

Appendix F

Mid-Chesapeake Bay Island Proposed Adaptive
Management Plan for James Island Project

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MID-CHESAPEAKE BAY ISLAND PROPOSED ADAPTIVE MANAGEMENT PLAN FOR JAMES ISLAND PROJECT

June 2005

1.0 PURPOSE OF ADAPTIVE MANAGEMENT AT BARREN ISLAND AND JAMES ISLAND

The Mid-Chesapeake Bay Island Environmental Restoration project will utilize suitable dredged material to complete island habitat restoration/ protection at Barren Island and habitat restoration at James Island. The proposed project at James Island will beneficially use suitable clean dredged material from the Chesapeake Bay to restore approximately 2070 acres of island habitat. The proposed habitat restoration/ protection project at Barren Island will create shoreline protection along the western side of Barren Island, and clean local dredged material will be used to build wetlands behind the protection. The goals of the Mid-Chesapeake Bay Island Environmental Restoration project (Mid-Bay Island), as stated in the Project Management Plan is:

“To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.”

2.0 MID-BAY ISLAND BACKGROUND

2.1 James Island

James Island is located in the Chesapeake Bay in Dorchester County, Maryland near the mouth of the Little Choptank River and about one mile offshore from Taylor’s Island (Figure 1). Since 1847, over 800 acres have eroded from the privately owned island. As of 2002, James Island consisted of three eroding island remnants totaling less than 100 acres. The habitat restoration project at James Island consists of creating new island habitat using clean dredged material from the Chesapeake Bay approach channels to the Port of Baltimore. Approximately 2070 acres of island habitat will be restored by placing 78 to 92 million cubic yards (mcy) of dredged material behind 45,235 linear feet of containment dikes. The dredged material will be placed, dewatered, graded, and planted if necessary to create 55% wetland habitat (approximately 1140 acres) and 45% upland habitat (approximately 930 acres). A variety of intertidal habitats will be restored in the wetland as areas including low marsh, high marsh, beaches, and mudflats. The wetlands will also include vegetated and unvegetated habitat islands, ponds, and tidal channels to enhance the habitat value for fish, reptiles, amphibians, birds, and mammals. Scrub shrub areas and forested areas will be created in the upland areas, and transition zones will be created between the upland and wetland areas. The containment dikes for the restoration project may be constructed using a single phase or a multi phase approach. Once construction is complete, the project is expected to accept dredged material for approximately 28 years assuming an average inflow rate of 3.2 mcy per year (USACE, 2005).

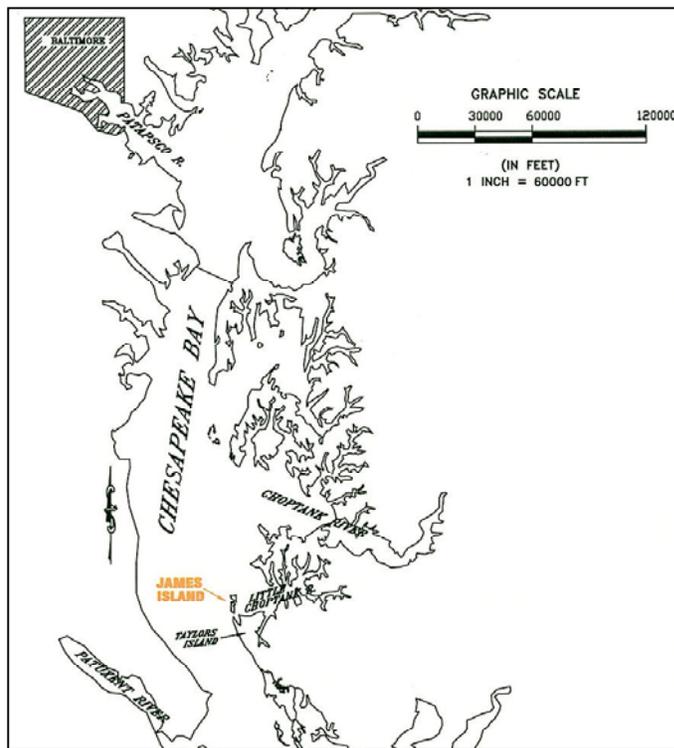


Figure 1. James Island Site Location

2.2 Barren Island

Barren Island is an uninhabited island located in the Chesapeake Bay in Dorchester County, Maryland near the Honga River and immediately west of Hoopers Island (see Figure 2). Since 1848, about 78% of its acreage has been lost to erosion. Currently, Barren Island consists of three eroding island remnants totaling about 180 acres in size. The island is federally owned and managed by the U.S. Fish and Wildlife Service (USFWS) as a satellite refuge area to Blackwater National Wildlife Refuge. The restoration/ protection project will consist of constructing 13,550 linear feet of breakwater along the western shore of Barren Island, extending southward beyond the island, and 3,840 linear feet of breakwater along the northern shoreline of the island. It is expected that once construction of the shoreline protection component is complete, local dredged material will be used to periodically fill in the areas behind the breakwater to create up to 94 acres of wetlands (USACE, 2005).

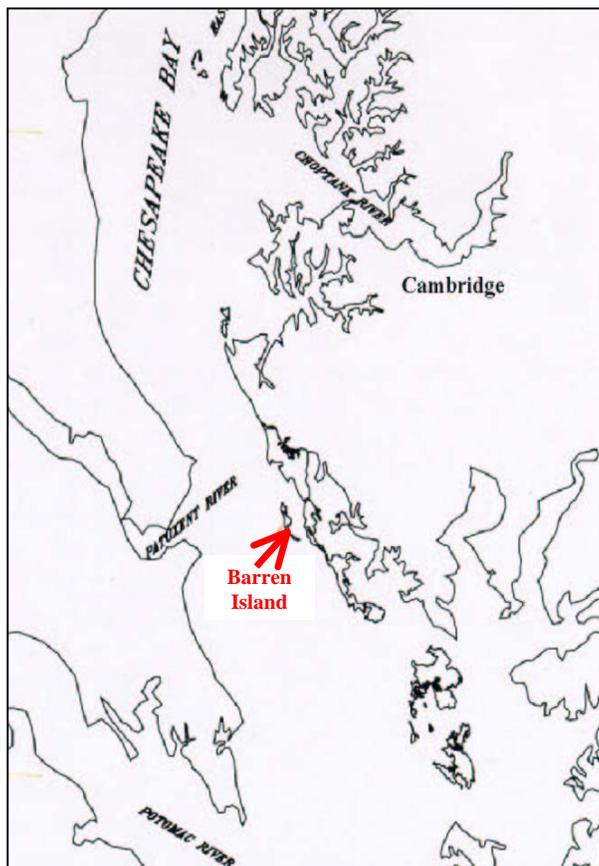


Figure 2. Barren Island Site Location

3.0 INTRODUCTION TO ADAPTIVE MANAGEMENT

Adaptive Management is an iterative process of setting a management plan, reviewing progress toward executing the goals and objectives of the plan, and revising the plan as necessary to reflect “lessons learned”. Adaptive management methods allow for versatility when developing environmental restoration projects. It allows management to continually refine objectives, goals, and implementation methods. Due to its versatility, Adaptive Management is very applicable to environmental restoration projects (USACE, 2004).

An Adaptive Management Plan includes the following key elements:

- Goals and objectives for the final project outcome
- Measurable end points upon which to evaluate progress toward those goals, including acceptable bounds of success around those end points
- Methods for measuring progress toward those end points
- A schedule for reviewing the measurements and assessing progress
- A mechanism for developing corrective actions when progress is outside of the acceptable bounds
- A mechanism for implementing those corrections, and
- A mechanism for incorporating the lessons learned from those assessments into a revised management plan, which could include revising the goals and objectives and/or the end points (USACE, 2004).

Figure 3 illustrates the Adaptive Management process.

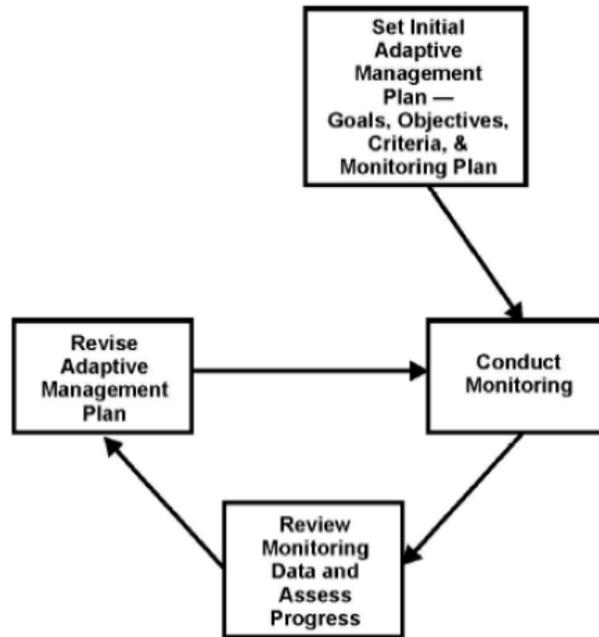


Figure 3. Adaptive Management Process (taken from USACE, 2004)

4.0 INTEGRATION OF THE ADAPTIVE MANAGEMENT PLAN WITH MID-BAY ISLAND ENVIRONMENTAL RESTORATION PROJECT MANAGEMENT

Adaptive Management practices are currently being used for the Poplar Island Environmental Restoration Project (PIERP), which is a project very similar to the proposed habitat restoration at James Island. The Adaptive Management process outlined for PIERP is the model for this Adaptive Management Plan. Management of the proposed Mid-Bay Island Environmental Restoration Project will incorporate both Adaptive Management and traditional task management methods. Tasks related to the habitat restoration goal will be managed using Adaptive Management methods, tasks such as general design, construction, and maintenance will be managed using more traditional task management methods (USACE, 2004). The Adaptive Management Plan described in this document outlines the Adaptive Management approach to tasks for both areas of the Mid-Bay Island project: habitat restoration/ protection at Barren Island and habitat restoration at James Island.

4.1 Management Structure

Figure 4 illustrates the organization of the management teams for PIERP; it is likely that the management team for the proposed Mid-Bay Island project will follow this model. The project partners, the Baltimore District of the U.S. Army Corps of Engineers (Corps) and the Maryland Port Administration (MPA), will form the Ecosystem Restoration Project Coordination Team. A Site Development Team, Site Operations Team, and Adaptive Management Team will support the Project Coordination Team and are responsible for daily tasks. The primary responsibility of the Adaptive Management Team will be to draft and execute management plans and guidance

documents related to the habitat restoration and environmental monitoring components of the project. In addition to members from the Corps and MPA, the Adaptive Management Team will include representatives from the Maryland Environmental Service (MES), and involved contractors (USACE, 2004).

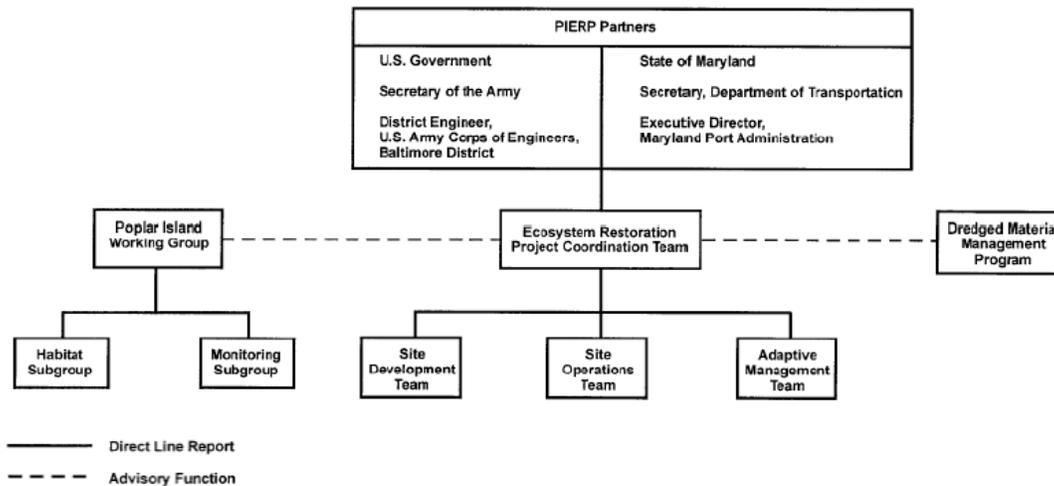


Figure 4. Example of Project Management Team Structure for PIERP (USACE, 2004)

4.2 Key Environmental Documents

Figure 5 illustrates the relationship between the Adaptive Management Plan and other key environmental documents for the PIERP (USACE, 2004). The same environmental documents will likely be required for the Mid-Bay Island Environmental Restoration Project. Some of the documents included in Figure 5, such as the Cell development Plans, the Wildlife Management Plan, and the Habitat Development Framework, will be drafted later in the project planning process.

The Habitat Development Framework (HDF) is the primary document supporting the island restoration. It provides the basic design goals and guidelines for each of the habitat types proposed for creation, such as low tidal marsh, high tidal marsh, habitat islands in the marsh, upland/ wetland transition zones, tidal creeks, ponds, upland scrub shrub, and upland forested habitat. The design goals and guidelines as described in the Mid-Bay Island feasibility study are reflected in the goals and objectives of the Adaptive Management Plan. The goals and objectives of habitat restoration will be evaluated on a regular basis, and, adjusted to reflect lessons learned during the ongoing development of the island. Any revisions resulting from the review process will be incorporated into an updated version of the HDF. Due to this system of regular updates, this Adaptive Management Plan (AMP) and the HDF will be mutually supportive documents (USACE, 2004).

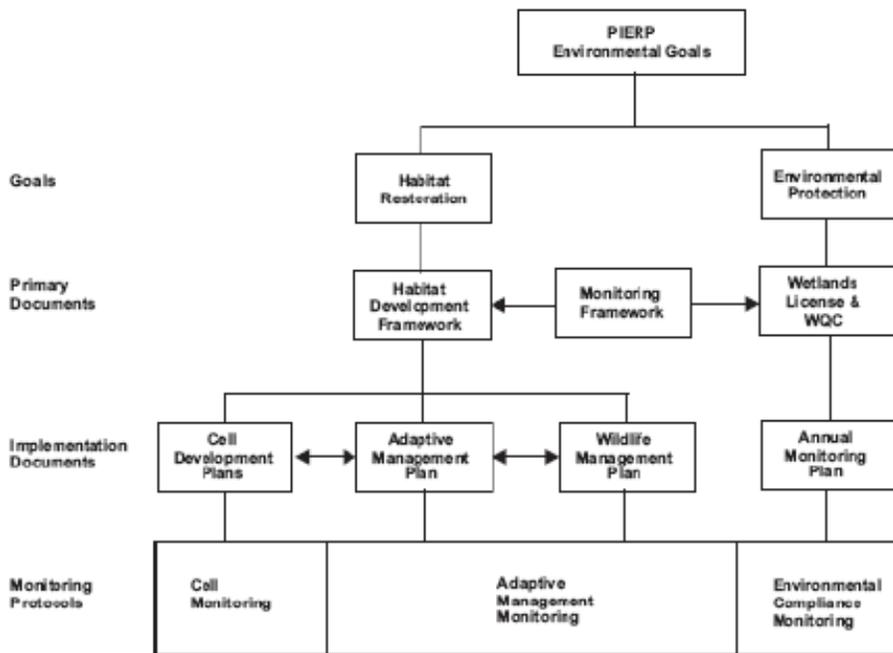


Figure 5. Example of Interrelationships of Key Environmental Planning Documents for PIERP (USACE, 2004)

The island habitat restoration project at James Island will be divided into discrete cells and subcells for purposes of dredged material placement and habitat restoration. A Cell Development Plan will be developed for each cell to outline the habitat restoration process in that cell. This Plan will provide cell-specific design details such as substrate elevation, tidal channel morphology (for marsh cells), and vegetation plantings. The specifics of the Cell Development Plan will be derived from the goals and guidelines contained in both the HDF and the AMP (USACE, 2004). The restoration/ protection project at Barren Island will not be divided into cells due to its smaller size. However, a plan that fills the same role as the Cell Development Plan may be developed for the Barren Island restoration/ protection project if necessary.

A Monitoring Framework will be prepared for the James Island and Barren Island projects in consultation with federal and state agencies. The Monitoring Framework will outline the study methods used to document progress on the habitat restoration goals. The studies in this framework will include sediment characterization, water quality, vegetation, submerged aquatic vegetation (SAV), and wildlife monitoring. Section 7.0 will describe how these studies support the monitoring component of the AMP. The AMP allows for the monitoring studies to be revised and additional studies added in response to project needs; therefore the Monitoring Framework will likely change as the AMP evolves (USACE, 2004).

5. ADAPTIVE MANAGEMENT APPROACH FOR MID-BAY ISLAND ENVIRONMENTAL RESTORATION PROJECT MANAGEMENT

Adaptive Management is a tiered approach that will relate to the broad habitat restoration goal of the Mid-Bay Island project, and to specific criteria for assessing progress toward attaining that goal. The hierarchy of elements in this Adaptive Management Plan is (USACE, 2004):

• Goal	Primary project goal
• Subgoal	Secondary goal in support of primary goal
• Objective	Action task to be implemented (e.g., create, improve, achieve)
• Attribute	Specific, measurable aspect of the objective (e.g., size, concentration, species composition)
• Criterion: • Target • Acceptable boundary around the target	Measurable endpoint for each attribute, expressed as: Most probable outcome Acceptable range around that outcome, recognizing environmental variability and the inherent uncertainty of ecological restoration projects
• Monitoring Plan • Approach/methods • Schedule	Plan for measuring progress toward achieving the objective, including: Specific approach to measuring each attribute Frequency for conducting the measurements

(Taken from USACE, 2004)

The Adaptive Management Team will implement the following steps for the Mid-Bay Island Adaptive Management process (USACE, 2004):

1. Develop the initial project goals, objectives, criteria, and monitoring framework.

This initial AMP is developed based on the goals and environmental parameters described in the Mid-Bay Island feasibility study.

2. Periodically assess progress toward meeting the objectives and criteria.

The Adaptive Management Team will review the Adaptive Management Plan annually by evaluating environmental monitoring data collected during the year and assessing progress toward achieving the Plan's objectives and criteria. The project partners can review specific objectives, criteria, or monitoring plans more frequently in response to project needs; interim Adaptive Management decisions will be documented and incorporated in the annual update.

3. Develop corrective actions, as necessary, to re-align the project design or operation or to adjust the key environmental plans.

If the annual review indicates that the project is not on target for meeting the objectives, the Adaptive Management Team develops corrective actions. Corrective actions can include redesigning or reconstructing, revising cell or habitat development guidelines, redefining goals or objectives, or modifying criteria. Following submittal to the Working Group for review, the proposed corrective actions will be implemented or submitted to the Site Development Team or Site Operations Team. All corrective actions are subject to the approval of the Ecosystem Restoration Project Coordination Team (USACE, 2004).

6. ADAPTIVE MANAGEMENT GOALS, OBJECTIVES, AND CRITERIA

The Adaptive Management Plan has two components: Restoration and Cell Development. The Restoration Component relates to habitat creation, and the outcome of the restoration once development is complete and the habitat has matured. This component establishes long term habitat restoration objectives that are used to evaluate the success of the project. Monitoring of

the restoration goals will begin after a discrete unit of the habitat has been completed. This leads to a varied monitoring schedule with some monitoring types not being performed until years into the project, or after the project has been completely developed.

The Cell Development Component of the AMP generally pertains to shorter term activities than the Restoration Component; it relates to habitat development within each cell. The details of dredged material placement, developing channels, achieving correct elevations, and final planting of vegetation are detailed in the Cell Development Component. This component creates interim objectives to work toward the long term objectives described in the Restoration Component. Assessment of the goals and objectives of the Cell Development Component will be done on an annual basis during project construction, and monitoring of these goals and objectives usually commences sooner in the project schedule than the Restoration Component monitoring (USACE, 2004). Figure 6 illustrates the Adaptive Management review process for the two components, and their relationship in the overall project plan.

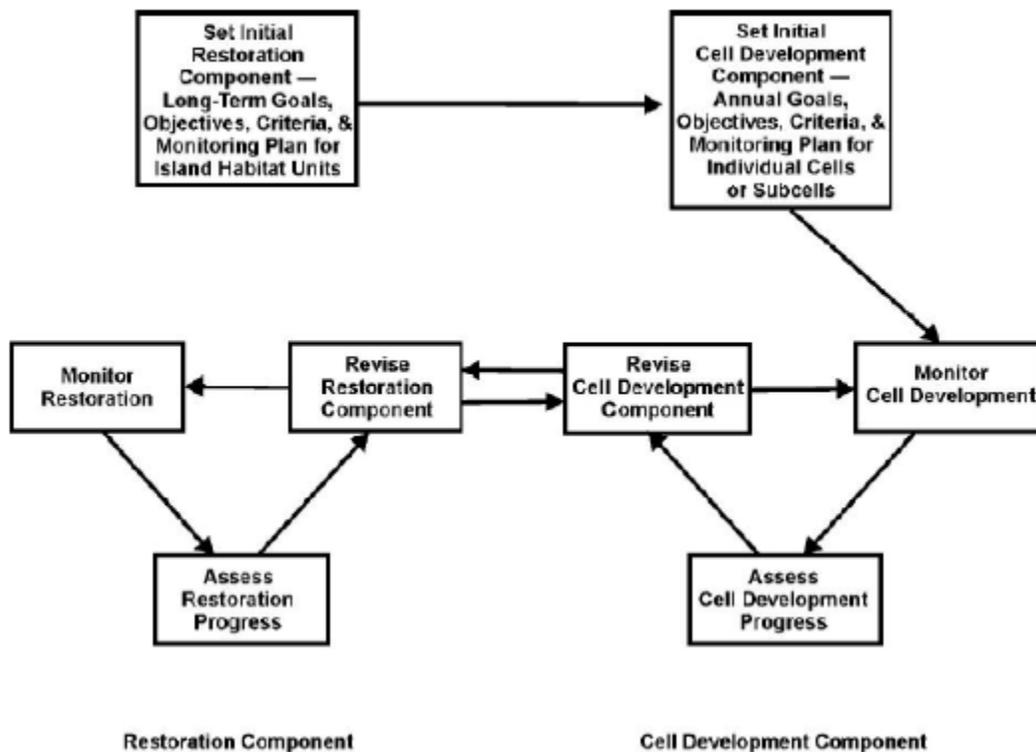


Figure 6. Interrelationship Between Restoration and Cell Development Components

6.1 Restoration Component

The habitat restoration goal of the Mid-Bay Island project is to create approximately 2070 acres of remote island habitat at James Island and restore up to 94 acres of wetlands and provide shoreline protection at Barren Island. The habitat at James Island will consist of 55% wetlands and 45% uplands. This Restoration Component is divided into ten subgoals:

- Restore and enhance marsh, aquatic, and terrestrial island habitat for fish, reptiles, amphibians, birds, and mammals

- Protect existing island ecosystems, including sheltered embayments
- Minimize impacts to existing fisheries nursery, feeding, and protective habitats
- Increase wetlands acreage in the Chesapeake Bay watershed
- Decrease local erosion and turbidity; Promote conditions to establish and enhance submerged aquatic vegetation;
- Promote conditions that support oyster recolonization
- Minimize impacts to rare, threatened, and endangered species and their habitat
- Minimize impacts to existing commercial fisheries
- Minimize establishment of invasive species to maximum extent possible
- Optimize the capacity for placement of dredged material (3.2 mcy/yr).

These subgoals were developed by the Mid-Bay Island Project Delivery Team (PDT) and documented in the Mid-Bay Island Feasibility Report. The AMP breaks down the subgoals into the Adaptive Management elements: objectives, attributes, and criteria (targets and acceptable bounds). Table 1 depicts an example of the AMP structure, and Attachment 1 contains the full Restoration Component of the Mid-Bay Island AMP (USACE, 2004).

No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
Subgoal #4: Increase wetlands acreage in the Chesapeake Bay watershed;								
4-1	Construct 1138 acres of additional wetlands at James Island using suitable dredged material from the Chesapeake Bay.	Size	1138 acres	1138 to 1242 acres	Engineering survey	Annual HDF update (MES, 2004)	MidBay Feasibility Study (Appendix C) states there will be 1138 acres of intertidal habitat. PIERP AMP sets acceptable bounds at $\pm 5\%$.	Total size of marsh cells in ___% design is ___. The restoration project has not yet begun.
4-2	Construct wetlands at Barren Island using local dredged material.	Size	TBD	TBD	Engineering survey	Annual HDF update (MES, 2004)	MidBay Feasibility Study (Appendix C) states there will up to 94 acres of intertidal habitat. PIERP AMP sets acceptable bounds at $\pm 5\%$.	Total size of marsh cells in ___% design is ___. The restoration project has not yet begun.

Table 1. Example of Adaptive Management Structure, Restoration Component

Restoration Component objectives relate to habitat creation for each subgoal, and many of the criteria for each objective establish numeric targets that are derived from project drawings, information described in the Mid-Bay Island feasibility study, and information from similar projects such as PIERP. Many of the subgoals also relate to habitat use by wildlife; the objectives for these goals tend to be non-numeric, establishing the presence or absence of the species in that particular habitat. The Restoration Component criteria presented in the AMP will include targets and bounds determined by the Adaptive Management Team. Data from environmental studies conducted in the vicinity of James Island and Barren Island and lessons learned from PIERP were used to develop the criteria. It should be noted that the acceptable bounds often establish a numerical range for the target, and success for the objective does not

necessarily require establishing an identical habitat to a reference area. The AMP also includes columns providing a reference, explanation, and source for each target and bound (see Attachments 1 and 2) (USACE, 2004c).

6.2 Cell Development Component

The Mid-Bay Island feasibility study provides one subgoal for the Cell Development Component: optimize the capacity for placement of dredged material (3.5 mcy/yr). Additional subgoals can be added to the AMP as project development progresses.

Objectives, attributes, and criteria will be assigned to describe each of the Cell Development subgoals, as outlined in Section 5.0. The objectives contained in the Cell Development component relate to operating goals and details on cell construction to prepare for habitat restoration. Operating goals can include dewatering and placement of dredged material. Cell construction goals can include criteria for hydrology, substrate, vegetation, and elevation. Table 2 is an example of the structure of the Cell Development Component from the PIERP AMP. The Cell Development Component pertinent to the Mid-Bay Island Restoration Project is located in Attachment 2. It should be noted that Table 2 contains objectives and attributes that are specific to a certain cell. These cell specific objectives and attributes are derived from the general objectives and attributes that would be provided in the Restoration Component (USACE, 2004c).

Subgoal #2: Operate Site to Optimize Drying and Consolidation of Placed Material and to Support Habitat requirements at James Island								
No.	Objective	Attribute	Criterion		Monitoring Plan		Source	Current Condition
			Target	Acceptable Bounds	Approach	Schedule		
2-1	Maximize Consolidation at James Island	Shrinkage factor	0.68		Calculated from measured void ratio and cut void ratio.		PIERP AMP	Not yet applicable
2-2		Void Ratio	2.8		Calculated from moisture content and specific gravity tests of in place material.		PIERP AMP	Not yet applicable
2-3		Surface elevation <ul style="list-style-type: none"> • Wetland cells • Upland cells 	(1)+1.4 ft. (2)+1.5 ft. (1)+20 ft. (2)+18 ft.		Engineering Survey		PIERP AMP	Not yet applicable

Table 2. Example of Adaptive Management Structure, Cell Development Component

7.0 MONITORING PLANS

A monitoring plan will be developed for each objective or attribute in the Restoration or Cell Development Components of the AMP. A monitoring plan outlines the parameters to be measured, the methods to be used, and the schedule for conducting the monitoring. The Monitoring Framework is usually cited in the AMP when additional information is needed regarding monitoring goals and methods. In addition to the Monitoring Framework, a monitoring plan will be developed annually for the Mid-Bay Island Environmental Restoration Project that will cover all the required regulatory monitoring. The annual monitoring plan is compiled from input from monitoring agencies, contractors, and lessons learned from previous

years of monitoring. It is expected that the Mid-Bay Island monitoring framework will be similar to PIERP, and contain studies to monitor discharge quality, SAV presence, sediment quality, water quality, benthic community, nekton, birds, and other wildlife. The results of these studies will be evaluated by the Adaptive Management Team and used to refine the AMP as needed.

8.0 ONGOING REVIEWS AND UPDATE

The Adaptive Management Team will review the AMP annually, however, the project partners can review specific objectives, criteria, or monitoring plans more frequently in response to project needs. The review process assesses the monitoring data for each criterion, and evaluates the progress toward achieving the habitat objectives. Favorable monitoring results and acceptable progress may lead the Adaptive Management Team to leave the AMP unrevised. However, the AMP can be revised in the following ways to correct unsatisfactory progress or monitoring results:

- Revise the Adaptive Management Plan level (subgoal, objective, attribute, criterion) to make it more realistic
- Revise the monitoring plan to better determine why progress is not occurring
- Revise the design and/or operation of the project to try to recover or redirect progress toward the goal or objective
- Revise the design and/or operation of the project to reflect a new or revised goal or objective
- Revise the Habitat Development Framework
- Revise the Monitoring Framework
- Revise individual cell development plans (USACE, 2004).

It is likely that the review process during the initial years of the project will concentrate on the Cell Development Component of the AMP. During the early stages of the project there will be few completed habitat areas to evaluate or monitor, and the Restoration Component may only have to be revised if an objective is determined to be unachievable. Monitoring for the long-term restoration goals outlined in the Restoration Component will begin once that habitat has been created at the project. The types of monitoring that may be required for the project are discussed in Section 7.0. Details of monitoring objectives, methods, and schedules will be included in a Monitoring Framework.

Historic records should be maintained to document the changes that have occurred to objectives, attributes, criteria, and the reasons those revisions were made in the evolving AMP. The records should include:

- Data used in the assessment (i.e., current conditions at the time of the assessment),
- Evaluations of those data versus the criteria,
- Recommended changes,
- Implemented changes or reasons for not implementing specific recommended changes. (USACE, 2004).

9.0 References:

U.S. Army Corps of Engineers (USACE), Baltimore District. 2005. Draft Environmental Impact Statement for Mid-Chesapeake Bay Island Ecosystem Restoration Feasibility Study. June 2005.

U.S. Army Corps of Engineers (USACE), Baltimore District. 2004. Poplar Island Environmental Restoration Project Adaptive Management Plan. July 2004.

Attachment 1
Adaptive Management Plan Restoration Component

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Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
Subgoal #1: Restore and enhance marsh, aquatic, and terrestrial island habitat for fish, reptiles, amphibians, birds, and mammals.								
1-1	Create 1138 acres of intertidal habitat at James Island.	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	Draft Mid-Bay Report (Appendix C) states there will be 1138 acres of intertidal habitat. (USACE, 2005)	Design phase/ construction has not begun.
1-2	Create low marsh at James Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-3		Location <ul style="list-style-type: none"> • Up-grade from sand beach • Not up-grade from sand beach 	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-4		Elevation	0.3 ft to 1.73 ft	TBD	Engineering survey	Annual HDF update	Elevations specified in Cell Development component of PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-5		Target Flora --species composition <ul style="list-style-type: none"> • S. alterniflora • S. patens • Other reference species • Nuisance species 	$\geq 80\%$ $\leq 20\%$ $\leq 20\%$ 0%	20-100% 0-80% 0-80% 0-10%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report. (USACE, 2005) Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-6		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	$\geq 90\%$	$\geq 85\%$	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report. (USACE, 2005) Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-7		Target Fauna utilization <ul style="list-style-type: none"> • Herpetiles • Wading birds • Waterbirds • Shorebirds • Waterfowl • Fish 	TBD	TBD	Bird Utilization & Wetlands Use by Wildlife Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	Design phase/ construction have not begun
1-8	Create high marsh at James Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-9		Location <ul style="list-style-type: none"> • Adjacent to uplands 	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-10		Elevation	1.73 to 2.2 ft.	TBD	Engineering survey	Annual HDF update	Elevations specified in Cell Development component of PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-11		Target Flora --species composition <ul style="list-style-type: none"> • S. patens • S. alterniflora • Other reference species • Nuisance species 	≥80% ≤20% ≤20% 0%	20-100% 0-80% 0-80% 0-10%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report. (USACE, 2005) Species percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-12		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	≥90%	≥85%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-13		Target Fauna utilization <ul style="list-style-type: none"> • Herpetiles • Wading birds • Waterbirds • Shorebirds • Waterfowl • Fish 	TBD	TBD	Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-14		Hummocks <ul style="list-style-type: none"> • size • location • elevation 	TBD TBD TBD	TBD TBD TBD	Engineering Survey	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-15	Create beach habitat at James Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-16		Size (length of shoreline)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-17		Slope	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-18		Substrate <ul style="list-style-type: none"> • type • size 	sand TBD	TBD TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-19		Target Flora --species composition <ul style="list-style-type: none"> • S. patens • S. alterniflora • Other reference species • Nuisance species 	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-20		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)—areas are expected to be sparsely vegetated.	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-21		Target Fauna utilization <ul style="list-style-type: none"> • Herpetiles • Wading birds • Water birds • Shorebirds • Waterfowl • Fish 	TBD	TBD	Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-22	Create unvegetated mudflat habitat	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-21	at James Island	Substrate <ul style="list-style-type: none"> • Type • Size 	Silt/clay/ fine sediment TBD	TBD TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-22		Elevation	-0.6 to +0.9 ft	TBD	Engineering survey	Annual HDF update	Elevations specified in Cell Development component of PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-23		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	0%	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid- Chesapeake Bay Feasibility Report. (USACE, 2005)	Design phase/ construction have not begun
1-24		Target Fauna utilization <ul style="list-style-type: none"> • Herpetiles • Wading birds • Water birds • Shorebirds • Waterfowl • Fish 	TBD	TBD	Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid- Chesapeake Bay Feasibility Report. (USACE, 2005)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-25	Create tidal creek habitats at James Island	Size	Acreage TBD	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report , Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-26		Dimension <ul style="list-style-type: none"> • Width • Depth 	TBD TBD	TBD TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility, Section 3 Report (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-27		Location <ul style="list-style-type: none"> • Low marsh • Mudflat • Beach 	Within intertidal habitat	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report , Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-28		Target Flora (SAV) Species Composition:			SAV Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 2 (USACE, 2005).	Not yet applicable.
		• Widgeon grass (<i>Ruppia maritime</i>)	80%	0%-80%				
		• Horned pondweed (<i>Zannichellia palustris</i>)	10%	0%-20%				
		• Sago pondweed (<i>Potamogeton pectinatus</i>)	10%	0%-20%			Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	
1-29		Target Flora –SAV density	TBD	TBD	SAV Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-30		Target fauna: <ul style="list-style-type: none"> • Forage fish • Commercial/predatory/higher trophic fish 	TBD TBD	TBD TBD	Fisheries Monitoring & Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
1-31	Create open water (pond/pool) habitats at James Island	Size	Acreage TBD		Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-32		Dimension <ul style="list-style-type: none"> • Width • Depth 	TBD TBD	TBD TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-33		Location <ul style="list-style-type: none"> • High Marsh • Uplands 	#TBD	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-34		Target Flora (SAV) Species Composition: <ul style="list-style-type: none"> • Widgeon grass (<i>Ruppia maritima</i>) • Horned pondweed (<i>Zannichellia palustris</i>) • Sago pondweed (<i>Potamogeton pectinatus</i>) 	80%	0%-80%	SAV Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 2. Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
		10%	0%-20%					
		10%	0%-20%					
1-35		Target Flora –SAV density	TBD	TBD	SAV Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-36		Target fauna: <ul style="list-style-type: none"> • Forage fish • Commercial/predatory/higher trophic fish • Herpetiles • Wading birds • Water birds • Shorebirds • Waterfowl 	TBD (not in all ponds)	TBD	Bird Utilization, Fisheries Monitoring, & Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
		TBD (not in all ponds)	TBD					
		TBD (in fish-less ponds)	TBD					
		TBD	TBD					
		TBD	TBD					
		TBD	TBD					
1-37	Create a habitat transition zone between upland and wetland habitat at James Island to disperse water flow into wetlands.	Width	TBD	TBD	Engineering Survey	Annual HDF update	Mid-Bay Report (Appendix C) states there will be a transition zone between the wetlands and uplands (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-38		Slope	TBD	TBD	Engineering Survey	Annual HDF update	Mid-Bay Report (Appendix C) states there will be a transition zone between the wetlands and uplands (USACE, 2005).	Design phase/ construction have not begun
1-39		Flora--% coverage	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP.	Design phase/ construction have not begun
1-40		Flora—species composition: Potentially freshwater wetlands species once upland cells have been dewatered.	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-41	Create 932 acres of forested and scrub shrub upland habitat at James Island.	Size <ul style="list-style-type: none"> • Scrub-shrub • Forested 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-42		Flora--% vegetation coverage <ul style="list-style-type: none"> • Scrub-shrub • Forested 	TBD	TBD	Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-43		Flora—Species composition in forested area (potential) <ul style="list-style-type: none"> • <i>P. taeda</i> • <i>A. rubrum</i> • <i>N. sylvatica</i> • <i>L. styraciflua</i> • <i>Q. alba</i> • <i>Q. rubra</i> • <i>Q. phellos</i> • <i>P.serotina</i> • <i>C. occidentalis</i> • <i>V. dentatum</i> • <i>L. benzoin</i> • <i>C. alnifolia</i> 	TBD	TBD	Vegetation Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report (USACE, 2005), Section 3 and PIERP AMP (USACE, 2004). Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-44		Flora—Species composition in scrub shrub area (potential) <ul style="list-style-type: none"> • <i>P. quinquefolia</i> • <i>C. radicans</i> • <i>Rubus sp</i> • <i>S. rotundifolia</i> • <i>I. frutescens</i> • <i>B. halimifolia</i> • <i>M. cerifera</i> • <i>P. maritima</i> 	TBD	TBD	Vegetation Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004). Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-45	Create unvegetated island nesting habitat for birds at James Island.	Size <ul style="list-style-type: none"> • Total area above high tide line • Individual area above high tide line • Diameter above high tide line 	8 acres ≤2 acres ≥50 feet (15 meters)	6-12 acres ≤2 acres ≥30 feet (10 meters)	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-46		Elevation	+8 feet	+6 feet – 12 feet	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-47		Moat <ul style="list-style-type: none"> • width at MLLW • depth at MLLW 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-48		Substrate <ul style="list-style-type: none"> • Material • Average shell diameter 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-49		Vegetation <ul style="list-style-type: none"> • % Cover • Height 	10%	5-20%	TBD	Measure in Spring prior to nesting season	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-50		Target Fauna utilization <ul style="list-style-type: none"> • Terns • Other colonial waterbirds/ shorebirds 	TBD	TBD	Bird Utilization Monitoring	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004) Monitoring specified in Mid-Chesapeake Bay Feasibility Report.	Design phase/ construction have not begun
1-51	Create vegetated island nesting habitat birds	Size <ul style="list-style-type: none"> • Total area above high tide line • Individual area above high tide line 	8 acres 3.5 acres	6-12 acres 2.5-5 acres	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-52		Moat <ul style="list-style-type: none"> • Width at MLLW • Depth at MLLW 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-53		Elevation	+8 feet	+6 feet – 12 feet	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-54		Substrate <ul style="list-style-type: none"> • Material • Average shell diameter 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-55		Vegetation <ul style="list-style-type: none"> • % Cover • Height 	≥60% Trees/ shrubs >3 feet high	≥50% >3 feet high	TBD	Measure in Spring prior to nesting season	Mid-Bay Report (Appendix C) (USACE, 2005) and PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
1-56		Target fauna: <ul style="list-style-type: none"> • Herons • Egrets • Other wading birds 	TBD	TBD	Bird Utilization, Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
1-57	Create intertidal habitats at Barren Island using local dredged material as it becomes available.	Size of low marsh	94 acres	Range TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) states there will be wetlands (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-58	Create low marsh at Barren Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) states there will be wetlands (USACE, 2005).	Design phase/ construction have not begun
1-59		Elevation	0.3 ft to 1.73 ft	TBD	Engineering survey	Annual HDF update	Elevations specified in Cell Development component of PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-60		Target Flora --species composition <ul style="list-style-type: none"> • S. alterniflora • S. patens • Other reference species • Nuisance species 	≥80% ≤20% ≤20% 0%	20-100% 0-80% 0-80% 0-10%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Species percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-61		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	≥90%	≥85%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-62		Target Fauna utilization <ul style="list-style-type: none"> • herpetiles • wading birds • waterbirds • shorebirds • waterfowl • fish 	TBD	TBD	Bird Utilization & Wetlands Use by Wildlife Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	Design phase/ construction have not begun
1-63	Create high marsh at Barren Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-64		Target Flora --species composition <ul style="list-style-type: none"> • S. patens • S. alterniflora • Other reference species • Nuisance species 	≥80% ≤20% ≤20% 0%	20-100% 0-80% 0-80% 0-10%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-65		Elevation	1.73 to 2.2 ft.	TBD	Engineering survey	Annual HDF update	Elevations specified in Cell Development component of PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-66		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	≥90%	≥85%	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-67		Target Fauna utilization <ul style="list-style-type: none"> • herpetiles • wading birds • waterbirds • shorebirds • waterfowl • fish 	TBD	TBD	Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-68		Hummocks <ul style="list-style-type: none"> • size • location • elevation 	TBD TBD TBD	TBD TBD TBD	Engineering Survey and Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-69	Create beach habitat at Barren Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-70		Size (length of shoreline)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-71		Slope	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-72		Substrate • type • size	sand TBD	TBD TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-73		Target Flora --species composition • <i>S. patens</i> • <i>S. alterniflora</i> • Other reference species • Nuisance species	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-74		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)-- areas are expected to be sparsely vegetated.	TBD	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-75		Target Fauna utilization <ul style="list-style-type: none"> • Herpetiles • Wading birds • Water birds • Shorebirds • Waterfowl • Fish 	TBD	TBD	Bird Utilization and Wetlands Use by Wildlife Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
1-76	Create unvegetated mudflat habitat at Barren Island	Size (acres)	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-77		Substrate <ul style="list-style-type: none"> • Type • Size 	Silt/clay/ fine sediment TBD	TBD TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-78		Elevation	TBD	TBD	Engineering survey	Annual HDF update	TBD	Design phase/ construction have not begun
1-79		Target Flora--% coverage by wetland plants (areas do not include channels, islands, ponds, or mud flats)	0%	TBD	Wetland Vegetation Monitoring	Annual HDF update	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-80	Create tidal creek habitats at Barren Island	Size	Acreage TBD		Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-81		Dimension <ul style="list-style-type: none"> • Width • Depth 	TBD TBD	TBD TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-82		Location <ul style="list-style-type: none"> • Low marsh • Mudflat 	Within intertidal habitat	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-83		Target Flora (SAV) Species Composition: <ul style="list-style-type: none"> • widgeon grass (<i>Ruppia maritime</i>) • horned pondweed (<i>Zannichellia palustris</i>) • Sago pondweed (<i>Potamogeton pectinatus</i>) 	80%	≥80%	SAV Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 2. Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
			10%	0%-20%				
			10%	0%-20%				
1-84		Target Flora –SAV density	TBD	TBD	SAV Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 2. Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-85	Create open water (pond/pool) habitats at Barren Island	Size	Acreage TBD		Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-86		Dimension <ul style="list-style-type: none"> • Width • Depth 	TBD TBD	TBD TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
1-87		Location <ul style="list-style-type: none"> • High Marsh • Uplands 	TBD	TBD	Engineering survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-88		Target flora: SAV (species composition TBD)	TBD	TBD	SAV Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 2. Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
1-89		Target Flora (SAV) Species Composition: <ul style="list-style-type: none"> • Widgeon grass (<i>Ruppia maritime</i>) • Horned pondweed (<i>Zannichellia palustris</i>) • Sago pondweed (<i>Potamogeton pectinatus</i>) 	80%	≥80%	SAV Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 2. Monitoring specified in Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/ construction have not begun
			10%	0%-20%				
			10%	0%-20%				

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
1-90		Target fauna: <ul style="list-style-type: none"> • Forage fish • Commercial/predatory/higher trophic fish • Herpetiles • Wading birds • Water birds • Shorebirds • Waterfowl 	TBD (not in all ponds) TBD (not in all ponds) TBD (in fish-less ponds) TBD TBD TBD TBD	TBD TBD TBD TBD TBD	Bird Utilization, Fisheries Monitoring, & Wetlands Use by Wildlife Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005)	Design phase/construction have not begun
1-91	Achieve use of restored and enhanced habitat at James Island and Barren Island by fish, reptiles, invertebrates amphibians, birds, and mammals.	Target species: <ul style="list-style-type: none"> • Invertebrate species TBD • Nekton species TBD • Avian species (including waterfowl, colonial waterbirds, shorebirds) TBD • Reptile species TBD • Mammal species TBD • Amphibian species TBD 	Presence of animal	TBD	Bird utilization terrapin, horsehoe crab, benthic, fisheries, and wetlands monitoring.	Annual HDF update	Target species from PIERP AMP (USACE, 2004). Monitoring from Mid-Chesapeake Bay Feasibility Report, Section 8 (USACE, 2005).	Design phase/construction have not begun

Subgoal #2: Protect existing island ecosystems, including sheltered embayments.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
2-1	Protect James Island from further erosion.	Size	Preserve James Island size at completion of dike construction	TBD	TBD—potentially Engineering Survey/ Aerial Survey	TBD	Section 3, Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	As of 2002, total area of James Island was <100 acres.
2-2	Enhance quiescent conditions on eastern side of the James Island.	Wave action—reduced from pre-construction	Protection construction	TBD	TBD—potentially Engineering Survey/ hydrodynamic modeling	TBD	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
2-3	Protect Barren Island from further erosion.	Size	Preserve Barren Island size at completion of construction	TBD	TBD—potentially Engineering Survey/ Aerial Survey	TBD	Section 3, Mid-Chesapeake Bay Feasibility Report (USACE, 2005)	Section 2 of the Mid-Chesapeake Bay Feasibility Report states that Barren Island is approximately 180 acres as of 2004.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
2-4	Protect the embayment east of Barren Island.	Wave action—reduced from pre-construction	TBD	TBD	TBD—potentially Engineering Survey/hydrodynamic modeling	TBD	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
Subgoal #3: Minimize impacts to existing fisheries nursery, feeding, and protective habitats								
3-1	Displace minimal known SAV beds or tidal marshes at James Island.	Acreage of SAV beds displaced.	0 acres	TBD	Environmental Studies and Construction Plan	Pre-construction	Section 6, Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	No known SAV beds are located within the James Island habitat restoration project footprint.
3-2	Displace minimal known SAV beds or tidal marshes at Barren Island.	Acreage of SAV beds displaced.	0 acres	TBD	Environmental Studies and Construction Plan	Pre-construction	Section 6 and Appendix C, Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	No known SAV beds are located within the western Barren Island restoration/protection project footprint. SAV presence in the northern option may need to be determined.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
3-3	Develop the habitats in Subgoal #1 to attract fisheries species to James Island and Barren Island.	Target species: (Fisheries species) <ul style="list-style-type: none"> • Crabs • Menhaden • Croaker • Spot • Striped bass 	Presence of fisheries species	TBD	Fisheries Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
3-4		Lifestage: <ul style="list-style-type: none"> • Juvenile • Adult 	Presence of varied life stages.	TBD	Fisheries Monitoring	TBD	Mid-Chesapeake Bay Feasibility Report, Section 3 (USACE, 2005) and PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
3-5	Cause no changes in sediment quality that would affect benthic habitat at James Island or Barren Island.	Chemical quality of sediment	Concentrations \leq criteria (Threshold effects level) If no criteria is available, concentrations \leq mean reference concentrations	Concentrations \leq 2 times reference mean concentration.	Sediment Quality Monitoring	TBD	PIERP AMP, Section 8 Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	See Section 2 of Mid-Chesapeake Bay Feasibility Report.

Restoration Goal: *To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.*

No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
3-6	Cause no accumulation of contaminants in benthic tissue at James Island or Barren Island.	Concentrations of organics and metals in tissue.	Concentrations ≤baseline concentration	Concentrations ≤2 times reference mean concentration.	Benthic Community Monitoring	TBD	PIERP AMP, Section 8 Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	See Section 2 of Mid-Chesapeake Bay Feasibility Report.

Subgoal #4: Increase wetlands acreage in the Chesapeake Bay watershed

4-3	Construct 1138 acres of additional wetlands at James Island using suitable dredged material from the Chesapeake Bay.	Size	1138 acres	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) states there will be 1138 acres of wetlands (USACE, 2005).	Total size of marsh cells in ___% design is ___. The restoration project has not yet begun.
4-4	Construct wetlands at Barren Island using local dredged material.	Size	94 acres	TBD	Engineering survey	Annual HDF update	Mid-Bay Report (Appendix C) (USACE, 2005).	Total size of marsh cells in ___% design is ___. The restoration project has not yet begun.

Restoration Goal: *To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.*

No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
Subgoal #5: Decrease local erosion and turbidity.								
5-1	Achieve shoreline protection for James Island and Taylors' Island.	Wave action—reduced from pre-construction	TBD	TBD	Pre- and post construction hydrodynamic studies.	Annual HDF update	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
5-2	Achieve shoreline protection for Barren Island and Hooper Island.	Wave action—reduced from pre-construction	TBD	TBD	Pre- and post construction hydrodynamic studies.	Annual HDF update	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
5-3	Improve water clarity	Secchi Depth (April 1 to October 1)	Chesapeake Bay Program (CBP) water quality criteria (see Source column)	CBP water quality criteria (see Source column)	Water Quality monitoring	Annual HDF update	EPA Ambient Water Quality Criteria for Chesapeake Bay (p. 96): Water clarity criteria for mesohaline and polyhaline waters of the Chesapeake Bay: Water depth Min. Secchi depth 1.0 m 1.0 m (3.3 ft) (3.3 ft) 1.5 m 1.4 m (4.9 ft) (4.6 ft) 2.0 m 1.9 m (6.6 ft.) (6.2 ft)	See Mid-Chesapeake Bay Feasibility Report Section 2.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
Subgoal #6: Promote conditions to establish and enhance submerged aquatic vegetation								
6-1	Enhance quiescent conditions on eastern side of the James Island.	Wave action—reduced from pre-construction	TBD	TBD	Pre- and post construction hydrodynamic studies.	Annual HDF update	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun
6-2	Protect the embayment east of Barren Island.	Wave action—reduced from pre-construction	TBD	TBD	Pre- and post construction hydrodynamic studies.	Annual HDF update	Section 3 and Section 6 of the Mid-Chesapeake Bay Feasibility Report (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
6-3	Improve water clarity	Secchi Depth (April 1 to October 1)	CBP water quality criteria (see Source column)	CBP water quality criteria (see Source column)	Water Quality monitoring	Annual HDF update	EPA Ambient Water Quality Criteria for Chesapeake Bay (p. 96): Water clarity criteria for mesohaline and polyhaline waters of the Chesapeake Bay: Water depth Min. Secchi depth 1.0 m 1.0 m (3.3 ft) (3.3 ft) 1.5 m 1.4 m (4.9 ft) (4.6 ft) 2.0 m 1.9 m (6.6 ft.) (6.2 ft)	See Mid-Chesapeake Bay Feasibility Report Section 2.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
6-4	Establish SAV in tidal creeks of constructed wetlands at Barren Island and James Island.	Species Composition:	80%	≥80%	SAV Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 2 (USACE, 2005).	Design phase/ construction have not begun
		<ul style="list-style-type: none"> • widgeon grass (<i>Ruppia maritima</i>) • horned pondweed (<i>Zannichellia palustris</i>) • Sago pondweed (<i>Potamogeton pectinatus</i>) 	10%	0%-20%				
6-5		% Coverage	TBD	TBD	SAV Monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report, Section 2 (USACE, 2005).	Design phase/ construction have not begun
Subgoal #7: Promote conditions that support oyster recolonization								
7-1	Reduce turbidity and minimize sedimentation on oyster bars at James Island and Barren Island. (See also Subgoal #5)	Sedimentation rate	0 inches per year	TBD	Shellfish bed sedimentation monitoring	Annual HDF update	Mid-Chesapeake Bay Feasibility Report Section 3 & 8 (USACE, 2005).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
7-2	Establish perimeter dike habitat that can be colonized by oysters at James Island	Size—linear feet of dike	45,235 linear feet	TBD	Engineering Survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report Appendix C (USACE, 2005).	Design phase/ construction have not begun
7-3	Establish breakwater and sill habitat that can be colonized by oysters at Barren Island.	Size—linear feet of dike <ul style="list-style-type: none"> • Western option • Northern option 	13,550 linear feet 3840 linear feet	TBD	Engineering Survey	Annual HDF update	Mid-Chesapeake Bay Feasibility Report Appendix C (USACE, 2005).	Design phase/ construction have not begun
7-4	Protect existing Natural Oyster Bars (NOBs) to the east of James Island (NOB 14-6, NOB 15-1, NOB 15-2) from adverse impacts, post-construction. (during construction is addressed in Subgoal #9)	Sedimentation (post construction)	0 inches per year	0 inches per year	Shellfish bed sedimentation monitoring. Hydrodynamic modeling studies	Post construction Pre-construction	Mid-Chesapeake Bay Feasibility Report Section 3 & 8 (USACE, 2005).	Design phase/ construction have not begun
7-5		Area Displaced	0 acres	0 acres	Construction Plan Engineering Survey	Post construction		

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
7-6	Protect existing NOB 23-4 to the east to the Barren Island from adverse impacts, post-construction. (during construction is addressed in Subgoal #9)	Sedimentation (from construction)	0 inches per year	0 inches per year	Shellfish bed sedimentation monitoring. Hydrodynamic modeling studies	Post construction Pre-construction	Mid-Chesapeake Bay Feasibility Report Section 3 & 8 (USACE, 2005).	Design phase/ construction have not begun
7-7		Area Displaced	0 acres	0 acres	Construction Plan Engineering Survey	Post construction	Mid-Chesapeake Bay Feasibility Report Section 3 (USACE, 2005)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
Subgoal #8: Minimize impacts to rare, threatened, and endangered species and their habitat								
8-1	Implement time of year restrictions to prevent human disturbance.	Target Species: • Bald Eagles • Wading bird rookeries • TBD	TBD	TBD	Bird Utilization & Wetlands Use by Wildlife Monitoring	Annual HDF update (MES, 2004)	TBD	Design phase/ construction have not begun
8-2		Distance	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
8-3		Time period	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
8-4	Implement inflow methods to minimize risk to marine species.	Target Species:	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
8-5		Method	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
Subgoal #9: Minimize impacts to existing commercial fisheries								
9-1	Construction will not adversely impact Natural Oyster Bars (NOBs) to the east of James Island (NOB 14-6, NOB 15-1, NOB 15-2)	Sedimentation (from construction)	0 inches per year	0 inches per year	Shellfish bed sedimentation monitoring. Hydrodynamic modeling studies	Pre- and post construction Pre-construction	Mid-Chesapeake Bay Feasibility Report Section 3 & 8 (USACE, 2005).	Design phase/ construction have not begun
9-2		Displacement	0 acres	0 acres	Construction Plan Engineering Survey	Pre- and post construction		

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
9-3	Construction will not adversely impact NOB 23-4 to the east of Barren Island	Sedimentation (from construction)	0 inches per year	0 inches per year	Shellfish bed sedimentation monitoring. Hydrodynamic modeling studies	Pre- and post construction Pre-construction	Mid-Chesapeake Bay Feasibility Report Section 3 & 8 (USACE, 2005).	Design phase/ construction have not begun
9-4		Displacement	0 acres	0 acres	Construction Plan Engineering Survey	Pre- and post construction		
9-5	Construction will not displace existing pound net locations at Barren or James Islands.	Number of licensed pound nets within footprint of James Island restoration project	0 nets	0 nets	Construction Plan Environmental Studies	Pre- and post construction	Mid-Chesapeake Bay Feasibility Report Section 3, Mid-Chesapeake Bay Feasibility Report Section 6 (USACE, 2005)	No licensed pound net locations are within recommended plan footprint at James Island.
9-6		Number of licensed pound nets within footprint of Barren Island restoration/ protection project	0 nets	0 nets	Construction Plan Environmental Studies	Pre- and post construction		

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
9-7	Minimize impact of construction of the projects at James Island and Barren Island on blue crab fishery.	Limit acreage of displaced crab potting areas within James Island project footprint.	TBD	TBD	Construction Plan Environmental Studies	Pre- and post construction	Mid-Chesapeake Bay Feasibility Report Section 3, Mid-Chesapeake Bay Feasibility Report Section 6 (USACE, 2005)	An estimated 1,900 acres of productive crabbing area would be displaced by the restoration project (USACE, 2005).
9-8		Limit acreage of displaced crab potting areas within Barren Island project footprint.	TBD	TBD	Construction Plan Environmental Studies	Pre- and post construction	Mid-Chesapeake Bay Feasibility Report Section 3, Mid-Chesapeake Bay Feasibility Report Section 6 (USACE, 2005)	The Barren Island restoration project will be built in shallower water and would not remove a significant amount of available area for crabbing.

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
Subgoal #10: Minimize establishment of invasive species to maximum extent possible								
10-1	Control invasive and nuisance species in habitat restoration areas at the James Island project.	Species Composition <ul style="list-style-type: none"> • Flora—<i>Phragmites australis</i> (common reed), <i>Lonicera japonica</i> (Japanese honeysuckle), nuisance species on habitat islands, others TBD. • Animal: mute swan, cormorant, predatory gulls, nutria, other species TBD. 	0%	0-10%	Bird utilization terrapin, horseshoe crab, benthic, fisheries, and wetlands monitoring.	TBD	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule*		
10-2	Control invasive and nuisance species in wetland restoration areas of Barren Island	Species Composition <ul style="list-style-type: none"> • Flora: <i>Phragmites australis</i> (common reed), <i>Lonicera japonica</i> (Japanese honeysuckle), nuisance species on habitat islands, others TBD. • Animal: mute swan, cormorant, predatory gulls, nutria, other species TBD. 	0%	0-10%	Bird utilization terrapin, horseshoe crab, benthic, fisheries, and wetlands monitoring.	TBD	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	Design phase/ construction have not begun
10-3	Reduce invasive species populations on existing Barren Island and James Island remnants to prevent colonization.	Species Composition <ul style="list-style-type: none"> • Flora: (see species above) • Animal: (see species above). 	0%	0-10%	Bird utilization terrapin, horseshoe crab, benthic, fisheries, and wetlands monitoring.	TBD	Monitoring specified in Mid-Chesapeake Bay Feasibility Report (USACE, 2005). Coverage percentages from PIERP AMP (USACE, 2004).	As of 2004, common reed is present on both Barren Island and James Island. 2002-2003 bird surveys documented

Attachment 2
Adaptive Management Plan Cell Development Component

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Restoration Goal: *To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.*

No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
Subgoal #1: Optimize the capacity for placement of dredged material (3.2 mcy/yr) at James Island.								
1-1	Manage inflow placement yearly at James Island.	Placement volume: <ul style="list-style-type: none"> • Total • Cell __ • Cell __ 	≅3.2 mcy/ year TBD TBD	TBD	TBD	Annual HDF update	MidBay Feasibility Report, Appendix C (USACE, 2005)	Design phase/ construction have not begun
		“Lifespan” of project	25 years	25 to 30 years	TBD	Annual HDF update	MidBay Feasibility Report, Appendix C (USACE, 2005)	Design phase/ construction have not begun
		Yearly placement <ul style="list-style-type: none"> • Year 1 • Year 2 • Year 3 • Etc. 	≅3.2 mcy/ year	TBD	TBD	Annual HDF update	MidBay Feasibility Report, Appendix C (USACE, 2005)	Design phase/ construction have not begun
Subgoal #2: Operate Site to Optimize Drying and Consolidation of Placed Material and to Support Habitat requirements at James Island								
2-4	Maximize Consolidation at James Island	Shrinkage factor	0.68	TBD	Calculated from measured void ratio and cut void ratio.	Annual HDF update (MES, 2004)	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
2-5		Void Ratio	2.8	TBD	Calculated from moisture content and specific gravity tests of in place material.	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
2-6		Surface elevation, average: <ul style="list-style-type: none"> • Wetland cells • Upland cells 	+1.5 ft. +18 ft.	TBD	Engineering Survey	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
Sub-Goal #3: Develop Cells to Achieve Habitat Requirements at James Island								
3-1	Construct demonstration cell to meet wetland physical requirements	Size	TBD	TBD	TBD	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
3-2		Hydrodynamics <ul style="list-style-type: none"> • Hydroperiod • Residence time • Maximum depth-average velocity in channels (at ebb) • Maximum scour velocity in channel (at ebb) • Width of outlet 	TBD	TBD	Engineering Survey	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-3		Low Marsh <ul style="list-style-type: none"> • Size • Elevation (at MLLW) • Tidal range • Salinity • pH • Alkalinity • Substrate type • Substrate salt content • Substrate pH • Substrate sulfides • Substrate nutrients 	TBD 0.3 ft to 1.73 ft. MTL-MHW 3-25 ppt 4.5-8.5 34-555 mg CaCO ₃ /L Silt/clay/sand/peat 10-35 ppt TBD TBD TBD	TBD	Engineering Survey	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: *To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.*

No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-4		Low marsh channel: <ul style="list-style-type: none"> • Depth at MLLW • Width--4th order, 3rd order, & 2nd order • Length--4th order • Length--3rd order • Length--2nd order • Length ratio--4th order • Length ratio--3rd order • Length ratio--2nd order • Bifurcation ratio--4th order • Bifurcation ratio --3rd order • Bifurcation ratio --2nd order • Sinuosity--4th order • Sinuosity--3rd order • Sinuosity--2nd order 	TBD	TBD	Engineering Survey	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-5		Mudflats <ul style="list-style-type: none"> • Size • Elevation (at MLLW) 	TBD -0.6 to +0.9 ft	TBD	TBD	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
3-6		Low marsh pond/pools <ul style="list-style-type: none"> • Size • Bank slope • Depth/ area at MLLW 	TBD 5:1 10% @ 0.5 ft, 80% @ 1 ft, 10% @ 3 ft	TBD	TBD	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
3-7		Nesting islands <ul style="list-style-type: none"> • Size (area above high tide line) • Elevation (at MLLW) • Width (diameter) of each island above high tide line • Substrate • Moat width • Moat depth 	2 acres 8 ft. ≥50 ft. Sand, covered with shell <0.5 in. TBD	≤2 acres ≥30 ft. Shell size <1.0 in. TBD	Engineering Survey	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-8		High Marsh <ul style="list-style-type: none"> • Size • Elevation (at MLLW) • Tidal range • Salinity • pH • Alkalinity • Substrate type • Substrate salt content • Substrate pH • Substrate sulfides • Substrate nutrients 	TBD 1.73 to 2.2 ft. MHW-MSHW 3-25 ppt 3.7-3.9 170-8600 mg CaCO ₃ /L Silt/clay/sand/peat TBD TBD TBD TBD TBD	TBD	TBD	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
3-9		High marsh pond/pools <ul style="list-style-type: none"> • Size • Bank slope • Depth/ area at MLLW 	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-10	Construct a demonstration cell to achieve low marsh habitat requirements	Species composition <ul style="list-style-type: none"> • Year 1 • Year 3 • Year 5 	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun

Mid-Chesapeake Bay Island Adaptive Management Plan—Cell Development Component

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-11	Construct a demonstration cell to achieve high marsh habitat requirements	Survival • Year 1 • Year 2	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-12		Species density • Year 1 • Year 3 • Year 5	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-13		% Cover • Year 2 • Year 3 • Year 5	≥50% ≥75% ≥90%	≥45% ≥70% ≥85%		Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun
3-14		Species composition • Year 1 • Year 3 • Year 5	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-15		Survival • Year 1 • Year 2	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-16		Species density • Year 1 • Year 3 • Year 5	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
3-17		% Cover • Year 2 • Year 3 • Year 5	≥50% ≥75% ≥90%	≥45% ≥70% ≥85%	TBD	Annual HDF update	PIERP AMP (USACE, 2004)	Design phase/ construction have not begun

Restoration Goal: <i>To restore and protect valuable but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material.</i>								
No.	Objective	Attribute	Criterion		Monitoring Plans		Source	Current Conditions
			Target	Acceptable Bounds	Approach	Schedule		
3-18	Provide goose fencing in the demonstration cell.	Grid Spacing	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun
Sub-Goal #4: Manage Undesirable Species on James Island and Barren Island								
4-1	Manage undesirable species	<ul style="list-style-type: none"> • Phragmites • Gulls • Swans • Cormorants • Predators 	TBD	TBD	TBD	Annual HDF update	TBD	Design phase/ construction have not begun

Attachment 3
Supporting Studies

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Supporting Studies from Monitoring Framework						
No.	Objective	Attribute	Monitoring Plan		Notes	Current Conditions
			Approach	Schedule		
1	Monitor physical and chemical (metals, etc.) parameters in sediments outside of the projects at James Island and Barren Island. Also monitor sediments within the project for input on ecological function and need for soil conditioning.	Concentrations of: <ul style="list-style-type: none"> Metals Nutrients Pesticides Dioxin/furan congener PCB congener PAHs 	Sediment Quality Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
2		Grain size	Sediment Quality Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
3	Monitor vegetation in restored marshes at James Island and Barren Island to provide operational input on survival of plant species and methods to increase planting success	Measure plant community: <ul style="list-style-type: none"> Species composition Density production 	Wetland Vegetation Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
4		Compare plant community: <ul style="list-style-type: none"> species composition zonation 	Wetland Vegetation Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
5	Monitor water quality characteristics in the project area to evaluate the presence (if any) of long-term changes.	Concentrations of CBP criteria (nutrients)	Water Quality Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
6		Concentrations of Inland Testing Manual (ITM) parameters (chemical)	Water Quality Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
7		Concentrations of priority pollutant metals and organics (field parameter).	Water Quality Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.

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Supporting Studies from Monitoring Framework						
No.	Objective	Attribute	Monitoring Plan		Notes	Current Conditions
			Approach	Schedule		
8	Monitor decapod and fish densities in the restored marshes, reference marshes, and the remnants of James Island and Barren Island.	Measure communities: <ul style="list-style-type: none"> species composition densities 	Wetlands Use by Fish Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
9	Monitor utilization and document types of fauna encountered on the projects at James Island and Barren Island.	Measure communities: <ul style="list-style-type: none"> species composition densities 	Wetlands Use by Wildlife Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
10	Monitor the change in sedimentation rates on charted oyster bars nearest to James Island and Barren Island.	Sedimentation rates	Shellfish Bed Sedimentation Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
11	Monitor bird utilization on and around the James Island and the Barren Island projects.	Measure communities: <ul style="list-style-type: none"> species composition densities 	Bird Utilization Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
12	Monitor the use of nesting and habitat by diamondback terrapins, and if the projects are affecting terrapin population dynamics.	Quantify nesting	Terrapin Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
13		Assess hatchling: <ul style="list-style-type: none"> viability sex ratio recruitment rates 	Terrapin Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
14	Monitor the location and health of submerged aquatic vegetation (SAV) in the vicinity of the projects at	Measure communities: <ul style="list-style-type: none"> species composition densities 	Submerged Aquatic Vegetation (SAV) Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.

Draft Mid-Chesapeake Bay Island Adaptive Management Plan—Supporting Studies

Supporting Studies from Monitoring Framework						
No.	Objective	Attribute	Monitoring Plan		Notes	Current Conditions
			Approach	Schedule		
15	James Island and Barren Island.	Location	Submerged Aquatic Vegetation (SAV) Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.
16		Size	Submerged Aquatic Vegetation (SAV) Monitoring in Mid-Chesapeake Bay Feasibility Study (USACE, 2005)	TBD		Project construction and monitoring have not yet started.

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