

STORMWATER MANAGEMENT REPORT

FOR

**2 OLD POINT RD,
NEWBURY, MA 01951**

Prepared for:

Vincent Godin
The Cottages Commercial, LLC
14 Plum Island Blvd.
Newbury, MA 01951

Prepared by:

Design Consultants, Inc.
120 Middlesex Avenue, Suite 20
Somerville, Massachusetts 02145

**Project No. 2020-067
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Appendix B	Existing & Proposed Drainage Areas
Appendix C	FEMA Flood Insurance Rate Map
Appendix D	Soils Information
Appendix E	Existing & Proposed Hydrology
Appendix F	Operation & Maintenance Plan

1.0 INTRODUCTION

The client is proposing to redevelop the site located at 2 Old Point Road and construct a new restaurant area with a mobile kitchen and outdoor seating, along with 54 parking spaces. The parking will be on gravel while maintaining some existing pavement.

2.0 STORMWATER MANAGEMENT POLICY

This project is a redevelopment project of an existing site that falls under the jurisdiction of the Massachusetts Wetlands Protection (M.G.L. Ch. 131 Section 40). The reference documents used for the proposed stormwater management system for the project were the MassDEP's Stormwater Management Handbook. The following report explains how these policies are met.

3.0 EXISTING CONDITION

The limit of work for the project is the parcels of land shown in the Town of Newbury's Assessor's Database as Parcel ID U02-153 and U02-154. The approximate total land area is 0.959 acres (43,059 SF). The parcel is bound by Old Point Road to the west, residential dwellings to the north and east and Plum Island Turnpike to the south. The site is bisected by Mcleod Ave, which splits the two parcels. Across Old Point Road to the west is the salt marsh connected to the Merrimack River. The parcels currently consist of 4 1-story buildings, pavement, gravel and some grass area. The existing site is 45% impervious.

According to the FEMA Flood Insurance Rate Map Number 25009C0141G, with an effective date of 7/16/2014, the site is located within a Zone AE with a Base Flood Elevation (BFE) El. 13 FT. The entire site is below the BFE. *(See Appendix C: FEMA Flood Insurance Rate Map)*

3.1 Soils

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the site includes two categories of soils. The majority of the site is classified as Hooksan-Urban land complex, 0 to 8 percent slopes. This soil classification is recognized as Hydrologic Soil Group (HSG) A. A small western portion of the site abutting the marsh, is classified as Ipswich and Westbrook mucky peats, 0 to 2 percent slopes, very frequently flooded. This soil classification is recognized as HSG D.

4.0 PROPOSED CONDITION

The project proposes to demolish two of the buildings currently located at the site and convert the use of the garage structure into a restaurant space with adjacent outdoor seating. A movable kitchen is proposed to be brought to the property to service the food preparations. The existing pavement at the entrance along the south side of the property will remain. The remaining parking area will consist of gravel, with the exception of the handicapped parking, which will be pavement. The paved/gravel parking area will provide 54 parking spaces. The outdoor seating area will consist of landscaping, sand, pea-stone gravel and permeable pavement making up the rest of the site.

4.1 Hydrologic Model

The hydrologic model was developed in HydroCAD, a computer program based on USDA's Technical Release TR-55, Urban Hydrology for Small Watersheds. Both existing and proposed conditions are modeled for the 2-year, 10-year, 25-year, and 100-year 24-hour storm events. HydroCAD allows for variable rainfall intensity throughout the storm duration, peaking near the

middle of the Type III, 24-hour storm. The drainage area's time of concentration (t_c) is assumed to be six minutes for this site, which is the minimum recommended by TR-55. Complete calculations, performed using the HydroCAD software, are included in the appendix.

5.0 CONSISTENCY WITH DEP STORMWATER MANAGEMENT POLICY

The project was designed with the consideration of the MassDEP's Stormwater Management Policy and associated standards. The project is also recognized as a redevelopment project under the MassDEP Stormwater Management Policy, and therefore meets the standards as a redevelopment project. The ways in which these standards are met is detailed below:

5.1 Standard 1 – Untreated Stormwater

“No New untreated stormwater conveyances (e.g. outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.”

The proposed drainage system does not include any new conveyances that discharge stormwater directly to wetlands or water of the Commonwealth without pre-treatment. BMP's are proposed to treat stormwater and to prevent any erosion to the surrounding resource areas. Since no new conveyances will directly discharge untreated stormwater, the project meets Standard 5.

5.2 Standard 2 – Post Development Peak Discharge Rates

“Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.”

The site was analyzed under both the existing and proposed conditions to compare the pre and post development peak discharge rates at the single design discharge point leaving the property that drains to the salt marsh across Old Point Road. The design point was analyzed to ensure that there is no impact on abutting properties and resource areas as a result of the project. A detailed description of both the existing condition hydrology and proposed condition hydrology is described below. A copy of the HydroCAD reports for both existing and proposed conditions are provided in Appendix E.

Existing Conditions Hydrology

The existing hydrology on site consists of a single subcatchment that flows to a single design discharge point at the salt marsh that connects to the Merrimack River. For hydrological design purposes, the catchment area is bound by the edges of the property line. The existing site has a catch basin owned by the Town of Newbury on the west side of the property and another catch basin on the south side along Plum Island Boulevard, located just off the property. The catch basin along Old Point Road collects runoff from the western paved portion of the site and the roof area. Its rim is located at El. 6.30 (NAVD88) which is low enough that it is flooded via tidal influence from the marsh during king tide events. Via the two catch basins, and any runoff that flows directly from the site across the road, the entire site drains to the salt marsh located across Old Point Road. This salt marsh is directly connected to the Merrimack River. The existing site is 45% impervious. (See Appendix B: Existing & Proposed Drainage Areas)

Proposed Conditions Hydrology

Under the proposed conditions, the site will still have a single design discharge point at the adjacent salt marsh which connects to the Merrimack River. Within the site there are two separate subcatchment areas. Subcatchment 10S consists of the majority of the site, including the landscaped area, the existing paved area and the gravel parking area which will drain to the larger bioretention area. The smaller, northwest portion of the site will drain to the smaller bioretention area. These bioretention areas will collect, filter and infiltrate runoff. The proposed site is 17% impervious (*See Appendix B: Site Plans*)(*See Appendix F: Existing & Proposed Conditions*)

Table 5.2.1: Hydrological Calculation Summary

Description	Existing Conditions		Proposed Conditions	
Drainage Area	43,173 +/- Square Feet		43,173 +/- Square Feet	
Storm Event (Year)	Offsite Peak Runoff (CFS)	Offsite Runoff Volume (CF)	Offsite Peak Runoff (CFS)	Offsite Runoff Volume (CF)
2	1.62	4,101	0.75	1,409
10	3.43	8,618	2.17	4,746
25	4.96	12,550	3.56	7,954
100	8.22	21,261	6.61	15,547

5.3 Standard 3 – Recharge to Groundwater

“Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive design, low impact development techniques, stormwater best management practices, and good operation and maintenance. 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 condition is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.”

The volume of the recharge system was calculated according to the Massachusetts Stormwater Handbook. The proposed design is recognized as a redevelopment project, as the proposed impervious area is decreased from the existing conditions, therefore it requires no additional groundwater recharge in the proposed conditions. However, even though there is to be no new net impervious area on site, there is a total of 7,319 SF of impervious area in the proposed design. Therefore, even though this is a redevelopment project, groundwater recharge volume has been provided. A total of 271 CF of groundwater recharge volume is provided between the two Bioretention areas. Therefore, this project meets Standard 3.

5.4 Standard 4 – Removal of 80% Total Suspended Solids

“Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.”

Stormwater management standards shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). As mentioned above, this project is a redevelopment project, therefore the impervious area is decreased in the proposed conditions. However, the project still provides two bioretention areas that have been selected to remove 90% of TSS from the on-site runoff.

The project does not fall within a Zone II or Interim Wellhead Protection Area. However, it does discharge directly to an Outstanding Resource Water (ORW). Therefore, Water Quality Volumes (WQV) should be calculated under the Massachusetts Stormwater Standards where 1” of WQV storage is required for all impervious surfaces. This project meets the definition of a redevelopment project under the Massachusetts Stormwater Standards. Therefore, it is only required to meet this standard to the maximum extent practicable. When WQV are calculated under the Massachusetts Stormwater Standards where 0.5” of WQV storage is required for all impervious surfaces, with 4,531 SF of paved area, the resulting WQV calculation is:

$$4,531 \text{ SF} \times 0.5" = 189 \text{ CF of WQV storage required}$$

The proposed project includes 271 CF of WQV storage between the two bioretention areas. Therefore, the proposed project exceeds Standard 4 on TSS removal and meets the WQV standard to the maximum extent practicable.

5.5 Standard 5 – Lands Uses with Higher Potential Pollutant Loads

“For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMP’s determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook.”

This project is not considered a Land Use with Higher Potential Pollutant Loads. Therefore, this standard is not applicable to this project.

5.6 Standard 6 – Critical Areas

“Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of specific source control and pollution prevention measures and the specific

structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook.”

As mentioned above, this project is not located within a Zone II wellhead protection area. However, the project does discharge directly to an ORW. This project also fits the definition of a redevelopment project and has been designed to meet the WQV requirement to the maximum extent practicable. Therefore, the WQV of 0.5” x the contributing impervious area has been used for sizing all of the bioretention areas. Refer to Standard 5 for detailed WQV calculations.

The project may not be located within a Wellhead Protection Area, however it does discharge to the adjacent salt marsh and it also falls within a Zone AE Flood Zone, or the 100 YR Flood Zone. Both of these areas are resource areas protected under the Massachusetts Wetlands Protection Act (M.G.L. c. 131 Section 40) and its implementing regulations (310 CMR 10.00). These resource areas have been heavily taken into consideration during the planning and stormwater design of this project, and an NOI will be filed with the Newbury Conservation Commission for work within the 100 YR Flood Zone.

5.7 Standard 7 – Redevelopment

“A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.”

A “redevelopment project” is defined in the Massachusetts Stormwater Handbook as “development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no increase in impervious area.” The proposed project meets the definition as the project proposes no net increase in impervious area. Therefore, it is a redevelopment project and is only required to meet the standards mentioned above to the maximum extent practicable. As discussed above, this project meets all of the standards required, with the exception of the WQV requirement which is met to the maximum extent practicable. However, this project has been designed to meet all of the Stormwater Management Standards.

5.8 Standard 8 – Erosion and Sediment Controls

“A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.”

Erosion and sediment controls will be in place throughout the site during all phases of demolition and construction. All existing catch basins in the project area will have a silt sack installed under the grate. Compost socks will line the edge of the site to protect the adjacent salt marsh from silted off-site runoff. The contractor will be responsible for checking all of the

erosion and sediment control measures periodically and after every major storm. The contractor will repair, replace, and maintain all erosion/sediment control measures through construction until all disturbed areas have been stabilized. An Erosion Control Plan is provided in Appendix A.

5.9 Standard 9 – Operation and Maintenance Plan

“A long-term operation and maintenance plan shall be delivered and implemented to ensure that stormwater management systems function as designed.”

A long term Operation and Maintenance Plan is included in Appendix F. The plan includes provisions for Construction Phase measures, as well as long term maintenance and inspections.

5.10 Standard 10 – Illicit Discharge to Drainage System

“All illicit discharges to the stormwater management system are prohibited.”

There are no known or suspected illicit discharges to the stormwater management system at the project site. Therefore, this project complies with Standard 10.

6.0 CONCLUSION

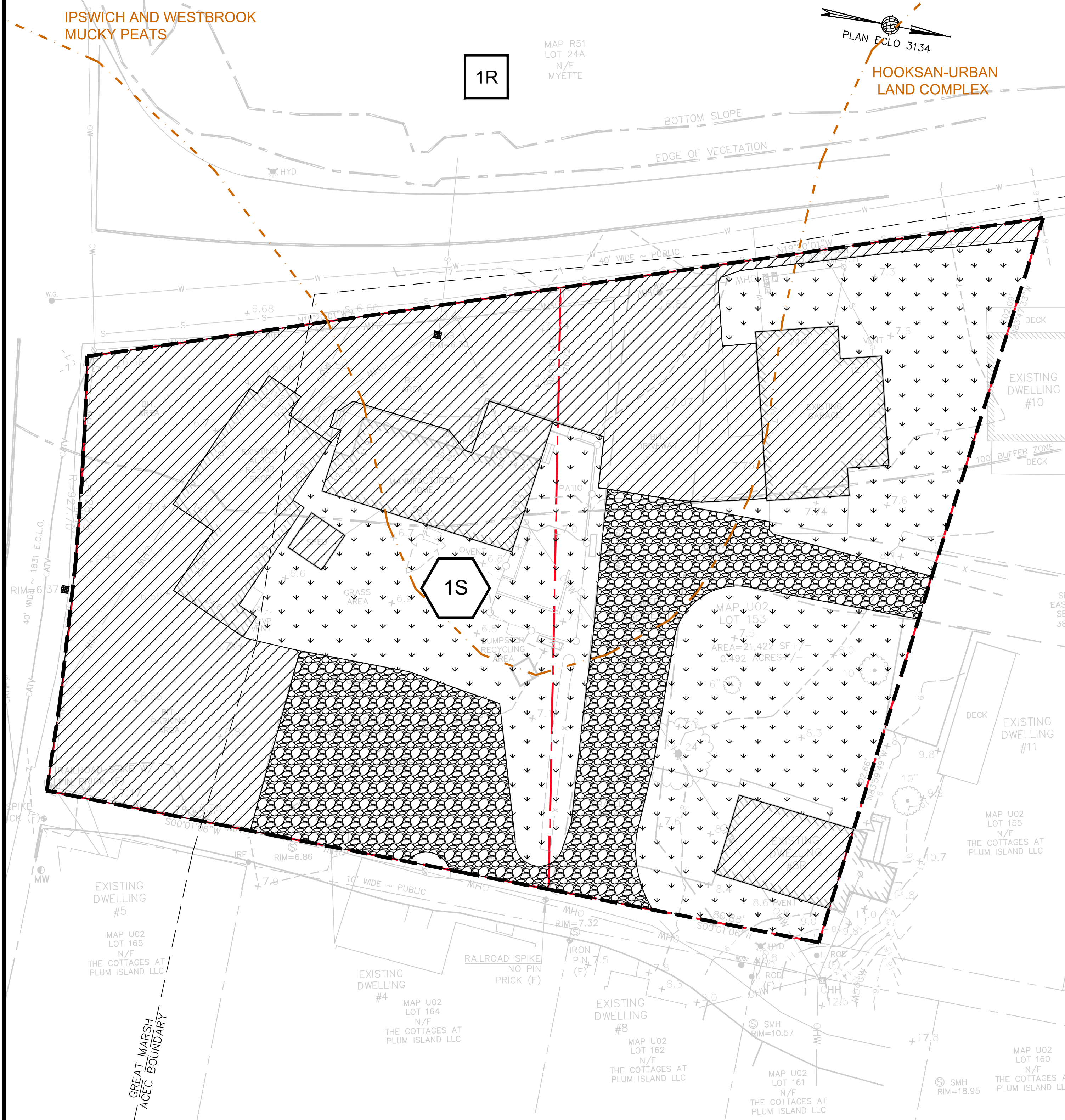
Based on DCI’s analysis of the existing and proposed conditions, the proposed site conditions meet the stormwater management criteria set. Design Point runoff volumes and peak flow rates for the 2-year, 10-year, 25-year, and 100-year storm events are decreased and each MassDEP Stormwater Standard is met. DCI concludes that the proposed redevelopment at 2 Old Point Road, Newbury, MA adheres to all applicable stormwater management policies.

Appendix A

SITE PLANS

Appendix B

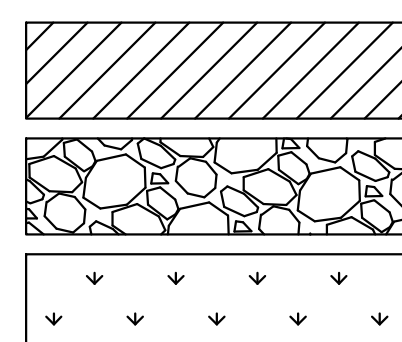
EXISTING & PROPOSED DRAINAGE AREAS



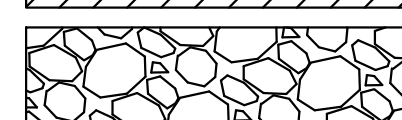
EXISTING

PROPOSED

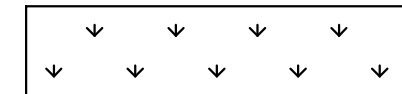
LEGEND



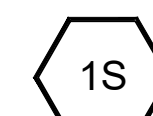
IMPERVIOUS AREA



GRAVEL



LANDSCAPE



SUBCATCHMENT

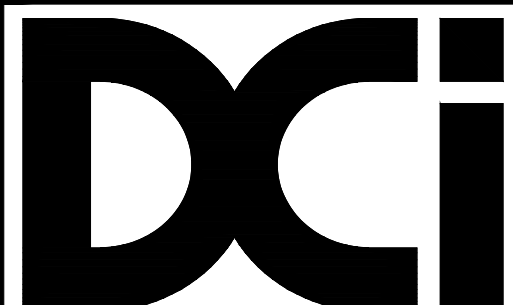


POND



DESIGN POINT

NORTH



Design Consultants Inc.

Somerville - Quincy - Newburyport

www.dci-ma.com

OWNER:
THE COTTAGES COMMERCIAL, LLC
14 PLUM ISLAND BLVD.
NEWBURY, MA 01951

ARCH:
JOE THE ARCHITECT
343 MEDFORD ST, SUITE 4C
SOMERVILLE, MA 02145

LANDSCAPE:
MICHAEL D'ANGELO
LANDSCAPE ARCHITECTURE LLC
732 EAST BROADWAY #3
BOSTON, MA 02127

PROJECT TEAM

2 OLD POINT RD
NEWBURY, MA.

PROJECT INFO

[illegible]

STAMP:

DRAINAGE AREA PLAN

SHEET NAME:

C401

SHT NO:

DR BY: MCH

DR BT. MCH
CLIK BY. CPO

CHK BY: SBS

PROJ NO: 20-067

DATE: 12/9/2020

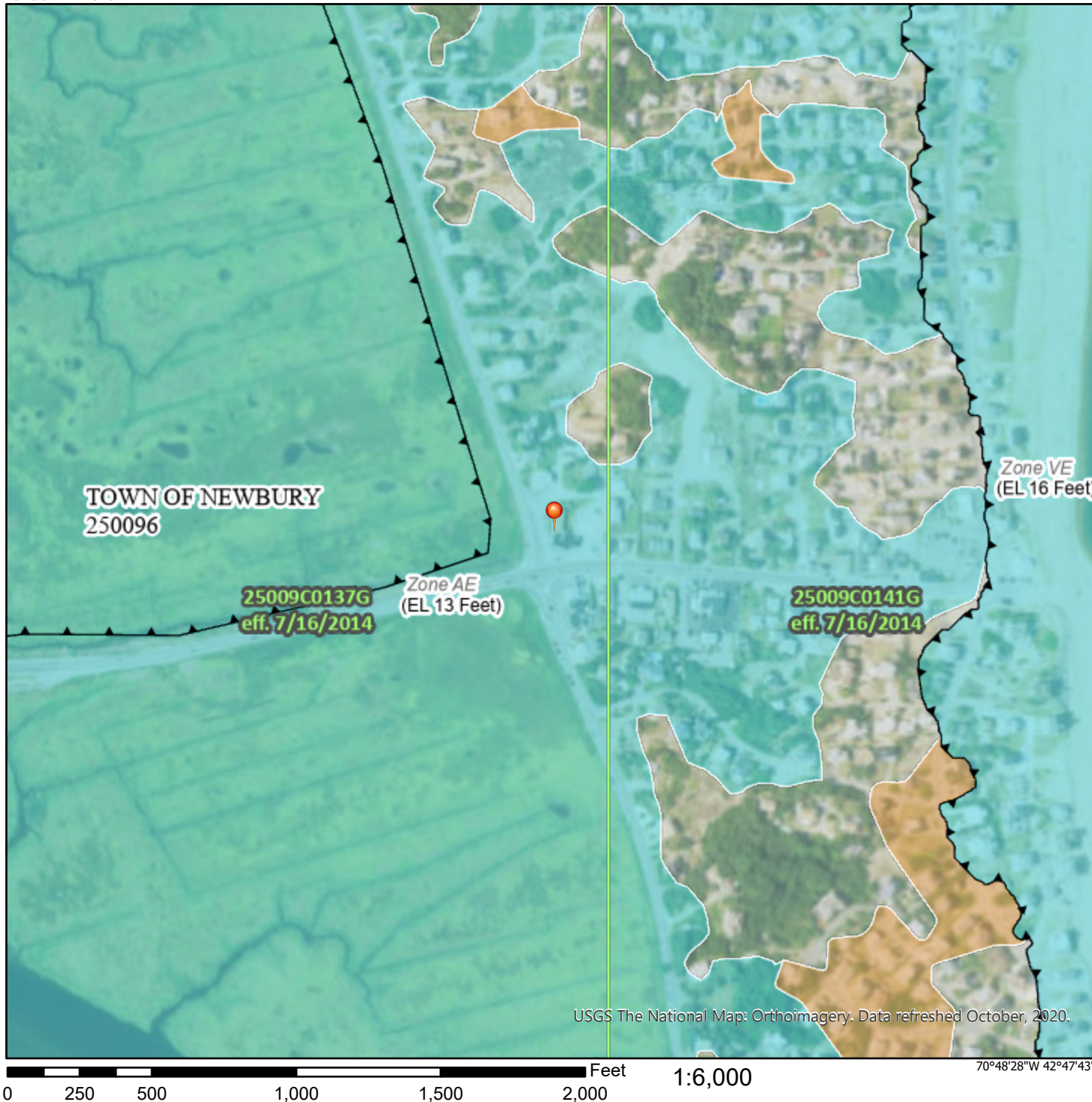
Appendix C

FEMA FLOOD INSURANCE RATE MAP

National Flood Hazard Layer FIRMette



70°49'6"W 42°48'10"N



Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/8/2020 at 4:19 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Appendix D

SOILS INFORMATION

Soil Map—Essex County, Massachusetts, Northern Part



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/7/2020
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MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part

Survey Area Data: Version 16, Jun 9, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 12, 2016

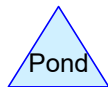
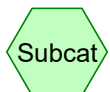
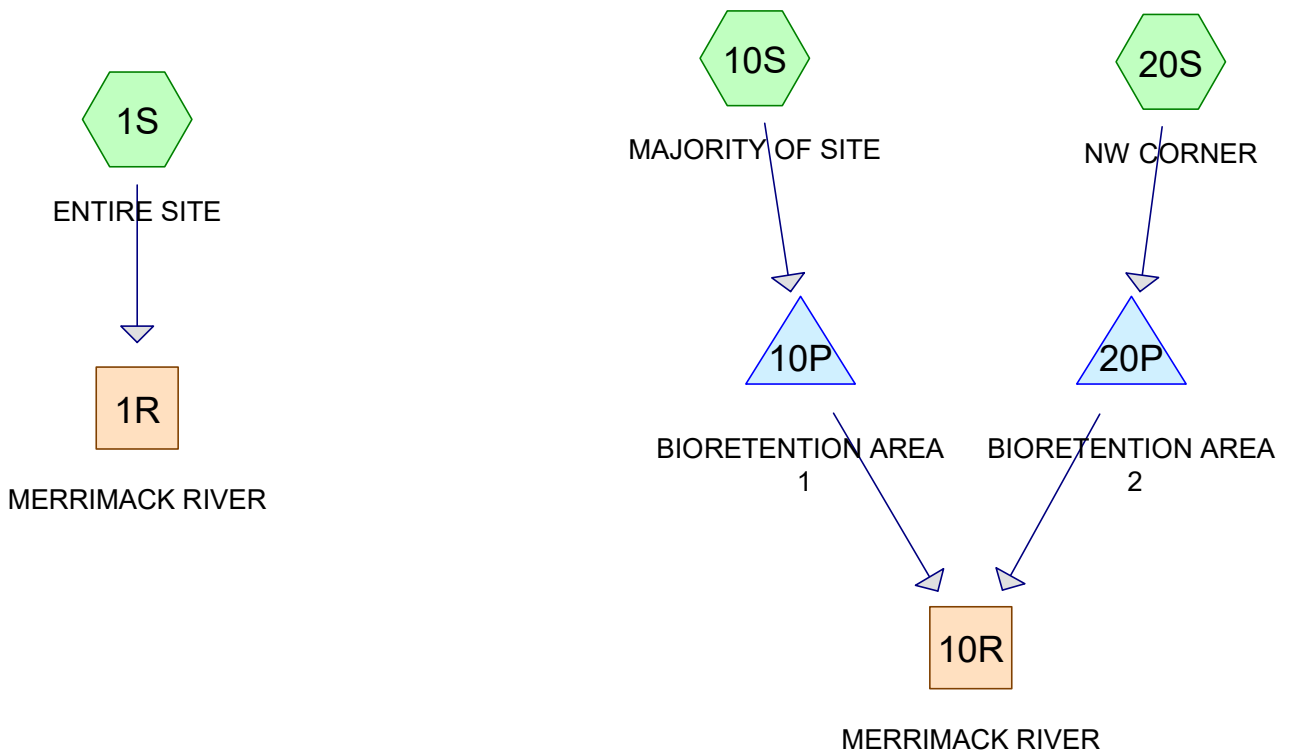
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
638B	Hooksan-Urban land complex, 0 to 8 percent slopes	18.3	56.9%
712A	Ipswich and Westbrook mucky peats, 0 to 2 percent slopes, very frequently flooded	13.8	43.1%
Totals for Area of Interest		32.1	100.0%

Appendix E

EXISTING AND PROPOSED HYDROLOGY



20-067 DR

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,887	49	50-75% Grass cover, Fair, HSG A (1S)
2,960	84	50-75% Grass cover, Fair, HSG D (1S)
15,007	39	>75% Grass cover, Good, HSG A (10S, 20S)
8,138	80	>75% Grass cover, Good, HSG D (10S)
20,442	76	Gravel roads, HSG A (1S, 10S, 20S)
17,738	98	Paved parking, HSG A (1S, 10S)
9,021	98	Roofs, HSG A (1S, 10S, 20S)

20-067 DR

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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
12,887	0	0	2,960	0	15,847	50-75% Grass cover, Fair
15,007	0	0	8,138	0	23,145	>75% Grass cover, Good
20,442	0	0	0	0	20,442	Gravel roads
17,738	0	0	0	0	17,738	Paved parking
9,021	0	0	0	0	9,021	Roofs

Summary for Subcatchment 1S: ENTIRE SITE

Runoff = 1.62 cfs @ 12.01 hrs, Volume= 4,101 cf, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
13,207	98	Paved parking, HSG A
6,234	98	Roofs, HSG A
2,960	84	50-75% Grass cover, Fair, HSG D
12,887	49	50-75% Grass cover, Fair, HSG A
7,885	76	Gravel roads, HSG A
43,173	78	Weighted Average
23,732		54.97% Pervious Area
19,441		45.03% Impervious Area

Summary for Subcatchment 10S: MAJORITY OF SITE

Runoff = 0.67 cfs @ 12.01 hrs, Volume= 1,908 cf, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,531	98	Paved parking, HSG A
845	98	Roofs, HSG A
11,396	39	>75% Grass cover, Good, HSG A
8,138	80	>75% Grass cover, Good, HSG D
11,168	76	Gravel roads, HSG A
36,078	68	Weighted Average
30,702		85.10% Pervious Area
5,376		14.90% Impervious Area

Summary for Subcatchment 20S: NW CORNER

Runoff = 0.07 cfs @ 12.03 hrs, Volume= 254 cf, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
3,611	39	>75% Grass cover, Good, HSG A
1,389	76	Gravel roads, HSG A
1,942	98	Roofs, HSG A
6,942	63	Weighted Average
5,000		72.03% Pervious Area
1,942		27.97% Impervious Area

Summary for Reach 1R: MERRIMACK RIVER

Inflow Area = 43,173 sf, 45.03% Impervious, Inflow Depth > 1.14" for 2-Year event
 Inflow = 1.62 cfs @ 12.01 hrs, Volume= 4,101 cf
 Outflow = 1.62 cfs @ 12.01 hrs, Volume= 4,101 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: MERRIMACK RIVER

Inflow Area = 43,020 sf, 17.01% Impervious, Inflow Depth > 0.39" for 2-Year event
 Inflow = 0.75 cfs @ 12.04 hrs, Volume= 1,409 cf
 Outflow = 0.75 cfs @ 12.04 hrs, Volume= 1,409 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: BIORETENTION AREA 1

Inflow Area = 36,078 sf, 14.90% Impervious, Inflow Depth > 0.63" for 2-Year event
 Inflow = 0.67 cfs @ 12.01 hrs, Volume= 1,908 cf
 Outflow = 0.76 cfs @ 12.04 hrs, Volume= 1,735 cf, Atten= 0%, Lag= 1.6 min
 Discarded = 0.01 cfs @ 12.00 hrs, Volume= 336 cf
 Primary = 0.75 cfs @ 12.04 hrs, Volume= 1,399 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 6.95' @ 12.04 hrs Surf.Area= 200 sf Storage= 173 cf

Plug-Flow detention time= 41.1 min calculated for 1,735 cf (91% of inflow)

Center-of-Mass det. time= 11.5 min (841.9 - 830.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	5.80'	173 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	147	50.0	0	0	147
6.80	200	56.0	173	173	220
Device	Routing	Invert	Outlet Devices		
#1	Primary	6.80'	4.0' long Sharp-Crested Rectangular Weir		
#2	Discarded	5.80'	2.410 in/hr Exfiltration over Surface area		
			2 End Contraction(s)		

Discarded OutFlow Max=0.01 cfs @ 12.00 hrs HW=6.91' (Free Discharge)

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

Primary OutFlow Max=0.69 cfs @ 12.04 hrs HW=6.94' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.69 cfs @ 1.23 fps)

Summary for Pond 20P: BIORETENTION AREA 2

Inflow Area = 6,942 sf, 27.97% Impervious, Inflow Depth > 0.44" for 2-Year event
 Inflow = 0.07 cfs @ 12.03 hrs, Volume= 254 cf
 Outflow = 0.01 cfs @ 13.45 hrs, Volume= 197 cf, Atten= 81%, Lag= 85.4 min
 Discarded = 0.01 cfs @ 13.40 hrs, Volume= 187 cf
 Primary = 0.01 cfs @ 13.45 hrs, Volume= 10 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.01' @ 13.45 hrs Surf.Area= 120 sf Storage= 98 cf

Plug-Flow detention time= 163.9 min calculated for 197 cf (77% of inflow)

Center-of-Mass det. time= 102.5 min (948.9 - 846.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	6.00'	98 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6.00	77	40.0	0	0	77
7.00	120	46.0	98	98	136

Device	Routing	Invert	Outlet Devices	
#1	Primary	7.00'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	6.00'	2.410 in/hr Exfiltration over Surface area	

Discarded OutFlow Max=0.01 cfs @ 13.40 hrs HW=7.00' (Free Discharge)

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

Primary OutFlow Max=0.01 cfs @ 13.45 hrs HW=7.01' (Free Discharge)

↑ **1=Sharp-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.28 fps)

Summary for Subcatchment 1S: ENTIRE SITE

Runoff = 3.43 cfs @ 12.00 hrs, Volume= 8,618 cf, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
13,207	98	Paved parking, HSG A
6,234	98	Roofs, HSG A
2,960	84	50-75% Grass cover, Fair, HSG D
12,887	49	50-75% Grass cover, Fair, HSG A
7,885	76	Gravel roads, HSG A
43,173	78	Weighted Average
23,732		54.97% Pervious Area
19,441		45.03% Impervious Area

Summary for Subcatchment 10S: MAJORITY OF SITE

Runoff = 1.90 cfs @ 12.01 hrs, Volume= 4,861 cf, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
4,531	98	Paved parking, HSG A
845	98	Roofs, HSG A
11,396	39	>75% Grass cover, Good, HSG A
8,138	80	>75% Grass cover, Good, HSG D
11,168	76	Gravel roads, HSG A
36,078	68	Weighted Average
30,702		85.10% Pervious Area
5,376		14.90% Impervious Area

Summary for Subcatchment 20S: NW CORNER

Runoff = 0.28 cfs @ 12.01 hrs, Volume= 738 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
3,611	39	>75% Grass cover, Good, HSG A
1,389	76	Gravel roads, HSG A
1,942	98	Roofs, HSG A
6,942	63	Weighted Average
5,000		72.03% Pervious Area
1,942		27.97% Impervious Area

Summary for Reach 1R: MERRIMACK RIVER

Inflow Area = 43,173 sf, 45.03% Impervious, Inflow Depth > 2.40" for 10-Year event
 Inflow = 3.43 cfs @ 12.00 hrs, Volume= 8,618 cf
 Outflow = 3.43 cfs @ 12.00 hrs, Volume= 8,618 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: MERRIMACK RIVER

Inflow Area = 43,020 sf, 17.01% Impervious, Inflow Depth > 1.32" for 10-Year event
 Inflow = 2.17 cfs @ 12.01 hrs, Volume= 4,746 cf
 Outflow = 2.17 cfs @ 12.01 hrs, Volume= 4,746 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: BIORETENTION AREA 1

Inflow Area = 36,078 sf, 14.90% Impervious, Inflow Depth > 1.62" for 10-Year event
 Inflow = 1.90 cfs @ 12.01 hrs, Volume= 4,861 cf
 Outflow = 1.99 cfs @ 12.01 hrs, Volume= 4,690 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.65 hrs, Volume= 379 cf
 Primary = 1.98 cfs @ 12.01 hrs, Volume= 4,311 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.09' @ 12.01 hrs Surf.Area= 200 sf Storage= 173 cf

Plug-Flow detention time= 17.6 min calculated for 4,675 cf (96% of inflow)

Center-of-Mass det. time= 4.9 min (813.2 - 808.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.80'	173 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	147	50.0	0	0	147
6.80	200	56.0	173	173	220

Device	Routing	Invert	Outlet Devices
#1	Primary	6.80'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Discarded	5.80'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.01 cfs @ 11.65 hrs HW=6.84' (Free Discharge)

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

Primary OutFlow Max=1.91 cfs @ 12.01 hrs HW=7.08' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.91 cfs @ 1.73 fps)

Summary for Pond 20P: BIORETENTION AREA 2

Inflow Area = 6,942 sf, 27.97% Impervious, Inflow Depth > 1.28" for 10-Year event
 Inflow = 0.28 cfs @ 12.01 hrs, Volume= 738 cf
 Outflow = 0.35 cfs @ 12.04 hrs, Volume= 642 cf, Atten= 0%, Lag= 2.0 min
 Discarded = 0.01 cfs @ 12.00 hrs, Volume= 207 cf
 Primary = 0.34 cfs @ 12.04 hrs, Volume= 434 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.11' @ 12.04 hrs Surf.Area= 120 sf Storage= 98 cf

Plug-Flow detention time= 56.8 min calculated for 640 cf (87% of inflow)

Center-of-Mass det. time= 17.0 min (835.8 - 818.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	6.00'	98 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6.00	77	40.0	0	0	77
7.00	120	46.0	98	98	136

Device	Routing	Invert	Outlet Devices	
#1	Primary	7.00'	3.0' long Sharp-Crested Rectangular Weir	
#2	Discarded	6.00'	2.410 in/hr Exfiltration over Surface area	

Discarded OutFlow Max=0.01 cfs @ 12.00 hrs HW=7.06' (Free Discharge)

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

Primary OutFlow Max=0.31 cfs @ 12.04 hrs HW=7.10' (Free Discharge)

↑ **1=Sharp-Crested Rectangular Weir** (Weir Controls 0.31 cfs @ 1.04 fps)

Summary for Subcatchment 1S: ENTIRE SITE

Runoff = 4.96 cfs @ 12.00 hrs, Volume= 12,550 cf, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
13,207	98	Paved parking, HSG A
6,234	98	Roofs, HSG A
2,960	84	50-75% Grass cover, Fair, HSG D
12,887	49	50-75% Grass cover, Fair, HSG A
7,885	76	Gravel roads, HSG A
43,173	78	Weighted Average
23,732		54.97% Pervious Area
19,441		45.03% Impervious Area

Summary for Subcatchment 10S: MAJORITY OF SITE

Runoff = 3.04 cfs @ 12.01 hrs, Volume= 7,643 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
4,531	98	Paved parking, HSG A
845	98	Roofs, HSG A
11,396	39	>75% Grass cover, Good, HSG A
8,138	80	>75% Grass cover, Good, HSG D
11,168	76	Gravel roads, HSG A
36,078	68	Weighted Average
30,702		85.10% Pervious Area
5,376		14.90% Impervious Area

Summary for Subcatchment 20S: NW CORNER

Runoff = 0.48 cfs @ 12.01 hrs, Volume= 1,218 cf, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
3,611	39	>75% Grass cover, Good, HSG A
1,389	76	Gravel roads, HSG A
1,942	98	Roofs, HSG A
6,942	63	Weighted Average
5,000		72.03% Pervious Area
1,942		27.97% Impervious Area

Summary for Reach 1R: MERRIMACK RIVER

Inflow Area = 43,173 sf, 45.03% Impervious, Inflow Depth > 3.49" for 25-Year event
 Inflow = 4.96 cfs @ 12.00 hrs, Volume= 12,550 cf
 Outflow = 4.96 cfs @ 12.00 hrs, Volume= 12,550 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: MERRIMACK RIVER

Inflow Area = 43,020 sf, 17.01% Impervious, Inflow Depth > 2.22" for 25-Year event
 Inflow = 3.56 cfs @ 12.01 hrs, Volume= 7,954 cf
 Outflow = 3.56 cfs @ 12.01 hrs, Volume= 7,954 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: BIORETENTION AREA 1

Inflow Area = 36,078 sf, 14.90% Impervious, Inflow Depth > 2.54" for 25-Year event
 Inflow = 3.04 cfs @ 12.01 hrs, Volume= 7,643 cf
 Outflow = 3.03 cfs @ 12.01 hrs, Volume= 7,469 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.10 hrs, Volume= 414 cf
 Primary = 3.02 cfs @ 12.01 hrs, Volume= 7,055 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.18' @ 12.01 hrs Surf.Area= 200 sf Storage= 173 cf

Plug-Flow detention time= 12.4 min calculated for 7,469 cf (98% of inflow)

Center-of-Mass det. time= 3.7 min (801.8 - 798.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	5.80'	173 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	147	50.0	0	0	147
6.80	200	56.0	173	173	220

Device	Routing	Invert	Outlet Devices		
#1	Primary	6.80'	4.0' long Sharp-Crested Rectangular Weir		
#2	Discarded	5.80'	2.410 in/hr Exfiltration over Surface area		

Discarded OutFlow Max=0.01 cfs @ 11.10 hrs HW=6.83' (Free Discharge)

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

Primary OutFlow Max=2.94 cfs @ 12.01 hrs HW=7.17' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.94 cfs @ 2.00 fps)

Summary for Pond 20P: BIORETENTION AREA 2

Inflow Area = 6,942 sf, 27.97% Impervious, Inflow Depth > 2.10" for 25-Year event
 Inflow = 0.48 cfs @ 12.01 hrs, Volume= 1,218 cf
 Outflow = 0.55 cfs @ 12.00 hrs, Volume= 1,120 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.85 hrs, Volume= 221 cf
 Primary = 0.54 cfs @ 12.00 hrs, Volume= 899 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.15' @ 12.00 hrs Surf.Area= 120 sf Storage= 98 cf

Plug-Flow detention time= 36.8 min calculated for 1,120 cf (92% of inflow)

Center-of-Mass det. time= 9.7 min (817.1 - 807.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	6.00'	98 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6.00	77	40.0	0	0	77
7.00	120	46.0	98	98	136

Device	Routing	Invert	Outlet Devices	
#1	Primary	7.00'	3.0' long Sharp-Crested Rectangular Weir	
#2	Discarded	6.00'	2.410 in/hr Exfiltration over Surface area	

Discarded OutFlow Max=0.01 cfs @ 11.85 hrs HW=7.03' (Free Discharge)

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

Primary OutFlow Max=0.52 cfs @ 12.00 hrs HW=7.14' (Free Discharge)

↑ **1=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 1.23 fps)

Summary for Subcatchment 1S: ENTIRE SITE

Runoff = 8.22 cfs @ 12.00 hrs, Volume= 21,261 cf, Depth> 5.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
13,207	98	Paved parking, HSG A
6,234	98	Roofs, HSG A
2,960	84	50-75% Grass cover, Fair, HSG D
12,887	49	50-75% Grass cover, Fair, HSG A
7,885	76	Gravel roads, HSG A
43,173	78	Weighted Average
23,732		54.97% Pervious Area
19,441		45.03% Impervious Area

Summary for Subcatchment 10S: MAJORITY OF SITE

Runoff = 5.62 cfs @ 12.00 hrs, Volume= 14,156 cf, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,531	98	Paved parking, HSG A
845	98	Roofs, HSG A
11,396	39	>75% Grass cover, Good, HSG A
8,138	80	>75% Grass cover, Good, HSG D
11,168	76	Gravel roads, HSG A
36,078	68	Weighted Average
30,702		85.10% Pervious Area
5,376		14.90% Impervious Area

Summary for Subcatchment 20S: NW CORNER

Runoff = 0.95 cfs @ 12.00 hrs, Volume= 2,379 cf, Depth> 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
3,611	39	>75% Grass cover, Good, HSG A
1,389	76	Gravel roads, HSG A
1,942	98	Roofs, HSG A
6,942	63	Weighted Average
5,000		72.03% Pervious Area
1,942		27.97% Impervious Area

Summary for Reach 1R: MERRIMACK RIVER

Inflow Area = 43,173 sf, 45.03% Impervious, Inflow Depth > 5.91" for 100-Year event
 Inflow = 8.22 cfs @ 12.00 hrs, Volume= 21,261 cf
 Outflow = 8.22 cfs @ 12.00 hrs, Volume= 21,261 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: MERRIMACK RIVER

Inflow Area = 43,020 sf, 17.01% Impervious, Inflow Depth > 4.34" for 100-Year event
 Inflow = 6.61 cfs @ 12.00 hrs, Volume= 15,547 cf
 Outflow = 6.61 cfs @ 12.00 hrs, Volume= 15,547 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: BIORETENTION AREA 1

Inflow Area = 36,078 sf, 14.90% Impervious, Inflow Depth > 4.71" for 100-Year event
 Inflow = 5.62 cfs @ 12.00 hrs, Volume= 14,156 cf
 Outflow = 5.68 cfs @ 12.00 hrs, Volume= 13,989 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 9.80 hrs, Volume= 472 cf
 Primary = 5.67 cfs @ 12.00 hrs, Volume= 13,517 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.38' @ 12.00 hrs Surf.Area= 200 sf Storage= 173 cf

Plug-Flow detention time= 7.7 min calculated for 13,942 cf (98% of inflow)

Center-of-Mass det. time= 3.0 min (787.1 - 784.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5.80'	173 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	147	50.0	0	0	147
6.80	200	56.0	173	173	220

Device	Routing	Invert	Outlet Devices
#1	Primary	6.80'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Discarded	5.80'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.01 cfs @ 9.80 hrs HW=6.85' (Free Discharge)

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

Primary OutFlow Max=5.57 cfs @ 12.00 hrs HW=7.38' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 5.57 cfs @ 2.48 fps)

Summary for Pond 20P: BIORETENTION AREA 2

Inflow Area = 6,942 sf, 27.97% Impervious, Inflow Depth > 4.11" for 100-Year event
 Inflow = 0.95 cfs @ 12.00 hrs, Volume= 2,379 cf
 Outflow = 0.94 cfs @ 12.01 hrs, Volume= 2,281 cf, Atten= 1%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.35 hrs, Volume= 251 cf
 Primary = 0.93 cfs @ 12.01 hrs, Volume= 2,030 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 7.21' @ 12.01 hrs Surf.Area= 120 sf Storage= 98 cf

Plug-Flow detention time= 21.4 min calculated for 2,273 cf (96% of inflow)

Center-of-Mass det. time= 6.2 min (798.5 - 792.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	6.00'	98 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6.00	77	40.0	0	0	77
7.00	120	46.0	98	98	136

Device	Routing	Invert	Outlet Devices	
#1	Primary	7.00'	3.0' long Sharp-Crested Rectangular Weir	
#2	Discarded	6.00'	2.410 in/hr Exfiltration over Surface area	

Discarded OutFlow Max=0.01 cfs @ 11.35 hrs HW=7.03' (Free Discharge)

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

Primary OutFlow Max=0.91 cfs @ 12.01 hrs HW=7.21' (Free Discharge)

↑ **1=Sharp-Crested Rectangular Weir** (Weir Controls 0.91 cfs @ 1.49 fps)

Appendix F

OPERATION & MAINTENANCE PLAN

Operation & Maintenance Plan (Permanent BMPs)

FOR

2 Old Point Road

Date: January, 2021

Owner/Operator: Vincent Godin
The Cottages Commercial, LLC
14 Plum Island Blvd.
Newbury, MA 01951

Inspection and Maintenance Schedule

Facility personnel will inspect the stormwater management system on a routine basis not less than once per month for the first six (6) months of operation and annually thereafter. Refer to project design and as-built plans for stormwater systems and landscaped area locations. Inspection and maintenance shall be performed as follows:

1. Landscaped Areas:

Landscaped areas shall be inspected and maintained on a regular basis. Areas that may be subject to erosion will be stabilized and reseeded immediately. Inspect soil and repair eroded areas monthly. Re-plant void areas as needed. Remove litter and debris monthly. Remove and replace dead vegetation twice per year in spring and fall. Replace soil media if ponding is witnessed more than 48 hours after rainfall event.

2. Roof Drains:

Inspections: The downspout inlets on the roof of the building will need periodic maintenance to ensure proper function. The required interval for this maintenance will vary by season; however, downspout inlets should be inspected for debris before the rainy season. When trees and other deciduous vegetation shed leaves that drop into the gutters, this will inhibit the flow of water and possibly clog downspouts. The leaves and/or debris must be removed in order for the system to work as designed.

Maintenance: Debris, such as leaves and trash, shall be removed by hand. Sediments shall be swept and collected or vacuumed.

3. Bioretention Areas

Inspections & Maintenance:

Following construction, inspect site following rain events. Add/replace vegetation in any eroded areas. Water to promote plant growth and survival, especially during the first two years and during dry spells.

Monthly:

- prune and weed swale to maintain appearance
- remove accumulated trash and debris
- replace mulch as needed

Annually:

- Inspect inflow area for sediment accumulation. Remove accumulated sediment or debris.
- Inspect site for erosion as well as sediment and mulch which have been moved around in the garden. Add/replace vegetation in any eroded areas.
- Inspect rain garden for dead or dying vegetation. Replace vegetation as needed.
- Test planting bed for pH. If the pH is below 5.2, limestone should be applied. If the pH is above 8.0, iron sulfate and sulfur should be applied.

Every 2 to 3 years:

- Remove and replace mulch

Stormwater System Inspection Report

General Information			
Location: 2 Old Point Road			
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Purpose of Inspection			
Weather Information			
Has it rained since the last inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Weather at time of this inspection?			

Site-Specific Stormwater Devices: (See above for inspection frequency)

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
1		<input type="checkbox"/> Yes <input type="checkbox"/> No		
2		<input type="checkbox"/> Yes <input type="checkbox"/> No		
3		<input type="checkbox"/> Yes <input type="checkbox"/> No		
4		<input type="checkbox"/> Yes <input type="checkbox"/> No		
5		<input type="checkbox"/> Yes <input type="checkbox"/> No		
6		<input type="checkbox"/> Yes <input type="checkbox"/> No		
7		<input type="checkbox"/> Yes <input type="checkbox"/> No		

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
8		<input type="checkbox"/> Yes <input type="checkbox"/> No		

Overall Site Issues

	Description		Corrective Action	Date for Corrective Action/Responsible Person
1	Are all slopes properly stabilized?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
2	Are natural resource areas (e.g., streams, wetlands, etc.) being subjected to erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
3	Are discharge points free of sediment deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No		

Certification Statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name:

Signature:

Date: