

STORMWATER EVALUATION

July 6, 2021

Project:

Quinapoxet Street- Holden
(102-14)

Prepared by:

QUINN ENGINEERING, INC.

PO Box 107

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SECTION 1

PROPERTY DESCRIPTION & EXISTING CONDITIONS

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The property is located on the south side of Quinapoxet Street adjacent to the Providence and Worcester Railroad in Holden, MA. The property contains an existing driveway and remnants of a sand/gravel mining operation. The following table contains a summary of the property and Figure 1 contains an aerial photo of the property taken circa September 2019.

PROPERTY AND EXISTING CONDITIONS:			
Address:		Quinapoxet Street - Holden, MA (102-14)	
Property Area:		18.8 Acres	
Zoning District:		R-1	
Overlay District:		Work is outside of the Watershed Protection Dist.	
Watershed:		Nashua	
Downstream Water Body:		Warren Tannery Brook	
ON SITE OR DOWNSTREAM		YES	NO
Floodplain on Site:	Ref. FM2503090005B		X
BVW or Surface Water:	Delineated By EcoTec, Inc.	X	

Table 1: Property and Existing Conditions Information.



Figure 1: Aerial photo of the property.

SECTION 2

CRITICAL AREAS

CRITICAL AREAS

Critical Areas are defined in the MA DEP Stormwater Handbook Vol. 1, Ch. 1, page 3 as *Outstanding Resource Waters* as designated in 314 CMR 4.00, *Special Resource Waters* as designated in 314 CMR 4.00, *recharge areas for public water supplies* as defined in 310 CMR 22.02 (Zone Is, Zone IIs and Interim Wellhead Protection Areas for groundwater sources and Zone As for surface water sources), *bathing beaches* as defined in 105 CMR 445.000, *cold-water fisheries* as defined in 310 CMR 10.04 and 314 CMR 9.02, and *shellfish growing areas* as defined in 310 CMR 10.04 and 314 CMR 9.02. The following table contains a summary of Critical Areas on the property or in close proximity downstream.

		ON SITE OR DOWNSTREAM	
Critical Areas:		YES	NO
ORW:			
- Class A Public Water Supplies			X
- Class A Public Water Supply Tributaries		X	
- Wetlands Bordering on Class A, B, SB, or SA ORWs		X	
- Vernal Pool			X
Special Resource Waters:			
- Water in National or State Park			X
- Water in Wildlife Refuge			X
Recharge Areas for Public Water Supplies:			
- Zone I			X
- Zone II			X
- IWPA			X
- Zone A:			X
Bathing Beaches:			X
Cold Water Fisheries:	Warren Tannery Brook (SARIS 8145525)	X	
Shellfish Growing Areas:			X

Table 2: Critical Areas.

SECTION 3

PROJECT SUMMARY & APPLICABILITY

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- A. The proposed work consists of the development of 2 single family house lots. The existing driveway is proposed to be used as a common driveway to access the lots. The existing driveway and stormwater controls associated with the driveway were constructed circa 2014 (MA DEP File #183-547). No improvements to the existing driveway are proposed as part of this work.
- B. The Massachusetts Stormwater Management Standards are enforced through the following state/federal mechanisms:
- Massachusetts Wetlands regulations (310 CMR 10.00),
 - 401 Water Quality Certification regulations (314 CMR 9.00),
 - Underground Injection Control (UIC) regulations for Class V wells (310 CMR 27.00),
 - EPA-MassDEP Municipal Storm Sewer Separate (MS4) Permit.

In order for these regulations to apply, jurisdiction must be established. The following table summarizes the applicability of the state/federal mechanisms at this site:

	APPLICABLE:	
	YES	NO
Massachusetts Wetlands regulations (310 CMR 10.00),		X
401 Water Quality Certification regulations (314 CMR 9.00),		X
UIC regulations for Class V wells (310 CMR 27.00),		X
EPA-MassDEP Municipal Storm Sewer Separate (MS4) Permit.	X	

Table 3: State/Federal Mechanisms for Enforcement.

The proposed work is located within an area of Holden that is automatically designed as an MS4 area. US EPA mapping has been included in the appendices.

- C. The MA DEP Stormwater Handbook Vol. 1, Ch. 1, page 3 states that the Stormwater Management Standards shall apply to the maximum extent practicable housing development and redevelopment projects comprised of detached single-family dwellings on four or fewer lots that have a stormwater discharge that may potentially affect a critical area;

For purposes of the Stormwater Management Standards, redevelopment projects are defined to include the following:

- Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;
- Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area; and
- Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers and stormwater retrofit projects.

Redevelopment projects are required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Redevelopment project must also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The proposed work cannot be considered a redevelopment project. **The MA DEP standards are applicable to the maximum extent practical.**

- D. Under Article XXIV, the Stormwater Management Bylaw, a Land Disturbance Permit is required because the project results in the disruption of more than 5,000 ft.² of new impervious 20,000 ft.² of disruption. Stormwater regulations associated with this bylaw have not been implemented yet.

SECTION 4

SOILS and ESHGWT

SOILS and ESHGWT

- A. The Web Soil Survey provided by the USDA NRCS has been used to identify the underlying site soils in the area of the proposed work as Pits, Gravel (Map Unit 600). Pits, Gravel soils are not classified by the USDA.
- B. Soil testing conducted by Clearwater Environmental, LLC identified the soils on site as sand or sand/gravel. The estimated seasonal high ground water table was found to be 72 inches below the ground surface. The results of the soil testing are consistent with the USDA mapping as Pits, Gravel. For the purpose of this report, the existing soils have been assumed to be hydrologic soil group (HSG) A.

SECTION 5

LID SITE DESIGN CREDITS

LID Site Design Credits

- A. The Low Impact Development Site Design Credits specified in the MA DEP Stormwater Handbook Vol. 3, Ch. 1, page 44 are used to potentially reduce or eliminate BMPs required to meet Standard #3 and #4. Credits 2 and 3 allows for roadway, driveway or parking lot runoff directed to pervious areas where plants provide filtration and the ground provides infiltration.
- B. “Qualifying Pervious Areas” are defined as natural or landscaped vegetated areas fully stabilized, with runoff characteristics at or lower than the NRCS Runoff Curve Numbers in the table in the MA DEP Stormwater Handbook Vol. 3, Ch. 1, page 44. The Qualifying Pervious Area may be located in the outer 50-foot portion of a wetland buffer zone. However, it must not be located in the inner 50-foot portion of a wetland buffer zone (that portion of the buffer zone immediately adjacent to a wetland).
- C. LID Credit 1 (Environmentally Sensitive Development) is proposed to be applied since all of the proposed work is located outside of the BVW buffer, runoff from the existing driveway flows to the existing stormwater BMPs and the proposed lots are approximately 9x larger than that required under the Zoning Bylaw. LID Credit 1 is subject to the several restrictions outlined in the MA DEP Stormwater Handbook Vol. 3, Ch. 1. The following is a summary of how the proposed work meets those restrictions:
- The total impervious cover footprint must be less than 15 % of the base lot area. Because alterations are limited in these areas under the Wetlands Protection Act Regulations, 310 CMR 10.00, the following wetland resource areas may not be included in the base lot area used for purposes of determining compliance with this requirement: any vegetated wetlands (Bordering Vegetated Wetland (BVW), Isolated Vegetated Wetland (IVW), Salt Marsh); Land Under Water and Waterways; Land Under Ocean; Bank; Coastal Bank; or 5,000 square feet or 10% of the Riverfront Area, whichever is greater.
The work is less than 15% of the base lot area and no work is proposed in any resource areas or buffer.
 - No alteration may occur in any coastal wetland resource areas other than Land Subject to Coastal Storm Flowage.
There are no coastal resource areas near the project area.
 - No alteration may occur in BVW or IVW.
No work is proposed in a BVW or IVW.
 - A minimum of 25% of the site must be protected as a natural conservation area. To qualify as a natural conservation area, an EEA Conservation Restriction must be placed on the protected area. Because alterations are limited in these areas under the Wetlands Protection Act Regulations, 310 CMR 10.00, the Natural Conservation Area must not include the following wetland resource areas: any vegetated wetlands (BVW, IVW, Salt Marsh); Land Under Water and Waterways; Land Under Ocean; Bank; Coastal Bank; or more than 5000 square feet or 10% of the Riverfront Area, whichever is greater.
A conservation restriction is not proposed. Further development potential, beyond the two proposed lots, on this property is significantly limited by lack of access. The proposed work is located on the front half of the proposed lots. The rear half of the lots are expected to remain undeveloped which is essentially a de-facto conservation area.
 - Stream buffers must be incorporated into the design of any areas adjacent to perennial and intermittent streams on the site. A stream buffer is the inner 50 feet of the buffer zone adjacent to the bank. At a minimum, no work, including any alteration for stormwater management, may be proposed in the 50-foot-wide area in the buffer zone along any wetland resource area.
Utility pole installation is the only work proposed in the BVW buffer.
 - The amount of impervious surface shall not exceed 40% of the area of the buffer zone between 50 and 100 feet from any resource area or the amount of existing impervious surface, whichever is greater.
Utility pole installation is the only work proposed in the BVW buffer.

- No work may be proposed in a buffer zone that:
 - Borders an Outstanding Resource Water,
 - Contains estimated wildlife habitat which is identified on the most recent Estimated Habitat Map of State-listed Rare Wetlands Wildlife prepared by the Natural Heritage and Endangered Species Program,
 - Contains slopes greater than 15% prior to any work

Utility pole installation is the only work proposed in the BVW buffer.

- Rooftop runoff must be disconnected in accordance with the requirements applicable to Credit 2.
Disconnected roof top runoff is proposed. The houses are proposed at least 160 feet from the BVW.

- Qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems.

Curb and gutter systems are not proposed. Runoff from the proposed driveways is proposed to flow overland. The driveways are proposed at least 150 feet from the BVW.

SECTION 6

MA DEP STORMWATER STANDARDS

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The following is a summary of the MA DEP Stormwater Standards and how this project meets those standards.

Standard 1: No New Untreated Discharges

- A. Discharges through all new outfalls are treated to meet the requirements of Standard 4.
- B. No new point discharges are proposed.

Standard 2: Peak Rate Attenuation

- A. Stormwater management systems are required to be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.
- B. The proposed work is located at the edge of an area that had been previously mined. A hydrologic analysis has been performed on the area surrounding the proposed single family development. For the purpose of this analysis, the following has been assumed:
 - The BVW has been designated as a “point of interest” (POI) and it is assumed that 100% of the runoff from the proposed work area is tributary to the BVW.
 - It is estimated that approximately 1/3 of the pre-development area is classified as “newly graded” (pervious area with no vegetation). The remaining pre-development area is assumed to be brush in good hydrologic condition.
- C. Calculations are provided in the attached appendices to demonstrate that post-development peak discharge rates tributary the BVW from this site do not exceed pre-development rates at the POI for the 2-year, 10-year and 100-year 24-hour storms. Rainfall values for each of these return periods have been obtained from the Northeast Regional Climate Center (NRCC) website. A copy of the climate data can be seen in the attached appendices.

RETURN PERIOD	RAINFALL (in.)
2-YEAR	3.18
10-YEAR	4.76
100-YEAR	8.51

Table 5: 24 Hour Rainfall Values.

- D. A summary of the hydrologic analysis can be seen in the following table.

POINT OF INTEREST	RETURN PERIOD		
BVW	2-YEAR	10-YEAR	100-YEAR
PRE DEVELOPMENT RATES (cfs):	0.01	0.30	3.49
POST DEVELOPMENT RATES (cfs):	0.01	0.30	3.49
% REDUCTION IN FLOW (POST vs. PRE)	0.00%	0.00%	0.00%

Table 6: Pre-development and Post-development runoff rates.

Standard 3: Recharge

- A. Loss of annual recharge to groundwater is required to be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.
- B. LID Credit 1 has been used to meet the recharge standard. See Section 5 of this report.

- C. In addition, the hydrologic analysis identifies that the pre-development runoff curve number (CN) is equal to that of the post-development CN. This indicates that recharge potential is expected to remain unchanged under the post-development conditions. The proposed impervious area is not expected to significantly affect recharge on the site, regardless of the use of LID Credit 1.

Standard 4: Water Quality

- A. 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:
1. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
 2. Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and
 3. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.
- B. A long term pollution prevention plan has been included on the site drawings.
- C. LID Credit 1 has been used to meet the water quality standard. See Section 5 of this report.
- D. It should be noted that a portion of the pre-existing conditions consists of existing pit/gravel that does not contain vegetation. Gravel surfaces are not considered “impervious” in the MA DEP Stormwater Handbook Vol. 3, Ch. 1, page 15, however, gravel surfaces can be source of turbidity in runoff. The proposed work results in stabilization of gravel surfaces on site.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPL)

- A. 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.
- B. Land uses with higher potential pollutant loads are defined in 310 CMR 10.04 and 314 CMR 9.02 to include the following: Land uses identified in 310 CMR 22.20B(2), 310 CMR 22.20C(2)(a)-(k) and (m), 310 CMR 22.21(2)(a)(1)-(8) and 310 CMR 22.21(2)(b)(1)-(6), areas within a site that are the location of activities that are subject to an individual National Pollutant Discharge Elimination System (NPDES) permit or the NPDES Multi-Sector General Permit; auto fueling facilities (gas stations); exterior fleet storage areas; exterior vehicle service and equipment cleaning areas; marinas and boatyards; parking lots with high-intensity-use; confined disposal facilities and disposal sites.
- C. Land uses with higher potential loads include land uses that the Department has determined are not suitable for Zone IIs and Zone As of public water supplies, including, without limitation, the following: automobile junk yards; the removal of sand and gravel within four feet of the historical high water mark; the storage of hazardous materials, liquid petroleum, liquid propane, chemical fertilizers, pesticides, manures, septage, sludge, road-deicing materials or sanding materials; snow or ice that has been removed from roads and is contaminated with de-icing chemicals; cemeteries, mausoleums; bulk oil terminals; commercial washing of vehicles and car washes. In addition, land uses with higher potential pollutant loads include: exterior fleet storage areas; exterior vehicle service maintenance and cleaning areas; marinas and boatyards; and parking lots with high-intensity-uses (1000 vehicle trips per day or more). Finally, land uses with higher potential pollutant load include confined disposal facilities as defined in 314 CMR 9.02 and disposal sites as defined in M.G.L. c. 21E and 310 CMR 40.000
- D. The proposed use is not classified as a LUHPPL.

Standard 6: Critical Areas

- A. For sites that may affect a Critical Area

1. Source control and pollution prevention measures must be identified in a long-term pollution prevention plan.
 2. BMPs must be suitable for the particular critical area.
 3. One-inch rule is used to calculate the *Required Water Quality Volume*.
 4. 44% TSS removal is not required prior to discharge.
- B. The property is located within or upstream of a Critical Area. Critical areas have been identified in Section 2 of this report.
- C. A long term pollution prevention plan has been provided on the site drawings.
- D. LID Credit 3 has been used to meet the water quality standard. See Section 5 of this report.

Standard 7: Redevelopment

- A. For purposes of the Stormwater Management Standards, redevelopment projects are defined to include the following:
1. Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;
 2. Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area; and
 3. Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers and stormwater retrofit projects.
- B. The proposed work cannot be considered a redevelopment project.

Standard 8: Construction Period Controls

- A. 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) is required to be developed and implemented.
- B. Construction period erosion controls have been provided on the site drawings.

Standard 9: Operation & Maintenance Plan

- A. A Long -Term Operation and Maintenance (O&M) Plan is required to be developed and implemented to ensure that stormwater management systems function as designed.
- B. Operation and maintenance requirements have been provided on the site drawings.

Standard 10: Illicit Discharges to the Drain System

- A. Standard 10 requires:
1. Measures to prevent illicit discharges must be included in Pollution Prevention Plan.
 2. An Illicit Discharge Compliance Statement must be submitted.
- B. Measures to prevent illicit discharges have been included in the O&M plan
- C. Quinn Engineering, Inc. is unaware of any illicit discharges within the area of the proposed work.

SECTION 7

APPENDICES

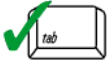
APPENDIX A
Massachusetts Stormwater Report Checklist



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

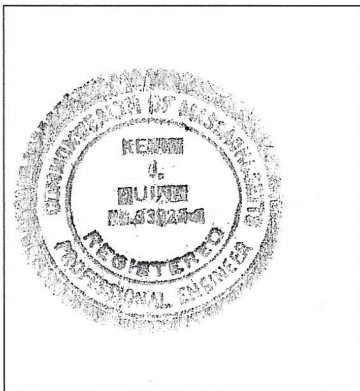
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Matthew J. Miller 7/2/2021
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☒ New development
☐ Redevelopment
☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☒ LID Site Design Credit Requested:
 - ☒ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☐ Required Recharge Volume calculation provided.
- ☒ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☐ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☒ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
 - ☐ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☒ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☒ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☒ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☒ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

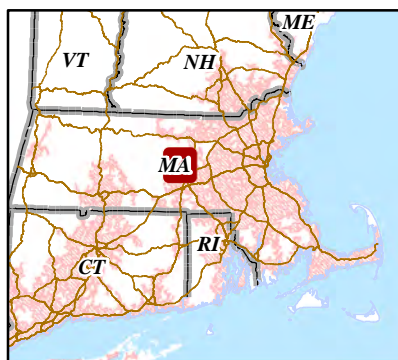
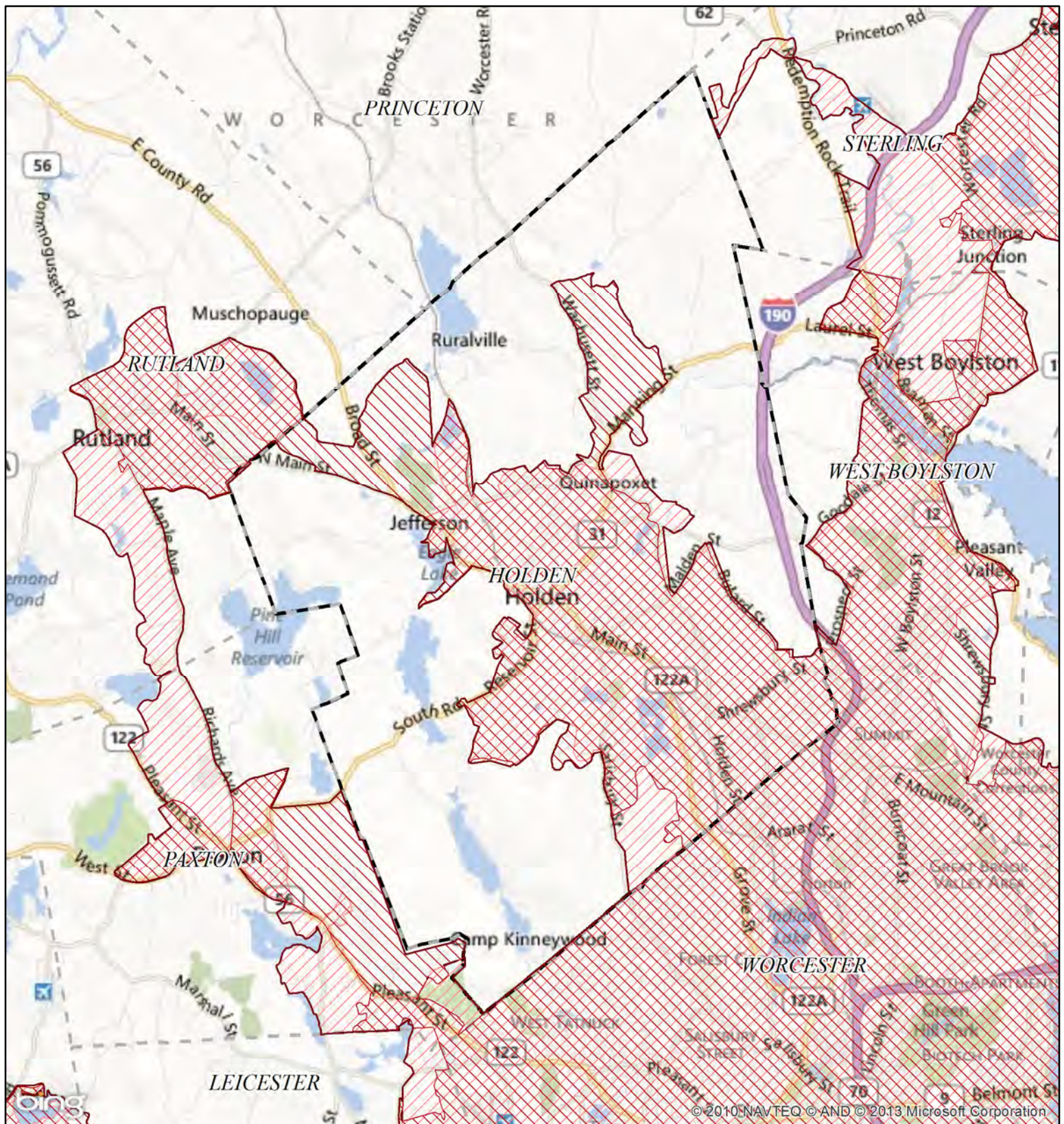
Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

APPENDIX B
US EPA MS4 Mapping



NPDES Phase II Stormwater Program Automatically Designated MS4 Areas

Holden MA

Regulated Area:

UA Based on 2000 Census	UA Based on 2010 Census
----------------------------	----------------------------



Town Population: 17346
Regulated Population: 14844
(Populations estimated from 2010 Census)



Urbanized Areas, Town Boundaries:
US Census (2000, 2010)
Base map © 2013 Microsoft Corporation
and its data suppliers

US EPA Region 1 GIS Center Map #8824, 8/9/2013

APPENDIX C
U.S.G.S. Locus Map

This topographic map displays the Paxton and Worcester North Quadrangles. The map is divided into two main sections. The upper section, labeled 'Holden Center' on the right, shows the town of Holden. Key features include the Warren Tannery Brook flowing through the center, several cemeteries (Grove, Saint, Mary's, Avenue, and Old Burying Ground), and a school. The town of Davis Hill is also marked. The lower section, labeled 'Jefferson' on the right, shows the town of Jefferson. Key features include Eagle Lake, Stump Pond, and the Christian Hill. The map includes contour lines indicating elevation, a grid system, and various roads and landmarks. A legend in the top left corner identifies symbols for water, elevation, and other features. A scale bar in the bottom left corner indicates distances in miles and kilometers.

Holden Center

APPENDIX D

Copy of MA DEP Online Map Viewer – Water Supply Protection Area Map

Map Tools

UNIONVILLE

Davis Hill

DAVIS HILL

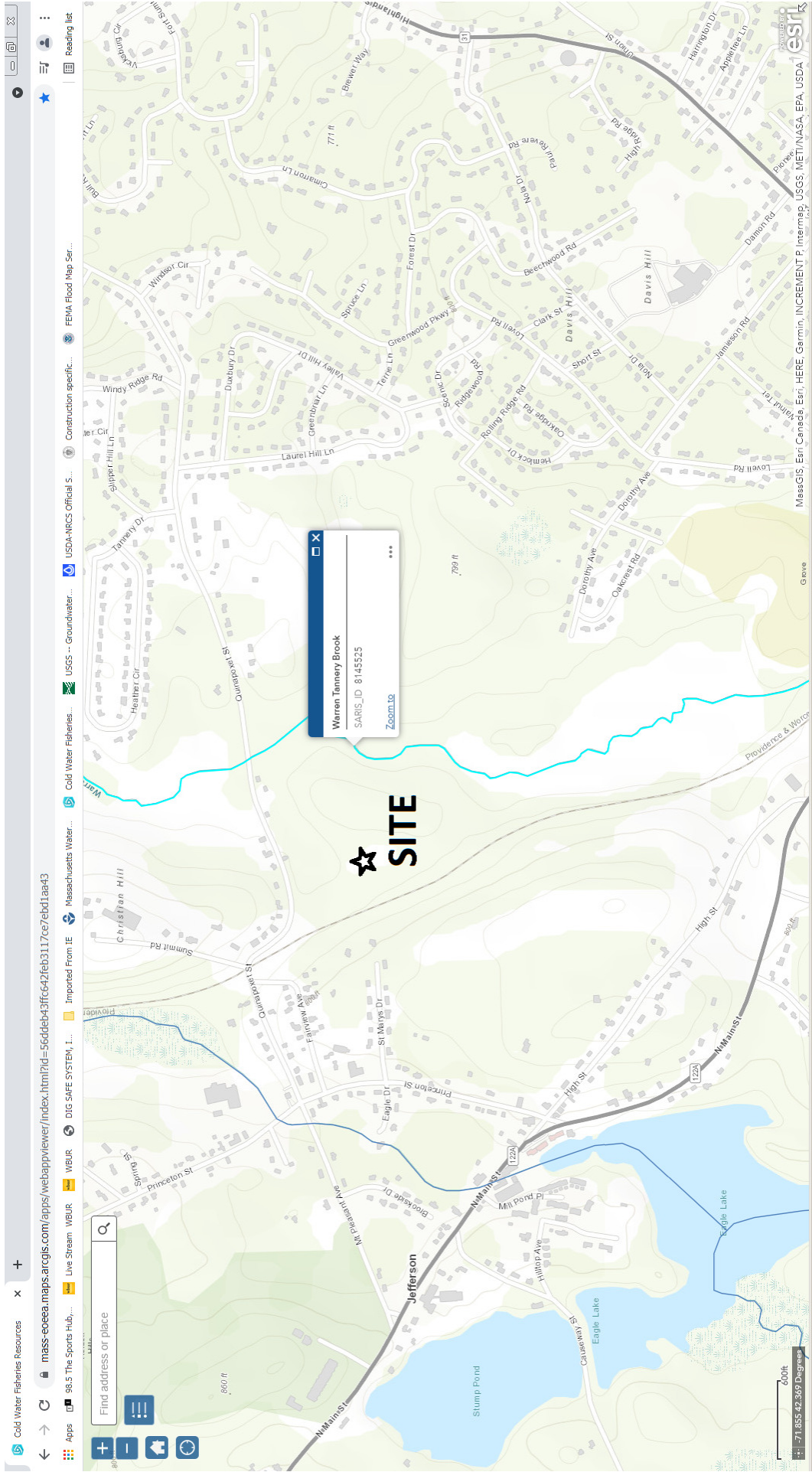
DAVIS HILL ELEMENTARY SCHOOL

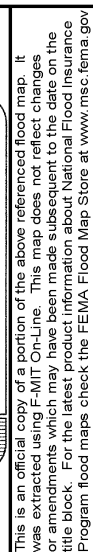
200 m 1000 ft

42°13'31.31N, 71°50'27.77W
42°38'51.71N, 71°54'03.10W

Microsoft Corporation © 2021 TomTom Ltd. All Rights Reserved.
Microsoft Map data © OpenStreetMap contributors, Imagery © Mapbox

APPENDIX E
Cold Water Fishery Mapping from Mass.gov





APPENDIX G
Rainfall from the Northeast Regional Climate Center

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.866 degrees West
Latitude	42.367 degrees North
Elevation	0 feet
Date/Time	Fri, 25 Jun 2021 14:23:26 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.42	0.52	0.68	0.85	1.07	1yr	0.73	1.04	1.25	1.59	2.03	2.62	2.84	1yr	2.32	2.73	3.15	3.84	4.47	1yr
2yr	0.35	0.53	0.66	0.87	1.10	1.38	2yr	0.95	1.27	1.60	2.01	2.53	3.18	3.44	2yr	2.82	3.31	3.80	4.52	5.16	2yr
5yr	0.40	0.63	0.79	1.06	1.35	1.72	5yr	1.17	1.58	2.01	2.53	3.18	4.00	4.38	5yr	3.54	4.21	4.82	5.65	6.36	5yr
10yr	0.45	0.71	0.90	1.22	1.59	2.04	10yr	1.37	1.86	2.38	3.02	3.79	4.76	5.25	10yr	4.21	5.05	5.76	6.69	7.46	10yr
25yr	0.53	0.84	1.07	1.47	1.96	2.54	25yr	1.69	2.31	2.98	3.79	4.78	5.99	6.68	25yr	5.30	6.42	7.31	8.38	9.22	25yr
50yr	0.59	0.94	1.21	1.70	2.30	3.01	50yr	1.98	2.73	3.55	4.53	5.71	7.14	8.02	50yr	6.32	7.71	8.75	9.94	10.82	50yr
100yr	0.67	1.08	1.40	1.98	2.70	3.57	100yr	2.33	3.21	4.21	5.39	6.80	8.51	9.63	100yr	7.53	9.26	10.48	11.79	12.70	100yr
200yr	0.75	1.23	1.60	2.29	3.17	4.23	200yr	2.74	3.79	5.01	6.42	8.11	10.14	11.58	200yr	8.98	11.14	12.55	13.99	14.91	200yr
500yr	0.90	1.49	1.94	2.81	3.93	5.28	500yr	3.39	4.72	6.28	8.07	10.22	12.81	14.80	500yr	11.33	14.23	15.94	17.54	18.44	500yr

Lower Confidence Limits

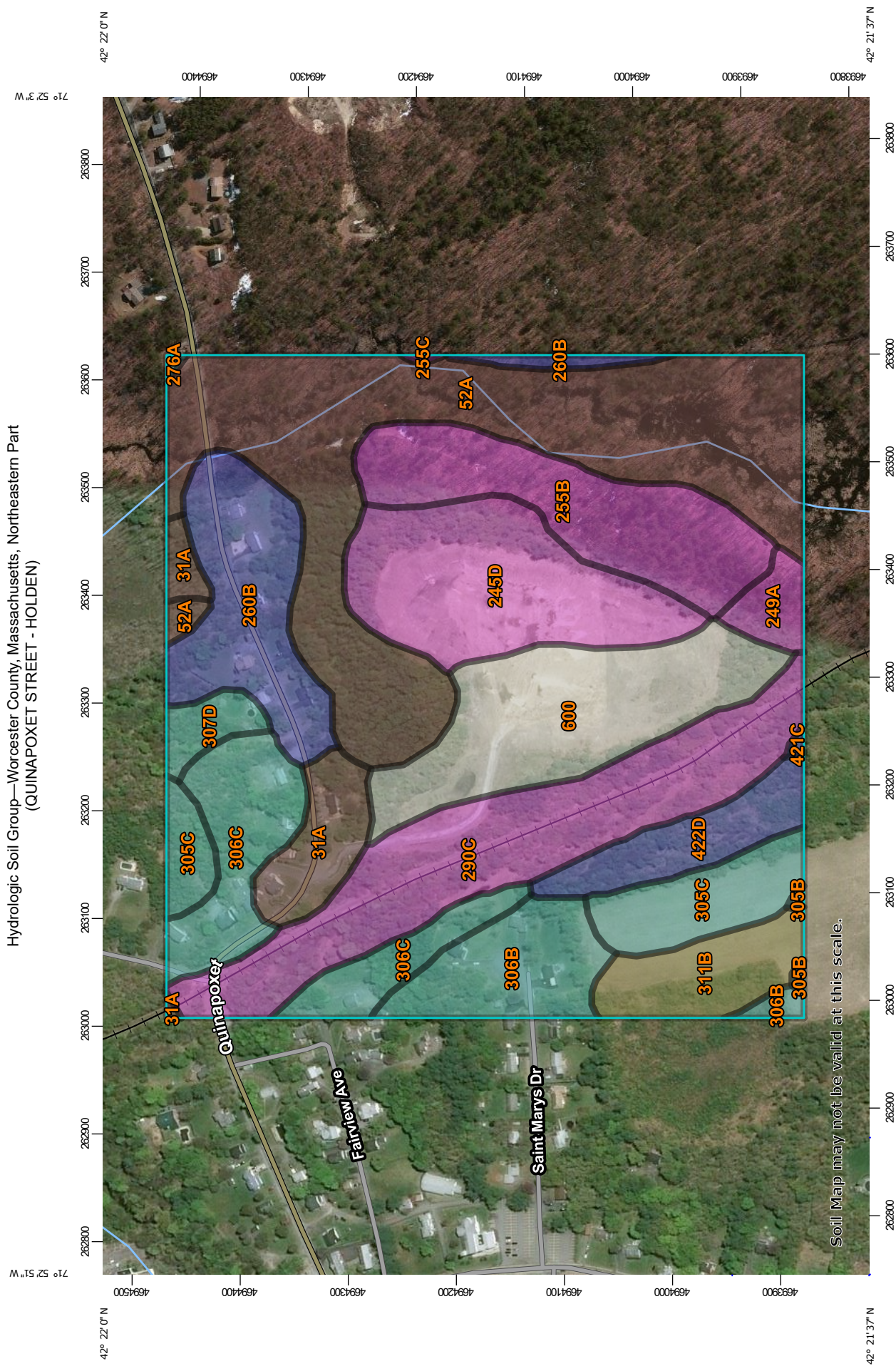
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1yr	0.19	0.30	0.37	0.49	0.61	0.86	1yr	0.52	0.84	1.01	1.43	1.82	2.16	2.29	1yr	1.91	2.20	2.81	3.28	3.83	1yr
2yr	0.33	0.52	0.63	0.86	1.06	1.25	2yr	0.91	1.22	1.42	1.84	2.35	3.08	3.34	2yr	2.73	3.22	3.68	4.39	5.02	2yr
5yr	0.38	0.58	0.72	0.99	1.25	1.47	5yr	1.08	1.44	1.71	2.22	2.83	3.66	4.02	5yr	3.24	3.86	4.42	5.28	5.95	5yr
10yr	0.42	0.64	0.79	1.11	1.43	1.66	10yr	1.23	1.63	1.86	2.52	3.23	4.12	4.61	10yr	3.65	4.44	5.08	6.05	6.74	10yr
25yr	0.47	0.72	0.89	1.28	1.68	1.96	25yr	1.45	1.91	2.16	3.00	3.85	4.81	5.53	25yr	4.26	5.32	6.09	7.24	7.95	25yr
50yr	0.52	0.79	0.98	1.41	1.89	2.21	50yr	1.63	2.16	2.43	3.42	4.39	5.38	6.33	50yr	4.76	6.08	6.97	8.31	9.03	50yr
100yr	0.56	0.85	1.07	1.54	2.11	2.50	100yr	1.82	2.45	2.72	3.40	5.04	6.03	7.23	100yr	5.34	6.95	7.97	9.54	10.26	100yr
200yr	0.62	0.93	1.17	1.70	2.37	2.83	200yr	2.05	2.77	3.06	3.78	5.79	6.75	8.26	200yr	5.98	7.94	9.12	10.92	11.67	200yr
500yr	0.70	1.04	1.34	1.95	2.77	3.34	500yr	2.39	3.27	3.58	4.36	6.99	7.76	9.81	500yr	6.87	9.44	10.87	13.10	13.83	500yr

Upper Confidence Limits

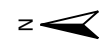
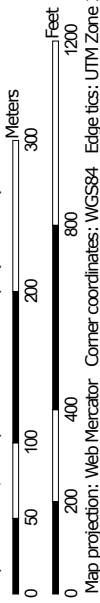
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.58	0.78	0.96	1.21	1yr	0.83	1.18	1.36	1.76	2.26	2.88	3.07	1yr	2.55	2.95	3.43	4.12	4.77	1yr
2yr	0.37	0.57	0.70	0.95	1.17	1.36	2yr	1.01	1.33	1.55	2.02	2.56	3.34	3.58	2yr	2.96	3.44	3.94	4.68	5.34	2yr
5yr	0.43	0.67	0.83	1.14	1.45	1.78	5yr	1.25	1.74	1.99	2.53	3.19	4.36	4.76	5yr	3.86	4.58	5.22	6.04	6.82	5yr
10yr	0.50	0.77	0.96	1.34	1.73	2.19	10yr	1.49	2.14	2.52	3.05	3.82	5.40	5.93	10yr	4.78	5.70	6.49	7.35	8.23	10yr
25yr	0.62	0.94	1.18	1.68	2.21	2.88	25yr	1.91	2.81	3.33	3.89	4.85	7.16	7.96	25yr	6.34	7.65	8.64	9.51	10.56	25yr
50yr	0.73	1.11	1.38	1.98	2.66	3.54	50yr	2.30	3.46	4.11	4.68	5.80	8.90	9.94	50yr	7.88	9.56	10.76	11.58	12.75	50yr
100yr	0.86	1.29	1.62	2.34	3.21	4.35	100yr	2.77	4.25	5.07	6.41	6.95	11.06	12.43	100yr	9.79	11.95	13.40	14.10	15.39	100yr
200yr	1.01	1.52	1.92	2.78	3.88	5.35	200yr	3.35	5.23	6.27	7.88	8.32	13.75	15.58	200yr	12.17	14.98	16.69	17.17	18.59	200yr
500yr	1.26	1.87	2.40	3.49	4.97	7.01	500yr	4.28	6.86	8.29	10.38	10.54	18.34	21.01	500yr	16.23	20.20	22.33	22.28	23.87	500yr

APPENDIX H
NRCS Web Soil Survey

Hydrologic Soil Group—Worcester County, Massachusetts, Northeastern Part (QUINAPOXET STREET - HOLDEN)



Map Scale: 1:5,000 if printed on A landscape (11" x 8.5") sheet.
 Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

C

C/D

D

Not rated or not available

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 15, Jun 10, 2020

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

Date(s) aerial images were photographed: Apr 8, 2011—Jul 9, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	3.1	3.5%
52A	Freetown muck, 0 to 1 percent slopes	B/D	20.5	22.7%
245D	Hinckley loamy sand, 15 to 25 percent slopes	A	8.5	9.4%
249A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	1.2	1.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.4	8.2%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	0.0	0.0%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B	6.8	7.5%
276A	Ninigret fine sandy loam, 0 to 3 percent slopes	C	0.1	0.1%
290C	Hinckley loamy sand, 8 to 15 percent slopes, very stony	A	11.4	12.6%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	0.1	0.1%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	4.3	4.7%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	C	4.3	4.8%
306C	Paxton fine sandy loam, 8 to 15 percent slopes, very stony	C	6.3	7.0%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	C	1.1	1.2%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	3.2	3.5%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	B	0.1	0.1%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	B	3.0	3.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
600	Pits, gravel		8.8	9.7%
Totals for Area of Interest			90.0	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX I
Soil Logs



Commonwealth of Massachusetts

City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Jim Harrity
Owner Name

Lot 2 Quinapoxet Street
Street Address

Holden
City/Town

Map/Lot 102/14

MA
State

01522
Zip Code

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐

2. Published Soil Survey available? Yes ☐ No ☐ If yes: Online Web Survey 600
Year Published Soil Map Unit

Pits Gravel
Soil Name

Soil limitations

3. Surficial Geological Report available? Yes ☐ No ☒ If yes: Year Published Publication Scale Map Unit

Geologic Material

Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒

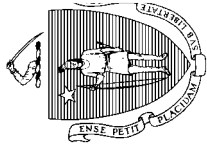
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Map Unit Name

Wetlands Conservancy Program Map

Map Unit Name



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) May/2021 Month/Year Range: Above Normal ☒ Normal ☐ Below Normal ☐
7. Other references reviewed: FIRM, DEP OLIVER, WSPA, Natural Heritage & Endangered Species Program Map

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: TP 5, 6, 7, 8

5/4/21 11:00 AM Cloudy 45°
Date Time Weather

1. Location

Ground Elevation at Surface of Hole: See attached plan

Location (Identify on Plan) See attached plan

2. Land Use: Gravel Pit
(e.g. woodland, agricultural field, vacant lot, etc.)

Few 0-10 %
Surface Stones Slope (%)

none outwash terrace
Vegetation Landform

Back Slope
Position on landscape (attach sheet)

3. Distances from: Open Water Body >100' feet Drainage Way >100' feet Possible Wet Area >100' feet
Property Line >50' feet Drinking Water Well >100' feet Other

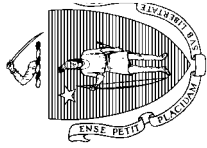
4. Parent Material: Sand Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

If Yes: Depth Weeping from Pit 72" Depth Standing Water in Hole 96"

Estimated Depth to High Groundwater: 72"



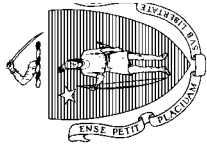
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-5 Date 5-4-21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-120"	C1	2.5Y7/4	72"			Sand			L	GR	

Additional Notes:



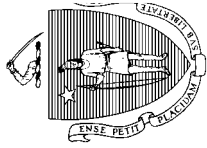
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-6 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-120"	C1	2.5Y7/4	72"			Sand			L	GR	

Additional Notes:



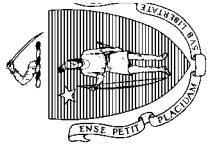
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-7 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-120"	C1	2.5Y7/4	72"			Sand			L	GR	

Additional Notes:



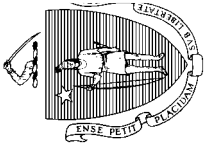
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-8 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-120"	C1	2.5Y7/4	72"			Sand			L	GR	

Additional Notes:



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- | | | |
|--|-------------------------|-----------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 72" all _____ inches | B. _____ inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |
2. Index Well Number _____ Reading Date _____ Index Well Level _____
- Adjustment Factor _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 1 _____ inches Lower boundary: 120 _____ inches

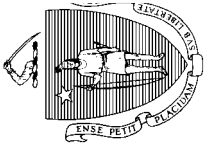
F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator _____ Date May 5-2021
Scott D Dupre: SE 2947 June 2005
Typed or Printed Name of Soil Evaluator *Date of Soil Evaluator Exam

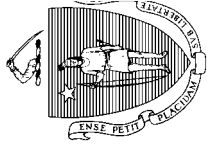
Julie VanArsdalen Holden
Name of Board of Health Witness Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal



Commonwealth of Massachusetts

City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Jim Harrity
Owner Name

Lot 1 Quinapoxet Street
Street Address

Holden
City/Town

Map/Lot 102/14

MA
State

01522
Zip Code

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐

2. Published Soil Survey available? Yes ☐ No ☐ If yes: Online Web Survey 600
Year Published Soil Map Unit

Pits Gravel
Soil Name

Soil limitations

3. Surficial Geological Report available? Yes ☐ No ☒ If yes: Year Published Publication Scale Map Unit

Geologic Material

Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒

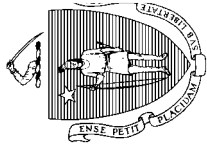
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Map Unit Name

Wetlands Conservancy Program Map

Map Unit Name



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) May/2021 Month/Year Range: Above Normal ☒ Normal ☐ Below Normal ☐
7. Other references reviewed: FIRM, DEP OLIVER, WSPA, Natural Heritage & Endangered Species Program Map

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: TP 1, 2, 3, 4 5/4/21 9:00 AM Cloudy 45°
Date Time Weather

1. Location

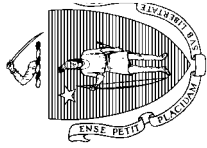
Ground Elevation at Surface of Hole: See attached plan

Location (Identify on Plan) See attached plan

2. Land Use: Gravel Pit Few 0-10 %
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)
- none outwash terrace Back Slope
Vegetation Landform Position on landscape (attach sheet)
3. Distances from: Open Water Body >100' Drainage Way >100' Possible Wet Area >100'
feet feet feet
Property Line >50' Drinking Water Well >100' Other
feet feet feet

4. Parent Material: Sand Unsuitable Materials Present: Yes ☐ No ☒
- If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐
- If Yes: Depth Weeping from Pit 72" Depth Standing Water in Hole 96"
- Estimated Depth to High Groundwater: 72"



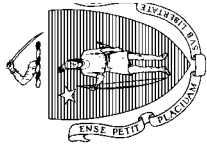
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-1 Date 5-4-21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-72"	C1	2.5Y7/4				Sand			L	GR	
72-120	C2	2.5Y5/4	72"			S & GR	25%	25%	L	GR	

Additional Notes:



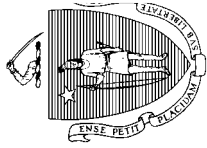
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-2 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-72"	C1	2.5Y7/4				Sand			L	GR	
72-120	C2	2.5Y5/4	72"			S & GR	25%	25%	L	GR	

Additional Notes:



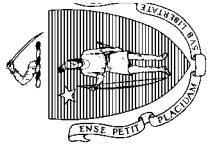
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-3 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-72"	C1	2.5Y7/4				Sand			L	GR	
72-120	C2	2.5Y5/4	72"			S & GR	25%	25%	L	GR	

Additional Notes:



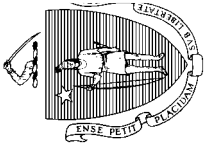
Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: TP-4 Date 5/4/21

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-72"	C1	2.5Y7/4				Sand			L	GR	
72-120	C2	2.5Y5/4	72"			S & GR	25%	25%	L	GR	

Additional Notes:



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- | | | |
|--|-------------------------|-----------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 72" all _____ inches | B. _____ inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |
2. Index Well Number _____ Reading Date _____ Index Well Level _____
- Adjustment Factor _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 1 _____ inches Lower boundary: 120 _____ inches

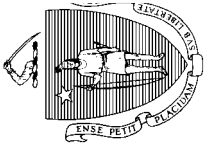
F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator _____ Date May 5-2021
Scott D Dupre: SE 2947 June 2005
Typed or Printed Name of Soil Evaluator *Date of Soil Evaluator Exam

Julie VanArsdalen Holden
Name of Board of Health Witness Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of HOLDEN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

APPENDIX J
Catchment Plan

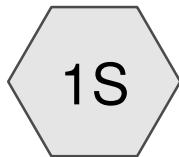


DATE: 7/7/21	QUINAPOXET STREET	QUINN ENGINEERING, INC. P.O. Box 107 Paxton, Massachusetts 01612 (508)753-7999 Fax:(508)795-0939
SCALE: 1"=100'		
PREPARED FOR: JEFFERSON MEADOWS, LLC C/O DENIS D'AMORE 23196 MARSH LANDING BLVD ESTERO, FL 33928	STORMWATER EVALUATION AREA	

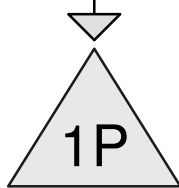
APPENDIX K

Pre-Development & Post-Development Hydrologic Analysis

- Type III, 2-Year 24 Hour Storm
- Type III, 10-Year 24 Hour Storm
- Type III, 100-Year 24 Hour Storm



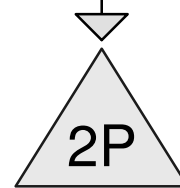
PRE-DEVELOPMENT
TRIB. TO BVW



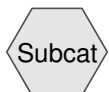
EXISTING BVW



POST-DEVELOPMENT
TRIB. TO BVW



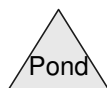
EXISTING BVW



Subcat



Reach



Pond



Link

Routing Diagram for HYDROCAD - 2021

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HYDROCAD - 2021

Prepared by Quinn Engineering, Inc.

HydroCAD® 10.00-19 s/n 01310 © 2016 HydroCAD Software Solutions LLC

Type III 24-hr 2-YEAR Rainfall=3.18"

Printed 7/2/2021

Page 2

Summary for Subcatchment 1S: PRE-DEVELOPMENT TRIB. TO BVW

Runoff = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-YEAR Rainfall=3.18"

	Area (sf)	CN	Description
*	23,822	77	NEWLY GRADED HSG A
*	47,644	30	BRUSH GOOD COND. HSG A
	71,466	46	Weighted Average
	71,466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Subcatchment 2S: POST-DEVELOPMENT TRIB. TO BVW

Runoff = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-YEAR Rainfall=3.18"

	Area (sf)	CN	Description
*	3,403	98	PROP. DRIVEWAY
*	3,600	98	PROP. HOUSE
*	1,468	77	PROP. GRAVEL TURNAROUND
*	62,995	39	GRASS HSGA
	71,466	46	Weighted Average
	64,463		90.20% Pervious Area
	7,003		9.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Pond 1P: EXISTING BVW

Inflow Area = 1.641 ac, 0.00% Impervious, Inflow Depth = 0.06" for 2-YEAR event

Inflow = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af

Primary = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs

Summary for Pond 2P: EXISTING BVW

Inflow Area = 1.641 ac, 9.80% Impervious, Inflow Depth = 0.06" for 2-YEAR event
Inflow = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af
Primary = 0.01 cfs @ 15.09 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs

HYDROCAD - 2021

Prepared by Quinn Engineering, Inc.

HydroCAD® 10.00-19 s/n 01310 © 2016 HydroCAD Software Solutions LLC

Type III 24-hr 10-YEAR Rainfall=4.76"

Printed 7/2/2021

Page 4

Summary for Subcatchment 1S: PRE-DEVELOPMENT TRIB. TO BVW

Runoff = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-YEAR Rainfall=4.76"

	Area (sf)	CN	Description
*	23,822	77	NEWLY GRADED HSG A
*	47,644	30	BRUSH GOOD COND. HSG A
	71,466	46	Weighted Average
	71,466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Subcatchment 2S: POST-DEVELOPMENT TRIB. TO BVW

Runoff = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-YEAR Rainfall=4.76"

	Area (sf)	CN	Description
*	3,403	98	PROP. DRIVEWAY
*	3,600	98	PROP. HOUSE
*	1,468	77	PROP. GRAVEL TURNAROUND
*	62,995	39	GRASS HSGA
	71,466	46	Weighted Average
	64,463		90.20% Pervious Area
	7,003		9.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Pond 1P: EXISTING BVW

Inflow Area = 1.641 ac, 0.00% Impervious, Inflow Depth = 0.41" for 10-YEAR event
 Inflow = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af
 Primary = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs

Summary for Pond 2P: EXISTING BVW

Inflow Area = 1.641 ac, 9.80% Impervious, Inflow Depth = 0.41" for 10-YEAR event
Inflow = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af
Primary = 0.30 cfs @ 12.29 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 1S: PRE-DEVELOPMENT TRIB. TO BVW

Runoff = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-YEAR Rainfall=8.51"

	Area (sf)	CN	Description
*	23,822	77	NEWLY GRADED HSG A
*	47,644	30	BRUSH GOOD COND. HSG A
	71,466	46	Weighted Average
	71,466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Subcatchment 2S: POST-DEVELOPMENT TRIB. TO BVW

Runoff = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-YEAR Rainfall=8.51"

	Area (sf)	CN	Description
*	3,403	98	PROP. DRIVEWAY
*	3,600	98	PROP. HOUSE
*	1,468	77	PROP. GRAVEL TURNAROUND
*	62,995	39	GRASS HSGA
	71,466	46	Weighted Average
	64,463		90.20% Pervious Area
	7,003		9.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, 1A - ASSUME MIN. FOR TR-55

Summary for Pond 1P: EXISTING BVW

Inflow Area = 1.641 ac, 0.00% Impervious, Inflow Depth = 2.12" for 100-YEAR event

Inflow = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af

Primary = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs

Summary for Pond 2P: EXISTING BVW

Inflow Area = 1.641 ac, 9.80% Impervious, Inflow Depth = 2.12" for 100-YEAR event
Inflow = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af
Primary = 3.49 cfs @ 12.11 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.10 hrs