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1.0 INTRODUCTION

This report will describe the hydrologic and hydraulic analysis for the proposed redevelopment of the property at #61 Beach Road in Vineyard Haven. The existing site has been developed with several commercial buildings, paved driveways and parking, and outdoor material storage. The proposed redevelopment will consist of a multifamily residential structure, paved driveways and parking, and an on-site wastewater treatment and disposal system. Two existing driveway entrances off of Beach Road (a State highway) will be slightly modified to reduce the overall widths and align with the proposed one-way parking aisles. The overall reduction in impervious surfaces and stormwater collection and disposal to the maximum extent practicable will be an improvement from the existing development which did not include stormwater management.

Figure 1 Tisbury GIS map showing the highlighted locus
1.1 EXISTING SITE

The property at #61 Beach Road contains approximately 1.75 acres of land according to the site plans prepared by Sourati Engineering Group (SEG) and is located on the south side of Beach Road in the Waterfront Commercial zoning district. There are no wetland resource areas within 100 feet of the property, but the property is located within a special flood hazard area according to FEMA’s Flood Insurance Rate Map (FIRM). The northerly half of the property is within a designated velocity zone (VE el. 12) while the southerly half is located within a shallow flooding area (AE el. 10) according to the FIRM. The existing buildings are all located at least partially within the mapped V-zone.

The existing development doesn’t have any stormwater collection components. Some of the buildings currently standing at the site having gutters with downspouts that release stormwater out onto the adjacent grade. Storm events have historically flooded the paved parking at the site with standing water according to local reports.

The USDA NRCS Dukes County soil survey maps the site as “Urban land” by which is described as excavated and filled lands. Sourati Engineering Group performed soil investigations as part of the Title 5 site evaluation for the on-site septic disposal system and found natural sand below a varying depth of fill material and a shallow depth to groundwater at the site at elevation 0.6 NAVD88. The NRCS soil survey does not list a hydrologic soil group at the site due to the varying conditions associated with fill and the shallow groundwater.

Two driveway openings connect the paved parking to Beach Road. A paved driveway in the center of the property allows access to an elevated area at the rear of the site that is used for staging of materials and boat storage. The existing impervious area consisting of roofs, pavement, and concrete is 44,882 square feet according to the survey performed by SEG that includes the front building that was recently torn down.

1.2 PROPOSED SITE DEVELOPMENT

Harborwood LLC proposes to demolish the existing buildings, remove the existing pavement and concrete and construct a new multi-use, three story raised structure with parking below and additional parking in front of the building. The building will include a mixture of retail, restaurant, and affordable housing units. An on-site septic system will be located in a raised area in the front central portion of the site with paved parking and access to either side.

The existing curb cuts for the driveways will be replaced by narrower one way entrance and exit routes. The proposed paved driveway access will have sections of pervious parking to either side at the entrance as shown on the attached plans. The total impervious area for the proposed project totals 44,661 s.f. which is a reduction from the existing conditions.

The proposed project will require a Notice of Intent application and therefore be subject to the Massachusetts Department of Environmental Protection (DEP) Stormwater Standards to the maximum extent practicable because it is considered a redevelopment project with a reduction
in impervious area according to those standards. Since the existing development did not have any stormwater collection or treatment components any efforts of implementing those into the proposed project would be an improvement.

The proposed pavement and pervious parking will slope towards vegetated swales that run along the sides and rear of the property. The swales will be constructed such that the fill beneath their footprint is removed down to the natural sands and replaced with clean sand, a planting soil, hardwood mulch, and a selection of woody shrubs and perennial grasses that will help filter and treat the stormwater runoff. Portions of the roof will drain to gutters, downspouts and drywells installed in the clean sand fill in the raised courtyard.

Incorporating the vegetated swales and drywells into the proposed site design is an improvement from the existing conditions. Storms that exceed the capacity of the stormwater collection system will temporarily flood into the parking areas and eventually out to collection system within Beach Road as currently happens with the existing conditions. The limitations at the site such as the shallow groundwater and the densely developed neighborhood make incorporating more stormwater components or increasing the capacity of those proposed to handle larger storms impracticable.
1.3 NRCS SOIL REPORT
Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

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

Soil Map

Map Scale: 1:3,000 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator  Corner coordinates: WGS84  Edge tics: UTM Zone 19N WGS84

Soil Map may not be valid at this scale.
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: Dukes County, Massachusetts
Survey Area Data: Version 17, Jun 11, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Nov 5, 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.
Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>64A</td>
<td>Pawcatuck and Matunuck mucky peats, 0 to 2 percent slopes, very frequently flooded</td>
<td>2.6</td>
<td>7.0%</td>
</tr>
<tr>
<td>259C</td>
<td>Carver loamy coarse sand, 8 to 15 percent slopes</td>
<td>0.3</td>
<td>1.0%</td>
</tr>
<tr>
<td>602</td>
<td>Urban land</td>
<td>23.0</td>
<td>63.5%</td>
</tr>
<tr>
<td>607</td>
<td>Water, saline</td>
<td>0.6</td>
<td>1.6%</td>
</tr>
<tr>
<td>608</td>
<td>Water, ocean</td>
<td>3.9</td>
<td>10.6%</td>
</tr>
<tr>
<td>610</td>
<td>Beaches, sand</td>
<td>0.3</td>
<td>0.8%</td>
</tr>
<tr>
<td>700A</td>
<td>Udipsamments, wet substratum, 0 to 3 percent slopes</td>
<td>2.7</td>
<td>7.6%</td>
</tr>
<tr>
<td>801</td>
<td>Nagunt sand, 0 to 1 meter water depth</td>
<td>1.6</td>
<td>4.4%</td>
</tr>
<tr>
<td>803</td>
<td>Nagunt sand, 1 to 2 meter water depth, dredged</td>
<td>1.2</td>
<td>3.4%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>36.3</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the
scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
Dukes County, Massachusetts

64A—Pawcatuck and Matunuck mucky peats, 0 to 2 percent slopes, very frequently flooded

Map Unit Setting
- National map unit symbol: 2tyqp
- Elevation: 0 to 10 feet
- Mean annual precipitation: 36 to 71 inches
- Mean annual air temperature: 39 to 59 degrees F
- Frost-free period: 140 to 250 days
- Farmland classification: Not prime farmland

Map Unit Composition
- Pawcatuck and similar soils: 50 percent
- Matunuck and similar soils: 35 percent
- Minor components: 15 percent
- Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pawcatuck

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

Typical profile
- Oe - 0 to 46 inches: mucky peat
- Cg - 46 to 60 inches: mucky sand

Properties and qualities
- Slope: 0 to 2 percent
- Depth to restrictive feature: More than 80 inches
- Natural drainage class: Very poorly drained
- Runoff class: Negligible
- Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.14 to 99.90 in/hr)
- Depth to water table: About 0 inches
- Frequency of flooding: Very frequent
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 5 percent
- Salinity, maximum in profile: Nonsaline to strongly saline (1.0 to 112.0 mmhos/cm)
- Sodium adsorption ratio, maximum in profile: 20.0
- Available water storage in profile: Very high (about 21.4 inches)

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

Description of Matunuck

Setting
Landform: Tidal marshes
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Partially-decomposed herbaceous organic material over glaciofluvial deposits and/or sandy marine deposits

Typical profile
Oe - 0 to 12 inches: mucky peat
Cg - 12 to 72 inches: sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.14 to 99.90 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Very frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to strongly saline (1.0 to 112.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 20.0
Available water storage in profile: Moderate (about 8.2 inches)

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

Minor Components
Beaches
Percent of map unit: 5 percent
Landform: Beaches
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hooksan
Percent of map unit: 5 percent
Landform: Dunes
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

**Sandyhook**
- **Percent of map unit:** 5 percent
- **Landform:** Back-barrier flats, back-barrier beaches
- **Landform position (three-dimensional):** Dip
- **Down-slope shape:** Linear
- **Across-slope shape:** Linear
- **Ecological site:** Tidal Salt Low Marsh mesic very frequently flooded (R144AY001CT), Tidal Salt High Marsh mesic very frequently flooded (R144AY002CT)
- **Hydric soil rating:** Yes

**259C—Carver loamy coarse sand, 8 to 15 percent slopes**

**Map Unit Setting**
- **National map unit symbol:** 2y07v
- **Elevation:** 0 to 250 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**
- **Carver, loamy coarse sand, and similar soils:** 80 percent
- **Minor components:** 20 percent
- **Estimates are based on observations, descriptions, and transects of the mapunit.**

**Description of Carver, Loamy Coarse Sand**

**Setting**
- **Landform:** Outwash plains, moraines
- **Landform position (two-dimensional):** Shoulder, footslope, backslope
- **Landform position (three-dimensional):** Crest, head slope, nose slope, side slope, riser
- **Down-slope shape:** Linear, convex
- **Across-slope shape:** Linear
- **Parent material:** Sandy glaciofluvial deposits

**Typical profile**
- **Oi - 0 to 2 inches:** slightly decomposed plant material
- **Oe - 2 to 3 inches:** moderately decomposed plant material
- **A - 3 to 7 inches:** loamy coarse sand
- **E - 7 to 10 inches:** coarse sand
- **Bw1 - 10 to 15 inches:** coarse sand
- **Bw2 - 15 to 28 inches:** coarse sand
- **BC - 28 to 32 inches:** coarse sand
- **C - 32 to 67 inches:** coarse sand
Properties and qualities
Slope: 8 to 15 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): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Dry Outwash (F149BY005MA)
Hydric soil rating: No

Minor Components
Deerfield
Percent of map unit: 10 percent
Landform: Outwash plains, outwash terraces, outwash deltas, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Merrimac
Percent of map unit: 5 percent
Landform: Outwash terraces, outwash deltas, kame terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley
Percent of map unit: 5 percent
Landform: Eskers, kame terraces, outwash plains, moraines, outwash terraces, outwash deltas, kames
Landform position (two-dimensional): Footslope, shoulder, backslope, summit, toeslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No
602—Urban land

Map Unit Setting
National map unit symbol: 98y6
Frost-free period: 175 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land
Setting
Parent material: Excavated and filled land

607—Water, saline

Map Unit Setting
National map unit symbol: mhb3
Frost-free period: 175 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Water, saline: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

608—Water, ocean

Map Unit Setting
National map unit symbol: mhb2
Frost-free period: 175 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Water, ocean: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.
610—Beaches, sand

Map Unit Setting

- National map unit symbol: 2y080
- Elevation: 0 to 20 feet
- Mean annual precipitation: 36 to 71 inches
- Mean annual air temperature: 39 to 55 degrees F
- Frost-free period: 145 to 240 days
- Farmland classification: Not prime farmland

Map Unit Composition

- Beaches, sandy surface: 90 percent
- Minor components: 10 percent
- Estimates are based on observations, descriptions, and transects of the map unit.

Description of Beaches, Sandy Surface

Setting

- Landform: Barrier beaches, beaches, shores, back-barrier beaches
- Landform position (two-dimensional): Footslope
- Landform position (three-dimensional): Riser
- Down-slope shape: Convex
- Across-slope shape: Linear
- Parent material: Beach sand

Typical profile

- C1 - 0 to 10 inches: sand

Properties and qualities

- Slope: 0 to 8 percent
- Runoff class: Negligible
- Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
- Depth to water table: About 0 to 12 inches
- Frequency of flooding: Very frequent
- Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mohms/cm)
- Available water storage in profile: Very low (about 0.5 inches)

Interpretive groups

- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 8
- Hydric soil rating: Unranked

Minor Components

Beaches, cobbly surface

- Percent of map unit: 8 percent
- Landform: Back-barrier beaches, barrier beaches, beaches, shores
- Landform position (two-dimensional): Footslope
- Landform position (three-dimensional): Riser
- Down-slope shape: Convex
- Across-slope shape: Linear
Hydric soil rating: Unranked

Beaches, bouldery surface
Percent of map unit: 2 percent
Landform: Shores, back-barrier beaches, barrier beaches, beaches
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Unranked

700A—Udipsamments, wet substratum, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: bd02
Elevation: 0 to 390 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 195 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Udipsamments, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the map unit.

Description of Udipsamments, Wet Substratum

Setting
Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile
^Ap - 0 to 3 inches: loamy fine sand
^C1 - 3 to 20 inches: fine sand
Ab - 20 to 24 inches: loamy fine sand
Bwb - 24 to 31 inches: fine sand
BC - 31 to 44 inches: fine sand
C2 - 44 to 51 inches: fine sand
C3 - 51 to 72 inches: very fine sand

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat):  Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table:  About 20 to 48 inches
Frequency of flooding:  None
Frequency of ponding:  None
Available water storage in profile:  Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated):  None specified
Land capability classification (nonirrigated):  3w
Hydrologic Soil Group:  A/D
Ecological site:  Coastal Dunes (R149BY002MA)
Hydric soil rating:  No

Minor Components
Tihonet
Percent of map unit:  10 percent
Landform:  Bogs
Landform position (two-dimensional):  Toeslope
Landform position (three-dimensional):  Tread, dip
Down-slope shape:  Linear
Across-slope shape:  Linear
Ecological site:  Wet Outwash (F144AY028MA)
Hydric soil rating:  Yes

Udipsamments
Percent of map unit:  5 percent
Landform:  Dikes
Landform position (two-dimensional):  Summit
Landform position (three-dimensional):  Tread
Down-slope shape:  Linear, convex
Across-slope shape:  Linear
Ecological site:  Coastal Dunes (R149BY002MA)
Hydric soil rating:  No

Udorthents, wet substratum
Percent of map unit:  5 percent
Landform position (two-dimensional):  Footslope
Landform position (three-dimensional):  Tread
Down-slope shape:  Linear
Across-slope shape:  Linear
Hydric soil rating:  No

801—Nagunt sand, 0 to 1 meter water depth

Map Unit Setting
National map unit symbol:  2y08n
Elevation:  0 feet
Mean annual precipitation:  40 to 50 inches
Mean annual air temperature:  39 to 55 degrees F
Frost-free period: 195 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Nagunt, 0 to 1 meter water depth, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nagunt, 0 To 1 Meter Water Depth

Setting
Landform: Washover-fan flats, flood-tidal delta flats
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile
A - 0 to 6 inches: sand
Cg - 6 to 16 inches: stratified sand to fine sand
Aseb - 16 to 21 inches: fine sand
C'g - 21 to 27 inches: sand
A''seb - 27 to 29 inches: sand
C"g - 29 to 59 inches: stratified sand to fine sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Subaqueous
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 99.19 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Very frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 6 percent
Salinity, maximum in profile: Very slightly saline to strongly saline (2.0 to 47.0 mmhos/cm)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Ecological site: Subaqueous Haline Flats (R144AY050RI)
Hydric soil rating: Yes

Minor Components
Marshneck, 0 to 1 meter water depth
Percent of map unit: 5 percent
Landform: Coves (water), shoals
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Subaqueous Haline Slopes (R144AY049RI)
Hydric soil rating: Yes
Pishagqua, 0 to 1 meter water depth

Percent of map unit: 5 percent
Landform: Bay bottoms
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Subaqueous Haline Low Energy Basins (R144AY048RI)
Hydric soil rating: Yes

Rhodesfolly, 0 to 1 meter water depth

Percent of map unit: 5 percent
Landform: Shores, shore complexes, washover fans, bay bottoms
Landform position (three-dimensional): Rise
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex, concave
Ecological site: Subaqueous Haline Slopes (R144AY049RI)
Hydric soil rating: Yes

803—Nagunt sand, 1 to 2 meter water depth, dredged

Map Unit Setting
National map unit symbol: 2y08g
Elevation: -10 to 0 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 195 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Nagunt, 1 to 2 meter water depth, dredged, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nagunt, 1 To 2 Meter Water Depth, Dredged

Setting
Landform: Washover-fan flats, flood-tidal delta flats
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile
A - 0 to 6 inches: sand
Cg - 6 to 16 inches: stratified sand to fine sand
Aseb - 16 to 21 inches: fine sand
C'g - 21 to 27 inches: sand
A'seb - 27 to 29 inches: sand
C''g - 29 to 59 inches: stratified sand to fine sand
Properties and qualities

- **Slope:** 0 to 2 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Subaqueous
- **Runoff class:** Negligible
- **Capacity of the most limiting layer to transmit water (Ksat):** High to very high (1.98 to 99.19 in/hr)
- **Depth to water table:** About 0 inches
- **Frequency of flooding:** Very frequent
- **Frequency of ponding:** None
- **Calcium carbonate, maximum in profile:** 6 percent
- **Salinity, maximum in profile:** Very slightly saline to strongly saline (2.0 to 47.0 mmhos/cm)

Interpretive groups

- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 8
- **Hydrologic Soil Group:** D
- **Ecological site:** Subaqueous Haline Flats (R144AY050RI)
- **Hydric soil rating:** Yes

Minor Components

**Rhodesfolly, 1 to 2 meter water depth, dredged**

- **Percent of map unit:** 5 percent
- **Landform:** Shore complexes, washover fans, bay bottoms, shores
- **Landform position (three-dimensional):** Rise
- **Down-slope shape:** Linear, concave
- **Across-slope shape:** Linear, convex, concave
- **Ecological site:** Subaqueous Haline Slopes (R144AY049RI)
- **Hydric soil rating:** Yes

**Marshneck, 1 to 2 meter water depth, dredged**

- **Percent of map unit:** 5 percent
- **Landform:** Coves (water), shoals
- **Landform position (three-dimensional):** Talf
- **Down-slope shape:** Linear
- **Across-slope shape:** Concave, linear
- **Ecological site:** Subaqueous Haline Slopes (R144AY049RI)
- **Hydric soil rating:** Yes

**Pishagqua, 1 to 2 meter water depth, dredged**

- **Percent of map unit:** 5 percent
- **Landform:** Bay bottoms
- **Landform position (three-dimensional):** Dip
- **Down-slope shape:** Concave
- **Across-slope shape:** Concave
- **Ecological site:** Subaqueous Haline Low Energy Basins (R144AY048RI)
- **Hydric soil rating:** Yes


1.4 **STORMWATER ANALYSIS PLANS**
Stormwater Analysis
Proposed Conditions

#61 Beach Road, Vineyard Haven, MA

PLAN BY: WOODS HOLE GROUP
A CLS COMPANY
107 WATERHOUSE ROAD, BOURNE, MA 02532
TELEPHONE: (508) 540-8080  FAX: (508) 540-1001

DATE: Aug. 7, 2020 SHEET: 2 OF 3

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**Stormwater Analysis**

Construction Details

#61 Beach Road, Vineyard Haven, MA

ALL DRYWELLS MUST BE INSTALLED IN A STRATUM OF COARSE SAND TO ALLOW FOR PROPER FUNCTIONING. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF THE EXISTING MATERIAL DOES NOT CONFORM TO THE GRADATION REQUIREMENTS OF COARSE SAND.

**TYPICAL DRYWELL DETAIL**

SCALE: 1" = 4'

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**TYPICAL SWALE DETAIL**

SCALE: 1" = 2'

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**Graphic Scale**

1" = 60'

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