

KELLY ISLAND WETLAND
RESTORATION

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**APPENDIX H
FILL
KELLY ISLAND WETLAND RESTORATION**

- * Please make sure answers to all of the questions in this appendix correspond to information on the application drawings.
- * See Joint Application Form Reference Guide - How to Calculate Square Feet, Cubic Feet, and Cubic Yards.

1. How many feet will the fill be placed channelward of the:

A. Tidal waters: mean high water line? 1,500 ft.
 mean low water line? 1,500 ft.

The fill will be placed within a containment area. The entire facility will be constructed in the water adjacent to the existing Kelly Island shoreline. A small sand dike (2-3 feet high) will be constructed on edge of Kelly island The seaward containment dike is a much larger sand berm. The seaward toe of the berm is about 1500 feet from the edge of Kelly Island.

B. Non-tidal waters: ordinary high water line? N/A ft.

2. How much fill will be located:

A. on subaqueous land (channelward of mean high water) Considering the placement area and the footprint of the sand berms (containment dike), the fill may cover 120-140 acres (roughly estimated)

B. on vegetated wetlands? 160,000 sq. ft. For conservative estimation purposes, assuming the containment dike on the island has a 40 ft footprint and is 4,000 feet long, it would cover roughly 3.5 acres (160,000 sq ft).

3. The fill will be (check one)

- A. Hauled in from upland sources
 B. x Obtained from dredged material

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4. What is the total volume of fill? 2.4 million cubic yards
 What is the total fill per running foot of shoreline? 2.4 million/6000feet=400 cubic yards

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5. What method will be used to place the fill? At Kelly Island, the sand material for construction and wetland filling will be delivered to the site in the same manner as the beaches (hopper dredge pumpout from a point offshore of Kelly Island). Once it reaches the site the pipeline will land on the shore and be extended offshore along the alignment of the containment beach. Material will be hydraulically placed. Dozers will push the fill ahead in addition to hydraulic advancement. Refer to Section 2.6.2 of the enclosed

April 2009 Delaware River Main Stem and Channel Deepening Environmental Assessment.

6. **How will the fill be retained?** An offshore containment dike made of 1.7 million cubic yards of sand that will provide up to 5,000 linear feet of sandy beach. Refer to Section 2.6.2 of the enclosed April 2009 Delaware River Main Stem and Channel Deepening Environmental Assessment.
7. **State the type and composition percentage of the fill material (e.g. sand 80%, silt 5%, clay 15%, etc.)** The sand material is 90-95% sand. The fine grained portion is 100% silt.
8. **Describe the type(s) of structure(s) to be erected on the filled area (if any).** No structures will be erected on the fill material. The site will become intertidal wetlands fronted by a sandy beach.
9. **What type of ground cover will be provided for the filled area(s) to prevent soil erosion and help keep sediment from reaching State waters?** A sand berm will contain the other dredged material. The berm will be planted with American beach grass (*Ammophila breviligulata*) which will be monitored and maintained. Within the 60-acre wetland area it is expected that wetland vegetation will naturally become established. If natural plant recruitment does not occur, the site topography will be evaluated and adjusted as necessary. The site will be planted with appropriate species if necessary.

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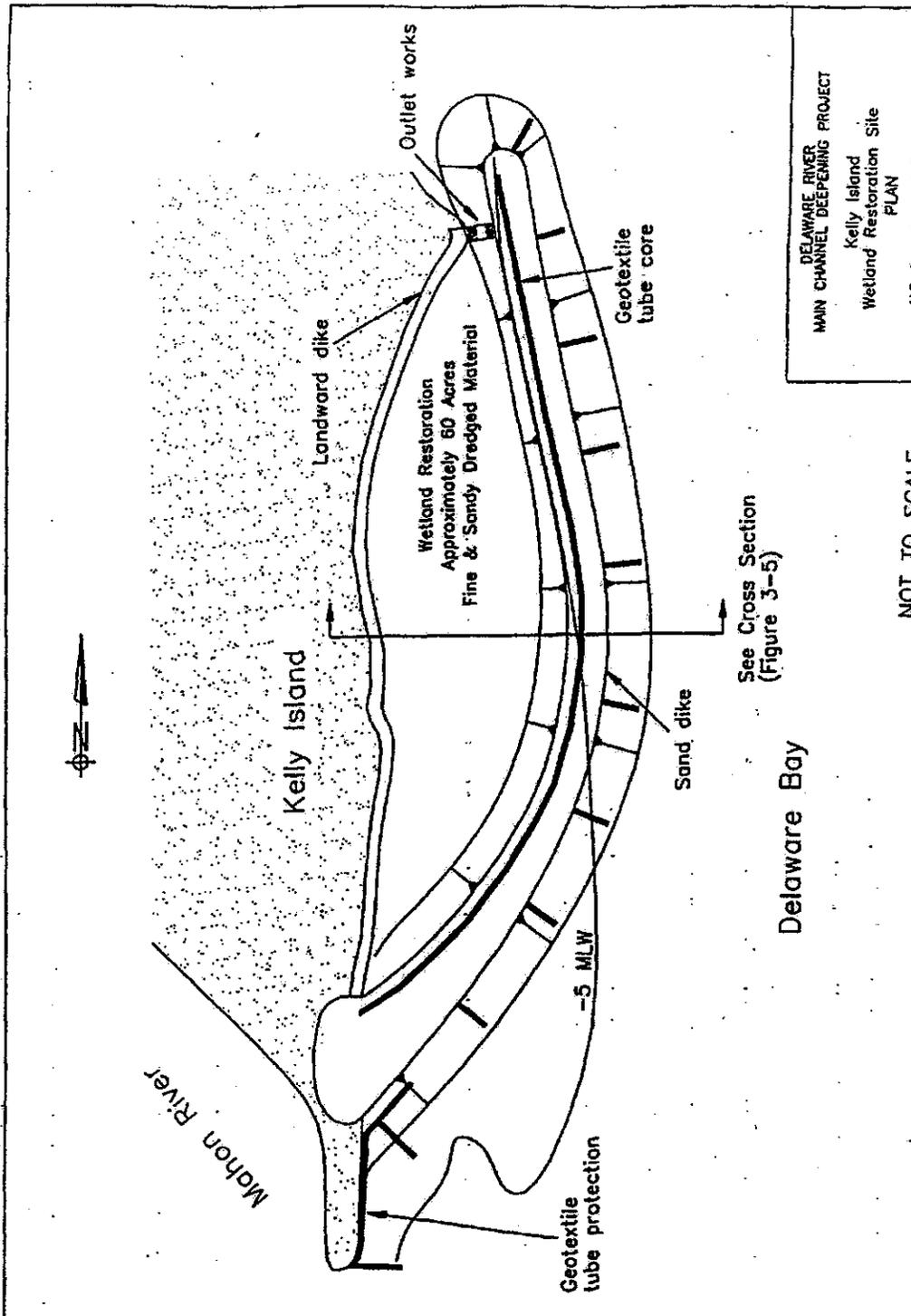


Figure 2-2. Kelly Island Plan.

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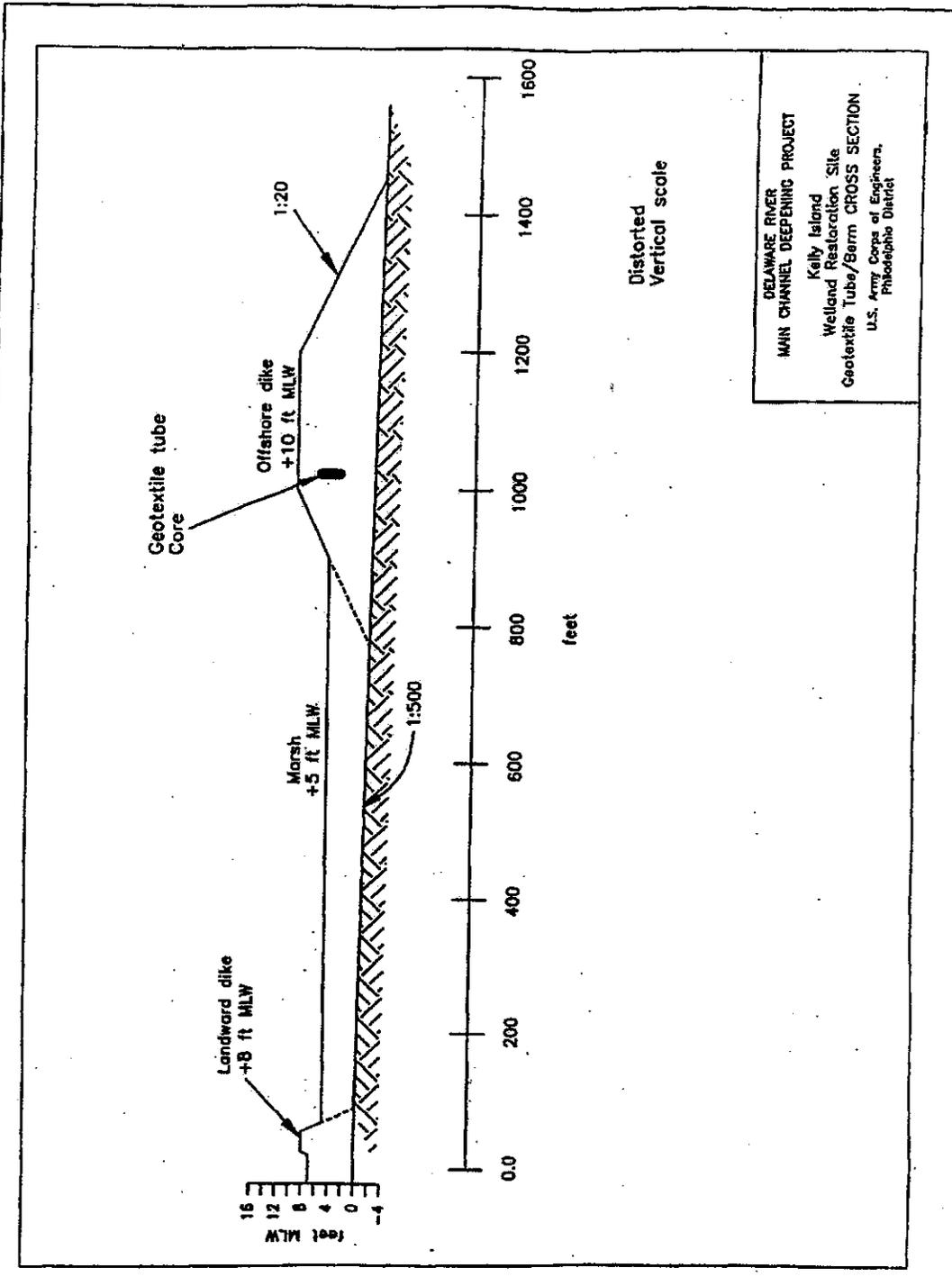


Figure 2-3. Kelly Island Geotextile Tube/Berm Cross Section.

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Mean High Water: _____
 Mean Low Water: _____
 Ordinary High Water: _____ (for non-tidal waters)

B. How many square feet of the structure will be located:

Channelward of Mean High Water: _____
 Channelward of Mean Low Water: _____
 Channelward of Ordinary High Water: _____ (for non-tidal waters)
 On vegetated wetlands: _____

C. Will the revetment be backfilled? ___ Yes ___ No
 If yes, complete Appendix H and include it in your application.

D. Will filter cloth be used behind the rip-rap structure? ___ Yes ___ No

E. What is the average slope of the existing bank? _____

F. What is the proposed slope of the rip-rap revetment?

(See page 3 for a guide to calculating slopes).

8. Sill Projects:

A. What is the base width of the proposed structure: 15'6"

B. What is the top width of the proposed structure: 27.6"

C. How many square feet of the structure will be located:

Channelward of Mean High Water: 2000
 Channelward of Mean Low Water: 0
 Channelward of Ordinary High Water: _____ (for non-tidal waters)
 On vegetated wetlands: _____

D. What will be the average height of the structure: 4'

E. How much of the structure (in inches) will extend vertically above:

Mean High Water: 0 Ordinary High Water: _____ (for non-tidal waters)

F. Are breaks or notches proposed in the sill to allow for greater flushing? ___ Yes X No

G. Will fill material be placed behind the sill? ___ Yes X No
 If yes, complete Appendix J and include it in your application.

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H. Will wetland vegetation be planted behind the sill? Yes No
 If yes, complete Appendix H and include it in your application.
 Please identify plant species and planting scheme (densities and time of year):

9. Construction Techniques (Complete for both Revetment and Sill Projects):

A. Will any dredging be required? Yes No If yes, how many cubic yards of material will be removed? _____ Describe dredging technique and method for handling dredge spoils:

(If dredging is proposed, please include appropriate dredging Appendix with your application).

B. Please describe the sequence of construction and any techniques that will be utilized to minimize adverse impacts on the aquatic environment, and to preserve existing vegetation (particularly woody vegetation) along the shoreline:

See Section 2.6.2 of the enclosed April 2009 Delaware River Main Stem and Channel Deepening Project Environmental Assessment

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CALCULATIONS

RUN = Base width of the structure (in feet) **RISE** = Vertical height of the structure (in feet)

I. How to calculate total cubic yards:

$$\frac{0.5 \times \text{RUN} \times \text{RISE} \times \text{Linear feet of shoreline stabilized}}{27} = \text{Total Cubic Yards}$$

II. How to calculate cubic yards per running foot of shoreline:

$$\frac{\text{Total \# Cubic Yards}}{\text{Linear feet of shoreline}} = \text{Cubic yards per running foot}$$

III. How to calculate slope: Slope = $\frac{\text{RUN}}{\text{RISE}}$

EXAMPLE:

If we propose to stabilize 100 linear feet of shoreline with a rip-rap revetment that has a basewidth of 6 feet and a height of 3 feet:

I. $\frac{0.5 \times 6 \times 3 \times 100}{27} = 33.33 \text{ Total Cubic Yards}$

II. $\frac{33.33}{100} = 0.333 \text{ Cubic Yards per running foot}$

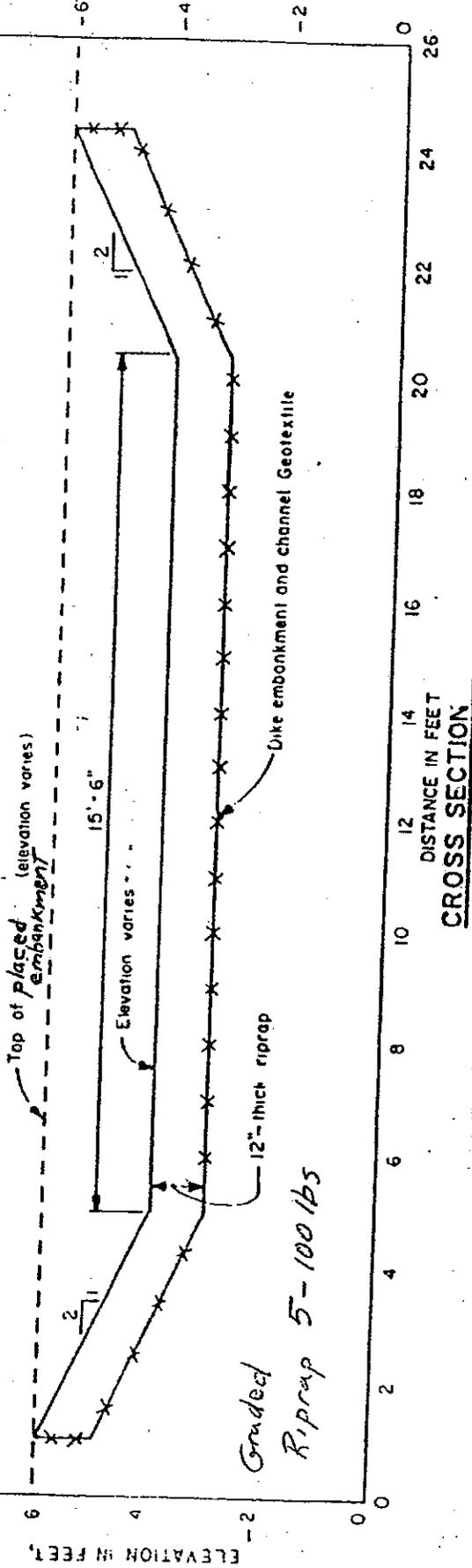
III. $\frac{6}{3} = \text{Slope of 2}$

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Kelly Island DE
 Del. Riv. Deepening
 Beneficial Use of Dredged Material Site

* Typical riprap lined channel for Containment area

* Channel will be constructed from control structure to daylight on exterior embankment



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APPENDIX K

JETTIES, GROINS, OR BREAKWATERS

KELLY ISLAND WETLAND RESTORATION

* Please make sure answers to all of the questions in this appendix correspond to information on the application drawings.

1. What type of material(s) will be used for the construction of the structure(s) (e.g. quarry stone, timber, rock gabions, sandbags, etc.)? The groins will be constructed from timber or vinyl sheetpile supported by circular timber piles.

2. How many feet will the structure(s) (groins on the sand berm) be placed channelward of the:

A. Tidal Waters: mean high water line? Approximately 150 ft.
mean low water line? Approximately 50 ft.

B. Non-tidal waters: ordinary high water line? N/A ft.

3. How much of your (entire) project will be located:

A. channelward of mean high water? The wetland area will cover 2.6 million sq ft (60 acres). The offshore sand berm foot print will add approximately another 2.5 million sq. ft. (50-60 acres). All of the project is adjacent to Kelly Island and covers bay bottom.

B. on vegetated wetlands? No vegetated wetlands are expected to be used. The fringe along the bayside edge of Kelly Island will be covered by a low sand dike. However, the edge of the island has limited (or no) live vegetation.

4. What will be the distance of separation between individual structures?

The groins will be separated by about 750 ft.

5. Are there similar structures in the vicinity of the project? ___ Yes ___ No If your answer is "Yes", describe the type and location(s) of the structures.

6. The structure(s) will be of: (check one)

A. Low-Profile design (The profile of the groin roughly mimics the slope of the sand berm and is initially only 2 ft above the elevation of the berm.)

B. N/A Continuous height

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7. How many feet will the structure(s) (on the sand berm) be placed landward of the:
- A. tidal waters: mean high water line? Approximately 140 ft.
mean low water line? Approximately 240 ft.
- B. non-tidal waters: ordinary high water line? N/A ft.
8. Will the area in the vicinity of the structure(s) be artificially nourished?
 Yes No If the answer is "Yes", complete Appendix H. The groins will be constructed with the large sand dike that acts as containment for the dredged sediments. The dike is described in Section 2.6.2 of the enclosed April 2009 Delaware River Main Stem and Channel Deepening Environmental Assessment. See the attached Appendix H for a description of the fill for the sand dike.
9. Approximately how many feet of shoreline have you lost over the last year?
_____ ft. (width) _____ ft. (length) The shoreline in this area is estimated to erode at up to 30 ft/yr along its entire length (roughly 5000 ft).
10. Will the landward end(s) of the structure be protected from out flanking with rip-rap? Yes No If our answer is "Yes", complete Appendix I.

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APPENDIX M

CONSTRUCTION IN STATE WETLANDS

KELLY ISLAND WETLAND RESTORATION

* Please make sure that all answers in this appendix correspond to information on the application drawings.

FOR PROJECTS INVOLVING ANY WORK IN STATE - REGULATED WETLANDS

1. Project description and explanation of need.

A description of the project is provided in Sections 2.4, 2.5, 2.6 and 2.7 in the enclosed April 2009 Delaware River Main Stem and Channel Deepening Environmental Assessment. Section 2.6.2 is specific to the Kelly Island wetland restoration. The economic benefits of the project are presented in Section 2.9.

Kelly Island has been eroding severely for many years, and has lost much of its shoreline, including almost all of its intertidal marsh. Wetlands at this location are eroding at a rate of up to 20 feet per year. Besides creating the additional wetland acres, the project will protect hundreds of acres of other tidal wetlands located landward of the restoration. The peat substrate that supported the ancient marsh has eroded back to remnants in many places. The loss of marsh on Kelly Island has exposed the navigation channel in the Mahon River to waves and the wetlands behind the island are threatened with overwash and loss. The loss of marsh is also adversely affecting existing habitats at the Bombay Hook National Wildlife Refuge (NWR).

2. What is area of impact for each activity in state wetlands?

Wetlands Walkways/Other Structures:

Filling	<u>60,000</u> sq. ft.	Length	<u>0</u> ft.
Dumping	<u>0</u> sq. ft.	Width	<u>0</u> ft.
Excavation	<u>0</u> sq. ft.	# Piles	<u>0</u>
		Height	<u>0</u> ft. over marsh

3. What is volume of fill or excavated material involved in this project?

Fill	<u>2,400,000</u> cubic yards
Excavation	<u>0</u> cubic yards

4. DNR # of state wetland map where project is located: ??

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ENVIRONMENTAL SUMMARY - PLEASE SUBMIT AN EVALUATION OF IMPACT OF THE PROPOSED ACTIVITY ON THE FOLLOWING (ATTACH ADDITIONAL SHEETS):

5. State reasons that structures cannot feasibly be located on lands other than wetlands.

A project that will restore and protect the wetlands at Kelly Island needs to be built in this location. Although approximately 3.5 acres of wetlands were mapped on the Delaware wetlands map in 1988, these areas have been largely lost due to continuing erosion.

6. Detail temporary and permanent changes which would be caused by the proposed project and the impact of these changes on the project area and adjacent areas.

The Kelly Island Wetland Restoration Project will restore approximately 60 acres of tidal wetlands along a 5,000 foot long shoreline of the Bombay Hook National Wildlife Refuge. The project will convert approximately 60 acres of shallow water habitat to a tidal marsh bordered by a large sand berm. See Sections 9.1 and 9.3 of the SEIS (July, 1997), and the Essential Fish Habitat Evaluation (Appendix B of the April 2009 Environmental Assessment).

7. Describe alternatives to the proposed action which would reduce or avoid environmental damage.

The State of Delaware requested that this environmentally sensitive area be considered for protection as part of the Delaware River Main Channel Deepening Project. Also, refer to Section 2.6.2 of the EA (April, 2009), Section 3.3.2.1 of the SEIS (July 1997) and Section 3.4.4 of the EIS (Feb, 1992).

8. Describe all measures to be taken during and after the completion of the proposed project to reduce detrimental effects.

A geotextile tube will be placed within the offshore dike as a factor of safety against a breach in the dike due to an extreme event and overwash. The crest of the tube will be placed to a crest elevation of +7 feet MLW. The tube will then be buried under an additional three feet of sand bringing the crest of the dike up to elevation +10 feet MLW. The protection that the tube provides should allow time for maintenance or repair work to be planned and executed if a breach should develop due to overwash.

A landward dike will be constructed along the edge of the existing marsh with a crest elevation of +8 feet MLW. The dike crest width will be 20-30 feet. The dike will prevent dredged material from flowing across or settling in the existing marsh. The dike will be built-up by trucking sand from the larger offshore dike to the landward dike during construction. The dike will not be constructed by hydraulic placement of sand. The dike will be left in place after construction to impound the site. In the future, if the State of Delaware decides that the site should function with unregulated tidal exchange with the bay, the landward dike may be removed. However, if the capability to impound the site at some future date is necessary, then the landward dike should not be removed.

Groins made of either timber or vinyl will be placed along the perimeter of the offshore dike to help limit longshore transport. Although the cross-section of the dike is designed to sustain sediment losses for many years without losing any of its function, groins will increase the longevity of the project, reduce potential maintenance, and add a factor of

safety against the risk that sand will be transported south along the project into the Mahon River entrance.

A baseline ecological characterization of Kelly Island habitats was conducted in 2001. This information will be used to verify and evaluate the ecological benefits of the project by comparing to post-construction monitoring data.

9. Describe all permanent environmental impacts which cannot be avoided.

The major environmental impact that can not be avoided is the change of 60 acres of shallow water habitat to tidal marsh. The change from shallow water habitat to tidal marsh was found to be acceptable during coordination with Federal and State regulatory agencies as part of the NEPA process. Tidal marsh is being lost (converted to) shallow water in many areas along the Delaware Bay shoreline. See Sections 9.1 and 9.3 of the SEIS (July, 1997), and the Essential Fish Habitat Evaluation (Appendix B of the April 2009 Environmental Assessment).

10. Submit detailed evaluation of impact of the proposed project on the following:

A. Value of tidal ebb and flow

- 1. Production Value: carrying organic matter to adjacent estuaries and coastal waters which serve as breeding areas for certain animal species (especially fish and shellfish).**

The production value is expected to increase with the addition of 60 acres of tidal marsh. See Sections 8.0 (Site LC9 is Kelly Island), 9.1.3, 9.1.5.1, 9.4, 9.3 of the SEIS (July, 1997).

- 2. Value as a natural protective system of absorption of storm wave energy, flood waters, and heavy rainfall, thereby decreasing flood and erosion damage.**

N/A

- 3. The prevention of silting in certain harbors and inlets thereby reducing dredging.**

N/A

- 4. Removal and recycling of inorganic nutrients.**

The restored 60 acre tidal marsh will increase the ability of the ecosystem to remove and recycle inorganic nutrients.

- 5. Effect on the estuarine waters.**

By reducing shore erosion and increasing the ability of the ecosystem to remove and recycle inorganic nutrients, the wetland restoration will have a positive impact on estuarine waters.

B. Habitat Value

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The wetland restoration will replace shallow water habitat with tidal marsh and beach (sand) habitat. Due to severe erosion in many areas along the Delaware Bay shoreline, beaches and tidal marsh are being lost and being replaced by shallow water habitat. Although approximately 3.5 acres of wetlands were mapped on the Delaware wetlands map in 1988, these areas have been largely lost due to continuing erosion.

1. Habitat for resident species of wildlife including furbearers, invertebrates, finfish.

Habitat for species such as furbearers and finfish, that use tidal marshes will increase. Habitat for species such as benthic invertebrates and finfish that use shallow water habitat will decrease. See Sections 8.0 (Site LC9 is Kelly Island), 9.1.3, 9.1.5, and 9.3 of the SEIS (July, 1997); and the Essential Fish Habitat Evaluation (Appendix B of the April 2009 Environmental Assessment).

2. Habitat for migratory wildlife species including waterfowl, wading birds, shorebirds, passerines, finfish, shrimp.

This project will increase habitat for migratory species such as waterfowl, long legged wading birds, shorebirds, and horseshoe crabs. Habitat for finfish that use shallow water habitat will decrease. See Sections 9.1.3, 9.1.5, and 9.3 of the SEIS (July 1997); and the Essential Fish Habitat Evaluation (Appendix B of the April 2009 Environmental Assessment).

3. Rearing area, nesting area, breeding grounds for various species.

The project will increase the breeding habitat for horseshoe crabs and certain species of waterfowl such as black duck. See Sections 9.1.3, 9.1.5, and 9.3 of the SEIS (July 1997); and the Essential Fish Habitat Evaluation (Appendix B of the April 2009 Environmental Assessment).

4. Habitat for rare or endangered plants.

No rare or endangered plants are known from this area based on coordination with State and Federal resource agencies and studies that were performed during the preparation of the SEIS (July 1997). See Section 10.1.1.3.

5. Presence of plants or animals known to be rare generally, or unique to the particular location.

None are known to occur in this area based on coordination with State and Federal resource agencies and studies that were performed during the preparation of the SEIS (July 1997). See Section 10.2.

6. Presence of plants or animals near the limits of their territorial range.

None are known to occur in this area based on coordination with State and Federal resource agencies and studies that were performed during the preparation of the SEIS (July 1997).

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7. Presence of unique geological or wetland features.

No unique geologic feature is known to occur in this area based on coordination with State and Federal resource agencies and studies that were performed during the preparation of the SEIS (July, 1997). The tidal wetlands in the vicinity of Kelly Island are extremely valuable to many fish and wildlife species. This is described in Section 3.3.2.7 of the SEIS (July 1997).

C. Aesthetic Effect - Consideration of the aesthetic effect may include:

1. Presence of plants or animals of a high visual quality.

The project would benefit species such as migratory waterfowl, horseshoe crabs, shorebirds and tidal marsh which have a high visual quality.

2. The presence of an associated water body.

The Delaware Bay is the associated water body. The restoration of the tidal marsh should increase the aesthetic effect.

3. Wetland type of topographic diversity.

There is minimal topographic diversity in this area. The project should be compatible with the surrounding landscape.

D. Impact of Supporting Facilities

The supporting facilities to be considered include any public or private construction, whether or not the construction occurs in the wetlands, which would be required for construction or operation of the proposed wetlands activity, such as roads, sewage disposal facilities, electric lines, water supply systems, and schools. Effects shall be separately determined for the lands neighboring such facilities.

All Kelly Island construction will take place from the water. No supporting facilities are required.

E. Effect on Neighboring Land Uses

1. The effects of the proposed wetland activity on neighboring land use are to be considered whether or not the neighboring lands are wetlands.

The restoration of this 60-acre wetland is compatible with the surrounding land use, which is wetlands.

2. The environmental, aesthetic and economic effects of the proposed wetlands activity on land uses neighboring the lands on which supporting facilities will be located may be considered.

There are no supporting facilities that will impact adjacent lands to the proposed project.

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F. Federal, State, Regional, County and Municipal Comprehensive Plans.

Compliance of the proposed activities with the plans of the jurisdiction in which it is proposed to take place, and its impact on the plans of other affected jurisdictions.

The project has been coordinated with Federal, State, and local jurisdictions through the NEPA process. Based on that coordination there was no indication that the plan was in conflict with any plans of these jurisdictions.

G. Economic Impact

See Section 2.9 of the enclosed April 2009 Delaware River Main Stem and Channel Deepening Project Environmental Assessment for a presentation of the project's economic benefits. Other than potential economic benefits resulting from increased recreational use, there are no direct or indirect economic benefits of the Kelly Island wetland restoration.

Economic Impact shall include a short and long-term evaluation of the following factors to the extent the effect is directly attributable to the proposed activity:

- 1. Jobs created or lost and the net income effect of jobs.**

None

- 2. Increases in revenues to or increases in expenditure by State, County and local governments (e.g., increased taxes from an increased tax base and increased expenditure for maintaining supporting facilities).**

None

- 3. Increases or decreases in the value attributable to the wetland as a source of nutrients to finfish, crustacea and shellfish and as habitats of such species or other flora or fauna of significant actual or potential economic value.**

Although the wetland restoration will change shallow water habitat to tidal wetland and beach habitat, the net benefit to fish and wildlife resources should be positive. Due to severe erosion in many areas along the Delaware Bay shoreline, beaches and tidal marsh are being lost and being replaced by shallow water habitat.

- 4. Increases or decreases in the value of the land as a recreational area.**

There should be a net increase to the value of the land as a recreational resource since the wetland will provide habitat for a number of recreational resources such as waterfowl, nursery habitat for finfish, and increased opportunity to observe wildlife such as migratory shorebirds and horseshoe crabs.

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5. **Increases or decreases in the cost of flood control or expected flood damage which might be caused by the effect of the activity on the natural capacity of the wetland to reduce flood damage.**

None

6. **Increases or decreases the costs of maintaining navigable harbors and waterways which would result from altering the capacity of the wetlands to absorb silt.**

The wetland restoration at Kelly Island will reduce the erosion of existing natural tidal wetlands that is occurring along approximately 5,000 feet of shoreline where the project is being built. This erosion contributes primarily silt-sized sediment to the Delaware estuary. Sand from the sand berm that will contain the wetland restoration may be transported to the south toward the Mahon River channel. These impacts are discussed on page 9-22 of the SEIS (July 1997). A series of groins is included in the Kelly Island berm plan in order to reduce the along shore transport of sand toward the Mahon River entrance. The change in costs for maintaining this navigation channel is unknown but is predicted to be negligible.

7. **The net economic effect, both public and private, or any contemplated supporting facilities.**

There will be no supporting facilities.

8. **The net economic effect, both public and private, of the proposed activity on neighboring land uses.**

The Kelly Island wetland restoration is not expected to have any significant economic effect on neighboring land uses that are also wetlands.

Revised: August, 2001

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