



ENGINEERING,
INC.

ENGINEERS
SURVEYORS

STORMWATER REPORT

For

“Acushnet Company Corporate Headquarters Improvements”

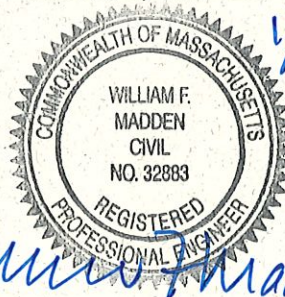
333 Bridge Street
Fairhaven, MA

Prepared for

Acushnet Company
P.O. Box 965
Fairhaven, MA 02719

Prepared by

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January 14, 2020
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DRAINAGE NARRATIVE

General Description

This project consists of enhancements to the corporate headquarters of the Acushnet Company located at 333 Bridge Street in Fairhaven, Mass. Improvements consist of a 900 square foot new entrance on the west side of the office building. An addition consisting of 7,500 square feet of employee amenity space is proposed to be located on the east (rear) side. Portions of the sidewalks, access drives, and landscaping will be altered such that the total amount of impervious surfaces will be reduced by 6,050 square feet.

Existing Conditions

The building proposed for enhancement is located on the northern portion of the property. The current finished floor area is 203,100 square feet. The property has a total land area of 49.25 acres. There is a separate warehouse and distribution facility approximately 500 feet south of the office building. The existing drainage system consists of catch basins with two foot deep sumps and outlet pipes which do not have hoods. Roof runoff is piped to the closed drainage system. There are three existing outfall pipes in the vicinity of the limits of work which discharge to headwalls at the Nasketucket River. There is also one paved waterway adjacent to the southwest corner of the building. The watershed created for the purposes of comparative analysis was limited to an 11.4 acre area bordered by Bridge Street to the north, the employee access drive to the east, the limits of work in the south parking lot, and the wetlands adjacent to the Nasketucket River.

Soils on the property consist of Paxton fine sandy loam (305B), 3 to 8 percent slopes, and Ridgebury fine sandy loam (70A), 0 to 3 percent slopes. The Paxton soil has a Hydrologic Soil Group rating of "C" and the Ridgebury soil is "D". These are relatively impervious soils which restrict the ability to infiltrate runoff at the site.

Storm event runoff volumes were input as listed for this area of Fairhaven by NOAA Atlas 14 Volume 10 Version 3.

Proposed Conditions

The proposed building additions and modifications to the site are all within the developed portion of the lot therefore this project can be categorized as 100% Redevelopment in accordance with Volume 2 Chapter 3 of the Stormwater Handbook. The site design results in a decrease in impervious surfaces of 6,050 square feet and matching increase in landscaped and lawn area. Improvements to the drainage system consist of the installation of "Eliminator" catch basin outlet hoods and a Rain Gardian Turret unit at the paved waterway. The reduction of impervious surfaces results in a decrease in the runoff

curve number for the watershed. The summary table for comparison of pre-development and post-development runoff rates and volumes indicates the decrease in peak rates and volumes for each storm event.

In summary, it is our opinion that this project as designed complies with the requirements of the Massachusetts DEP Stormwater Management Standards for a Redevelopment project.

Drainage Summary

Table 1 – Pre-Development vs. Post-Development to Nasketucket River

Storm Event	Pre		Post		Pre vs. Post changes	
	Peak Discharge (cfs)	Volume (ac-ft.)	Peak Discharge (cfs)	Volume (ac-ft.)	Peak Discharge (cfs)	Volume (ac-ft.)
2 yr	49.91	2.61	48.72	2.52	-1.19	-0.09
10 yr	76.60	4.13	75.56	4.02	-1.04	-0.11
25 yr	92.91	5.07	91.96	4.96	-0.95	-0.11
100 yr	118.53	6.56	117.71	6.45	-0.82	-0.11



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.

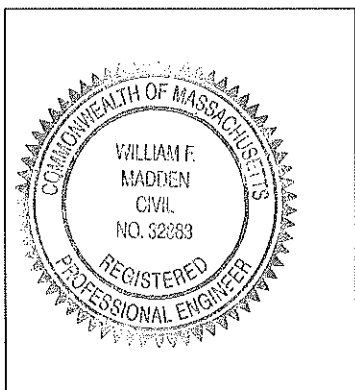
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



William F. Madden 1/14/20
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 proprietary 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.

COMPLIANCE WITH THE STORMWATER MANAGEMENT STANDARDS

The Stormwater Management Standards

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.
 - *This project does not include any new outfalls.*
2. Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
 - *Post-development peak discharge rates are reduced due to the decrease in impervious surfaces.*
3. Loss of annual recharge to groundwater shall 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. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.
 - *The portion of the property within the limits of work contains soils which are classified as Hydrologic Soil Group "C" and "D" which is not conducive to infiltration. The reduction in impervious surfaces results in a lesser storm volume which is similar to providing a separate infiltration component.*
4. 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 a long-term pollution prevention plan, and thereafter are 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.

- *Full compliance with this standard is not required for Redevelopment projects. TSS removal will be improved due to the reduction in impervious surfaces, the installation of catch basin outlet hoods, and the installation of a Rain Guardian Turret unit at the existing paved waterway.*

5. 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, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

- *This site is considered a land use with higher potential pollutant load due to daily vehicle trips in excess of 1,000 per day. The project will result in an improvement over existing conditions for the same reasons listed above under Standard 4.*

6. 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 the 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. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

- *This project is not located within a Zone II of a public water supply. The reduced runoff is discharged to the Nasketucket River which is not classified as an Outstanding or Special Resource Water.*

7. 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.

- *This project is considered 100% Redevelopment.*

8. 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.

- *Construction period erosion and sedimentation control measures are included on the design plan.*

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

- *A long-term operation and maintenance plan has been listed on the design plans.*

10. All illicit discharges to the stormwater management system are prohibited.

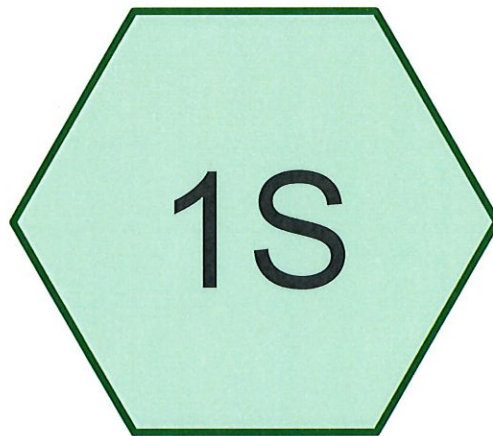
- *An illicit discharge statement is included in this report.*

Date: 1/13/20

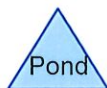
To whom it may concern:

I hereby certify that no illicit discharge connections presently exist nor will any be permitted in the future within the stormwater management systems at the facility located at 333 Bridge Street, Fairhaven, Mass.


Acushnet Company



Existing



Routing Diagram for 9364 Pre

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.642	74	>75% Grass cover, Good, HSG C (1S)
1.863	80	>75% Grass cover, Good, HSG D (1S)
8.935	98	Building, Walks, Pavement (1S)
11.439	94	TOTAL AREA

9364 Pre

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.642	HSG C	1S
1.863	HSG D	1S
8.935	Other	1S
11.439		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.642	1.863	0.000	2.505	>75% Grass cover, Good	1S
0.000	0.000	0.000	0.000	8.935	8.935	Building, Walks, Pavement	1S
0.000	0.000	0.642	1.863	8.935	11.439	TOTAL AREA	

9364 Pre

Type II 24-hr 2 Year Storm Rainfall=3.40"

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=498,300 sf 78.11% Impervious Runoff Depth=2.74"

Tc=6.0 min CN=94 Runoff=49.91 cfs 2.610 af

Total Runoff Area = 11.439 ac Runoff Volume = 2.610 af Average Runoff Depth = 2.74"

21.89% Pervious = 2.505 ac 78.11% Impervious = 8.935 ac

Summary for Subcatchment 1S: Existing

Runoff = 49.91 cfs @ 11.96 hrs, Volume= 2.610 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 Year Storm Rainfall=3.40"

	Area (sf)	CN	Description
*	389,200	98	Building, Walks, Pavement
	81,150	80	>75% Grass cover, Good, HSG D
	27,950	74	>75% Grass cover, Good, HSG C
	498,300	94	Weighted Average
	109,100		21.89% Pervious Area
	389,200		78.11% Impervious Area

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

9364 Pre*Type II 24-hr 10 Year Storm Rainfall=5.02"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=498,300 sf 78.11% Impervious Runoff Depth=4.33"
Tc=6.0 min CN=94 Runoff=76.60 cfs 4.126 af

Total Runoff Area = 11.439 ac Runoff Volume = 4.126 af Average Runoff Depth = 4.33"
21.89% Pervious = 2.505 ac 78.11% Impervious = 8.935 ac

Summary for Subcatchment 1S: Existing

Runoff = 76.60 cfs @ 11.96 hrs, Volume= 4.126 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=5.02"

	Area (sf)	CN	Description
*	389,200	98	Building, Walks, Pavement
	81,150	80	>75% Grass cover, Good, HSG D
	27,950	74	>75% Grass cover, Good, HSG C
	498,300	94	Weighted Average
	109,100		21.89% Pervious Area
	389,200		78.11% Impervious Area

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

9364 Pre*Type II 24-hr 25 Year Storm Rainfall=6.02"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=498,300 sf 78.11% Impervious Runoff Depth=5.32"

Tc=6.0 min CN=94 Runoff=92.91 cfs 5.068 af

Total Runoff Area = 11.439 ac Runoff Volume = 5.068 af Average Runoff Depth = 5.32"**21.89% Pervious = 2.505 ac 78.11% Impervious = 8.935 ac**

Summary for Subcatchment 1S: Existing

Runoff = 92.91 cfs @ 11.96 hrs, Volume= 5.068 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Storm Rainfall=6.02"

	Area (sf)	CN	Description
*	389,200	98	Building, Walks, Pavement
	81,150	80	>75% Grass cover, Good, HSG D
	27,950	74	>75% Grass cover, Good, HSG C
	498,300	94	Weighted Average
	109,100		21.89% Pervious Area
	389,200		78.11% Impervious Area

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

9364 Pre*Type II 24-hr 100 Year Event Rainfall=7.60"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=498,300 sf 78.11% Impervious Runoff Depth=6.88"

Tc=6.0 min CN=94 Runoff=118.53 cfs 6.563 af

Total Runoff Area = 11.439 ac Runoff Volume = 6.563 af Average Runoff Depth = 6.88"
21.89% Pervious = 2.505 ac 78.11% Impervious = 8.935 ac

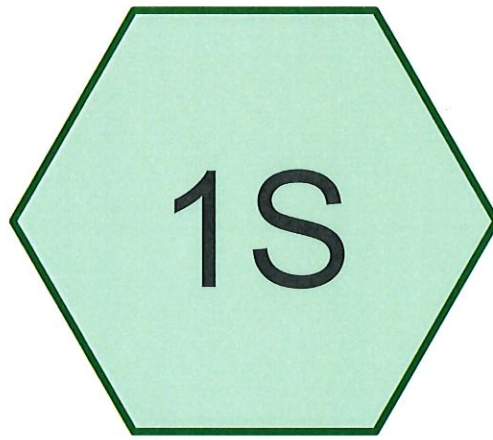
Summary for Subcatchment 1S: Existing

Runoff = 118.53 cfs @ 11.96 hrs, Volume= 6.563 af, Depth= 6.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 Year Event Rainfall=7.60"

	Area (sf)	CN	Description
*	389,200	98	Building, Walks, Pavement
	81,150	80	>75% Grass cover, Good, HSG D
	27,950	74	>75% Grass cover, Good, HSG C
	498,300	94	Weighted Average
	109,100		21.89% Pervious Area
	389,200		78.11% Impervious Area

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



Proposed



Routing Diagram for 9364 Post

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Project Notes

Rainfall events imported from "9364 Pre.hcp"

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.763	74	>75% Grass cover, Good, HSG C (1S)
1.881	80	>75% Grass cover, Good, HSG D (1S)
8.796	98	Building, Walks, Pavement (1S)
11.439	93	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.763	HSG C	1S
1.881	HSG D	1S
8.796	Other	1S
11.439		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.763	1.881	0.000	2.643	>75% Grass cover, Good	1S
0.000	0.000	0.000	0.000	8.796	8.796	Building, Walks, Pavement	1S
0.000	0.000	0.763	1.881	8.796	11.439	TOTAL AREA	

9364 Post*Type II 24-hr 2 Year Storm Rainfall=3.40"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed

Runoff Area=498,300 sf 76.89% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=93 Runoff=48.72 cfs 2.515 af

Total Runoff Area = 11.439 ac Runoff Volume = 2.515 af Average Runoff Depth = 2.64"
23.11% Pervious = 2.643 ac 76.89% Impervious = 8.796 ac

9364 Post

Type II 24-hr 2 Year Storm Rainfall=3.40"

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Summary for Subcatchment 1S: Proposed

Runoff = 48.72 cfs @ 11.96 hrs, Volume= 2.515 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 Year Storm Rainfall=3.40"

	Area (sf)	CN	Description
*	383,150	98	Building, Walks, Pavement
	81,934	80	>75% Grass cover, Good, HSG D
	33,216	74	>75% Grass cover, Good, HSG C
	498,300	93	Weighted Average
	115,150		23.11% Pervious Area
	383,150		76.89% Impervious Area

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

9364 Post*Type II 24-hr 10 Year Storm Rainfall=5.02"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed

Runoff Area=498,300 sf 76.89% Impervious Runoff Depth=4.22"

Tc=6.0 min CN=93 Runoff=75.56 cfs 4.021 af

Total Runoff Area = 11.439 ac Runoff Volume = 4.021 af Average Runoff Depth = 4.22"**23.11% Pervious = 2.643 ac 76.89% Impervious = 8.796 ac**

9364 Post

Type II 24-hr 10 Year Storm Rainfall=5.02"

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Summary for Subcatchment 1S: Proposed

Runoff = 75.56 cfs @ 11.96 hrs, Volume= 4.021 af, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Storm Rainfall=5.02"

	Area (sf)	CN	Description
*	383,150	98	Building, Walks, Pavement
	81,934	80	>75% Grass cover, Good, HSG D
	33,216	74	>75% Grass cover, Good, HSG C
	498,300	93	Weighted Average
	115,150		23.11% Pervious Area
	383,150		76.89% Impervious Area

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

9364 Post*Type II 24-hr 25 Year Storm Rainfall=6.02"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed

Runoff Area=498,300 sf 76.89% Impervious Runoff Depth=5.20"
Tc=6.0 min CN=93 Runoff=91.96 cfs 4.959 af

Total Runoff Area = 11.439 ac Runoff Volume = 4.959 af Average Runoff Depth = 5.20"
23.11% Pervious = 2.643 ac 76.89% Impervious = 8.796 ac

9364 Post

Type II 24-hr 25 Year Storm Rainfall=6.02"

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Summary for Subcatchment 1S: Proposed

Runoff = 91.96 cfs @ 11.96 hrs, Volume= 4.959 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

Type II 24-hr 25 Year Storm Rainfall=6.02"

	Area (sf)	CN	Description
*	383,150	98	Building, Walks, Pavement
	81,934	80	>75% Grass cover, Good, HSG D
	33,216	74	>75% Grass cover, Good, HSG C
	498,300	93	Weighted Average
	115,150		23.11% Pervious Area
	383,150		76.89% Impervious Area

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

9364 Post*Type II 24-hr 100 Year Event Rainfall=7.60"*

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Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed

Runoff Area=498,300 sf 76.89% Impervious Runoff Depth=6.77"
Tc=6.0 min CN=93 Runoff=117.71 cfs 6.450 af

Total Runoff Area = 11.439 ac Runoff Volume = 6.450 af Average Runoff Depth = 6.77"
23.11% Pervious = 2.643 ac 76.89% Impervious = 8.796 ac

9364 Post

Type II 24-hr 100 Year Event Rainfall=7.60"

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Summary for Subcatchment 1S: Proposed

Runoff = 117.71 cfs @ 11.96 hrs, Volume= 6.450 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 Year Event Rainfall=7.60"

	Area (sf)	CN	Description
*	383,150	98	Building, Walks, Pavement
	81,934	80	>75% Grass cover, Good, HSG D
	33,216	74	>75% Grass cover, Good, HSG C
	498,300	93	Weighted Average
	115,150		23.11% Pervious Area
	383,150		76.89% Impervious Area

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

70° 52' 7" W

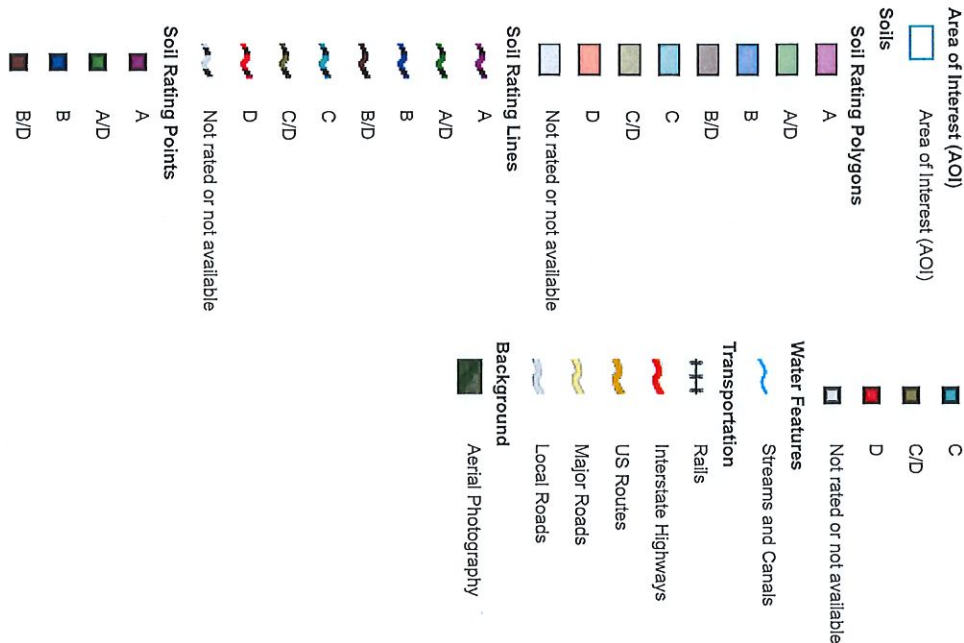


Soil Map may not be valid at this scale.

Map Scale: 1:7,020 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



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: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 13, Sep 12, 2019

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—Jul 3, 2017

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
1	Water		8.7	3.4%
32A	Wareham loamy sand, 0 to 3 percent slopes	A/D	11.8	4.6%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	47.8	18.7%
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D	1.4	0.5%
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.2	0.1%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	15.2	5.9%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	17.2	6.7%
242B	Hinckley loamy sand, 3 to 8 percent slopes	A	5.3	2.1%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	10.1	3.9%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	62.6	24.5%
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D	12.4	4.9%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	1.7	0.7%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	11.0	4.3%
446B	Gloucester-Hinckley complex, 3 to 8 percent slopes, very stony	A	6.3	2.5%
449B	Gloucester-Hinckley complex, 3 to 8 percent slopes	A	20.0	7.8%
602	Urban land		5.0	2.0%



Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
617	Pis - Udothents complex, gravelly		9.9	3.9%
651	Udothents, smoothed	A	8.7	3.4%
Totals for Area of Interest			255.2	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.

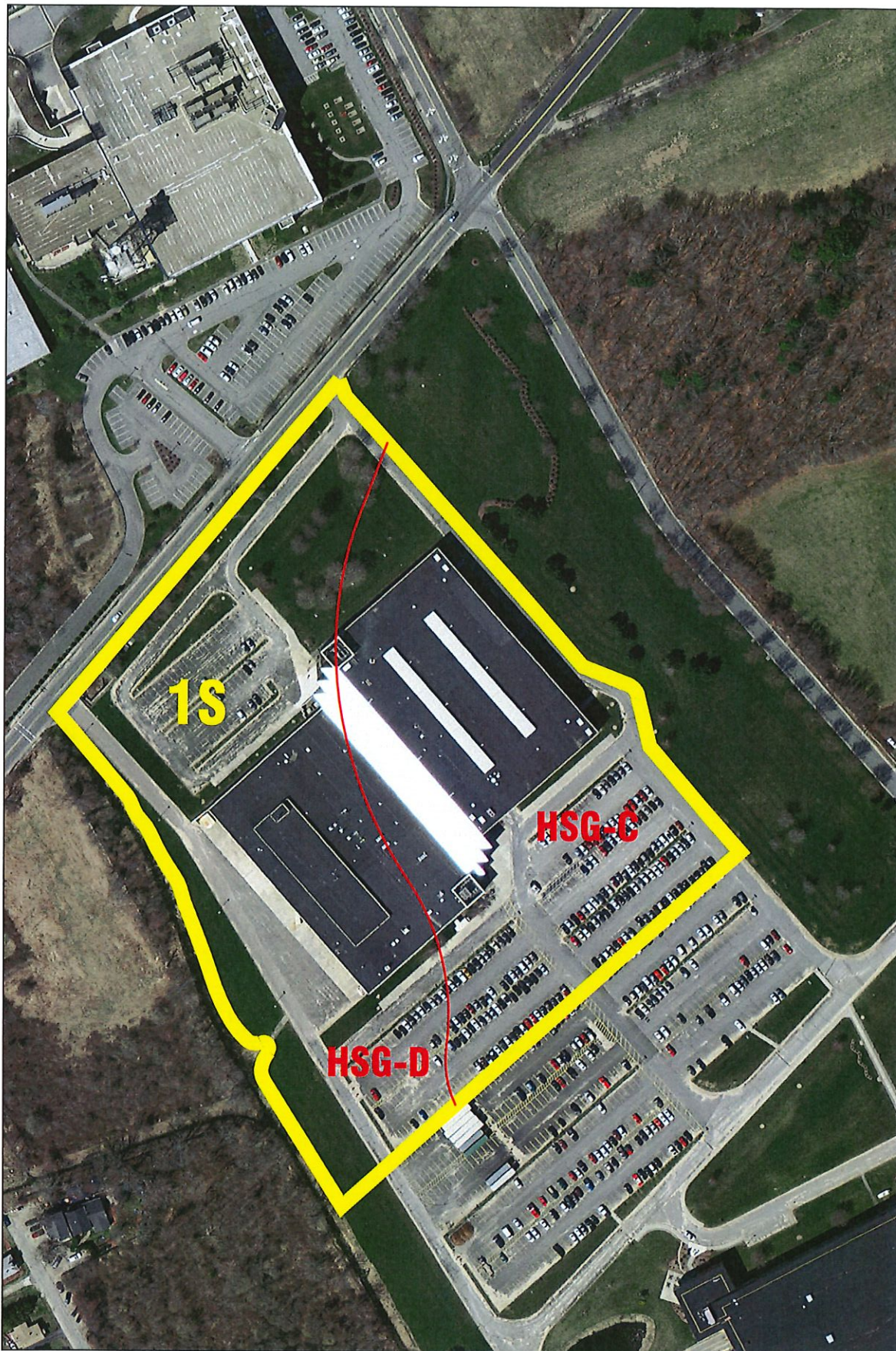
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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



SCALE: 1" = 200' PRE & POST WATER SHED MAP
ACUSHNET COMPANY

SOURCE: MASS GIS
FAIRHAVEN, MA



ENGINEERING, INC.