



## **RECORD OF DECISION**

### **Dyke Marsh Wetland Restoration and Long-term Management Plan / Environmental Impact Statement**

#### **George Washington Memorial Parkway, Virginia**

## **INTRODUCTION**

The Department of the Interior, National Park Service (NPS), has prepared this Record of Decision (ROD) for the George Washington Memorial Parkway Dyke Marsh Wetland Restoration and Long-term Management Plan and Final Environmental Impact Statement (final plan/EIS). This ROD states the decision, describes the other alternatives considered and the environmentally preferable alternative, discusses the basis for the decision, lists measures to minimize environmental harm, and briefly describes public and agency involvement in the decision-making process. The non-impairment determination for the selected action, which is required by NPS *Management Policies 2006* (NPS 2006), is attached to this ROD.

## **PURPOSE AND NEED FOR THE PLAN/EIS**

Dyke 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 federal government in 1960, and continuing through 1972, during NPS administration of the marsh, it was dredged extensively for the gravel deposits that underlay the marsh, resulting in accelerated erosion and loss of marsh. According to historic documents, the original extent of the property, including the marsh and adjacent land, covered approximately 650 acres. In 1937, the main part of the marsh north of the promontory covered approximately 184 acres, plus 16 acres south of the promontory, and an additional 15 to 20 acres west of the parkway. The current extent of the marsh is about 60 acres, plus the 15 to 20 acres west of the parkway (Litwin et al. 2011). 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. The NPS is required to restore Dyke Marsh, under Public Law (P.L.) 93-251, and the Water Resources Development Act of 2007.

The purpose of this plan is to develop and implement actions for restoration and long-term management of the tidal freshwater marsh and other associated wetland habitats that have been lost or impacted in the Dyke Marsh. A restoration and long-term management plan is needed at this time to

- 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 (delayed restoration will result in increased restoration costs); and
- Improve ecosystem services that benefit the Potomac River Watershed and the Chesapeake Bay.



The objectives of the final plan/EIS are listed below.

#### **NATURAL RESOURCES**

- Restore, protect, and maintain tidal freshwater wetlands and associated ecosystems to provide habitat for fish, wildlife, and other biota.
- Ensure that management actions promote native species while minimizing the intrusion of nonnative invasive plants.
- Reduce erosion of the existing marsh and provide for erosion control measures in areas of restored marsh.
- To the extent practicable, restore and maintain hydrologic processes needed to sustain Dyke Marsh.
- Protect populations of state rare species such as swamp sparrow (*Melospiza georgiana*) and river bulrush (*Bolboschoenus fluvialis*).
- Increase the resilience of Dyke Marsh and provide a natural buffer to storms and flood control in populated residential areas.

#### **CULTURAL RESOURCES**

- Design and implement the plan in a manner that preserves and protects the historic resources and cultural landscape features associated with Dyke Marsh and the George Washington Memorial Parkway.

#### **VISITOR EXPERIENCE**

- Enhance appropriate educational, interpretation, and research opportunities at Dyke Marsh and enhance accessibility for diverse audiences.

#### **BACKGROUND**

Dyke Marsh has been altered periodically from the early 19th century into the 20th century, including dredging operations in the marsh in the 20th century that resulted in degradation of the marsh. Manipulations of Dyke Marsh began in the early 1800s when colonial landowners tried to convert the marsh area first into a place for ships to tie up and then into pasturelands for grazing (NPS 2009a). In an attempt to create a wet meadow, dikes were constructed around the marsh to keep the tidal influx of water out of the marsh. However, the dikes were difficult to maintain and the land was later abandoned. Shortly after, portions of the dikes failed and the inflow of tidal water formed channels through the meadow, and the tidal freshwater marsh was reestablished (NPS 1977).

In the early 1930s, Smoot Sand and Gravel Corporation (SSGC) acquired 650 acres of land along the Potomac River from Bucknell University. The parcel included the southern 260 acres of Dyke Marsh adjacent to the lands belonging to the United States. By 1940, SSGC had dredged a large portion of the open water areas and destroyed a great deal of marshland (NPS 1977). Between 1940 and 1972, approximately 270 acres of the original marsh were mined for sand and gravel by SSGC, including the swamp forest wetlands of the promontory south of Hog Island Gut.

In the late 1950s, the federal government, local citizens, and various conservation groups in and around Washington, D.C., began expressing concern that the marsh was degrading due to SSGC mining activities. In response to publicity about the marsh and mounting public interest, in April 1959, House Resolution (HR) 2228 was introduced to authorize the Secretary of the Interior to acquire the southern 260 acres of Dyke Marsh from SSGC for the NPS. The bill, which was intended as a tool for



preservation, described Dyke Marsh as “an area of irreplaceable wetlands near the Nation’s Capital which is valuable for the production and preservation of wildlife” (Cong. Rec. 86 [first sess.] [1959]).

In May 1959, the Committee on Public Works submitted a report to accompany bill HR 2228, stating that it was in the interest of the government to own this strip of land along the Potomac River because it would help preserve the aesthetic qualities of the memorial parkway (S. Rep. 86-280 [1959]). A deed completing the exchange and conveying title to the land from SSGC to the United States was executed on May 31, 1960.

Congress passed P.L. 86-41 granting the U.S. government a legislative mandate for management of the marsh (UMCES 2004) on June 11, 1959. The passage of this legislation ensured that a substantial portion of the wetland would remain intact, but allowed SSGC to continue to dredge in some areas of the marsh. As a result, mining continued in certain portions of the marsh until 1972, when SSGC relinquished its dredging rights. Once the property had passed into federal ownership in 1960, the NPS started activities to fill the deep holes created by the dredging. The NPS continued to fill dredged areas in Dyke Marsh into the early 1970s. However, the NPS realized that there was no effective and scientifically sound management plan for the marsh, and that placing fill materials to restore the marsh should be more thoroughly analyzed. As a result, the filling of the dredged areas was halted. To help resolve the need for an effective management plan, P.L. 93-251 was enacted on March 7, 1974, authorizing the U.S. Army Corps of Engineers (USACE) to assist the NPS in planning, designing, and implementing the restoration and expansion of Dyke Marsh (NPS 1977).

Although impacts to the marsh from dredging activities have caused the most easily recognizable changes to the marsh, several other changes have resulted from past activities in and near the marsh. The outfall of Hunting Creek and Cameron Run into the Potomac River upstream of the marsh has been altered by the development of the George Washington Memorial Parkway, urbanization within the watershed, the development of a golf course along the creek and parkway, and upstream channelization. The sediment load from Hunting Creek, which was once carried toward the marsh and helped maintain a depositional environment, is now deposited mostly north of the marsh at the creek’s confluence with the Potomac River, where mudflats and emergent wetlands are beginning to develop. These changes have greatly reduced the amount of sediment and nutrients supplied to the marsh by Hunting Creek (NPS 1977; UMCES 2004). More recent disturbances include rebuilding the Woodrow Wilson Bridge and several associated interchanges at Hunting Creek and Cameron Run, which could further alter the hydrology in the creek and result in additional impacts on the marsh downstream.

## **DECISION (SELECTED ACTION)**

The NPS’s decision is to implement alternative C: Hydrologic Restoration and Fullest Possible Extent of Wetland Restoration (Preferred Alternative) as the selected action, which was described as the NPS’s preferred alternative in the final plan/EIS. The final plan/EIS was released to the public for the required 30-day no-action period beginning October 10, 2014 and ending November 10, 2014. Under the selected action, the marsh will 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 Belle Haven Marina. Implementation of the different phases will be dependent upon available funding and fill material. The initial phase will include installation of a breakwater, establishment of marsh in the footprint of the historic promontory, placement of fill in the deep channels within the park boundaries, and restoration of marsh along the edge of existing marsh in waters less than 4 feet deep (approximately 40 acres) to stabilize the marsh and protect Hog Island Gut. Future phases will continue marsh restoration until a sustainable marsh is achieved and meets the overall goals of the project, and breaks will be installed to reintroduce tidal flows west of the Haul Road. The outer edges of the containment cell structures will be placed at the park boundary in the river. Restoration of 16 acres of wetlands south of the



breakwater will also be included as an option. Approximately 180 acres of various wetland habitats could be created overall, including the option.

#### **GENERAL CONSTRUCTION APPROACH**

Construction will take place from the water to the greatest extent possible, using marine construction equipment. Material will be brought in by barge and stored on the barges. There will be little, if any, need for staging areas on land in the park.

#### **BREAKWATER STRUCTURE AT LOCATION OF HISTORIC PROMONTORY**

The selected action includes the construction of a breakwater structure in the historic location of the promontory that was dredged and, as a result, altered the hydrology of the marsh. Construction of the breakwater in that area will redirect erosive flows away from the marsh, particularly during strong storms, and will reestablish hydrologic conditions that encourage sediment accretion (Litwin et al. 2011; USACE 2013). Under the selected action, the breakwater will be aligned with the historic southern edge of the promontory, and emergent marsh will be created within the footprint of the historic promontory to the north of the breakwater (see figure 1 in the final plan/EIS).

Construction of the breakwater is designed to protect one of the most prominent and important features of the Dyke Marsh system, the large tidal gut called 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 removed the promontory and other wetlands that created the northward bend in the tidal gut channel. As a result, Hog Island Gut 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 used in the development of this plan indicate that establishing of a breakwater just downstream of the existing mouth of the gut will protect the gut by introducing a northward bend in the channel and also redirect flows and encourage sediment accretion.

The breakwater structure will likely be armorstone or riprap and constructed in a trapezoidal shape. The side slopes of the stone will be approximately 2:1 from the top of the breakwater to the river bottom elevation, including at the end section. The stone will be brought in by barge and placed from the water.

#### **DEEP CHANNEL FILL WITHIN NPS BOUNDARIES**

Fill will be placed in the deep channels just north of the historic extent of the promontory. The deep channel fill will help to reestablish some of the hydrologic conditions conducive to accretion rather than erosion. The channels will be filled with larger material (gravel or larger), and placement of fill in the channels will be delivered to the site via barge.

#### **CONSTRUCTION APPROACH FOR CONTAINMENT CELLS**

The restored marsh will be constructed using a series of containment cells that will be filled with hydraulic slurry. Dredge material used for fill will be evaluated by the USACE 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 size and configuration of the containment cells may be adjusted to address design and construction constraints. Several cells, especially those within the 4-foot depth contour, will be smaller to address specific situations; however, larger cells will be generally used. Phasing of the restoration will generally target filling cells adjacent to vulnerable areas, such as next to the channel wall of Hog Island Gut, and areas immediately along the shoreline first, and then work outward toward the river channel.



Depending on the location of the cells, a variety of materials will be used to construct the containment cell walls. All containment cell walls would be installed from the water. Steel sheet piling will be used to protect the containment cells during restoration for cells that are located further into the river in deeper water and are more exposed to river flows and wave action. Sand-filled geotextile tubes might also be used in select areas; these will be removed after restoration. The sheet piling will be configured to allow intertidal exchange when installed, or cut or perforated once the fill has been placed but before any planting takes place to begin to allow the development of a seed bank. Once all restoration activities are complete, the sheet piling will be removed, cut, or driven into the river bed so the result is a soft edge to the marsh. Plans addressing intertidal exchange will be developed in greater detail at later stages of design.

Vinyl sheet piling may be used for containment cells that are located in water deep enough that hay bales would not be sturdy enough but steel sheet piling would not be necessary. As with the steel sheet piling, the vinyl sheet piling will be installed from the water using pile drivers or vibrating equipment. The vinyl piling will be cut or driven into the river bed when the restoration activities are complete. A list of all options for containment cell materials is shown in table 1.

**TABLE 1. POTENTIAL CONTAINMENT CELL MATERIALS AND WHERE THEY WILL BE USED**

Containment Cell Materials	Where Used
Coir Biologs	In shallow water (up to 4 feet deep); on the leeward side of more substantial containment that will dissipate wave energy.
Hay Bales	In shallow water (up to 4 feet deep); on the leeward side of more substantial containment that will dissipate wave energy.
Geotextile Tubes (sand-filled)	In medium depth water that is slightly more exposed, although low energy areas are still desirable. Geotextile tubes are generally temporary or maintained. They are typically removed or hidden (covered) (USACE 1998).
Vinyl Sheet Piling	In deeper water that is moderately protected, but where solutions for shallower water would not work.
Steel Sheet Piling	In deeper water or in situations where flows or wave action requires sturdier materials. Steel sheet piling is typically cut or driven into the river bed after restoration activities are complete.

#### **NATURAL EDGES ON THE OUTERMOST EXTENT OF THE CONTAINMENT CELLS**

The outermost edge of the restored marsh (the edge furthest from the shore) will be designed to be a soft, natural edge without noticeable armoring or sheet piling. Achieving a soft, natural edge requires that the outermost containment cell not be completely filled and be designed so the toe of the slope is at the outermost wall of the containment cell at the NPS boundary. Emergent marsh vegetation will not be established all the way to the edge of this cell because the slope and increasing water depth will not support emergent marsh vegetation throughout the cell. However, it is expected that submerged aquatic vegetation (SAV) will become established in the deeper waters riverward of the emergent marsh. In some places where the outer channel is particularly deep, the toe of the steeper slope may need to be hardened. Vegetation will be established at the appropriate elevations, with plants such as yellow pond-lily (*Nuphar lutea*) in deeper areas and narrowleaf cattail (*Typha angustifolia*) in shallower areas.



To achieve natural edges for the newly created tidal guts, the openings and the beginnings of the channels will be cut mechanically, and additional guts will be allowed to form naturally over time. The walls of the tidal gut mouths will be stabilized with biodegradable materials until the guts reach equilibrium.

#### **APPROACHES TO VEGETATION REESTABLISHMENT**

Use of vegetation appropriate to the elevation (water depth) within the containment cells is an important component of the restoration process. Several options can be used, depending on factors such as available seed sources, type of wetlands desired in a cell, available plant material, and cost constraints. These options include allowing plants to establish naturally by seed or other propagules, seeding mudflats, or transplanting plugs of nursery plants. Revegetation activities will be conducted by NPS staff, contractors, or volunteers. The NPS will prepare the planting plans. Plant species used for the plantings will include narrowleaf cattail, river bulrush (*Bolboschoenus fluviatilis*) if available, wild rice (*Zizania aquatica*), jewelweed (*Impatiens capensis*), arrow arum (*Peltandra virginica*), pickerel weed (*Pontederia cordata*), and yellow pond-lily, among others. As previously noted, it is expected that SAV will become established on its own where appropriate depths and other conditions exist.

Goose exclosures will be used to prevent herbivory by geese. The NPS will monitor for and remove nonnative invasive species according to methods described in the National Invasive Species Management Plan (NISC 2008).

Costs for vegetation reestablishment will vary, depending on the type of planting strategy used, and the type of labor used.

#### **REESTABLISH HYDROLOGICAL CONNECTIONS TO THE INLAND SIDE OF THE HAUL ROAD**

The selected action includes the reintroduction of tidal flows to both sides of the Haul Road via the installation of culverts or bridges. Reintroduction of intertidal exchange will encourage reestablishment of a floodplain swamp forest and facilitate the management of nonnative invasive vegetation species that have established in the area. The configuration and materials used for the culverts and bridges will be determined later in the design process. It is likely that two to three breaks will be introduced in the road, although the final design will determine the exact number. Contractors will use heavy equipment, such as a backhoe, to cut each break in the road. The road will be reestablished over the breaks, and will continue to serve as a trail to the marsh after construction is complete. Appropriate sediment and erosion control practices will be used, and should removal of trees be necessary, impacts will be mitigated by planting new native trees or possibly other appropriate native vegetation in the disturbed area.

#### **WASHINGTON GAS PIPELINE**

A Washington Gas pipeline, buried beneath the river bottom, passes through the project area near the area of the historic promontory. The pipeline is grandfathered from a permit issued to Washington Gas in 1961. The NPS will work with Washington Gas to ensure appropriate construction practices are used so that vibrations in the vicinity of the pipeline are minimized and there are no adverse impacts to the pipeline. Washington Gas has provided a list of mitigation measures, including specific requirements for pile driving and minimum distances to ensure that the northern promontory and sheet piling do not impact the gas line during construction. There will be no expected impacts on the gas line after construction is completed.

#### **ADAPTIVE MANAGEMENT**

Adaptive management is used when there are clearly defined desirable outcomes to a project, but there is some uncertainty as to long-term impacts, so that adjustments to implementation may be needed to ensure that the outcome will be achieved. Adaptive management will be a key element in the implementation of



the selected action in this plan/EIS. Marsh restoration will be phased, and there are many factors that could affect the success of this restoration project, contributing to uncertainty. Adaptive management will be useful in this planning effort to make adjustments to vegetation establishment, manage nonnative invasive species throughout the marsh, and track the overall restoration approach to ensure restoration is successful. Adaptive management frameworks describe the initial actions to be taken, metrics used to ensure objectives are being met, monitoring actions to be taken, and subsequent actions that will be taken if monitoring indicates the objectives are not being met.

The adaptive management framework for this project is discussed in detail in appendix A of the final plan/EIS. The plan will establish baseline preconstruction conditions, monitor post-construction conditions, and compare conditions to control sites and a reference marsh. The marsh at Piscataway Park on the Potomac River will be used as a control site and reference marsh, due to its proximity to Dyke Marsh and similar marsh type. The NPS will monitor vegetation establishment (amount of vegetation and species types), elevation, and rates of erosion or accretion. Vegetation in the newly created marsh should be approximately the same as what is currently in the existing marsh or in the reference control marsh at Piscataway Park. A limit on nonnative species (in terms of percentage of overall vegetation) will be established, and nonnative species will be removed upon discovery. Elevation, erosion, and accretion will be monitored to make sure the breakwater and other changes are working as expected. Hydrology and salinity will also be monitored, and observations of SAV will be made as opportunities arise during monitoring of other parameters.

#### **MEASURES TO MINIMIZE ENVIRONMENTAL HARM**

All practical means to avoid or minimize environmental harm from the selected alternative have been adopted. The project will require multiple permits and approvals from federal, state, and county agencies. These approvals will encompass the project's several year implementation period and allow for flexibility if the project needs to extend beyond this time frame. Restoration activities will proceed in an incremental and phased approach that will be guided by, and adjusted in response to, the adaptive management plan. Monitoring will be conducted in accordance with the adaptive management plan, and will determine factors contributing to the success or failure of the restoration, justify adaptive management actions, and allow for the better understanding of factors contributing to marsh loss throughout Dyke Marsh.

Permits that must be obtained for the project will require application of pollution prevention principles, spill prevention measures, standard practices related to air quality, and implementation of appropriate sediment and erosion control practices. The permits will also dictate construction timing to prevent adverse effects on fish spawning and wildlife reproduction seasons. Other measures specifically mentioned in the plan/final EIS that will be taken to minimize harm to the environment include the following:

- Containment cell edges will be constructed to have "soft" edges; hard pilings will eventually be removed, driven into the river bed, or cut to allow formation of an emergent marsh edge and to minimize visual impact; areas where SAV can recolonize will remain at the marsh edges.
- The marsh will be accessed by water to the greatest extent possible; there will be no heavy land traffic and little, if any, need for staging areas on land in the park.
- Any fill used will be tested to ensure that it meets standards relating to possible contamination and has the appropriate particle size and consolidation rate so that the site will develop characteristics of marsh soils and sediments over time that can support vegetation.
- A temporary exclusion zone will be established around the historic dyke remnants, extending perhaps 10 feet from the feature, delineated by a high-visibility barrier such as snow fence with warning signs. Coupled with a verbal briefing of construction personnel, this will greatly reduce



the likelihood of accidental impacts to the historic resource. All warnings and barriers will be removed when construction is complete.

- If archeological resources are discovered during construction, all work in the immediate vicinity of the discovery will be halted until the resources can be identified and documented and an appropriate mitigation strategy can be developed. Consultation with the Virginia State Historic Preservation Office (SHPO), the NPS, and/or the NPS regional archeologist will be coordinated to ensure that the protection of resources is addressed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 will be followed.
- The NPS will monitor for and remove nonnative invasive species according to methods described in the National Invasive Species Management Plan (NISC 2008).
- The NPS will work with Washington Gas to ensure appropriate construction practices are used so that vibrations in the vicinity of the pipeline are minimized and there are no adverse impacts to the pipeline.
- Stone will be used for the construction of the breakwater (as opposed to sheet piling or other hard material) to create the most natural appearance and minimum visual impacts.
- Removal of trees, if necessary, will be mitigated by planting new native trees or possibly other appropriate native vegetation in the disturbed area.

It is expected that additional measures to minimize environmental harm will be identified through the permitting process and consultation.

## **ENVIRONMENTALLY PREFERABLE ALTERNATIVE**

The NPS has identified alternative C as the environmentally preferable alternative. Of all the alternatives considered, alternative C will provide the most beneficial impacts on resources and values, including short-term stabilization of the marsh and minimization of erosion. The alternative will also allow for future restoration of the entire marsh by placing the breakwater on the southern alignment, and therefore allow full restoration of the promontory. This alternative will allow for the most environmental benefits, including creation of habitat, water quality and floodplain protection benefits, restoration of cultural landscapes, and improvement of visitor experience. Under alternative B, future restoration would be limited by the configuration of the breakwater, and under alternative A (no action), the marsh would continue to erode, eventually entirely; therefore neither of those alternatives would be considered environmentally preferable.

## **ALTERNATIVES CONSIDERED BUT NOT SELECTED**

### **Alternative A: No Action**

Under alternative A, no restoration would occur, and the marsh would be managed as it is currently, including providing basic maintenance related to Haul Road, controlling non-native invasive plant species, and enforcing 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, and eventually erode in its entirety (Litwin et al. 2011).

Current management actions that would continue to be implemented include continuation of scientific research and evaluation in the marsh and continuation of management of nonnative invasive plants. Educational and interpretive activities would continue to inform the public about marsh ecology and



natural processes in the marsh. Cooperation with various entities, such as the group “Friends of Dyke Marsh,” would continue.

The actions that would continue under alternative A are described in detail on pages 37 and 38 of the final plan/EIS, including those actions that would continue under both action alternatives.

### **Alternative B: Hydrologic Restoration and Minimal Wetland Restoration**

Under alternative B, the focus would be on the most essential actions that would reestablish hydrologic conditions that protect 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, and wetlands would be restored in waters less than 4 feet deep. This alternative also includes fill of some deep channels near the breakwater. The final element of this alternative would be 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. Approximately 30 acres west of the Haul Road could be influenced by tidal flows as a result. These actions would not necessarily happen in any particular order, and might be dictated by available funds. However, it is assumed that the breakwater would be constructed first. This alternative would create approximately 70 acres of various new wetland habitats and allow the continued natural accretion of soils and establishment of wetlands given the new hydrologic conditions.

The actions that would take place under alternative B are described in detail on pages 38 to 48 of the final plan/EIS.

### **BASIS FOR DECISION**

In selecting alternative C: Hydrologic Restoration and Fullest Possible Extent of Wetland Restoration for implementation, the NPS evaluated each alternative based on its ability to meet the plan objectives (see table 5 of the final plan/EIS), environmental impacts (see “Chapter 4: Environmental Consequences” of the final plan/EIS), anticipated effort with implementation, the degree of management flexibility, and costs. Alternative C provides the greatest amount of benefits from its initial phases of restoration by stabilizing the marsh and allows for flexibility in restoration approaches such that the fullest possible extent of marsh restoration can be achieved.

Alternative B also meets many of the plan objectives and would protect and stabilize important areas of the marsh and restore additional acreage, though it would not include full restoration of the promontory. However, alternative C provides more flexibility in implementation and the additional marsh restoration under alternative C would provide the greatest amount of benefits, namely full restoration of the promontory, stabilization of important areas of the marsh in the initial phase of restoration, and reestablishment of important hydrological functions.

### **PUBLIC AND AGENCY INVOLVEMENT IN THE PLANNING PROCESS**

#### **Public Scoping**

**Public Notification**—A Notice of Intent to prepare an environmental impact statement (EIS) was published in the Federal Register on April 8, 2008 (Volume 73, Number 68).

On April 7, 2008, George Washington Memorial Parkway released the Public Scoping Newsletter for the Dyke Marsh Restoration and Long-term Management Plan/EIS for public review and comment. The public was invited to submit comments on the scope of the planning process and potential alternatives through May 23, 2008.



***Public Scoping Meeting***—During the scoping period, a public scoping meeting was held at Belle View Elementary on April 22, 2008. The meeting included information about the development of the plan and planning processes. NPS staff was present to answer questions, provide additional information to workshop participants, and record their input.

***Public Scoping Comments***—During the initial public scoping period, nearly 300 pieces of correspondence were entered into the Planning, Environment, Public Comment (PEPC) system either from direct entry by the commenter, or uploading of emails, faxes, and hard copy letters by NPS staff. Of the approximately 50 letters submitted from outside the region immediately surrounding Dyke Marsh (District of Columbia, Maryland, Virginia), concerns regarding hunting access in areas near Dyke Marsh were almost the exclusive topic of the communications. Among commenters from the region, the three topics that received the majority of the comments were expressions of support of the restoration of Dyke Marsh, concerns regarding the impact of the restoration on Belle Haven Marina, and concerns regarding continued access to hunting in areas near Dyke Marsh.

It should be noted that prior to the public scoping meeting on April 22, 2008, a notice was posted on the National Rifle Association's website stating there was going to be a meeting that evening with officials from the NPS and the Virginia Department of Game and Inland Fisheries (VDGIF) to discuss the future of hunting in the Dyke Marsh area. The inaccurate information contained in the notice generated national interest in the meeting and the process. Changing the current hunting opportunities available to the public outside of the marsh boundary is outside the scope of the plan/EIS and was not considered in the final plan/EIS.

## **Alternatives Scoping**

***Alternatives Scoping Brochure***—A brochure was prepared and mailed on April 24, 2012, to the project's mailing list, comprising the original preliminary list and those added after the first public scoping meeting. This brochure summarized the alternative concepts that the USACE had developed for the NPS.

***Alternatives Scoping Public Meeting***—A second public scoping meeting was held on May 8, 2012, at Indigo Landing restaurant at the Washington Sailing Marina in Alexandria, Virginia, to review the additional research and alternatives developed by the USACE following more than a year's worth of modeling and research. The public comment period following this meeting was held open until June 20, 2012. At the meeting, representatives from NPS introduced the project and later discussed the National Environmental Policy Act (NEPA) process. Representatives from USACE presented the results of their research, results of research conducted by the U.S. Geological Survey (USGS), and four alternative scenarios for consideration in the plan/EIS. Comment cards were available, and attendees were also encouraged to submit comments online on the NPS PEPC website.

***Alternatives Scoping Comments***—Comments following the May 8, 2012, alternatives meeting primarily expressed support or opposition for the initial four alternatives, and also asked what the costs would be or expressed concern over likely project costs. Many commenters expressed concern that the project would cause the Belle Haven Marina to close or would restrict or reduce recreational access and opportunities in the marsh. Several commenters suggested approaches that would allow the marina to remain open and still allow for restoration. For example, several commenters suggested that alternative D (which ultimately became alternative C in the EIS document when alternatives were refined after this meeting, and the original alternative C was dropped) should not include the option to fill the sailboat mooring area, and others suggested that the minimal or intermediate restoration alternatives would be more appropriate. Several commenters also described the high-quality fishing grounds of the deeper holes in the marsh, and were concerned about the filling of these deeper areas. Other commenters were in favor of the restoration of wetland habitat for birds and other wetland-dwelling species.



## **Public Review of the Draft Plan/EIS**

On January 15, 2014, the NPS published a Notice of Availability in the Federal Register for the draft plan/EIS. The 60-day public comment period was open through March 18, 2014. The public comment period was announced on the project website, posted on the park's website, and announced through a press release. The draft plan/EIS was available on the PEPC website and via hard copy upon request from the park. A public open house meeting was held at Indigo Landing restaurant at the Washington Sailing Marina on February 26, 2014, in the middle of the public review period. A total of 100 individuals attended the meeting.

Hard copies of the draft plan/EIS were mailed to the U.S. Environmental Protection Agency (USEPA) and state review agencies, and were made available at local libraries in Fairfax County. In addition, copies of the newsletter announcing the release of the draft plan/EIS were sent to interested parties, elected officials, and other appropriate local and state agencies. Members of the public were able to submit their comments on the project through the PEPC website or by mailing comments to the park.

During the comment period, the NPS received 313 pieces of correspondence. All correspondence that was submitted outside of the PEPC system was entered into PEPC for analysis, including letters received by email or through the U.S. mail and comments received at the public meetings. Once all correspondences were entered into PEPC, each was read, and specific comments within each piece of correspondence were identified. A total of 621 comments was derived from the correspondences received, and substantive comments, or those comments that "raise, debate, or question a point of fact or policy," were further analyzed and responses were prepared. All comments received were carefully considered and incorporated into the final plan/EIS as necessary. Appendix D of the final plan/EIS describes the public review process in greater detail, and includes a content analysis report, concern response report, and comment letters received from businesses, organizations, and agencies.

## **Final Plan/EIS**

Changes made in the final plan/EIS as a result of public comment include a modification to alternative C to eliminate the optional fill area in the vicinity of Belle Haven Marina. Other changes made were factual in nature and did not result in changes to the NPS preferred alternative or the outcome of the impact analysis for any of the management alternatives considered.

The final plan/EIS was available for public inspection for a 30-day no-action period, which began with the publication of the U.S. Environmental Protection Agency Notice of Availability of the final plan/EIS on October 10, 2014, and ended on November 10, 2014. As with the draft plan/EIS, the NPS issued its own Federal Register Notice of Availability of the final plan/EIS on October 10, 2014. The NPS also announced the availability of the final plan/EIS on the park's websites and by press releases. As with the draft plan/EIS, notification of the availability of the final plan/EIS was sent directly to the park's mailing lists of interested parties, elected officials, and appropriate local and state agencies. The final plan/EIS was made available on the PEPC website and at local libraries; a limited number of hard copies was available upon request by contacting the park superintendent.

## **Agency Consultation**

Consultation and coordination with several agencies has continued throughout the planning process for this plan/EIS. The Baltimore and Norfolk Districts of USACE, Virginia and Maryland agencies, and the Virginia SHPO have all been informed of the project and the process. Letters initiating consultation under Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act and/or requesting information or comments were sent to the agencies as described below. Copies of these letters and any responses received are provided in appendix C of the plan/final EIS.



## **U.S. FISH AND WILDLIFE SERVICE**

As part of the planning process, a science team was convened to review information about the marsh and provide input to the process. This team included two U.S. Fish and Wildlife Service (USFWS) personnel who are very familiar with the marsh and surrounding habitat: John Gill, USFWS Maryland Fishery Resources Office, Biologist (who had completed wetlands restoration for local projects and a fish inventory of Dyke Marsh in 2001–2004); and Sandy Spencer, USFWS, Eastern Virginia Rivers National Wildlife Refuge Complex, Wildlife Biologist (Masters research at Dyke Marsh beginning in 1997). No federally listed species were identified during the discussions that addressed that subject, and discussions with the agency included discussions of migratory fish, particularly with respect to the timing of dredging activities to avoid affecting breeding seasons.

A letter dated June 27, 2013, from George Washington Memorial Parkway was sent to USFWS to reconfirm the previously discussed information and to initiate consultation with the USFWS about the presence of federally listed rare, threatened, or endangered species in or near the parks. No response was received. A copy of the draft plan/EIS was also sent to the USFWS. No response was received. Prior to future implementation, NPS will consult with USFWS to determine whether any new federally listed species have been recorded in the area.

## **National Oceanic and Atmospheric Administration-National Marine Fisheries Service**

NPS has submitted the final plan/EIS for review by National Marine Fisheries Service (NMFS) because the federally endangered shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus* ssp. *oxyrinchus*) use the Potomac River as a migratory corridor to and from spawning grounds at Little Falls, about 20 kilometers north of Dyke Marsh. NMFS did review the EIS and had no comments. Dyke Marsh itself is unlikely to be used for spawning, overwintering, or foraging by sturgeon, however, prior to construction, NPS will consult with NMFS to confirm this determination. Regardless, all construction will observe time-of-year restrictions and best management practices to protect the sturgeon and other anadromous fish.

## **Virginia State Historic Preservation Office**

A letter was sent in December 2009 from George Washington Memorial Parkway to the Virginia SHPO in accordance with Section 106 of the National Historic Preservation Act. The letter initiated consultation with the Virginia SHPO and provided information about the archeological assessment conducted at the marsh for this project. Virginia Department of Historic Resources responded on January 6, 2010, and stated that they found that the assessment provided a clear and thorough presentation of Dyke Marsh's archeological potential. They agreed that the proposed restoration should consider the preservation of the intact portions of the historic dikes located in the southeastern section of the marsh and that consideration should be given to avoidance of archeologically sensitive areas in planning the restoration. If avoidance is not possible, they stated that further identification efforts would be necessary to locate and evaluate any archeological sites that may be affected by the proposed restoration activities.

A copy of the draft plan/EIS was sent to the Virginia SHPO. The response, dated March 11, 2014, confirmed that there was agreement in 2009 that the entire fastland portion of the project area would be considered sensitive for the presence of Native American sites dating from the past 5,000 years, and noted that if construction is proposed in archeologically sensitive areas, further identification efforts and continued consultation continue to be necessary. The letter also discussed two Runway Safety Area Enhancement projects at the Ronald Reagan Washington National Airport, which required mitigation for wetlands impacts. Part of the mitigation is providing funding for the construction of the breakwater at Dyke Marsh, and therefore the SHPO requested additional consultation, given the link between the two projects. Discussion of the consultation with Metropolitan Washington Airports Authority and Federal Aviation Administration is included in the following section. Partial funding for the first phase of the



marsh restoration and construction of the breakwater has been provided through mitigation approved in the USACE Section 404 permit for the Ronald Reagan Washington National Airport expansion, and the consultation process for that project has taken place separately.

The NPS sent a response to Virginia Department of Historic Resources in summer 2014 stating that the intention of the NPS is to continue consultation if construction should be proposed in an archeologically sensitive area as part of its responsibilities under Section 106 of the National Historic Preservation Act. The response also committed to incorporating information about consultation on the runways project in the final plan/EIS.

A Programmatic Agreement (PA) between the Virginia Department of Historic Resources and the National Park Service was executed in September 2015. The USACE signed as a concurring party to the PA in October 2015. The Metropolitan Washington Airports Authority was invited to sign as a concurring party, but they declined to sign. The PA identifies the NPS' responsibility to implement phased identification of historic properties of an archeological nature for future phases of the Dyke Marsh Wetland Restoration project.

#### **Metropolitan Washington Airports Authority**

The NPS engaged in consultation with the Metropolitan Washington Airports Authority and the Federal Aviation Administration (FAA) regarding wetlands mitigation requirements for a separate project under its Runway 4-22 and Runway 13-33 Runway Safety Area Enhancements in 2013. That project included the transfer of jurisdiction of 2.4 acres of the Potomac River bed from the NPS to the FAA. The Section 106 and Section 7 consultation and permitting for the Runway 4-22 and Runway 13-33 Runway safety Area Enhancements were undertaken between Metropolitan Washington Airports Authority and the Virginia Department of Historic Resources in 2010. The NPS completed its Section 106 consultation with the District of Columbia Historic Preservation Office for the transfer of jurisdiction of the 2.4 acres of Potomac River bed on April 29, 2013. As part of the NPS Finding of No Significant Impact and wetlands mitigation for the transfer of jurisdiction between the NPS and FAA for the 2.4 acres, Dyke Marsh was identified as the mitigation site for Metropolitan Washington Airports Authority. The Section 106 consultation responsibility for the NPS for the overall Dyke Marsh Wetland Restoration project, which includes this mitigation effort, is part of this EIS process.

#### **Virginia Department of Conservation and Recreation**

A letter dated June 27, 2013, from George Washington Memorial Parkway was sent to the Nongame and Environmental Programs Manager for the Virginia Department of Conservation and Recreation (VA DCR) about the presence of state rare, threatened, or endangered species in or near the parks. No response was received. The draft EIS was provided to the VA DCR for their review and comment. Virginia agencies responded through their review clearinghouse. Copies of these letters are available in appendix D of the final plan/EIS.

#### **Virginia Department of Game and Inland Fisheries**

The VDGIF submitted a letter to the NPS on May 22, 2008, recommending further consultation with the agency concerning bald eagle habitat, anadromous fish habitat, and stating general support for the project. The draft plan/EIS was provided to VDGIF for their review and comment. Virginia agencies responded through their review clearinghouse. Responses are available in appendix D of the final plan/EIS.



## **U.S. Environmental Protection Agency**

The NPS received a letter dated March 18, 2014 from the USEPA providing its comments on the draft plan/EIS, and rating the draft plan/EIS as LO, Lack of Objections. The USEPA's letter is in appendix D of the final plan/EIS.

## **CONCLUSION**

Overall, among the three alternatives considered, the selected action best meets the purpose, need, and objectives of the plan/EIS and is expected to provide the greatest amount of benefits from its initial phases of restoration by stabilizing the marsh and allows for flexibility in restoration approaches such that full marsh restoration is possible. The selected action incorporates all practical means to avoid or minimize environmental harm and will not result in the impairment of park resources and values or violate the NPS Organic Act.

The required "no-action period" before approval of the ROD was initiated on October 10, 2014, with the U.S. Environmental Protection Agency's Federal Register notification of the filing of the final plan/EIS (79 FR 61303)

The official responsible for implementing the selected action is the Superintendent of George Washington Memorial Parkway, Virginia.

**Approved by:**



Robert Vogel, Regional Director  
National Capital Region, National Park Service

6-29-14  
Date



## **ATTACHMENT A: NON-IMPAIRMENT DETERMINATION**

Pursuant to the National Park Service (NPS) *Guidance for Non-Impairment Determinations and the NPS NEPA Process* (NPS 2011), a non-impairment determination for the selected action is included here as an appendix to the Record of Decision.

Chapter 1 of the final plan/EIS describes the related federal acts and policies regarding the prohibition against impairing park resources and values in units of the national park system. The prohibition against impairment originates in the NPS Organic Act, which directs that the NPS shall:

promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

According to *NPS Management Policies 2006*, an action constitutes an impairment when its impact “would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values” (NPS 2006, sec. 1.4.5). To determine impairment, the NPS must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (NPS 2006, sec. 1.4.5).

National park system units vary based on their enabling legislation, natural and cultural resources present, and park missions. Likewise, the activities appropriate for each unit and for areas in each unit vary. For example, an action appropriate in one unit could impair resources in another unit.

As stated in the *NPS Management Policies 2006* (NPS 2006, sec. 1.4.5), an impact on any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park’s general management plan or other relevant NPS planning documents as being of significance

The NPS-selected action is the same as the preferred alternative (alternative C) in the final plan/EIS. A non-impairment determination was completed for this alternative. The resource impact topics analyzed for the selected alternative are water resources, including hydrology and sediment transport, surface water quality in the Potomac River; soils and sediments; floodplains; vegetation and wetlands; fish and wildlife; species of special concern; archeological resources; historic structures and districts; and cultural landscapes.

### **WATER RESOURCES, INCLUDING HYDROLOGY AND SEDIMENT TRANSPORT, SURFACE WATER QUALITY IN THE POTOMAC RIVER**

In the plan/EIS, the water resources topic was considered in terms of the aspects of water resources affected by the proposed action or by the no-action alternative. In the final plan/EIS, several aspects of water resources were considered. Hydrology and sediment transport and surface water quality were



considered as separate impact topics, but both relate to determining whether the water resources in Dyke Marsh might be impaired.

## **HYDROLOGY AND SEDIMENT TRANSPORT**

The mean tidal range in the area of the marsh is between 0.5 and 0.9 meter (1.64 and 2.95 feet) (UMCES 2004), and U.S. Geological Survey (USGS) data show that the mean streamflow in the Potomac River ranged between 4,017 and 23,760 cubic feet per second between the years of 1931 and 2011. Nutrients and sediments, which are critical to the health of the marsh, are delivered to the marsh through the hydrology of the tidal guts and the process of water washing over the wetlands during the ebb and flow of tides.

Drainage in the marsh is controlled both by tidal flows and general flow in the Potomac River (UMCES 2004). A 2009 bathymetry study in the marsh indicates that although the main channel of the river used for shipping is on the east side of the Potomac, there are deep channels that may have been created by or enlarged as a result of hydrologic changes caused by past sand and gravel dredging activities (NPS 2009b). These channels run upstream–downstream through the marsh and exacerbate erosive effects in the marsh. Although the depth of the Potomac River adjacent to the eastern edge of the marsh was historically shallow ( $\leq 4$  feet) and provided some protective measures to the shoreline (Litwin et al. 2011), the current deep channels off the eastern edge of the marsh allow wave energy to impact the shoreline (Litwin et al. 2011). These effects have been compounded by the removal, during the early stages of dredging, of a small promontory from the southern end of the marsh, immediately downstream of the two channels. This promontory served as an energy barrier for the southern marsh, especially from storm-induced waves from the south; prevented the full brunt of flood flows from pushing up the Hog Island Gut; and allowed sediments to aggrade in the marsh (Litwin et al. 2011). The islands on the northern end of the marsh, originally tidal guts that have now become isolated, are also allowing increased flow through these channels.

Hog Island Gut, the last significant tidal gut remaining in the marsh, currently empties downstream into the river near the location of the historic dikes and the location of the former promontory. In the past, this gut and other guts in the marsh had more meanders and emptied upstream toward the north. Existing river flows are directed through the marsh and the marsh outflows are in a southerly direction. Additionally, the mouth of Hog Island Gut is slowly moving further into the marsh due to sediment deposition in that area, and the smaller tidal tributaries are being eroded (Litwin et al. 2011).

Implementation of the selected action will result in mostly beneficial effects on hydrology and sediment transport by shielding the marsh from storms, redirecting flows, and creating low energy areas in which sediment will settle out and accrete. Construction of the breakwater will also result in localized, significant beneficial impacts on hydrology because it will restore natural hydrologic and sediment transport processes that were present in the marsh prior to the removal of the historic promontory. The establishment of these fundamental changes will also allow for measurable benefits to other key resources in the marsh. Adverse impacts to hydrology and sediment transport will be limited to shorter-term construction-related impacts resulting from temporary diversion of flows. The contribution of the beneficial impacts of the selected action on the hydrology and sediment transport characteristics of Dyke Marsh and the Potomac River to the impacts from past, present, and reasonably foreseeable projects will be appreciable because the impacts of the other projects are for the most part localized, and the scale of the Dyke Marsh restoration under this alternative will be relatively large.

## **WATER QUALITY**

Dyke Marsh and the Dyke Marsh Wildlife Preserve are located on the upper tidal portion of the Potomac River, immediately south of the City of Alexandria, Virginia, near Washington, D.C. Water quality



concerns in this reach of the Potomac River include high nutrient loads, turbidity, some heavy metals, and toxic chemicals from stormwater runoff; combined sewer overflows from the District of Columbia during heavy rains; and legacy sources of chemicals, including polychlorinated biphenyls (PCBs). In spite of the water quality issues, the marsh and nearby river are able to attain a number of their various designated uses, such as supporting aquatic life, as required by the Clean Water Act.

Hydrology and water quality are fundamental characteristics of the water resources of the park, including the Potomac River and its tributaries. These water resources are crucial to the natural integrity of the park and the opportunities for enjoyment of the park. The *George Washington Memorial Parkway Long-range Interpretive Plan* defines the overall purpose of Dyke Marsh Wildlife Preserve, which is “to protect irreplaceable wetlands which are valuable for the reproduction and preservation of wildlife near the Nation’s Capital” (NPS 2005). The hydrology and water quality of the park provide important ecological bases for the development and productivity of park wetlands. The plan also states that Dyke Marsh is important because it contributes to the health of the Potomac River and the Chesapeake Bay Watershed by filtering pollutants contributed from adjacent urban land uses. Marsh restoration will provide localized benefits to water quality by increasing marsh acreage, and increasing water quality benefits of restored marsh. Construction will cause short-term adverse impacts related to disturbing sediments on the bottom. Best management practices (BMPs) will be used to prevent water quality issues; containment walls will also prevent and minimize impacts. There will be some initial scour around the breaks in Haul Road. Implementation of the selected action will possibly contribute long-term beneficial impacts on water quality to the impacts of other past, present, and reasonably foreseeable projects. The contribution will be noticeable, but not appreciable, because the impacts from alternative C will still be mostly localized, even with the larger acreage of expansion.

Altogether, because there will be mostly beneficial impacts to hydrology, sediment transport, and water quality, and adverse impacts will be limited to construction activities and managed with BMPs, the selected action will not result in impairment of water resources.

## **SOILS AND SEDIMENTS**

The marsh has a predominance of sand and gravel deposits between 16 feet and 50 feet, overlain by soft depositional mud and with lenticular interlaid units of silt and clay. Such a sedimentary sequence reflects the changing conditions in depositional environment from one of swift-moving waters, where only heavy sands and gravel will fall out of the water column, to one of slack water, allowing finer silts and clays to settle (NPS 2000). The years of dredging and marsh removal (from the early 1930s to 1972) have altered the marsh and riverbed topography. Where shallow contours once existed, there are now deep holes and channels that contribute to the erosion of the marsh, because shallower sediments slough off into these deeper waters.

Soils and sediment are both important to the park purpose and significance as they provide the foundation for the vegetation and wetlands characteristic of the parkway and its views and vistas. Accumulation of sediments, rather than erosion of sediments or failure for the system to capture sediments, allows for accretion and growth of Dyke Marsh. Under the selected action, sediments on the river bottom will be covered with fill that will eventually become wetlands soils, resulting in beneficial impacts and allowing marsh restoration to succeed. The soils west of Haul Road will eventually become hydric and support the reestablishment of wetlands in this area. Sediments on the river bottom will be replaced with fill that will eventually become wetland soils. The breakwater will necessitate covering river bottom sediments with armorstone and will result in compaction. Construction will generally result in short-term adverse impacts, mostly related to soil disturbance and some soil compaction. The selected action will contribute long-term cumulative beneficial impacts on soils and sediments in Dyke Marsh and the adjacent Potomac River to the mostly adverse impacts from other past, present, and reasonably foreseeable projects. The



contribution will be appreciable, particularly because the cumulative impacts are localized for the most part, and the scale of the Dyke Marsh restoration under this alternative will be relatively large.

Because adverse effects on soils and sediments will be limited and there will be primarily long-term beneficial effects, the selected action will not result in impairment to soils and sediments.

## **FLOODPLAINS**

Dyke Marsh provides several floodplain functions and values, including flood storage and natural moderation of floods, nutrient reduction, wildlife habitat for floodplain species, and scenic open space. Flooding of the project site is more closely associated with winds, changing barometric pressure, and storm surges than with influx from spring runoff. This is due primarily to the fact that the average land elevation is near sea level, and the river has a large flood storage capacity.

The maximum elevation throughout Dyke Marsh is approximately +6 feet relative to mean low water. Flooding of the entire project area occurs only occasionally. The Federal Emergency Management Agency has identified the entire extent of Dyke Marsh to be a flood zone affected environment, or below the 100-year flood elevation of 10.8 feet National Geodetic Vertical Datum of 1929 (FEMA 1990; County of Fairfax 2010).

Preservation of the floodplain is key to the integrity of the park wetlands and indirectly necessary for the fulfillment of the purpose of the park. As previously noted, the *George Washington Memorial Parkway Long-range Interpretive Plan* defines the overall purpose of Dyke Marsh Wildlife Preserve, which is “to protect irreplaceable wetlands which are valuable for the reproduction and preservation of wildlife near the Nation’s Capital” (NPS 2005). Restoration of the marsh will raise the base flood elevation by 1.8 inches, but will also greatly increase marsh area. The increases in marsh area will provide a buffer from flooding to the parkway and inland properties during storm events. Other floodplain functions and values will also be increased. There will be some short-term adverse impacts on floodplain function and values as the result of the placement of the containment structures that could restrict the assimilative capacity of the existing marsh temporarily. The selected action will contribute beneficial, but localized, cumulative impacts to the beneficial impacts from other projects, as well as short-term adverse construction-related impacts, resulting in overall benefits to the floodplain in Dyke Marsh and on the Potomac River. The contribution from the long-term beneficial impacts will be noticeable, whereas the contribution from the short-term adverse impacts will be imperceptible.

Because there will be few adverse impacts and primarily long-term beneficial impacts, the selected action will not result in impairment to floodplains.

## **VEGETATION AND WETLANDS**

The National Capital Region vegetation classification and mapping project, which began in 2001, has identified 12 plant communities in the floodplain forests and wetlands of Dyke Marsh. Dyke Marsh has tidal freshwater marsh, swamp forest, floodplain forest, and wetland areas within the forested areas. Floodplain forests such as those found at Dyke Marsh occur along rivers where periodic flooding submerges low-lying vegetation, and are dominated by trees that are adapted to saturated soils. Throughout the history of Dyke Marsh, the floodplain forest has remained a relatively stable community (NPS 1993). The co-dominant tree species in the floodplain are pumpkin ash and red maple. Swamp forest, temporarily and seasonally flooded forest, such as Central Appalachian Maple/Ash Swamp Forest, is also present in Dyke Marsh on disturbed mesic areas underlain by rich soils with moderately high base saturation levels (NVI 2009).



Dyke Marsh itself contains an extensive, valuable wetland complex characterized as a tidal freshwater mixed high marsh, which is the principal marsh community along all the estuarine rivers in the northern half of Virginia, from the Potomac River to the James River. This association occupies the higher-elevation zone of freshwater to slightly oligohaline (brackish) river marshes. These are mixed, dense, and often diverse marshes with highly variable species composition and patch dominance.

Two wetland types, as identified by the National Wetlands Inventory, compose 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 can be loosely grouped into freshwater emergent wetlands, freshwater forested wetlands, and freshwater scrub-shrub wetlands, as well as the riverine wetlands that form guts in the marsh. The forested wetlands also loosely correspond with the swamp forest and floodplain forest vegetation communities discussed above.

The presence of submerged aquatic vegetation (SAV) has increased in recent years, despite an overall decline in past decades. Prior to the 1930s, SAV had a major presence in the marsh and surrounding waters (UMCES 2004). SAV began to decline in the late 1930s and was not recorded as present in the 1977 *Dyke Marsh Environmental Assessment* (NPS 1977). SAV began to reappear in the early 1980s, and by 1986 the cover of SAV in continuously inundated portions of the marsh was 70 percent to 100 percent (UMCES 2004). Prior to 1996, various reports concluded that SAV was reestablishing in the Potomac River, including Dyke Marsh (Johnston 2000). In 2003, Hurricane Isabel affected the majority of the SAV near Dyke Marsh. Beds that were mapped in 2002 were not observed in 2003. VIMS data from 2003 show zero percent coverage within Dyke Marsh waters; however, by 2008, SAV coverage was mostly between 70 and 100 percent (VIMS 2014).

As noted, the overall purpose of Dyke Marsh Wildlife Preserve is “to protect irreplaceable wetlands which are valuable for the reproduction and preservation of wildlife near the Nation’s Capital” (NPS 2005). The plan states that Dyke Marsh is significant in that it is “one of the largest naturally occurring tidal freshwater marshes in the National Park System,” and contains a narrowleaf cattail (*Typha angustifolia*) community that is a dominant vegetative feature. The wetlands and the vegetation in the Dyke Marsh wetlands are therefore fundamental to the purpose of the park and the ecology of the Potomac River. Under the selected action, the new restored wetland vegetation (180 acres) will protect existing vegetation, including river bulrush and other unusual plants, in addition to increasing overall marsh acreage and protecting the tidal freshwater marsh from disappearing. Implementation of phase one will protect the existing marsh then allow additional restoration to move forward in the future. Long-term significant beneficial impacts on wetlands will result, because the selected action will protect an important regional resource. In addition, the breaks in Haul Road and resulting hydrologic reconnections will discourage continued establishment of nonnative invasive plants in that location, because repeated inundation favors the reestablishment of native plants over nonnative plants, which is a substantial benefit for vegetation in the park.

Adverse effects during construction will be minimal and relatively short term. Construction will take place from the water using barges to avoid impacts on existing wetlands from construction equipment traversing the existing marsh. Construction will place containment cells abutting existing marsh, which could prevent erosive forces from continuing to degrade their edges, reducing erosion and fragmentation. However, construction of the breakwater will permanently cover approximately 0.15 acres of subaqueous wetlands. Also, existing SAV could be displaced if they exist where the containment cells or breakwater are being placed. However, this will be a short-term impact for the containment cell construction areas, because SAV will be expected to recolonize the resultant new edge of the marsh (USACE 2013). In the event of an accidental sediment spill during construction, SAV could be impacted if the sediment plume blocks light from reaching the plants or if sediment settles from the water onto the plants. However, this



situation is unlikely to occur because of erosion and sediment control plans and use of BMPs. Finally, no impacts on wetlands are expected from filling the deep channel in the eastern portion of the project area. The selected action will contribute long-term cumulative benefits to the impacts from other projects, including protection of the marsh from some of the erosive effects of other projects. The contribution of the beneficial impacts of alternative C on wetland restoration and vegetation colonization in Dyke Marsh will be appreciable, particularly since the cumulative impacts of other past, present, and reasonably foreseeable projects are for the most part localized, and the scale of the Dyke Marsh restoration under this alternative will be relatively large.

Because of the significant benefits of marsh restoration on vegetation and wetland ecology, and the relatively minimal, short-term disturbances to existing vegetation and wetlands during construction, the selected action will not result in impairment to wetlands and vegetation.

## **FISH AND WILDLIFE**

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 exact composition of the benthic community in Dyke Marsh is not known, but reports show the presence of a variety of worms, mollusks, arthropods, and insects (UMCES 2004). A variety of native snails and clams are common in the marsh, as well as species characteristic of polluted waters. Over 300 individual species were identified in the preserve during an arthropod inventory conducted by the NPS and the Laboratory of Entomology and Biodiversity at Georgetown University (Barrows and Kjar 2003).

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), and are important to the park purpose and significance for that reason. The selected action will increase wetland and marsh habitat by up to 180 acres, with a smaller first phase that will stabilize and slightly increase overall marsh acreage, and will substantially increase the number of species and population sizes over the long term. The amount of new habitat and associated benefits will be noticeable and potentially significant. There will be some adverse effects during construction, but generally these will be short term and localized. Construction-related impacts will result from the use of marine equipment, and include temporary displacement of fish and wildlife as the result of construction noise and vibrations. Less mobile species of aquatic wildlife could be buried during the fill process. Restrictions on construction periods will likely be put in place per agreements with the Virginia Department of Game and Inland Fisheries and NMFS to minimize adverse effects from vibration and construction noise on species of fish and wildlife that breed in the marsh.

The selected action will contribute long-term cumulative beneficial impacts on wildlife to the mostly localized impacts from other past, present, and reasonably foreseeable projects. The contribution will be appreciable because the cumulative adverse impacts of projects are for the most part localized, and the scale of the Dyke Marsh restoration under this alternative is relatively large.

Because the long-term impacts will be mostly beneficial, and adverse effects will be shorter term, localized, and/or mitigated through permit restrictions on construction periods, the selected action will not result in impairment to fish and wildlife.



## SPECIES OF SPECIAL CONCERN

Although there are no federally listed species in the marsh, several state-listed plant and animal species are found in Dyke Marsh, and these species have a special haven in the marsh. Six state-listed species of special concern occur in the preserve, including two bird species and four plant species (table 2). 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 (Steury, pers. comm. 2014). Other bird species, the king rail (*Rallus elegans*), Virginia rail (*Rallus limicola*), and sora (*Porzana carolina*), are extremely rare transients in Dyke Marsh and are not known to nest in or near the marsh. These species are included on the 2013 Virginia Department of Conservation and Recreation Species Watch List as S3 (king rail and Virginia rail) and S2 (sora) for presence only (nonbreeding status) (VA DCR 2014).

In 1984, the federally endangered green floater (*Lasmigona subviridis*), a small mussel, was found along the Potomac River, but not in the marsh (UMCES 2004). Also, two species of sturgeon, the Atlantic and shortnose, have been found in the Potomac River, but have not been found in Dyke Marsh. It is possible that both species of sturgeon may pass by the area on the way to and from spawning up river, but there are no data showing that they use the marsh in any way (Kynard et al. 2007; Mangold et al. 2004).

TABLE 2. SPECIES OF SPECIAL CONCERN AT DYKE MARSH

Scientific Name	Common Name	State Status
<i>Ixobrychus exilis</i>	least bittern	S3 – Watchlist, vulnerable
<i>Melospiza georgiana</i>	swamp sparrow	S1 for breeding – Critically imperiled
<i>Carex davisii</i>	Davis' sedge	S1 – Critically imperiled
<i>Bolboschoenus fluviatilis</i>	river bulrush	S2 – Imperiled
<i>Geum laciniatum</i>	rough avens	S1 – Critically imperiled
<i>Sparganium eurycarpum</i>	giant bur-reed	S3 – Watchlist, vulnerable

Source: NPS 2009c; Cartwright, pers. comm. 2013.

### LEAST BITTERN

The least bittern (*Ixobrychus exilis*), considered a species of special concern by the Commonwealth of Virginia and the NPS, typically inhabits herbaceous or scrub-shrub wetlands, favoring marshes with tall emergent vegetation. Heavy growths of cattail, bulrush, bur-reed, and reeds are favored feeding sites (NatureServe 2009). The birds typically arrive at nesting grounds in April or early May, nest from late May to early July, and leave by September or October. Currently, there are fewer than six nesting birds at Dyke Marsh per year (NatureServe 2009; NPS 2009c), but they have been confirmed to be breeding in the marsh. Loss of wetlands poses the most substantial threat to this species. Marshland invasions by common reed and purple loosestrife may alter and degrade least bittern habitats as well (NatureServe 2009).

### SWAMP SPARROW

The swamp sparrow (*Melospiza georgiana*) is a small perching bird that uses a variety of wetland habitats, including herbaceous and scrub-shrub wetlands (NatureServe 2009). Habitat requirements for this species include shallow, standing water; low, dense cover; and scattered, elevated perches. Swamp sparrows are uncommon in the marsh, particularly depending on the season. Single individuals have been



confirmed (Cartwright, pers. comm. 2013), and breeding pairs have also been confirmed (FODM 2009, 2011; Johnston 2000; Cartwright, pers. comm. 2013). Threats to the swamp sparrow are similar to those of the least bittern, and also include tidal flooding, which reduces reproductive success (Eyler et al. 1999).

#### **DAVIS' SEDGE**

Davis' sedge (*Carex davisii*), which has been found in the park and for the first time in Virginia, is perennial and is typically found on calcareous soils in floodplain forests, dry to moist fields or woods, and alluvial meadows. This plant flowers from May to July and is native to eastern North America (Steury 2004; Thompson 2003). Many species rely on the seeds of this plant for food, including various insects and bird species (Hilty 2009). Nonnative invasive species and habitat alteration and loss pose a great threat to this plant (Thompson 2003).

#### **RIVER BULRUSH**

River bulrush (*Bolboschoenus fluviatilis*), considered a dominant species in the existing marsh (NPS 2009c), is a common and important wetland plant found in dense colonies at the edges of marshes and along streams in shallow freshwater or mildly brackish wetlands (NHESP 2008; Runkel and Roosa 1999). Threats to river bulrush include habitat disruption, loss, and degradation.

#### **ROUGH AVENS**

Rough avens (*Geum laciniatum*) is found in a wide range of habitats, including hardwood forests, limestone woodlands, muddy riverbanks, forested swamps, marshes, and roadsides. This perennial herb is found in most of the United States east of the Mississippi, and flowers from June to July with fruit developing from mid-July to mid-September (NYNHP 2009). At Dyke Marsh, rough avens grows against the edge of Haul Road and is being lost to succession as other plants around it mature and outcompete the rough avens (NPS 2009c).

#### **GIANT BUR-REED**

Giant bur-reed (*Sparganium eurycarpum*) grows on mud, sand, or gravel and can be found in shallow standing water, and on the edges of streams and marshes (NHDFL 2002; Runkel and Roosa 1999), and occurs throughout a large portion of North America. The plant was found in Dyke Marsh during Natural Heritage Inventory surveys (Johnston 2000). This perennial aquatic herb is considered a good soil binder at marsh edges and along streams (Runkel and Roosa 1999). The plant flowers in early June with fruit developing from July to September (Runkel and Roosa 1999; NHDFL 2002). Bur-reed provides food and shelter for a variety of wetland animal species (Runkel and Roosa 1999). Threats to giant bur-reed are similar to those for the plant species listed above (NHDFL 2002).

All of these species represent less common species of vegetation or wildlife that exist in the irreplaceable wetlands that the preserve was created to protect, and are therefore important to the preserve and the larger parkway. Under the selected action, restoration of the marsh will provide additional nesting and foraging habitat for both the swamp sparrow and the least bittern, and increase acreage in which river bulrush and giant bur-reed could become established, resulting in long-term, potentially significant beneficial impacts. Temporary displacement of both bird species near the construction area will be likely during construction. However, both bird species will be expected to readily recolonize the marsh after construction was complete. To prevent disturbance of the birds during their breeding seasons, restrictions on construction will be put into place in consultation with the state. Reconnection of tidal flows west of Haul Road will discourage continued establishment of nonnative invasive plants in the areas with restored hydrologic connection, and will create conditions that will encourage reestablishment of rough avens and Davis' sedge. The NPS will identify the populations of Davis' sedge and rough avens prior to construction, and protect the plants during construction activity. Because BMPs will be incorporated and



there will be limitations on construction during breeding periods, impacts related to construction will be short term adverse.

The selected alternative will contribute long-term cumulative beneficial impacts on habitat for the plant and bird species of concern in Dyke Marsh to the mostly localized adverse impacts of other projects. The contribution will be noticeable, and possibly appreciable, given the greater extent of marsh restored under the selected alternative than under the other action alternative considered.

Because there will be substantial benefits to species of concern from the selected action, and adverse impacts will be construction-related and will be managed so that they will be minimized, the selected action will not result in impairment to fish and wildlife.

## ARCHEOLOGICAL RESOURCES

An archeological assessment of the Dyke Marsh vicinity was completed in 2009 (NPS 2009a), and included a surface inspection of the upland areas adjacent to the marsh to look for indicators of that archeological resources might be present, the compilation of a detailed history of the property, and a review of the history of the marsh itself to gain an understanding of the potential for archeological sites in the area. No archeological survey was conducted, and no sites have been recorded in the marsh or on the adjacent upland areas. The assessment concluded with recommendations for a formal survey that will identify specific archeological sites at Dyke Marsh.

Based on studies of sea level rise in the Chesapeake estuary, the marsh was dry land until at least 6000 BC and probably until 3000 BC. Therefore, Paleo-Indian and Archaic period campsites may be present in the undisturbed portions of the marsh. Because no underwater prehistoric archeological sites have ever been found in the Potomac River, the existence of such sites is speculative, but the possibility of their presence cannot be discounted. Sites related to the use of the marsh after it was diked in the 19th century, such as hunting cabins or illegal taverns, might also be present. Where dredging has occurred, these sites have likely been destroyed. The upland areas adjacent to the marsh also have high potential for archeological sites, mostly for the Woodland Period, circa 1000 BC to AD 1600, and for the 19th century.

As noted, the *George Washington Memorial Parkway Long-range Interpretive Plan* defines the overall purpose of Dyke Marsh Wildlife Preserve, which is “to protect irreplaceable wetlands which are valuable for the reproduction and preservation of wildlife near the Nation’s Capital” (NPS 2005). The plan mentions that the history of Dyke Marsh illustrates a lineage of human interaction with this environment, from Native American hunting and fishing and colonial farming with the creation of dykes to sand and gravel dredging and current use of the marsh as a preserve and recreation area. Restoration activities under the selected action will stabilize the marsh and substantially reduce erosion, which will therefore protect archeological resources in and adjacent to the marsh. Introduction of low energy tidal flows west of Haul Road will not affect any archeological resources. Construction activities in the marsh will take place from the water and will not affect archeological resources. Additional testing at the sites of the breaks in the Haul Road will be conducted prior to construction. If archeological resources are discovered during construction, all work in the immediate vicinity of the discovery will be halted until the resources can be identified and documented and an appropriate mitigation strategy can be developed.

The restoration of the marsh and reduction of erosion under the selected action will contribute beneficial cumulative impacts on archeological resources in the park to impacts from other projects by protecting the archeological resources in Dyke Marsh. The contribution will be appreciable.

Because many of the impacts will be beneficial, resulting in protection of archeological resources, and any possible disturbance to archeological resources related to the construction of breaks in the Haul Road,



will be mitigated through Section 106 of the National Historic Preservation Act, and any discovered resources will be protected, the selected action will not result in impairment to archeological resources.

## **HISTORIC STRUCTURES AND DISTRICTS, AND CULTURAL LANDSCAPES**

Dyke Marsh is part of the George Washington Memorial Parkway, which is listed in its entirety in the National Register of Historic Places (NRHP) as a historic district (NPS 1981; NPS 1995). The historic district is nationally significant under Criteria B and C. Under Criterion C, the district is significant for its landscape architecture as part of the long and continuous planning of the Washington, D.C., region. As a parkway, the district has several areas of significance: community planning and development, landscape architecture, transportation, commemoration, and preservation. The parkway was a product of master landscape architects such as Gilmore D. Clarke. The parkway also has significance as a means of conservation, protecting scenic and recreational resources from development along the river corridor.

Under Criterion B, the historic district is significant for its commemorative association with George Washington and Clara Barton (for the Clara Barton Parkway in Maryland). The older Mount Vernon section and the upper parkway commemorate the life of Washington, who had a strong association with the Potomac River corridor and was responsible for the selection of the nation's new capital site.

The stretch of the parkway adjacent to Dyke Marsh preserves much of this original vision. Traffic flows unimpeded, as the original planners intended. The heaviest use of the parkway has become commuting, however, rather than its original intention for recreational use. The parkway there passes through an extensive complex of woodlands and marshes, which still draws birds and other wildlife. Dense trees screen the parkway from residential development on the inland side, contributing to an atmosphere removed from urban bustle.

The only remaining portions of the historical dike are located on the south side of Dyke Marsh, and are occasionally visible at low tide. No surveys have been completed on the conditions of these remaining portions of the dike. All other structures associated with 19th or early 20th century land uses are no longer extant. Other than the dike, there are no structures in the survey area.

Dyke Marsh has not yet been formally identified as a cultural landscape, although it may qualify as a component landscape of the George Washington Memorial Parkway historic district. As defined by the NPS, a component landscape is "a definable physical area of a landscape that contributes to the significance of a National Register property, or, in some cases, is individually eligible for listing in the National Register" (NPS 1998). A future cultural landscape inventory will be needed to formally identify the character-defining features of the Dyke Marsh landscape as they relate to the Mount Vernon Memorial Highway. The scenic qualities of the marsh area and the views to it from the parkway are noted in the NRHP nomination and cultural landscape report (NPS 1995; NPS n.d.).

The cultural landscape report identifies the design principles, or the landscape features that defined the original design principles, that guided the planning of the Mount Vernon Memorial Highway: alignment, grading, planting, views, structures, and materials. South of Alexandria, the road was characterized by its horizontally and vertically curving alignment. This alignment allowed the road to follow the land's natural topography and controlled driving speeds, which were originally designed to be 35 miles per hour. Median strips, wide lanes, and limited access were also designed to increase safety. Separated byways for horseback riding were planned to parallel the road, although only the section from Hunting Creek to New Alexandria was originally laid out. Although grading took place, transitions in grade were made with long vertical curves. Areas that were regraded were rounded for 10 feet to ease the transition between the new road and the existing topography.



The Dyke Marsh section of Mount Vernon Memorial Highway provided natural views of the waterfront and the marsh. As such, existing plantings around the marsh were cleared as little as possible. Minor plantings were added to finish the edges between the road and existing woodland. Small-scale features originally in the section included rustic guardrails and cedar light standards. Views from this section included a view across the river where the road widened to include an overlook turnout (NPS n.d.).

The marsh is visible from the parkway at certain points, as the parkway passes in and out of wooded areas. The parkway also passes over the marsh where Hog Island Gut extends to the west of the parkway, offering sweeping views of the marsh. The southern portion of the marsh is visible just north of the former promontory that was dredged. It is in this area that the remnants of the historic dike are located.

The purpose of the George Washington Memorial Parkway, as authorized in the Capper-Crampton Act, was for the protection and preservation of the lands along the Potomac River and it expanded upon the mission of the previously 1928-authorized Mount Vernon Memorial Highway that was to serve as a scenic, commemorative roadway connecting Washington, D.C., with the George Washington Mount Vernon estate. The parkway design and the configuration of the parkway and incorporation of scenic vistas of natural features such as Dyke Marsh are fundamental features of the park, as well as a fundamental element of the historic district Marsh restoration under the selected action will stabilize and restore a large area of marsh, resulting in beneficial impacts on the historic landscape. The existing remnants of the dike will be protected by reduced erosion, and by measures put in place during construction. The breakwater will be constructed of large stones and will be in the southern alignment, screened from view from the parkway with marsh plantings. It will represent a minimal intrusion into the historic landscape. Restoration of Dyke Marsh under alternative C will contribute beneficial cumulative impacts on the cultural landscape and historic district to the adverse impacts of the other projects. The contribution will be appreciable, because erosion of the marsh will be prevented and the breakwater will not be highly intrusive.

Because there will be beneficial impacts on the historic landscape from the stabilization and restoration of the marsh and, the adverse visual effects of the breakwater will be mitigated, and none of the impacts will be considered an adverse effect under Section 106, the selected action will not result in impairment to historic structures or districts or cultural landscapes.

## SUMMARY

The NPS has determined that the implementation of the NPS selected action (alternative C) will not constitute an impairment of the resources or values of the park. As described above, implementing the selected action is not anticipated to result in adverse impacts constituting impairment of resources or values whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park or identified as significant in the park's general management plans or other relevant NPS planning documents. This conclusion is based on the consideration of the park's purpose and significance, a thorough analysis of the environmental impacts described in the final plan/EIS, relevant scientific studies, the comments provided by the public and others, and the professional judgment of the decision maker guided by the direction of the NPS *Management Policies 2006* (NPS 2006).

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PROGRAMMATIC AGREEMENT  
Between  
THE NATIONAL PARK SERVICE  
and  
THE VIRGINIA DEPARTMENT OF HISTORIC RESOURCES  
Concerning  
THE DYKE MARSH RESTORATION PROJECT  
In  
FAIRFAX COUNTY, VIRGINIA

**WHEREAS**, the George Washington Memorial Parkway was established pursuant to what is known as the Capper-Cramton Act, Public Law 71-284, 46 Stat. 482, (May 29, 1930), and became a unit of the national park system pursuant to Executive Order 6166 of June 10, 1933 (taking effect August 10, 1933), and the George Washington Memorial Parkway (hereinafter Park) is administered by the National Park Service (hereinafter NPS);

**WHEREAS**, the NPS is charged in its administration of the units of the National Park System to meet the directives of other laws, regulations, and policies including the NPS Organic Act as codified in Title 54 US code Section 100101(a) to "conserve the scenery, natural and historic objects, and wild life in the System units and to provide for the enjoyment of the scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations"; and

**WHEREAS**, the Park is a nationally significant historic property entered on the National Register of Historic Places (hereinafter NRHP) June 2, 1995 for its commemorative, design, and scenic qualities and the Dyke Marsh is an important landscape feature that contributes to the significance of the Park; and

**WHEREAS**, the NPS intends to undertake actions to help restore Dyke Marsh, within the Park along the Potomac River, in an effort to re-establish the previous footprint and dynamic ecosystem of the marshlands that existed prior to their damage by dredging activities within the Park (hereinafter Project); and

**WHEREAS**, the Project is proposed in phases as was described in the Dyke Marsh Wetland Restoration and Long-term Management Plan Draft Environmental Impact Statement (hereinafter DEIS) released to the public for review and comment and finalized as shown in the Final Environmental Impact Statement (hereinafter FEIS); and



**WHEREAS**, the NPS has determined that this Project constitutes an undertaking subject to review under Section 106 of the National Historic Preservation Act (hereinafter NHPA), 54 U.S.C. § 306108 (formerly 16 U.S.C. § 470f), and *Protection of Historic Properties*, its implementing regulations, 36 CFR Part 800, herein referred to as Section 106; and

**WHEREAS**, the NPS has consulted with the Virginia Department of Historic Resources, which is the Virginia State Historic Preservation Office (hereinafter SHPO), pursuant to the 2008 *Programmatic Agreement among the National Park Service (US. Department of the Interior), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers for Compliance with Section 106 of the National Historic Preservation Act* (hereinafter 2008 PA) available at <http://www.achp.gov/npspa.pdf> and according to 36 CFR Part 800.14(b)(1)(ii); and

**WHEREAS**, the NPS has invited the participation as consulting parties under Section 106 the United States Army Corps of Engineers (hereinafter Corps), who accepted, and the Metropolitan Washington Airports Authority (hereinafter MWAA), who declined, and the NPS has been in communication with consulting parties regarding the undertaking; and

**WHEREAS**, the NPS proposes to phase implementation of the Project by work elements as described in the FEIS, and the NPS has identified historic properties in the Area of Potential Effects (APE) but also proposes to phase identification and evaluation of historic properties of an archeological nature, pursuant to 36 CFR Part 800.4(b)(2); and

**WHEREAS**, the NPS proposes to phase application of the criteria of adverse effect, which is provided for in 36 CFR Part 800.5(a)(3); and

**WHEREAS**, to comply with Federal Aviation Administration (hereinafter FAA) safety orders, the MWAA is required to extend Runway 15-33 of Ronald Reagan Washington National Airport into the Potomac River (see Figure 1), which will require approximately 5.3 acres of fill in the river bottom, 2.4 acres of which is administered by NPS, and NPS has agreed to transfer to the FAA for the purpose of safety improvements the administrative jurisdiction of that acreage of riverine wetlands, of which 1.95 acres requires fill while the rest is considered buffer; and

**WHEREAS**, MWAA has presented the NPS with a mitigation proposal for the impacts to wetlands caused by the expansion of Runway 15-33 that consists of funding the construction of a breakwater feature located at the site of the historic location of the former promontory of Dyke Marsh (see Figure 2) as part of the initial phase of the environmental restoration, and



**WHEREAS**, for projects requiring authorization by both NPS and the Corps mitigations that satisfy both entities permitting requirements are strongly encouraged by Director's Order 77-1; and

**WHEREAS**, a permit from the Corps Regulatory Branch may be required for impacts to waters and/or wetlands pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act to construct the Project; and

**WHEREAS**, the NPS has selected the Corps to develop an interagency agreement for their assistance to the NPS as the design and construction agent for the Project; and

**WHEREAS**, the Corps and NPS have agreed to designate the NPS as the lead federal agency to fulfill their collective responsibilities under Section 106; and

**WHEREAS**, NPS has completed the identification of historic properties for the Project undertaking save for potential archeological resources that may be impacted by future phases of the Project, and in consultation with the SHPO, finds that the January 2009 document titled *Archeological Assessment for Dyke Marsh Preserve, George Washington Memorial Parkway, Fairfax County, Virginia* provides a clear and thorough presentation of Dyke Marsh's archeological potential; and

**WHEREAS**, the NPS has determined in consultation with the SHPO that implementation of the initial phases of the Project, including restoration efforts in previously dredged and disturbed portions of Dyke Marsh, will have no adverse effect on *identified* historic properties, including the Park, but future phases of the Project may affect as yet *unidentified* archeological resources that may contribute to the significance of the Park, or may be eligible for listing in the NRHP on an individual basis; and

**WHEREAS**, the NPS has solicited and considered the views of the public using its National Environmental Policy Act public involvement procedures pursuant to 40 CFR Part 1500.2(d) and 40 CFR Part 1506.6; and

**WHEREAS**, the NPS has notified the Advisory Council on Historic Preservation (ACHP) of the intention to develop a project specific programmatic agreement, pursuant to 36 CFR Part 800.14(b)(1)(ii) and has invited the ACHP to participate in consultation and the ACHP has declined to participate; and

**NOW THEREFORE**, the NPS and the SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.



## **STIPULATIONS**

The NPS shall ensure that the following measures are carried out.

### **I. CONSULTATION**

The NPS shall consult with the SHPO in carrying out the terms of this agreement. Such consultation may include but not be limited to written correspondence, conference calls, face-to-face meetings, and/or field visits.

### **II. PLANNING AND COMPLIANCE PREPARATION**

- A. Consistent with the provisions of the 2008 PA, the NPS shall prepare documentation for the actions using the "Assessment of Actions Having an Effect on Cultural Resources" form (also called the Assessment of Effect form). Forms will be reviewed by NPS cultural resource advisors who meet the professional qualifications set forth in the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* in the fields of archeology, history, historic landscape architecture, and historic architecture.
- B. Actions that meet the criteria for streamlined review, found in Stipulation III.C of the 2008PA, will require no further review. The NPS shall submit Assessment of Effect forms to the SHPO to document actions that the NPS considers to meet the criteria for streamlined review, found in Stipulation III.C of the 2008 PA. If the criteria for streamlined review are not met, the NPS shall submit the assessment forms to the SHPO for review and comment.
- C. If the NPS determines that the refining of plans for future phases of the proposed Dyke Marsh restoration may alter the qualities that make a contributing structure, landscape or landscape feature significant, the NPS will prepare design alternatives and/or landscape treatment plans to avoid, minimize, or mitigate the Project's adverse effects for submission to the SHPO for review and approval prior to implementation.

### **III. REVIEW REQUIREMENTS**

- A. The NPS shall submit for review and comment to the SHPO, and upon their request, to consulting parties, all construction drawings and documents in draft form in electronic or print format as requested for a 30 calendar day period that begins upon receipt. This review is for elements of the



restoration for future phases of the Project not fully described in the FEIS to determine effects of the proposed design on historic properties. This includes all required plans, such as detailed construction plans for the various types of restoration structures proposed for the future phases. The plans will include types of equipment used, staging areas, equipment access, all ground disturbing activity, including tree and vegetation removal and use of trails and roadways.

- B. No construction work will commence until after the 30 day review period in Stipulation III.A. If there is an adverse effect on historic properties, the adverse effect will be resolved, and mitigation, if any, may require completion prior to commencing construction work.
- C. All final drawings will be provided in electronic or print format as requested to the SHPO and other consulting parties prior to the commencement of construction.

#### **IV. IDENTIFICATION, EVALUATION, AND TREATMENT OF HISTORIC PROPERTIES**

- A. For the future phases of the Project, the NPS shall ensure that an archeological survey program, for identification of terrestrial and submerged archeological sites within the Project APE, is developed in consultation with the SHPO and other consulting parties. Prior to affecting any potentially eligible archeological site, the NPS shall develop a testing program of sufficient intensity to provide an evaluation of eligibility for the National Register of Historic Places (NRHP) in consultation with SHPO and other consulting parties, following the regulations outlined in 36 CFR Part 800.4(c).
- B. If, as a result of the testing program, archeological sites are identified within the Project APE that are determined eligible for the NRHP, the NPS shall develop a plan for their avoidance, protection, or recovery of information in consultation with the SHPO and other consulting parties. Prior to implementation, the plan shall be submitted to the SHPO and other consulting parties for a 30 calendar day review and comment period starting upon receipt.
- C. All data recovery plans prepared under the terms of this Agreement shall include the following elements:



1. Information on the archeological property or properties where data recovery is to be carried out, and the context in which such properties are eligible for the National Register;
2. Information on any property, properties, or portions of properties that will be destroyed without data recovery;
3. Discussion of the research questions to be addressed through the data recovery with an explanation/ justification of their relevance and importance;
4. Description of the recovery methods to be used, with an explanation of their pertinence to the research questions; and
5. Information on arrangements for any regular progress reports or meetings to keep the SHPO and other consulting parties up to date on the course of the work. The plan should contain the expected timetable for excavation, analysis and preparation of the final report.
6. NPS shall ensure that the approved treatment plan or data recovery plan is implemented prior to those project activities that could affect the archeological site(s).
7. NPS shall notify the SHPO and the other consulting parties in writing once the fieldwork portion of the treatment plan or data recovery plan is complete and provide a brief management summary so that a site visit may be scheduled, if requested. Project activities may proceed following this notification while the technical report is in preparation. NPS may proceed with implementation of construction or construction related ground disturbing activities in the area and within the boundary of the affected archeological site(s) while the technical report is in preparation.

## **V. REPORTING REQUIREMENTS**

- A. For future phases of the proposed Project, the NPS shall provide to the SHPO and other consulting parties a draft summary or letter report in electronic or print format as requested briefly describing the findings of the work, required in Stipulation IV of this document, for a 30 calendar day review and comment



period starting upon receipt. The summary/letter report shall include, as appropriate, recommendations on NRHP eligibility or potential eligibility of all identified archeological sites (and if applicable any newly identified historic properties), recommendations for further archeological investigations, the potential effects of the Project on historic properties, and suggested measures to resolve adverse effects through avoidance, minimization or mitigation.

- B. The SHPO and other consulting parties shall provide their comments to the NPS within 30 calendar days from the date of receipt of the draft summary/letter report. If no comments are received within the 30 day period, the NPS shall assume that the non-responding party has no comments. A lack of comments has the same effect as a concurrence, it is not an impediment. If the consulting parties concur with the recommendations for that phase, the NPS may proceed with the next step in the process for that phase. If the consulting parties do not concur with the NPS' recommendations for that phase, the parties shall consult further to resolve the issues following the provisions for dispute resolution in Stipulation X of this document.
- C. The NPS shall ensure that the draft summaries/letter reports for all phases of the Project are incorporated into one final technical report. The SHPO and other consulting parties shall provide their comments on the draft technical report to the NPS within 30 calendar days from date of receipt of the draft report. If the NPS does not receive comments within the 30 day comment period, the NPS shall assume that the non-responding party has no comments. A lack of comments has the same effect as a concurrence, it is not an impediment. The NPS shall ensure that all comments on the draft technical report received during the 30 day period are considered in preparation of the final report. The NPS shall submit two (2) archivally bound hardcopies and one electronic copy in Adobe® Portable Document Format (.pdf) of its approved final report to the SHPO and one (1) copy of that document to each of the consulting parties in whichever of these two formats is requested.
- D. All cultural resource work performed under the terms of this Agreement shall be carried out by or under the direct supervision of a professional who meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44739) in the appropriate discipline.



1. All archeological studies conducted on submerged sites will be carried out by an archeologist trained in underwater archeology using current methods and equipment.
  2. Archeologists working on submerged sites within the Project APE will secure all necessary permits from the Virginia Marine Resources Commission and the Corps prior to conducting field work.
- E. All archeological studies conducted pursuant to this Agreement shall be consistent with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-44742, September 1983), the ACHP's *Section 106 Archeology Guidance* (June 2007) and the SHPO's *Guidelines for Conducting Historic Resources Survey in Virginia* (2011), and subsequent revisions or replacements.
- F. All historical, architectural and landscape studies resulting from this Agreement shall be consistent with pertinent standards and guidelines of the Secretary of the Interior, including, as applicable, the Secretary of the Interior's *Standards and Guidelines for Historical Documentation* (48 FR 44728-30) and for *Architectural and Engineering Documentation* (48 FR 44730-34), the SHPO's *Guidelines for Conducting Historic Resources Survey in Virginia* (2011), and "Photographic Documentation for National Park Service (NPS) Register Nominations and Virginia Department of Historic Resources (DHR) Basic Survey" (Updated Sept. 13, 2006), and subsequent revisions or replacements.
- G. Upon the completion of all stipulations to this Agreement, the NPS shall notify the SHPO and the other consulting parties and the ACHP that the NPS has fulfilled all its responsibilities under this Agreement and that the duration of the Agreement has ended pursuant to Stipulation XV.
- H. The NPS shall release or withhold information related to this Agreement according to all applicable laws, regulations, and policies, and will encourage the SHPO, the consulting parties, signatories, invited signatories, and concurring parties to likewise abide by these requirements to the extent they are able.



## **VI. CURATION**

Within 60 days of the NPS's release of the final technical report, the NPS shall deposit all archeological materials and appropriate field and research notes, maps, drawing and photographic records collected as a result of archeological investigations arising from this Agreement (with the exception of human skeletal remains and associated funerary objects) for permanent curation with the NPS repository in the National Capital Region, a repository which meets the requirements in 36 CFR 79, *Curation of Federally Owned and Administered Archeological Collections*. All such items shall be made available to educational institutions and individual scholars for appropriate exhibit and/or research under the operating policies of the NPS.

## **VII. POST REVIEW DISCOVERIES**

A. The NPS shall ensure that all construction documents include the following provisions:

1. If previously unidentified historic properties or unanticipated effects to historic properties are discovered in the park during construction, the construction contractor shall immediately halt all activity within a 100 foot radius of the discovery, notify NPS within 24 hours of the discovery, and implement interim measures to protect the discovery from looting and vandalism.
2. Immediately following upon NPS's receipt of the notification required in Stipulation VII.A.1 of this document, the NPS shall
  - (a) inspect the construction site to determine the extent of the discovery and ensure that construction activities have halted;
  - (b) clearly mark the area of the discovery;
  - (c) implement additional measures, as appropriate, to protect the discovery from looting and vandalism; and
  - (d) have an archeologist meeting the requirements of Stipulation V.D. inspect the construction site to determine the extent of the



discovery and provide recommendations regarding its NRHP eligibility and treatment; and

- (e) notify the SHPO and other consulting parties of the discovery describing the measures that have been implemented to comply with Stipulations VII.A.1 and A.2 of this document.
3. Within 48 hours of NPS's receipt of the notification described in Stipulation VII.A.2 (e) of this document, the NPS shall provide the SHPO and other consulting parties with its assessment of the NRHP eligibility of the discovery and the measures the NPS proposes to take to resolve adverse effects. In making its official evaluation, the NPS, in consultation with the SHPO and other consulting parties may assume the discovery to be NRHP-eligible for the purposes of Section 106 pursuant to 36 CFR Part 800.13(c). The SHPO and other consulting parties shall respond within 48 hours after their receipt of NPS's submission of its official evaluation.
  4. The NPS, which shall take into account the consulting parties' recommendations on eligibility and treatment of the discovery, shall ensure that appropriate actions are carried out and provide the SHPO and the other consulting parties with a report on these actions when they have been implemented.
  5. Construction activities may proceed in the area of the discovery when the NPS has determined that implementation of the actions undertaken to address the discovery pursuant to Stipulation VII.A are complete.

## **VIII. EMERGENCIES**

Should an emergency situation occur which represents an imminent threat to public health or safety, or creates a hazardous condition, after the NPS learns of it and notifies appropriate law enforcement and emergency personnel as necessary, the NPS shall immediately notify the SHPO and the ACHP of the condition which has initiated the situation and the measures taken to respond to the emergency or hazardous condition. Should the SHPO or the ACHP desire to provide technical assistance to the NPS, they shall submit comments to NPS within 7 calendar days from notification, if the nature of the emergency or hazardous condition allows for such coordination.



## **IX. HUMAN REMAINS**

- A. The NPS shall make all reasonable efforts to avoid disturbing gravesites and associated funerary artifacts. The NPS shall treat all human remains in a manner consistent with the ACHP's "Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects" (February 23, 2007; <http://www.achp.gov/docs/hrpolicy0207.pdf>) or ACHP policy in effect at the time remains and funerary artifacts are handled.
1. The NPS shall contact law enforcement and emergency personnel as appropriate if human remains are discovered.
  2. If the remains found on federal lands are determined to be of Native American origin, the NPS shall comply with the provisions of the Native American Graves Protection and Repatriation Act, 25 USC § 3001 et seq. and the accompanying regulations at 43 CFR part 10. If the remains are found on non-federal lands or are determined not to be of Native American origin, the NPS shall comply with the Virginia Antiquities Act, Section 10.1-2305 of the Code of Virginia, final regulations adopted by the Virginia Board of Historic Resources and published in the Virginia Register on July 15, 1991, or subsequent revisions; or follow appropriate regulations established by the state of jurisdiction.
  3. The NPS shall use reasonable efforts to ensure that the general public is excluded from viewing any burial site or associated funerary artifacts. Subject to applicable law, the SHPO and the consulting parties to this Agreement shall release no photographs or images of any burial site or associated funerary artifacts to anyone including the press and general public. If they do release such photographs or images, accidentally, voluntarily, or pursuant to applicable law, they will notify the NPS and the other parties as soon as possible. The NPS shall notify the appropriate federally recognized tribes or individual Virginia tribes when burials, human skeletal remains, or funerary artifacts are encountered on the project; or follow appropriate regulations established by the state of jurisdiction.



## **X. DISPUTE RESOLUTION**

A. Should any consulting party object in writing to the NPS regarding any action carried out or proposed with respect to this Agreement or the implementation of its terms, the NPS shall consult with the objecting party in an effort to resolve the objection. If, after initiating such consultation, the NPS determines that the objection cannot be resolved, the NPS shall:

1. Forward all documentation relevant to the dispute, including the NPS' proposed resolution, to the ACHP. The ACHP shall provide the NPS with its advice on the resolution of the objection within 30 days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the NPS shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, consulting parties to this Agreement, and provide them with a copy of this written response. The NPS will then proceed according to its final decision.

2. If the ACHP does not provide its advice regarding the dispute within the 30 day time period, the NPS may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the NPS shall prepare a written response that takes into account any timely comments regarding the dispute from the consulting parties to this Agreement, and provide them and the ACHP with a copy of such written response.

B. The NPS's responsibility to carry out all actions under this Agreement that are not the subject of the objection remains unchanged.

C. At any time during implementation of the measures stipulated in this Agreement, should an objection pertaining to this Agreement or the effect of the Project on historic properties be raised by a member of the public, the NPS shall notify the other consulting parties, and attempt to resolve the objection. If the NPS determines that the objection cannot be resolved, the NPS shall comply with Stipulations X.A and X.B of this document.

## **XI. ANTI-DEFICIENCY ACT**

The NPS's obligations under this Programmatic Agreement are subject to the availability of appropriated funds, and the stipulations of this Programmatic Agreement



are subject to the provisions of the Anti-Deficiency Act. The NPS shall make reasonable and good faith efforts to secure the necessary funds to implement this Programmatic Agreement in its entirety. If compliance with the Anti-Deficiency Act alters or impairs the NPS's ability to implement the stipulations of this agreement, the NPS shall consult in accordance with the amendment and termination procedures found at Stipulations XII and XIII of this agreement.

## **XII. AMENDMENT**

Any signatory to this Agreement may propose to the NPS that it be amended or modified, whereupon NPS shall consult with the consulting parties to consider such an amendment. This Agreement may then be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date it is signed by all of the signatories and filed with the ACHP.

## **XIII. TERMINATION**

- A. If any signatory determines that the terms of this Agreement will not or cannot be carried out, that party shall immediately consult with the other signatories and concurring parties to seek an amendment in accordance with Stipulation XII of this document. If within thirty (30) days an amendment cannot be reached, any signatory may terminate the Agreement upon written notification to the other signatories and concurring parties.
- B. Once the Agreement is terminated, and prior to work continuing on the Project, the NPS must either (a) execute another Programmatic Agreement or a Memorandum of Agreement pursuant to 36 CFR Part 800.14(b) or 36 CFR Part 800.6, respectively, or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR Part 800.7. The NPS shall notify the signatories as to the course of action it will pursue.
- C. In the event that this Agreement is terminated, the NPS shall submit to the SHPO and the other consulting parties a technical report with the results of any surveys or treatment measures that have been implemented to date, up to and including the date of termination.



#### **XIV. COORDINATION WITH OTHER FEDERAL REVIEWS**

In the event that the NPS or other agency applies for additional federal funding or approvals for the Project and the undertaking remains unchanged, such funding or approving agency may comply with Section 106 by agreeing in writing to any applicable terms of this PA and notifying and consulting with the SHPO. Any necessary modification will be considered in accordance with Stipulation XII (Amendment).

#### **XV. DURATION OF AGREEMENT**

This Agreement shall continue in full force and effect until 10 years after the date of the last signature of a signatory party, or until NPS makes the notification under Stipulation V.G. At any time in the 6-month period prior to the end of the 10 year term, the NPS may request the SHPO to consider an extension of this agreement. No extension shall be effective unless all signatory parties to this Agreement have agreed with it in writing.

Execution of this Agreement by the NPS, the SHPO, and its submission to the ACHP in accordance with 36 CFR Part 800.6(b) (1) (iv), shall, pursuant to 36 CFR Part 800.6(c), be considered to be an agreement with the ACHP for the purposes of Section 110(l) of the NHPA (54 USC 306114). Execution and submission of this Agreement and implementation of its terms evidence that the NPS has afforded the ACHP an opportunity to comment on the Project and its effects on historic properties, and that the NPS has taken into account the effects of the Project on historic properties.



PROGRAMMATIC AGREEMENT  
Between  
THE NATIONAL PARK SERVICE  
and  
THE VIRGINIA DEPARTMENT OF HISTORIC RESOURCES  
Concerning  
THE DYKE MARSH RESTORATION PROJECT  
In  
FAIRFAX COUNTY, VIRGINIA

**Signatories**

George Washington Memorial Parkway

By: Alexy Romero

Date: 9/11/15

Alexy Romero  
Superintendent  
George Washington Memorial Parkway

Virginia Department of Historic Resources

By: Julie V. Langan

Date: 9/15/15

Julie V. Langan  
State Historic Preservation Officer  
Director, Virginia Department of Historic Resources

**Concurring Parties**

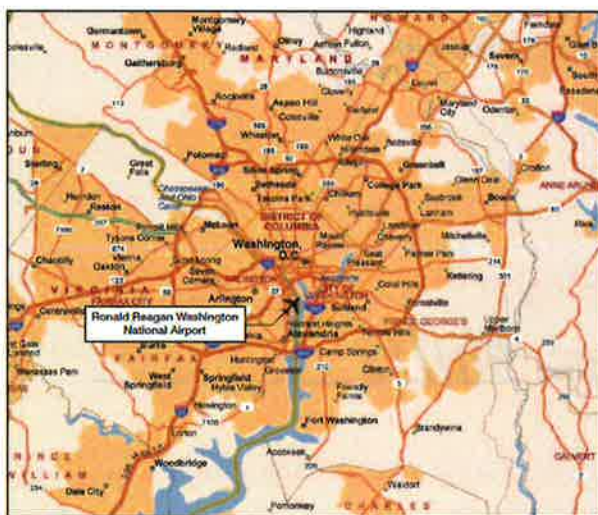
U.S. Army Corps of Engineers

By: William T. Walker

Date: 10/20/15

William T. Walker  
Chief, Regulatory Branch





Source: MapPoint 2004  
Prepared by: Ricordo & Associates, Inc., February 2010.

Not to Scale  
↑ north

Exhibit I-1

Regional Setting



Source: Amels Express, 2001 (Lead Airports Design Consultants, Inc., September 2010 (Proposed Action).  
Prepared by: Ricordo & Associates, Inc., October 2010.

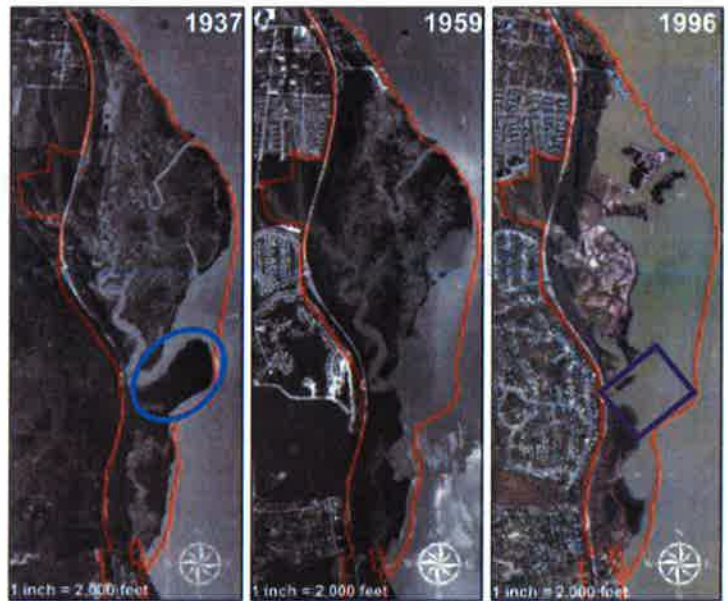
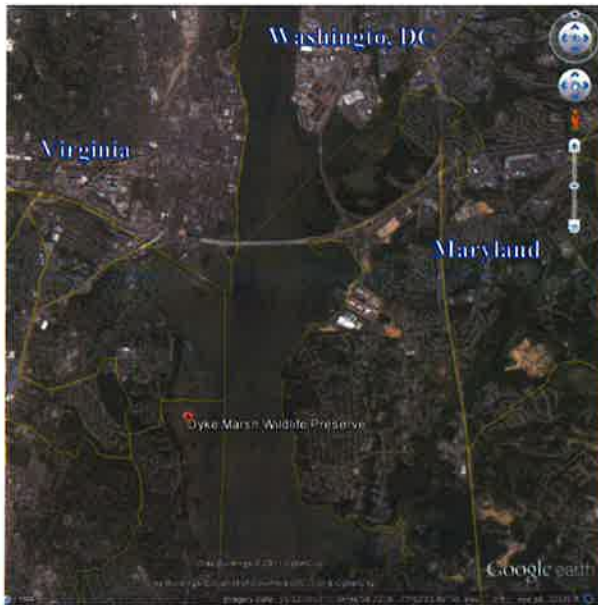
Exhibit I-4

Proposed Action - Runway 15-33

REPRODUCED SCALE IS APPROXIMATE

Figure 1 – Ronald Reagan Washington National Airport Location Map and Proposed Runway 15-33 Expansion Plan (from 2013 Final Environmental Assessment Runway 4-22 and Runway 15-33 RSA Enhancements)





Imagery Original Source: Fairfax County, Virginia

Reproduced Scale is Approximate

Figure 2 – Dyke Marsh Location Map and Historic Imagery Showing Former Promontory at Dyke Marsh and Proposed Area of Breakwater at Former Promontory Location

Figure derived from Google Earth and Dyke Marsh Wetland Restoration and Long-term Management Plan Final Environmental Impact Statement (Figure I-2)

Former Promontory of Dyke Marsh



Breakwater Construction Area





