

MEMORANDUM

DATE: June 23, 2016
TO: Liz Durkee, Oak Bluffs Conservation Agent
FROM: Stan Humphries, Senior Coastal Geologist 
RE: Proposed Beach Raking Project – Preliminary Findings and Recommendations
PROJECT #: TOOB\16-172.01

Proposed Project:

- Activities – The Beach Committee “Proposed Raking for Pay Beach and Inkwell” is for the long-term project (Attachment 1). The “Immediate Actions to Address the Present Condition of Pay Beach” is for the short-term project described as follows: *Raking of the dredge material placed on Pay Beach in 2015 will be raked as soon as practical; rocks collected may be removed from the beach to a site identified and approved for deposition. The front of the dredge material on Pay Beach will be re-graded to create a 1:10 slope above Mean High Water.*
- Wetland Resources Areas – Coastal Beach, Land Subject to Coastal Storm Flowage and Buffer Zone to Coastal Bank and Coastal Dune.
- Local Bylaw interests, characteristics and regulations –
 Section 2.02(2) Preamble states: *Coastal beaches... are significant to wildlife and wildlife habitat, storm damage prevention, recreation usage, historic and natural views and vistas, and flood control.*
 Section 2.02(3) Characteristics, critical to the proposed project, are:
 (B) *Storm damage prevention, erosion control, or flood control include, but are not limited to: sediment volume and form, dispositional cycles, and wave intensities.*
 (C) *Natural and historic views and vistas include, but are not limited to: natural erosion and deposition cycles, beach relief and elevation, and a sense of openness and solitude.*
 (D) *Recreation include, but are not limited to: topography, sediment grain size, water quality, water circulation rates and patterns, unobstructed access along the shore, natural erosional and depositional cycles and wave intensity.*

Section 2.02(4) Prohibitions:

Cleaning and raking of a coastal beach is prohibited in the Drift Line Zone due to the sensitive nature of this portion of the high beach wand when the area adjacent to the spring high tide zone is designated a nesting habitat for any species of tern or the piping plover. The Drift Line Zone consists chiefly of organic material deposited on the backshore during high spring tides or storms. Drift Lines may contain large quantities of marine algae, eelgrass, and marsh detritus. Bacteria and fungi quickly break down this organic matter, releasing nutrients into the sand and eventually back to the sea.

Section 2.10(1)(B) Land Subject to Coastal Storm Flowage is significant to *(1) Flood control, erosion control, and storm damage prevention...*

Section 2.10(2) Regulation, relative to the proposed project, is: *(A) The work shall not reduce the ability of the land to absorb and contain floodwaters, or to buffer inland area from flooding and wave damage.*

- State Act interests and regulations –

Section 10.27(1) Preamble states: *Coastal beaches... are significant to storm damage prevention, flood control and the protection of wildlife habitat.*

Section 10.27(3) *Any project on a coastal beach, except any project permitted under 310 CMR 10.30(3)(a), shall not have an adverse effect by increasing erosion, decreasing the volume or changing the form of any such coastal beach or an adjacent or downdrift coastal beach.*

Introduction:

- Beach raking in N.E. – Over the last 10 years, at least, beach rakes and their usage has involved 20-30 coastal and inland cities/towns in MA, including the Massachusetts Department of Conservation and Recreation - DCR (T.J. Chapman, *pers. comm.*). Many towns, including Oak Bluffs, have management plans and regulations that specifically address raking of wrack and seaweed (Attachment 2); but there are none that specifically address the physical structure of the beach as it does in other regions of the U.S. (e.g., FL and MS). One reason for this may be that glacial sediments complicate the raking process. An example of a management plan that includes raking is being used by the DCR (Attachment 3).
- Provincetown Study – Recent findings of beach raking investigation *suggests that raking did not contribute to any discernable accretion or erosion in the region of the beach that was actively raked (above MHW)*. However, changes in beach profiles did occur below the raking area in the area influenced by the tide. This finding was a byproduct of the study and the removal of rocks may not have occurred since the sediments are not glacial in nature nor associated with a dredged disposal program.

- Raking Procedure – Beach raking is done by a machine that is pulled by a vehicle whose speed controls the size and amount of material that is removed. The slower the vehicle speed and conveyor belt of the raking machine moves, the larger the material size. Depth of the raking is also a consideration. In general, 6-inches is too deep because the machine would move too slow and while 2-3 inches allows the machine to move faster, it will pick up gravel size material (T.J. Chapman, *pers. comm.*). Raking should not be confused with sifting where large volumes of material are excavated and screened for a particular grainsize.

Preliminary Findings:

- Geology of Oak Bluffs - A majority of the northeast-facing coast of Martha's Vineyard consists of outwash plain deposits underlain by terminal moraine deposits. While gravelly coarse sand is the dominant beach sediment, cobble with some boulder size material exists in the nearshore areas (Skehan, J.W., 2001). Therefore, offshore pebble to cobble sized material may be deposited onshore during storm events. This is not the case along the southern shore of the Vineyard where there are only outwash plain deposits. These beaches are more sandy and have less coarse material as their composition.
- Resource areas along Pay and Inkwell Beaches -
 - Coastal Beach - *means 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 human-made structures, when these structures replace one of the above lines, whichever is closest to the ocean.* The project would be located above MHW and extend landward towards the bank, dune or seawall. Assuming a 3-foot depth of beach sediment above MHW, a 4-inch (0.3 feet) work depth of the raking would comprise a direct alteration of 10%. Relocation of some material (i.e., only larger sized sediments) would comprise less than 10%.
 - 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.* There is an area on the south end of Pay Beach comprising approximately 22,500 square feet that would be defined as Coastal Dune. It includes numerous mounds that are vegetated with American beach grass (*Ammophila brevigulata*) and areas between the mounds that have been flattened by beach goers. Any raking and disposal activities should be setback from this area.
 - Coastal Bank - *means the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland.* This resource area abuts Pay Beach for nearly its entire length and was reconstructed when concrete walls and slabs were removed in 2010. Since a

wide range of sediments exist within the Coastal Bank, the toe of the bank would be an appropriate location for the disposal of rocks that may be raked from the beach.

- Land Subject to Coastal Storm Flowage - *means 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.* There is a flood Zone VE (el. 21) mapped on Pay Beach and a flood Zone VE (el. 13) mapped on Inkwel Beach. Waves greater than 3-foot high will be expected in these areas during the 100-year storm. With no substantial change to the beach from raking, the impacts of flooding is expected to be negligible. Deposition of rocks along the toe of the bank from the raking project may assist in controlling flood erosion.

- Approval Considerations –

1. Both Pay and Inkwel Beaches have been used for dredged material disposal and continued maintenance as “engineered” beaches and future maintenance recommendations have been provided (Applied Coastal, 2010);
2. Disposal of dredged material on Pay Beach in 2015 was partially sieved but a large amount of pebble to cobble size material remains on the beach above the intertidal zone;
3. The material was also deposited in such a manner that an abrupt grade change exists along its seaward edge. This embankment will rapidly erode unless it can be changed to a more natural beach grade of between a 1:7 – 1:10 slope;
4. With *recreational usage* being a protected interest of the Bylaw and sediment grain size being a critical characteristic, raking of the rocks (3/4” or greater, coarse pebble and cobble) is reasonable to consider;
5. The “rocks” cannot be removed from the beach because this would reduce the volume of the beach. All material removed during the raking must be disposed of elsewhere on the beaches. Simple disposal methods not involving other alterations (i.e., trench excavation) is preferred; and,
6. Protection of the vegetated dune area is paramount.

Preliminary Recommended Conditions:

- Engineered Beaches: Pay Beach and Inkwel Beach have been and are proposed to be used as dredged material disposal areas for beach nourishment purposes. The raking project is a trial for these beaches only and do not open the permitting to other beaches.
- Two Project Areas: 1) Pay Beach between the two stone groins approximately 800 linear feet; located landward of MHW to the toe of the Coastal Bank and 15 feet from the Coastal Dunes; comprising a strip approximately 50 feet wide for a total area of 40,000 square feet. 2) Inkwel Beach between the Pay Beach groin and its south groin approximately 435 linear feet; located

landward of MHW to the seawall; comprising a strip approximately 35 feet wide for a total area of 15,225 square feet.

- Raking and Grading Procedure: The vehicle used to pull the raking machine shall not exceed 1800 rpm and the rake shall be placed at a depth of 3-4 inches. Raked material shall be disposed along the toe of the Coastal Bank between the Coastal Dune and the north groin within a 5-foot wide strip. This area would accommodate a maximum of 260 cubic yards (475'x5'x3') of material. A front-end loader shall be used to grade the steep slope embankment just above MHW to a maximum slope of 1:10. Additional passes of the rake shall be allowed immediately after the grading is completed.
- Trial Basis – a four-month timeframe (July to November) shall be considered. After the initial raking, the frequency of raking shall be limited to once every two weeks or a maximum of eight (8) times.
- Short-term Monitoring – Pre- and post-raking photos shall document each raking event. Specific stations or transects shall be determined and used for the photo locations. Amount, size and scale of material removed, as well as the disposal location and dimensions, shall be documented.
- Short-term Reporting – A written report with photos shall be submitted and presented to the Commission each month during the trial project. Adjustments to the approach and approval shall be discussed as the project proceeds.
- Annual consideration – Based on the results of the trial period, the Order of Conditions can be amended for project implementation during the following two years. This process would consider the “Proposed Raking Plan for Pay Beach and Inkwel” that has been recently submitted to the Commission (Attachment 1). One to three year extensions can be considered one month prior to the OOC expiration date.
- Long-term Monitoring – TBA
- Long-term Reporting – TBA

References: TBA

Attachment 1

Proposed Raking Plan for Pay Beach & Inkwell
prepared by Oak Bluffs Beach Commission

Proposed Raking Plan for Pay Beach and Inkwell

As part of normal maintenance the beaches may be raked as needed, but no more than twice per week during the season, from May 15 to Labor Day. Raking will be completed by 10:00 am.

The areas to be raked are from Mean High Water to the seawall or the base of dunes, with equipment staying 10 feet away from dune areas.

Raking will be done parallel to the beach's trend, and not perpendicular, to avoid moving material below the mean high water line.

Raking will be done with a four-wheel drive tractor and a surf rake. Raking will be limited to a depth of 3" to preserve in place as much mass as possible while allowing for a quality recreation experience.

When dredge material is placed on beaches, raking may commence once the material is spread, without restriction as to timing. Raking may be done to a depth of 6". Rocks collected from dredge material may be removed from the beach to a site to be identified.

Clean gravel, cobbles or stones screened from the beach shall be retained on the beach and buried at the foot of dunes; trash and debris will be removed from the beach.

The dry portion of wrack located above Mean High Water may be removed and buried along with stones at the base of dunes, taking care not to deposit any material on dunes where it can smother live plants. Seaweed is useful to help build and sustain dunes; as it decays, it provides organic matter to the dune that helps to establish and support growth of beach grass.

At the end of the summer season, beach management staff and the Conservation Commission shall review all maintenance procedures and recommend any modifications for the following year.

Immediate Actions to Address the Present Condition of Pay Beach

Raking of the dredge material placed on Pay Beach in 2015 will be raked as soon as practical; rocks collected may be removed from the beach to a site identified and approved for deposition.

The front of the dredge material on Pay Beach will be regraded to create a 1:10 slope above Mean High Water.

Attachment 2

Cape Cod Raking
prepared by E. Durkee, Oak Bluffs Conservation Agent

Cape Cod Raking (E. Durkee)

Yarmouth – to remove debris and litter, seaweed, rake to skim surface to avoid scraping sediment

Falmouth – cobble and stones screened from the beach shall be returned to the beach

Brewster – denied beach raking; some raking grandfathered(?)

Harwich – component of comprehensive permit for town to allow beach nourish/dredge, seaweed

Provincetown – must be done in a way that preserves existing form, volume and grain size distribution of beach (new application – hand raking only)

Chatham – removal of seaweed

Bourne – clean debris, trash, detritus

Mashpee – removal of large accumulations of seaweed

Barnstable – removal of seaweed

Dennis – grandfathered; CC considering a comprehensive plan/permits

Attachment 3

DCR Beach Maintenance & Operations (BMP)



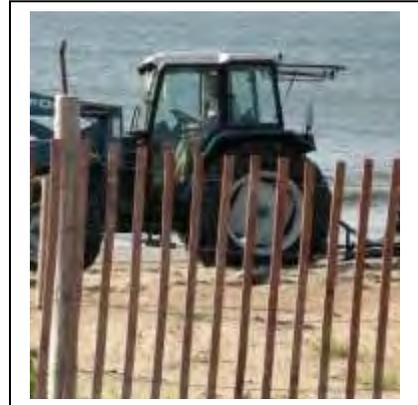
**MA Department of Conservation and Recreation
Office of Regional Planning
Best Management Practices**

3/2015

Beach Maintenance & Operations

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Goal: Beaches and barrier dunes are important coastal resources and critical habitats for plants and wildlife. Dunes function as a buffer to storm surges and flooding, protecting local communities, diffusing energy and reducing erosion from high winds and waves. The following guidelines are intended to improve protection of barrier beach and dune system resources, including native vegetation and rare shorebird habitat, while conducting routine or periodic maintenance activities.



Guidelines:

- Beach maintenance activities occur in coastal wetland resource areas and are therefore subject to review under the Wetlands Protection Act (see BMP for Compliance with the MA Wetlands Protection Act).
- The most effective method to ensure compliance with the Wetlands Protection Act (WPA) is to file an Operational Maintenance Plan (OMP) for review by the local Conservation Commission. The OMP includes a description of all routine and periodic maintenance activities. The OMP is submitted with a Notice of Intent and involves a public hearing, after which the Conservation Commission issues an Order of Conditions permitting activities that will comply with the Regulations. Standard maintenance activities may include installation of beach fencing, beach grooming / raking, reclamation of sand from parking areas and access roads, and routine maintenance of parking areas and roadways. DCR's Coastal Ecologist can work with you to prepare and submit the OMP.
- Vehicular Access: Maintenance and emergency vehicle access that occurs within the boundaries of coastal wetland resource areas (as defined by the WPA) should be described in the OMP. During the rare shorebird nesting season, all authorized vehicles should stay at least 100 yards away from the fenced boundaries of any bird management zones.
- Equipment Operation: DCR's equipment shall be operated in a manner and location that will minimize potential environmental impacts. DCR operations staff is trained to operate heavy equipment in sensitive areas and is aware of the protection of coastal resources and of rare shorebird nesting activities.

- **Equipment Storage:** There shall be no stockpiling of any kind of material or storage of equipment or vehicles beyond existing paved areas. This shall exclude special events, as approved by the Conservation Commission.
- **Beach Cleaning / Raking:** This is a specific routine maintenance activity that requires vehicular access and should be described in the OMP. The frequency of this work activity is variable depending on the intensity of public use during the recreation season, and staff maintenance capacity. The Coastal Ecologist and shorebird monitoring consultants will assist with resource protection by providing information to MassParks staff regarding location of nesting sites and avoidance strategies. MassParks staff should not remove any wet portions of the wrack line so that it is available as a food source for shorebirds. Areas proposed for mechanical beach cleaning after April 1st shall be first surveyed by a qualified monitor approved by NHESP, to determine whether the proposed work is within 100 yards of any unfledged chicks of state listed shorebirds. If chicks are present within 100 yards, the monitor must be present during any beach cleaning / raking activities until the chicks have fledged.
- **Removal of winter debris:** Debris shall be removed from the beach each year during the month of March. In order to remove debris, staff members use front-end loaders, bulldozers, Recreational Trailer Vehicles (RTV), Gators, and a pick-up and/or dump trucks. This work should occur before April 1st, unless approved by NHESP. If work must occur after April 1st, all beach areas to be impacted must be first surveyed by a qualified shorebird monitor and approved by NHESP, to determine status and locations of state-listed shorebirds.
- **Parking Lot / Access Road / Boat Ramp Maintenance:** If these activities normally occur within the boundaries of coastal wetland resource areas, they should be described in the OMP. This is a year round activity, but the majority of the sand reclamation is done in the spring, using a front end loader and dump truck to return sand to the public beach area.
- **Seawall Sand Maintenance:** Seawalls exist at some of DCR's coastal facilities. Beach sand builds up along the seawall and after major storms. The wall cap was designed to contain blowing sand on the beach. When the beachside of the wall is full, it creates a ramp that accelerates deposition of sand onto the sidewalks and boulevard. Sand that accumulates along the entire length of the seawall is removed and re-graded back away from the seawall using front-end loaders and bulldozers. This operation is performed during March in the spring, and in the fall during October and November; or as needed based on sand accumulation surpassing half the height of the seawall.
- **Re-grading of the beach:** If rare shorebirds are nesting, no re-grading or bulldozing of sand on the beach shall occur between April 1st and August 31st unless approved by NHESP. If work must occur between April 1st and August 31st, the beach work areas must be first surveyed by a qualified shorebird monitor and approved by NHESP, to determine status and locations of state-listed shorebirds
- **Reclamation of sand:** Preservation of sand on the beach is an ecological and shore protection priority to avoid impacts to the beach system and to preserve its storm protection functions. Sand blown from the beach and not retrieved accelerates the erosion of the beach and diminishes its

shore protection functions. Sand that accumulates along roadways may create a safety hazard and obstructs passage for vehicles and pedestrians. The majority of the sand reclamation is performed in the spring and/or after coastal storms. Bobcat tractors operate to scrape sand that has blown onto sidewalks and roadways and may place the sand onto the beach under the following conditions:

- a) DCR obtains a determination that public safety is at risk as a consequence of sand accumulation on the roadway that prevents safe passage. This determination will be made by the Massachusetts State Police, DCR Ranger or by a DCR Senior Operations Supervisor.
 - b) DCR staff will first assess the deposited sand for any discolored or contaminated material. If any are found, they will be separated, won't be placed on the beach and the contaminated sand shall be removed from the site.
 - c) This task will be performed immediately after the storm event ceases by DCR and/or maintenance contractors retained by DCR
 - d) DCR will capture images and create a log record with the date and time of the event. DCR District Management will provide the record within 72 hours after operations are concluded to the Conservation Commission, as evidence of compliance.
 - e) Sand that is collected by street sweepers will only be removed from the site.
- Sand / Dune Stabilization: Installation of sand fence is conducted in the fall. Staff transport fencing material to the beach using Gators, Pick-up Trucks and front-end loaders. Sand fence should be removed in the early spring prior to shorebird nesting season. MassParks staff are sometimes assisted by volunteers for this work activity. Installation and removal of sand fences should be included in the OPM.
 - Proactive Dune Stabilization: Essential barrier dunes can be stabilized and even newly established through proactive management strategies including dune grass planting and Biomimicry. Biomimicry can be used for small scale restoration projects, using 14 inch wooden shims to stabilize replacement sand. The shims are placed into the beach at regular intervals and effectively capture sand during storm events. When they become mostly buried they can be pulled upward and left in place to collect additional sand. This activity must be coordinated with the DCR Coastal Ecologist.
 - Predator Control: Mammals such as foxes, coyotes, skunks, and raccoons and birds such as crows and owls will often consume shorebird eggs or juvenile shorebirds. The Coastal Ecologist works with partner agencies to implement predator control strategies and should be contacted if this is a concern at your facility.
 - Public Outreach / Environmental Education: Development of an educational outreach strategy in coordination with our environmental partners and monitoring consultants has long-term benefits for protection of rare shorebirds.