

Town of Cape Charles



Cape Charles Public Beach and Dune Management Plan

A guidance document of appropriate practices and activities

developed by the

Cape Charles Wetlands and Coastal Dune Board

February 2019

Acknowledgements

The service and valuable input of the members of the Cape Charles Wetlands and Coastal Dune Board is acknowledged:

Ann Hayward Walker, Chair

Russ Dunton, Vice Chair

Joe Fehrer

Bill Prickett

Bob Roche

The Board expresses our sincere appreciation to Ms. Tracy Outten for her timely, kind, and very capable assistance with our meetings, plan review, consolidating citizen input, and editing. In addition, we acknowledge and greatly appreciate the citizens who provided input in 2016 and 2018 for this plan.

Table of Contents

- Acknowledgements..... 2
- List of Figures 4
- List of Tables 4
- Introduction 5
 - Purpose 6
 - Cape Charles Beach Description and Plan Scope..... 7
- Historical Background 8
- Coastal Processes: Dunes, Beach Shape, and Vegetation..... 10
- Regulations Governing the Beach and Dune System..... 11
 - Commonwealth of Virginia 11
 - Town of Cape Charles 12
 - FEMA..... 12
- Issues, Problems, and Challenges 13
- Good Management Practices for Beach and Dunes 15
 - Beach-side Dune Vegetation..... 17
 - Boardwalk-side Vegetation..... 18
 - Nuisance/Invasive Vegetation 19
 - Access, Walkways, and Gathering Places 19
 - Typical Structures, Uses, and Activities 21
 - Winter Preparations..... 22
 - Sand Fencing 23
 - Spring Clean Up..... 23
 - Seasonal Beach Cleaning..... 23
 - Monitoring 24
- Implementation Options and Resources 24
 - Funding 25
 - Personnel 26
- Summary 27
- References 29
- Glossary..... 31
- Appendix A. Citizen Input, 2018 and 2016

List of Figures

1. Survey map of Scott Estate, Cape Charles, 1887.....	8
2. US Army Corps of Engineers, Cape Charles dredging project survey.....	9
3. US Army Corps of Engineers, Cape Charles stabilization plan 6/2/16	9
4. Typical Chesapeake Bay Dune Profile in natural areas	10
5. East View Beach, Norfolk.....	17
6. Volunteer tree growth in Cottage View section of Ocean View.....	18
7. Photo of Japanese Sedge.....	19
8. Sand trail access at Washington Avenue.....	20
9. Temporary sand fences at Madison Ave. trapping blowing sand.....	22
10. Avoid beach cleaning in the upper half of the beach.....	24
11. Avoid beach cleaning over emerging ABG.....	24

List of Tables

1. Beach access options.....	21
2. Good practices and implementation schedule.....	26
3. Types of personnel resources.....	27

Introduction

This Beach and Dune Management Plan was developed by the Wetlands and Coastal Dune Board (WCDB) at the request of the Cape Charles Town Council. In June of 2016, the Town of Cape Charles requested that the Board make recommendations for beach, dune and sand management to Town Council, which the board did in September of 2016. Subsequently, the town asked the board to develop a sand and dune management plan, including providing an opportunity for residents' comments into the scale of the sand's wind erosion problem and potential practices to mitigate future wind erosion events.

Three primary information sources guided the development of this plan:

- Regulatory guidance: Commonwealth of Virginia Dune Guidelines, town ordinances, and Federal Emergency Management Agency (FEMA)-related guidance for grants.
- Knowledge (science, experience, monitoring): Scientific reports by the Virginia Institute of Marine Science (VIMS); scientific studies and literature review of plans from other areas; the experience of local government managers and residents; and shoreline monitoring. In 2016, the WCDB reviewed many beach, dune, sand management plans of other coastal towns (approximately 23 plans, plus > 35 additional documents), as well as studies/surveys by VIMS and the US Army Corps of Engineers. The WCDB also engaged with Norfolk's former manager of Environmental Services (Mr. Lee Perkins), who had over 30 years of experience in managing another southern Chesapeake Bay beach and dune system at Ocean View. Mr. Perkins' experience with the Ocean View beach, and lessons learned over the years, was most helpful in developing this plan.
- Public input from town residents: Two questionnaires (July 2016 and October 2018) with expressions of their preferred values for the beach, along with statements of problems to be addressed and suggested solutions. A summary of these comments is contained in **Appendix A**.

This plan encompasses the public beach and the dunes, which are an integral part of the public beach area. Under Commonwealth of Virginia regulations, publicly-owned land is excluded from the permitting authorities of wetlands and coastal dune boards. However, the town has requested advice and recommendations from this board to help guide town management of this vital public resource. In this context, Cape Charles WCDB recommendations are advisory, that is, non-binding. However, the board's recommendations are consistent with town ordinances, which represent the town's policy.

The Town of Cape Charles Comprehensive Plan (2009) describes the value of the beach to the town in multiple sections:

- II.5 Natural Resources
- III.A.5 Planning Framework Policies and Descriptions
- III-D.2 Amenities

From the Board's review and public input regarding the beach and dunes, the following represent guiding principles, goals, and priorities (in no particular order):

- Beach is a vital town asset (both resident recreation and tourism-based economy)
- Protect public beach from degradation (continue with beach nourishment) for present and future generations
- Protect and enhance the beach as an amenity for residents and visitors

- Preserve the integrity of and accessibility to the water's edge
- Town beach is known for sunset views of beach and harbor – especially at north end
- Control dune, beach and shoreline erosion - Natural erosion of the shoreline must be abated to maintain the safety of the residents' homes, welfare and recreational opportunities
- Protect and preserve the coastal dunes
- Stabilize dunes for wave attenuation and protection of public property
- Manage the sand and minimize sand transport off the beach
- Maximize sand retention on beach, prevent sand migration landward to Bay Ave.
- Establish a plan for funding continual maintenance and sand nourishment of the beach
- Make the optimal use of USACE beach nourishment opportunities
- Implement actions to avoid jeopardizing FEMA funding when needed after storms

Beach nourishment is not a long-term, one-time solution. Once it begins, it requires periodic re-nourishment, typically every four to five years on average, or following major storms (ANPDC, 2016).

Most of the historic area of Cape Charles is in the 100-year floodplain with the beach identified as the VE Zone, also known as the coastal high hazard area (FEMA 2005). The wide shallow-water area, the development of the dunes, and the breakwaters are necessary to provide a storm buffer between the Chesapeake Bay and the historic housing area.

All southeastern Virginia is experiencing the highest rate of sea level rise on the east coast. Higher sea levels will increase coastal erosion and flooding in the future. Potential for inundation, flooding and shoreline change is being addressed through grants to National Fish and Wildlife Foundation, The Nature Conservancy, Old Dominion University, College of William and Mary and University of Virginia to develop a Resilience Adaptation Feasibility Tool (The RAFT), which can be viewed at <http://maps.coastalresilience.org/virginia/>.

The Eastern Shore Hazard Mitigation Plan (ANPDC, 2016) presents a comprehensive risk assessment for the Eastern Shore; Chapter 12 contains Cape Charles' assessment. This plan used a state-of-the-art tool (HAZUS) to estimate damages to Cape Charles due to wind, coastal erosion, coastal flooding and stormwater flooding. The worst-case scenario for the Town is a storm that causes storm surge and pushes water into the town but the roads in the historic part of the town are also at risk from inundation and sea level rise.

It is important going forward to increase our understanding of the relationship between the beach area and sea level rise, as well as defining appropriate short- and long-term mitigating actions.

Purpose

The purpose of this plan is to guide the town maintenance of the beach and dunes in accordance with ordinances and good practices, as informed by science, experience, regulations and citizen input.

Special consideration is given to the town's annual budget cycle and planning. Maintenance of the beach and dunes is the responsibility of the town's Department of Public Works and Utilities and is overseen by the Public Works supervisor. The recommendations in this plan are intended to align with the work planning of Public Works and their input into the budget cycle.

Key times and activities in the annual budget cycle relevant to the public beach and dunes are:

- 1 July – beginning of the town’s fiscal year.
- September – begin implementing preparations to mitigate winter storm impacts, e.g., install temporary sand fences perpendicular to the water to trap blowing sand down the beach.
- January/February – optimal planting time for American Beach Grass (ABG); review past year’s learnings and incorporate into budget for next fiscal year; raise new budget requests; develop next FY budget, e.g., funds for new walkways and ABG; preparation for building new ramps for access.
- March/April – Public Works to begin preparations for the summer season; present and revise budget; implement new construction, e.g., walkways; complete by spring break.
- May – finalize budget, train workers on good practices for beach maintenance; begin summer maintenance, order ABG for January planting.
- June through August – using the actual FY budget allocation, conduct routine summer beach maintenance in accordance with good practices in this plan.

Cape Charles Beach Description and Plan Scope

This plan is for the public beach area and dunes, including the boardwalk on Bay Avenue. The public beach area is located on the Chesapeake Bay in Northampton County, the southern county on Virginia’s Eastern Shore.

The dedicated public beach of the Town extends north-south adjacent to Bay Avenue, from Washington Avenue (north) to Mason Avenue (south) for a distance of approximately 2,400 linear feet. This beach is protected by five breakwaters totaling approximately 800 linear feet of protection from the 25-mile fetch in the NW and SW directions.

The Cape Charles/Coastal Primary Sand Dune Zoning Ordinance uses the following technical definitions:

- **Beach** means the shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that *extends from the low water line landward* to where there is a marked change in either material composition or physiographic form such as a dune, or the nearest impermeable manmade structure, such as a bulkhead, revetment, or paved road. The beach is also considered a non-vegetated wetland, i.e., all that land lying contiguous to mean low water and which land is between mean low water and mean high water not otherwise included in the term “vegetated wetlands.”
- **Dune** means a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from 10% or greater to less than 10%, and upon which is growing 10 species of vegetation including, but not limited to, American beach grass (ABG).

Additional definitions of terms used in this plan are contained in the Glossary.

Access via the beach to the water for swimming, kayaking, and kite boarding is within the plan scope. However, this plan excludes activities or practices for the land areas beyond the boardwalk, e.g., parking or food trucks on Bay Avenue, and for the water areas west of the low water line, e.g., water activities including but not limited to swimming, jet skis, kite boarding, and boat rafting.

Historical Background

When Cape Charles was established in 1886, the western shore was undeveloped as shown in **Figure 1**. In 1911, wetlands near the Chesapeake Bay were drained and filled. The original east-west avenues were extended west, and two more north-south streets were added: Bay Avenue along the edge of the Bay and Harbor Avenue between Bay Avenue and Pine Street. The additional 38 acres of filled land provided 97 new building lots in the Sea Cottages Addition.

In 1935, a wooden bulkhead was constructed to protect the Town from surge water (ANPDC 2016). This bulkhead had been refurbished or repaired over the years.

In 1985, the Town of Cape Charles installed groins and bulkheads, totaling approximately 800 lineal feet of protection from the 25-mile fetch in the NW and SW directions. The 1985 project added about 300 feet of beach seaward of the bulkhead. Dunes formed along the boardwalk and were noticeably higher at the south end. Over 20 years the beach shifted due to wind erosion, NW storms and heavy wave action. The dunes eroded heavily at the north end, with water surge scouring the base of the boardwalk, especially between Madison and Jefferson Avenues. At one point, the drop from the boardwalk to the beach below was about 6' and was a public safety hazard. Between 2001 and 2006, the town installed five breakwaters in two separate projects along with beach nourishment. Since the construction of the breakwaters the beach has shifted again due to winds, unusual summer waves and tides. These two projects helped stabilize the beach and created a primary dune system along the entire beach but retaining sand on the north end is a challenge.

The town and US Army Corps of Engineers signed a Letter of Agreement in 1987, which provides the Corps a 50-year easement to deposit the dredged sand in the designated upland placement site eastward of “the Hump” near the harbor, or on the public beach, when carrying out periodic dredging of navigation channels in the vicinity of the town. The dredging occurs infrequently; twice in the last 30 years.

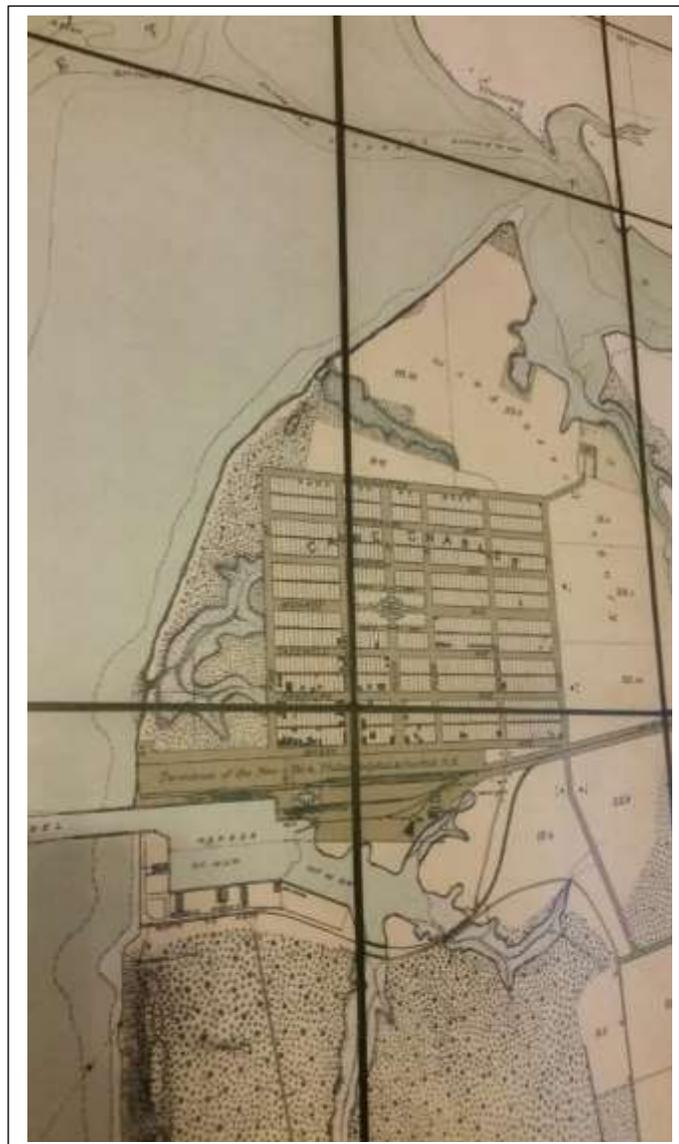


Figure 1. Survey map of Scott Estate, Cape Charles, 1887. Courtesy of Virginia and George Savage.

Since March 2015, the Town has received approximately 100,000 cubic yards of sandy dredge material as part of the US Army Corps of Engineers' federal harbor dredging project of the channel by Cherrystone Bar and the harbor entrance. The Corps conducted a pre-dredging survey (**Figure 2**).

In the early summer of 2016, the Cape Charles Town Manager asked the WCDB to serve in an advisory capacity and develop recommendations or suggested good management practices for managing the sand on the town's public beach, including the dunes, in anticipation of the imminent sand nourishment by the Corps. In August 2016, 70,000 cubic yards was deposited in the designated upland placement site and 30,000 cubic yards was deposited on the public beach.

In the fall of 2016, the Corps stabilized the beach with sand fencing and planting post-deposition of American Beach Grass (ABG) in late fall 2016 (**Figure 3**). The board delivered recommendations to the town council in September 2016. These recommendations have been incorporated as appropriate into the good practices recommended in this plan.

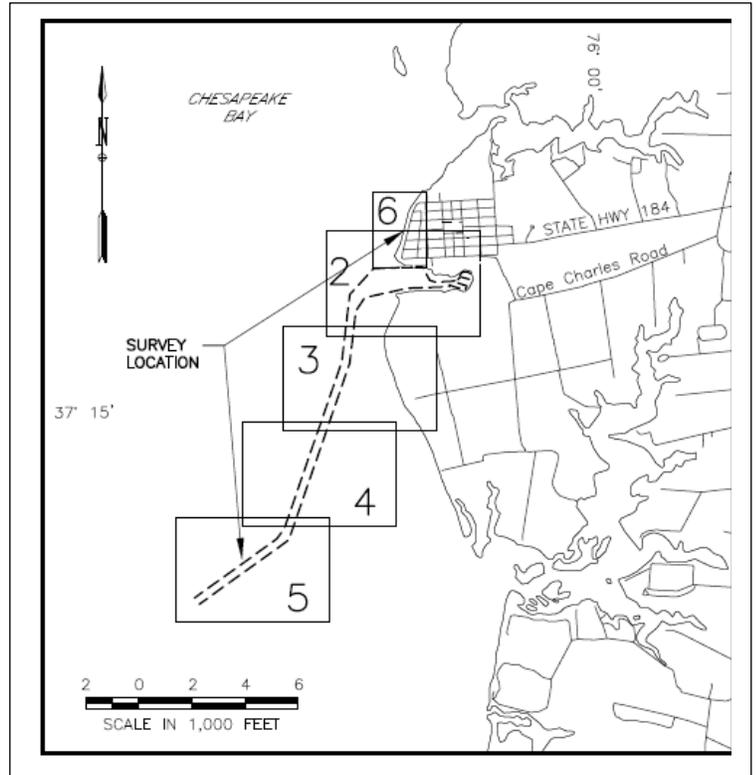


Figure 2. US Army Corps of Engineers, Cape Charles dredging project survey.



Figure 3. US Army Corps of Engineers, Cape Charles stabilization plan 6/2/16.

Coastal Processes: Dunes, Beach Shape, and Vegetation

(excerpt and adapted from City of Norfolk, 2012)

Sand dunes and dune vegetation are important beach assets for these reasons:

- They provide protection for bayfront property from erosion, especially during storm events. In Cape Charles, the dunes mitigate erosion which historically has undermined the boardwalk and could erode the public road and sidewalks on the western side of Bay Avenue, both of which are the responsibility of the Virginia Dept. of Transportation.
- The dunes serve as a sand reservoir.
- Together, dunes and vegetation contribute to an aesthetically pleasing, "natural" beach.
- They provide habitat for many species of coastal creatures, including birds, crabs, etc.

The dunes are the area landward of the active beach where dune grasses are the dominant plants. In the beach profile in Figure 4, the Cape Charles dunes are the primary dunes. **Note that the Cape Charles public beach, in an “urban” area does not have secondary dunes.** The toe refers to the base of the dune where it meets the beach. The berm is the dry, sandy area where we typically put our beach blankets. The beach face is the sloped area leading down to the water, where the water meets the sand. The Cape Charles beach has breaking waves under higher-than-normal wind conditions, e.g., > 15 knots. The beach shape is in a constant state of flux due to the tides as well as the variable forces of wind and waves. For example, most beaches naturally lose sand in the winter and gain sand in the summer because of wave climate changes.

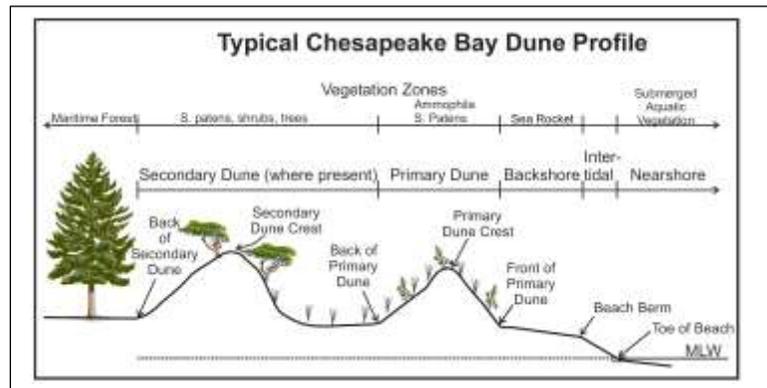


Figure 4. Typical Chesapeake Bay Dune Profile in natural areas. Source: Hardaway, 2004

Waves absorb energy from the wind. This energy is carried by the waves to the shore where the waves unleash energy onto the beach. Wave energy shifts and moves sand throughout the beach. Higher waves shift sand from the berm into deeper water, flattening the beach face. Smaller waves can move sand back to the berm, but the dominant process is that winds move the sand from the beach into the shallows. Stronger winds and larger storms create larger waves and more serious impacts to the berm and beach face. For example, hurricane strength winds can cause storm surge, a dramatic rise in sea

level along the coast, which washes over the beach and any adjacent property, causing significant damage.

Dunes act to reduce the impact of storm damage. During more severe storm events, the dune provides a reservoir of sand used to protect the landward areas. The dunes can prevent waves and storm surge from washing over the land. Dunes are not hardened shoreline features and do not offer permanent armor against wave and wind-driven erosion or flooding. However, dunes are a recommended living shoreline and best practice for managing the beach except for extreme, infrequent conditions.

Dune vegetation is an important component of the dune system because it prevents the dune from eroding away. The stems and roots of dune plants trap sand. While these plants continue to grow, they continue to trap more and more sand, which in turn stabilizes and strengthens the dune. Sand fences and other wind barriers trap sand in a similar way, but these barriers lack the ability to grow as the dune grows. When sand fences deteriorate, the rusting metal and wood splinters become safety hazards.

However, sand fencing can be useful when managing pedestrian traffic. A few people randomly walking *over* dunes will not cause significant damage to the dune or surrounding vegetation, but dunes will not tolerate repeated trampling. Once the vegetation along a path is destroyed, wind and continued use will cause the path to erode faster than the surrounding dune, compromising the dune's ability to provide adequate protection against storm damage.

Regulations Governing the Beach and Dune System

The following regulations, guidance, and codes apply to the beaches and coastal primary sand dunes along Cape Charles' public beach on the Chesapeake Bay and were used in developing this plan.

Commonwealth of Virginia

Under the Coastal Primary Sand Dune and Beach Regulation (1993), all coastal sand dunes and beaches in the Commonwealth of Virginia are currently regulated by the Code of Virginia, § 28.2-1400 et seq., Coastal Primary Sand Dunes and Beaches. This regulation provides a model ordinance that certain localities may adopt. Changes to the regulation and model ordinance require action by the Virginia General Assembly. § 28.2-1408 of the Code of Virginia specifically states that:

"No permanent alteration of or construction upon any coastal primary sand dune shall take place which would (i) impair the natural functions of the dune, (ii) physically alter the contour of the dune, or (iii) destroy vegetation growing thereon unless the wetlands board or the Commission, whichever is applicable, determines that there will be no significant adverse ecological impact, or that the granting of a permit is clearly necessary and consistent with the public interest, considering all material factors."

The Virginia Coastal Zone Management (CZM) Program, established in 1986 through Executive Order, is a network of Virginia state agencies and local governments, that administers enforceable laws, regulations and policies that protect our coastal resources¹, which affect the Cape Charles beach and dunes. The CZM Program fosters sustainable development. The Department of Environmental Quality (DEQ) houses the Virginia CZM Program office in Richmond and serves as the lead agency of the network

¹ <https://www.deq.virginia.gov/Programs/CoastalZoneManagement/Laws,Regulations,Guidance.aspx>

of agencies. The Cape Charles and Northampton county terrestrial and aquatic areas are ranked as critical in terms for their ecological value² Advisory Policies for Geographic Areas of Particular Concern³, which includes public recreation areas, and Advisory Policies for Shorefront Access Planning and Protection. Cape Charles and Northampton County have received numerous CZM grants over the years⁴.

Town of Cape Charles

As authorized by the Code of Virginia, § 28.2-1403, the Town of Cape Charles adopted the Coastal Primary Sand Dune Ordinance in 1994. The Dune Ordinance also covers beaches.

In Cape Charles, all the dunes associated with the public beach are town property. Some uses and activities are acceptable, such as the construction of walkways and observation platforms, but these should not alter the contour of the coastal primary sand dune. The Board advises that the town management of the public beach should be consistent with its ordinance, which directly incorporates the state guidelines.

The Town's Comprehensive Plan, which was updated in 2016, signifies the public beach as an important amenity to Cape Charles. The Plan states that it is of utmost importance that Cape Charles maintain its beach for the future safety and benefit of its citizens by:

- Continued funding for maintenance and sand replenishment of the beach.
- Encouraging educational programs in cooperation with the Eastern Shore Birding Festival, the Virginia Marine Science Museum, county schools and other educational venues.
- Planning and maintaining suitable protective measures.
- Protecting and preserving the coastal dunes.

FEMA

FEMA programs and requirements also affect beach and dune management. The Town has utilized post-disaster FEMA funds to repair the substantially damaged fun pier and to complete a beach re-nourishment. The Town joined the National Flood Insurance Program (NFIP), administered by FEMA, on February 2, 1983. The January 2016 FEMA NFIP insurance report shows that property owners in the Town have 234 flood insurance policies, a decrease of 82 policies since 2011, but still 51 policies more than in 2003.

The new Flood Insurance Rate Map (FIRM) is most likely the cause of the vast reduction in the number of overall policies, however as of January 2016 there were still 150 low-risk policies, indicating that residents would still like to be prepared for flood events. Cape Charles participates in the Community Rating System (CRS) program, which provides incentives for NFIP communities to complete activities that reduce flood hazard risk.

2

<https://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/BlueGreenInfrastructure.aspx>

3

<https://www.deq.virginia.gov/Programs/CoastalZoneManagement/Laws,Regulations,Guidance.aspx#advisory%20policies%20for%20areas%20of%20geographic%20concern>

⁴ <https://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/nsamp.pdf>

The NFIP recognizes the importance of dunes in reducing coastal flood hazards and has established special mapping, insurance, and floodplain management criteria designed to help communities protect the dunes. A primary frontal dune (PFD), as defined by the NFIP, is a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms.

The Flood Insurance Rate Maps depict Special Flood Hazard Area (SFHA) extending from offshore to the inland limit, or landward toe, of a primary frontal dune along an open coast, and any other area subject to high-velocity wave action (i.e. subject to wave heights of 3 feet or more, regardless of beach contour or existence of any dunes). The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater for coastal hazards mapping. The hazard zone is determined by detailed studies of storm surge flooding, storm-induced erosion, and wave effects. The VE Zone, also known as the coastal high hazard area, is an area subject to high velocity water including waves. VE Zone Base Flood Elevations (BFEs), are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) combined with certain wave effects. The VE zone is mapped using criteria that reflect the combined influence of storm surge stillwater elevations, primary frontal dunes, and the controlling wave heights (either breaking wave heights or wave run-up of 3 feet or greater). The mapped inland boundary of the VE Zone is defined by the landward toe of the PFD, and thus the PFD boundary (and mapped VE Zone) can shift as the landward toe of the dune migrates.

Issues, Problems, and Challenges

This section discusses various issues that influence the town's planning for and management of the public beach, including citizen comments, limited resources (e.g., funding, staff), shoreline erosion, seasonal flooding, sea level rise, and the need for ongoing sand nourishment.

Over the years, experience and comments by town staff and residents have identified a variety of issues and problems which need to be addressed in the plan. Examples of issues, problems and challenges considered during the development of this plan include:

- Access to the beach – what kind and how many “walkways” should be provided? How is safe access to the beach and water assured?
- Blowing sand from the beach has been a problem, usually when winds blow from the northwest, onto sidewalks, yards, and into homes along Bay Avenue. Blowing sand has reduced the walking area in sidewalks and raised the ground level in yards, e.g., at the north end over a foot above the street level. Bay Avenue residents have spent considerable sums removing sand from their yards and homes. Is it “right” for sand from public beach to become “trash” on private property, which property owners must pay for its removal?
- What are the optimal good practices for regular (at least weekly) beach cleaning in the summer to provide an attractive setting for beach users?
- What uses and activities should be allowed, or not, on the beach, or restricted to portions of the beach?
- What temporary structures should be allowed, or not, on the beach? How long is temporary, overnight, throughout the summer?

- How should competing or conflicting uses, activities, and structures be resolved?
- What are the long-term priorities, and funding levels, needed to sustain the value of the town's public beach, especially about sand nourishment and beach grass planting?
- What viewsheds should be protected and how?
- Should management actions aim to maintain dunes of a certain configuration?
- What minimum winter maintenance is necessary annually and what are the good practices?
- What kind of monitoring is recommended?
- In what ways should good practices for the beach and dunes relate to flood/storm surge?

The town has less than 1,000 residents and a limited budget. The Dept. of Public Works (currently 5 individuals) is responsible for maintaining the beach, regular beach cleaning and emptying trash in the summer, along with their other responsibilities throughout the old town of Cape Charles. Their routine responsibilities include: maintaining Central Park (e.g., bathrooms, gazebo, lighting and fountain), street sweeping and debris removal in the gutters, emptying public trash containers, monthly water meter reading, collection and disposal of resident yard/storm debris, support for public events (e.g., security fencing/ trash removal), and replenishing pet bags along the boardwalk, trail, and in the park.

The use of volunteers has been suggested to supplement town resources and assist with some beach maintenance, e.g., planting dune grass. However, it appears unfeasible for the town staff to oversee volunteer activities, in part due to liability issues. However, the use of volunteers may be possible if they are managed by an organization whose mission includes working with volunteers, e.g., a non-governmental organization, in coordination with town staff.

The Cape Charles public beach is part of the Chesapeake Bay coast in Northampton County. Dynamic environmental conditions which have a dominant influence on the public beach and result in shoreline change and sediment transport include, but not limited to (Hardaway, 2004):

1. Erosion. Long term trend for the county is about -1.0ft/year. Shoreline recession is the overall trend.
2. Sand deposition. The overall net movement of sands along the coast is to the south.
3. Regular exposure to high winds from the northwest in winter.
4. Gradual subsidence and sea level rise.

Maintaining the dunes is one component of protecting the town infrastructure from seasonal flooding and potential sea level rise. Cape Charles is facing sea level rise, which in coastal Virginia is projected to be among the highest levels on the East Coast. Historical shoreline changes, seasonal flooding, and projected sea level rise affects residents, businesses, and plans for future development and infrastructure. A resource available to assess Cape Charles vulnerability and preparedness to deal with sea level rise is the Resilience Adaptation Feasibility Tool (RAFT), which was developed by an academic interdisciplinary collaborative, the "Core Team," led by the University of Virginia Institute for Environmental Negotiation (IEN), the Virginia Coastal Policy Center (VCPC) at William & Mary Law School, and Old Dominion University/ Virginia Sea Grant (ODU). The town should continue to explore the utility of RAFT in relation to long-term beach and dune planning.

The goal of RAFT is to help Virginia's coastal localities improve resilience to flooding and other coastal storm hazards while remaining economically and socially viable. It is an easy and accessible scorecard to

define a locality's resilience. The RAFT features three key components, creating a "full service" tool for localities:

1. The Resilience Scorecard provides a comprehensive assessment of community resilience to flooding while remaining economically and socially relevant. Cape Charles' RAFT Scorecard can be found at <https://capecharles.municipalcms.com//files/documents/CapeCharlesRAFTScoreCard1701104831091718AM.pdf>
2. A workshop for community thought leaders to use the assessment to develop a Resilience Action Checklist for increasing community resilience. Cape Charles' Action Checklist can be found at <https://capecharles.municipalcms.com//files/documents/CapeCharlesResilienceActionChecklist1701110530091718AM.pdf>.
3. Ongoing assistance during implementation of the Resilience Action Checklist, both in the form of technical assistance and assistance in finding funding.

Towns like Cape Charles, and cities, with coastal beaches and economies, which are dependent upon summer tourism, periodically re-nourish the beaches by depositing additional sand. As part of its civil works mission, the Corps provides shore protection, including beach nourishment, under the Flood and Coastal Storm Damage Reduction Program (Army Corps of Engineers, 2007). The frequency of nourishment is influenced by need, cost, and funding. Cape Charles does not have a Corps of Engineers project to provide continuing beach nourishment.

Norfolk and Virginia Beach have projects funded by the United States Army Corps of Engineers (USACE) to periodically nourish public beaches. Information about USACE projects for Norfolk and Virginia Beach can be found at <https://www.nao.usace.army.mil/StormFloodRisk/>. Highlights include:

- Norfolk, Willoughby Spit and Vicinity Coastal Storm Damage Reduction Project, completed in 2017 added 1.2 million cubic yards of sand along the shoreline, widening the beach to 60 feet and creating a slope to 5 feet above mean low water. Construction cost: \$34.5 million.
- Virginia Beach Hurricane Protection and Storm Damage Protection Project (Sandbridge is a separate project). Completed in 2001, this project widened 100-foot beach at 9-feet above sea level with a gradual slope to sea level, seawall/sand dune system, and an intricate network of storm drains and pump stations to remove water from upland areas. During the last nourishment event in 2012, contractors added 1.25 million cubic yards of sand from 15th to 70th Streets. Another nourishment is scheduled for 2019. This is a 65% federally authorized and funded project, including design, construction and administration costs.

The Board has considered the above problems, issues and challenges in developing good practices.

Good Management Practices for Beach and Dunes

The good practices presented in this section incorporate experience and observations from the Board, town staff, and residents who grew up in Cape Charles and have observed the beach over decades. Public comments, in italics, have been inserted in the relevant sub-section to enable citizens to see how and where many of their comments have been incorporated.

This plan also incorporates some good practices from the City of Norfolk (2012), when they are relevant to Cape Charles. The City of Norfolk's Ocean View beach has many similar issues to the Cape Charles public beach. Noteworthy differences are that Ocean View has no street or boardwalk separating homes from the beach and, in the Cottage View section before the Virginia Dune Law was passed, property owners were allowed to grade and move sand adjacent to the public beach. Mr. Lee Perkins, Norfolk's manager of Environmental Services, was responsible for managing the Ocean View/Willoughby Spit beaches for nearly 30 years. He visited and walked our entire beach in July 2016.

Noteworthy beach and dune management observations include:

- American beach grass (ABG) is the best way to stabilize the dunes and prevent sand blowing. Experience has shown that for a city/town beach, the dunes should be managed with ABG sprigging in winter (January/February) to achieve a low, wide (40') profile, which will also mitigate sand blowing off the beach.
- Dry sand on all parts of the beach moves readily with strong winds (>25 mph). Sand moves off the beach when the winds blow out of the northwest. The dry sand along the beach adds to the dune height especially at the south end of the beach and fills in the wooden walkways from the boardwalk to the beach, especially at Randolph and Tazewell Avenues. Dry sand at the northern end historically has moved off the beach, across, and down Bay Avenue and then collects in the sidewalks, yards, and window sills (even with storm windows) of the homes along Bay Ave. Dry sand on the boardwalk side of the dunes also moves with the wind, unless mitigated by vegetation on the dunes.
- Sand blowing south along Bay Avenue has resulted in blockages of the storm water outfall on the harbor side near the intersection of Mason and Bay Avenues. This contributes to street flooding during and after storm events.
- With the benefit of hindsight, it would have been ideal to sprig and fence the beach at the north end at least one winter season before the Corps nourishment. Without that pre-nourishment planting, a great deal of sand deposited in 2016 at the north end moved off the beach onto Bay Avenue.
- Since the Corps nourishment and sprigging, it's evident that beach and dunes have been responsive to active management. i.e., sand capture through beach grass planting and winter sand fences. Especially at the north end, the newly-established low, wide dunes are reducing the amount of sand blowing onto Bay Ave.
- Any future sand nourishment should be planned 2 or 3 years in advance to allow pre-deposition planting of ABG enough time to establish and minimize sand transport off the beach.
- Beach use seems concentrated at the south end of the beach and at the Madison Avenue access. Also, when the beach is sufficiently deep, beach goers occupy the portion of the beach closest to the water.
- Generally, for public safety, the boardwalk, streets/curbs, and sidewalks should be kept clear of sand. This is not the responsibility of property owners.

The Board recommends adopting the following objectives in order of decreasing priority for the Cape Charles Beach and Dune Management Plan:

1. To maintain or improve on the ability of the primary frontal dune to protect the public boardwalk, street and adjacent properties from wave erosion, storm water surge, and storm-

induced flooding which results from sand buildup in, and poor functioning of, the storm outfall at the southern end of Bay and Mason Avenues in the harbor;

2. To minimize inundation of areas behind the primary frontal dune crest by accumulating wind-blown sand into a low, wide dune system;
3. To maintain sand reservoirs and the stability of the shore through the dune system;
4. To maintain and improve public access to the beach;
5. Promote dune robustness that meets or exceeds FEMA primary frontal dune volume criteria, including consideration of FEMA flood zone boundary and does not result in changes to the flood zone designation;
6. To maintain water views at each end of Bay Avenue, in conjunction with advancing one or more of the other priorities listed.

Especially at the northern end of the beach, these objectives are supported by a low, wide continuous dune system, as shown in **Figure 5**. A long-term plan should be developed to manage the dunes, with particular consideration given to ongoing planting and other management actions designed to maintain dune present height (no increase in height) and promote a 40' wide continuous dune system between the north and south primary access points for beach users and town equipment.



Figure 5. East View Beach, Norfolk. (A.H. Walker photo)

The planting of native vegetation to trap sand is always preferable to the use of man-made structures. Vegetation should be planted on areas of bare sand, on both the bay and landward sides of the dune.

The town should educate the public about beach vegetation, including the value of ABG, avoiding trampling on it, nuisance vegetation, including volunteer trees which can kill ABG.

Beach-side Dune Vegetation

By all accounts, i.e., scientific study and experience, the top good practice for the public beach is to plant (during January and February) and maintain American Beach Grass on the Bayside and top of the dunes to stabilize dune size and prevent sand transport, and avoid activities, structures, and other vegetation that could undermine its viability. ABG is salt and wind tolerant.

The town should budget regularly for planting ABG in areas that have bare sand, or to encourage seaward movement of the dunes. Orders for ABG should be placed mid-year so enough stock can be grown and harvested for planting in January/February. ABG hit their peak growth by the end of June. The cost is about \$70-100 for 1000 scrapes/plants. Suppliers are listed in the in USACE Planting Plan, the 2016 recommendations and notes from Lee Perkins. Order plants 6 months in advance so they can be grown and be ready for planting in the winter.

Plant in January at front of dune and keep it moving seaward. Even when the top 4" are frozen, power augers will go through the sand. There's always a risk that Nor'easter could wipe out new plantings. Don't plant after March. The recommended planting density is 3 colms minimum per hole; they compete to take hold, which promotes thicker growth faster. ABG should be planted 9" deep, otherwise the wind can pull up the colms and the plant can dry out.

For areas on the beach that are periodically inundated with salt/brackish water, e.g., mid-beach between Madison and Jefferson Avenues, *Spartina patens* is appropriate because it tolerates salt water.

Boardwalk-side Vegetation

Refine/replant street side of dunes, i.e., in 5' minimum path next to boardwalk. The town planner should consult with the Board to develop a vegetation plan for the length of the boardwalk. Refer to the Native Plants for Dune Restoration and Habitat Diversity: A Source Guide (City of Norfolk 2009) for plants which thrive in the lower Chesapeake Bay coastal area. Specific recommendations made for the boardwalk side of the dunes include:

- Remove volunteer trees as part of annual maintenance, e.g., early spring. They shade and kill ABG and other beach grasses. To remove, cut and brush substance to kill the roots (don't use sand disturbing equipment). If volunteer trees are not removed, they could dominate the dunes as they have in the Cottage View section of Ocean View in Norfolk (Figure 6), which will undermine healthy dune vegetation, require more access structures, and further obstruct views.
- *Panicum amarum* 'Dewey Blue' Switchgrass or beach grass is good on the street/back side of the dune (doesn't like salt and wind as much as ABG)
- Remove trumpet vine that is encroaching on boardwalk to simplify maintenance, plant other suitable plants identified in the Norfolk guide.



Figure 6. Volunteer tree growth in Cottage View section of Ocean View. (A.H. Walker photo)

Nuisance/Invasive Vegetation

Sedge grass is invasive, and their root secretion kills ABG. During his 2016 site visit, Mr. Perkins identified that the sedge grass is present in several places on the public beach. As the spike grows, it hardens, and becomes a safety hazard as shown in **Figure 7**, from the 2016 recommendations. The sedge was present around the toe of the dunes, where barefoot beach-goers could step on the spur. For these reasons it is undesirable and may need to be removed. Its presence should be actively monitored by the town and/or Board for this reason.

Japanese Sedge (photo below from south end of beach, 7/26/16)



Figure 7. Photo of Japanese Sedge (A.H. Walker photo)

If it becomes a problem, the town should develop a plan to remove it which includes spraying it to kill the sedge grass before it goes dormant in the fall. Treat with Rodeo (glyphosate) which has approval in aquatic environments. Town personnel who are involved in spraying must wear task-appropriate personal protective equipment and will need to have a blue marker because Rodeo is a clear liquid. Emeril Forest can advise about how to spray with certifications.

Access, Walkways, and Gathering Places

Walkways provide access from the street to the beach and are the responsibility of the town. Types of access walkways include: elevated walkways, sand trails, and on-grade walkways defined by mats.

Elevated walkways have much higher levels of general maintenance requirements (and costs) than non-structural walkways and trails. Elevated walkways should be maintained regularly to prevent any safety or health concerns.

The safest option for accessing the beach is to use a town-constructed public walkway which has been constructed according to building code standards, maintained and inspected regularly. Poorly constructed wooden walkways (both elevated and on-grade) with rusty nails and fasteners can create opportunities for tetanus exposure. Walkways that are not regularly maintained also pose similar health risks.

Sand trails and on-grade walkways have the lowest level of maintenance and replacement costs. If sand fencing is used to demarcate a path, it must be rigorously maintained and replaced when damaged. Use posts and rope instead to define path, which is easy to move if trails move. **Figure 8** is a good example of a sand trail, which is at Washington Ave.

Public comment: Don't let the dunes get any higher, keep the sand out of the street gutters and sidewalks, and on Bay Avenue yards. One owner spent \$6000 on sand removal from the yard.

Public comments: Need better entrances and larger platforms to access the beach and watch sunsets; more people are showing up to view sunsets. Replace wooden decks and walkways with trek decking since wood rots. Keep the sand off access ways and consider walkways (mats) to the high-water mark.

Public comment: Create a shaded picnic area near the pavilion (or entrance to fun pier).

Public comment: Enlarge swimming area. There have been too many close calls. Consider life guards.

Public comments: A separate dog area would be nice so dogs would not be on the main part of the beach. Keep dog waste out of the water! Doggie bag stands are good! There should be ample dog waste containers.

Comment by Mr. Perkins: Dune mats are a total waste of money. They get covered up too quickly and are a safety hazard - slippery when wet! The preferred access to beach is a sand trail – narrow about 6' wide. Observe natural dynamics for where to put the trail. Stay away from elevated walkways. Dune grasses don't grow in the shade. Better to do BMP of sand trail, mid-height of dune grass, stable.



Figure 8. Sand trail access at Washington Ave. (A.H. Walker photo)

Access at North and South Ends of Bay Avenue

Wooden walkway is recommended for pedestrian access at the north and south ends of Bay Avenue, i.e., at Washington and Mason Avenues, respectively. The walkway at the south end is wooden, elevated, and connects to the Fun Pier. Pedestrian access is provided from the boardwalk and to the beach by stairs on the side. These access points should be modified to become ADA compliant. An ADA ramp at the south end should extend into the beach sufficient distance for those with walking disabilities to be able to reach the lower half of the beach.

Next to the south end walkway, sand trails should be wide enough to accommodate access by town equipment, e.g., four-wheeled vehicles for trash pickup, as well as the beach grooming machine.

Access at Intersections of Other Streets

At the intersection of other streets, the town should plan on budgeting for designing and installing new ADA compliant walkways that don't bisect the dune and take pedestrians over the dunes. Plan for/budget to construct dune-appropriate (open pile) walkways across the dunes (going forward the town should not cut thru the dunes to provide access but use fencing to direct people over the dune). The options which have been proposed include: wooden walkways, sand trails and dune mats, which are used in some Delaware beaches.

Table 1 displays access options considered and their anticipated benefits and limitations.

Option	Benefits	Limitations	Recommendation
Elevated wooden walkways	Provides stable footing	High initial construction cost, possible seasonal sand cover and removal, long-term maintenance as dune changes	Use at Mason Ave. beach entrance. Use composite decking material to minimize long-term expense
Sand trails	Environmentally friendly and manageable as sand moves, inexpensive	Low cost, training required for town personnel to manage, not as stable/easy to walk on as wood	Use for entrances at other streets
Dune mats	Environmentally friendly, easy to manage maintenance, ADA compliant	Moderate cost, potential safety hazard – slippery when wet, durability?	Not recommended
Rope and posts	Environmentally friendly and manageable as sand moves, inexpensive	Not for isolated use	Use with sand trails to define path sides

Table 1. Beach access options.

Typical Structures, Uses, and Activities

The following semi-permanent structures, uses and activities are typical of what can be found within the town's beach area: volleyball nets, town trash cans, signs, picnic tables, town information stands, beach walking, sunbathing, swimming, and dog walking.

The fun pier, pavilion, and platforms by walkways are gathering places by the beach. Fishing is a regular activity on the fun pier. User needs for these structures should be evaluated short-term and longer-term, and a plan developed for their design, enlargement and maintenance.

Public comment: The town should consider what, if any, temporary structures can be left on the beach overnight, such as sun shade tents, kayaks, kiteboard stands, and Hobe Cat sailboats.

Public comment: Need better signs for clearer warnings to stay off the rocks, even with graphics to show ankles and legs slices by oyster shells, which puts people at risk from a bacterial infection.

Public comment also noted that toilets, showers, water fountains need to be refurbished (rusted, broken, and leaking) and weekly maintenance during the season.

Dogs on the beach under control by the owners has been allowed but is limited between April 1 and Labor Day from 9 p.m. to 9 a.m. Dog access is not universally supported. Concerns have been expressed over dog waste that is not picked up that results in waste being stepped on and waste going in the water resulting in unsanitary conditions. Some residents have recommended that an area be designated for dog use, with perhaps longer hours, however the Town has decided not to move forward with a designated dog area.

Town Parks and Recreation provides two volleyball nets on the upland part of the beach near Monroe Avenue. Their location should be monitored each year, and moved if needed, to keep away from the toe

of the dunes. A sign should be placed nearby to raise the awareness of volleyball players to avoid trampling dune grass.

Other temporary structures, uses, and activities which have been present in the past include: beach chairs and umbrellas, coolers, trolleys to transport beach gear, corn hole boards, paddle boards, floats, sun shade tents, kayaks, kiteboards, and Hobe Cat sailboats. Section 14-8 of the Town Code⁵ addresses the placing obstructions on beach. The code states that it shall be unlawful for any person to put, place or set any equipment, such as dugouts, chairs, umbrellas, windbreaks, surfboards, air floats, kayaks, rafts, boats, personal watercraft or similar paraphernalia not actually occupied or engaged, or to build or erect any fence or other obstruction, on any public beach, so as to obstruct, impede or retard the free and unconstrained use and occupancy of such beach by the public. However, the volleyball courts are an exception, and other structures, may be appropriate if so determined by the town.

Water activities which do not originate from the beach, such as boat rafting (a group of power boats anchoring together in shallow water) and jet ski use, which are related to the town beach and appropriate matters of concern to the Town, but not are within the purview of the Wetlands And Coastal Dune Board. Beach-adjacent activities but east of the boardwalk, e.g., food trucks and public bathrooms, also are outside the scope of this plan.

However, for public safety, several comments recommended that clearly marked designated areas for jet skis and other motorized vehicles be clearly marked **and separate from** all swimming areas.

Winter Preparations

After the tourist season, let beach naturalize over the winter (don't remove seaweed). Walk the beach and conduct a visual survey of changes relative to the overall plan that should be addressed in winter preparation and in the next fiscal year budget.

Install temporary sand fencing in the fall after beach season for sand control and dune stabilization during the winter months. This sand fencing should be installed perpendicular to the shore to trap blowing sand and mitigate the collection of sand in the walkways. Installation locations which have been effective to date are: on the beach, between Randolph and Mason Avenues, between Tazewell and Randolph Avenues, and between Jefferson and Madison Avenues. Constantly monitor the installation locations and adjust the locations as needed. **Figure 9** illustrates how effective this temporary fencing is at trapping sand. This fencing was installed in early November and photo was taken mid-January.

Plant ABG in January and February as needed.



Figure 9. Temporary sand fences at Madison Ave. trapping blowing sand (A.H. Walker photo)

⁵ https://library.municode.com/va/cape_charles/codes/code_of_ordinances?nodeId=CO_CH14BEWA

Sand Fencing

Standard, slatted wood sand fencing is the preferred form, since it is cost-effective, readily available, easy to handle, and can be erected quickly. A height of four feet, measured from the ground surface after installation, normally is recommended for temporary sand trapping and dune-building sand fences, although other heights might be used in certain areas based on unusual conditions. The fencing can be supported with wooden posts at no more than 10-foot intervals. The minimum practical length for posts is about 6 feet, although longer and more deeply embedded posts are often advantageous. The fencing material may be secured by fastening it to each post with sturdy zip ties, and the fencing should be woven between the posts so that every other post has fencing facing the bay-ward side.

If the base of a sand fence is placed at ground level, dunes will build against and up the structure. In areas with wind-blown sand migrating off the beach, fencing should be placed six to ten feet below the dune crest on the beach side, with a second row halfway up the dune, to inhibit sand from blowing up and over the dune. The dune will then grow in volume toward the water instead of landward. Newly-collected sand should be retained in its location, unless it is needed elsewhere on the beach, and vegetated on the beach side of the sand accumulation to promote low, wide dune propagation toward the water.

Spring Clean Up

In March, visually survey the beach to: 1) assess locations which may need some of the sand collected over the winter and 2) identify locations where ABG has begun to move seaward. Preferably in April after the end of the winter storm season, remove the temporary sand fencing. Assess whether to leave the accumulated sand in place, which is preferred. If some areas need sand nourishment, move excess sand from the mid to lower beach to those areas. AVOID operating equipment near the toe of the dunes and near any emerging beach grass.

Sand scraping, i.e., using a front-end loader to scrape up sand at low tide and deposit it on the beach, should be avoided. Cape Charles nearshore shallows dampen waves. Scraping accelerates erosion and scraping nearshore increases erosion and flooding potential, and disturbs intertidal areas, which is discouraged by environmental agencies. It has been noted that following the most recent beach nourishment, and due to natural forces, significant shoaling has been observed, particularly at the southern third of the beach. The town may want to monitor this sand movement over time and may need to develop a plan to address it in the future as it relates to public use of the beach.

Seasonal Beach Cleaning

Public comment: Sweep beach twice a day.

The town mechanically removes manmade and natural debris (e.g., beach wrack which is defined as the accumulations of organic debris on the upper tide lines from algae, eelgrass, and terrestrial plant sources that strands on the ebbing tide) during the recreational use season, which generally begins at spring break and ends in the fall when the weather turns cold and windy. This plan recognizes that beach goers desire a clean beach. For this purpose, the town has purchased a beach-cleaning machine and uses four-wheeled vehicles to empty the trash cans installed on the beach.

The good practice for operating the beach cleaning machine is to operate: 1) close to the high tide line, 2) no further inland than half the width of the beach, and 3) avoid running any mechanical equipment near the toe of dunes or emerging beach grass. Specifically, keep mechanical equipment 10' off the

dune vegetation line and don't run over rhizomes. Stay away from sand spurge which sends out the initial plant pioneer vegetation, then ABS plants come in with their rhizomes. **Figures 10 and 11** illustrate practices to avoid, i.e., the beach cleaning machines are too close to the dunes and running over emerging ABG.



Figure 10. Avoid beach cleaning in the upper half of the beach (A.H. Walker photo).



Figure 11. Avoid beach cleaning over emerging ABG (A.H. Walker photo).

Monitoring

Monitoring of the beach, and the natural processes influencing it, is fundamental to understanding how it changes and planning its ongoing management in accordance with desired outcomes. The town and Corps also have conducted periodic surveys for monitoring purposes. Monitoring is required by the Corps if the town obtains a federal project and can be costly.

VIMS has surveyed Cape Charles public beach since the 1970s as part of their ongoing Shoreline Studies Program. In 2016, VIMS provided a rough estimate to routinely survey (about \$7,000) and monitor (aerial photographic monitoring is estimated to cost \$1500). They recommended carrying this out twice a year and after major storms, which has been the general methodology for public beaches.

To be most useful in assessing change, monitoring should occur on a regular basis, e.g., once or twice a year, using agreed methods and survey locations. The town does not have such a program and the VIMS proposed costs are unfeasible.

Another option is developing a routine monitoring plan that uses town personnel, volunteers, e.g., Northampton High School marine science students or an NGO such as the Master Naturalists, and/or drones.

The board recommends that the town develop a monitoring plan to be implemented. A formal monitoring plan is probably unnecessary at this time if town personnel conduct a pre-season beach visit to plan an annual strategy, maintain the beach and dunes accordingly for upcoming season.

Implementation Options and Resources

The town annual budget should have line items for beach maintenance consistent with the good practices in this document, including ABG planting and regular sand nourishment. A post-summer survey can determine the level of funding that will be needed for sand and ABG in the next fiscal year.

For convenience, **Table 2** summarizes the list of good practices, as well as the schedule recommended for implementing them.

Considerations for the funding, personnel and equipment needed to implement the good practices recommended in this plan are discussed in the next section.

Funding

In the 2018 fiscal year (July 2017 through June 2018), \$40,000 was allocated toward beach maintenance safety supplies and equipment (note: “beach maintenance, safety supplies, and equipment” is the budget item used to recognize funding for all beach nourishment, which includes vegetation and equipment costs). Most of that budget was used for sand fencing and normal maintenance costs, and there was no beach nourishment that fiscal year. For fiscal year 2019, \$30,000 was allocated and, as of November 2018, 12% of the budget had been used, primarily on sand fencing.

Items which need to be considered in future budget cycles are discussed in the remainder of this section.

One option for beach nourishment might be regular grooming of the Corps upland spoil area near the harbor to sustain it as a viable, continuing source of sand, or to sell that sand and designate those funds for sand nourishment. Another option might be approaching the Corps and suggesting that Cape Charles tie into some Corps project that has excess sand, with the understanding that the Corps generally does dredging in fall, when sea turtles are migrating until about mid-December. This can become problematic given that turtles are protected under the Endangered Species Act and harm to them must be avoided.

Any new purchased sand should be coarser than the Corps dredge material to reduce sand transport.

The current cost of sand per cubic yard is approximately \$14. The Town requires approximately 12,000 cubic yards of sand to completely nourish the beach. To completely nourish the Town beach, the approximate cost is anywhere between \$20,000 and \$25,000 (including staff time, etc.). This cost includes the nourishment of the beach north of Monroe Avenue.

It is recommended to completely nourish the beach with new sand either once every other year or twice every five years, and periodically as needed. When needed and available, sand accumulated over the winter could be re-distributed with bulldozers, the budget for which should account for equipment costs, beach closing time, and staff hours.

A beach monitoring survey should be done every other year, including documenting a dune “footprint” to show the migration of the sand. A topographical survey should be budgeted periodically to carefully monitor the height of the dunes. Vegetation costs should also be budgeted, ranging from \$70-\$100 for 1,000 AGB scrapes/plants. In addition, the budget should include the long-term project costs for proposed elevated walkways.

Grants to fund sand nourishment should be pursued, however, the Town should be aware that funds received through grants typically do not cover maintenance and operation costs, and the Town should also pay close attention to the stipulations of any grant and compare the benefits vs. the costs of taking the grant funds.

	Good Practice	Timing
1	Maintenance sprigging of American Beach Grass (ABG) on bayside of dunes. (see Good Practice section for details)	Jan-Feb every five years and/or following storms
2	Develop, implement plan for regular beach nourishment; always sprig 1-2 full growing seasons ahead of any beach nourishment	Jan - Feb planting (mid-winter), then nourish with sand following fall or spring seasons
3	Develop and implement vegetation plan for along boardwalk side of dunes, e.g., Dewey Blue (<i>Panicum amarum</i>) beach grass	As soon as practical. New planting: early fall September
4	Spring Clean Up – remove sand fences, assess sand movement, reallocate sand as necessary (do not scrape near emerging vegetation!)	Preferably April, since some wind storms, i.e., 2018, have occurred in March
5	Remove volunteer trees and other plants next to boardwalk that are not in the plan (see Good Practice section for details)	Annual, early fall, and/or early spring
6	Conduct seasonal beach cleaning (see Good Practice section for details)	April – Oct (tourist season)
7	Budget for ABG planting and other beach, dune expenses	Budget cycle (see page 7)
8	Order ABG for winter sprigging (order 6 months ahead so they can be grown)	May-June
9	Maintain volleyball courts; refine location as necessary but to be <i>at least</i> 10' away from tow of dunes	May- August
10	Remove/treat Japanese Sedge	Early Fall (before dormancy) when deemed necessary
11	For winter, install temporary sand fencing perpendicular to the shore	Annual, before January
12	Encourage low, 40' wide dunes at north end of beach	Ongoing
13	Keep boardwalk, streets, curbs and sidewalks clear of sand	Quarterly
14	Keep storm drains and gutter free of sand and debris	Ongoing
15	Maintain existing structural walkways at north and south end of Bay Ave (Washington Ave and Mason Ave.)	Annual
16	Maintain wide sand trail for machine access at the south end of Bay Ave (Mason Ave.)	Annual
17	Modify and maintain south and north end walkways to be ADA compliant	As soon as practical, then annual
18	Maintain gathering places at Fun Pier, gazebo and platforms	Annual
19	Enhance picnic table gathering spots adjacent to boardwalk between Mason and Randolph Aves.	As soon as practical, then annual
20	Plan for, budget, build and maintain dune-appropriate access points at other street intersections on Bay Avenue	As soon as practical, then annual
21	Town establish semi-annual routine monitoring plan, along with post-storm monitoring strategy	As soon as practical
22	Monitor beach and assess for annual strategy and input into budget planning	Annual: November, March
23	Add more warning signs to stay off rocks	Prior to summer season
24	Assess safety aspects (boardwalk, sidewalk, structures, and beach) and update actions	Annual: prior to summer season

Table 2. Good practices and implementation schedule.

Personnel

Three different types of personnel could carry out the good practices recommended in this plan and these personnel options could carry out different tasks. Each option has associated benefits and limitations, as shown in **Table 3**. The town will need to annually assess and plan which resources are appropriate to manage the public beach.

Personnel Type (source)	Potential tasking	Benefit(s)	Limitation(s)
Town staff (Dept. of Public Works)	Beach maintenance, annual survey for budget planning, develop annual budget priorities for the beach	Dedicated personnel already in the budget, familiarity with the beach and town equipment. Liability covered.	Competing priorities for their time and attention
Contractors (e.g., Emerald Forest, others)	Sand nourishment, plant ABG/sprigging, install fencing, construct walkways	Designated, qualified resource which frees up town staff for other responsibilities. Liability covered.	Requires a funding allocation in the budget, and time to select a contractor and manage their work
Volunteers (e.g., NGO that manages volunteers; high school or community college class)	Plant ABG, possibly assist with periodic topographic surveys	Low cost, educational value	Liability concerns (needs to be covered by a sponsoring organization), training and oversight required by sponsoring organization and coordinated with the town

Table 3. Types of personnel resources.

Summary

Beyond explicit good practices, the following actions are highlighted to further assure appropriate long-term management of the Cape Charles Public Beach by the town:

- Conduct annual safety assessment, new needs, implementation of actions, in addition to quarterly removal of sand on Bay Ave. sidewalks
- Define and enhance preferred gathering places and recreational structures, in relation to access points and existing structures
- Develop semi-annual monitoring plan
- Develop beach nourishment plan (new sand every 4-5 years and after storms) and always plant ABG in nourishment areas at least one full growing season before planned nourishment
- Develop boardwalk-side vegetation management plan.

In summary, the beach and dunes of Cape Charles are a valuable environmental and socio-economic resource. They require continuous adaptive management. This plan proposes balancing environmental considerations with the needs of Cape Charles’ citizens and its visitors. The Cape Charles Wetlands and Coastal Dune Board hopes that by being proactive in recommending a set of recurring good practices the town will be better equipped to protect this important resource now, and with a look forward to the dunes’ role enabling resilience from future storm surge, shoreline erosion, and sea level rise. The Board recognizes that beach management is ongoing. Good practices should be revisited and refined as new information comes to light.

References

Primary References

- Accomack-Northampton Planning District Commission (ANPDC). 2016. Eastern Shore Hazard Mitigation Plan. 575 pages. Accessed at <http://www.a-npdc.org/wp-content/uploads/2016/04/FullHMP2016.pdf>
- Army Corps of Engineers, Coastal and Hydraulics Laboratory, Engineer Research and Development Center (ERDC). 2007. Beach Nourishment – How Beach Nourishment Projects Work. Accessed at <https://www.iwr.usace.army.mil/Portals/70/docs/projects/HowBeachNourishmentWorksPrimer.pdf>
- Cape Charles/Coastal Primary Sand Dune Zoning Ordinance. 1994. Appendix C in the Town of Cape Charles Zoning Ordinance. Accessed at <https://capecharles.municipalcms.com//files/documents/document1468125754102413.pdf>
- City of Norfolk. 2012. Chesapeake Bay Coastal Management Area (CBCMA) Guidance Document: *A comprehensive guide to appropriate practices and activities within the City of Norfolk's Chesapeake Bay Coastal Management Area.*
- City of Norfolk. 2016. Sand Management Plan (SMP) Guidance Document: *A comprehensive guide to sand management criteria within the City of Norfolk's Ocean View Bayfront Area.*
- City of Norfolk, Division of Environmental Services. 2009. Native Plants for Dune Restoration and Habitat Diversity: A Source Guide. Accessed at <https://www.norfolk.gov/DocumentCenter/View/3830>
- FEMA. 2005. Flood Hazard Zones: Coastal Flood Hazard Analysis and Mapping Guidelines. Focused Study Report. 55 pages. Accessed at http://www.fema.gov/media-library-data/20130726-1541-20490-5010/frm_p1ero.pdf
- FEMA Flood Insurance Study Northampton County (2013). Accessed at https://www.rampp-team.com/county_maps/virginia/northampton/northampton_va_fis_tables_1.pdf
- Hardaway, Jr., C. S., and Byrne, R. J. 1999. *Shoreline Management in Chesapeake Bay*. Special Report in Applied Marine Science and Ocean Engineering Number 356. Virginia Sea Grant Publication VSG-99-11. Virginia Institute of Marine Science, Virginia Sea Grant College Program. Gloucester Point, VA.
- Hardaway, Scott. 2004. Shoreline Evolution Chesapeake Bay Shoreline Northampton County, Virginia. Virginia Institute of Marine Science. Accessed at http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/Northampton/NHShoreEvolutionReport.pdf
- Town of Cape Charles Comprehensive Plan. 2009 plus updates. Accessed at <http://www.capecharles.org/docview.aspx?docid=12990>
- Virginia Marine Resources Commission. *Shoreline Development BMP's: Best Management Practices for Shoreline Development Activities Which Encroach In, On, or Over Virginia's Tidal Wetlands, Coastal Primary Sand Dunes and Beaches and Submerged Lands*. 2600 Washington Ave., Newport News, VA.

Additional References

Coastal Dune and Protection Marine Extension Bulletin (contains some good tips, or “good practice” information) Accessed at <https://www.whoi.edu/fileserver.do?id=87224&pt=2&p=88900>

The Dune Book – North Carolina Sea Grant. Accessed at http://www.seagrant.umaine.edu/files/chg/RogersNashdune_booklet.pdf

Beach Profiling and Monitoring by Volunteers. Accessed at <http://roussev.net/sdhash/tutorial-data/files/145.pdf>
www.seagrant.umaine.edu/files/pdf-global/otherformat/emerymethod.doc

FEMA 540 Rule:

An example application of FEMA 540 Rule on east coast – one community mapped accessed at http://crgis.stockton.edu/dune_assessment/soc/report/main_frame/results/540-rule.htm

How to apply 540 rule (method). Accessed at http://crgis.stockton.edu/dune_assessment/brg/docs/fema-540.pdf

Draft NJ Dunes Management Manual. 2015. Accessed at <http://njseagrant.org/wp-content/uploads/2015/03/Draft-DUNE-MANUAL-7apr2015.pdf>

Town of Dennis MA, Erosion Management Plan. Accessed at http://www.town.dennis.ma.us/Pages/DennisMA_BComm/beachmanagement/Erosion.pdf

Town of Falmouth MA, Beach Management Plan. Accessed at http://www.falmouthmass.us/beach%20management%20plan/final_bmp_april.pdf

Topsail Beach Dune/Beach Management. Accessed at <http://www.topsailbeach.org/Departments/BeachManagement/tabid/121/Default.aspx>

Tybee Island, GA Beach Management Plan. Accessed at <http://www.cityoftybee.org/DocumentCenter/Home/View/402>

Glossary

BASE FLOOD ELEVATION (BFE) means the elevation in feet of the one percent (1%) annual chance flood level, as shown in the FIS and FIRM.

BEACH means the shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that extends from the low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff, or marsh, or where no such change can be identified, to the line of woody vegetation (usually the effective limit of storm waves), or the nearest impermeable manmade structure, such as a bulkhead, revetment, or paved road.

BEACH FACE means the section of the beach normally exposed to the action of wave uprush. The foreshore of the beach.

BEACH NOURISHMENT means the process of replenishing a beach by artificial means; e.g., by the deposition of dredged materials, also called beach replenishment or beach feeding.

BEACH PROFILE means 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.

BERM means (1) on a beach: a nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by WAVE action or by means of a mechanical plant as part of a beach recharge scheme. (2) a linear mound or series of mounds of sand or gravel generally paralleling the water at or landward of the line of ordinary high tide.

COASTAL HIGH HAZARD AREAS mean those areas identified as VE Zones on the FIRM extending from offshore to the inland limit of the Coastal Primary Sand Dune, as defined by state law (Code of Virginia Title 28.2), and subject to wave heights of three feet or more.

COASTAL PRIMARY SAND DUNE or DUNE means a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon which is growing any of the following species: American beach grass (*Ammophilla breviligulata*); beach heather (*Hudsonia tomentosa*); dune bean (*Strophostylis spp.*); dusty miller (*Artemisia stelleriana*); saltmeadow hay (*Spartina patens*); seabeach sandwort (*Arenaria peploides*); sea oats (*Uniola paniculata*); sea rocket (*Caiile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass (*Panicum ararum*). For purposes of this ordinance, COASTAL PRIMARY SAND DUNE shall not include any mound of sand, sandy soil, or dredge spoil deposited by any person for the purpose of temporary storage.

EROSION means (1) the wearing away of the land by natural forces. On a beach, the carrying away of beach material by wave action, tidal currents or by deflation. (2) The wearing away of land by the action of natural forces. The collapse, undermining or subsidence of land along the shore of a lake or other body of water. Erosion is a covered peril if it is caused by waves or currents of water exceeding their cyclical levels which result in flooding.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) means the federal agency under which the NFIP is administered. In March 2003, FEMA became part of the newly created U.S. Department of Homeland Security.

FLOOD or FLOODING means (a) a general or temporary condition of partial or complete inundation of normally dry land areas from either of the following: (1) The overflow of inland or tidal waters; or (2) The unusual and rapid accumulation or runoff of surface waters from any source. (b) The collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature such as flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding as defined in subparagraph (a)(1) of this definition. (c) Mudflows which are proximately caused by flooding as defined in subparagraph (a)(2) of this definition and are akin to a river of liquid and flowing mud on the surface of normally dry land areas, as when earth is carried by a current of water and disposed along the path of the current.

FLOOD INSURANCE RATE MAP (FIRM) means the official map on which FEMA has delineated both the special flood hazard areas and other flood areas within the city. The FIRM may be available digitally.

FLOODPLAIN or FLOOD-PRONE AREA means any land area susceptible to being inundated by water from any source.

FORESHORE means (1) The part of the shore, lying between the berm crest and the ordinary low water mark, which is ordinarily traversed by the uprush and backwash of the waves as the tides rise and fall. (2) The same as the beach face where unconsolidated material is present. (3) In general terms, the beach between mean higher high water and mean lower low water.

HURRICANE means a cyclonic storm, usually of tropic origin, covering an extensive area, and containing winds in excess of 75 miles per hour.

LOWER LOW WATER DATUM means an approximation to the plane of mean lower low water that has been adopted as a standard reference plane for a limited area and is retained for an indefinite period regardless of the fact that it may differ slightly from a better determination of mean lower low water from a subsequent series of observations.

MEAN HIGH WATER (MHW) means the average elevation of all high waters recorded at a particular point or station over a considerable period of time, usually 19 years. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the result to the equivalent of a mean 19-year value. All high-water heights are included in the average where the type of tide is either semidiurnal or mixed. Only the higher high-water heights are included in the average where the type of tide is diurnal. Mean high water in the latter case is the same as mean higher-high water.

MEAN LOWER LOW WATER (MLLW) means the average height of the lower low waters over a 19-year period. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the result to the equivalent of a mean 19-year value.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) means the program of flood insurance coverage and floodplain management administered under the Act and applicable federal regulations promulgated in Title 44 of the Code of Federal Regulations, Subchapter B.

NEARSHORE means (1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20 meters.

NONVEGETATED WETLANDS means all that land lying contiguous to mean low water and which land is between mean low water and mean high water not otherwise included in the term “vegetated wetlands” as defined and also includes those non-vegetated areas of Back Bay and its tributaries and the North Landing River and its tributaries subject to flooding by tides including wind tides but not including hurricane or tropical storm tides.

NOURISHMENT means the process of replenishing a beach. It may be brought about naturally, by longshore transport, or artificially by the deposition of dredged materials.

OVERTOPPING means water carried over the top of a coastal defense due to wave run-up or surge action exceeding the crest height.

SAND means an unconsolidated (geologically) mixture of inorganic soil (that may include disintegrated shells and coral) consisting of small but easily distinguishable grains ranging in size from about .062 mm to 2.0 mm.

SEDIMENT means (1) Loose, fragments of rocks, minerals or organic material which are transported from their source for varying distances and deposited by air, wind, ice and water. Other sediments are precipitated from the overlying water or form chemically, in place. Sediment includes all the unconsolidated materials on the sea floor. (2) The fine-grained material deposited by water or wind.

SEDIMENT TRANSPORT means the main agencies by which sedimentary materials are moved are: gravity (gravity transport); running water (rivers and streams); ice (glaciers); wind; the sea (currents and longshore drift). Running water and wind are the most widespread transporting agents. In both cases, three mechanisms operate, although the particle size of the transported material involved is very different, owing to the differences in density and viscosity of air and water. The three processes are: rolling or traction, in which the particle moves along the bed but is too heavy to be lifted from it; saltation; and suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the air or water.

SLOPE means the degree of inclination to the horizontal. Usually expressed as a ratio, such as 1:25, indicating one unit rise in 25 units of horizontal distance; or in a decimal fraction (0.04). Also called gradient.

SURGE means (1) Long-interval variations in velocity and pressure in fluid flow, not necessarily periodic, perhaps even transient in nature. (2) The name applied to wave motion with a period intermediate between that of an ordinary wind wave and that of the tide. (3) Changes in water level as a result of meteorological forcing (wind, high or low barometric pressure) causing a difference between the recorded water level and that predicted using harmonic analysis, may be positive or negative.

TOE means (1) Lowest part of sea- and portside breakwater slope, generally forming the transition to the seabed. (2) The point of break in slope between a dune and a beach face.

VE Zones mean FEMA-defined coastal high hazard areas. They are areas subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.

WAVE means (1) An oscillatory movement in a body of water manifested by an alternate rise and fall of the surface. (2) A disturbance of the surface of a liquid body, as the ocean, in the form of a ridge, swell or hump. (3) The term wave by itself usually refers to the term surface gravity wave (progressive).

Appendix A. Citizen Input, 2018 and 2016

Citizen Comments on Issues, Problems, or Good Practices - 2018	
Problems and Good Practice Suggestions	Board Comments
Problems, e.g., sand movement off the beach, waste, trash, flooding/storm surge relationships	
Storm drains get clogged causing street to flood.	Town is aware.
Appropriate beach sand. The sand on the dunes now is super fine.	The deposited sand was per an agreement with the Corps of Engineers. Agree that any new purchased sand should be coarser (heavier).
How to keep the sand from blowing east and south? More fences in winter? I have specific ideas, other than taller fences in winter time for winter storms to mitigate sand. Not sure about waste, trash and surge, the bay is what it is and stuff washes up. It is the sand that is the issue. Trash cans are enough and spaced about right.	Planting ABG especially at the north end, and installing temporary sand fences during the winter, worked well in early 2018. Plan proposes to continue that practice.
I live across from the beach and have spent \$6000 altering my front yard due to sand blown over from the dunes. This did not happen until the foreign dredged sand was put on the beach. I have to winterize my yard due to sand. I realize living on the Bay front you have some issues with sand and wind. But as stated, there was no problem until 2015 when dredged sand was applied. Due to the height of the dunes, weeds, and trees, I have lost the view from my house. This has lessened the value of my property.	Very unfortunate impact. Current recommended good practices should mitigate the possibility of that kind of impact going forward, except under conditions that erode the beach and dunes where extensive sand nourishment is required.
Access methods on shore e.g., sand trails, mats, walkways, ramps, and by water, e.g., boat, kayak etc.	
Use mats! Little sitting areas at the top trails where people can wander, make it an amenity.	See plan section on Good Practices: "Access, walkways, and gathering places" for pros and cons of mats.
Replace wooden decks/walkways with trek decking. Wood rots & breaks.	Agree. Recommended good practices call for walkway maintenance. See plan section on Good Practices: "Access, walkways, and gathering places;" added "trek" as a potential material. See also observations at the beginning of the Good
Keep the access walkways clear of sand. The two walkways and platforms both need to be rebuilt and could be a little larger platform also. More people show up for sunset viewing, larger platform would be nice.	Agree. Recommended good practices call for walkway maintenance. See plan section on Good Practices: "Access, walkways, and gathering places;" added "trek" as a potential material. See also observations at the beginning of the Good
We support the suggestion of having mats that go from the entrance to the beach to the high watermark of the tide to facilitate beach traffic.	See plan section on Good Practices: on "Access, walkways, and gathering places" for pros and cons of mats.
Beach activities and uses, e.g., sunbathing, cornhole, special events, picnic, dog walking	
Dog beach would be nice. Then dogs would not be on main beach. (People bring their dogs despite the rules.)	Some dog owners do not pick up after their pets. Therefore, reviewers of comments declined to dedicate a special area which could result in concentration of feces-contaminated runoff.
All good activities here, keep them going. Doggie bags stands are good.	Comment noted and appreciated.
We support the idea of designating an area for pet owners to walk their animals during the day. This area should have an ample supply of animal waste pick up and deposit receptacles.	Some dog owners do not pick up after their pets. Therefore, reviewers of comments declined to dedicate a special area which could result in concentration of feces-contaminated runoff.
Water recreational activities and uses, e.g., swimming, paddle board, fishing, boat rafting, kayaks	
Enlarge protected SWIMMING area. Boats and people mixing very dangerous.	See plan section on Good Practices: "Typical structures, uses, and activities." Also, managing the swimming area is beyond the scope of this plan.
All good here.	Comment noted and appreciated.
There should be a designated area for Jet skis and other motorized vehicles so that they are not interspersed with the swimmers. There have been too many close calls to allow the status quo to continue.	See plan section on Good Practices: "Typical structures, uses, and activities."
Structures, e.g., gazebo, volleyball courts, shade tents	

Citizen Comments 2018

You can't see the Bay anymore from the Gazebo because sand dune is too high. Shaded picnic area next to Gazebo?	Comment noted in section on "Typical structures, uses, and activities."
Toilets, showers, water fountains, need weekly maintenance during tourist season. All need to be refurbished; especially with as many tourists that Cape Charles receives. Lots of rust and broken handles, water dripping or running continuously.	Comment noted in section on "Typical structures, uses, and activities."
Gazebo is fine, volleyball courts are fine, too. People's shade tents used in summer are all fine, too. Love seeing people use the beach to its fullest.	Comment noted and appreciated.
View (visual access, viewshed) from boardwalk and beach	
Sand dunes are too high and obstruct view.	Virginia guidelines, based on science, and experience in Norfolk recommend against lowering the dunes for the primary purpose of view. This plan, however, does recognize the value of water and sunset views from the beach.
Better entrance and larger platforms to enter. Keep sand off the two walkways to get to platform. With the dunes, you simply will not be able to see over them to see the water from the boardwalk. Not sure you can change that. The dunes are important. But, the dunes should be wider at base and not as tall. I think that is important.	See plan section on Good Practices: "Typical structures, uses, and activities." See also "Access, walkways, and gathering places." Virginia guidelines, based on science, and experience in Norfolk recommend against lowering the dunes for the primary purpose of view. This plan, however, does recognize the value of water and sunset views from the beach.
Remove mounds of sand and weeds. Preserve a standard depth of dunes.	See plan section on Good Practices: Seasonal Beach Cleaning. See also observations in this section.
Safety, e.g., water, rocks	
Need a beach monitor/lifeguard to enforce rules.	Comment noted in section on "Typical structures, uses, and activities."
No issue here.	Comment noted and appreciated.
There should be clear warnings about climbing on the rocks, even semi-horrific graphics. We have witnessed and experienced in our family too many accidents of ankles and legs being sliced by the razor sharp shells that have sliced their ankles and legs below the waterline of the rocks. And, of course, any incision below the waterline puts the victim at risk for a potentially deadly bacterial infection.	See plan section on Good Practices: "Typical structures, uses, and activities."
Water Quality	
Diapers in the gutters, and storm water contamination. Clean the gutters more often.	Comment noted. Gutter maintenance is beyond the scope of this plan.
All is fine.	Comment noted and appreciated.
Maintenance - seasonal, long term	
Public works does a good job. Keep grooming beach - I hear good feedback on that from visitors.	Comment noted and appreciated. See Section 4: Seasonal Beach Cleaning.
All is fine.	Comment noted and appreciated.
Beach should be swept for seaweed and debris twice a day in season.	See plan section on Good Practices: Seasonal Beach Cleaning.
Another category of issues, problems, or practices (please use back if you need more space)	
Dogs on the beach!! Waste in water.	Some dog owners do not pick up after their pets. Therefore, reviewers of comments declined to dedicate a special area which could result in concentration of feces-contaminated runoff.
Sand dunes - Please don't let them get any higher.	See plan section on Good Practices: Seasonal Beach Cleaning.
Nothing to add here.	Comment noted and appreciated.

<p>Height of dunes, unsightly and inappropriate vegetation. The information below was taken directly from the City of Norfolk SMP. We quote this info because we feel that is what is necessary to correct what has happened to our dunes. Even visitors have commented on the dunes negatively. Dunes made up of newly deposited, wind-blown sand are often bare of vegetation and highly susceptible to wind erosion. Blown sand increases dune height and this moving sand then spills over and widens the dune as it migrates landward. Sand encroachment can be mitigated by ensuring dunes remain vegetated and fenced. Vegetation should be planted on areas of bare sand, on both the bay and landward sides of the dune. Plant authorized types of native vegetation for dune stabilization and is recommended on the tops of the dunes and on steep slopes. Materials such as Christmas trees and brush are not effective as sand capture, are unsightly, and not recommend for placement of dunes. None of the above was done and this is why we have the dune problems on Bay Avenue and is what needs to be done to correct the problem. No one would listen when we advised the town of the incredible amounts of blown sand covered our properties and the dunes continued to grow higher and higher. Also this report states that Zone X (which is our zone per FEMA) is areas where the flood hazard is lower than that in the Special Flood Hazard Area. Zone X designates areas where the annual probability of flooding is less than 0.2%. Therefore, there is not a need for the dunes to be this high.</p>	<p>There is a lack of unanimous agreement among citizen input about the height of dunes and vegetation. Virginia guidelines, based on science, and experience in Norfolk recommend against lowering the dunes for the primary purpose of view. This plan, however, does recognize the value of water and sunset views from the beach. This plan includes recommended practices for vegetation in Section 4: "Beach-side dune vegetation; Boardwalk-side dune vegetation; and Nuisance/invasive vegetation."</p>
<p>Recommendation for sand control over the winter for the Town Council's consideration. As you know since the dredging and buildup of the sand dunes on the southern end of Bay Ave., the houses located at the south end of Bay Ave. get sand blown accumulations and damage every winter. We have lost our grass (smothered by sand), had considerable expense with sand removal and sand blown erosion to our property. We recommend the Town put up Sand fencing. This temporary fencing can be put up in the middle island of Bay Ave. or on the lawn strips adjacent to the road on the east side of Bay Ave. These sand fences act as a sand break, forcing windblown, drifting sand to accumulate in a desired place where sand can be easily collected. The drifting and settling of sand behind and in front of such a fence occurs because the wind speed on both the downwind and windward sides are less than that on the far windward side, allowing light materials such as sand to settle. This creates a pile both in front of and behind the sand fence causing more sand to drop out. This would make the sand easy to collect and save damage to the houses and landscaping located on the Bay Ave. properties. We appreciate your consideration as this sand issue has a costly and damaging impact to the homeowners on Bay Ave.</p>	<p>Agree that winter sand control is needed. See Section 4: "Winter Preparations."</p>
<p>For the Cape Charles Beach and Dune Management Plan, what matters most to me is:</p>	
<p>Continuous dune line for surge protection.</p>	<p>Agreed.</p>
<p>Sand blowing off dunes to property, no view of the Bay since dunes are so HIGH.</p>	<p>Agree that sand control is needed. See Good Practices section observations and "Winter Preparations."</p>
<p>Sand damage on Bay Ave. properties.</p>	<p>Agree that sand control is needed. See Good Practices section observations and "Winter Preparations."</p>

Citizen Comments - Sand Management - June 2016

How is the beach important to you?

The beach is one of the most positive assets of my home. When I purchased my home, I paid more money than those even one block back due to proximity, but mostly due to the view of the Bay. Even though the dunes are lower at my end, Bay view is almost obscure from the deck I built several years ago to enjoy the view. Even the view from several steps up is slowly disappearing. In the past, I would have one or two cars parked at my end to enjoy the view of the sunset. Because the dunes have become increasingly higher going south, the number of cars at my end that still have the view are all at this end in the evening. Now I have cars on both sides of the street blocking the evening view for me.

My home is on the beach front because I love the Chesapeake Bay & Bay Avenue.

It's the reason I bought my home on Bay Avenue.

The beach is very important to me and to the Town of Cape Charles.

View, swimming, sailing.

Part of my life born and raised here. When a youth, we spent summers swimming, boating, etc.

The beach is an integral part of Cape Charles and is one of the reasons we bought our house. It's such a pleasure to see the bay and the beautiful sunsets.

Has the blowing sand and/or dunes affected your property or business? If so, how?

The sand has pitted new windows that I have put in my house. The sand comes in and is on my window sills after a high wind even through a storm window and a double pane. This never happened the first 7 yrs. I was here.

The water view has been cut off by the build up of sand dunes.

The sand has blasted my homes exterior paints and etched my windows.

The "high"/"tall" sand dunes have affected/obstructed the view of the Bay I once enjoyed from my front porch.

The buildup of the dunes has diminished our view.

Ruined my rug and some furniture on the porch and added more than a foot to my yard and sidewalk!

Yes. The sand continually blows into our yard and landscaping, any gaps in our doors and windows, and onto our screens. We have not had this type of problem to this extent before.

What questions or concerns do you have regarding the sand dunes, given the dynamic nature or sand movement by high winds and storm surge?

I have read the history of Cape Charles. We don't get storm surges high enough to pass any of the dunes at the levels they are. I see more water and damages in the streets from poor maintenance of drains. I see drains that have become clogged with the sand that has been dumped on the beach in the past two years. The streets are a real problem, not the level of the bay water and the ability of a dune to keep it back. Virginia Beach is a nice big beach on the Atlantic Ocean. You don't see dunes at all along the boardwalk there. Because they know people enjoy walking on the Boardwalk to actually see the Ocean. I think some dunes are a positive. The height of CC dunes have become a negative growing monster.

As they say in Real Estate "A picture is worth a thousand words." The esthetics to the eye signals "like" or "dislike." From every view point, we do not like the sand dunes in our face, yard and house. Plus the whole picture of uneven dunes and several different vegetation growing up and down the Boardwalk. You cannot sit on the gazebo and enjoy the beach views, because it is blocked by a wall of sand. The sand fencing is used to force windblown, drifting sand from accumulating in a desired place. Sounds like a good plan but without doing anything to control fencing except to add fences to more fences the sand dunes are completely out of control - too high, too wide and growing more each year.

My biggest question is what purpose do they serve? Storm surge is a myth on the CC beach front. To my knowledge not one property on Bay has had any damage due to a storm surge. I grew up in CC and have asked others have they ever seen the Bay breach the boardwalk with the same answer "NO."

I do not think that the dunes significantly protect our property from storm damage. This is a false argument.

Nothing but real problem - more blowing sand!! Storm surge is NOT a problem.

The dunes have become so high it is impossible to see the water. The sand that has been placed on the new enlarged beach is too fine and therefore, blows inappropriately. There is no sand fencing in place or appropriate plantings.

Do you have any historical observations about the beach, sand, and/or dunes that you believe are important to future planning?

I like the expanded beach. I understand that as a positive. But it is the town's responsibility to manage what happens in the swell of a dunes that is too large as a result of an unnatural amount of sand brought in.

Three years ago when we moved to Cape Charles on Bay Avenue, the Westerly view from our home was just perfect. In front was a small dune, just right for protection and erosion, yet not invasive to our view of the water/beach. The growth of the sand dunes has been appalling. The sand went from the base of the sand fence to over it and covering it over completely by several feet. A storm fence is approximately 4 ft. For the growth of the dunes that is a serious concern, in another 3 years sand could grow from this unacceptable height to another 12 ft. Plus more feet in areas that are already too high to calculate. Not only height but breadth of the sand dunes is growing. The beach will probably return to its natural width after several winters. The need to haul in more sand will be the solution, as was done in the Northern end. That is costly for the town. The width of the dune is growing towards the water. Why not level out the existing dunes to build back the beach on a yearly schedule of maintenance.

Another view point is protection to the home owners on Bay Ave. We have exercised our God given adult decision making process to live on the water front. It is our responsibility to manage our yards, homes and re-build any damaged property from storms. We choose to live where we do and want the privilege that came with the home, to see the water. The town has allowed the management of the beachfront to get out of control. I realize we cannot control the wind but management should be implemented and put in the budget. Since there exists walk ways to get to the beach (a struggle to keep open) and plenty of open water on the North and South end of the Boardwalk, there is no logic in the dunes keeping us safe from water flooding our homes. We are out of the floodplain - the whole town.

The dunes are not natural or ecologically unique in anyway. I am in favor of a plan to keep their height to a maximum of 3 ft. above the boardwalk elevation. The town seems to have adequate funds for beach grooming, fireworks, very competitive salaries, etc. I think that they will be able to manage the dunes as well.

Beach is one of biggest attractions town has. Can no longer watch sunset from a car, the only public place on the Shore this could be done.

At this point of time, the people are using the dunes as a playground with no apparent regard to the rules listed.

Other comments, suggestions:

I have noticed a couple of inches of growth to the dunes in my first 7 years. Since the sand was brought in last year for the expansion of the beach I noticed almost 3 ft. growth just last winter. Also the town needs to maintain all the sand on the sidewalks near Bay front. There are either elderly owners trying to maintain the collected sand, or empty houses that don't maintain it at all. It's not right that it becomes their responsibility to remove sand that normally would not be there in the amount they get since expansion of the beach. Also it seems we have a new little beach to the harbor side down by the pier, due to all the new sand. This should be a beach in town for DOGS too.

The beachfront does not give pleasure to us but is the reason the tourists are coming to Cape Charles. Tourism is the reason for Cape Charles' growth, in fact Cape Charles is the fastest growing town of the Eastern Shore. Since there is no industrial job for our local citizens, tourism is the main way to give local jobs and income to folks that choose to live here. Merchants, Restaurants, artist, etc. rely on the growth of tourism and tourists are drawn to the beach/water. Just another reason to keep the beachfront on top priority. I would like the town to budget money to keep the dunes from growing, implement a plan to manage the beachfront on an ongoing basis. First, do a major job to level the dunes to the lowest point that exists now. To make that attractive, Bay Ave. dunes should look consistent to the whole beach. One height all along the front. Use the existent surplus of sand to fill in where needed. Sprig the dunes and then yearly maintain the height. Let us work together to keep Cape Charles the place to come and want to come back to and make it a permanent home. Thank you for the opportunity to express my heart felt thoughts on the existing beachfront dunes and the problems plus solutions that challenge the citizens of beautiful Cape Charles.

I think the sand dunes, if we must have them, should be no taller than 36" above the boardwalk. They are not natural, they have been created by man with fencing upon fencing. If the height was limited to 36" above the boardwalk and maintained at that height every year it would afford people a longer distance to view sunsets etc. Presently everyone who can't get out of their cars and walk out to the beach have to view it from the northern end. The northern end is open and will never be other than that. The south end is open, there are open walk ways to the beach, thus there are three ways flooding will occur if we ever have a storm surge that would rise to the level of the boardwalk. Cape Charles is the only place on the Eastern Shore that has a public viewing of the Bay and there seems to be an effort to destroy this by a select few. Down with the dunes, and implement a good maintenance plan to maintain the drift of sand and the build up of the dunes. "We are no longer in the Flood

Would really like to see the dunes "managed" so they are not so tall/high to obstruct the view of the Bay. In addition, I am concerned about all the sand on Bay Ave. (the street surface). Would like this cleaned up/removed and this includes the cleaning/removing of sand on the walkways to the beach and returned to the beach! Lastly, signs should be posted to ask people to keep off the dunes.

Benchmark storm (Hurricane) of 1933 only flooded Bay Ave. and did not have boardwalk bulkhead at that time. Water has never come close to breaching it since it was built in 1934-35!! The beach itself is beautiful, but you can not see it unless you walk over the dunes!! The North end does not need anymore sand as it is building up all the time since they put the rip rap down!! SUGGESTION: Put the sand farther North on Bay Creek property (They need it!) and the old Ferry Dock property!! It will eventually end up on us anyway!! People LIVING on the beach should have a STRONG SAY in this, as they are the ones that are affected by the sand!!

Bringing in more tourists is beneficial to Cape Charles and with this comes responsibility to all of us. They shouldn't be allowed to be disruptive to our beach area, i.e., littering, dogs on the beach, etc. The rules which are displayed on our signs should be enforced.