

**NORTH NANTASKET BEACH
MANAGEMENT PLAN**



HULL, MASSACHUSETTS

February 2012



Undated, early postcards of North Nantasket Beach; on left, looking south from S Street, on right, north from L Street.

ACKNOWLEDGEMENTS	2
INTRODUCTION	2
1. WETLANDS PROTECTION ACT/BARRIER BEACH RESOURCES	4
Geologic Background	5
Climate Change	6
Overview of Plan Area and Functions	6
2. MAINTENANCE ACTIVITIES	9
General Maintenance	9
Dune Maintenance	10
Dune and Beach Profiling	11
Dune Repair and Restoration	11
Emergency Access	11
Spring	12
Annual Beach Cleaning	12
Annual Beach Grass Planting	12
Summer	12
Debris Management	12
Seaweed Management	12
Fall	13
Review of Maintenance Procedures	13
3. BEACH ACCESS	13
Pedestrian Access	13
Handicapped Access	14
Vehicle Access	14
4. EMERGENCY CONDITIONS	14
Major Storm and Hurricane Conditions	14
Winter Conditions	15
Health Emergency Conditions	16
5. REQUIRED BEST PRACTICES AND PROCEDURES	17
Access Paths	17
Beach Grass Planting	17
Beach Maintenance: Use of Hand Tools	17
Beach Maintenance: Use of Rake-type Machines	18
Beach Profiling	19
Emergency Cleanup Procedures	19
Major Storm and Hurricane Emergency Procedures	19
Vehicle Access	20
6. EFFECT OF PLAN	20
7. REGULATIONS	21
8. DEFINITIONS	23
9. BIBLIOGRAPHY	25
APPENDIX A – The Formation of Nantasket Beach	
APPENDIX B – Maps of the North Nantasket Beach Management Plan Area	
APPENDIX C – DEP Wetlands Technical Assistance, Shoreline from L to X Streets	

ACKNOWLEDGEMENTS

Participants in the 2012 update to the North Nantasket Beach Management Plan include:

Conservation Commission, Sheila Connor, Chair
Conservation Administrator, Anne Herbst
Department of Public Works, Marc Fournier, Director
LEC Environmental Consultants, Inc., Stan Humphries, Senior Coastal Geologist
Hull Beach Management Committee, Rhoda Kanet, Chair, Nancy Bilodeau, Paul Epstein, Rob Gilman, Peter Larson, Nancy Marten

INTRODUCTION

This beach management plan (BMP or Plan) is, first and foremost, one that addresses natural resource functions and values. Its purpose is to define how the Town of Hull will manage North Nantasket Beach in accordance with the Massachusetts Wetlands Protection Act so that it may protect and maximize its wetland values while providing access and preserving its recreational value.

Several Town Departments share management responsibilities: The Hull Conservation Commission is charged with protecting and preserving the wetland resources of North Nantasket Beach through enforcement of the Massachusetts Wetlands Protection Act. Some activities described in this beach management plan will require, or have already required, a permit from the Conservation Commission. It is also anticipated that there will be additional filings under the Wetlands Protection Act when there are new projects or activities. A Request for the Determination of Applicability (RDA) may be filed for simple projects and a Notice of Intent (NOI) would be filed for more involved projects. Public meetings or hearings will occur and the Commission will vote on whether to issue a wetlands permit. An Order of Conditions (OOC) is the permit that is issued.

The Department of Public Works (DPW) shall review this plan and the Required Best Practices and Procedures described within, with the Conservation Administrator (or in her/his absence, the Conservation Commission) before each seasonal cleanup and maintenance of the beach. The DPW shall always keep this plan on hand, and review it periodically keeping in mind the understanding of conservation principles.

The Police Department shall review this Plan as well as the Wetlands Protection Act with the Conservation Commission (or their designee) in order to understand how the plan affects the use of the beach in the Town of Hull.

The general public and private landowners who access and live near the beach also have responsibilities for their interactions with the Beach and Primary Dune Area. These responsibilities range from the simple task of taking care of one's trash to the more complex task of requesting permits for projects that will affect the beach and primary dune. Beachfront landowners, in particular, must work with the Conservation Commission to obtain permission for activities that "remove, dredge, fill or alter" the land that surrounds them.

With a landmass of just 2.5 square miles and a remarkably varied 27 miles of coastline the Town of Hull has the exceptionally challenging task of preserving and protecting the wetland resources of a relatively stable, yet fragile barrier beach upon which

exists one of the most densely populated and almost completely built-out towns in the Commonwealth.



The Town's coastline includes bays, estuaries, rocky promontories, beaches and bluffs. Its bayside has sandy coves, inlets, and marshes, a tidal pond, and a state designated Area of Critical Environmental Concern. On the ocean facing side there are two large crescent beaches, a small sandy pocket cove bounded by large rock outcrops, a boulder-strewn point, rocky cliffs, and a 3.5-mile long sand, gravel and cobble barrier beach. Along with its unique geography and geology comes the responsibility to manage this unique natural environment.

This management plan addresses North Nantasket Beach (the "BMP Area"), the northernmost 2 miles of the 3.5-mile barrier beach (see maps, Appendix B). The southern 1.5-mile portion, Nantasket Reservation, is owned and managed by the Massachusetts Department of Conservation and Recreation (DCR).



North Nantasket Beach looking north from Phipps Street towards Allerton Hill. Left to right: frontal dune, cobble, gravel, wrack lines, and fine-grained sand.

North Nantasket Beach is a 2-mile long barrier beach made up of a variety of sediments that range in size from fine-grained sand to gravel to cobble. Drumlins, such as Point Allerton, are composed of a mixture of sediment types including clay, silt, sand, pebble, cobble and boulders, and historically have provided the material that forms Nantasket Beach. In high wave energy environments such as Nantasket Beach, the finer sediments tend to be transported by waves and currents leaving the coarser sediments behind. These sediments are often referred to as a lag deposit. This is the source of the naturally occurring range of sediments found on Nantasket Beach. Traveling north from Phipps Street to X Street both the grain size of the sediments and the slope of the beach increases with the most northern portion of the beach, R to X Street, which lies south of Point Allerton, consisting of a steeper sloped beach, coarser sand, cobbles, and small boulders.

There is a narrow, fairly continuous, vegetated primary frontal dune along North Nantasket Beach. At the very southern end of North Nantasket Beach the dune takes the form of small hummocks; at the northern end where the sand supply is meager and the beach is not of sufficient width, the dune is lower, less substantial and is composed of greater proportions of gravel and cobble than of fine-grained sand. The term "primary dune" or "primary frontal dune" is commonly defined as the coastal dune closest to the

coastal beach. Other dunes located behind, or landward, of the primary dune are older deposits and generally lower in elevation. The primary dune is the first line of defense against coastal storm flooding and provides sand to the adjacent beaches. Beach grass, wrack, and other vegetation on the dunes traps sand and stores it as a future sediment supply for the beaches.

The beach is narrowest at both ends of the BMP Area and is at its widest where the vegetated primary frontal dune is most developed. At this part of the beach low tide exposes a wide, almost flat expanse of fine-grained, hard-packed sand intermingled with gravel and some cobble.

A majority of the vegetated primary frontal dune is located within a 50-foot wide parcel of land known as Beach Avenue. The primary dune is widest in the vicinity of Lewis Street, which is an area centered within the beach's 2-mile length. There are remnants of an historic concrete seawall buried within sections of the primary dune and in some areas this seawall is exposed.

The Beach Management Plan reflects the best management practices for the stewardship of the beach. The Town will make every effort to comply with the BMP as the same may exist. Notwithstanding the use of the terms "shall" or "will", nothing contained in this plan shall be construed to create an obligation or responsibility on the part of the Town to take any particular action on the beach; however, any actions that the Town takes on the beach will be in accordance with this Plan and applicable law."



The aftermath of an April 2007 storm that exposed remnant sections of seawall.

1. WETLANDS PROTECTION ACT / BARRIER BEACH RESOURCES

The Massachusetts Wetlands Protection Act (WPA) regulates activities in various wetland resource areas in order to protect public interests. The wetland areas of primary focus for this management plan include barrier beach, coastal beach, coastal dune, and land subject to coastal storm flowage. Other relevant wetland areas include land under the ocean and land containing shellfish. The public interests protected by these wetland resource areas include storm damage prevention, flood control, and protection of wildlife habitat, and may include protection of marine fisheries and shellfish.

The WPA Regulations provide general performance standards that guide the review and permitting of activities to ensure that no adverse effects will occur to resource areas. The applicable standards for barrier beaches are found in 310 Code of Massachusetts Regulations (CMR) 10.27 (3-7) for coastal beaches and in 310 CMR 10.28 (3-6) for coastal dunes. In general, the protected physical characteristics of coastal beaches and dunes include form, volume and the ability to respond to wave and wind action. However, fencing and other devices designed to increase primary dune development, as well as plantings compatible with the natural vegetative cover, may be permitted. There are no performance standards associated with land subject to coastal storm flowage.

Under the WPA, barrier beaches are significant to storm damage prevention and flood control and are likely to be significant to the protection of marine fisheries and wildlife

habitat and, where there are shellfish, the protection of land containing shellfish. Coastal beaches are significant to storm damage prevention, flood control and wildlife habitat. Tidal flats, which are a part of coastal beaches, are likely to be significant to the protection of marine fisheries and, where there are shellfish, to land containing shellfish. Coastal dunes are likely to be significant to storm damage prevention and flood control; all coastal dunes on barrier beaches and the coastal dune closest to the coastal beach in any area are significant to storm damage protection and flood control. Coastal dunes are also often significant to the protection of wildlife habitat.

Areas along North Nantasket Beach are also mapped as estimated and priority habitats for state-protected rare species [Common Tern (*Sterna hirunda*) and Seabeach Dock (*Rumex pallidus*)] and they contain shellfish, primarily surf clams. Therefore pursuant to the WPA, activities that may result in altering, dredging, filling and removing these natural resources are subject to regulation by the Conservation Commission.

Geologic Background

The coastal geologic and morphologic construct of Nantasket Beach is critical to the protection of the occupants of the Town of Hull as well as Hull Bay and the various islands located on the south side of the entrance channel to Boston Harbor. The beach is a low-lying strip of land comprising a range of unconsolidated sediments deposited by currents, wave, tides and winds over the last several thousand years. It extends roughly parallel to the trend of the coast and connects drumlin deposits including Strawberry Hill in the central portion and Allerton Hill to the north. The size of unconsolidated sediments along North Nantasket Beach range from fine sand to cobbles (less than 10 inches in diameter).



Cobbles and boulders are found in areas exposed to high wave energy during storm events because the lighter pebbles, sand, and silt have been removed by strong waves and currents. In addition to the dynamics of erosion and transport of finer grained material, wave action also tends to accumulate cobble along the higher tide line and this accumulation can tend to move landward during storm events. This is a form of (cobble) dune building function.

Cobbles are naturally rounded or oval stones larger than pebbles, but smaller than boulders that measure between 3 and 10 inches in diameter. Beach cobble stones are polished round and smooth by years of wave energy. They are alternately exposed and covered by sand depending on the tides, waves and seasons of the year.

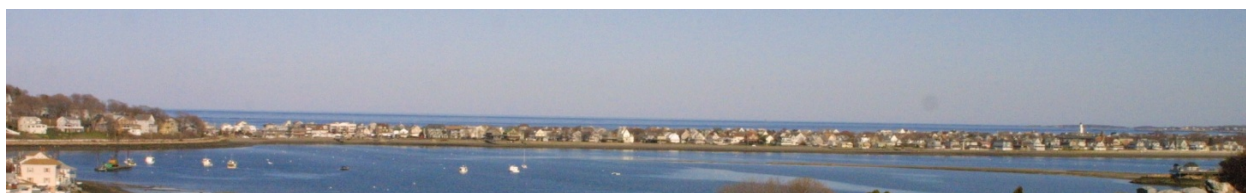
A cobble beach contains rocks that represent many periods of geologic history. The pink, green, or gray granites formed from hot molten rock deep within the earth's crust. Brick red, flinty stones may have come from an historic volcano. Those with mica flakes reveal a history of great heat and pressure.

All of Nantasket Beach is designated as a barrier beach by the Massachusetts Office of Coastal Zone Management (CZM). CZM has published Barrier Beach Inventory Maps for the coastal regions of Massachusetts with the designation for the Nantasket map being HL-6. In the regulations to the Massachusetts Wetlands Protection Act, barrier beaches are, in

part, defined as “generally consisting of coastal beaches and coastal dunes”. WPA regulations CMR 310 10.29 further define barrier beaches.



Looking north from Gunrock Beach to North Nantasket Beach. Strawberry Hill drumlin is in the center with the Allerton Hill drumlin on the far right. Below, the North Nantasket barrier beach seen from the bay side with Allerton Hill on the far left.



Climate Change

Sea level rise and an increasing frequency and intensity of coastal storms are among the projected impacts of a warming global climate. In the Boston area, seas are currently rising at the rate of nearly one foot per century. While future rates of sea level rise are uncertain, projections are in the range of 2 to 4 feet, or higher, by the end of the century. The dunes serve as critical protection against flooding and storm damage during winter northeasters. The impacts of climate change will make it more challenging to maintain and protect our dune system – and all the more critical that we do so in order to protect lives, property, and town infrastructure.

Overview of Plan Area and Functions

This beach management plan addresses the Beach and Primary Dune Area. For the purposes of this plan, the Beach and Primary Dune Area lies between the western boundary of Beach Avenue (where Beach Avenue is unpaved), or the eastern edge of the pavement of Beach Avenue, and the extreme low water of the Atlantic Ocean (see maps Appendix B).

Storms, erosion, floods and other hazards are of overriding importance to the evolution and maintenance of developed barrier beaches and to the people who occupy them. Effective protection of the beach resource areas (i.e., beach and primary dune) from high tides and flooding and against damage by the ocean under storm conditions requires sufficient vegetation, elevation and width to dissipate the force of the waves.

As a result of these flooding conditions, these areas are considered to be land subject to coastal storm flowage, which is defined in the WPA Regulations to mean land subject to any inundation, caused by coastal storms up to and including that caused by the 100-year storm, surge of record, or storm of record, whichever is greater. The Federal Emergency Management Agency (FEMA) published a set of Flood Insurance Rate Maps (FIRMs) on May 2, 1983 showing what is being defined as the Beach and Primary Dune Area as a Velocity (V) Zone with elevations of 17 and 19 feet NGVD. Preliminary flood maps

released by FEMA in 2008 show the V-zone elevations ranging from 17 to 32 feet NAVD. A V-zone is a special flood hazard area where waves three (3) feet in height or greater are expected during a 100-year storm event or, put more precisely, the storm that has a 1% chance of occurring in a given year. The “Blizzard of ’78” is an example of a storm event nearly of this magnitude in Hull.

In order to protect public and private property the primary dune should provide as continuous and as unbroken a barrier for the entire length of North Nantasket Beach as is possible given that controlled and managed access points must be maintained by the Town through the application to, and subsequent issuance of, a valid Order of Conditions by the Hull Conservation Commission. Such Orders of Conditions for managed access points may be issued for a period not to exceed three years. While the beach and primary dune provide protection to public and private property, the beach affords recreational uses to all. Accordingly, the Town of Hull has a vital interest in the continued protection and maintenance of the Beach and Primary Dune Area and may perform annual routine preservation and has the right and responsibility to cause their restoration in the event of damage or destruction.

Coastal beaches serve as a sediment source for dunes and subtidal areas. Steep storm waves cause beach sediment to move offshore, resulting in a gentler beach slope and greater energy dissipation. Less steep waves cause an onshore return of beach sediment, where it will be available to provide protection against future storm waves. A coastal beach at any point serves as a sediment source for coastal areas downdrift from that point. The oblique approach of waves moves beach sediment alongshore in the general direction of wave action.

All sediment that comprises the volume and form of the beach plays an important role in dissipating wave energy and reducing storm damage. Beaches tend to naturally attain a profile that is in equilibrium with the wave, current and tidal forces acting upon it. This natural profile maximizes wave dissipation. As a result, manipulation of the volume and form, which establishes the natural profile, may reduce the capacity of the beach to dissipate wave energy and thus may lead to increased storm damage.

Finally, coastal beaches are extremely important in the recycling of nutrients derived from storm drift and tidal action. Vegetative debris along the wrack line is vital for resident and migratory shorebirds, which feed largely on invertebrates that use the wrack as habitat.



The string of debris stranded by the tide that runs the length of the beach is called a wrack line. When sand blows over wrack line, it begins to accumulate and provides a nutrient rich medium for seeds entrapped in the wrack to germinate in this pioneering zone, which extends landward from the wrack line on the upper beach through the dune area. This vegetation can become the first stages of the creation of a foredune. The wrack also provides isolated sources of food and shade that supports a community of isopods and amphipods as well as providing food for sandpipers and other shorebirds and wading birds.



On beaches with little slope there may be three distinct wrack lines. The lowest, or most seaward wrack line, indicates the height of the last high tide, the next landward line shows the height of the last spring tide, and the highest, often intermingled with man-made debris, shows the reach of the last big storm.

During typical tides there is a greater proportion of marine vegetation to debris in the wrack. The wrack is less dense and dries more quickly and the washed-up seaweed, algae, eel grass and marsh plants may provide a source of nutrients and seeds for the pioneer species of flora, a foraging habitat for shorebirds and a substrate for accumulating sand. Below the wrack line in the lower intertidal zone are infauna (invertebrates such as mollusks and crustacea) that are also eaten by shore birds.

In severe storms, wrack can be composed of not only marine vegetation such as algae and plants in the genera *Fucus*, *Laminaria* and *Zoster* which are most abundant on northern shores, but also of animal matter, marine debris, solid waste and other pollutants. The wrack line in these storms usually indicates an exceptionally high tide mark that will likely not be returned naturally to the sea during succeeding high tides and may provide a breeding habitat for fecal coliform and create a health hazard to humans.



Coastal dunes aid in storm damage prevention and flood control by supplying sand to coastal beaches. Coastal dunes, which are higher than the coastal beaches that they border, protect inland coastal areas from storm damage and flooding by storm waves and storm elevated sea levels because they absorb the impact of storm surge and high waves, preventing or delaying flooding of inland areas and damage to inland structures. Wider and taller coastal dunes

Frontal dunes showing effects of a late April Northeaster, 2007.

provide greater protection because their larger mass is better able to withstand and dissipate wave action. In order to protect this function, coastal dune volume must be maintained while allowing the coastal dune shape to conform to natural wind and water flow patterns.

Vegetation cover contributes to the growth of coastal dunes by providing conditions favorable to sand deposition and stability by anchoring the dune. American beach grass, which grows up to 2'-3'



in height, traps windblown sand causing it to accumulate around the plants. Its stems and leaves also lower wind velocities at the dune surface and keeps accumulated sand from blowing away.

Although beach grass produces seeds, it most often propagates through its rhizomes (underground stems), which can spread horizontally up to 6'-10' annually. These underground stems respond to increased sand cover by sending up a new rhizome. From the new rhizome, a new shoot forms. During its growing season, which typically lasts from April to October, this network of underground rhizomes extends the plants laterally, while the plants continue to grow upwards through accumulating layers of sand.

The beach and primary dune are a combination of dynamic landforms that have changing characteristics and boundaries according to seasonal and storm generated processes. Sediment is exchanged between these two areas as a result of storm overwash and wave erosion, as well as windblown accumulation and wind scouring. The vegetated boundary that typically separates the primary dune from the beach can migrate landward or seaward. Therefore, these two areas are protected as one natural beach and dune system.



The final part of the wave that travels up the beach is called the swash.

The clattering and rattling caused when cobble is tossed around in the swash is like no other sound ...
....and playing tag with the edge of the swash is like no other game.



Top: High tide, cobble and swash at X Street.

Bottom: Low tide, looking north along North Nantasket Beach towards Allerton Hill from Phipps Street.

2. MAINTENANCE ACTIVITIES

General Maintenance

Maintenance includes both proactive and reactive procedures that occur throughout the year. An exceptional effort must be made to avoid negative effects that may take place when maintaining both the hardscape and landscape features of the beach and primary dune system. Proactive efforts to protect and stabilize the resource include the continued

oversight and care of man-made structures such as access points and fencing, beach grass planting, and filling of primary dune escarpments with sand cleaned of debris reclaimed from the road surface of Beach Avenue and sand obtained through permitting from dredging or other sources.

Removal of debris in order to provide our citizens and visitors with a litter free beach, removal of excessive amounts of debris and fly infested seaweed that has been declared a health hazard, and emergency measures conducted in the wake of severe weather events are all reactive responses to man-made or naturally occurring actions.

Keeping the beach litter free consists of special, episodic, and scheduled maintenance to remove a range of man-made materials from the beach and primary dune. Marine debris from recreational, commercial and fishing boats is often caught up in the wrack line. Landside litter, including plastic bags and pieces, balloons, trash and garbage, often blows up into the primary dune and beach grass areas. Cleaning efforts typically include the removal of a mixture of these materials.



The maintenance and cleaning of the paved portion of Beach Avenue, which parallels the primary dune, must also be taken into account as sand, gravel, and cobble often may be deposited on the road surface by wind and storm overwash. In

Looking north along Beach Avenue.

order not to restrict pedestrian and vehicular passage and to conserve this resource, this sand, gravel, and cobble must be removed only from the road surface as frequently as possible by use of a street sweeper, cleaned of any debris, and replaced on the beach or stored for future use. This routine road maintenance shall not adversely affect the landward edge of the dune and will be monitored on a regular basis by the Conservation Administrator (or in her/his absence the Conservation Commission).

Removal of sand, gravel and/or cobble and grading of sand and cobbles in the BMP Area will have an adverse effect on storm damage prevention and flood control and is not allowed, except to move sediment deposited as the result of beach replenishment activities, or as permitted by the Conservation Commission.

Dune Maintenance

In order to provide for effective dune restoration, the Town of Hull may erect suitable fencing at the seaward toe of the primary frontal dune in accordance with such standards as may be permitted by the Conservation Commission and adopted by this plan. Such fencing can trap windblown sand and build up the dune where none exists. Fencing can be also be used to promote the expansion of an existing dune. In both cases, a zigzag configuration (with sides facing the northwest and southwest directions) is most effective during the

dominant winter and summer winds, respectively. Fencing constructed in a linear configuration can also be used to limit or direct pedestrian traffic.

Dune and Beach Profiling

Dune and beach profiling shall be done in the winter and summer, or at a greater frequency if deemed necessary by the Conservation Administrator (or in her/his absence, the Conservation Commission). The Conservation Administrator (or in her/his absence, the Conservation Commission) shall be required to take profiles at W, Lewis, and Phipps Streets. The information obtained shall be used for the preservation, maintenance, and restoration of the dunes. **See page 19: Required Best Practices and Procedures, Beach Profiling.**

Dune Repair and Restoration

Repair of the primary frontal dune may occur at any time of the year should the necessity arise. Small dune openings on Town property, resulting from the creation of unpermitted access paths, other human alterations, or natural damage from storms, will be repaired by the Town of Hull under the supervision of the Conservation Administrator (or in her/his absence the Conservation Commission). The Town will use appropriate grain-size sand to repair the opening. Repaired openings should be planted with beach grass as soon as practicable to stabilize the dune. Larger dune restoration projects must be permitted through the Conservation Commission.



July 2005



March 2006



April 2008

Emergency Access

Emergency access requires that Beach Avenue be maintained at a width of at least 18 feet. The 18-foot width is measured starting from the western boundary of the Beach Avenue utility poles. The Town of Hull DPW may remove sand, gravel, and cobble from Beach Avenue as necessary to maintain the legal width to ensure public safety access. This material may be stored for future use or be deposited as stated in Major Storm and Hurricane Emergency Procedures. Any widening of Beach Avenue shall be conducted in accordance with Orders of Conditions issued by the Conservation Commission.

Spring

Annual Beach Cleaning shall be scheduled by the Town to occur in late spring, but no later than the Friday proceeding Memorial Day. Debris shall be removed from the beach only by persons who have participated in the annual spring training or its equivalent sponsored by the Beach Management Committee and/or Conservation Administrator (or in her/his absence, the Conservation Commission).

The cleaning or removal of debris and seaweed may be conducted by hand or by a rake-type machine. The Town Manager and Conservation Administrator (or in her/his absence, the Conservation Commission) shall decide whether to use hand or machine labor. Cleaning both debris and seaweed by hand or by rake-type machine shall be conducted in accordance with Required Best Practices as described in Beach Maintenance: Use of Hand Tools and Beach Maintenance: Use of Rake-type Machines. **See page(s) 17-19.**

Annual Beach Grass Planting should occur in early spring, but no later than April 15th. Planting native vegetation is the best method for dune creation, stabilization, improvement, and repair. No matter what sand-trapping method is used, all dunes should be vegetated for stabilization. **See page 17: Required Best Practices and Procedures: Beach Grass Planting.**

Summer

Debris Management shall occur on a regular basis from Memorial Day to Labor Day. In general, debris removal shall be conducted by hand. From the Friday preceding Memorial Day through June 30, debris shall be removed from the beach three to seven days per week. Dune and beach maintenance may occur at any time of year with beach cleaning being performed in accordance with Required Best Practices and Procedures. When removing debris less than seven days per week, efforts shall be made to space the cleanup days.

From July 1 through Labor Day, debris shall be removed five to seven days per week. From the day following Labor Day through September 30, the town shall endeavor to remove debris from the beach three to seven days per week. When removing debris less than seven days per week, efforts shall be made to space the cleanup days. In the event of a heavy accumulation, the Town Manager and Conservation Administrator (or in her/his absence, the Conservation Commission) shall decide whether to use hand or machine labor.

Seaweed Management shall be handled as follows: Seaweed shall be removed as necessary as determined by the Conservation Administrator (or in her/his absence, the Conservation Commission) and Town Manager. The Conservation Administrator's and Town Manager's determination shall be based on, without limitation, weather reports, thickness of the seaweed, and odor of the seaweed. Seaweed shall be cleaned from the beach in the area between ten feet seaward of the base of the primary dune and mean high water.

Seaweed shall be removed from the beach only by persons who have participated in the annual spring training or its equivalent sponsored by the Beach Management Committee and/or the Conservation Commission. In general, summer seaweed removal shall be conducted with hand tools. In the event of a heavy accumulation, the Town Manager and

Conservation Administrator (or in her/his absence, the Conservation Commission) may allow the use of machine labor if the seaweed accumulation is greater than can reasonably be removed by hand. Cleaning both debris and seaweed by hand or by rake-type machine shall be conducted in accordance with Required Best Practices and Procedures as described in Beach Maintenance: Use of Hand Tools and Beach Maintenance: Use of Rake-type Machines. **See pages 17-19.**

Fall

Review of Maintenance Procedures: At the end of the summer season, the Beach Management Committee and the Conservation Commission may review all maintenance procedures and shall invite all persons involved to participate in the review. The purpose of this review is to recommend any modifications to routine maintenance procedures. The Beach Management Committee and the Conservation Commission, either individually or together, shall provide a written summary of their findings to the Selectmen and Town Manager and other interested parties.

3. BEACH ACCESS

It is particularly important to prevent destruction of dune vegetation as loss of vegetation can lead to blowouts, lowering of dune profiles, and destruction of wildlife habitat. Beach grass must be protected from foot traffic, otherwise stems are broken and the plant dies. To protect the dunes, visitors should not play, rest, or walk on vegetated dune areas and should only use approved pedestrian access paths to reach the beach. Educational signs shall direct pedestrians to these paths and educate them as to the protective nature of the dunes.

Pedestrian Access



The Town is committed to providing the residents of Hull and visitors with well-maintained, safe and appropriate pedestrian access to North Nantasket Beach while preserving the environmental functions of the beach and dune.

Pedestrian access paths shall be available at all current street endings. All paths will be constructed and maintained in accordance with a valid Order of Conditions issued by the Conservation Commission. **See page 17: Required Best**

Practices and Procedures: Access Paths. Currently the Town maintains access paths from Malta to L Streets (excluding A Street) in accordance with an Order of Conditions. In the future, if the Town chooses to do work on access paths from M to X Streets or at A Street, it must do so under a valid Order of Conditions.

The Beach Management Committee and the Conservation Commission shall monitor the condition of the dune system, inspecting all openings and access paths no less than two times each year, once in the spring and once in the fall and inform the Town Manager of any necessary repairs or alterations.

Handicapped Access

The access point at A Street shall meet ADA requirements for handicapped accessibility including, but not limited to, appropriate ramps, platforms, slope and parking. Beach-accessible wheelchairs are available at the Fire Station at A Street and Nantasket Avenue. Information regarding the availability of beach-accessible wheelchairs will be provided to the public at the corner of A Street and Beach Avenue.

Vehicle Access

No motor vehicles, including town vehicles, shall access or gain entry to, or park upon the primary dune except as may be necessitated for allowed construction, public safety, or for dune maintenance, and for emergencies as declared by the Town of Hull and permitted by the Conservation Commission. Vehicle use on the beach is prohibited except for Town approved users such as those engaged in beach maintenance, storm cleanup, law enforcement, emergencies and public safety. Emergency and non-emergency vehicle access is permitted only at A Street, the DCR access south of Phipps Street, and at X Street. Any damage to the beach or primary dune as a result of vehicle use must be repaired in accordance with requirements established by the Conservation Commission.

In an emergency, emergency vehicles shall not be restricted. However, any damage to the beach or primary dune as a result of emergency vehicle use must be repaired in accordance with requirements established by the Conservation Commission. **See page 20: Required Best Practices and Procedures: Vehicle Access.**

A non-structural ramp for vehicular use at A Street may consist of unconsolidated sediment not to exceed a minimum, practicable width and shall extend seaward of the vegetated primary dune line. To construct and maintain the ramp, the DPW may use compatible material approved by the Conservation Administrator (or in her/his absence, the Conservation Commission). The Conservation Administrator shall be notified when maintenance on the ramp is required. With approval from the Conservation Administrator the Town may use a roll-out mat on top of the sand ramp. If other maintenance is required to maintain vehicular access at A or X Streets, it must be permitted by the Conservation Commission.

4. EMERGENCY CONDITIONS

Major Storm and Hurricane Emergency Conditions



Emergency conditions are a result of natural changes in the Beach and Primary Dune Area, which threaten the public safety, health and welfare of the community within the North Nantasket Beach area. Moderate to major coastal storms, which include winter-type northeasters, tropical storms and the rare

[North Nantasket Beach. Winter storm 2008.](#)
[Photograph courtesy Nancy Bilodeau.](#)

hurricane, generally consist of high onshore winds (sustained over 35 mph with stronger gusts) that work in conjunction with elevated tides and storm driven waves to produce storm surges and overwash. Major coastal flooding and beach erosion occurs at tide heights over 13.5' measured at Boston. During such storm events the combined forces of wind and water may produce widespread flooding which is the greatest threat for an emergency. Although the dune may withstand, or delay flooding, storm surges that occur at high tide or continue to build through additional tide cycles can overtop or cause blowouts in the dune as flood waters move landward into homes, businesses, roads and parking areas carrying beach and dune sediments landward. Precipitation (i.e. rain; snow and ice) may also contribute to emergency conditions and are addressed under **Winter Conditions**.

Access to the roadways is imperative for police, fire, rescue, and evacuation operations. Unless access is restored after each high tide in all storm events the severity of the emergency may not be controlled. The primary differences between northeasters and hurricanes may require different emergency responses. Typically, northeasters have a longer duration (1-3 days) over several high tides. As a result, flood waters, sediment and debris may accumulate on Beach Avenue and connecting streets several times during a storm. In contrast, hurricanes are fast moving storms that occur during one tidal cycle (less than 12 hours) with a storm surge that extends further landward or inland. Because hurricane wind speeds are greater than northeasters, wind-driven debris may impose an additional emergency condition. Access ways will most likely need to be cleared only once, after the entire hurricane has passed.

Town debris removal costs may be reimbursable by the state and federal government, so accurate records of location, amount, personnel and equipment usage should be kept. **See page 19: Required Best Practices and Procedures: Major Storm and Hurricane Emergency Procedures.**

Winter Conditions

Ice and snow accumulations, both with and without the influence of major coastal storms, pose winter emergency conditions when roadways become impassible. Removal operations should be confined to the paved portions of Beach Avenue and connecting streets. While plowing, windrows of snow may be formed along the dunes parallel with Beach Avenue. However, the natural beach and primary dune should not be excavated for any reason. Along Beach Avenue from Revere to Coburn Streets, the Town has installed in the pavement, and will maintain, plastic delineators to ensure that snow plows (and other vehicles) stay clear of the dune. The road width is marked by locating the delineators 18 feet from utility poles on the west side of the street, or at the toe of the dune, if the toe of the dune is less than 18 feet from the utility pole. To protect beach grass from being smothered with sand and other material the Town will, to the greatest degree possible, minimize placement of snow on the primary dunes during snow plowing operations.

Water accumulation from melting snow or flooding may be relieved with pumps. Discharge may take place on the beach; no discharge may take place on the primary dunes.

Health Emergency Conditions

There may be instances when debris and wrack on the beach pose a threat to public health and safety and an emergency cleanup is required. Any person may notify the Health Agent, who is the Health Officer of the Town of Hull, of a possible health emergency condition. Upon receiving such notice, or upon her/his own suspicion, the Health Agent, or her/his designee, shall investigate the possible condition. The Health Agent may declare a health emergency condition if s/he determines that conditions on the beach pose a present or imminent threat to the health or safety of the general public.

Conditions that pose a present or imminent threat to the health or safety of the general public include, but are not limited to, accumulations of seaweed that have become infested with flies or other insects, or that are of sufficient height to indicate that an insect infestation is likely and concentrations of clams, mussels, shellfish or any other organic material that is in a rotting condition or likely to be rotting and possibly infested with insects.

Upon determining that a health emergency condition exists, the Health Agent shall notify the Town Manager. The Town Manager shall notify both the Conservation Administrator or Conservation Commission and the DPW. Upon notification that a health emergency condition exists and that the Conservation Commission has issued an emergency permit; the DPW shall commence cleanup procedures to be performed in accordance with the Wetlands Protection Act and the Beach Management Plan within 24 hours of such notice and shall complete such cleanup within 72 hours of notification. Cleaning of seaweed shall be conducted in accordance with Required Best Practices and Procedures as described in Beach Maintenance: Use of Hand Tools, and Beach Maintenance: Use of Rake-type Machines, except to the extent that the Emergency Order issued by the Conservation Commission requires different procedures. **See pages 17-19.**

The Conservation Administrator or designee shall supervise all emergency cleanup work on the beach pursuant to a health emergency condition and shall have the authority to stop and/or alter the cleanup. DPW employees, contractors, and other individuals carrying out the emergency cleanup shall follow all local By-Laws and state and federal laws pertaining to coastal wetland protection under emergency procedures.

All Town employees doing so shall have participated in a beach cleanup seminar or its equivalent sponsored by the Beach Management Committee and/or the Conservation Commission held in preparation for the current season, or the most recent seminar, if the seminar has not yet been held for the current season.

At the next Beach Management Committee meeting following the determination that an health emergency condition exists, the Committee may review the cleanup process and shall invite all persons involved in that process to participate in the review. The purpose of this review is to monitor the executed cleanup and suggest any necessary modifications to the procedures. The Beach Management Committee or the Conservation Commission shall provide a written summary of its findings to all interested parties.

5. REQUIRED BEST PRACTICES AND PROCEDURES

Access Paths

The width of the paths from Malta to L Street shall be 48 inches wide at all points along the fenced pathways. However, when paths have been damaged and need to be re-built, the Conservation Commission may approve re-establishment of the path at a width of 52" so that the DPW can use smaller equipment for routine maintenance. The width is maintained by the fencing, which will be repaired if damaged by storms. The slope of the access paths should be 1:7.5 at openings with a sand path and 1:5 if an access path has a removable non-skid ramp approved by the Conservation Commission. Access paths from Malta through L Street shall be delineated with well-maintained snow fencing. The paths should be angled to the southeast to provide for maximum storm protection during northeast storm events. The Conservation Administrator (or in her/his absence, the Conservation Commission) will check the height of the access paths in the spring and the fall to ensure that they conform to the requirements of the Order of Conditions. Compatible sand may be added or re-graded to maintain proper height and slope. The work will be conducted by the DPW under the supervision of the Conservation Administrator. The work will be restricted to the access path area, with care not to damage nearby vegetation.



Beach Grass Planting



The Town will maintain a regular program of beach grass planting to protect and repair the dune. The Beach Management Committee is responsible for coordinating a volunteer beach grass planting day each spring in order to ensure that annual planting of beach grass occurs. Since 2006, the Beach Management Committee has coordinated nearly 100 volunteers in the planting of 15,000 beach grass plants each year.

Beach grass (*Ammophila breviligulata*) is planted most successfully from November 15th to April 15th when the ground is not frozen. Planting holes should be spaced 12 to 18 inches apart, in staggered rows. Two or three beach grass culms should be planted in each hole; their roots set 7 to 9 inches below the dune surface. Sand should be packed tightly around the plants to eliminate air in the root zone.

Beach Maintenance: Use of Hand Tools

The use of any hand tools other than pitch forks and/or rakes to remove debris or seaweed must be approved by the Beach Management Committee and/or the Conservation Administrator (or in her/his absence, the Conservation Commission) prior to use.

Individuals carrying out the cleanup shall make reasonable efforts to remove as little sand as possible from the beach. Individuals shall rake up the debris and seaweed, shake it out to release as much sand as possible, and place it in the bucket of a front-end loader or in a truck.

In performing the cleanup, the Town may place both a front-end loader and a truck on the beach. Vehicles accessing the beach for cleaning purposes may access the beach only at designated access points, which are the following: south of Phipps Street, A Street, and X Street.

Photograph courtesy of Pat Petrilli.
First published in the Hull Times, March 2008.



The front-end loader will maintain its bucket in an upright position since its purpose in the cleanup is to assist in the movement of debris. The front-end loader is not to use its bucket to move or remove sediment (including sand, gravel, and cobble) unless due to the nature of the debris, the Conservation Commission grants permission to do so.

There shall be no disturbance to dunes, beach grass, beach plants, or other natural vegetation. All mechanical equipment shall be kept a minimum of ten feet from the seaward edge of the primary dune.

Beach Maintenance: Use of Rake-type Machines

A rake-type machine may be used to remove masses of debris and/or seaweed if approved by both the Beach Management Committee and the Conservation Commission prior to use. Prior to the initial use, the Town shall make all reasonable efforts to test the rake under consideration and to discuss the qualities of the rake with other towns using the same make and model.

The operator of the machine shall have a clear view of where the rake is relative to the surface of the beach to allow greater control in avoiding scraping or moving beach material during the seaweed removal process. At all times, the rake must remain at or above the beach surface. Individuals carrying out the cleanup shall make reasonable efforts to remove as little sand, gravel, and cobble as possible from the beach. Individuals shall rake up the seaweed and shake it out to release as much sand as possible before removing the seaweed from the beach.

If the rake-type machine requires it, the Town may place both a front-end loader and a truck on the beach to facilitate the cleanup. Vehicles accessing the beach for cleaning purposes may access the beach only at designated access points, which are the following: south of Phipps Street, A Street, and X Street. The front-end loader shall maintain its bucket either in an upright position or at grade in a stationary position.

The front-end loader is not to use its bucket to move or remove sediment (including sand, gravel, and cobble) unless due to extreme volumes or size of the debris, the Conservation Commission grants permission to do so. In such a case, every effort will be made to avoid moving or removing sediment. With permission from the Conservation Administrator (or in her/his absence, the Conservation Commission), seaweed may be re-

deposited back in the ocean during receding or lowering tide cycles. Debris must be removed from the seaweed before re-depositing it in the ocean. Follow up restoration of the beach and water quality testing of the nearshore waters may be required to assure the beach meets swimming standards for bacteria.

There shall be no disturbance to dunes, beach grass, beach plants, or other natural vegetation. All mechanical equipment shall be kept a minimum of ten feet from the seaward edge of the primary dune.

Beach Profiling

The purpose of the beach and dune profiles is to create a database for the studying of the movement of the beach and dunes. The profiles shall extend from Beach Avenue seaward to the approximate low tide line. The profiles may be performed by the modified Emery Rod method as well as using other surveying techniques.

Emergency Cleanup Procedures

In performing an emergency cleanup procedure, Best Practices for Use of Hand Tools and/or Rake Type Machines shall be followed. In addition the Town may place both a front-end loader and a truck on the beach to facilitate the cleanup. The material causing the condition shall be removed from the beach. Individuals carrying out the emergency cleanup shall make reasonable efforts to remove as little sand, gravel, and cobble as possible from the beach.

Major Storm and Hurricane Emergency Procedures

Emergency preparation actions before a storm occurs may include: removing objects (e.g. trash cans, benches, removable walkways) and debris (e.g. lobster pots or large logs) that could act as projectiles; filling beach access ways with sediments to control overwash damage; and taking photos of pre-storm conditions. As noted elsewhere in this document, removal of cobbles is prohibited (unless permitted by the Conservation Commission), as these sediments serve an important storm damage prevention function. For safety reasons, emergency response actions during the storm should ideally occur during periods below half-tide.

Sediment and debris cleared from Beach Avenue and connecting streets should be stockpiled in areas that are not threatened by continued storm processes. Debris should be removed and discarded properly as soon as is practicable. All sediment should be returned to the beach and primary dune, or stored for future use on the beach or dune, based on the recommendation of the Conservation Administrator (or in her/his absence, the Conservation Commission). Post-emergency actions may include: repairs to eroded sections of the beach and primary dune; re-establishing the beach access paths; and taking photos of post-storm conditions. The Conservation Administrator, or her/his designee, should take pre and post storm photos at the same set of designated locations for every storm.

Vehicle Access

Vehicles on the beach shall not be allowed to exceed the speed limit of 15 mph. Vehicles are required to be at least ten feet away from the Primary Dune Area or dune vegetation (seaward side of the primary dune) at all times except when engaged in dune replenishment or dune nourishment. The toe of the dune and dune vegetation typically advances seaward during the spring and summer season. Vehicles shall be used on the beach in a manner that will not create ruts on the beach and will vary their path to achieve this.

6. EFFECT OF PLAN

This Plan represents a series of objectives for the Town of Hull. It is recognized that not all objectives will be capable of completion at this time. Accordingly, a failure to comply with the provisions of the Plan shall not cause an invalidation of any acts nor shall the same cause or be the basis of any action against the Town of Hull. Any deviation from the Plan shall, however, be for a good cause.

This Plan does not attempt to define and regulate all parameters of beach and primary dune delineation, function, or management, and the Town of Hull declares its intent to review and update this Plan as may be needed from time to time to reflect appropriate new and beneficial knowledge. Any proposal for modifications to the Plan shall be submitted both to the Board of Selectmen for review and to the Conservation Commission for any activities that require permits under the Wetlands Protection Act.

This Plan is declared to be an exercise of the police power in the interest of safety and welfare for the protection of persons and property. In addition to any other power that the Town may have to adopt this Plan, its adoption is also pursuant to the authority to adopt same as provided for under Chapter 81 of the Code of the Town of Hull. If any parts of this Plan are for any reason held to be invalid, such adjudication shall not affect the validity of the remaining portions of this Plan.

This Plan shall take effect upon its final adoption by the Selectmen. Any proposals for amending the Plan should be sent to the Board of Selectmen. Finally, the Town may establish a "Beach Management Fund". All moneys in said fund shall be used for purposes regarding regulation, preservation, and protection of the beach and primary dune system of the Town of Hull.



7. REGULATIONS

- 7.1 The Hull Board of Selectmen and the Town Manager shall enforce this Plan.
- 7.2 Construction is prohibited on the primary dune except for access control structures if permitted by the Conservation Commission.
- 7.3 No person shall be on the primary dune unless:
- One is on an access control structure or walkway, or
 - For the purpose of constructing or maintaining the dune or allowed structures with the permission of the Town of Hull and permitted by the Conservation Commission, or
 - For the purpose of removing debris, which shall be done with great care not to damage the dune or beach grass, or
 - For the purpose of enforcement of this Plan, or
 - For emergencies as deemed necessary by Town of Hull Police and/or Fire Departments and/or the Town Manager and/or Board of Selectmen.
- 7.4 Christmas trees may not be discarded or placed on the beach.
- 7.5 The removal, cutting, burning, or destruction of natural vegetation, sand fence, or such other types of dune protection devices is prohibited, except as necessary for construction or maintenance authorized pursuant to the Plan and permitted by the Conservation Commission.
- 7.6 The removal or relocation of sand, cobbles and other naturally occurring sediments either from or within the Beach and Primary Dune Area is strictly prohibited, except as permitted by the Conservation Commission.
- 7.7 Sand, gravel, and cobbles which are transported by action of wind, tides, storms or any combination thereof to Beach Avenue or other public roads, or other locations off of the beach that pose a safety hazard, shall be returned to the Beach and Primary Dune Area free of foreign material and debris including, but not limited to tar macadam, asphalt/concrete, aluminum/vinyl siding, lobster traps, glass, trash, grass clippings, branches, and leaves as soon as practicable in accordance with the practices stated herein. Sand, gravel, and cobbles may be temporarily stored off-site before return to the Beach and Primary Dune Area. Sand, gravel, and cobbles shall not be placed on top of dune vegetation and shall be placed along the seaward edge of the dune or at unvegetated areas of the dune or at Point Allerton Cove at the discretion of the Conservation Administrator (or in her/his absence, the Conservation Commission). The repaired dune area shall be vegetated as soon as practicable. Existing areas of beach grass will tolerate up to 1 ½ feet of cover without the need to revegetate.
- 7.8 No primary dune shall be directly or indirectly altered to cause adverse effects on the coastal dune by the action or inaction of any person or entity. The

Town may cause the dune to be restored to its pre-existing condition. The Town may also maintain and replace, on a routine basis, sand fencing, other access control structures, signs, and beach grass (at appropriate planting time) that have been significantly damaged or destroyed.

- 7.9 Vendors shall conduct their business in a manner that will not damage existing dunes and only in areas designated by the Town of Hull. Vendors shall not park on the primary dune or park in such a way as to require patrons to stand on or traverse the primary dune.
- 7.10 There shall be no open or closed fires permitted on dunes. Fires on the beach are prohibited except with permission from public safety officials.
- 7.11 No animals shall be allowed on the beach from June 1st through September 15th. At all other times animals on the beach must be on a leash under control of the owner or caretaker who shall be held liable for the animal's behavior. Dogs are not allowed on the dunes. All animal excrement must be picked up by the owner or caretaker immediately, removed from the beach, and disposed of properly in accordance with Town By-Laws.
- 7.12 North Nantasket Beach is a "Carry In/Carry Out" area. No person shall drop, throw, or place any litter, garbage, or other refuse, including cigarette butts and household waste materials on the Beach or Primary Dune Area. Clean up and removal of all refuse is the responsibility of the visitor.
- 7.13 Suitable, regulatory, and cautionary signs shall be erected regarding beach policies and relevant town By-Laws.
- 7.14 Whoever violates any of the provisions of this Plan shall be deemed to have violated the provisions of the Code of the Town of Hull authorizing this Plan. Violators shall be subject to a fine of up to \$300.00, or such maximum fines as may be otherwise provided by law, whichever is greater. A violation of this Plan may also be penalized by a non-criminal disposition as provided for in M.G.L. C. 40, section 21 D and as provided for under Chapter 1 of the Code of the Town of Hull. Each day's violations shall constitute a separate violation. If any person or entity violates the provisions of this Plan, or causes damage to the dune or beach, including but not limited to physically damaging or destroying the access control structures, signs, and beach grass, or lowering the elevation of the dune, the Town may initiate civil action against such person or entity to protect the dune and beach system, and to restore the same. Nothing contained herein shall however, operate to limit civil actions or criminal prosecutions which the Town may take under this Plan, or any other applicable law, rule, regulation or right.

8. DEFINITIONS

Access Control Structure or Walkway is a constructed means of crossing the Primary Dune Area in accordance with drawings approved by the Hull Board of Selectmen, the Town Manager, and permitted by the Conservation Commission.

Barrier Beach is a narrow, low-lying strip of land generally consisting of coastal beaches and dunes extending roughly parallel to the trend of the coast. It is separated from the mainland by a narrow body of fresh, brackish, or saline water or a marsh system. A barrier beach may be joined to the mainland at one or both ends.

Beach Area is that area between the extreme low tide line and the seaward edge of the Primary Dune as hereinafter defined. This definition is consistent with "coastal beach" as defined in the Wetlands Protection Act Regulations.

Beach Profile is a cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or sea wall, extend over the backshore, across the foreshore, and seaward underwater into the nearshore zone.

Coastal Beach is unconsolidated sediment subject to wave, tidal and coastal storm action which forms the gently sloping shore of a body of salt water and includes tidal flats. Coastal beaches extend from the mean low water line landward to the dune line, coastal bankline, or the seaward edge of existing man-made structures, when these structures replace one of the above listed lines, whichever is closer to the ocean.

Conservation Administrator shall mean a person knowledgeable of the beach, the dunes and their care retained by the Town of Hull. In any periods during which no such expert is regularly retained, it shall mean such other knowledgeable person designated by the Town Manager.

Debris means any man-made substance either washed up or left behind on the beach. Examples include balloons, plastic bags, buoys, lobster traps, cigarette butts and pilings. It does not include natural vegetation or seaweed known as wrack.

Coastal Dune means any natural hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash. Coastal dune also means sediment deposited by artificial means, and serving the purpose of storm damage prevention or flood control. This definition is consistent with "coastal dune" as defined in the Wetlands Protection Act Regulations.

Landward Edge of the Primary Dune is the intersection line of the backslope of the dune and the grade of the land extending from the easterly line of Beach Avenue where Beach Avenue is constructed, or the westerly side of Beach Avenue as shown on the Town of Hull Assessors map where Beach Avenue is not constructed adjoining oceanfront properties.

Natural Vegetation shall include the terms "native vegetation" or "indigenous vegetation". Specifically, it shall include such plants as beachgrass (*Ammophila breviligulata*), dusty miller (*Artemisia stelleriana*), sea rocket (*Cakile edentula*), seaside goldenrod (*Solidago sempervirens*), bayberry (*Myrica pensylvanica*), beach pea (*Lathyrus japonicus*), salt-spray rose (*Rosa rugosa*), or seaside spurge (*Euphorbia polygonifolia*), or any other plants which normally grow in sand, or may be planted on the slopes of dunes or behind them, no distinction being made as to how such plants are introduced into their location.

Primary Dune, or primary frontal dune, is the coastal dune closest to the beach.

Relative Sea Level Rise is the combination of worldwide (eustatic) sea level rise and glacioisostatic adjustment of a landmass. On average, in quantitative terms over the past sixty years Massachusetts has been sinking at a rate of 1.9mm per year (0.0062 ft/year) while the ocean has been rising at 1mm per year (0.003 ft/yr), resulting in an approximate rate of relative sea level rise in Massachusetts of one vertical foot every 100 years. This rate of sea level rise does not include any projected increases resulting from climate change.

Sand Fence shall include the term "snow fence" of a barricade type, erected in a line or a pattern to accumulate sand and aid in the formation of a dune. It also may be used to direct the flow of pedestrian traffic. The following types shall be used: picket type consisting of light wooden fence held together by wire, and secured by posts; such other material as may be designed and approved for the same purpose by the Hull Board of Selectmen, the Town Manager, and the Conservation Commission.

Seaward Edge of the Primary Dune is the intersection line between the foreslope of the dune and the gradient of the beach area, the vegetation line, or the upper drift line, whichever is the more easterly or seaward.

Seaweed is any of numerous marine plants and algae, such as Irish moss (*Chondrus crispus*), kelps (*Laminaria spp.*, *Alaria esculenta*; *Agarum cribrosum*); rockweeds, (*Fucus spp*) various species of brown algae growing attached to intertidal rocks; sea lettuce (*Ulva lactuca*); and deadman's fingers (*Codium fragile*).

Storm Emergency is a situation so declared by the public authority having the jurisdiction and authority to declare an emergency.

Summer Season is Memorial Day through Labor Day.

Upper Drift Line or Wrack Line is that line produced by the winter spring tides (highest tides of the year) which contain natural deposits of ocean borne debris/flotsam such as seaweed and the seeds, rhizomes, or detached plants, which can germinate and/or grow to produce a zone of new dune vegetation.

Vegetation Line is that line separating the most seaward extent of naturally occurring or planted salt tolerant plants from the beach.

Wrack or Drift Line is washed-up marine vegetation and organic material deposited on the backshore during high tides and storms. These deposits often contain fragments and seeds of dune plants, which are beneficial to dune redevelopment.

9. BIBLIOGRAPHY

The Guidelines for Barrier Beach Management in Massachusetts, A Report of the Massachusetts Barrier Beach Task Force (MCZM, 1994) was utilized as a reference document for resource impact information and some general recommendations in this Beach Management Plan.

The Wetlands Protection Act Regulations are found in 310 Code of Massachusetts Regulations 10.00.

The Wetlands Protection Act is found at Massachusetts General Laws Chapter 131, Section 40.

Appendix A

The Formation of Nantasket Beach

“Formerly isolated drumlins, more or less eroded by the sea, may thus be tied together by sand beaches, as has been the case on the Massachusetts coast, in the formation of Nantasket beach. Here beaches have in some cases been built so rapidly that the old cliffs have been protected from further erosion, and thus drumlins in various stages of dissection, but now some distance inland from the shore, enter into the construction of this remarkable land-mass.”

Amadeus William Grabau. A Textbook of Geology. D.C. Heath & Co., Boston and New York, 1920

In 1907, Professor, D. W. Johnson of Harvard's Department of Geology and Geography taught an advanced course in Physiography, which included the investigation of shoreline topography. One of his three students, Mr. W. G. Reed, Jr. chose Nantasket Beach as his subject. Later that year Reed presented his paper on the development of Nantasket Beach in New York at a meeting of the geologists of the eastern United States. The resulting paper, “The form of Nantasket Beach” authored by D. W. Johnson and W. G., Reed, Jr. was published in 1910 in the Journal of Geology (vol. 18, p. 162). The paper described the successive stages by which a number of “lost” and eroded drumlins contributed to the formation of Nantasket Beach by the “cutting back and tying together of these drumlins.” Theirs remains a classic on the subject and Hull, with its drumlin-dominated topography, comprises a classic post-glacial depositional landscape.

Drumlins are low, smoothly rounded, and elongated hills made up of compacted glacial till that has been sculpted beneath the ice of a moving ice sheet or glacier. Drumlins can either exist singularly or in a group; a group of drumlins is called a swarm. There are over 200 drumlins in the Boston area with about 30 or so “drowned” drumlins making up many of the islands in Boston Harbor. According to the National Park Service, “The Boston Harbor Islands are a geological rarity, part of the only drumlin swarm in the United States that intersects a coastline.”

In addition to these “drowned” drumlins there are also “lost” drumlins that have been completely eroded. Many of the “lost” drumlins contributed to the formation of not only Nantasket Beach, but also all of Hull from Atlantic Hill north, which consists of a barrier beach.

The following illustrations show how the “lost” drumlins (in dotted lines) contributed to the creation of Hull's barrier beach and are from Grabau's Textbook of Geology, which were reproduced from the studies of D. W. Johnson and W. G. Reed, Jr. (Figs. 1 to 6).

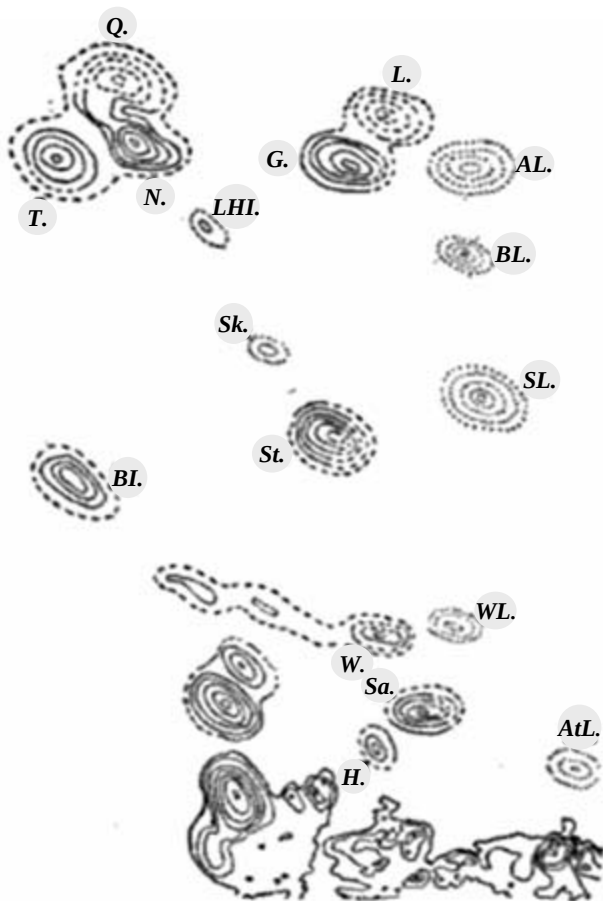
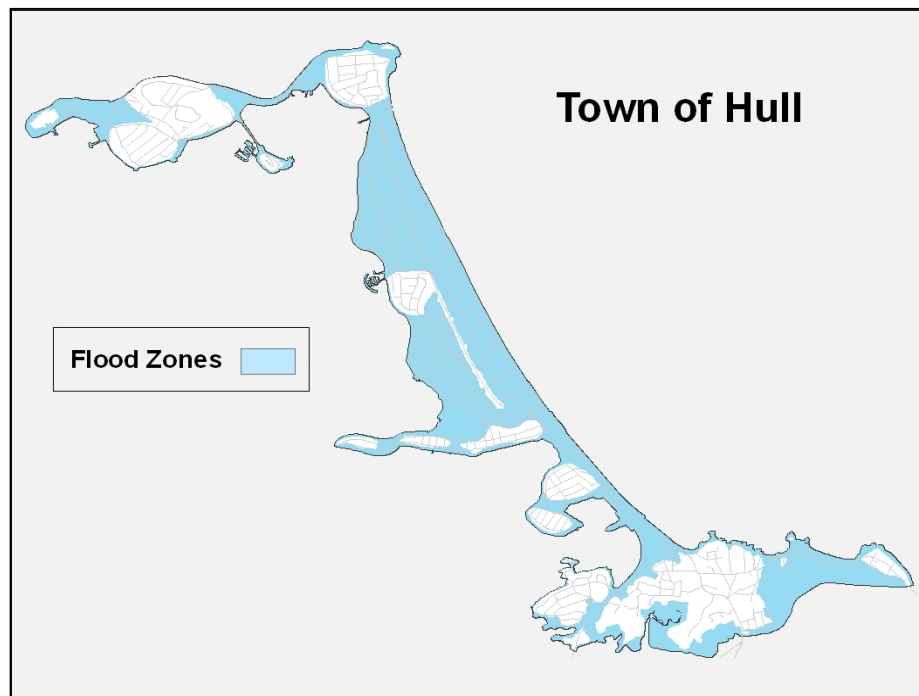


FIG. 727. — Development of Nantasket Beach. (After Johnson and Reed.) First stage, original drumlins restored. Restoration in dotted lines.

- | | | |
|-------------|--------------------------|---------|
| <i>AL.</i> | Allerton Lost | Drumlin |
| <i>AtL.</i> | Atlantic Lost | Drumlin |
| <i>BL.</i> | Bayside Lost | Drumlin |
| <i>BI.</i> | Bumkin Island | |
| <i>G.</i> | Great Hill | |
| <i>H.</i> | Hampton Hill | |
| <i>L.</i> | Little Hill | |
| <i>LHI.</i> | Little Hog Island | |
| <i>N.</i> | Nantasket Hill | |
| <i>Q.</i> | Quarter Ledge | |
| <i>Sa.</i> | Sagamore Head | |
| <i>Sk.</i> | Skull Head | |
| <i>SL.</i> | Strawberry Lost | Drumlin |
| <i>St.</i> | Strawberry Hill | |
| <i>T.</i> | Thornbush Hill | |
| <i>W.</i> | White Head | |
| <i>WL.</i> | White Head Lost | Drumlin |
| <i>WP.</i> | Windmill Point Sand Spit | |

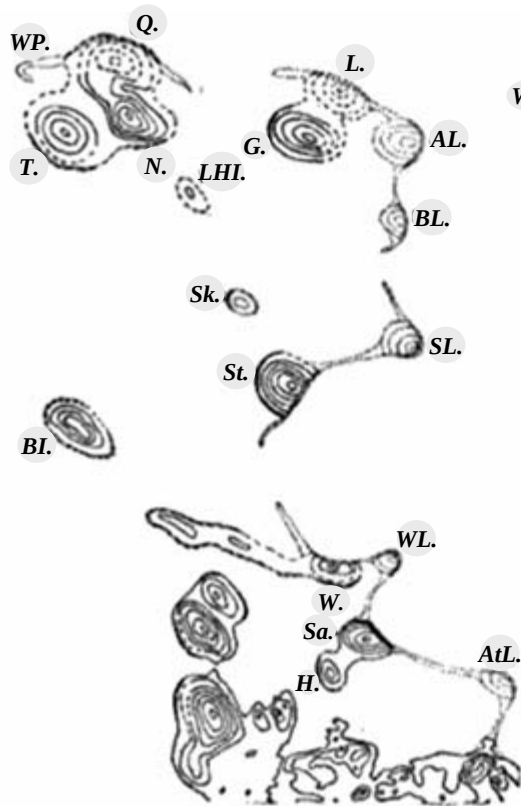


Fig. 2. 2nd Stage. Early erosion and connection of some of the drumlins by large bars or tombolos.

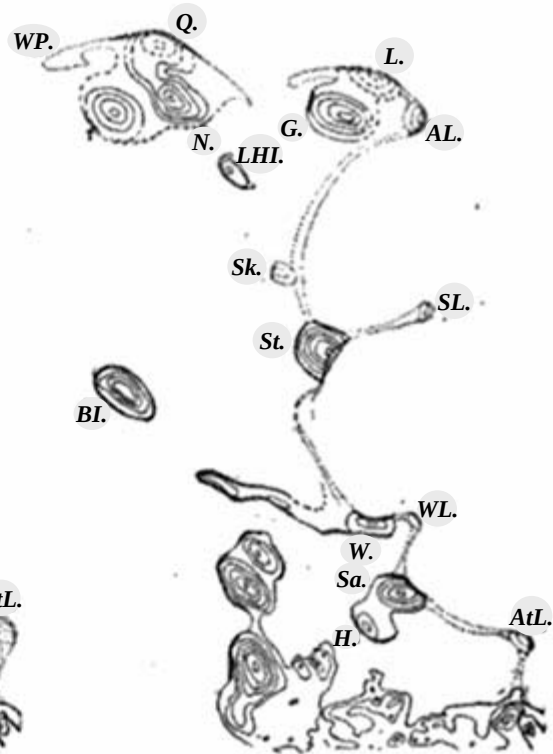


Fig. 3. 3rd Stage. Further connection of eroded drumlins by beaches.

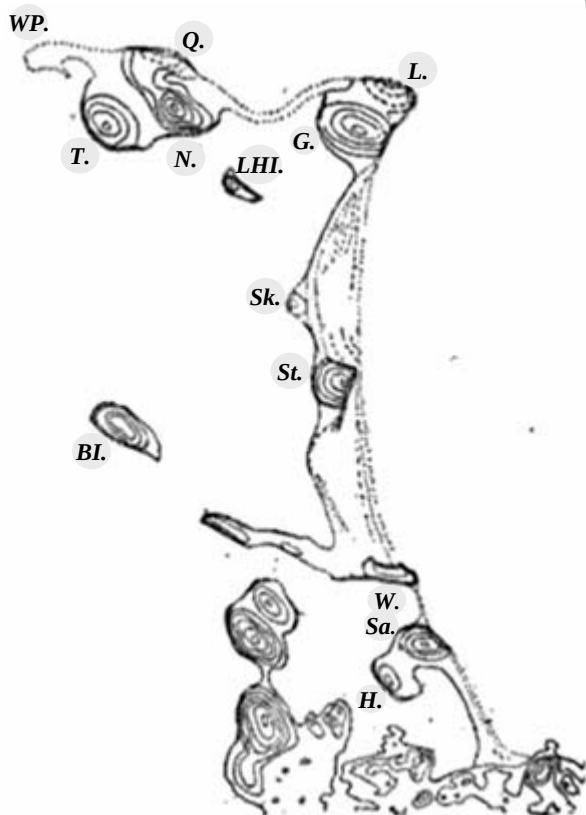


Fig. 4. 4th Stage. Development of beach-ridge and beach-plain.

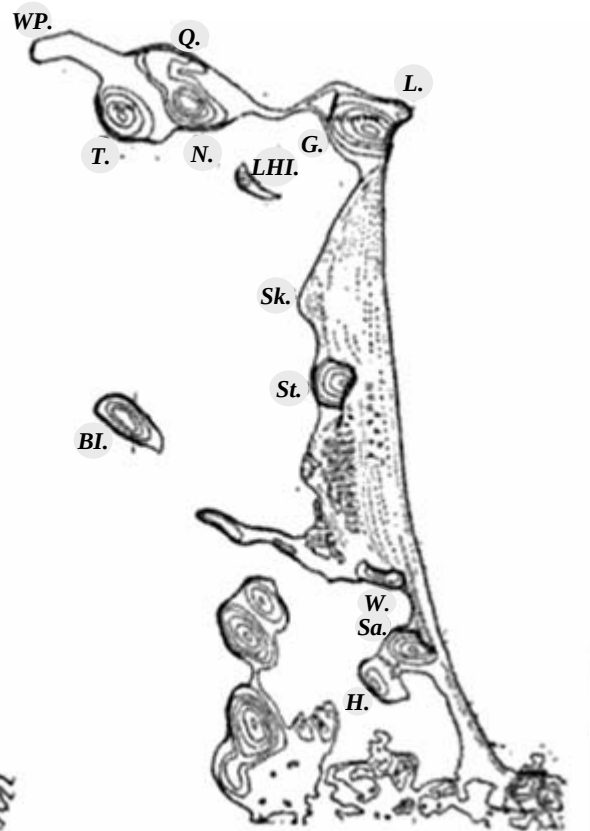


Fig. 5. 5th Stage. The modern beach. Consisting of old cliffed drumlins with broad beach-plain.

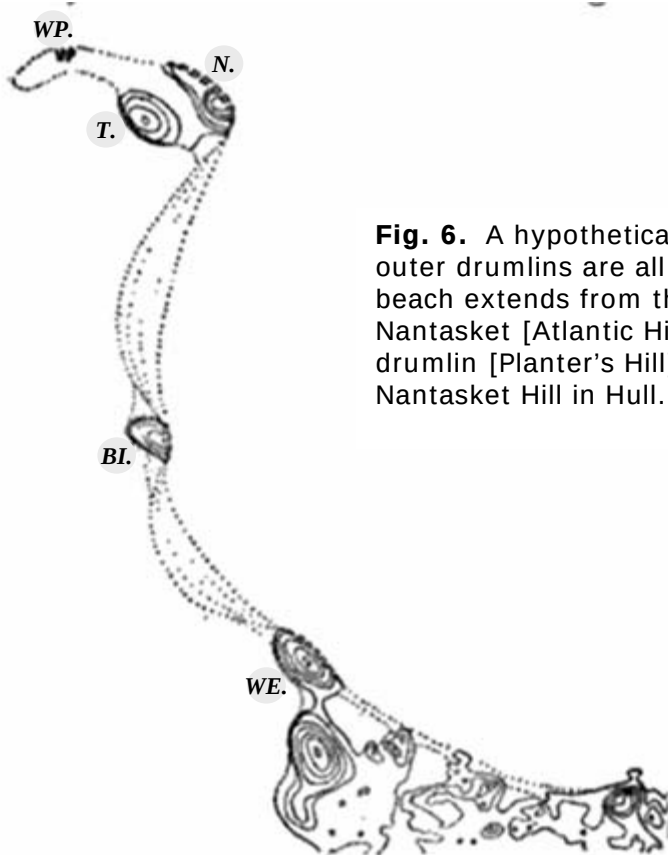
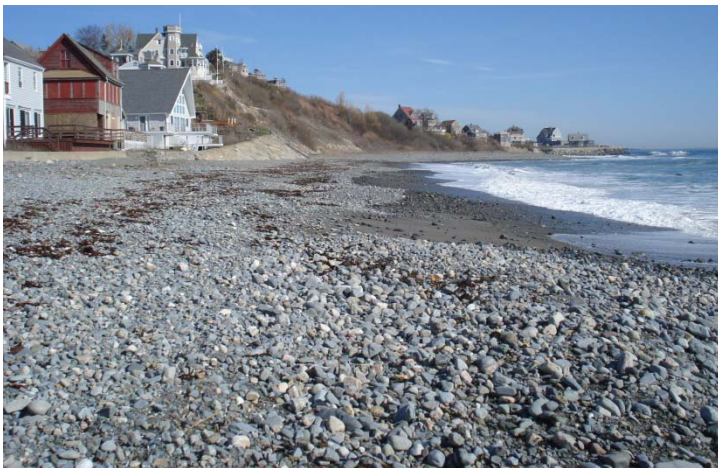


Fig. 6. A hypothetical future stage. The outer drumlins are all worn away and the beach extends from the rocky ridges at Nantasket [Atlantic Hill] to World's End drumlin [Planter's Hill] and thence to Nantasket Hill in Hull.



The Allerton Hill drumlin, once a source of sediment for North Nantasket beach, is armored with a revetment and can no longer continue to contribute sediment to North Nantasket beach.













MAP 5. H Street to Q Street of Plan Area.

200 100 0 200 Feet

North Nantasket Beach Management Plan

BMP Beach and Primary Dune Area
Seaward to MLW

BEACH AVE (NOT PAVED)

BMP Beach and Primary Dune Area
Seaward to MLW

BMP Beach and Primary Dune Area
Seaward to MLW

MAP 6. Q Street to W Street of Plan Area.







COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE
20 RIVERSIDE DRIVE, LAKEVILLE, MA 02347 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

17 SEP 2007

Hull Conservation Commission
253 Atlantic Avenue
Hull, Massachusetts 02045

RE: HULL--Wetlands
Technical Assistance
Shoreline from L to X Streets

Dear Commissioners:

Upon a request from your Commission for technical assistance, Jim Mahala from the Department of Environmental Protection (DEP), Southeast Regional Office met with several members of the Conservation Commission, Commission staff, Chairman from the Board of Selectmen, Town Manager, Town Counsel, Chairwoman of the Beach Management Committee, and the environmental consultant hired by the Town to help prepare the Town's Beach Management Plan for Nantasket Beach (the "Beach Management Plan Consultant"), on July 16, 2007. Members of the staff of the Massachusetts Office of Coastal Zone Management (CZM) also attended. The meeting resulted from the Town's request that the Department provide technical assistance to the Conservation Commission relative to what might be allowable under the Wetlands Protection Act Regulations to minimize storm damage as a result of sediment (mostly cobble with some sand) accumulation in front of an existing vertical seawall, which sediment tends to ramp up over the wall and the cobbles may act as projectiles during storm events. We understand that the Town has previously excavated and relocated cobble in front of the seawall and deposited the cobble near the low tide line in an attempt to reduce storm damage.

Following a brief discussion at Town Hall, participants walked the beach from X Street to L Street and observed the conditions of the beach, sediment type, presence and density of vegetation and viewed the extent to which the seawall is exposed along the shoreline. As a result of the meeting and on-site inspection, DEP has the following suggestions and recommendations for your consideration. Note, however, this letter is not an approval or other authorization for any activities related to managing the beach, and it is without prejudice to the claims of the Commonwealth for past environmental violations there.

As you are aware, Nantasket Beach is a densely developed barrier beach with much of the barrier subject to coastal storm flowage. As you know, residing alongside the ocean comes with its risks. Northeasters and hurricanes are capable of causing substantial damage to conventional structures due to wave action and storm surge, flooding and overwash can result in damage to structures located landward of the oceanfront, and over the longer-term sea level rise will likely exacerbate the threat to buildings and infrastructure on the barrier beach. Elimination of the

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD Service - 1-800-298-2107.

DEP on the World Wide Web: <http://www.mass.gov/dep>

Printed on Recycled Paper

threat of storm damage to existing development is not realistic, however, steps can be taken to reduce the potential for storm damage on both a short-term and long-term basis.

All sediment that comprises the volume and form of the beach plays an important role in dissipating wave energy and reducing storm damage. Many beaches within the Commonwealth have a significant cobble component to the overall volume of the beach. Some barrier beaches are anchored at one or both of their ends by glacial landforms called drumlins, such as Point Allerton. Drumlins are composed of a mixture of sediment types: clay, silt, sand, pebble, cobble and boulders. In high wave energy environments such as Nantasket Beach, the finer sediments tend to be transported by waves and currents leaving the coarser sediments behind. These sediments are often referred to as a lag deposit. Thus, the accumulation of cobble along the northern end of Nantasket Beach is a natural occurrence and not unusual.

The Department generally does not permit manipulations to the natural profile of the beach or dunes. Beaches tend to naturally attain a profile that is in equilibrium with the wave, current and tidal forces acting upon it. Consequently, manipulations to the profile may reduce the capacity of the beach to dissipate wave energy and thus may lead to increased storm damage. There may be instances though on a densely developed shoreline, particularly where the shoreline has existing coastal engineering structures, where minor manipulations to the profile may be allowed in accordance with the requirements of the Wetlands Protection Act to attempt, temporarily, to reduce the risks of storm damage. The situation that presently exists, particularly between U and X Streets, where cobble has been deposited up against and, in some areas, over the top of the seawall, may be one in which a modification to the composition of the profile could potentially reduce the risk of storm damage as a result of cobble acting as projectiles during storm events. Based on an appropriately developed record of the facts, including facts that demonstrate that the impact of the proposed activities on the protected resource are mitigated, excavating a limited amount of cobble in the vicinity of the seawall to attempt temporarily to abate the potential for cobble to act as a projectile during storm events could still allow the resource to serve the statutory interest of storm damage prevention, and may be permissible.

As discussed with the Town's Beach Management Plan Consultant at the site visit, in order to meet the performance standards for coastal beaches [310 CMR 10.27(3)] the Town would need, among other things, to replace the cobble with sand from an offsite source so as to minimize the change in form of the beach, and spread the excavated cobble further seaward on the profile in the vicinity of the beach berm. The Department recommends that this sand be vegetated to improve stability and enhance storm damage protection. Also, cobble removal could only occur in the designated area abutting the seawall. Further, the Department would recommend prohibiting moving cobble in areas where dense vegetation has been established. The details of such a manipulation would need to be developed by the Town, working with its Beach Management Plan Consultant, with assistance from DEP and CZM staff. The Department cautions the Town, however, that this type of beach manipulation may only temporarily reduce the potential for storm

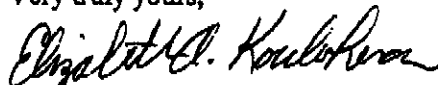
damage and it is essential that the shift of cobble be mitigated by adding sediment to the beach from an outside source.

The Department would also recommend that the Town's Beach Management Plan Consultant evaluate other storm damage reduction strategies. For example, beach nourishment could be conducted along areas where beach width is minimal and/or a primary dune could be constructed and vegetated in areas where it's non-existent to improve the ability of the beach and dune system to provide storm damage protection to the development in this area. DEP and CZM staff would be available to review such plans and provide technical feedback.

Please be advised that implementation of any activity that will remove, fill, dredge or alter an area subject to protection under the Wetlands Protection Act will require the filing of a Notice of Intent (NOI) and receipt of an Order of Conditions. The Department would recommend that the beach management plan that the Town is currently developing include, among other things, a strategy for addressing the issue of the cobble at the seawall that could be implemented through a NOI filing and subject to certain conditions as deemed appropriate by the Conservation Commission, subject to MassDEP superseding review under the Wetlands Protection Act.

We look forward to continuing to work with the Town in addressing the issues arising from the cobble that has accumulated at the seawall, and in developing a management plan for Nantasket Beach that helps the Town maximize the benefits of this important resource for the environment and for the public. If you have any questions regarding this matter, please contact Jim Mahala at (508) 946-2806.

Very truly yours,



Elizabeth A. Kouloheras

Bureau of Resource Protection

K/JM

cc: Town of Hull
Office of the Selectmen
253 Atlantic Avenue
Hull, MA 02045

Commonwealth of Massachusetts
Office of the Attorney General
One Ashburton Place
Boston, MA 02108
ATTN: I. Andrew Goldberg, Esq.

DEP - NERO
ATTN: Rachel Freed
Heidi Zisch, Esq.

DEP - Boston
ATTN: Lealdon Langley

Massachusetts Office of Coastal Zone Management
251 Causeway Street, Suite 800
Boston, MA 02114
ATTN: Rebecca Haney
Jason Burtner