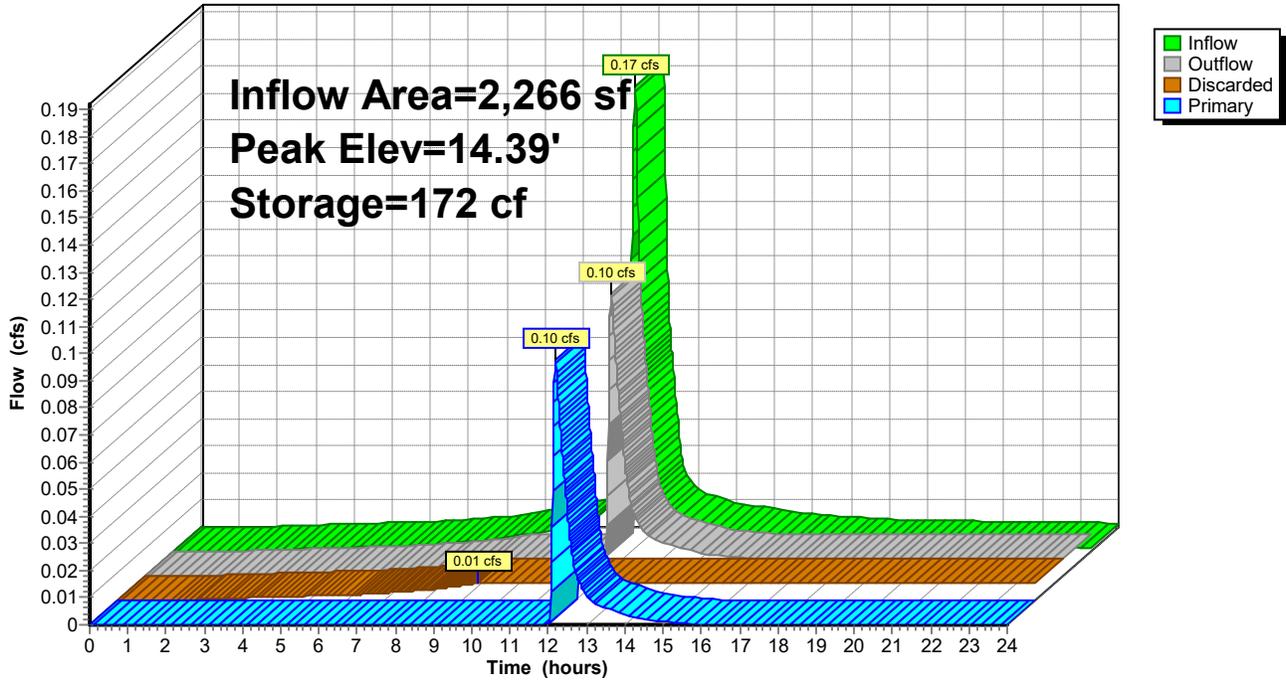
Type III 24-hr 2-YEAR Rainfall=3.39"

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**Pond IU: Infiltration Unit**

Hydrograph



**Prop. Conditions**

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Type III 24-hr 2-YEAR Rainfall=3.39"

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**Summary for Pond SUM-1: SUM-1**

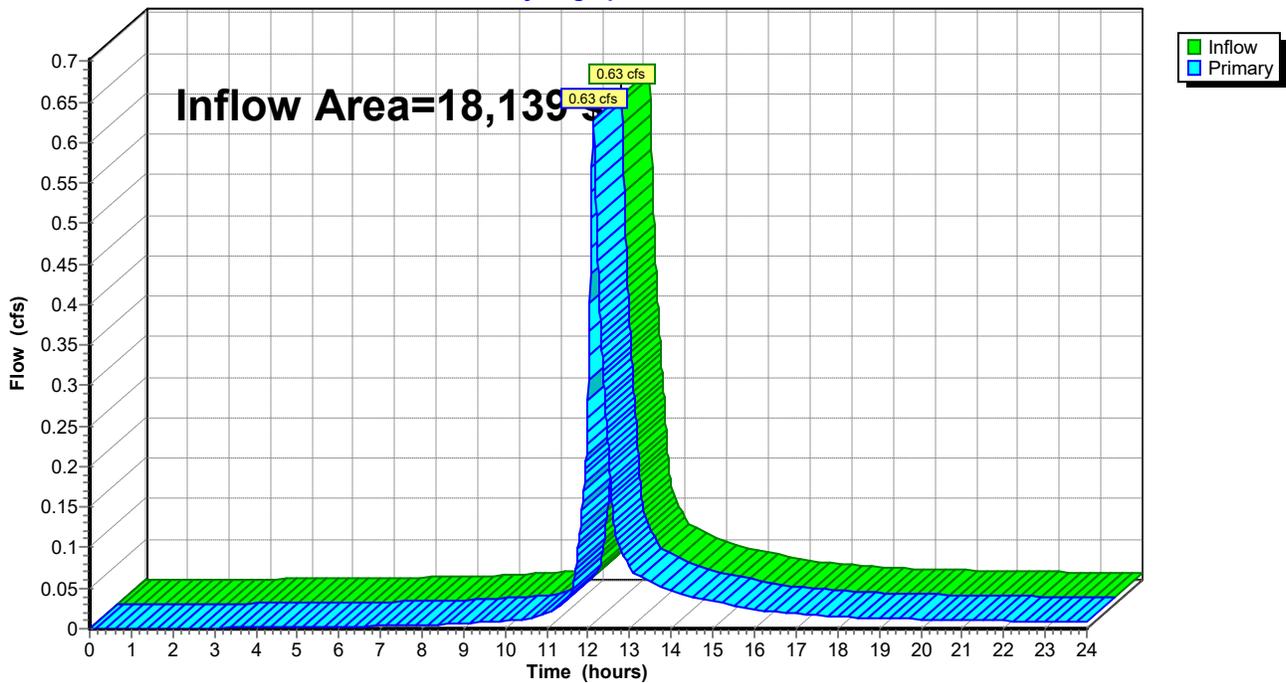
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 18,139 sf, 26.86% Impervious, Inflow Depth > 1.42" for 2-YEAR event  
Inflow = 0.63 cfs @ 12.13 hrs, Volume= 2,154 cf  
Primary = 0.63 cfs @ 12.13 hrs, Volume= 2,154 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph



**Prop. Conditions**

Type III 24-hr 10-YEAR Rainfall=5.23"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1P-S: Site**

Runoff Area=15,873 sf 16.42% Impervious Runoff Depth>2.96"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=1.15 cfs 3,910 cf

**Subcatchment 2P-S: Prop. Building**

Runoff Area=2,266 sf 100.00% Impervious Runoff Depth>4.99"  
Tc=6.0 min CN=WQ Runoff=0.27 cfs 942 cf

**Pond IU: Infiltration Unit**

Peak Elev=14.50' Storage=196 cf Inflow=0.27 cfs 942 cf  
Discarded=0.01 cfs 444 cf Primary=0.23 cfs 437 cf Outflow=0.24 cfs 880 cf

**Pond SUM-1: SUM-1**

Inflow=1.38 cfs 4,346 cf  
Primary=1.38 cfs 4,346 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 4,852 cf Average Runoff Depth = 3.21"**  
**73.14% Pervious = 13,267 sf 26.86% Impervious = 4,872 sf**

**Prop. Conditions**

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Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Subcatchment 1P-S: Site**

Runoff = 1.15 cfs @ 12.11 hrs, Volume= 3,910 cf, Depth> 2.96"

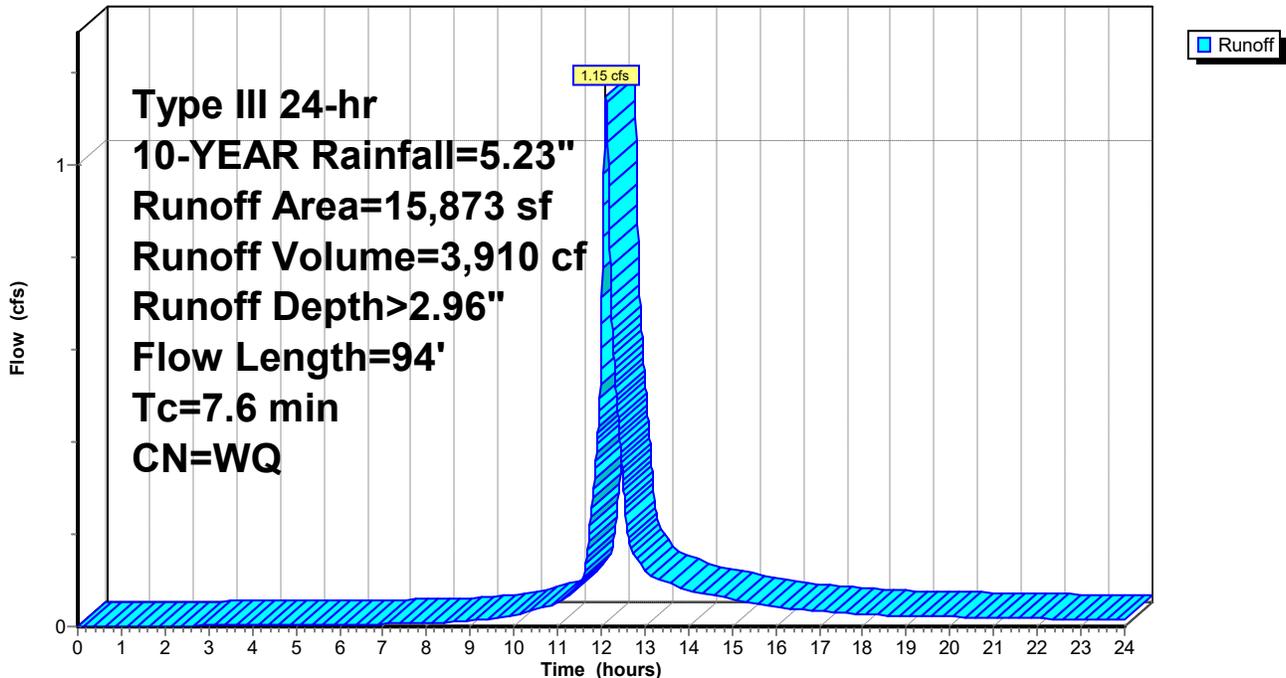
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YEAR Rainfall=5.23"

Area (sf)	CN	Description
2,575	98	Paved parking, HSG C
0	98	Roofs, HSG C
8,577	74	>75% Grass cover, Good, HSG C
1,813	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
31	98	Unconnected pavement, HSG C
15,873		Weighted Average
13,267		83.58% Pervious Area
2,606		16.42% Impervious Area
31		1.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1P-S: Site**

Hydrograph



**Prop. Conditions**

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Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Subcatchment 2P-S: Prop. Building**

Runoff = 0.27 cfs @ 12.08 hrs, Volume= 942 cf, Depth> 4.99"

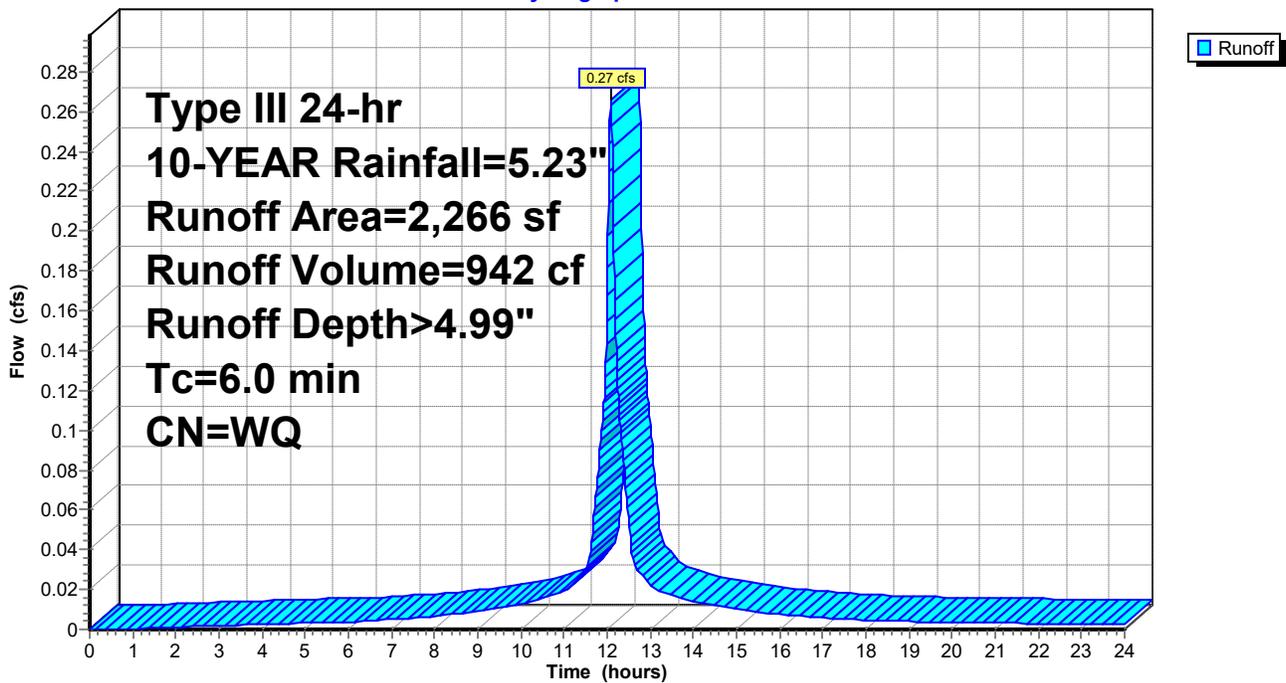
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YEAR Rainfall=5.23"

Area (sf)	CN	Description
0	98	Paved parking, HSG C
2,266	98	Roofs, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
2,266		Weighted Average
2,266		100.00% Impervious Area

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

**Subcatchment 2P-S: Prop. Building**

Hydrograph



**Prop. Conditions**

Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Pond IU: Infiltration Unit**

Inflow Area = 2,266 sf, 100.00% Impervious, Inflow Depth > 4.99" for 10-YEAR event  
 Inflow = 0.27 cfs @ 12.08 hrs, Volume= 942 cf  
 Outflow = 0.24 cfs @ 12.12 hrs, Volume= 880 cf, Atten= 10%, Lag= 2.3 min  
 Discarded = 0.01 cfs @ 8.12 hrs, Volume= 444 cf  
 Primary = 0.23 cfs @ 12.12 hrs, Volume= 437 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 14.50' @ 12.12 hrs Surf.Area= 274 sf Storage= 196 cf

Plug-Flow detention time= 98.8 min calculated for 880 cf (93% of inflow)  
 Center-of-Mass det. time= 62.5 min ( 809.2 - 746.7 )

Volume	Invert	Avail.Storage	Storage Description
#1A	13.50'	181 cf	<b>11.17'W x 24.50'L x 2.88'H Field A</b> 787 cf Overall - 335 cf Embedded = 451 cf x 40.0% Voids
#2A	13.67'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		516 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	<b>1.020 in/hr Exfiltration over Surface area</b>
#2	Primary	14.20'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Discarded OutFlow** Max=0.01 cfs @ 8.12 hrs HW=13.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.23 cfs @ 12.12 hrs HW=14.50' (Free Discharge)  
 ↑2=Orifice/Grate (Orifice Controls 0.23 cfs @ 1.87 fps)

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**Pond IU: Infiltration Unit - Chamber Wizard Field A**

**Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)**

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

3 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 22.50' Row Length +12.0" End Stone x 2 = 24.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width

2.0" Base + 30.5" Chamber Height + 2.0" Cover = 2.88' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 335.3 cf Chamber Storage

786.6 cf Field - 335.3 cf Chambers = 451.3 cf Stone x 40.0% Voids = 180.5 cf Stone Storage

Chamber Storage + Stone Storage = 515.8 cf = 0.012 af

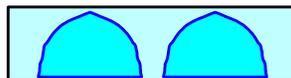
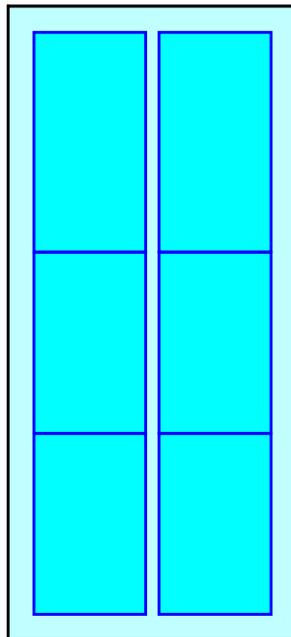
Overall Storage Efficiency = 65.6%

Overall System Size = 24.50' x 11.17' x 2.88'

6 Chambers

29.1 cy Field

16.7 cy Stone



**Prop. Conditions**

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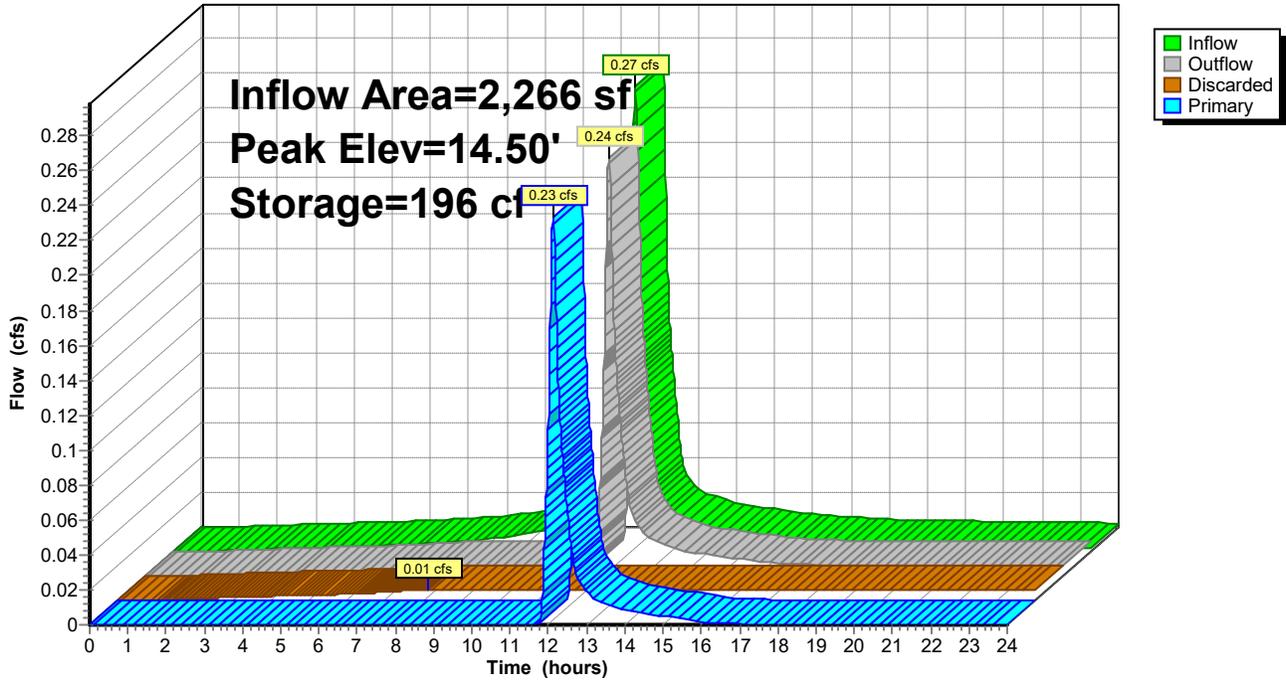
Type III 24-hr 10-YEAR Rainfall=5.23"

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**Pond IU: Infiltration Unit**

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=5.23"

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**Summary for Pond SUM-1: SUM-1**

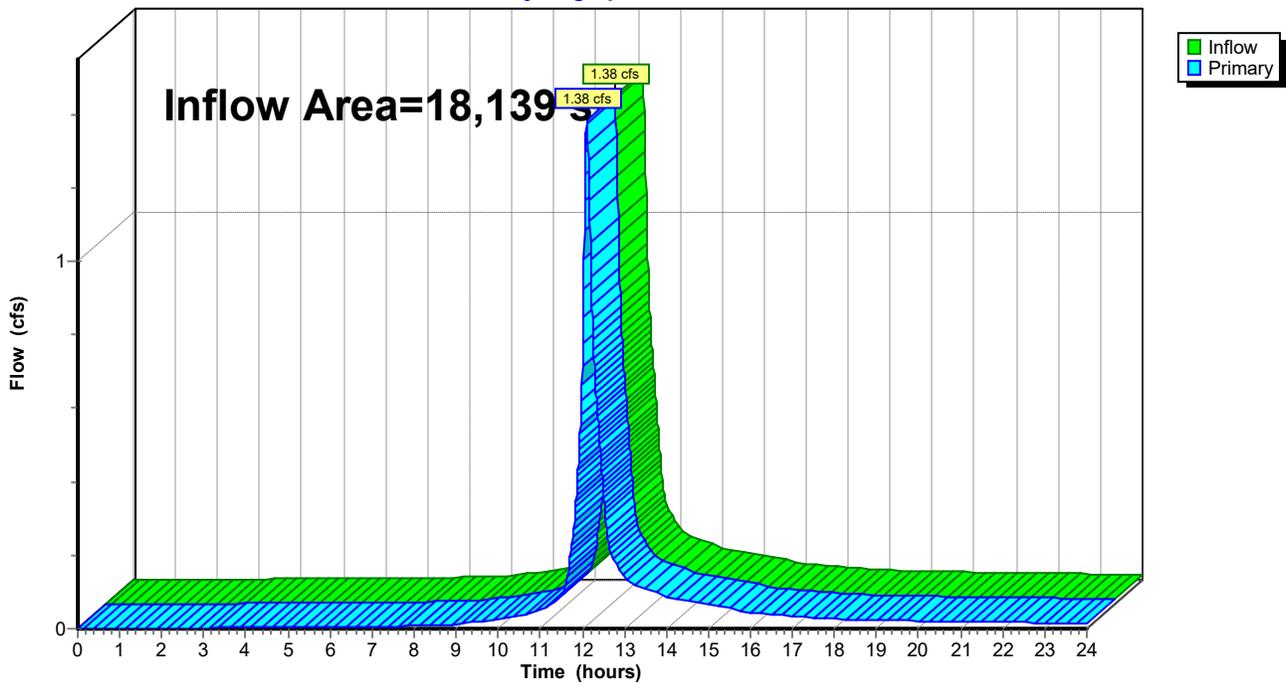
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 18,139 sf, 26.86% Impervious, Inflow Depth > 2.88" for 10-YEAR event  
Inflow = 1.38 cfs @ 12.11 hrs, Volume= 4,346 cf  
Primary = 1.38 cfs @ 12.11 hrs, Volume= 4,346 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph



**Prop. Conditions**

Type III 24-hr 100-YEAR Rainfall=8.16"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1P-S: Site** Runoff Area=15,873 sf 16.42% Impervious Runoff Depth>5.54"  
Flow Length=94' Tc=7.6 min CN=WQ Runoff=2.16 cfs 7,329 cf

**Subcatchment 2P-S: Prop. Building** Runoff Area=2,266 sf 100.00% Impervious Runoff Depth>7.91"  
Tc=6.0 min CN=WQ Runoff=0.42 cfs 1,494 cf

**Pond IU: Infiltration Unit** Peak Elev=14.61' Storage=218 cf Inflow=0.42 cfs 1,494 cf  
Discarded=0.01 cfs 489 cf Primary=0.37 cfs 900 cf Outflow=0.38 cfs 1,389 cf

**Pond SUM-1: SUM-1** Inflow=2.53 cfs 8,229 cf  
Primary=2.53 cfs 8,229 cf

**Total Runoff Area = 18,139 sf Runoff Volume = 8,823 cf Average Runoff Depth = 5.84"**  
**73.14% Pervious = 13,267 sf 26.86% Impervious = 4,872 sf**

**Prop. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Summary for Subcatchment 1P-S: Site**

Runoff = 2.16 cfs @ 12.11 hrs, Volume= 7,329 cf, Depth> 5.54"

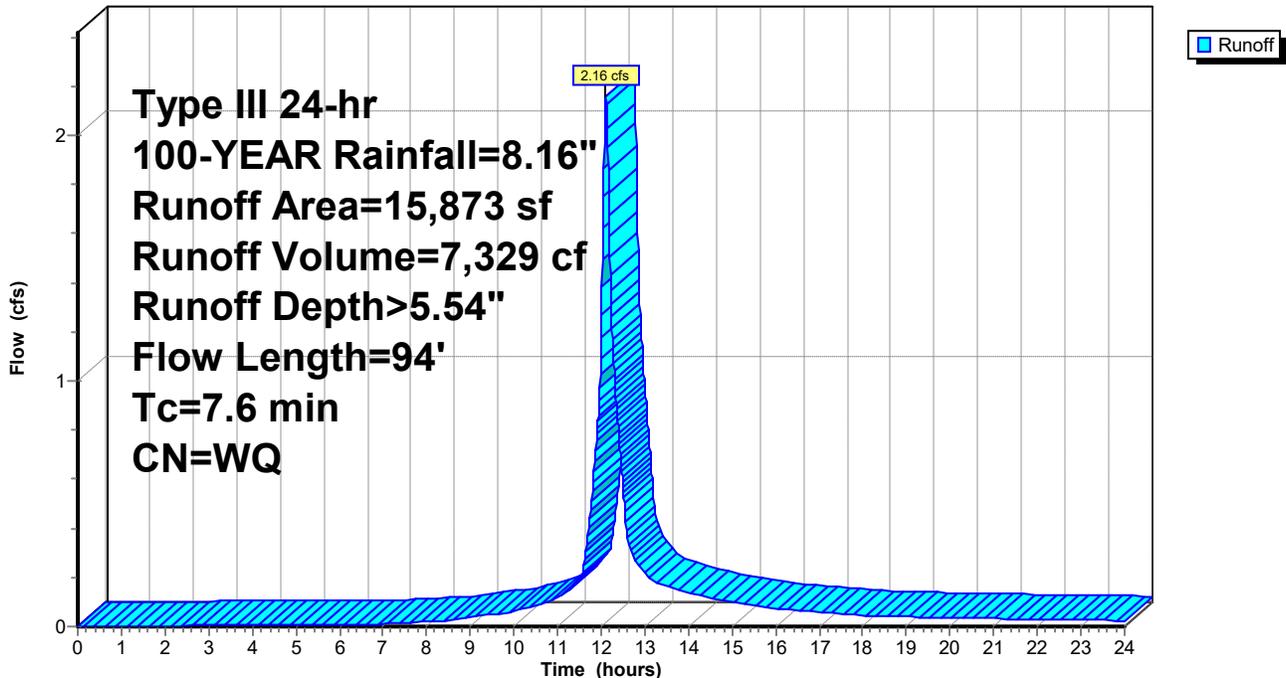
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YEAR Rainfall=8.16"

Area (sf)	CN	Description
2,575	98	Paved parking, HSG C
0	98	Roofs, HSG C
8,577	74	>75% Grass cover, Good, HSG C
1,813	70	Brush, Fair, HSG C
2,877	77	Brush, Fair, HSG D
31	98	Unconnected pavement, HSG C
15,873		Weighted Average
13,267		83.58% Pervious Area
2,606		16.42% Impervious Area
31		1.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.39"
0.4	44	0.1126	1.68		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
7.6	94	Total			

**Subcatchment 1P-S: Site**

Hydrograph



**Prop. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Summary for Subcatchment 2P-S: Prop. Building**

Runoff = 0.42 cfs @ 12.08 hrs, Volume= 1,494 cf, Depth> 7.91"

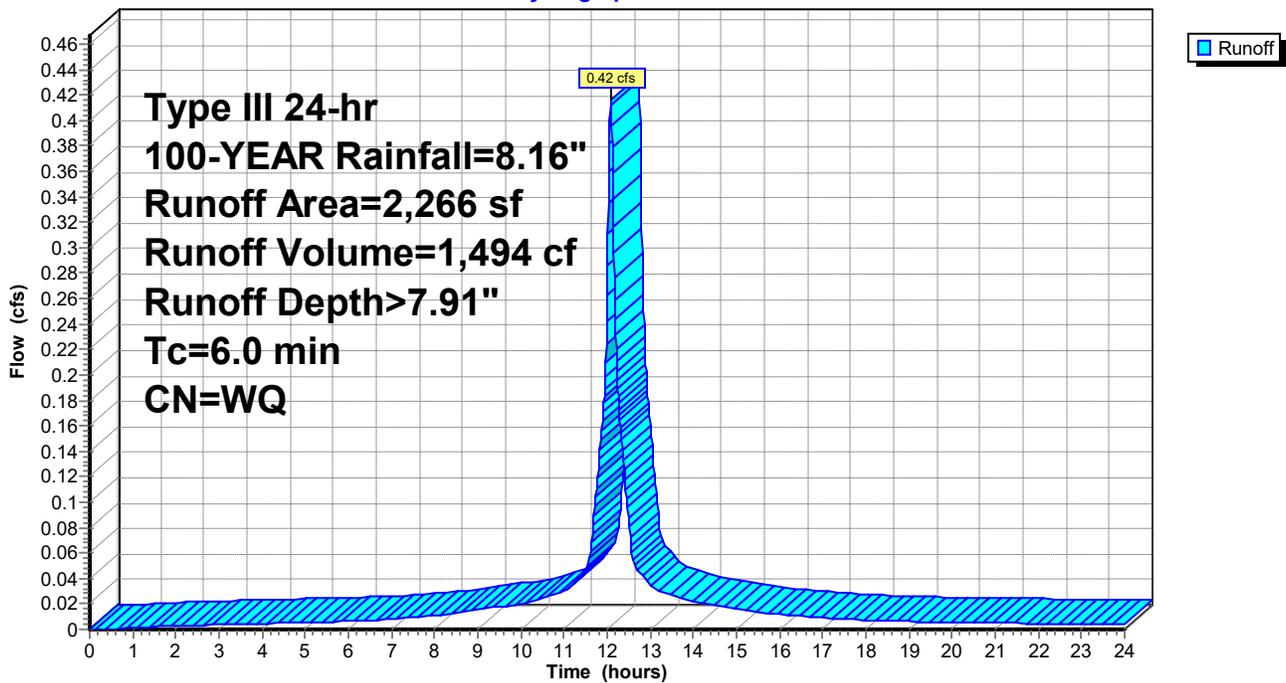
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YEAR Rainfall=8.16"

Area (sf)	CN	Description
0	98	Paved parking, HSG C
2,266	98	Roofs, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
2,266		Weighted Average
2,266		100.00% Impervious Area

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

**Subcatchment 2P-S: Prop. Building**

Hydrograph



**Prop. Conditions**

Type III 24-hr 100-YEAR Rainfall=8.16"

Prepared by HP

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**Summary for Pond IU: Infiltration Unit**

Inflow Area = 2,266 sf, 100.00% Impervious, Inflow Depth > 7.91" for 100-YEAR event  
 Inflow = 0.42 cfs @ 12.08 hrs, Volume= 1,494 cf  
 Outflow = 0.38 cfs @ 12.12 hrs, Volume= 1,389 cf, Atten= 9%, Lag= 2.2 min  
 Discarded = 0.01 cfs @ 6.26 hrs, Volume= 489 cf  
 Primary = 0.37 cfs @ 12.12 hrs, Volume= 900 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 14.61' @ 12.12 hrs Surf.Area= 274 sf Storage= 218 cf

Plug-Flow detention time= 73.3 min calculated for 1,389 cf (93% of inflow)  
 Center-of-Mass det. time= 34.4 min ( 774.8 - 740.4 )

Volume	Invert	Avail.Storage	Storage Description
#1A	13.50'	181 cf	<b>11.17'W x 24.50'L x 2.88'H Field A</b> 787 cf Overall - 335 cf Embedded = 451 cf x 40.0% Voids
#2A	13.67'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		516 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	<b>1.020 in/hr Exfiltration over Surface area</b>
#2	Primary	14.20'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Discarded OutFlow** Max=0.01 cfs @ 6.26 hrs HW=13.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.37 cfs @ 12.12 hrs HW=14.61' (Free Discharge)  
 ↑2=Orifice/Grate (Orifice Controls 0.37 cfs @ 2.18 fps)

**Prop. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Pond IU: Infiltration Unit - Chamber Wizard Field A**

**Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)**

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

3 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 22.50' Row Length +12.0" End Stone x 2 = 24.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width

2.0" Base + 30.5" Chamber Height + 2.0" Cover = 2.88' Field Height

6 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 335.3 cf Chamber Storage

786.6 cf Field - 335.3 cf Chambers = 451.3 cf Stone x 40.0% Voids = 180.5 cf Stone Storage

Chamber Storage + Stone Storage = 515.8 cf = 0.012 af

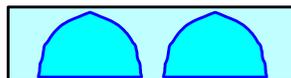
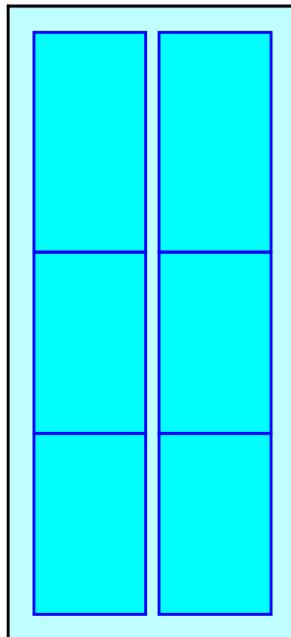
Overall Storage Efficiency = 65.6%

Overall System Size = 24.50' x 11.17' x 2.88'

6 Chambers

29.1 cy Field

16.7 cy Stone



**Prop. Conditions**

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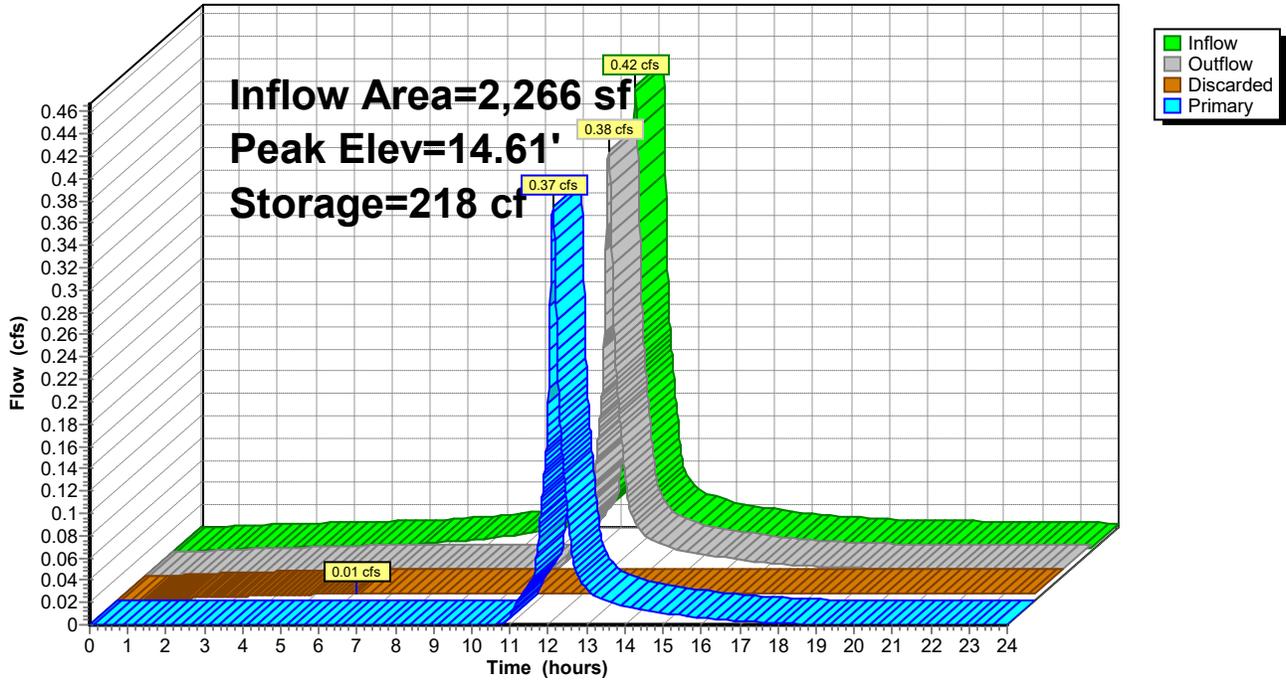
Type III 24-hr 100-YEAR Rainfall=8.16"

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**Pond IU: Infiltration Unit**

Hydrograph



**Prop. Conditions**

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Type III 24-hr 100-YEAR Rainfall=8.16"

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**Summary for Pond SUM-1: SUM-1**

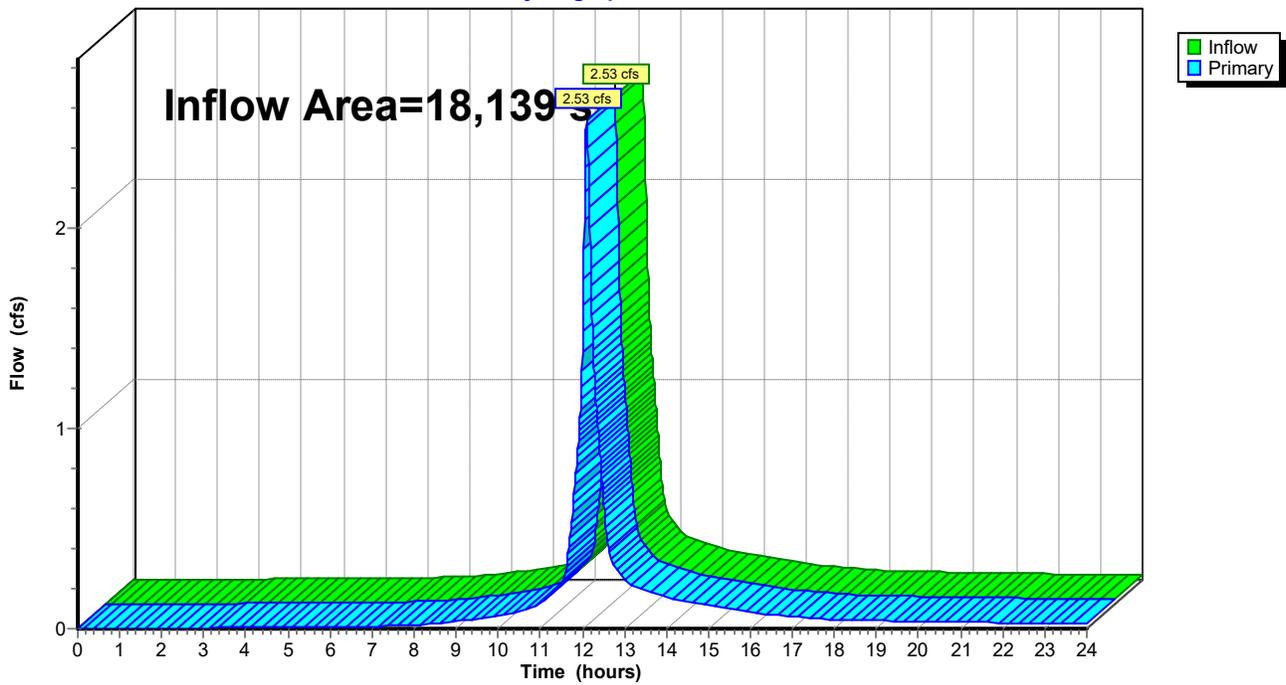
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 18,139 sf, 26.86% Impervious, Inflow Depth > 5.44" for 100-YEAR event  
Inflow = 2.53 cfs @ 12.11 hrs, Volume= 8,229 cf  
Primary = 2.53 cfs @ 12.11 hrs, Volume= 8,229 cf, Atten= 0%, Lag= 0.0 min

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

**Pond SUM-1: SUM-1**

Hydrograph





**Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan**



## **CONSTRUCTION PERIOD EROSION AND SEDIMENTATION CONTROL SUMMARY**

The following measures shall be maintained throughout the site construction phase of the project.

### **Catch Basin Protection:**

Existing and proposed catch basins shall be protected with haybale barriers and/or inlet filters prior to the completion of paving. Haybales shall also be placed around grates and catch basins within the construction/demolition areas to ensure that runoff entering the catch basin has been filtered prior to discharge.

### **Stabilized Construction Entrance:**

A temporary stabilized construction entrance shall be installed at the entrance to the project. The purpose of the construction entrance is to remove sediment attached to vehicle tires and minimize its transport and deposition onto public road surfaces. The construction entrance shall be composed of a 6-inch thick (minimum) bed of coarse crushed stone that extends a minimum of 25 feet into the Subject Property. The construction entrance shall be a minimum of 20 feet wide. The crushed stone bed shall be replenished as necessary to maintain the proper function.

### **Linear Erosion Controls:**

Linear Erosion Controls (Compost Fiber Roll) shall be placed at the limits of work where the slope is less than 4:1. They shall be placed in a sturdy position and supported/anchored to withstand the forces of the elements and the circumstances of construction activities. The fiber rolls shall be installed in a manner that shall prevent runoff from passing over, under, or around the fiber rolls (i.e. all of the runoff shall pass through the rolls). It shall be the construction/demolition contractor's responsibility to maintain the linear erosion controls in a functional condition throughout the duration of construction/demolition activities. The contractor shall also remove any large accumulations of sediment in a timely manner and dispose the material appropriately.

### **Materials Management Practices:**

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff during the course of construction. The Contractor's Superintendent shall be responsible for ensuring that these procedures are followed:

#### 1. *Good Housekeeping*

The following good housekeeping practices shall be followed on-site during construction:

- a. An effort shall be made to store only enough products required to do the job.
- b. All materials stored on-site shall be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers shall be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
- c. Products shall be kept in their original containers with the original manufacturer's label in legible condition.
- d. Substances shall not be mixed with one another unless recommended by the manufacturer.
- e. Whenever possible, all of a product shall be used up before disposing the container.

- f. Manufacturer's recommendations for proper use and disposal shall be followed.
- g. The Contractor's Superintendent shall be responsible for daily inspections to ensure proper use and disposal of materials.

2. *Hazardous Substances*

These practices shall be used to reduce the risks associated with hazardous substances. Material Safety Data Sheets (MSDSs) for each product with hazardous properties that is used at the Project shall be obtained and used for the proper management of potential wastes that may result from these products. A MSDS shall be posted in the immediate area where such product is stored and/or used and another copy of each MSDS shall be maintained in the job trailer at the Project. Each employee who must handle a Hazardous Substance shall be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

- a. Products shall be kept in original containers with the original labels in legible condition.
- b. Original labels and MSDSs shall be procured and used for each product.
- c. If surplus product must be disposed, manufacturer's and local/state/federal required methods for proper disposal must be followed.

3. *Hazardous Waste*

It is imperative that all hazardous waste be properly identified and handled in accordance with all applicable hazardous waste standards, including the storage, transport and disposal of the hazardous wastes. There are significant penalties for the improper handling of hazardous wastes. It is important that the Contractor's Superintendent seeks appropriate assistance in making the determination of whether a substance or material is a hazardous waste. For example, hazardous waste may include certain Hazardous Substances, as well as pesticides, paints, paint solvents, cleaning solvents, pesticides, contaminated soils, and other materials, substances or chemicals that have been discarded (or are to be discarded) as being out-of-date, contaminated, or otherwise unusable, and can include the containers for those substances; other materials and substances can also be or become Hazardous Wastes, however. The Contractor's Superintendent is also responsible for ensuring that all site personnel are instructed as to these Hazardous Waste requirements and also that the requirements are being followed.

4. *Product Specific Practices*

The following product specific practices shall be followed on the job site:

Petroleum Products

All on-site vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall not be stored at the Subject Property.

Fertilizers

Fertilizers shall be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer shall be worked in the soil to limit exposure to stormwater. The contents of any partially used bags of fertilizer shall be transferred to a sealable plastic bin to avoid spills.

#### Cleaning Solvents

All containers shall be tightly sealed and stored when not in use. Excess solvents shall not be discharged to the storm sewer system, but shall be properly disposed of according to manufacturer's instructions or state and federal regulations.

#### Concrete Wastes

Concrete trucks shall be allowed to wash out or discharge surplus concrete or drum wash water on the Subject Property, but only in specifically designated diked and impervious washouts which have been prepared to prevent contact between the concrete wash and stormwater. Waste generated from concrete wash water shall not be allowed to flow into drainage ways, inlets, receiving waters or any location other than the designated concrete washout. Waste concrete may be poured into forms to make rip-rap or other useful concrete products. Concrete washouts shall be located at minimum 100 linear feet from drainage ways, inlets, surface waters and wetland resource areas.

The hardened residue from the concrete washout diked areas shall be disposed in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the Contractor. Maintenance of the washout is to include removal of hardened concrete. The Contractor's Superintendent shall be responsible for seeing that these procedures are followed.

Saw-cut Portland Cement Concrete (PCC) slurry shall not be allowed to enter storm drains or watercourses. Saw-cut residue should not be left on the surface of pavement or be allowed to flow over and off pavement. Residue from saw-cutting and grinding shall be collected by vacuum and disposed in the same manner as excess concrete.

#### 5. Solid and Construction Wastes

All waste materials shall be collected and disposed at an appropriate solid waste disposal area.

#### 6. Sanitary Wastes

A minimum of one portable sanitary unit shall be provided for every ten (10) workers present during the construction period. All sanitary waste shall be collected from the portable units a minimum of one time per week by a licensed portable facility provider in complete compliance with local and state regulations.

All portable sanitary units shall be located in an area where the likelihood of the unit contributing to stormwater discharges is negligible. Additional containment BMPs must be implemented, such as gravel bags or specially designed plastic skid containers around the base, to prevent wastes from contributing to stormwater discharges.



**Long Term Operation and Maintenance Plan**



## 1.0 INTRODUCTION

The proposed stormwater controls have been designed to ensure stormwater quality. In order for this to continue in the long term, it is necessary to implement the following long term Operation and Maintenance Program.

## 2.0 RESPONSIBLE PARTY

*Owner:*

53 Bel Air Road Realty Trust  
Chris McKenna, Trustee  
4 Otis Avenue  
Cohasset, MA 02025

\_\_\_\_\_  
Signature of Owner

\_\_\_\_\_  
Date

*Responsible for Operation, Maintenance and Emergency Repairs:*

53 Bel Air Road Realty Trust  
Chris McKenna, Trustee  
4 Otis Avenue  
Cohasset, MA 02025

*Notification of Future Property Owners:*

Prior to any sale of the property in the future, the prospective buyer would be made aware of the presence of stormwater management systems and the requirement for proper operation and maintenance.

## 3.0 MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES

The stormwater management facilities were designed to require little or no intervention in the operation and to require relatively little maintenance once the stormwater controls are installed. However, the drainage improvements shall be subject to the following maintenance schedule.

### 3.1 Routine Maintenance

The following areas, system components, and measures will be inspected and the identified deficiencies will be corrected. Plans and details of the stormwater management system components are presented on the Project Plans. Maintenance of the system components may include the removal and legal disposal of any accumulated sediments and debris. The following standards will be met after construction is complete:

#### **Infiltration Gallery (Dry-Well):**

Inspect the infiltration system at least four (4) times per year and at the end of the foliage and snow removal seasons, to ensure that there is no sediment or debris entering the infiltration system. The infiltration system shall be cleaned when sediment is observed at depths of 2-inches.

**Vegetated Areas:**

Inspect vegetated areas early in the growing season to identify active or potential erosion problems. Re-plant bare areas, or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

**Gutters:**

The gutters should be cleared of leaves and cleaned a minimum of twice per year. Preferable in Spring and Autumn.

**Driveways & Parking Areas:**

Clear accumulations of winter sand in driveways and parking areas at least once per year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping.

**3.2 Non-Routine Maintenance**

All catch basins, grates and pipes should be inspected once every four (4) years for proper function, clogging, signs of deterioration and structural inadequacy. Any adverse situations are to be repaired as needed.

**3.3 Non-Periodic Inspection**

The storm water management system shall be inspected after installation by a Registered Professional Civil Engineer to confirm its adequacy. The inspection shall include an examination of all components of the system.

**3.4 Record keeping**

A maintenance inspection report will be made after each inspection. Maintenance inspection reports shall be maintained by the Owner for a period of no less than 5-years.

**4.0 PUBLIC SAFETY FEATURES**

The stormwater management facilities were designed to be inherently safe.

**5.0 ESTIMATED O&M BUDGET**

The estimated annual budget to conduct the specified operation and maintenance is approximately One hundred dollars per year (\$100/year).

**ATTACHMENT A**

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**INSPECTION LOG**



Site Status: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_ Site Conditions: \_\_\_\_\_

Inspection Frequency Key: A=annual; Q=quarterly and at the end of foliage and snow removal seasons

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
<b>Debris Removal</b>				
Adjacent area free of debris?	A/Q			
Inlets and Outlets free of debris?	A/Q			
Facility (internally) free of debris?	A/Q			
<b>Vegetation</b>				
Surrounding area fully stabilized? (no evidence of eroding material)	A/Q			
Grass mowed?	A/Q			
<b>Dry Well</b>				
Sign of differential settlement	A/Q			
Sediment Accumulation	A/Q			
<b>Structural Components</b>				
Any evidence of structural deterioration?	A			
Grates in good condition?	A			
Spalling or cracking of structural parts?	A			
<b>Outlet/Overflow Spillway</b>	A			
<b>Other</b>				
Noticeable odors?	A			
Evidence of flow bypassing facility?	A			
Other?	A			

Inspector Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Overall Condition of Facility:  Acceptable  Unacceptable

If any of the Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The Next Routine inspection is scheduled for approximately: \_\_\_\_\_ (Date)

Inspected by: (Signature) \_\_\_\_\_  
 Inspected by: (Printed) \_\_\_\_\_