

STORMWATER MANAGEMENT REPORT

for

Proposed funicular system
& associated site improvements

1 High Pole Hill Road
Provincetown, Massachusetts

December 3, 2018

Prepared for:

Cape Cod Pilgrim Memorial Association
PO Box 1125
Provincetown, MA 02657

Prepared by:



COASTAL ENGINEERING CO., INC.
260 Cranberry Highway
Orleans, MA 02653

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Stormwater Management Standards

Project Narrative

The project site consists of one parcel that is owned by the Cape Cod Pilgrim Memorial Association. The upper site consists of the Pilgrim Monument and Provincetown Museum with associated parking and gathering areas. The lower portion of the lot that fronts on Bradford street is the locus for the subject project. It is currently an undeveloped area of the lot which consists of various groundcover and vegetation, including a few fences and signage. The majority of this area is located within Land Subject to Coastal Storm Flowage as it is located below the Base Flood Elevation of 9.0 NAVD 88.

The project consists of constructing a funicular (inclined elevator) that will bring passengers up the side of the hill to the upper portion of the lot where the Pilgrim Memorial and Provincetown Museum are located. A granite column supported pavilion is proposed as the launching pad or “station” where the entering and exiting will occur for the funicular uses. The site will be raised slightly to accommodate the pavilion landing area to be above the BFE at elevation 10.25. The remainder of the site leading to Bradford street will include paved walkway surfaces that will comply with ADA handicap accessibility. Native vegetation and ornamental shrubs will be implemented throughout the site.

This project is classified as a Redevelopment Project under the Massachusetts Stormwater Management Guidelines because the site has already been developed with structures and other less pervious improvements. The guidelines require that site improvements be made to contain stormwater runoff on the site for percolation into the ground if a new project, or reduce the stormwater runoff to the maximum extent practicable if the project is determined to be a Redevelopment Project.

Therefore the project has implemented drainage measures to reduce the stormwater runoff to adjacent sites to the maximum extent practicable by means of a shallow underground infiltration system comprised of cultec chambers and stone. There will be approximately a 2' separation distance between the bottom of the system to the groundwater elevation of 3.0 NAVD 88. A perimeter drip trench will be installed around the proposed pavilion and piped via 4" PVC piping to the cultec chambers. There are also (2) two sets of French drains that will collect stormwater from the walkways that will also be piped to the manifold of the cultec chamber system. Calculations for this system, including pre and post flows are attached to this stormwater management report. The soils of the site have been studied and have been determined to be coarse medium sand yielding a high infiltration rate.

The accompanying plan and design specifications show the Best Management Practices (BMP) proposed for the project.

Below are the descriptions of the extent to which the DEP Stormwater Management Standards have been met.

Standard 1: No New Untreated Discharges

This is a redevelopment project and there are no new untreated discharges proposed for this project.

Standard 2: Peak Rate Control and Flood Prevention

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.

Standard 3: Recharge to Groundwater

*The soils analysis indicates a soil type **612D (Hooksan Sand)** which is used in the recharge calculations provided. The sizing of storm water infiltration components is based on the 25-year storm event and the SCS TR-20 method and run-off from the site is directed to infiltration components to the maximum extent*

practicable and complies with BMPs. Recharge BMPs have been designed to infiltrate the required recharge volume (see Appendix E Drainage Calculations Report) to the maximum extent practicable.

Standard 4: Water Quality

There are good housekeeping practices proposed such as routine inspection and maintenance of the stormwater management system. Spill prevention and response is through the Fire and Police Departments of the Town of Provincetown. The maintenance of the proposed stormwater management system will be performed by an entity/designee appointed by the Cape Cod Pilgrim Memorial Association. Lastly, there is an inspection and maintenance schedule proposed in the accompanying O & M Manual.

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

There are no proposed high potential pollutant loads.

Standard 6: Critical Areas

The proposed stormwater management system has been designed to the maximum extent practicable.

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

We have met the associated standards 2 and 3 (see the attached plan and Appendix E Drainage Calculations Report). We have met the minimum required recharge standards and the post-development of the site will have improved conditions from the pre-development conditions. This standard is met by the proposed system as designed in accordance with the Massachusetts Stormwater Handbook. The infiltration rate at the site is greater than 2.4 inches per hour and site run-off will be further contained.

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

Silt fences are proposed along the property sidelines and along the clearing edges to act as a limit of work. The contractor is responsible for compliance during construction. The proposed inspection and maintenance schedule during construction will be daily and conducted by the contractor. Attached is a typical inspection and maintenance log form.

Standard 9: Operation and Maintenance Plan

A long-term O&M Plan is submitted in Appendix B.

Standard 10: Prohibition of Illicit Discharges

To the best of our knowledge, there are no existing illicit discharges at the site and the proposed very public nature of the proposed project does not facilitate any type of illicit discharges at the site.

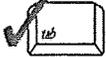
Appendix A
MA DEP
Checklist for Stormwater Report



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.

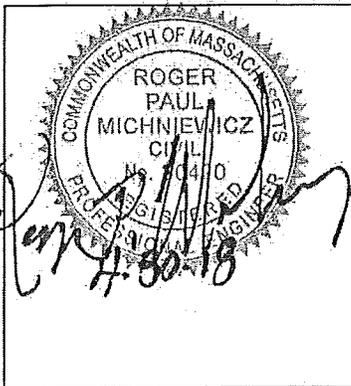
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Roger P. Michniewicz 4-30-18
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.

OPERATIONS AND MAINTENANCE REPORT

for

Proposed funicular system
& associated site improvements

1 High Pole Hill Road
Provincetown, Massachusetts

December 3, 2018

Prepared for:

Cape Cod Pilgrim Memorial Association
PO Box 1125
Provincetown, MA 02657

Prepared by:



COASTAL ENGINEERING CO., INC.
260 Cranberry Highway
Orleans, MA 02653

Table of Contents

Park Facility Description

Responsible Party for Operation and Maintenance of Facility

Schedule of Inspection and Maintenance of System

Source Control Best Management Practices

O & M Log Form

Facility Description

Project Narrative

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Therefore the project has implemented drainage measures to reduce the stormwater runoff to adjacent sites to the maximum extent practicable by means of a shallow underground infiltration system comprised of cultec chambers and stone. There will be approximately a 2' separation distance between the bottom of the system to the groundwater elevation of 3.0 NAVD 88. A perimeter drip trench will be installed around the proposed pavilion and piped via 4" PVC piping to the cultec chambers. There are also (2) two sets of French drains that will collect stormwater from the walkways that will also be piped to the manifold of the cultec chamber system. Calculations for this system, including pre and post flows are attached to this stormwater management report. The soils of the site have been studied and have been determined to be coarse medium sand yielding a high infiltration rate.

Owner and Responsible Party

The owner and responsible party for the operation and maintenance of the park facility at 1 High Pole Hill Road, Provincetown, MA is the following:

Owner: Cape Cod Pilgrim Memorial Association

Operator: K. David Weidner, PhD, Executive Director

Schedule of Inspection and Maintenance of Facility

1. The stormwater management system requires regular attention in order to ensure the effectiveness of the facility. It is recommended that the facility be inspected annually by a professional engineer in order to ensure that the facility is properly maintained. Any deterioration threatening the structural integrity of the facilities shall be immediately repaired.
2. Drainage system shall be inspected quarterly and as needed on a regular basis to ensure proper functioning and operation. A detailed maintenance logbook shall be kept on site detailing the date of inspection, condition of system, date and type of cleaning performed and date and type of repairs performed.

Source Control Best Management Practices

1. Trash containers shall be covered. If leaks are found the container shall be replaced.
2. Any trash container area shall be kept clear of debris.
3. Proposed walkways shall be regularly maintained and swept as required to alleviate siltation and/or debris from entering the infiltration areas.

Appendix C
Stormwater Management Log

Appendix D
Soils Map & FEMA Firmette

Area of Interest (AOI)

Soil Map

Soil Data Explorer

Download Soils Data

Shopping

Search

Map Unit Legend

600	Pits, sand and gravel	1,628.4	0.2
602	Urban land	3,757.2	0.5
607	Water, saline	35,561.6	5.1
608	Water, ocean	392,619.4	56.7
610	Beaches	5,220.3	0.8
611	Dune land	984.1	0.1
612C	Hooksan sand, 3 to 15 percent slopes	6,190.6	0.9
612D	Hooksan sand, 15 to 35 percent slopes	2,381.7	0.3
613C	Hooksan-Dune land complex, 15 to 35 percent slopes	3,341.6	0.5
652	Dumps, landfill	367.3	0.1
665	Udipsammments, smoothed	4,623.8	0.7
Totals for Area of Interest		692,159.2	100.0

Soil Map

(not to scale)



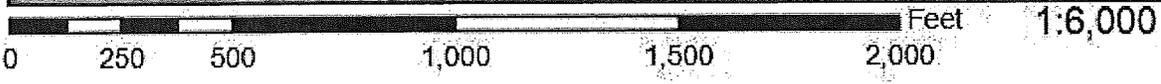
National Flood Hazard Layer FIRMette



42°3'23.74"N



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNR
DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



0 250 500 1,000 1,500 2,000

Feet 1:6,000

Barnstable County, Massachusetts

612D—Hooksan sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2x1kq
Elevation: 0 to 190 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hooksan

Setting

Landform: Dunes
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Crest, base slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy eolian deposits

Typical profile

C1 - 0 to 20 inches: sand
C2 - 20 to 30 inches: sand
C3 - 30 to 64 inches: sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very high (14.17 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Succotash

Percent of map unit: 8 percent

Landform: Spits, dunes, barrier flats

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Concave, linear

Across-slope shape: Linear

Hydric soil rating: No

Beaches

Percent of map unit: 5 percent

Landform: Beaches

Landform position (three-dimensional): Riser

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: Unranked

Dune land

Percent of map unit: 5 percent

Landform: Dunes

Landform position (two-dimensional): Backslope, shoulder, footslope, summit

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

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: Unranked

Sandyhook

Percent of map unit: 2 percent

Landform: Back-barrier flats, back-barrier beaches

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Tidal Salt High Marsh mesic very frequently flooded (R144AY002CT), Tidal Salt Low Marsh mesic very frequently flooded (R144AY001CT)

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Barnstable County, Massachusetts

Survey Area Data: Version 14, Oct 6, 2017

