

FINAL
ENVIRONMENTAL ASSESSMENT
DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

U.S. Army Corps of Engineers
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ENVIRONMENTAL ASSESSMENT

DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

1.0 Introduction

1.1 Purpose

The purpose of this Environmental Assessment (EA) is to evaluate changes to the affected environment and changes to the Delaware River Main Channel Deepening Project (Deepening Project) since completion of the April 2009 Delaware River Main Stem and Channel Deepening Project Environmental Assessment (USACE, 2009). Specifically, this document addresses the proposed listing of the New York Bight Distinct Population Segment of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as a federally listed endangered species; the proposed listing of the northwest Atlantic Distinct Population Segment of loggerhead sea turtle (*Caretta caretta*) as a federally listed endangered species; changes to the Deepening Project construction schedule; and revisions to the dredged material disposal plan. This document updates the February 1992 Environmental Impact Statement (USACE, 1992), the July 1997 Supplemental Environmental Impact Statement (USACE, 1997) and the April 2009 EA (USACE, 2009), which were previously prepared for the Deepening Project. Evaluations of impacts on resources addressed in these documents are not discussed in this EA and are incorporated by reference.

1.2 Authorized 45-Foot Deepening Project Description

The authorized deepening project as shown on Figure 1 provides for modifying the existing Delaware River Federal Navigation channel (Philadelphia to Sea Project) from 40 to 45 feet at Mean Low Low Water (MLLW) with a dredging overdepth of one foot allowed. For the rock area however, an overdepth of two feet is required, with no allowable overdepth. The channel follows the existing channel alignment from Delaware Bay to Philadelphia Harbor, Pennsylvania and Beckett Street Terminal, Camden, New Jersey. The channel side slopes are 3 horizontal to 1 vertical. The project also includes deepening of an existing Federal access channel at a 45-foot depth to Beckett Street Terminal, Camden, New Jersey. The channel width (same as the existing 40-foot project) is 400 feet in Philadelphia Harbor (length of 2.5 miles); 800 feet from the Philadelphia Navy Yard to Bombay Hook (length of 55.7 miles); and 1,000 feet from Bombay Hook to the mouth of Delaware Bay (length of 44.3 miles).

The project area is divided into five reaches (AA/A, B, C, D, and E) (Figure 1). Reach AA/A extends from the upper project limit at Allegheny Avenue, Philadelphia PA to Billingsport Range, located near the Philadelphia International Airport. Reach B extends from Tinicum Range, located opposite of the airport to Cherry Island Range, located opposite of Wilmington, Delaware. Reach C extends from Deepwater Point Range, located below Wilmington, DE to

New Castle Range, located at the mouth of the Chesapeake and Delaware (C&D) Canal. Reach D extends from Reedy Island Range, located south of the C&D Canal to Liston Range, located just north of Delaware Bay. Reach E covers the remaining portion of the project area from the lower portion of Liston Range in the upper portion of Delaware Bay to naturally deep water in the lower portion of the bay.

The project includes 11 bend widenings and the remarking of one additional bend, which is naturally deeper than 45 feet, at various ranges as listed below as well as provision of a two space anchorage to a depth of 45 feet within the existing 40-foot anchorage at Marcus Hook, PA. The existing turning basin adjacent to the former Philadelphia Naval Shipyard will not be deepened as part of the 45-foot project.

USACE (2009) indicated that the project includes 11 bend widenings at various ranges. It noted that the Miah Maull - Cross Ledge bend would not be widened. The Miah Maull – Cross Ledge bend will be widened as part of the project, however no dredging is required at this location. The Miah Maull – Cross Ledge bend is sufficiently deep and will only require repositioning of navigation buoys to effect the widening.

Also, included as part of the Federal project is the relocation and addition of buoys at the other 11 modified channel bends. Ten new buoys are proposed: Philadelphia Harbor (2), Tinicum Range (1), Eddystone Range (1), Bellevue Range (3), Cherry Island Range (1), Bulkhead Bar Range (1), and Liston Range (1).

The following channel bends will be modified:

MAIAH MAULL-CROSS LEDGE: 200 foot width increase at the apex of the west side of the bend;

LISTON-BAKER: Maximum width increase on the east edge of 250 feet, over a distance of 4,500 feet south of the apex, and extending 3,900 feet north from the apex (BW2 - channel station 275 + 057);

BAKER-REEDY ISLAND: 100-foot width increase at the west edge apex of the bend over a distance of 3500 feet both north of and south of the apex (BW3 - channel station 265 + 035);

REEDY ISLAND-NEW CASTLE: Maximum widening of 400 feet at the west apex of the bend, tapering to zero over a distance of 3,200 feet south of the apex and to zero over a distance of 4,000 feet north of the apex (BW4 - channel station 238 + 982);

NEW CASTLE-BULKHEAD BAR AND BULKHEAD BAR-DEEPWATER: The west edge of Bulkhead Bar range is extended by 300 feet to the south and 300 feet to the north; the widening

tapers to zero at a distance of approximately 3,000 feet south of the south end of Bulkhead Bar and 3,000 feet north of the north end of Bulkhead bar (BW5 - channel station 212 + 592 and 209 + 201);

DEEPWATER-CHERRY ISLAND: A maximum channel widening of 375 feet is required at the western apex of the bend. The widening tapers to zero at a distance of about 2,000 feet both north and south of the apex (BW6 - channel station 186 + 331);

BELLEVUE-MARCUS HOOK: The east apex of the bend requires a 150 foot widening over existing conditions, along a total length of approximately 4,000 feet (BW7 - channel station 141 + 459);

CHESTER-EDDYSTONE: The southwest apex of the bend requires a maximum 225 foot widening, with a transition to zero at the northeast end of Eddystone range, over a linear distance of approximately 6,000 feet (BW8 - channel station 104 + 545);

EDDYSTONE-TINICUM: The northeast apex of this bend requires a 200 foot widening, with a transition to zero at a distance of about 1,200 feet northeast and southwest of the bend apex (BW9 - channel station 97 + 983);

TINICUM-BILLINGSPORT: The north channel edge of Billingsport will be widened by 200 feet at the northern apex of the Tinicum-Billingsport bend. This results in a maximum widening of approximately 400 feet, with a transition to zero at a distance of about 2,000 feet west of the apex (BW10 - channel station 79 + 567);

BILLINGSPORT-MIFFLIN: The south apex of the bend will be widened a maximum of 200 feet to the south, and transitioned to zero at a distance of approximately 3,000 feet northeast of the apex (BW11 - channel station 72 + 574);

EAGLE POINT-HORSESHOE BEND: The northwest edge of Horseshoe Bend requires a maximum widening of 490 feet to the north. The widening transitions to zero at a distance of approximately 4,000 lineal feet west of the west end of Horseshoe Bend, and at a distance of 1,500 lineal feet north of the north end of the bend (BW12 - channel station 44 + 820 to 41 + 217).

1.2.1 Dredged Material Disposal Plan

The dredged material disposal plan for the riverine portion of the Deepening Project will utilize the existing Federal CDF sites (National Park, Oldmans, Pedricktown North, Pedricktown South, Penns Neck, Killcohook, Reedy Point North, Reedy Point South, and Artificial Island). The Fort

Mifflin site in Philadelphia, PA will also be used for disposal of rock removed in the vicinity of Marcus Hook, PA.

1.2.2 Beneficial Use of Dredged Material in Delaware Bay

Three beneficial use projects were included as part of the project:

1. Wetland restoration and habitat creation at Kelly Island, DE;
2. Beach restoration and habitat creation at Broadkill Beach, DE; and
3. Wetland restoration and erosion protection at Egg Island Point, NJ.

Both the wetland restorations and beach placement will help control the severe erosion that is occurring at many areas along the Delaware Bay shorelines.

However, due to a reduction in the quantity of material to be dredged for the Deepening Project, there is not enough material in Delaware Bay to construct all three beneficial use projects during initial construction. As such, the Egg Island Point wetland restoration is being deferred until such time as sufficient dredged material quantities are available to support this element of the project. While this project feature would provide environmental benefits in Delaware Bay, it was not developed as project justification or as mitigation for project impacts. Therefore, no actions are required to offset deferral of Egg Island Point.

The Kelly Island, Egg Island Point and Broadkill Beach beneficial use projects were described in detail in the April 2009 EA (USACE, 2009), which is incorporated here by reference.

1.2.3 Initial Construction

For the initial deepening, material would be dredged by hydraulic and hopper dredges and placed in CDFs in the Delaware River portion of the project area, and placed for beneficial uses in Delaware Bay (Figure 1). In addition, rock would be removed in the vicinity of Marcus Hook, PA and placed in the Fort Mifflin CDF in Philadelphia, PA. The initial dredging quantities and placement locations are distributed among the project reaches as follows:

Reach AA	994,000 cubic yards	National Park
Reach A	1,666,600 cubic yards	Pedricktown North
Reach B	4,664,900 cubic yards	Pedricktown North and South, Oldmans, Fort Mifflin
Reach C	2,502,800 cubic yards	Killcohook, Reedy Point South
Reach D	2,051,100 cubic yards	Reedy Point South, Artificial Island
Reach E	4,081,700 cubic yards	Kelly Island, Broadkill Beach

Total approximately 16,000,000 cubic yards

1.2.4 Rock Removal

Approximately 77,000 cy of bedrock from the Delaware River near Marcus Hook, PA (River Mile 76.4 to River Mile 84.6) would be removed to deepen the federal navigation channel to a depth of 47 feet below MLLW. Rock will be placed in the Fort Mifflin CDF located in Philadelphia, PA (Figure 1). In order to remove the rock by blasting, holes drilled into the rock are packed with explosive and inert stemming material at the surface in order to direct the force of the blast into the rock. The depth and placement of the holes along with the size and blast timing delays of the charges control the amount of rock that is broken and energy levels released during the blasting operations. The rock removal would be conducted by drilling, blasting, and excavating relatively small areas until the required cross section of bedrock is removed. Rock blasting and mechanical removal of rock from the river would occur between 1 December and 15 March. It is now anticipated that rock removal can be completed over one winter season rather than two as stated in the April 2009 EA (USACE, 2009).

1.2.5 Operation and Maintenance

The required maintenance dredging of the 45-foot channel will increase by 862,000 cubic yards per year (cy/yr) from the current 3,455,000 average cy/yr for the 40-foot channel for a total of 4,317,000 cy/yr. Only areas shallower than 45 feet will be dredged during maintenance activities. Maintenance dredging in the Delaware River portion usually takes place over an approximately 2 month period between August and December using a hydraulic cutterhead dredge. All material excavated from the river portion of the project will continue to be placed in existing approved Corps CDFs. The timing and duration of maintenance dredging in Delaware Bay varies. Dredging in the bay is done using a hopper dredge with open water disposal at the approved Buoy 10 site. Maintenance dredging is expected to be conducted yearly on an as needed basis.

1.2.6 Status of Initial Construction

Initial construction for the Deepening Project began with the dredging of the Delaware River channel within Reach C on March 1, 2010 and concluded on September 18, 2010. Reach C extends from the Delaware Memorial Bridge to just below the C&D Canal (Figure 1). The work was completed using two 24-inch hydraulic cutterhead suction dredges. Approximately 3,594,963 cy of material was removed from Reach C and placed in the federally owned Killcohook CDF.

The next construction contract is scheduled for award in October 2011. The lower portion of Reach B, extending from Oldmans Creek, New Jersey to just upstream of the Delaware Memorial Bridge would be deepened (Stations 143+000 to 176+000). It is anticipated that a

hydraulic cutterhead suction dredge will remove material from the channel and place it in the federally owned Pedricktown South CDF.

2.0 Evaluation of Changes to the Project and the Environment since the 2009 EA

This section of the EA evaluates changes to the project and changes to the environment since the 2009 EA (USACE, 2009). This section addresses the proposed listing of the New York Bight Distinct Population Segment of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as a federally listed endangered species; the proposed listing of the northwest Atlantic Distinct Population Segment of loggerhead sea turtle (*Caretta caretta*) as a federally listed endangered species; changes to the Deepening Project construction schedule; and revisions to the dredged material disposal plan.

2.1 Proposed Endangered Species Listings

2.1.1 Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

On October 6, 2010, NMFS published a Notice in the Federal Register proposing to list three Distinct Population Segments of Atlantic sturgeon in the Northeast Region of NMFS. The following summary is taken from the October 6, 2010 Federal Register notice:

“SUMMARY: We, NMFS, have completed an Endangered Species Act (ESA) status review for Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Based on the status review report (ASSRT, 2007), and other information available since completion of the status review report, we have determined that the species is comprised of five distinct population segments (DPSs) that qualify as species under the ESA: Gulf of Maine (GOM); New York Bight (NYB); Chesapeake Bay (CB); Carolina; and South Atlantic. We have also determined that, for those DPSs that are located within the jurisdiction of NMFS’ Northeast Region, listing as threatened is warranted for the GOM DPS, and listing as endangered is warranted for the NYB DPS and CB DPS. A separate proposed listing determination is issued for the two DPSs within NMFS’ Southeast Region in today’s **Federal Register.**”

The New York Bight Distinct Population Segment (NYB) includes all Atlantic sturgeon whose range occurs in watersheds that drain into coastal waters, including Long Island Sound, the New York Bight, and the Delaware Bay, from Chatham, Massachusetts to the Delaware-Maryland border on Fenwick Island, as well as wherever these fish occur in coastal bays, estuaries, and the marine environment from Bay of Fundy, Canada, to the Saint Johns River, Florida.

In response to the Federal Register notice, the Corps prepared a Biological Assessment outlining potential impacts to the Atlantic sturgeon resulting from the Deepening Project (USACE, 2011). A “biological assessment” is part of the process provided under Section 7(a)(4) of the Endangered Species Act. Section 7(a)(4) was added to the Act to provide NMFS and other Federal agencies a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species at an early planning stage. The evaluation of potential

impacts to Atlantic sturgeon resulting from the Deepening Project as presented in the Biological Assessment is incorporated into this EA by reference. The Biological Assessment has been submitted to NMFS for their review. NMFS will issue a Conference Report containing recommendations for reducing adverse impacts so that project construction can continue. The Corps intends to implement all NMFS recommendations. If the species is listed, NMFS will adopt the Conference Report to act as a final Biological Opinion.

The primary concern with the Atlantic sturgeon is whether or not impacts associated with the Deepening Project "jeopardizes the continued existence" of the species. Federal regulation defines this term as "engaging in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Based on the Biological Assessment (USACE, 2011) the Corps concluded that the Deepening Project will not jeopardize the continued existence of Atlantic sturgeon.

There may be a potential impact to overwintering juvenile Atlantic sturgeon as a result of underwater blasting, which is required to remove bedrock in the Marcus Hook range. Blasting would take place between 1 December and 15 March. The measures listed below focus on preventing physical injury to juveniles that may be near the blasting area, but would likely protect the larger adult fish if any were present since there is evidence that smaller fish are more vulnerable to injury than larger fish (USACE, 1997). Studies have shown that the size of charge and distance from detonation are the two most important factors in determining fish mortality from blasting (Teleki and Chamberlain, 1978; Wiley *et al.*, 1981; and Burton, 1994). In addition, the measures listed below were used in North Carolina to successfully minimize impacts to sturgeon and have been coordinated with the NMFS for use with this project:

- Scare charges will be used for each blast. A scare charge is a small charge of explosives detonated immediately prior to a blast for the purpose of scaring aquatic organisms away from the location of an impending blast. Two scare charges will be used for each blast. The detonation of the first scare charge will be at 45 seconds prior to the blast, with the second scare charge detonated 30 seconds prior to the blast. Some fish may not locate the origin of the first scare charge. The second scare charge allows fish to better locate the source of the charge and maneuver away from the source.
- Average pressure shall not exceed 70 pounds per square inch (psi) at a distance of 140 feet.
- Maximum peak pressure shall not exceed 120 psi at a distance of 140 feet.
- Pressure will be monitored for each blast only at a distance of 140 feet.
- Surveillance for schools of fish will be conducted by vessels with sonar fish finders before each blast, and if fish schools are detected, blasting will be delayed until they leave. The surveillance zone will be approximately circular with a radius of about 500 feet extending outward from each blast set.

Adverse impacts to fish will be further minimized by conducting blasting between December 1 and March 15 as recommended by the Delaware River Basin Fish and Wildlife Management Cooperative, and using controlled blasting methods such as delayed blasting and “stemming” to reduce the amount of energy that would impact fish. Finally, fish avoidance techniques will be utilized to drive fish away from the proposed blasting area to reduce the detrimental impact to fish. Monitoring impacts to fish from the blasting will also be conducted to verify that impacts are minimal.

The pre- and post-blast monitoring for fish including Atlantic sturgeon shall be conducted under the supervision of a principal biologist that has at least a Master of Science degree in fisheries biology or similar fields and must have obtained in their name any required approvals/permits to work with Atlantic sturgeon.

In addition to the protection measures associated with blasting activities, NMFS approved observers will be onboard hopper and mechanical dredges to monitor for take of Atlantic sturgeon. Confined disposal facilities will be monitored for work utilizing hydraulic cutterhead suction dredges. The discovery of any sturgeon will be immediately reported to NMFS.

In a letter dated August 5, 2011 NMFS provided recommendations to minimize and/or monitor the effects of Reach B dredging on Atlantic sturgeon. The following is excerpted from their letter:

To minimize and/or monitor effects of the proposed Reach B dredging on Atlantic sturgeon, NMFS recommends the following:

1. The ACOE should conduct the dredging in such a way that work begins in the area furthest upstream (i.e., near river mile 73.5) and works downstream (to river mile 69.5). NMFS is making this recommendation to minimize possible effects to Atlantic sturgeon which are known to occur in summer holding areas located near river mile 68.
2. The ACOE should conduct sediment sampling following the completion of dredging to confirm that substrate type is unchanged following the deepening of Reach B. It is NMFS understanding that the ACOE has determined that substrate is unlikely to be changed as a result of the dredging; however, as Atlantic sturgeon are thought to make habitat selections at least partly based on substrate type, NMFS requests that the assertion regarding substrate type be confirmed through post-dredge sampling and that these results be provided to NMFS. Should it be found that substrate type has changed as a result of the deepening, ACOE should work with NMFS to develop an appropriate restoration method to restore substrate types in this reach.
3. The ACOE should work with Atlantic sturgeon researchers to monitor the movement of acoustically tagged Atlantic sturgeon during the dredging operations. The ACOE Norfolk District recently completed a successful study of Atlantic sturgeon behavior during cutterhead dredging in the James River, and NMFS believes that a similar study in the Delaware River would aid both the ACOE and NMFS in assessing potential effects of future dredging activities

in the river. If acoustic monitoring is not possible, the ACOE should work with the ACOE office in Vicksburg to determine the DIDSON camera system can be used to monitor sturgeon movements during dredging. If acoustic or DIDSON monitoring is completed, ACOE should provide the results of this monitoring to NMFS.

4. Per the RPMs and Terms and Conditions of NMFS 2009 Opinion, the ACOE will ensure that the dredge disposal area is monitored for shortnose sturgeon daily. The ACOE should also monitor for Atlantic sturgeon and any whole sturgeon or sturgeon parts observed at the disposal site should have the species identification verified by an expert.

5. The ACOE should promptly report any observations of Atlantic sturgeon, dead or alive, during the dredging or disposal operations, to NMFS. Interactions with Atlantic sturgeon should be included in all protected species reporting submitted to NMFS. All reports should be made to Julie Crocker at (978)282-8480 or by e-mail (Julie.Crocker@noaa.gov).

6. In the event that any dead Atlantic sturgeon or their parts are observed during dredging or disposal operations, the ACOE should retain the fish in cold storage until disposal instructions are discussed with NMFS. A genetic sample should also be taken of any Atlantic sturgeon observed during dredging or disposal activities. Procedures for taking genetic samples are outlined in Attachment I to this letter.

The Corps intends to implement NMFS' recommendations during the upcoming Reach B dredging work. Therefore, we have concluded that by following the measures listed above for protection of the Atlantic sturgeon and any additional recommendations provided in NMFS' conference opinion that dredging for the Deepening Project will not have a significant impact on the environment.

2.1.2 Loggerhead Sea Turtle (*Caretta caretta*)

On March 5, 2008, NMFS published a Notice in the Federal Register concluding that a petition to reclassify the northwest Atlantic Distinct Population Segment (DPS) of loggerhead sea turtle from threatened to endangered may be warranted. On March 16, 2010 NMFS proposed to designate the northwest Atlantic DPS as endangered. In a March 22, 2011 Federal Register notice, NMFS announced a six month extension of the deadline for a final listing decision. In their March 22, 2011 notice NMFS stated: "In consideration of the disagreement surrounding the population status and magnitude and immediacy of the threats for the proposed Northwest Atlantic Ocean DPS of the loggerhead turtle, we extend the timeline for the final determination for an additional 6 months (until September 16, 2011) to resolve the scientific disagreement." Based on a conference call discussion between NMFS and the Corps it was agreed that NMFS should provide a conference opinion for the loggerhead sea turtle that provides recommendations for the protection of the northwest Atlantic DPS and an appropriate incidental take statement that can become effective if the final determination is to list the northwest Atlantic DPS of loggerhead sea turtle as endangered. NMFS will provide their conference opinion as part of their conference report for Atlantic sturgeon.

The Corps prepared a biological assessment entitled "A Biological Assessment for Potential Impacts to Federally Listed Threatened and Endangered Species of Sea Turtles, Whales and the

Shortnose Sturgeon Resulting from the Delaware River Main Stem and Channel Deepening Project” in January 2009 (USACE, 2009a). This endangered species consultation with NMFS was discussed in the April 2009 EA (USACE, 1009). On July 17, 2009 NMFS issued their Biological Opinion (NMFS, 2009), which concluded that the proposed action is likely to adversely affect but is not likely to jeopardize the continued existence of the loggerhead sea turtle. The evaluation of potential impacts to the loggerhead sea turtle resulting from the Deepening Project as presented in USACE (2009a) and NMFS (2009) is incorporated into this EA by reference.

Following the reasonable and prudent measures listed in the Biological Opinion (NMFS, 2009), it is the intention of the Corps to continue monitoring for sea turtles during dredging projects, when warranted. Sea turtle observer(s) shall be on board any hopper dredge working in areas of concern (below the Delaware Memorial Bridge) from May 1 through November 15. The observer shall be on board the dredge continually during this window. While on board the dredge the observer shall provide the required inspection coverage on a rotating, six/eight hours on and six/eight hours off, basis. In addition, these rotating six/eight hour periods should vary from week to week. In addition, hopper dredging that occurs in the Bay (*i.e.*, reaches D and E) from May 1 through November 15 will include sea turtle deflectors on the hopper dragarms to minimize sea turtle impacts. All such dredging and monitoring will be conducted in a manner consistent with the current incidental take statement issued by NMFS for the Deepening Project. The District will continue to coordinate monitoring results with NMFS, and work to develop appropriate measures to minimize impacts. The Corps will also implement any additional recommendations provided by NMFS for the loggerhead in their conference opinion. Therefore, we have concluded that by following the reasonable and prudent measures provide by NMFS for protection of the loggerhead sea turtle and any additional recommendations provided in their conference opinion that dredging for the Deepening Project will not have a significant impact on the environment.

2.2 Project Changes

2.2.1 Revised Construction Schedule

Appendix A provides the current construction schedule and the type of dredge that would be used for different reaches of the river and bay for the Deepening Project. Dredging is scheduled to be in compliance with Delaware River Basin Fish and Wildlife Management Cooperative recommended dredging restrictions for protection of fishery resources in the Delaware River and Bay. While this is our best estimate of the construction schedule based on available information, it should be noted that all contracts are subject to the availability of project funds. For this reason, a given contract may slide to another calendar year, but the time of year the work will be conducted will not change in order to adhere to environmental dredging windows. As such, it is concluded that changes to the construction schedule do not result in any new or significant impacts to the affected environment.

As stated in the April 2009 EA, in order to best meet the competing hopper dredging restrictions recommended by the Cooperative for the Atlantic sturgeon, sandbar shark and overwintering blue crabs, the Broadkill Beach portion of the project was scheduled to take place between 1

April and 30 June. To protect sandbar shark during this period, the plan was to float the dredge pipe to avoid disruption of sandbar shark movements and to stockpile sand above mean high water from 15 April to 15 September. After 15 September, sand was to be graded below mean high water to widen the beach. However, during a May 13, 2010 project coordination meeting between the Corps, State of Delaware Department of Natural Resources and Environmental Control (DNREC), and Dr. Dewayne Fox, an Atlantic sturgeon researcher with Delaware State University, it was decided that a more acceptable time of year for construction of the Broadkill Beach project is from 15 September to 15 December. Dredging and shoreline work during this time would avoid any impacts to the sandbar shark, the sand tiger shark, the horseshoe crab, and local residents and vacationers using the beach during the summer months. According to Dr. Fox, dredging at this time would not impact Atlantic sturgeon, as his data show they are not using this area at this time of year. It is concluded that this change in schedule for construction of the Broadkill Beach project will not have a significant impact on the environment.

2.2.2 Dredged Material Disposal Plan

2.2.2.1 Reach C Construction

During the 2009-2010 contract to deepen Reach C of the Deepening Project, an additional 1 million cubic yards of material deposited in the channel during the preconstruction and construction periods. This material was removed under the Reach C contract and placed in the Killcohook CDF. The placement of this material has minimal impact on the long range capacity of the area as there is 23 million cubic yards of excess capacity beyond the 50 year period of analysis at the Killcohook CDF. Therefore, the additional 1 million cubic yards placed in the Killcohook CDF will not have a significant impact on the environment.

2.2.2.2 Wilmington Harbor Maintenance Dredging and the Pedricktown South CDF

There are plans to utilize the Pedricktown South CDF to provide capacity for the Wilmington Harbor, Delaware project. It is anticipated that the CDF will be needed for 8 dredging cycles in the next 25 years for a total need of 5.2 million cy. The Reach B complex of Pedricktown North, South, and Oldmans has an excess capacity of over 10 million cy beyond the 50 year period of analysis, therefore the additional material placed will not impact the Deepening Project and will not have a significant impact on the environment.

2.3 Public Review of the Draft Environmental Assessment

As a result of the public review of the draft EA, it was determined that consideration of the potential project impact on several freshwater mussel species in the Delaware River and the American eel (*Anguilla rostrata*) was warranted. It was also determined that consideration should be given to the cumulative impact of the Deepening Project along with two other unrelated port development projects that are reasonably foreseeable in the future. These issues are discussed in the sections below.

2.3.1 Freshwater Mussels

Several species of freshwater mussels are of concern in the Delaware Estuary. These include: dwarf wedgemussel (*Alasmidonta heterodon*), triangle floater (*Alasmidonta undulate*), brook floater (*Alasmidonta varicose*), alewife floater (*Anadonta implicata*), eastern elliptio (*Elliptio complanata*), yellow lampmussel (*Lampsilis cariosa*), eastern lampmussel (*Lampsilis radiata*), green floater (*Lasmigona subviridis*), tidewater mucket (*Leptodea ochracea*), eastern pondmussel (*Ligumia nasuta*), eastern pearlshell (*Margaritifera margaritifera*), eastern floater (*Pyganodon cataracta*), and squawfoot (*Strophitus undulatus*).

In the 2008 State of the Delaware Estuary, prepared by the Partnership for the Delaware Estuary, the status of freshwater mussels is defined as follows:

“North America has the world’s greatest diversity of native freshwater mussels (more than 300 species), however, more than 75 percent have special conservation status. The leading causes of mussel decline are habitat and water-quality degradation. For example, dams that block fish passage can affect reproduction, gene flow, and may prevent recolonization from adjacent tributaries following disturbance. Of the 12 or more native species in the Delaware Estuary Watershed, even the most common mussel is patchy in abundance and may not be successfully reproducing across much of its range.”

Comments received on the Draft EA included concern for increased salinity due to the deepening project and sea level rise and the impact to freshwater mussels. In 2010 freshwater mussel beds were found in the Delaware River between Chester, PA and Trenton, NJ. Section 4.1.2.3 of the April 2009 Environmental Assessment reports salinity modeling results from simulation of the 1965 drought of record with a channel deepened to 45 feet, DRBC projected 2040 consumptive use and a 2040 sea level rise projection based on NOS tide gauge data collected during the 20th century along the coasts of New Jersey and Delaware. Results are reported at the Delaware Memorial Bridge (RM 69), Chester, PA (RM 83) and the Ben Franklin Bridge (RM 100) (Table 4-1 of the April 2009 EA). Modeling results are provided for each scenario (deepened channel, 2040 consumptive use, 2040 sea level rise) and for the three scenarios combined. Results are the peak 7-day-average change in salinity resulting from each scenario compared with the background range of salinity during the 1965 simulation period. Ben Franklin Bridge results are presented as the peak 7-day-average change in chlorides because of the DRBC chlorinity standard at RM 98 but are converted here to change in salinity using the conversion factor that chlorides represent 55 percent of total salinity.

At the Delaware Memorial Bridge, background salinity for the 1965 drought of record ranged from 0 to 6 ppt. The projected peak 7-day average increase for the three combined scenarios is 0.9 ppt. At Chester, PA, background salinity for the 1965 drought of record ranged from 0 to 1.8 ppt. The projected peak 7-day-average increase for the three combined scenarios is 0.3 ppt. And at the Ben Franklin Bridge, background salinity for the 1965 drought of record ranged from

0 to 0.3 ppt. The projected peak 7-day-average increase for the three combined scenarios is 0.036 ppt. Projected salinity increases resulting from a deepened channel, 2040 consumptive use and 2040 sea level rise would continue to decrease moving upstream. Based on these results, it is concluded that these small increases in salinity even during the recurrence of the drought of record would have an insignificant impact on freshwater mussels. Worst case salinities for the Delaware Memorial Bridge, Chester, PA and the Ben Franklin Bridge would be 6.9, 2.1 and 0.336 ppt, respectively.

2.3.2 American Eel (*Anguilla rostrata*)

In a letter of comment on the draft Environmental Assessment, the U.S. Fish and Wildlife Service noted that a petition to list the American eel (*Anguilla rostrata*) as threatened under the Endangered Species Act was received by the Service in April 2010. The Service is currently evaluating the petition to determine if the listing may be warranted. The letter notes that the Delaware River watershed's eel population is stable and an excellent source of recruitment for adjoining watersheds with declining populations including the Chesapeake Bay/Susquahanna River Basin.

A review of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for American eel (April 2000) did not identify any specific dredging related concerns affecting American eel. Harvest pressure and habitat losses resulting from blocked stream access and pollution are the primary causes of any possible decline in abundance. The Pennsylvania Fish and Boat Commission states that the Delaware River has the most abundant population of eels of all streams in the State (PFBC, 2000). The abundance of eels in the Delaware is attributed to the fact that there are no dam obstructions to prevent upriver migration. The Delaware River Basin Fish and Wildlife Management Cooperative has not recommended a time of year dredging restriction for protection of American eel. The deepening project will not impact American eel in any manner other than a general disturbance to fish in close proximity to a working dredge. If the U.S. Fish and Wildlife Service proposes to list the American eel as threatened, the Corps will request a conference opinion that provides recommendations for the protection of the species with regard to the deepening project.

2.3.3 Cumulative Effects

The CEQ defines cumulative impacts as “the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” Two port development projects are considered reasonably foreseeable future actions. Both of these actions involve dredging up to 40 feet, and are not dependent on the deepening project.

The Paulsboro Marine Terminal has received a Department of the Army permit for construction, dated January 28, 2011. The New Jersey Department of Environmental Protection issued their permit including water quality certification and coastal zone management approval on October 15, 2010. The project is to re-develop the former 130-acre British Petroleum (BP) Oil Terminal and the adjacent 45-acre former Essex Industrial Chemicals, Inc. (Essex) properties located adjacent to the Delaware River and Mantua Creek in the Borough of Paulsboro, Gloucester County into a new, deep-water marine terminal with associated processing, distribution, assembly and intermodal operations. In order to avoid impacts to fish resources, no in water work will take place between March 15th and June 30th of any given year. As a result of this project, the loss of 4.4 acres of Federally regulated waters of the U.S., including wetlands will be mitigated at the DREAM Park mitigation site located in Logan Township, Gloucester County, New Jersey. Loss of 1.06 acres of SAV habitat will be mitigated by transplanting and replanting SAV in accordance with approved plans and specifications.

The Southport Marine Terminal is still in the planning stages, and is currently undergoing the Department of the Army permit process. A Public Notice for the project was issued by the Corps on August 24, 2010. The applicant has also applied for a permit from the Pennsylvania Department of Environmental Protection, which includes a request for water quality certification and coastal zone management approval. The applicant has also requested coastal zone management approval from the New Jersey Department of Environmental Protection. The project location is at the eastern end of the Philadelphia Naval Business Center, formerly known as the Philadelphia Naval Shipyard, in the city and county of Philadelphia, Pennsylvania. The proposed project would construct a new marine terminal on approximately 116 acres of currently vacant land.

The applicant has prepared mitigation plans for aquatic impacts associated with this project, and submitted them to the Corps for review as part of permit processing. The mitigation sites are located upstream of Philadelphia within the freshwater tidal reaches of the Delaware River at the confluence of Neshaminy Creek. The final mitigation plan will be determined as part of the permit process.

Both the Paulsboro and Southport Marine Terminal projects have been carefully planned and can be constructed with minimal impact to the environment with appropriate mitigation. Including the deepening project, all three projects will involve temporary short-term effects on the environment during construction, which could last over a year in duration. Minor discharges will result from air and noise emissions from construction equipment, and minor turbidity from earth disturbances and dredging. All three projects will use existing containment facilities for placement of dredged material. Construction timing for Paulsboro and Southport are not known, so it can't be determined if these projects will be constructed at the same time or in different years. Construction timing relative to the deepening project is also unknown. These projects occur within Reaches A and AA of the deepening project. All three projects conform to

recommended time of year restrictions for protection of fishery resources. That assumes that a permit for construction of Southport would be conditioned the same as the Paulsboro permit for in water work. From the standpoint of air and noise emissions, turbidity, disposal capacity for dredged material, and impacts to fishery and other aquatic resources, the cumulative adverse environmental impacts associated with the Paulsboro and Southport projects do not alter the evaluations made with regard to these subject areas in the 1992 EIS, 1997 SEIS and 2009 EA.

3.0 Conclusion and Findings

This EA concludes that potential impacts to the Atlantic sturgeon and loggerhead sea turtle resulting from the Deepening Project are similar in nature to those evaluated in USACE (1997) and USACE (2009). Therefore, the actions proposed and evaluated in this EA are consistent with the project actions previously detailed and documented, and do not result in any new or significant impacts to the affected environment. Also, changes to the project schedule and changes to the dredged material disposal plan will not result in any additional impacts from those previously evaluated. Since it is concluded that potential project impacts are similar to those previously evaluated, it has been determined that preparation of a new or Supplemental Environmental Impact Statement is not warranted for these project changes identified herein, and a Finding of No Significant Impact (FONSI) for the proposed changes is appropriate.

4.0 References

Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American Eel. Fishery Management Report No. 36.

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. 174 pp.

Burton, W.H. 1994. Assessment of the Effects of Construction of a Natural Gas Pipeline on American Shad and Smallmouth Bass Juveniles in the Delaware River. Prepared by Versar, Inc. for Transcontinental Gas Pipe Line Corporation.

National Marine Fisheries Service. 2009. Biological Opinion for Deepening of the Delaware River Federal Navigation Channel.

Partnership for the Delaware Estuary. 2008. State of the Delaware Estuary 2008. Estuary News Volume 18 Issue 3 Summer 2008. PDE Report No. 08-01.

Pennsylvania Fish and Boat Commission. 2000. Pennsylvania Fishes Chapter 9 American eel.

Teleki, G.C. and A.J. Chamberlain. 1978. Acute Effects of Underwater Construction Blasting in Fishes in Long Point Bay, Lake Erie. J. Fish. Res. Board Can. 35: 1191-1198.

U.S. Army Corps of Engineers (USACE), Philadelphia District. 1992. Delaware River Comprehensive Navigation Study, Main Channel Deepening, Final Interim Feasibility Study and Environmental Impact Statement.

U.S. Army Corps of Engineers (USACE), Philadelphia District. 1997. Delaware River Main Channel Deepening Project (Pennsylvania, New Jersey, and Delaware) Supplemental Environmental Impact Statement.

U.S. Army Corps of Engineers (USACE) Philadelphia District. 2009. Delaware River Main Stem and Channel Deepening Project, Environmental Assessment.

U.S. Army Corps of Engineers (USACE) Philadelphia District. 2009a. A Biological Assessment for Potential Impacts to Federally Listed Threatened and Endangered Species of Sea Turtles, Whales and the Shortnose Sturgeon Resulting from the Delaware River Main Stem and Channel Deepening Project.

U.S. Army Corps of Engineers (USACE) Philadelphia District. 2011. A Supplemental Biological Assessment for Potential Impacts to the New York Bight Distinct Population Segment of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) Which is Proposed for Federal Endangered Species Listing Resulting from the Delaware River Main Stem and Channel Deepening Project.

Wiley, M.L., J.B. Gaspin, and J.F. Goertner. 1981. Effects of Underwater Explosions on Fish with a Dynamic Model to Predict Fishkill. *Ocean Science and Engineering* 6(2): 223-284.

APPENDIX A

UPDATED PROJECT SCHEDULE

<p align="center">DELAWARE RIVER MAIN CHANNEL DEEPENING</p> <p align="center">PROJECT SCHEDULE - SEPTEMBER 2011</p>											
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