WETLANDS STATEMENT OF FINDINGS

For Dyke Marsh Wetland Restoration – Phase 1
George Washington Memorial Parkway
Fairfax County, Virginia

Recommended:____
Superintendent, George Washington Memorial Parkway (NPS) Date

Concurred:____
Chief, Water Resources Division (NPS) Date

Approved:____
Director, National Capital Region (NPS) Date

Contents

INTRODUCTION

The National Park Service (NPS), in cooperation with the US Army Corps of Engineers (USACE), proposes to implement the first phase of the Dyke Marsh restoration project. The National Park Service (NPS) has prepared and made available an Environmental Impact Statement (EIS) for the proposed Dyke March Wetland Restoration and Long-term Management Plan in George Washington Memorial Parkway (NPS 2014). The EIS evaluated three alternatives: a no-action alternative and two action alternatives. The EIS analyzed the potential impacts these alternatives would have on the natural, cultural, and human environment. The Draft EIS was released for public comment from January 15, 2014 through March 18, 2014. The Final EIS was released on October 9, 2014. The Record of Decision approving the preferred alternative was signed on June 29, 2016. Congress has also declared in several pieces of legislation that the marsh is a valuable resource to the region, and should be preserved and restored, particularly in Public Law (P.L.) 93-251 in 1974, and most recently in the Water Resources Development Act of 2007 (WRDA 2007, Section 5147).

Implementation of the wetland restoration actions called for in the approved plan will help protect the existing wetlands from erosion, nonnative invasive plants, loss of habitat, and altered hydrologic regimes; restore wetlands and ecosystem functions and processes lost through sand and gravel mining and shoreline erosion; avoid increased costs from delayed restoration; and improve ecosystem services that benefit the Potomac River watershed and the Chesapeake Bay.

During final design of the initial phase of wetland restoration it was determined that the new breakwater and wetland containment cell would impact more than 0.25 acres of existing wetlands, which is more than what was estimated for the conceptual design analyzed in the EIS. Therefore, this Statement of Findings was prepared to assess the effects on wetlands caused by implementing the first phase of wetland restoration. Executive Order 11990: Protection of Wetlands requires the National Park Service and other federal agencies to evaluate the likely impacts of action in wetlands. NPS Director's Order #77-1: Wetland Protection and Procedural Manual #77-1 provide NPS policies and procedures for complying with Executive Order 11990. This Statement of Findings (SOF) documents compliance with these NPS wetland protection procedures. It will be available for public review until November 2, 2017. Submit comments on-line at: http://parkplanning.nps.gov/DykeMarsh. Or send your comments to:

Superintendent, George Washington Memorial Parkway
Attn: Dyke Marsh Wetland Restoration Statement of Finding
700 George Washington Memorial Parkway
Turkey Run Park Headquarters
McLean, Virginia 22101

PROPOSED ACTION

The National Park Service, in cooperation with the USACE, would build a stone breakwater structure, construct a marsh containment cell, and fill a deep channel scar in the river to help control shoreline erosion, reestablish hydrologic conditions, and restore almost 10 acres of palustrine and riverine wetlands (figure 1). The containment cell area includes a cobble beach sill and soil fill and planted area behind the sill. Construction would take place from the water to the greatest extent possible, using marine construction equipment. Material would be brought in by barge and stored on the barges. There would be little, if any, need for staging areas on land.

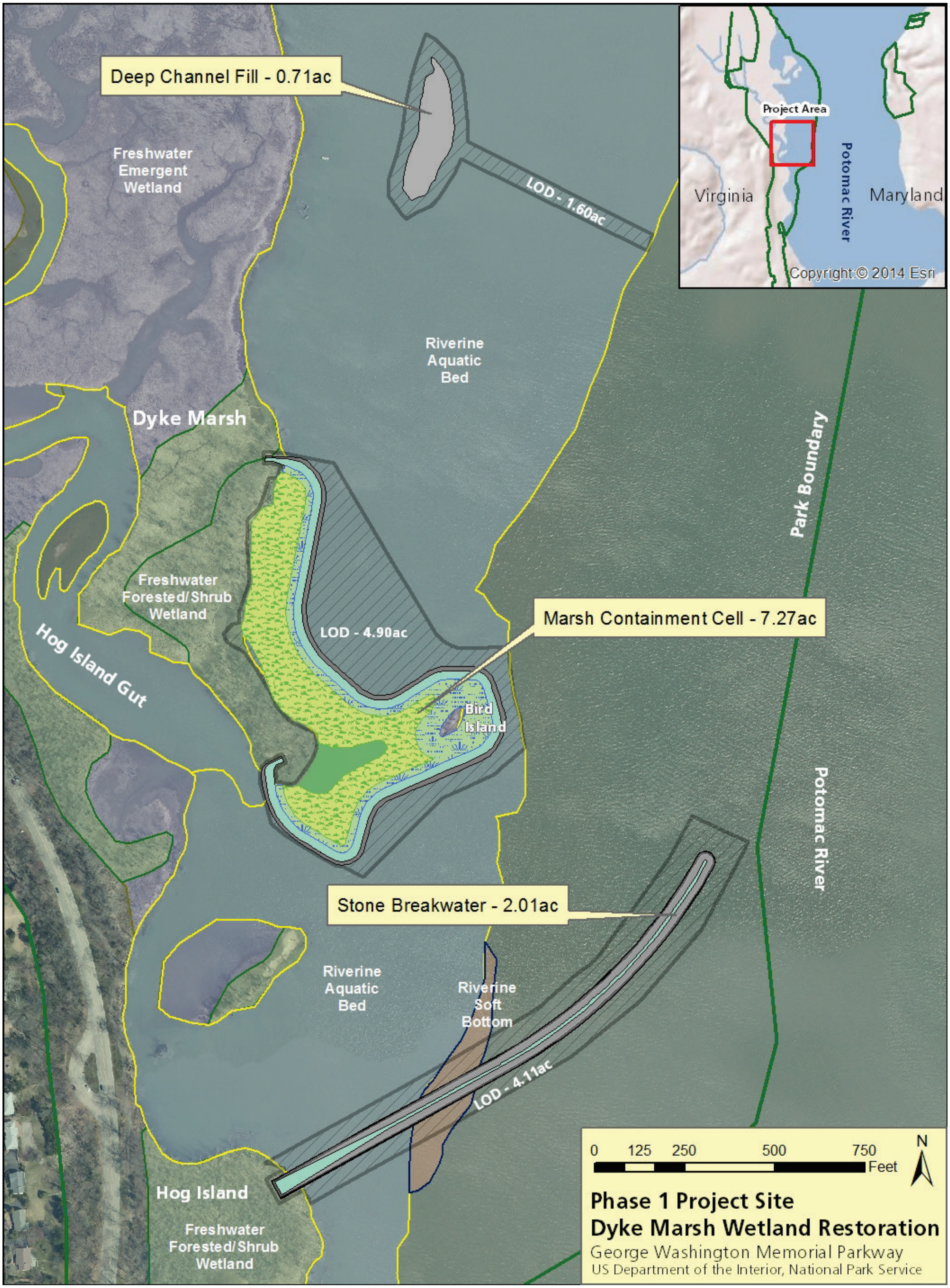

Figure 1. Dyke Marsh Wetland Restoration Project Site

Promontory Breakwater Structure

A contractor supervised by the USACE would construct a stone breakwater structure in the historic location of the promontory. Past dredge mining for sand and gravel in the promontory altered the hydrology of the marsh. One of the most prominent and important features of the Dyke Marsh system is the large tidal gut, Hog Island Gut. The gut once meandered through the marsh with its mouth facing in a northerly direction. Direct dredge mining and erosion of the marsh has removed the promontory and other wetlands that created the bend in the tidal gut channel, and it now empties to the south and downstream, thereby increasing its vulnerability to erosion and channel widening within the gut channel itself (Litwin et al. 2011). The USACE models indicate that establishment of a breakwater just downstream of the current mouth of the gut would both protect the gut by introducing a bend in the channel and would also redirect flows and encourage sediment accretion (Litwin et al. 2011; USACE 2013). The main benefit and purpose of the breakwater is to protect the existing marsh from strong storms/hurricanes tracking up the Potomac River. The breakwater will also redirect sediments coming out of Hog Island Gut back toward the marsh as they were historically. Currently these sediments are lost downstream as they enter the Potomac River.

The breakwater would be placed on historic northern edge of the promontory, close to the historic edge of Hog Island Gut, forcing flows in the gut to turn to the north, as this channel once did. It would tie into the shore of Hog Island and extend into the river about 1,500 feet and have an average width at the base of 55 feet (figure 1).

The breakwater structure would be constructed of armorstone or riprap. Armorstone boulders are typically larger than 2,000 pounds each, and Class III riprap is smaller rock, which in Virginia ranges from 500 to 1,500 pounds (Chesapeake Materials 2013). The stone breakwater would be constructed in a trapezoidal shape. The side slopes of the stone would be approximately 2:1 from the top of the breakwater to the river bottom elevation, including at the end section (figure 2). The stone would be brought in by barge and placed from the water. The stones would have a natural appearance and a relatively low need for maintenance over time.

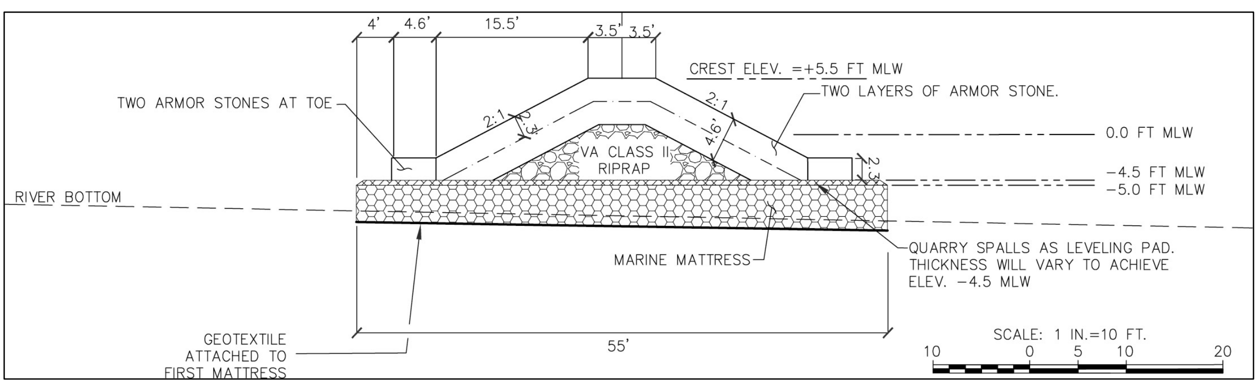

Figure 2. Typical Cross-Section of Stone Breakwater

Marsh Containment Cell

A contractor supervised by the USACE would construct a containment cell, a structure placed in the open water that allows for fill to be placed inside raising the river bed elevation. The containment cell will extend Dyke Island and surround Bird Island covering a total of 7.27 acres (figure 1). The containment cell wall would consist of a constructed cobble beach sill behind which will be filled with hydraulic slurry using clean fill. The USACE will evaluate any dredge material used for fill for level of contaminants, particle or grain size, and consolidation rates. Only clean fill will be used for construction of the containment cells, in accordance with applicable laws and regulations. The particle size and consolidation testing will ensure the fill is appropriate for the site and will develop characteristics of marsh soils and sediments over time that can support vegetation.

The cobble beach sill will extend into the river to a maximum depth of 4 feet below the mean low water elevation (MLW) and protect the containment cell from erosion caused by river currents and wave action while allowing for intermittent flooding. The sill will consist of a rock-filled marine mattresses placed on the river bottom, followed by a layer of quarry spall or riprap, then capped with 18-inch layer of smaller cobble. The top of the sill that is above MLW will have a 10 to 1 slope. Below MLW the sill will have a 2.5 to 1 slope. At the sill ends that tie into the existing shore, wetland vegetation will be removed, soil excavated, a rock-filled marine mattress layer installed, and riprap placed on the marine mattress (figure 3). A geotextile blanket will be placed behind the cobble sill followed by clean soil fill and topsoil covering the new containment cell.

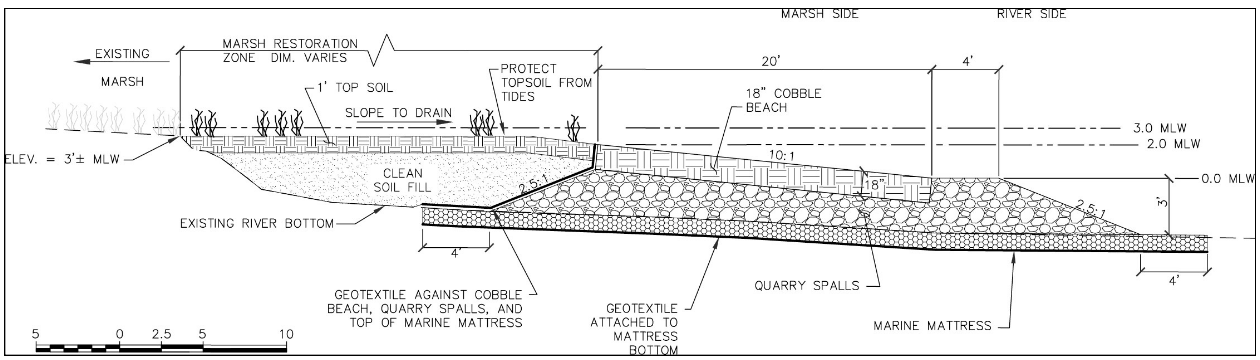

Figure 3. Typical Cross-Section of Marsh Containment Cell

Vegetation Reestablishment

Following containment cell construction, the contractor would immediately start revegetating the new cell. NPS and USACE revegetation specialists prepared a marsh planting plan for reestablishing native wetland species within the containment cell. This plan identifies three different planting zones based on elevations relative to the mean low water elevation. The contractor will plant green arrow arum (*Peltandra virginica*) and pickerelweed (*Pontederia cordata*) in the lowest zone (2 to 3 feet above MLW) next to the cobble sill and around bird island, narrowleaf cattail (*Typha angustifolia*) in the middle zone (3 to 3.5 feet above MLW), and a variety of wetland shrubs, including elderberry (*Sambucus canadensis*), buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and black willow (*Salix nigra*) in the upper zone (3.5 feet above MLW). See figure 4 for approximate planting locations. In areas disturb by construction near the new breakwater and containment cell and below MLW, it is expected that submerged aquatic vegetation (SAV) would volunteer and become established on its own where favorable conditions exist.

In addition, bird exclosures would be used to prevent herbivory by geese. The exclosures would consist of stakes placed around the edges of the restored marsh, with strings stretched between the stakes and flagged so they are visible by birds and other wildlife. The strings would be placed at intervals that prevent geese from landing between them, and the areas would be surrounded by plastic or wire mesh fencing.

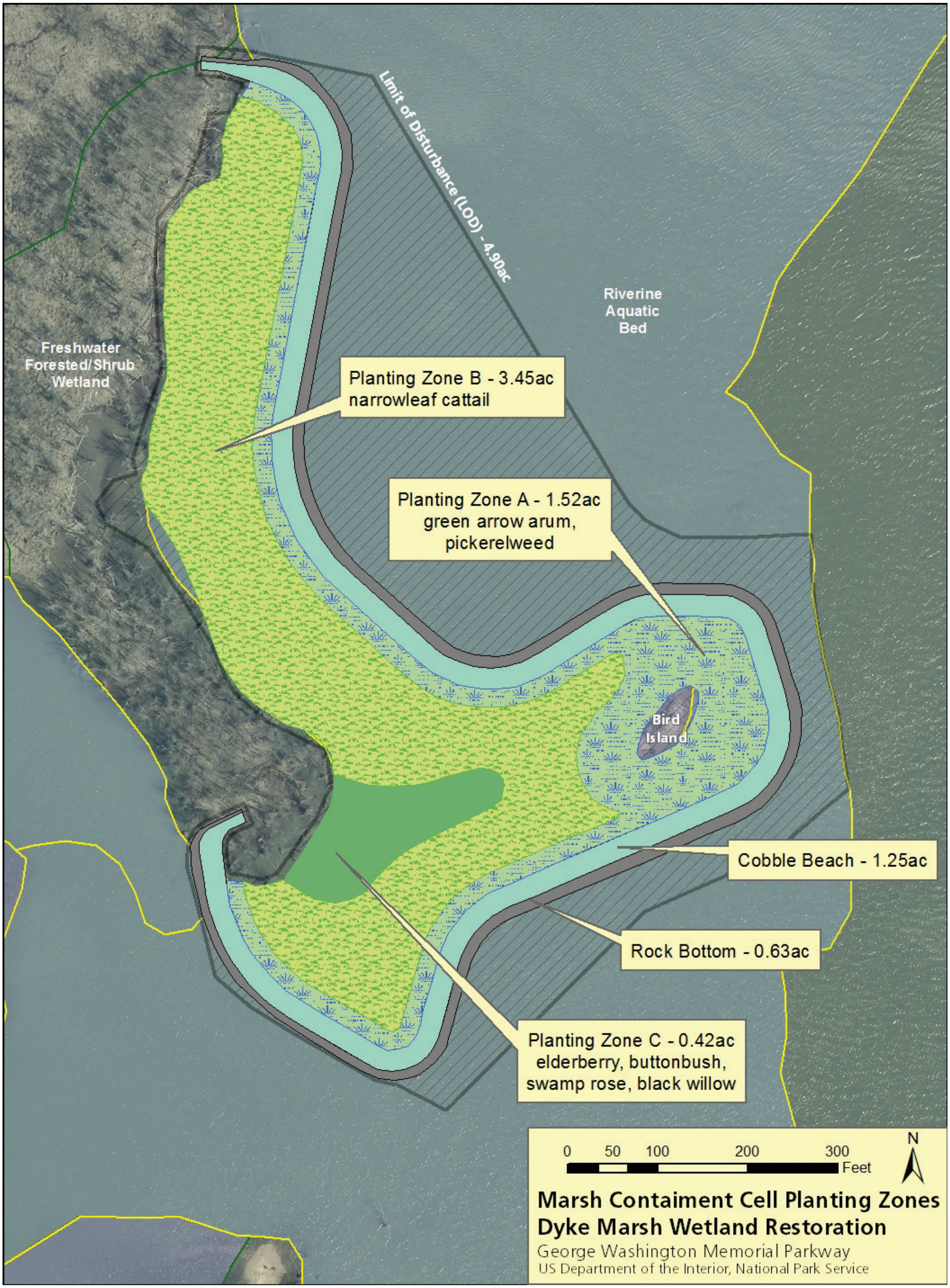

Figure 4. Marsh Containment Cell Planting Zones

The NPS would monitor for and remove nonnative invasive plant species in the containment cell in accordance with methods described in the National Invasive Species Management Plan (NISC 2008). As necessary, the NPS would apply approved herbicides to control *Phragmites*, purple loosestrife (*Lythrum salicaria*), and other nonnative invasive plant species. Invasive nonnative species would be treated up to three times per year, especially when invasive exotic plants are vulnerable or before fruiting. Replanting the area after control treatments of exotics may be necessary.

Deep Channel Scar Fill

A contractor would fill a 12-foot deep channel scar in the river north of the new containment cell that covers 0.71 acres (figure 1). The scar fill would help to reestablish some of the hydrologic conditions conducive to accretion rather than erosion. The scar would be filled with soil and capped with large quarry spall material, and placement of fill in the channels would be delivered to the site via barge. The backhoe equipment would use sonar and Global Positioning System coordinates to deposit the material in the appropriate areas.

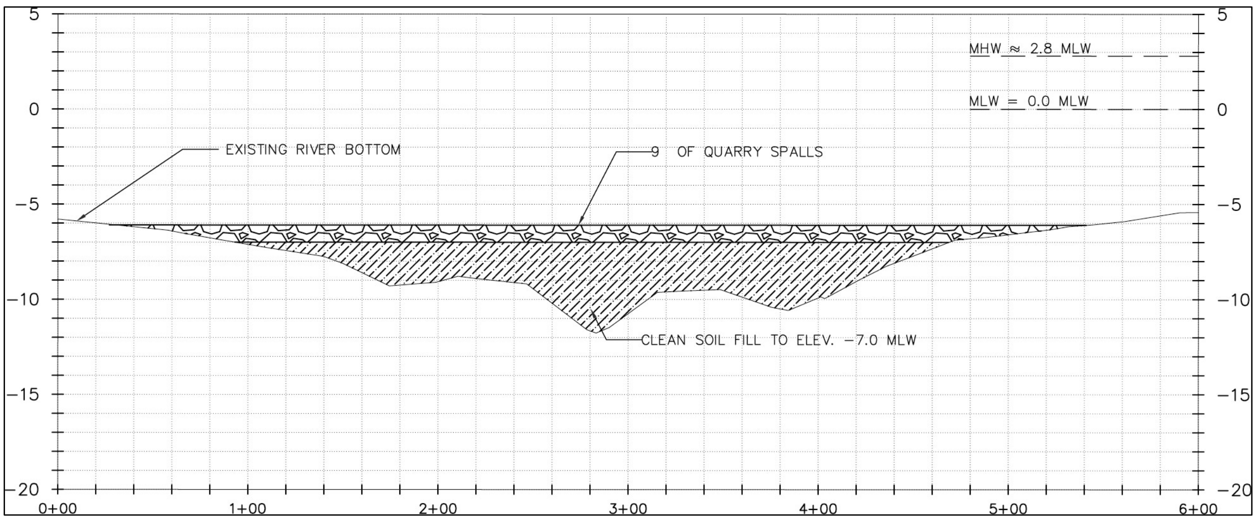

Figure 5. Profile of Scar Fill Area

SITE DESCRIPTION

Dyke Marsh is a large wetland area on the Potomac River south of Alexandria, Virginia, that is part of the George Washington Memorial Parkway. The marsh is one of the few remaining tidal freshwater marshes on the Potomac River. Such marshes provide habitat for many species of plants and animals, including rare species and species of state concern. Before the marsh came under the ownership of the National Park Service, and continuing during NPS administration, it was dredged extensively for the gravel deposits that underlay the marsh, and the result has been loss of over 100 acres and acceleration of erosion in the marsh. The post-mining marsh remnant is shrinking rapidly as a result of erosion. Storm waves driven upstream from tropical storms, hurricanes, and nor'easters (large-scale coastal storms whose winds blow predominantly out of the northeast) have been the primary agents of marsh erosion, rather than flooding from upriver (figure 6). Researchers found that linear erosion in the marsh averages between 6 and 8 feet per year, and that the outer walls of Hog Island Gut are not stable without the protective promontory removed in the 1950s that had directed flow from the gut upstream; they also found that without intervention through manmade stabilization of geological features such as the promontory, the marsh would continue to deconstruct (Litwin et al. 2011; Litwin et al. 2013).

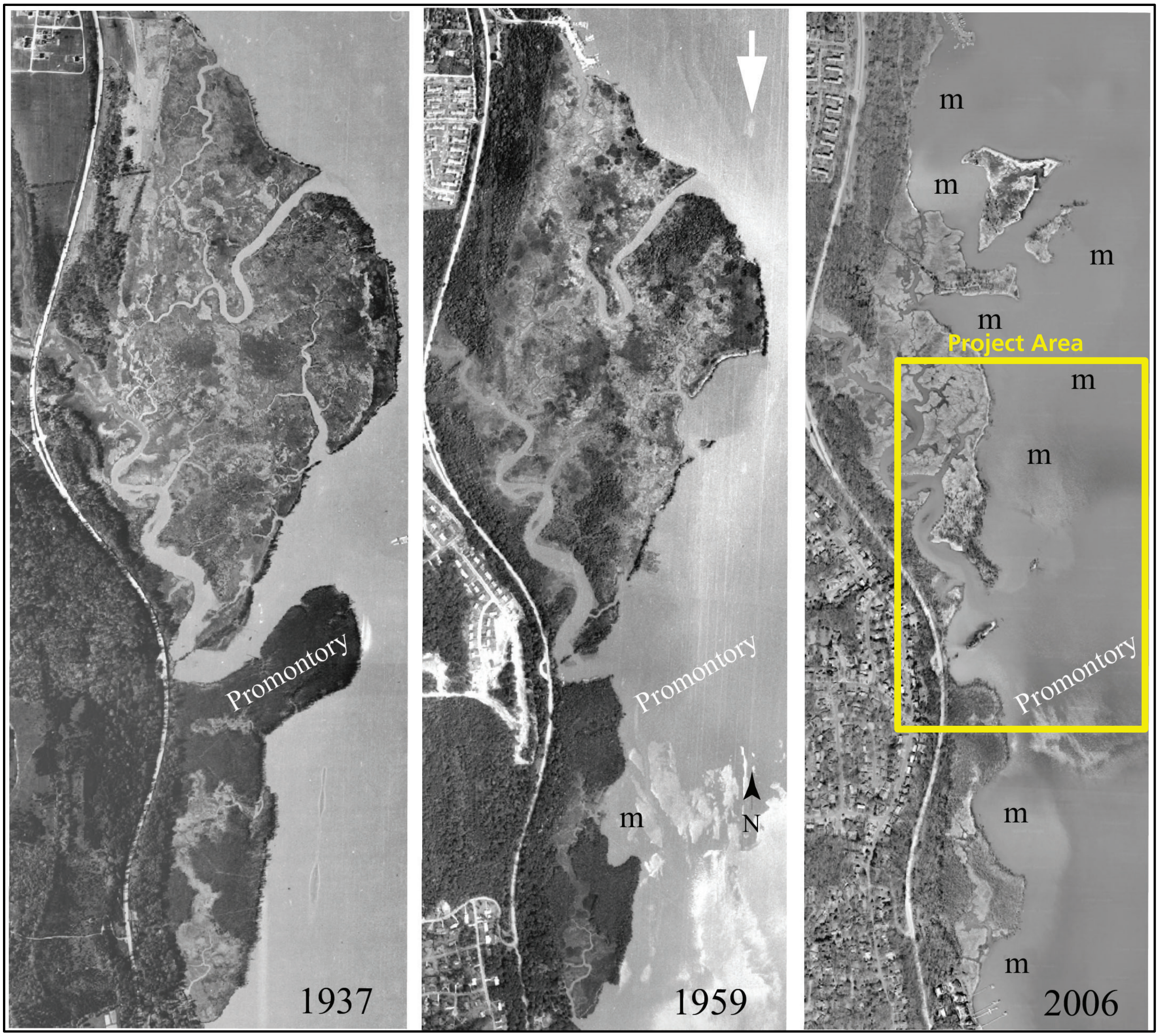

Figure 6. Dyke Marsh Historical Aerial Photographs from 1937, 1959, and 2006, Showing Extent of Dredging and Erosion. Areas Mined Out Are Noted by the Letter "m" (modified from Litwin et al. 2011).

Dyke Marsh has tidal freshwater marsh, swamp forest, and floodplain forest, with wetland areas within the forested areas. Two wetland types, as identified by the National Wetlands Inventory, comprise the majority of the preserve: palustrine (freshwater), persistent emergent, seasonally tidal (PEM1R); and palustrine, broad-leaved deciduous forested, seasonally tidal (PFO1R). The remainder of the wetlands in the preserve are composed of smaller, fragmented wetland areas and are a combination of scrub-shrub wetlands and forested wetlands, including palustrine, broad-leaved deciduous scrub-shrub, seasonally tidal (PSS1R); palustrine, broad-leaved deciduous scrub-shrub / persistent emergent, seasonally tidal (PSS1/EM1R); palustrine, broad-leaved deciduous forested, temporarily tidal (PFO1S); palustrine, broad-leaved deciduous forested, temporarily flooded nontidal (PFO1A); and palustrine, broad-leaved deciduous forested / persistent emergent, seasonally tidal (PFO1/EM1R) (USFWS 2000). These wetlands can be loosely grouped into freshwater emergent wetlands, freshwater forested wetlands, and freshwater scrub-shrub wetlands, as well as the riverine wetlands that form the guts in the marsh (figure 1).

The PEM1R wetland plant community is dominated by several different species, such as narrowleaf cattail (*Typha angustifolia*), spotted touch-me-not or orange jewelweed (*Impatiens capensis*), rice cutgrass (*Leersia oryzoides*), arrow arum (*Peltandra virginica*), sweetflag (*Acorus calamus*), river bulrush (*Bolboschoenus fluviatilus*), and spatterdock (*Nuphar lutea*) (Hopfensperger 2007). The PFO1R wetland plant community is dominated by pumpkin ash (*Fraxinus profunda*), box elder (*Acer negundo*), red maple (*Acer rubrum*), common water willow (*Justicia americana*), and silver maple (*Acer saccharinum*), (Hopfensperger 2007).

The dominant riverine aquatic bed (SAV) species is *Hydrilla verticillata*, a nonnative species. Other species include eelgrass (*Vallisneria americana*), waternymph (*Najas minor*), and common hornwort (*Ceratophyllum demersum*). Both waternymph and common hornwort are also nonnative. Although native species are preferred, nonnative SAV still provide functions and values similar to native species. They provide sources of food, safety, and habitat for aquatic animals; thus, SAV beds are valued even if they are of lower quality (Valley, Cross, and Radomski 2004; NPS 2010).

Functional Values Assessment of Project Area Wetlands

Palustrine Emergent, Scrub-Shrub, and Forested Wetlands. Dyke Marsh palustrine wetlands provide several functions and values, including flood storage and natural moderation of floods, nutrient reduction, wildlife habitat for wetland species, scenic open space. These wetlands trap sediment and pollutants from stormwater runoff and provide a natural filter before this runoff enters local waterways. They store large volumes of water and function as a "sponge," reducing the likelihood of flooding during storm events and protecting the shoreline from erosion.

One of the most important functions is to provide habitat and food web support for fish and wildlife. The fish and wildlife of Dyke Marsh are indicative of species that occupy the freshwater and terrestrial communities in the Washington, D.C., area (NPS 2000). Previous dredging of the marsh has greatly reduced its size, changed its hydrologic functions, and altered the amount and type of habitat available to support both resident and migratory fish and wildlife species. However, despite these alterations, the marsh provides habitat for 38 fish species, 16 reptile species, 14 amphibian species, 34 mammal species, more than 200 bird species, and many species of invertebrates (UMCES 2004; Barrows and Kjar 2003; Johnston 2000; Mangold et al. 2004; FODM 2012). The number of breeding bird species in the marsh varies; in a 2003 breeding bird survey, there were at least 46 species of birds confirmed to be breeding in the marsh (Booth 2006), but in 2011 there were 40 confirmed breeding species (FODM 2012).

The federally threatened northern long-eared bat as well as the Atlantic and short-nosed sturgeon are identified as potentially being present within Dyke Marsh. Several state-listed species of both plant and animal are found in Dyke Marsh. Based on input from the USFWS, the USACE, NPS staff, and local academics with knowledge of the marsh, six state-listed species of special concern occur in the preserve, including two bird species (least bittern [*Ixobrychus exilis*] and swamp sparrow [*Melospiza georgiana*]) and four plant species (Davis' sedge [*Carex davisii*], river bulrush [*Bolboschoenus fluviatilis*], rough avens [*Geum laciniatum*], and giant bur-reed [*Sparganium eurycarpum*]). In addition, the marsh is used as foraging habitat by the bald eagle (*Haliaeetus leucocephalus*), a recently delisted species; one bald eagle nest was recently confirmed in the forest adjacent to the marsh between the Haul Road and Hog Island Gut.

Riverine Aquatic Beds. The riverine aquatic beds (submerged aquatic vegetation) within the project area (figures 1 and 2) are composed mostly of *Hydrilla* and other non-native. But areas covered with submerged aquatic vegetation in the Potomac are generally understood to be high quality beds based on information received from the Virginia Institute of Marine Science. Submerged aquatic vegetation provides a series of functions including habitat, water quality enhancement, and sediment stability. The aquatic beds provide habitat for a number of species. Fish species find protective nurseries in bay grass beds. Microscopic zooplankton, an important component of the food chain, feed on the decaying bay grasses, thereby keeping the bed healthy and free of waste. Migratory waterfowl feed on bay grasses and the animals that live in the bay grass beds (Chesapeake Bay Program 2012).

Submerged aquatic vegetation is an ecological indicator of water quality that provides a quick and visible monitoring method for water quality degradation. Ecosystem services of submerged aquatic vegetation include absorption of nitrogen and phosphorus, release of dissolved oxygen from photosynthesis, sediment trapping, and reduce excess nutrients that would otherwise further impair the Chesapeake Bay watershed (Chesapeake Bay Program 2012).

Aquatic beds attenuate wave action and water velocity which decreases turbidity in the water column and can benefit the animals in the area as well the submerged aquatic vegetation itself. The submerged aquatic vegetation acts as a natural filter which traps sediment reducing adverse impacts of sedimentation. The roots of the vegetation provide stability at the bottom of the Bay and its tributaries thereby reducing erosion and further sediment pollution (Virginia Department of Education 2013).

Riverine Rocky Shore and Rock Bottom. Installing the marsh sill and stone breakwater will create rocky shore and rock bottom habitat that will help sustain existing fish and wildlife wetlands by dampening wave and tidal energy that has caused substantial erosion and loss of marsh habitat. The non-vegetated beach areas of the cobble sill and breakwater will provide habitat for various terrestrial wildlife such as shorebirds. Crustaceans, mussels, algae, and other rock-dwelling organisms will likely colonize these shallow water structures. The interstitial spaces among the larger rocks will accommodate different fish species and a refuge area for larval and juvenile fish and potentially increasing species richness of smaller fishes and crustaceans compared to less complex soft shore habitats (Erdle et al. 2006).

Unconsolidated (Soft) Bottom Habitat. A small area of riverine soft bottom habitat (figure 1) would be affected by constructing the stone breakwater. Soft sediment habitat is the most common riverine habitat type in the Potomac. Unconsolidated bottom habitats include environments where the bottom consists of fine grain sediments, sand and mud. Their biodiversity and productivity vary depending upon depth, light exposure, temperature, sediment grain size and abundance of microalgae and bacteria (Ocean Health Index 2015). This habitat typically supports high densities of clams, worms, crustaceans, and other benthic invertebrates. Benthic microalgae are also present in this habitat when shallow enough that light can penetrate to the bottom (VIMS 2015). The organisms that dwell in this habitat are important to the overall food chain and diversity of the system.

JUSTIFICATION FOR USE OF THE WETLANDS

The purpose of the proposed action is to begin the first phase to restore the tidal freshwater marsh and other associated wetland habitats that have been lost or impacted in Dyke Marsh. Dyke Marsh wetland resources, plant and animal communities, and natural ecosystem functions have been damaged by previous human uses and continued erosion, and are subject to continuing threats, such as alterations to the hydrology in the Potomac River and in nearby tributaries, and other effects from urbanization in the surrounding region. This wetland restoration will 1) protect the existing wetlands from erosion, nonnative invasive plants, loss of habitat, and altered hydrologic regimes; 2) restore wetlands and ecosystem functions and processes lost through sand and gravel mining and shoreline erosion; 3) avoid increased costs (delayed restoration will result in increased restoration costs); and 4) and improve ecosystem services that benefit the Potomac River Watershed and the Chesapeake Bay.

In order to meet the Dyke Marsh restoration objectives, it would be necessary to cause sort-term impacts to existing palustrine and riverine wetlands. Over the long-term, the first phase of restoration would replace low value submerged aquatic vegetation that is dominated by nonnative *Hydrilla* with stable palustrine wetlands and rocky shore and rock bottom riverine habitat.

INVESTIGATION OF ALTERNATIVE SITES AND DESIGNS

Preferred Alternative

Under this alternative, the marsh would be restored in a phased approach up to the historic boundary of the marsh and other adjacent areas within NPS jurisdictional boundaries, except for the area immediately adjacent to the marina. The initial phase of the preferred alternative would install a breakwater in the outline of the historic promontory, fill a 12-foot deep scar in the river bottom, and restore a marsh area along the south edge of Dyke Island and around Bird Island to stabilize the marsh and protect Hog Island Gut. Future phases would continue marsh restoration until a sustainable marsh is achieved and meets the overall goals of the project, and breaks would be installed to reintroduce tidal flows west of the Haul Road. The historic boundaries lie between the historic promontory and northern end of Dyke Island near the Haul Road. The outer edges of the containment cell structures would be placed at the park boundary in the river.

Hydrologic Restoration and Minimal Wetland Restoration Alternative

This alternative was fully evaluated in the EIS. It focused on the most essential actions that would reestablish hydrologic conditions that shield the marsh from erosive currents and protect the Hog Island Gut channel and channel wall. A breakwater structure would be constructed on the south end of the marsh, in alignment with the northernmost extent of the historic promontory, close to the historic edge of hog island gut, and wetlands would be restored to wherever the water is less than 4 feet deep. This alternative also includes fill of some deep channel near the end of the breakwater. The final element of this alternative is the reestablishment of hydrologic connections to the inland side of the Haul Road to restore bottomland swamp forest areas that were cut off when the Haul Road was constructed. This alternative would create fewer acres of new wetland habitats than the preferred alternative, but would allow the continued natural accretion of soils and establishment of wetlands given the new hydrologic conditions.

No Action Alternative

Under this alternative, there would be no restoration. Current management of the marsh would continue, which includes control of nonnative invasive plant species, ongoing interpretive and environmental education activities, scientific research projects, and enforcement of existing regulations. There would be no manipulation of the marsh other than emergency, safety-related, or limited improvements or maintenance actions. The destabilized marsh would continue to erode at an accelerated rate.

SUMMARY OF WETLAND IMPACTS

The impacts of implementing the first phase of restoration on wetlands are summarized in table 1. The wetland impact acreages were calculated using ArcMap by intersecting the wetland polygons with the footprint of all components of the marsh containment cell, stone breakwater, and deep channel fill. The wetland polygons used in the analysis included data from the National Wetland Inventory, 2015 Chesapeake Bay SAV Coverage, and USACE Dyke Marsh restoration plan drawings. The construction of the stone breakwater and marsh containment cell and filling of the deep channel scar would cause short-term impacts on up to 8.82 acres of existing wetlands. Work in the adjacent construction zone (limits of disturbance [LOD] area shown in figure 1) would temporarily impact up to an additional 11.46 acres of wetlands most of which is non-native submerged aquatic vegetation. In the nearby riverine areas disturb by construction, it is expected that submerged aquatic vegetation would volunteer and become established on its own where favorable conditions exist. Over the long-term, phase one of the Dyke Marsh wetland restoration project would result in a net gain of 1.17 acres of high quality wetlands. The 950 feet of stone breakwater that extends past the existing riverine soft bottom habitat accounts for the additional 1.17 acres of riverine habitat (table 1). The restored wetlands would have similar function and value as existing wetlands in Dyke Marsh (table 2). The wetland function and value variables evaluated were based on the analyses presented in the Final EIS (NPS 2014). This project is expected to have a stabilizing effect on the remaining 100-acres of upstream wetlands that would also result in expansion of upstream wetland areas. A monitoring program would be carried out to evaluate the success of the wetland restoration treatments over time and would identify problems that require remedial measures.

TABLE 1: DYKE MARSH RESTORATION IMPACTS

Restoration Area	Palustrine		Riverine				
Wetland Impact	Forest/Shrub	Emergent	Aquatic Bed	Rocky Shore	Rock Bottom	Soft Bottom	Total Acres
Marsh Containment Cell							
Temporary or Permanent Loss	-0.42	-0.05	-6.80	0.00	0.00	0.00	**-7.27**
Restored Wetland Area	0.42	4.96	0.00	1.25	0.64	0.00	**7.27**
Net Permanent Gain of Loss	0.00	4.91	-6.80	1.25	0.64	0.00	**0.00**
Stone Breakwater							
Temporary or Permanent Loss	-0.08	0.00	-0.50	0.00	0.00	-0.26	**-0.84**
Restored Wetland Area	0.00	0.00	0.00	1.69	0.32	0.00	**2.01**
Net Permanent Gain of Loss	-0.08	0.00	-0.50	1.69	0.32	-0.26	**1.17**
Deep Channel Fill							
Temporary or Permanent Loss	0.00	0.00	-0.71	0.00	0.00	0.00	**-0.71**
Restored Wetland Area	0.00	0.00	0.71	0.00	0.00	0.00	**0.71**
Net Permanent Gain of Loss	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Limits of Disturbance (LOD)							
Temporary Loss	-0.37	-0.06	-10.61	0.00	0.00	-0.42	**-11.46**
Restored Wetland Area	0.37	0.06	10.61	0.00	0.00	0.42	**11.46**
Net Permanent Gain of Loss	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total Permanent Gain or Loss	**-0.08**	**4.91**	**-7.30**	**2.94**	**0.96**	**-0.26**	**1.17**

TABLE 2: COMPARISON OF FUNCTIONS AND VALUES FOR DYKE MARSH WETLAND RESTORATION PROJECT

Function and Values	Palustrine		Riverine			
	Forest/ Shrub	Emergent	Aquatic Bed	Rocky Shore	Rock Bottom	Soft Bottom
Biotic Functions						
Fish/Shellfish Habitat, Aquatic Diversity/ Abundance	-	X	X	X	X	X
Wildlife Habitat, Wildlife Diversity/ Abundance, and Faunal Productivity	X	X	-	X	-	-
Native Species, Habitat Diversity, and Floral Productivity	X	X	-	X	-	-
Special Status Species	X	X	-	-	-	-
Hydrologic Functions						
Flood Attenuation/ Alteration and Economic Flood Protection Value	X	X	-	X	-	-
Sediment/Toxicant/ Pathogen Retention	X	X	X	-	-	X
Nutrient Removal/ Retention/ Transformation & Water Purification	X	X	X	-	-	-
Production Export & Detrital Export to Downstream Systems	X	X	X	-	-	-
Sediment/Shoreline Stabilization & Erosion and Sediment Control	X	X	-	X	X	-
Cultural Values						
Recreation/Economic Tourism Value	X	X	-	X	-	-
Uniqueness/Heritage	X	X	-	-	-	-
Education, Research/Scientific Value, and Interpretation	X	X	-	X	-	-
Visual Quality/Aesthetics	X	X	-	X	-	-
Historical Value	X	X	-	-	-	-
Total Number of Functions and Values	**13**	**14**	**4**	**8**	**2**	**2**

WETLAND MITIGATION

The National Park Service would implement the following mitigation measures during or after construction of the new breakwater structure, containment cell, and deep channel fill whenever feasible to minimize impacts to existing wetlands related to the proposed improvements. Although the exact mitigation measures to be implemented would depend upon the final design and approval of plans by relevant agencies, the following is a list of actions that would take place:

- Action would be conducted so as to avoid degrading water quality to the maximum extent practicable. Measures would be employed to prevent or control spills of fuels, lubricants, or other contaminants from entering the waterways. Actions would be consistent with state water quality standards and Clean Water Act Section 401 certification requirements.
- Appropriate erosion and siltation controls would be maintained during construction, and all exposed soil in the containment cell would be stabilized in accordance with approved permitted plans.
- Management techniques would be implemented to foster rapid development of target native wetland plant communities and to eliminate invasion by exotic or other undesirable species.
- The contractor will not occupy the existing marsh outside the designated construction zone to conduct any work.
- The contractor will access cobble beach seal and stone breakwater tie-ins from the river only and make reasonable efforts to minimize need to excavate and/or displace soft river bottom material to access tie-in areas.

Monitoring and Remedial Actions

The National Park Service will implement a monitoring program to assess the success of the wetland restoration as outlined in Appendix A of the Final EIS. The objectives of this monitoring are to determine if the restoration goals are achieved, to measure the effectiveness of restoration efforts, and to identify remedial action if restoration efforts are unsuccessful in meeting the performance criteria. The structure and composition of wetland vegetation will be assessed in the area to be restored and the reference marsh at Piscataway Park on the Potomac River. The objective will be to establish a wetland community to which the recovery of the restored site can be compared. This will help to determine the long-term target wetland vegetation community for the restored area. Plant establishment will be evaluated by comparing recovery within the restoration area with the reference marsh. If monitoring shows that the desired results are not being produced, remedial measures could include planting with native wetland species, noxious weed control, bird fencing adjustments, and other minor containment cell modifications.

COMPLIANCE

Prior to the implementation of the proposed action, the National Park Service would obtain appropriate state and federal approval for some of the proposed activities. The Final EIS includes a detailed description of the regulatory permitting required for this project. A list of permits, approvals, and regulatory requirements associated with the proposed action are as follows:

- Virginia Department of Environmental Quality, Virginia Marine Resources Commission, and USACE permits per Section 10 of the Rivers and Harbors Appropriations Act, Section 401, 404 and 408 of the Clean Water Act, and applicable state environmental regulations.
- Concurrence from the SHPO, Virginia Department of Historic Resources per Section 106 of the NHPA
- Concurrence from the National Marine Fisheries Service Office of Protected Resources per Section 7 of the Endangered Species Act regarding listed Atlantic and shortnose sturgeons.
- Concurrence from the National Marine Fisheries Service Habitat Conservation Division regarding impacts on essential fish habitat (SAV) per Magnuson-Stevens Fishery Conservation and Management Act
- Concurrence from the US Fish Wildlife Service per Section 7 of the Endangered Species Act regarding northern long-eared bat and Bald and Eagle Protection Act regarding nesting bald eagles at Dyke Marsh.
- Concurrence from the Fairfax County Wetlands Board per Virginia State Wetlands Act and Fairfax County Wetlands Zoning Ordinance.
- Concurrence from Virginia Department of Environmental Quality with the NPS consistency determination per Virginia's Coastal Management Program, as mandated by the Coastal Zone Management Act.

CONCLUSION

The long-term loss of 8.82 acres, and the temporary disturbance of 11.46 acres, of existing submerged, nonnative, aquatic vegetation, and unconsolidated river bottom, would be compensated with the restoration of 9.99 acres of stable, high value palustrine and riverine, emergent and scrub-shrub wetlands. The new breakwater, containment cell, and deep channel fill will help restore natural hydrologic processes resulting in reduced erosion of, and serve to protect, the existing 100-acre wetland. These improvements will slow river flows and encourage buildup of sediments in areas that had been impacted by past dredge mining and erosion. These sediment deposits are expected to naturally revegetate adding to the existing 100-acre area of palustrine and scrub-shrub wetlands in Dyke Marsh.

The National Park Service concludes that implementing the first phase of the Dyke Marsh wetland restoration project by constructing a stone breakwater and marsh containment cell and filling a deep channel scar will result in a long-term net gain in wetland function and value similar to the past wetlands at Dyke Marsh that were lost to past dredge mining and other activities that destabilized hydrologic conditions at the marsh. Construction activities will be managed to minimize disruption to the surrounding wetland environment. Mitigation and compliance with regulations and policies to prevent impacts to wetlands and water quality would be strictly adhered to during and after the construction. Individual permits with other federal and cooperating state and local agencies would be obtained prior to construction activities. No long-term net loss of wetlands would occur from implementing the preferred alternative. Therefore, the National Park Service finds the preferred alternative to be acceptable under Executive Order 11990 for the protection of wetlands.

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REFERENCES

Barrows, E.M., and D.S. Kjar

2003 "Biodiversity Database of the Washington, D.C., Area." Accessed October 30, 2009 at http://biodiversity.georgetown.edu.

Booth, G.

2006 "A Sanctuary Amid the Sprawl." *Virginia Wildlife*. October 2006.

Chesapeake Bay Program.

2012 *Bay Grasses*. Retrieved 12 8, 2016, from Chesapeake Bay Program: http://www.chesapeakebay.net/issues/issue/bay_grasses#inline

Chesapeake Materials, LLC

2014 Products page. Accessed April 8, 2013 at http://www.chesapeakematerials.com/products/products.htm.

Erdle, S.Y., J.L.D. Davis, K. G. Sellner (editors)

2006 *Management, Policy, Science, and Engineering of Nonstructural Erosion Control in the Chesapeake Bay: Proceedings of the 2006 Living Shoreline Summit.* CRC Publ. No. 08-164.

Friends of Dyke Marsh (FODM)

2012 *Bird List*. Accessed December 20, 2012 at http://www.fodm.org/updated.htm.

Hopfensperger, K.N.

2007 *Effects of Annual and Perennial Community Dynamics on Tidal Freshwater Marsh Ecosystem Functioning*. University of Maryland. Program of Marine, Estuarine, and Environmental Science.

Johnston, D.W.

2000 "The Dyke Marsh Preserve Ecosystem." *Virginia Journal of Science* 51:223–271.

Litwin, R.J., J.P. Smoot, M.J. Pavich, H.W. Markewich, E. Oberg, B. Helwig, B. Steury, V.L. Santucci, N.J. Durika, N.B. Rybicki, K.M. Engelhardt, G. Sanders, S. Verardo, A.J. Elmore, and J. Gilmer

2011 *Analysis of the Deconstruction of Dyke Marsh, George Washington Memorial Parkway,and Manmade Causes, and Effective Restoration Scenarios*. U.S. Geological Survey Open-file Report 2010-1269.

Litwin, R.J., J.P. Smoot, M.J. Pavich, E. Oberg, B. Steury, B. Helwig, H.W. Markewich, V.L. Santucci, and G. Sanders

2013 Rates and Probable Causes of Freshwater Tidal Marsh Failure, Potomac River Estuary, Northern Virginia, USA. Wetlands. SWS. DOI 10.1007/s13157-013-0461-6. October 3, 2013.

Mangold, M.F., R.C. Tipton, S.M. Egler, and T.M. McCrobie

2004 *Inventory of Fish Species within Dyke Marsh, Potomac River (2001–2004)*. U.S. Fish and Wildlife Service, in conjunction with Maryland Fishery Resources Office. Annapolis, Maryland.

National Invasive Species Council (NISC)

2008 2008–2012 National Invasive Species Management Plan.

National Park Service

2000 *Raised Boardwalk and Improvements to Wildlife Viewing Areas at Dyke Marsh Environmental Assessment*. George Washington Memorial Parkway. April 2000.

2010 Aquatic Plants. Accessed on May 14, 2014 at http://www.nps.gov/plants/alien/pubs/midatlantic/hyve.htm.

2014 Dyke Marsh Wetland Restoration and Long-Term Management Plan/ Final Environmental Impact Statement.

Ocean Health Index

2015 Soft Bottom Habitats (subtidal). Accessed March 2, 2016 at http://www.oceanhealthindex.org/methodology/components/soft-bottom-habitats.

US Army Corps of Engineers (USACE)

2013 Dyke Marsh Restoration Project Design Technical Memorandum, Phase 3. March 2013. Prepared for the USACE Baltimore District by RK&K.

United States Fish and Wildlife Service (USFWS)

2000 National Wetland Inventory Data Mapper. Accessed August 4, 2009 at http://wetlandsfws.er.usgs.gov/imf/sites/NWI_CONUS/CONUS_metadata/topoq24.htm

University of Maryland Center for Environmental Science (UMCES)

2004 "Summary of Informational Workshop for Dyke Marsh Preserve."

Valley, R.D, T.K. Cross, and P. Radomski

2004 The Role of Submersed Aquatic Vegetation as Habitat for Fish in Minnesota Lakes, Including the Implications of Non-Native Plant Invasions and their Management. Minnesota Department of Natural Resources Special Publication 160.

Virginia Department of Education.

2013 Grasses, grasses, everywhere. Accessed June, 2016 at http://www.doe.virginia.gov/instruction/science/elementary/lessons_bay/lesson_plans/grasses_everywhere/grasses.pdf

Virginia Institute of Marine Science (VIMS)

2015 Shallow Water Habitats. Accessed December 9, 2015 at http://web.vims.edu/bio/shallowwater/physical_characteristics/habitat_types.html.

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