FINDING OF NO SIGNIFICANT IMPACT
FLOOD CONTROL & COASTAL EMERGENCY REPAIR
INDIAN RIVER INLET NORTH SHORE, SUSSEX COUNTY, DELAWARE
FLOOD CONTROL AND COASTAL EMERGENCY ACT (PL 84-99)

OVERVIEW

The United States Army Corps of Engineers (Corps) has evaluated the dredging of the flood shoal west of Indian River Inlet Bridge in Sussex County Delaware. The beneficial use of this dredged material will be to replace sand removed by Hurricane Sandy on the Delaware Seashore State Park. The Corps authority for the Indian River Inlet and Bay Project is the Flood Control and Coastal Emergency Act (PL 84-99). The project area for this action is the Indian River Inlet flood shoal adjacent to the U.S. Coast Guard (USCG) Facilities and Delaware Seashore State Park, located in Sussex County, Delaware. This work is being funded under the Flood Control and Coastal Emergency Act (PL 84-99).

PURPOSE AND SPECIFICATIONS

From 1957 to 1990, over 2 million cubic yards of sand were dredged from the inlet interior in order to obtain beachfill for the eroding shoreline north of the inlet. However, with the start of the Indian River Inlet sand bypassing program in 1990, no additional inlet interior dredging has been required or performed to obtain beachfill or for maintenance of the channel. In 2009-10 beneficial use of dredged materials was used to fill scour holes present on the northern shore adjacent to the USCG facility. Since 2010 there has been no further dredging of the flood shoal, and beach nourishment has been continually undertaken by DNREC from the sand bypass pump station, pumping on average 100,000 cubic yards (cy) of sand per year.

In September of 2012 Hurricane Sandy made landfall on the eastern coast of the United States. The impact of the landfall removed hundreds of thousands of cubic yards of sand from the Delaware Seashore State Park beach. Prior to hurricane Sandy it was estimated the beach was in need of 140,000 cy of sand for replenishment. The sand bypass system located at Indian River Inlet replenishes on average 100,000 cy of material each season. Following hurricane Sandy it is estimated that the Delaware Seashore beach now needs approximately 520,000 cy of sand to properly nourish the beach and protect existing infrastructures, which is above and beyond the capabilities of the sand bypass system that is currently in place

The plan is to dredge the flood shoal to the authorized depth of -24 ft NAVD. Dredging the flood shoal provides advance maintenance of the channel by reducing infilling of adjacent sediments. The total estimated quantity of material needed from dredging is 520,000 cy. All dredged material will be beneficially used to stabilize and nourish the Delaware State Park beach and to construct a dune system to protect the existing roadway and newly constructed Indian River Inlet Bridge. The material dredged consists mostly of sand (approx. 90%).

In the proposed plan, the Delaware Seashore State Park beach will be replenished by the beneficial use of dredged materials taken from the flood shoal and a protective dune system will be rebuilt. The amount of material needed for replenishment is approximately 520,000 cy. The duration of the dredging operation should be approximately 2-3 months. Dredging and beneficial use of dredged material is the preferred alternative for beach replenishment because it is the most cost effective and least environmentally damaging alternative that would meet the project goals

If no action is taken to replenish beach sands and rebuild dunes, there is a high probability of the complete loss of the beach north of the jetty at Delaware Seashore State Park with potential for loss of infrastructure including the existing roadway and Indian River Inlet Bridge. This action would protect the bridge and roadway from potential failure and reestablish the beach and dune system removed by hurricane Sandy.

COORDINATION

The project was developed by the USACE and DNREC. The Environmental Assessment for the project was forwarded to the U.S. Environmental Protection Agency Region III, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, DNREC, and all other known interested parties.

ENDANGERED SPECIES IMPACT
Initial coordination with the U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS) has determined that there will be no effect on federally listed species found in the project area. This consultation will be concluded prior to project construction

WATER QUALITY / CLEAN AIR ACT COMPLIANCE
There will be temporary impacts on the air and water quality during dredging**.** However, pursuant to Section 401 of the Clean Water Act, a 401 Water Quality Certificate will be obtained for this project from DNREC. In addition, a General Conformity analysis under the Clean Air Act has determined that emissions associated with the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOCs) in a Moderate Nonattainment Area (50 tons VOCs and 100 tons NOx per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

COASTAL ZONE
Based on the information gathered during the preparation of the Environmental Assessment, and the application of appropriate measures to minimize project impacts, it was determined in accordance with Section 307(C) of the Coastal Zone Management Act of 1972 that the plan complies with and can be conducted in a manner that is consistent with the approved Coastal Zone Management Program of Delaware. A consistency determination from DNREC will be obtained for this project.

CULTURAL IMPACTS
Several cultural resource investigations have been conducted within and in the vicinity of the proposed project. A 1978 Cultural Resources Overview by Gilbert/Commonwealth of Indian River and Bay designated the original (1988) shoreline protection project area as a low sensitivity zone with respect to Native American archaeological resources. The Indian River Inlet was surveyed in 1984 as part of a larger Delaware inner continental shelf study. Since Indian River Inlet has historically been used for commerce, the potential for shipwrecks in the vicinity is high; however, due to an extensive history of dredging that has occurred in the proposed project area, it is our opinion that the project will have no adverse effects on historic or cultural resources. The selected alternative and the USACE determination of effects will be coordinated with the Delaware State Historic Preservation Officer, Federally Recognized Tribes and other consulting parties pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended and its implementing regulations 36 CFR Part 800.

RECOMMENDATION
Because the Environmental Assessment concludes that the work described is not a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

_____
Date

_____
John C. Becking, P.E.
Lieutenant Colonel, Corps of Engineers
District Engineer

DRAFT ENVIRONMENTAL ASSESSMENT

FLOOD CONTROL & COASTAL EMERGENCY REPAIR
INDIAN RIVER INLET NORTH SHORE, SUSSEX COUNTY, DELAWARE
FLOOD CONTROL AND COASTAL EMERGENCY ACT (PL 84-99)

PREPARED BY:
PHILADELPHIA DISTRICT
U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA 19107

March 2013

FLOOD CONTROL & COASTAL EMERGENCY REPAIR
INDIAN RIVER INLET NORTH SHORE, SUSSEX COUNTY, DELAWARE
FLOOD CONTROL AND COASTAL EMERGENCY ACT (PL 84-99)

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1.0 Project Location

The project area for this action is the Indian River Inlet flood shoal and Delaware Seashore State Park beach north of the inlet jetty (Figure 1).

2.0 Project Authority

Indian River Inlet (Sand Bypass Facility) is authorized under the Delaware Coast, Cape Henlopen to Fenwick Island Project by Section 203 of the Flood Control Act of 1968 (Public Law No. 90-483; 82 Stat. 739) in accordance with Senate Document Number 90, 90th Congress, 2nd session, and modified by section 869 of the Water Resources Development Act of 1986 (Public Law No. 99- 662, 100 Stat. 4182). The General Design Memorandum (GDM) for the sand bypassing component of the project was approved by the Chief of Engineers on January 21, 1986. The proposed work in this assessment is being funded under PL84-99 for Flood Control and Coastal Emergencies (33 U.S.C. 701n) in response to a Federal disaster declaration from Hurricane Sandy.

In accordance with the National Environmental Policy Act (NEPA) of 1969, this assessment supplements previous NEPA documents referenced as: Final Environmental Impact Statement (USACE, 1971), Final Environmental Impact Statement – Draft Supplement (USACE, 1975a), Final Environmental Impact Statement – Indian River Inlet Project Maintenance (USACE, 1975b), Environmental Assessment/Finding of No Significant Impact (FONSI) – Indian River Inlet Sand Bypass Plant (USACE, 1984) and Environmental Assessment/FONSI – Indian River Inlet and Bay Maintenance Dredging and Beneficial Use of Dredged Material Section 104, Navigation (USACE, 2009).

3.0 Purpose and Need for Action

The project area for this action is the Delaware Seashore State Park beach north of the Indian River inlet jetty located in Sussex County, Delaware. The project area encompasses the flood shoal borrow area located near the federal navigation channel within Indian River Inlet and the beach extending from the jetty for approximately 5,200 feet (ft) north. The north shore of Indian River Inlet has a long history of beach erosion due to the interruption of the northward flow of sand caused by the construction of the inlet jetties. This erosion has made the critical infrastructure of Delaware Route 1 and the approach to the Indian River Inlet Bridge more vulnerable to storm damages. To provide a consistent source of sand for the north shore, a sand bypass facility was constructed in 1990 by the Corps of Engineers and is operated and maintained by the State of Delaware. This sand bypass system basically mimics the natural net flow of sand from south to north by actively pumping sand from the south fillet across the inlet, and placed on the north shore. The sand pumping rates are variable, but are on average about 100,000 cubic yards (cy) per year.

Prior to the construction of the sand bypass system, sand was periodically obtained from the interior Indian River Inlet and placed on the north shore beach. From 1957 to 1990, over 2 million cy of sand were dredged from the inlet interior for the Federal navigation

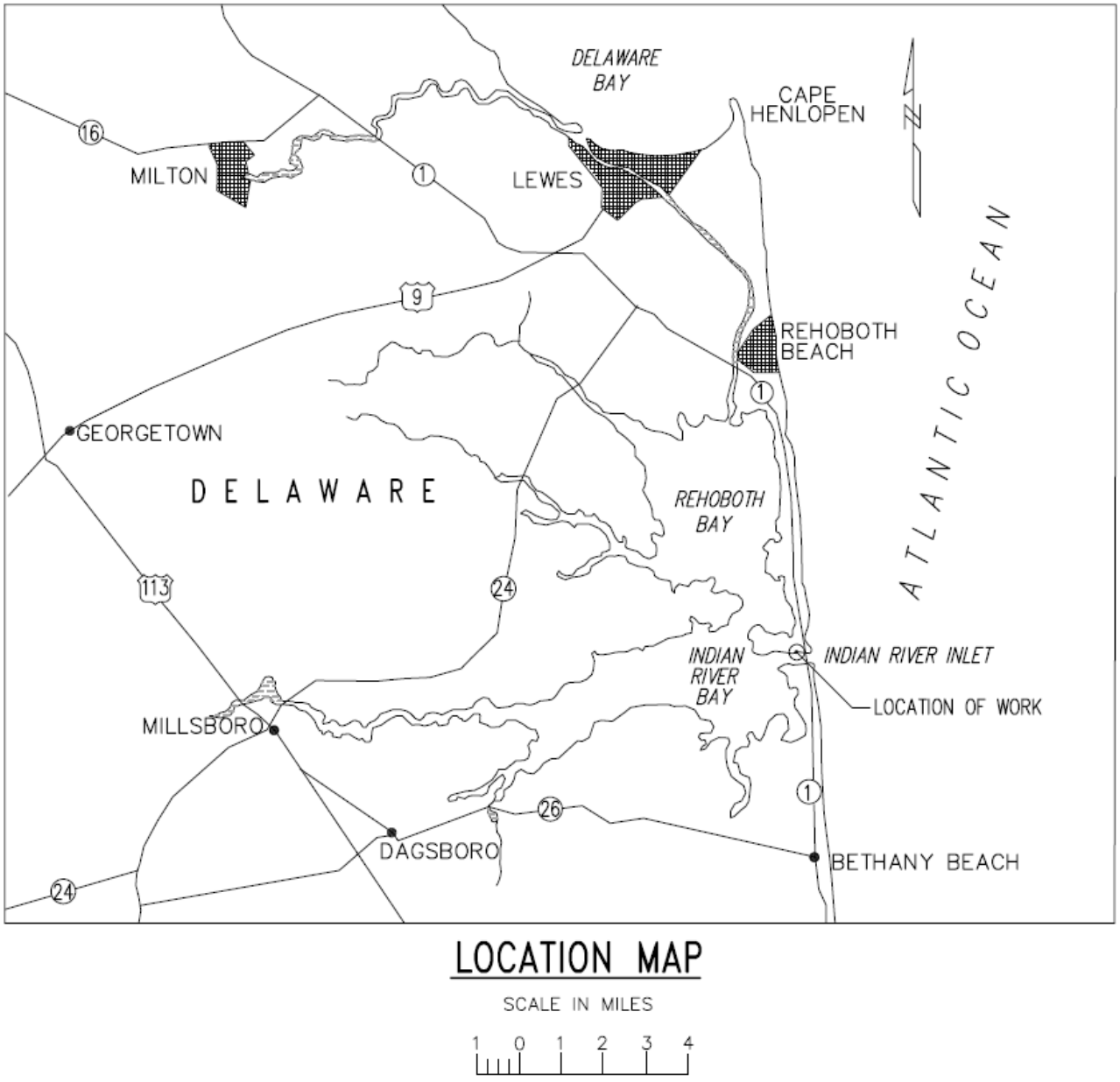


Figure 1. Indian River Inlet project location map.

channel, and to obtain beach fill for the eroding shoreline north of the inlet. However, with the start of the Indian River Inlet sand bypassing program in 1990 and subsequent work on scour holes located near the USCG facility in 2010, no additional inlet interior dredging has been required or performed to obtain beachfill or for maintenance of the channel.

In recent years, the annual pumping of the sand bypass alone at Indian River Inlet has not kept pace with erosion on the north side (due to a number of factors), which resulted in a diminished beach profile, and a higher vulnerability to storm damages. This vulnerability was exposed in October of 2012 when Hurricane Sandy eroded hundreds of thousands of cubic yards of sand from the northern side of the inlet. This resulted in Route 1 and the approach to the newly constructed Indian River Inlet bridge experiencing overwash from the storm surge. This overwash forced the closure of this critical highway for several days until State crews could remove thousands of cubic yards of sand, and make necessary repairs (Photos 1-2).

Following hurricane Sandy, an estimated 520,000 cy of sand will be needed to restore the beach template. This sand will be used to rebuild the dune system, which protects the roadway (Hwy 1), newly constructed Indian River Inlet Bridge, and to replenish the beach. Pumping of sand by DNREC occurs seasonally during non peak tourism months and deposits approximately 100,000 cy of material onto the beach north of the jetty. Replacement of sand on the beach is an emergency action. This area (Photos 3-4), if subjected to additional storm events, would likely fail completely allowing for impacts to transportation on the Highway 1 corridor and possible loss of infrastructure leading to even further costs and loss of coastal transportation and commerce by land. In addition, to the current need of 520,000 cy to repair the north shore beach, a sand source such as the proposed flood shoal sand source (borrow area) (Figure 2) may be required for future actions due to storms/emergency actions, and to supplement the existing annual sand nourishment from the sand bypass plant on an “as needed” basis.

Photo 1: State Route 1 and Indian River Bridge during a recent storm (March 6, 2013).

Photo 2: State Route 1 and Indian River Bridge during a recent storm (water pooling) (March 6, 2013).

Photo 3: North Shore Beach Existing Conditions (under bridge) (February 12, 2013).

Photo 4: North Shore Beach Existing Conditions (February 12, 2013).

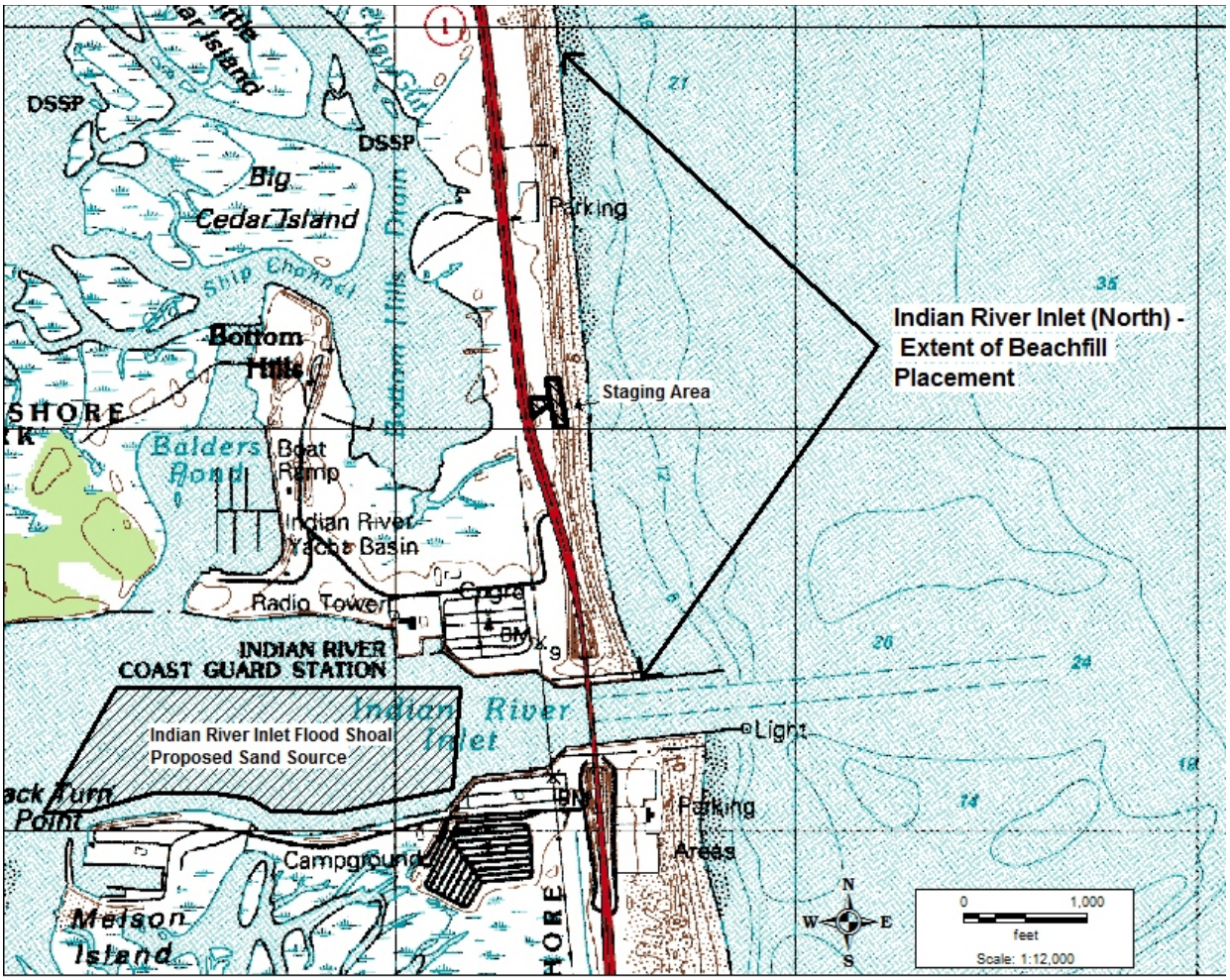


Figure 2. Indian River Inlet project vicinity.

4.0 Alternatives

Protecting the North Shoreline

Alternatives considered for protecting the north shoreline of Delaware Seashore State Park include: no action, dredging of materials from the flood shoal area, and trucking of material from other locations to the site. The alternatives were considered with respect to project cost, habitat loss due to construction activities, destruction of benthic organisms, turbidity increases, disturbances to fish and wildlife, during spawning, nesting, and migratory periods, and recreational uses of the area specifically Delaware's premiere surfing beach located in the State Park.

No Action

If no action is taken to nourish the beach, continued erosion will occur particularly during storm events until such a time that the roadway and newly constructed bridge will be endangered and or impassable. Loss of the inlet crossing is unacceptable as it is the only means of reaching the other side of the inlet versus driving the long way around. First responders and emergency personnel rely on the bridge and road network in the State Park to access areas in and around the Indian River area by land. Loss of the road during recent storm events has led to extended response and travel times involving first responders, complicating patient delivery to medical facilities in a timely manner and economic interruptions.

A significant quantity of sand is available within Indian River Inlet to replenish the beach. It would be necessary to dredge the shoal in the inlet to a depth of -24 NAVD, and place the sand in such a position as to provide storm damage reduction benefits.

Dredged material from flood shoal to replenish North shoreline

The preferred alternative is to dredge the flood shoal to a depth of -24 ft NAVD. Dredging the flood shoal also provides advance maintenance of the channel by reducing infilling of adjacent sediments. The total estimated quantity of material to be dredged is approximately 520,000 cy and will be removed from the flood shoal by hydraulic pipeline dredging. All dredged material will be beneficially used to nourish the beach, replenishing the sand there and to rebuild dunes removed by Hurricane Sandy. The material to be dredged consists mostly of sand (approx. 94%). In addition to the current need of 520,000 cy, this flood shoal sand source may be required for future actions due to storms/emergency actions, and to supplement the sand nourishment from the sand bypass plant on an "as needed" basis.

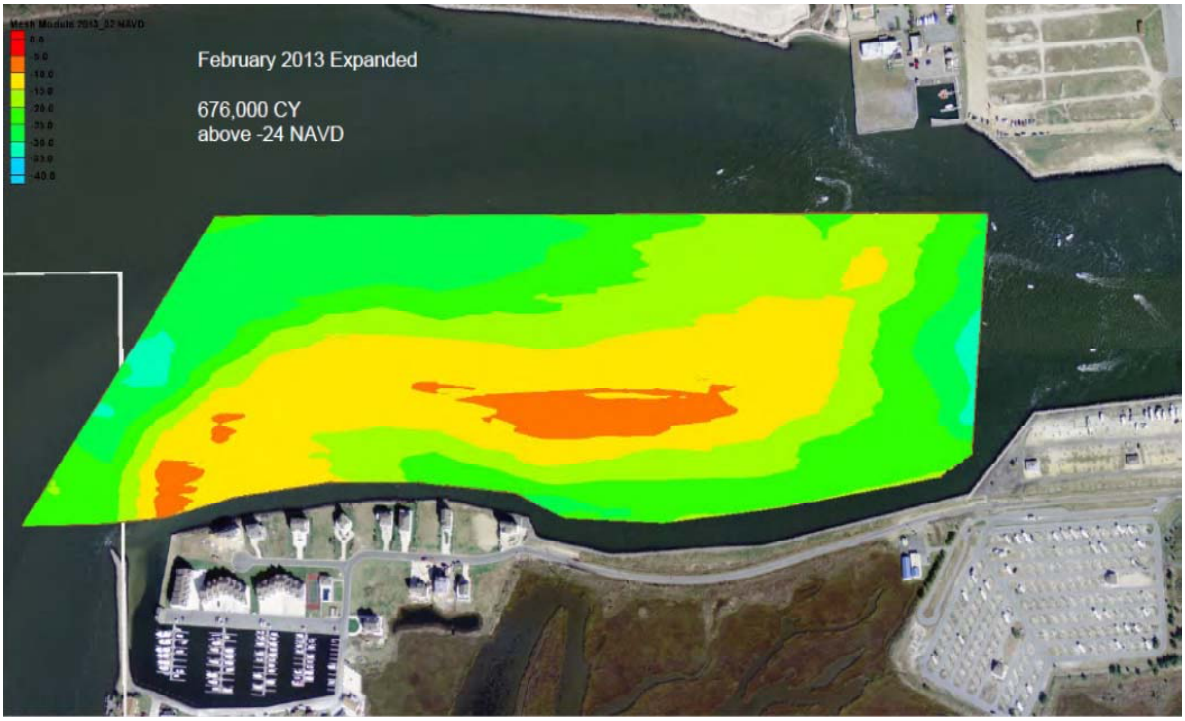


Figure 3. Flood shoal area showing existing bathymetry (February 2013). Proposed dredging depth is to -24 ft. NAVD and potentially includes entire colored area.

Trucking of material from sand quarries to the site

Adequate material is available and located inland in sand quarries. This material would be suitable to replenish sands lost on the beach and could be used to rebuild the dune system. This option would not be as desirable. Costs associated with transporting 500,000 plus cy of material at roughly 12 cy per truck, the wear and tear on the existing road system, increased emissions, and the increased traffic on an already congested roadway are all factors that negatively impact this project. Therefore, the trucking of materials is not recommended.

Contractors Staging Area

Regardless of the alternative used to replenish the beach contractor staging areas must be created. The alternatives for use of staging areas are, no staging area, and areas located directly under IRI bridge and on the beach approximately 2300 ft north of the jetty.

Staging Areas Under IRI Bridge

Two areas exist that were used by the contractor in the building of Indian River Inlet Bridge. These areas span two spaces directly under the newly constructed bridge and will be used as concurrent staging areas with an area on the beach. Storage of equipment and materials in these areas allots for mentioned items to be in close proximity to the location of proposed work. Problems arise as to daily movement of materials and equipment from these staging areas to the worksite, possible damage to the existing bridge could result from impacts and collisions from the movement of pipe sections and heavy equipment. A benefit is that these areas are already disturbed and no additional special measures would need consideration. (Figure 5)

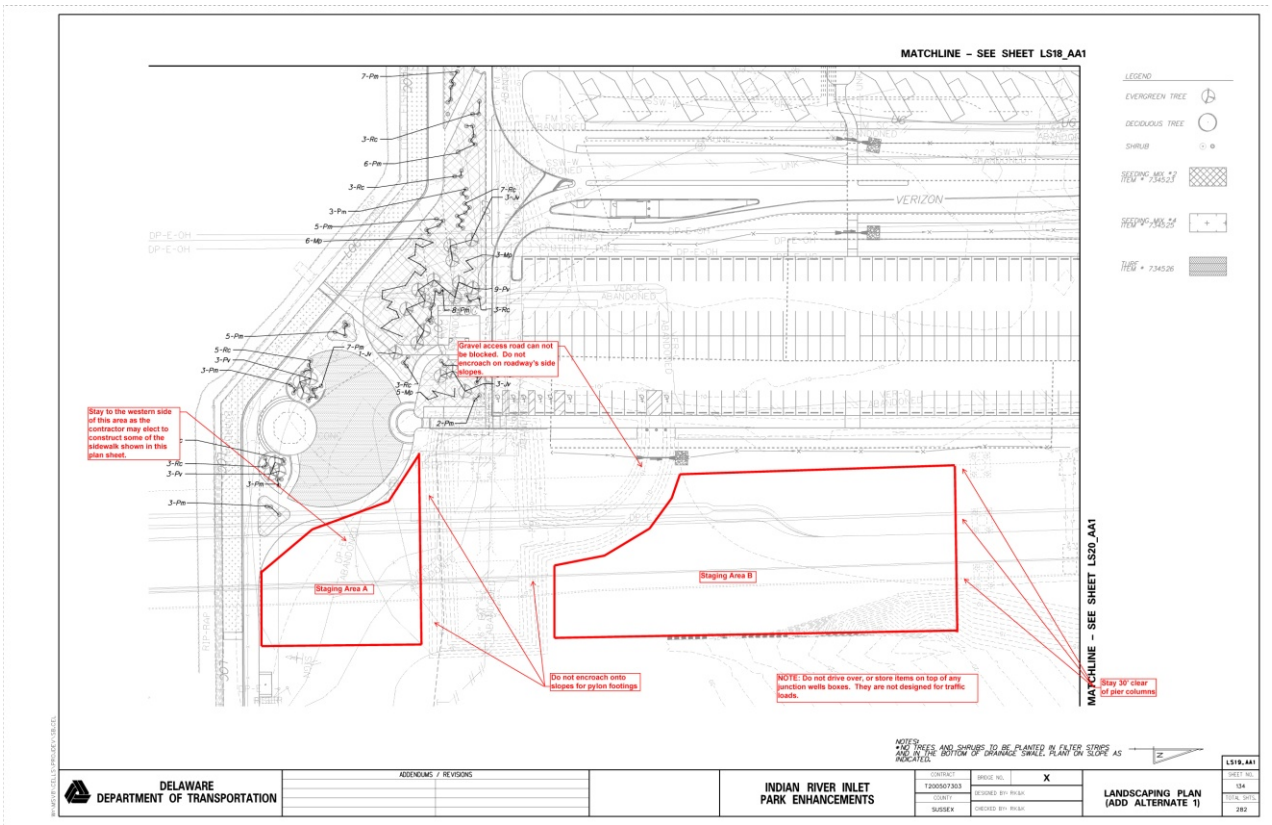


Figure 4: Proposed staging areas A and B under IRI bridge

Staging area on the beach

The concurrent staging area is a location on the beach roughly halfway up the proposed project area. The proposed staging area will be located 2,300 ft north of the jetty and encompass an area 40 ft long by 100 ft wide. Access to this area will be in the form of a temporary road that will be 25 ft wide by 100 ft long lined by geotextile and covered with gravel. Both access road and staging area will be delineated by 4-foot - plastic construction fence. The access road and staging area will be temporary in nature and will be removed when the staging area is no longer needed returning the beach and access road areas to pre construction conditions. Consultation with Delaware State Parks affirms that the likelihood of any threatened or endangered species in the area is unlikely, but surveys of the area for the federally listed piping plover and seabeach amaranth will be conducted prior to construction activity. A potential problem with the proposed area involves high tides as the area is located within the historical high tide zone. If an unseasonable or storm driven high tide occurs then equipment and materials will need to be relocated. (Figure 6).

Figure 5: Proposed staging area on beach

Photo 5: Indian River Inlet project area showing beach staging area

Preferred Design Alternative

The preferred design alternative for the project will be for dredging of the flood shoal area to a depth of -24 NAVD and beneficial use of dredged material to nourish the beach north of the jetty. This would be accomplished by dredging and filling of approximately 520,000 cubic yards of sand to restore a berm and dune system on the north shore for a length of approximately 5,200 linear feet beginning from the north jetty, and extending northward. The construction template will result in a 100 to 150-ft wide berm with an elevation of +9.0 ft NAVD and a foreshore slope of 5H:1V. The berm will have a dune on top with an overall dune crest elevation of +16.0 ft NAVD and width of 25 ft with 3H:1V slopes. The installation of dune fencing, crossovers and dune grass plantings would subsequently be conducted by the State of Delaware. A staging area will be needed for the contractor and a site designated 2,300 ft north of the jetty has been identified and will be used in conjunction with two areas located under the IRI bridge.

Overall, adverse environmental effects from dredging the flood shoal would be minor and short-lived for preferred alternatives. The beneficial use of dredged material would allow the immediate improvement of navigation in the Bay, as well as, protecting the shoreline north of the jetty there by preserving the newly constructed bridge and existing roadway from erosion. Environmentally, dredging the flood shoal has short-term, temporary impacts to the Indian River Inlet ecosystem, but should not have any long-term detrimental impacts on the area save the change from shallow water habitat to deep water habitat in the shoal area. The use of staging areas is beneficial to the project decreasing costs and emissions from the transport of personnel and equipment to the site. Environmental impacts from the staging areas will be minimal as the

area under the IRI bridge has been previously disturbed and the area designated on the beach has been scoured by hurricane Sandy lending to the belief that there exists very little chance of any threatened or endangered flora or fauna to be present in these areas. The preferred design alternative is the most cost effective and least environmentally damaging alternative that would meet the project goals. Representative plans (plan and cross section views) can be seen in Figures 7-10. In addition, a summary of the alternatives can be found in Table 1.

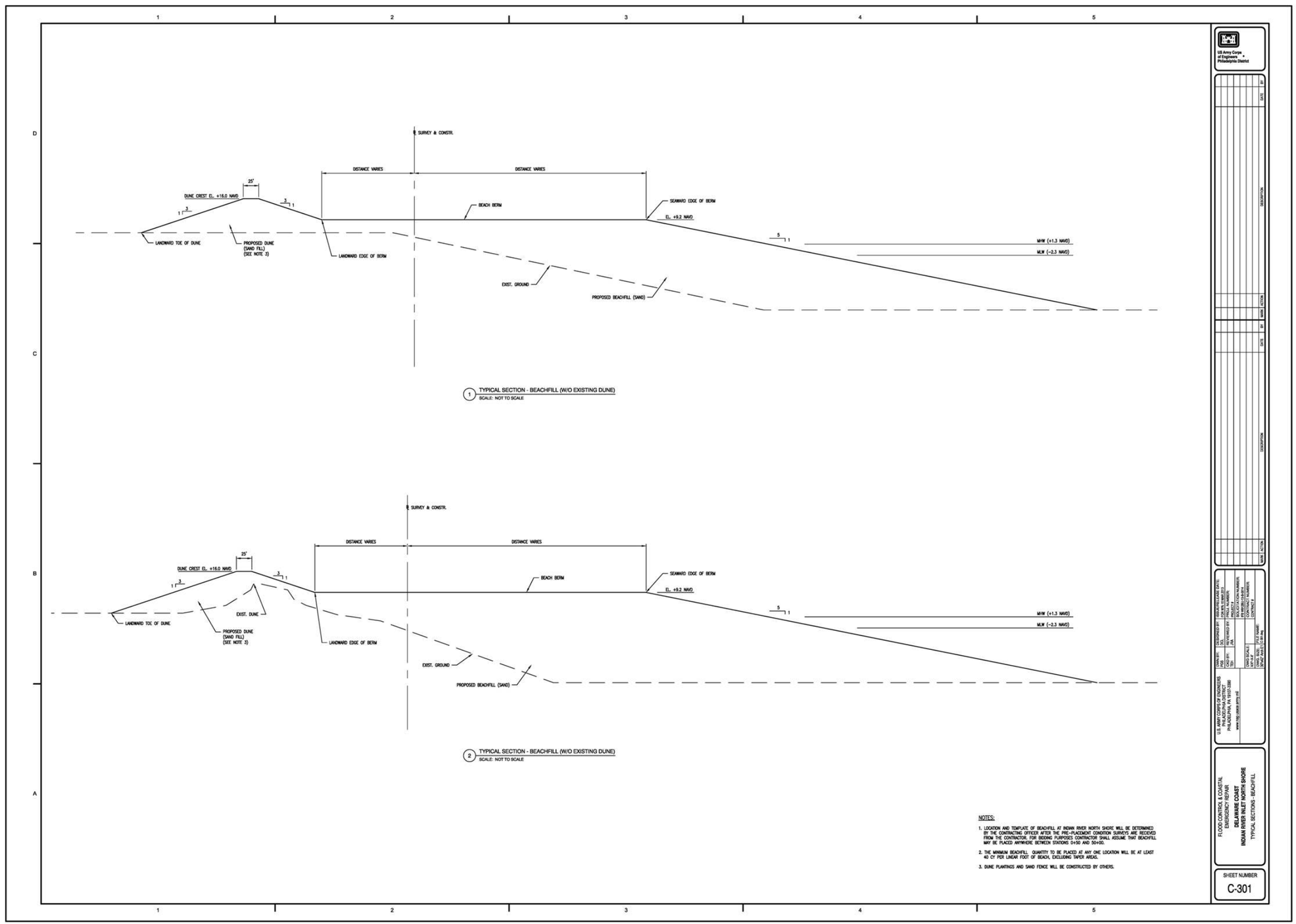


Figure 6: Typical cross section of Beach

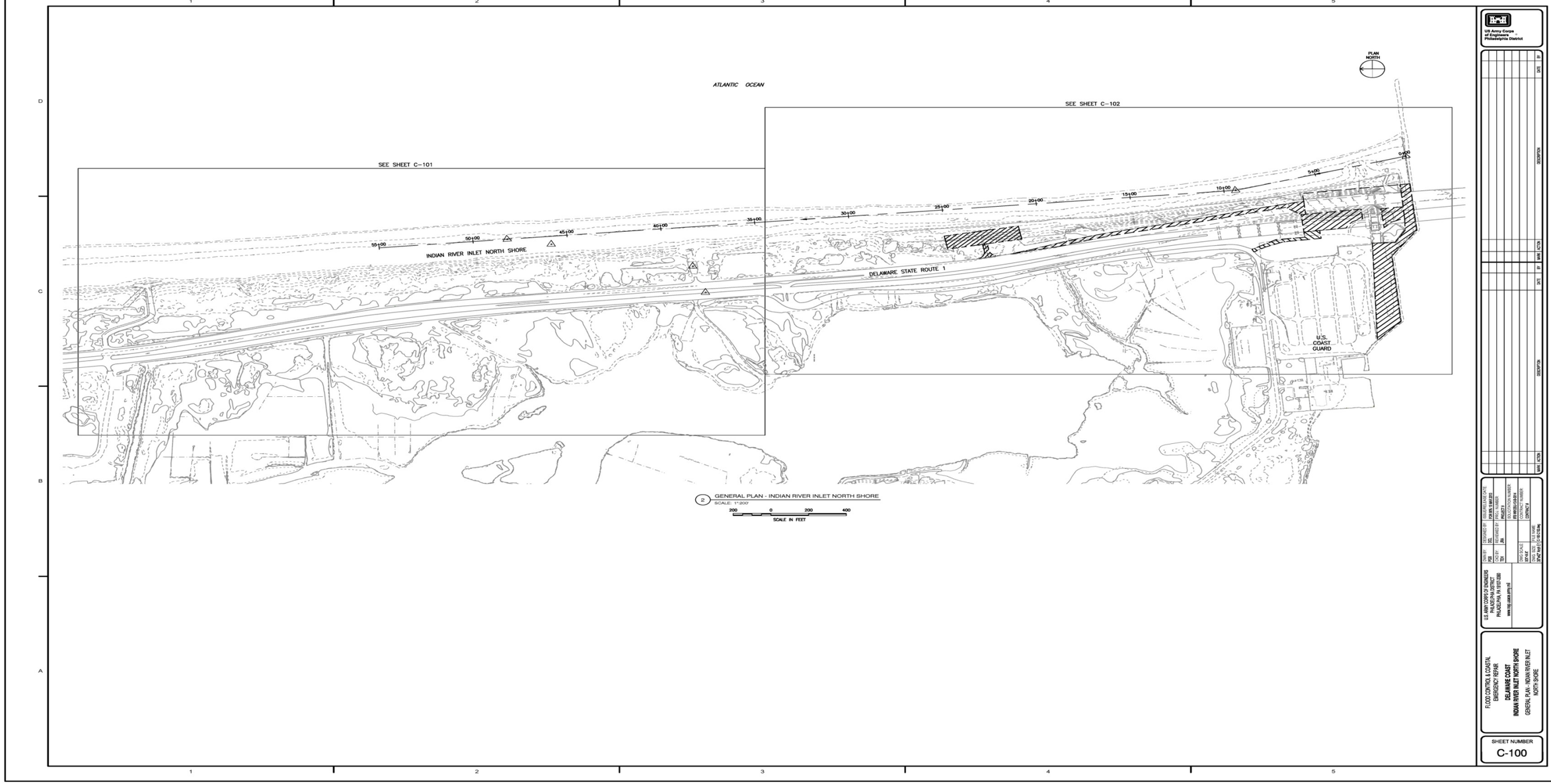


Figure 7: General Plan

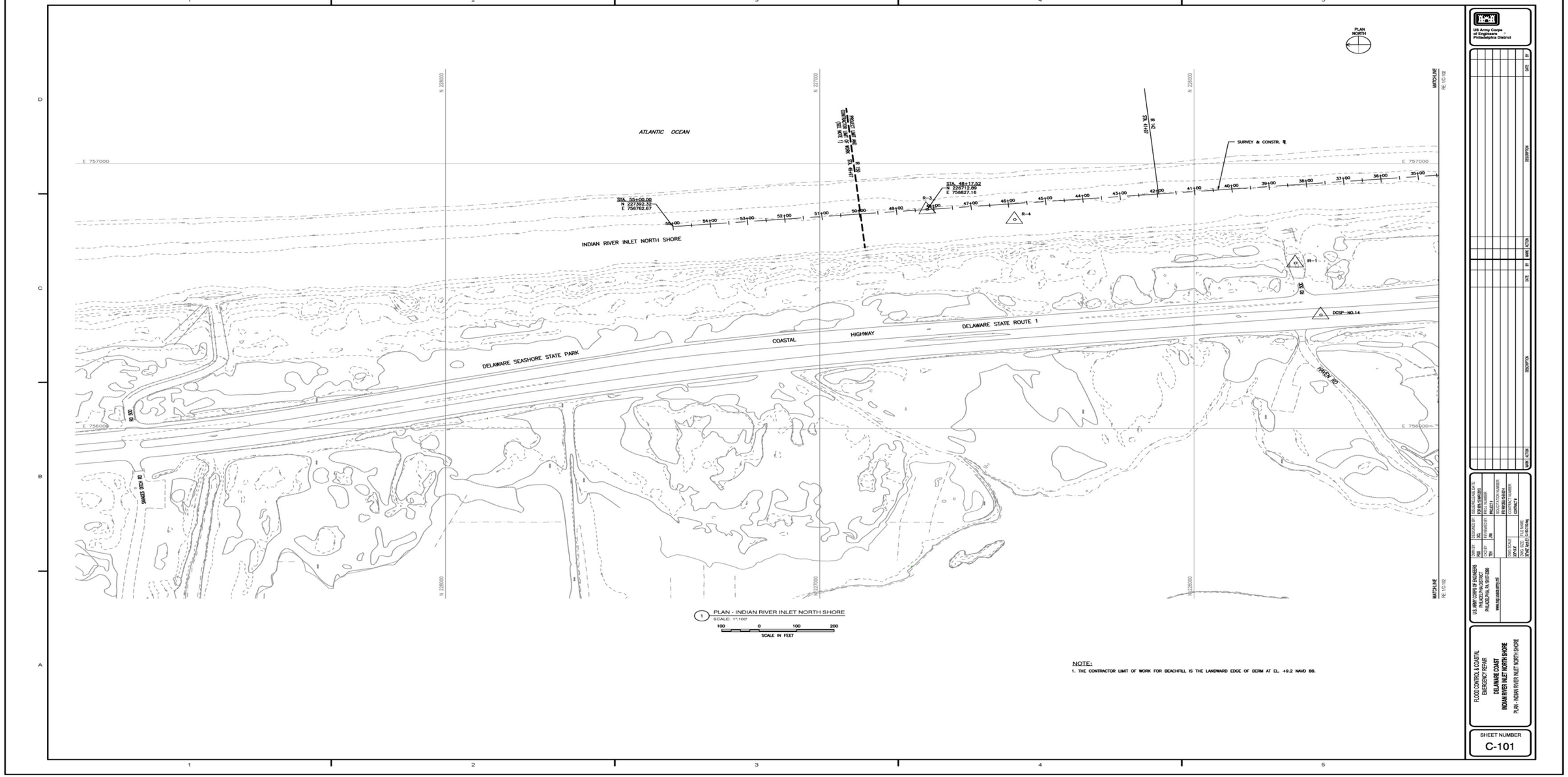
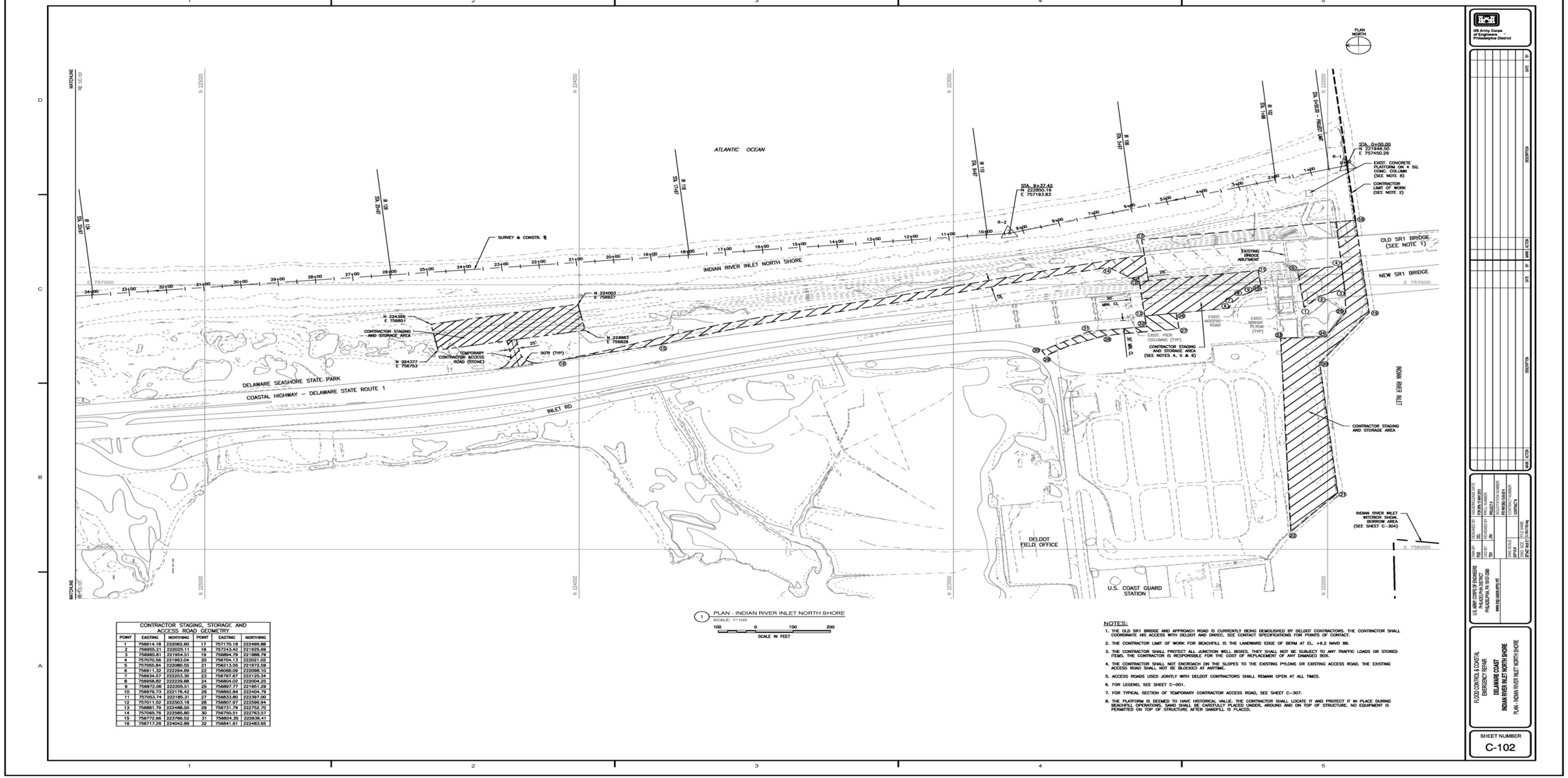


Figure 8: Plan view North Section



CONTRACTOR STAGING, STORAGE AND ACCESS ROAD GEOMETRY					
POINT	EASTING	NORTHING	POINT	EASTING	NORTHING
1	756914.18	223062.60	17	757170.18	222498.88
2	756955.21	222025.11	18	757243.42	221925.69
3	756985.81	221954.51	19	756894.79	221888.79
4	757070.56	221963.04	20	756704.13	222021.02
5	757055.84	222080.55	21	756213.55	221972.59
6	756911.32	222264.69	22	756098.09	222098.10
7	756934.57	222253.30	23	756797.67	222125.34
8	756958.82	222229.88	24	756804.02	222004.25
9	756972.06	222205.51	25	756897.77	221951.29
10	756979.73	222176.42	26	756892.84	222404.79
11	757053.74	222185.31	27	756833.80	222367.00
12	757011.52	222503.18	28	756807.97	222596.94
13	756881.79	222468.50	29	756731.79	222752.70
14	757065.78	222585.80	30	756750.51	222763.57
15	756772.96	223786.52	31	756824.35	222636.41
16	756717.29	224042.89	32	756841.61	222483.95

1 PLAN - INDIAN RIVER INLET NORTH SHORE
SCALE: 1"=100'
100 0 100 200
SCALE IN FEET

NOTES:

1. THE OLD SR1 BRIDGE AND APPROACH ROAD IS CURRENTLY BEING DEMOLISHED BY DELDOT CONTRACTORS. THE CONTRACTOR SHALL COORDINATE HIS ACCESS WITH DELDOT AND DNREC. SEE CONTACT SPECIFICATIONS FOR POINTS OF CONTACT.
2. THE CONTRACTOR LIMIT OF WORK FOR BEACHFILL IS THE LANDWARD EDGE OF BERM AT EL. +9.2 NAVD 88.
3. THE CONTRACTOR SHALL PROTECT ALL JUNCTION WELL BOXES. THEY SHALL NOT BE SUBJECT TO ANY TRAFFIC LOADS OR STORED ITEMS. THE CONTRACTOR IS RESPONSIBLE FOR THE COST OF REPLACEMENT OF ANY DAMAGED BOX.
4. THE CONTRACTOR SHALL NOT ENCROACH ON THE SLOPES TO THE EXISTING PYLONS OR EXISTING ACCESS ROAD. THE EXISTING ACCESS ROAD SHALL NOT BE BLOCKED AT ANYTIME.
5. ACCESS ROADS USED JOINTLY WITH DELDOT CONTRACTORS SHALL REMAIN OPEN AT ALL TIMES.
6. FOR LEGEND, SEE SHEET C–001.
7. FOR TYPICAL SECTION OF TEMPORARY CONTRACTOR ACCESS ROAD, SEE SHEET C–307.
8. THE PLATFORM IS DEEMED TO HAVE HISTORICAL VALUE. THE CONTRACTOR SHALL LOCATE IT AND PROTECT IT IN PLACE DURING BEACHFILL OPERATIONS. SAND SHALL BE CAREFULLY PLACED UNDER, AROUND AND ON TOP OF STRUCTURE. NO EQUIPMENT IS PERMITTED ON TOP OF STRUCTURE AFTER SANDFILL IS PLACED.

US Army Corps of Engineers
Philadelphia District

FLOOD CONTROL & COASTAL EMERGENCY/REPAIR
DELAWARE COAST
INDIAN RIVER INLET NORTH SHORE
PLAN - INDIAN RIVER INLET NORTH SHORE

SHEET NUMBER
C-102

Figure 9: Plan view South Section

Table 1. Comparison of Major Alternatives for Protecting the Delaware Seashore State Park Beach north of the jetty

Alternative	Potential Issues / Support	Cost	Benefits	Conclusion
No Action	-Does not solve the problem. -Existing structures at risk. (inlet bridge, roadway, jetty/beach) -Significant economic damages	$0	None	Not recommended.
Dredging of Inlet Flood Shoal Area (beneficial use of dredged material)	- Short-term environmental impact during dredging/filling to aquatic biota and wildlife. - Temporary turbidity plume during dredging/filling -Temporary impacts on recreation (fishing, surfing, etc.)	Low	-Storm damage reduction for critical infrastructure (IRI Bridge and Route 1 approach). - Provides for improved, safer navigation in the Inlet. - Provides deep water habitat in Inlet -Provides materials suitable for project with limited transportation costs	Recommended.
Off site trucking of materials to project	- Most costly - Does not improve navigation in the Inlet. -Increased wear and tear on roads -Increased traffic on local roads -Increased construction duration	High	-Storm damage reduction for critical infrastructure (IRI Bridge and Route 1 approach). - Will provide adequate amounts of material	Not recommended. Does not meet project goals.

5.0 Existing Environment

The project area is the southern interior shoreline of Indian River Inlet (flood shoal) and the Delaware State Park beach north of the jetty, located in Sussex County, Delaware. Figure 3 illustrates the existing bathymetric conditions in Indian River Inlet.

A geotechnical investigation of the Indian River Inlet Flood Shoal was conducted from 5/18/2009 through 5/20/2009 for the Philadelphia District. O'Brien & Gere, a sub-contractor for the Philadelphia District, was used to conduct the investigation, complete the boring logs and classify the samples. O'Brien & Gere contracted Uni-Tech Drilling Co., Inc. to perform the borings. Three borings were advanced through the shoal using standard penetration testing (SPT) and the drive and wash method. The location and percent composition of the samples collected from each of the borings is shown in the table 3 below. All of the borings were advanced to a depth of 24 ft below the top of the shoal. All of the samples collected from the top of the shoal to the maximum dredge depth for this project were classified as poorly graded sand (averaged over the three samples to be 94%) (Table 3).

Table 2. Soil Composition of Samples Collected from the Proposed Dredging Area.

Sample Number	Northing	Easting	Classification	Percent Gravel	Percent Sand	Percent Fines
KFB-32	221309	753626	24	0-6	90-98	1-3
KFB-33	221396	754203	24	0-2	93-98	1-5
KFB-34	221481	754802	24	0-11	85-98	1-3

Additional geotechnical investigations of the Indian River Inlet Flood Shoal were conducted on February 13, 2013 by the Philadelphia District Army Corps of Engineers. Five grab samples were taken at different locations of the flood shoal. Grab samples were taken at a depth of six inches and subjected to a sieve analysis. All of the samples taken at the grab depth of six inches showed poorly graded sands (averaged over five samples to be 98%) (Table 4)

Table 3. Soil Composition of Grab Samples Collected from Proposed Dredging Area

Sample Number	Northing	Easting	Classification	Percent Gravel	Percent Sand	Percent Fines
Sample #1	221270.95	754804.84	Grab	0	99.8	0.2
Sample #2	221256.66	753824.39	Grab	0	99.4	0.6
Sample #3	221277.54	755555.90	Grab	1.7	97.3	1.0
Sample #4	221527.54	754825.19	Grab	1.3	98.5	0.1
Sample #5	220969.21	754795.83	Grab	0.2	99.3	0.5

The Indian River Inlet flood shoal was sampled by coring in May of 2009. Three cores were cut to -24 NAVD. Logs report acceptable material existing to a depth of at least -20 NAVD. USACE assumes elevations of top of sand have been restored since the 2009-2010 dredging. Current elevations of the flood shoal suggest the presence of appreciable amounts of suitable material for beach replenishment. Materials that have deposited since the 2009-2010 dredging are not directly represented by core sample logs generated in 2009, but recent grab samples are very likely good representations of current shoal composition.

5.1 Fishery Resources

Surveys conducted in the 1960s in the project area identified 38 species in Indian River Bay. Five of those species accounted for 92% of the catch. These species were striped killifish (*Fundulus majalis*), Atlantic silverside (*Menidia menidia*), mummichog (*Fundulus heteroclitus*), winter flounder (*Pseudopleuronectes americanus*), and bay anchovy (*Anchoa mitchilli*). Although Indian River Bay does not support a commercial fishery, it indirectly contributes by serving as a spawning and nursery area for several economically valuable species. Species known to spawn in the bay include winter flounder, bay anchovy, Atlantic menhaden (*Brevoortia tyrannus*), Atlantic silverside, and hogchoker (*Trinectes maculatus*). Species known to use the upper estuary as a nursery area, include spot (*Leiostomus xanthurus*), weakfish (*Cynoscion regalis*), Atlantic menhaden, and bluefish (*Pomatomus saltatrix*). Recreational fishing in Indian River Bay is popular and sport fishes include winter and summer flounder, snapper (*Lutjanus campechanus*), blue fish, striped bass (*Morone saxatilis*), and blowfish (*Sphoerides maculatus*).

Essential Fish Habitat

Under provisions of the Magnuson-Stevens Act, areas along the Atlantic coast, including the proposed project area are designated as Essential Fish Habitat (EFH) for species with Fishery Management Plans (FMP's). The NMFS has identified EFH within 10' X 10' square coordinates. The study area contains potential EFH for various life stages for 21 species of managed fish. Table 5 presents the managed species and their life stage that EFH is identified in the Indian River Inlet area. The habitat requirements for the identified EFH species and their representative live stages are provided in Table 6.

Table 4. Summary of Essential Fish Habitat (EFH) Designation for Indian River Inlet (NMFS Website, 2009).

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*				X
haddock *(Melanogrammus aeglefinus)*				
pollock *(Pollachius virens)*				
whiting *(Merluccius bilinearis)*				
red hake *(Urophycis chuss)*	X	X	X	
white hake *(Urophycis tenuis)*				
redfish *(Sebastes fasciatus)*	n/a			
witch flounder *(Glyptocephalus cynoglossus)*				
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*				
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
ocean pout *(Macrozoarces americanus)*				
Atlantic sea scallop *(Placopecten magellanicus)*				
Atlantic sea herring *(Clupea harengus)*			X	X
monkfish *(Lophius americanus)*	X	X		
bluefish *(Pomatomus saltatrix)*			X	X
long finned squid *(Loligo pealeii)*	n/a	n/a		
short finned squid *(Illex illecebrosus)*	n/a	n/a		
Atlantic butterfish *(Peprilus triacanthus)*			X	X
Atlantic mackerel *(Scomber scombrus)*				
summer flounder *(Paralichthys dentatus)*		X	X	X
scup *(Stenotomus chrysops)*	n/a	n/a	X	X
black sea bass *(Centropristis striata)*	n/a		X	X
surf clam *(Spisula solidissima)*	n/a	n/a		
ocean quahog *(Artica islandica)*	n/a	n/a		
spiny dogfish *(Squalus acanthias)*	n/a	n/a		
tilefish *(Lopholatilus chamaeleonticeps)*				
king mackerel *(Scomberomorus cavalla)*	X	X	X	X

Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
sand tiger shark *(Carcharias taurus)*		X		X
Atlantic angel shark *(Squatina dumerili)*		X	X	X
Atl. sharpnose shark *(Rhizopriondon terraenovae)*				X
dusky shark *(Carcharhinus obscurus)*		X		
sandbar shark *(Carcharhinus plumbeus)*		X	X	X
scalloped hammerhead shark *(Sphyrna lewini)*			X	
tiger shark *(Galeocerdo cuvieri)*		X		

Table 5. Habitat Utilization of Identified EFH Species Identified in the Indian River Inlet (NMFS Website, 2009)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod *(Gadus morhua)*				Bottom habitats Rocks, pebbles, gravel Temps <10 C 29-34% salinity 10-150 m depth
red hake *(Urophycis chuss)*	Surface waters of inner continental shelf, peaks in June and July. Temps <10 C <25% salinity	Surface waters, peaks in Sept and Oct. Temps <19 C >0.5% salinity <200 m depth	Bottom habitats with shell fragments Temps <16 C 31-33% salinity <100 m depth	Bottom habitats in depressions (mud or sand) Temps <12 C 33-34% salinity 10-130 m depth
winter flounder *(Pleuronectes americanus)*	Bottom habitats (muddy sand, sand, gravel), February to June. Temps <10 C 10-30% salinity <5 m depth	Pelagic and bottom waters, March to July. Temps <15 C 4-30% salinity <6 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 10-30% salinity 1-50 m depth	Bottom habitats (mud, sand, gravel) Temps <25 C 15-33% salinity 1-75 m depth
windowpane flounder *(Scopthalmus aquosus)*	Surface waters, peaks May and Oct Temps <20 C <70 m depth	Pelagic waters, peaks May and Oct Temps <20C <70 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 5.5-36% salinity 1-100 m depth	Bottom habitats (mud or fine grained sand) Temps <26.8 C 5.5-36% salinity 1-100 m depth
Atlantic sea herring *(Clupea harengus)*			Pelagic waters and bottom habitats Temps <10 C 26-32% salinity 15-135 m depth	Pelagic waters and bottom habitats Temps <10 C >28% salinity 20-130 m depth
monkfish *(Lophius americanus)*	Surface waters, March to Sept Temps <18 C 15-1000 m depth	Pelagic waters, peaks March to Sept Temps 15 C 25-1000 m depth		

Table 5. Habitat Utilization of Identified EFH Species Identified in the Indian River Inlet (NMFS Website, 2009)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
bluefish *(Pomatomus saltatrix)*			Pelagic waters, Mid-Atlantic estuaries May to Oct Temps 19-24 C 23-36% salinity	Pelagic waters, Mid-Atlantic estuaries April to Oct Temps 14-16 C >25% salinity
Atlantic butterfish *(Peprilus triacanthus)*			Pelagic waters, estuaries spring to fall Temps 3-28 C 3-37% salinity 1-365 m depth (most <120)	Pelagic waters, estuaries summer to fall Temps 3-28 C 4-26% salinity 10-365 m depth (most <120)
summer flounder *(Paralichthys dentatus)*		Pelagic waters, peaks May and Oct Temps 9-12 C 23-33% salinity 10-70 m depth	Demersal waters (mud, but prefers sand) Temps >11 C 10-30% salinity 0.5-5 m depth	Demersal waters and estuaries 0-25 m depth
scup *(Stenotomus chrysops)*			Demersal waters, spring and summer in estuaries and bays Temps >7 C >15% salinity 0-38 m depth	Demersal waters and inshore estuaries Temps >7 C >15% salinity 2-185 m depth
black sea bass *(Centropristis striata)*			Estuaries in spring and summer; rough bottom, shellfish, and eelgrass beds Temps >6 C >18% salinity 1-38 m depth	Inshore estuaries from May to Oct; structured habitat sand and shell substrates preferred Temps >6 C >20% salinity 20-50 m depth
king mackerel *(Scomberomorus cavalla)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
Spanish mackerel *(Scomberomorus maculatus)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
cobia *(Rachycentron canadum)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity
sand tiger shark *(Odontaspis taurus)*		Shallow coastal waters <25 m depth		Shallow coastal waters <25 m depth
Atlantic angel shark *(Squatina dumerili)*		Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth
Atl. sharpnose shark *(Rhizoprionodon terraenovae)*				Shallow coastal waters <25 m depth

Table 5. Habitat Utilization of Identified EFH Species Identified in the Indian River Inlet (NMFS Website, 2009)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
dusky shark *(Carcharhinus obscurus)*		Shallow coastal waters, inlets, and estuaries <25 m depth		
sandbar shark *(Carcharhinus plumbeus)*		Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth	Shallow coastal waters <50 m depth
scalloped hammerhead shark *(Sphyrna lewini)*			Shallow coastal waters <200 m depth	
tiger shark *(Galeocerdo cuvier)*		Shallow coastal waters <200 m depth		

5.2 Aquatic and Terrestrial Biological Resources

The invertebrate community in the vicinity of Indian River Inlet is productive and diverse. Sampling in this area conducted in the 1970s identified blue crabs (*Callinectes sapidus*), hydroids, bryozoans, snails, limpets, polychaete worms, hermit crabs, lady crabs (*Ovalipes ocellatus*), and amphipods. The hard clam (*Mercenaria mercenaria*) was found within one mile of the west end of the inlet channel. This is the most commercially valuable shellfish resource in Indian River Bay, though production has declined due to extensive harvesting and a lack of suitable substrate. The number of commercial oyster landings has also declined, and blue crabs are only harvested for recreation.

This portion of Indian River Bay is highly utilized by waterfowl, sea, and wading birds. The most common species of waterfowl are American brant (*Branta bernicla*), canvasback (*Aythya valisineria*), scaup (*Aythya affinis*) , scoter (*Melanitta americana*) , and merganser (*Mergus merganser*) . Other avifauna using this area include heron (*Ardeidae sp*.), egret (*Egretta sp*.), rail (*Rallidae sp*.), sandpiper (*Scolopacidae sp*.), osprey (*Pandion haliaetus*), and tern (*Sternidae sp*.).

Marine mammals, which are indicative of the coastal zone may occur in and around the project area; however, they are typically migratory in nature and not likely to stay in the project area.

The Delaware Seashore State Park shoreline and dune ecosystem supports a variety of species. Common avians include many species of gull to include the herring gull (*Larus smithsonianus*), laughing gull (*Leucophaeus atricilla*), and terns (*Sternidae sp*.). Other avians common to the dune and shore area vary on the time of year, but encompass a wide range of species including: sandpipers like the killdeer (*Charadrius vociferus*), wrens such as the Carolina wren (*Thryothorus ludovicianus*) and a multitude of migratory song birds including but not limited to: warblers, sparrows, robins, and finches. The dune and upper beach area supports many terrestrial species including the ghost crab (*Ocypode quadrata*), velvet ant (*Mutillidae sp*.), and wolf spider **(***Lycosidae sp*.) and is host to many coastal plant communities. The predominant vegetation growing on the existing dune areas consists of American beachgrass (*Ammophila breviligulata*), seaside goldenrod (*Solidago sempervirens),* sea rocket (*Cakile dentata*) and beach clotbur (*Xanthium echinatum*). Because most of the dune present within the affected area is a primary dune, fauna inhabiting the dune is scarce, but may include several species of passerine birds, and typical mammalian species such as the eastern cottontail (*Sylvilagus floridanus*). Some of the plants found on the dune may also be found on the upper beach, which transitions into a mostly barren area above the high tide line with little biological activity. Several species of gulls (*Larus* spp.) may be present within the upper and lower beach and may be observed feeding on carrion, plant matter or invertebrates within the beach wrack. The lower beach including the intertidal zone is

frequently inhabited by shorebirds including sanderling (*Calidris alba*), semipalmated sandpiper (*C. pusilla*), and western sandpiper (*C. mauri*), which utilize these areas to feed on invertebrate infauna.

Delaware Seashore State Park contains a number of interdunal wetlands that have formed within depressions or blow out areas between dunes. These wetlands represent unique valuable habitats in the marine coastal areas that exhibit freshwater bog-like conditions. A review of the National Wetlands Inventory identified one area (a palustrine scrub-shrub wetland) within the project area located about 2,200 feet north of the inlet. However, this wetland has since been eliminated due to erosion and overwash, and is currently a flattened sandy area with sparse vegetation (personal communication with Eileen Butler- DE State Parks on 3/20/2013). This location is proposed as a temporary staging area for this project.

5.3 Air and Water Quality

Ambient air quality is monitored by the Delaware Department of Natural Resources and Enviromental Control‘s (DNREC) Division of Air and Waste Management and is compared to the National Ambient Air Quality Standards (NAAQS) throughout the state, pursuant to the Clean Air Act of 1970. Six principal "criteria" pollutants are part of this monitoring program, which include ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM10 and PM 2.5), and lead (Pb). Sources of air pollution are broken into stationary and mobile categories. Stationary sources include power plants that burn fossil fuels, factories, boilers, furnaces, manufacturing plants, gasoline dispensing facilities, and other industrial facilities. Mobile sources include vehicles such as cars, trucks, boats, and aircraft.

Sussex County, Delaware within which the Federal Action will take place is classified as moderate nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). The Indian River Inlet project site is within the Philadelphia-Wilmington-Atlantic City Nonattainment Area (PA-NJ-DE-MD).

Indian River Bay is an estuary fed by freshwater streams and tidal flushing from the Atlantic Ocean. Freshwater inflow is estimated to be on the order of one percent of the volume attributed to tidal flushing. Freshwater inflow comes into the bay through three major tributaries. Tides are semidiurnal with a mean range of 2.3 feet at the U.S. Coast Guard Station gage at the inlet.

Water quality in Indian River Bay is generally good and considered suitable for primary contact recreation. Mild eutrophication, resulting in increased primary productivity, is common in the shallow open bay during the summer. This eutrophication is attributed to non-point source pollution such as fertilizer runoff and malfunctioning septic systems.

5.4 Hazardous, Toxic and Radioactive Waste (HTRW)

A review of the Delaware Environmental Navigator (DEN) (http://maps.dnrec.delaware.gov/navProgramMap/) was conducted on March 19, 2013 to identify any areas of concern that may contain HTRW. This review identified three SIRS (Site Investigation and Restoration Site) sites, leaking underground storage tanks (LUSTS), underground storage tanks (USTS), above ground storage tanks (ASTS) and an NPDES (National Pollution Discharge Elimination System) discharge.

Three sites are listed in the Delaware’s SIRS database that are identified in the general vicinity of the project. One site is the discovery of a chlorine gas cylinder at Delaware Seashore State Park near Indian River Inlet (DE -026) in 1992. In a memo from DNREC dated April 21, 2010, the disposal action was completed in 1992 and the status is now inactive.

A second site, The Indian River Life Saving Station (IRLSS) property (DE-1349), is about 4,000 feet to the north of the beachfill project boundary. The IRLSS is a historical property that was once used by the United States Lifesaving Service, which was later changed to the U.S. Coast Guard. This property was later turned over to the DNREC

Division of Soil and Water Conservation for offices and storage of heavy equipment, which vacated the site in the mid-1990's. The site now houses a museum and gift shop. Due to the presence of leaking underground storage tanks (LUSTS), this site was part of a preliminary assessment and site investigation. Remedial activities were conducted in 1998 where three UST's were removed along with 38 tons of petroleum-impacted soils from the site. This action included the backfilling of clean soil. Based on this, the Delaware UST Management Branch issued a "No Further Action Required" letter with a cautionary note requiring that a Contaminated Soil Management Plan be developed in the event of future intrusive activities at the site. Recent sample results show slightly elevated levels of arsenic, iron and some petroleum hydrocarbons within the location of the former USTs, but no widespread areas of contamination. Based on this information, the EPA does not anticipate any further action under the Federal Superfund Program unless new information or conditions change that warrant further Superfund consideration (letter from U.S. EPA Region III to DNREC dated 2/20/2008).

A third site is the North Artillery Range, which is part of the Formerly Used Defense Sites (FUDS) program (C03DE006402), is about 6,000 feet to the north of the beachfill project boundary. This site is approximately 364 acres in size, and was used as an automatic weapons firing point for anti-aircraft target practice by the U.S. Army. This site is now part of Delaware Seashore State Park. A Site Inspection Report (USACE, 2010) investigated the potential for munitions and explosives of concern (MEC) and munitions constituents (MC) at the site. The types of munitions identified in this report that were likely used at this range include small arms, 40 mm HE (high explosive) HEI (high explosive incendiary), Mark II and 3.25 –inch target rockets, MK1. After a thorough inspection of the property, which included sampling the soils and sediments for explosives and explosive residues and metals, this investigation concluded that the land portion of this site has no reports of MEC or MD (munitions debris) that are known to exist; and surface soil, subsurface soil and sediment analyses yielded no explosive MC detections. This report further concluded that no Chemicals of Potential Concern (COPC) or Chemicals of Potential Ecological Concern (COPEC) were identified in any of the media at this site.

Two LUSTS were identified in the vicinity by the DEN. One of the LUSTS sites is at the Indian River Life Saving Station (discussed above) where three tanks were removed in 1998. The other LUST was identified at the U.S. Coast Guard Station (N9110231) in Indian River Inlet where an underground storage tank was removed in 1990. A letter from DNREC Division of Air and Waste Management (dated 10/10/91) concluded that residual "low levels of contamination near the tank location pose no threat to human health or the environment, and no further action is required at the present time"

.

Several existing underground storage tanks (USTs) in the general project vicinity were identified by the DEN at the Coast Guard Station, Indian River Life Saving Station, Old Inlet Bait and Tackle, South Shore Marina, and the DNREC sand bypass facility. Above ground storage tanks (ASTs) were identified at the Indian River Sand Bypass Facility, Indian River Inlet Delaware Seashore State Park, U.S. Coast Guard Station, the Indian River Inlet Bridge Area, and the Indian River Life Saving Station. No further information was available on the DEN for these AST or UST locations.

One historical NPDES wastewater discharge was located in the inlet area and was operated by the Delaware Seashore State Park. This discharge was discontinued in 2000, and is now treated through the Sussex County South Coastal Wastewater Treatment Facility.

5.5 Threatened and Endangered Species

Based on previous coordination of USACE projects in the Indian River Inlet area (2009), it is likely that there are no endangered or threatened species in the project area. Discussions with Delaware Seashore State Park staff, Delaware Natural Heritage Program and U.S. Fish and Wildlife Service determined that there was no recent history of endangered or threatened species on the beach within the project area; though it is possible with the change in beach conditions that the area may become attractive to the Federally listed piping plover (*Charadrius melodus*), and based on historical evidence that the seabeach amaranth (*Amaranthus pumilus*) has a tendency to appear on disturbed areas after storm events. Surveys of the respective areas will need to be conducted prior to construction. In addition, there are no impacts anticipated for State-listed species in the project area; however, Section 7 consultation for the Federally listed species under the Endangered Species Act will be concluded prior to project construction.

5.6 Cultural Resources

Project Area of Potential Effect
The Area of Potential Effect (APE) of the selected alternative includes the dredging of the Indian River Inlet Flood Shoal. It also includes beach nourishment activities along 5,200-foot long section of shoreline north of the Indian River Inlet with access and staging.

Archaeological Resources

There are a significant number of prehistoric and proto-historic archaeological sites recorded within the larger Indian River and Bay area. Four of these sites are listed on the National Register of Historic Places. They include the Townsend Island Site, the Possum Point Site, and Swan Creek (No. 2) Site which together comprise the Indian River Middle Woodland Archaeological complex. The fourth prehistoric archaeological resource is the Poplar Thicket Site. All of these sites fall outside of the current project's area of potential effect.

The 1978 Cultural Resources Overview by Gilbert/Commonwealth of Indian River and Bay designated the original (1987) shoreline protection project area as a low sensitivity zone with respect to prehistoric archaeological resources. The Philadelphia District's 1984 Environmental Assessment noted that the entire surface north of the inlet now appears to be covered by dredged material of varying depths. An on-site inspection of the project area by the District Archaeologist in 2004 revealed no cultural deposits exposed in the eroding shoreline.

Historic Resources

Four historic properties are located in the general area: White House Farm, Prince George Chapel, the Isaac Harmon Farm, and the Indian River Life Saving Station. White House Farm is an early eighteenth century brick plantation house on the north side of Indian River Bay that is oriented towards the river. Prince George Chapel is a mid-eighteenth century wood frame public structure in the community of Dagsboro. The Isaac Harmon Farm is a mid-nineteenth century vernacular structure on the Nanticoke Indian community north of Indian River. The Indian River Life Saving Station is a late nineteenth century wood frame structure of Victorian design located north of the bay inlet on the Atlantic coast. All of these historic properties are outside of the current project's APE.

There is a submerged concrete structure (the foundation of an old Coast Guard observation tower), which is exposed annually due to wind and wave action. This structure alone does not appear to be eligible for listing on the National Register of historic places.

5.7 Recreation

Many forms of recreation occur in the project area. The significant forms of recreation that take place within the project include but are not limited to recreational fishing, occupation of the beach, collection of historical artifacts in the form of colonial half pennies, and surfing as the area north of the inlet jetty is considered as a premier Delaware

surfing destination.

6.0 Environmental Impacts

6.1 Fishery Resources

Direct impacts on most finfish would be minimal due to their ability to avoid the dredging equipment and project area during the construction period. The dredging operation will increase turbidity levels on a short-term basis, which could reduce fish utilization of the project area. There will be a permanent loss of benthic organisms. In addition, a temporary disturbance to the area could limit the quantity of food organisms available to some species of fish. Fish populations would most likely utilize a different portion of the bay and return after the disturbance is completed. Many of the benthic organisms represent a food source for resident and migratory fish. Initial elimination of the benthic community through dredging would reduce the amount of forage habitat for some fish species within the immediate affected area. This effect is expected to be short-term as bottom-feeding fish would shift to other similar nearby unaffected or recolonized areas and then return to the area to feed after benthic recolonization occurs.

Essential Fish Habitat

Assesment: Based on the listed habitat utilization by the designated EFH species (see Section 5.2), it appears that most of the species will not be found in the immediate project area, due to a depth requirement or the fact that they are very migratory in nature (i.e, the sharks). There is the potential for a few species to be found in the project area and these would include: winter flounder, windowpane flounder, summer flounder, scup, king mackerel, Spanish mackerel, and cobia. Most of the listed fish species are not estuarine resident species and therefore only utilize this area on a seasonal basis, primarily in the warmer summer months. During the summer months the estuary is typically utilized as a forage area for juveniles and adults and nursery area for larvae and young of the year life stages. The only apparent exception to this is winter flounder which spawns in the estuary, generally from February through June. The proposed dredging is scheduled to be undertaken in early to late Summer 2013 (June-Sept). Since adults and juveniles of the listed species are mobile, it is expected that they will avoid the areas of disturbance and therefore will not be impacted. Young of the year and larval stages of some species will be directly impacted specifically for summer flounder. There is a potential that the dredging activities will adversely impact young of the year and larval summer flounder in the proposed area. As per personal communication with NMFS and DNREC Division of Fish and Wildlife a onetime waiver will be given to allow dredging in the project area during the time of year that these life stages will be most vulnerable. This allowance is being given based on the emergency nature of the project and the need to replace sands which protect the roadway and newly constructed bridge. In addition, the dredged areas would be available for deposition of winter flounder eggs in subsequent years after the dredging activities are completed.

Cumulative Effects on Essential Fish Habitat: USACE, DNREC, and NMFS anticipate limited cumulative effects associated with this project on EFH and managed species. Direct impacts will be encountered by the summer flounder life stages that inhabit the flood shoal area during the dredging, but with the emergency nature of the project the impact is being waived. The project will change the habitat for fish from a shallow shoal and trough area to a sandy bottom area. This will probably result in a change in species utilizing the area. We conclude that the project will have a limited direct effect on EFH and not result in cumulative impacts to EFH.

Conclusion: Based upon the project design, the minimal long-term impacts associated with dredging operation the Corps believes that the potential adverse impacts to EFH will not be substantial. In addition, the emergency action is necessary and a waiver of dredging window restrictions was requested from DNREC and NMFS. A verbal ok for a one-time waiver was given during a telephone conservation (March 6, 2013) with DNREC Fish and Wildlife (Edna Stetzer and John Clark) and the National Marine Fisheries Service (Karen Greene and Danielle Palmer).

6.2 Aquatic and Terrestrial Biological Resources

Initial construction activities would result in a loss of some benthic organisms, especially non-motile species in the immediate vicinity through burial or displacement. This would be a short-term impact as benthic recovery normally begins soon after the disturbance has ended, and is usually completed within a few months to a few years. Bowen and Marsh (1988) compared a recently dredged offshore borrow pit for beach renourishment with a 5-year old borrow pit, and determined that relative to the old pit, the new pit showed complete recovery within a year based on several aspects of community structure, but differences in species composition were evident. USACE (2001) conducted benthic investigations of borrow areas off of the northern New Jersey coast and concluded that after initial impacts on the infaunal assemblage, including decreases in abundance, biomass, taxa richness and the average size of the biomass dominant; the abundance, biomass, and taxa richness recovered quickly after the first dredging operation with no detectable difference between the dredged and undisturbed areas by the following spring. It can be expected that after the dredging operation, the affected areas would first be colonized by surface-dwelling opportunistic species. This may gradually change within a few years to a more-deeper burrowing community composed of larger-sized organisms. The long-term impact to the benthic community would not be significant due to the availability of a similar sandy substrate. Since Hurricane Sandy removed the preexisting dune system through wind and wave action, the communities of organisms that typically inhabited the dune systems are virtually nonexistent and only limited impacts will result through burial of species clinging to the area. The majority of terrestrial and avian species, which inhabit the shoreline area are highly mobile, and should experience limited impacts as beach nourishment and dune building take place. Once the dune system has been rebuilt and beach sands replenished, the shoreline ecosystem will have been returned to its pre-storm state allowing for the common residents of the ecosystem to re-colonize the area.

6.3 Air and Water Quality

General Conformity Review and Emission Inventory
Indian River Inlet

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal Actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Indian River Inlet, the Federal Action is to conduct dredging in the Indian River Inlet and Bay channel and beneficially use the dredged material to replenish beach sands on the Delaware Seashore State Park beach north of the jetty. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction. Sussex County, Delaware within which the Federal Action will take place is classified as moderate nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). The Indian River Inlet project site is within the Philadelphia-Wilmington-Atlantic City Nonattainment Area (PA-NJ-DE-MD).

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project would not be funded with Federal Highway Administration money and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Indian River Inlet Maintenance Dredging and Beneficial Use project must be compared to the GC trigger levels presented below.

Pollutant	General Conformity Trigger Levels (tons per year)
NOx	100
VOCs	50

Table 1 (see Appendix A) provides the NOx and VOC emission factors selected for each equipment/engine category

and shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

hp-hr = # of engines*hp*LF*hrs/day*days of operation

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

emissions (g) = power demand (hp-hr) * emission factor (g/hp-hr)

emissions (tons) = emissions (g) * (1 ton/907200 g)

Tables 2 and 3 (see Appendix A) present the emission estimates for NOx and VOCs, respectively. The tables present the emissions from each individual equipment/engine category and the combined total. Table 4 (Appendix A) presents the pollutant emissions from employee vehicles and also summarizes the total emissions for the project.

The total estimated emissions that would result from construction of the Indian River Inlet Maintenance Dredging and Beneficial Use of Dredged Material Project are 15.8 tons of NOx and 2.2 tons of VOCs. These emissions are below the General Conformity trigger levels of 100 and 50 tons per year for each pollutant. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOCs) in a Moderate Nonattainment Area (100 and 50 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

Impacts to water quality are considered to be short-term and minor. Turbidity and sedimentation resulting from the construction would be minor due to the heavy nature of the sandy dredged material, USACE anticipates that there would be no long-term adverse impacts to water quality resulting from the project.

Dredging within the borrow area may encounter anoxic sands, which could initially appear darker in color and produce a sulfurous odor (hydrogen sulfide gas) on the recipient beach. This effect would be short-lived as the sands would quickly oxidize and bleach out in the air and sunlight.

6.4 Hazardous, Toxic and Radioactive Waste (HTRW)

A review of the DEN identified several sources of potential HTRW in the general vicinity of the project. Based on the documentation of remedial activities and distances away from the project activities, it is unlikely that HTRW would be encountered during project construction activities.

6.5 Threatened and Endangered Species

Impacts to state or federally endangered or threatened species are not anticipated from this project. There are four species which may occur in the project area and include: Atlantic sturgeon (*Acipenser oxyrinchus*) , loggerhead turtle (*Caretta caretta*), piping plover, and seabeach amaranth. As per communication with National Marine Fisheries Service (NMFS) and DNREC, the possibility of impacting the Atlantic sturgeon and loggerhead turtle are minimal as these species are mobile and are not likely to interact with hydraulic pipeline dredges. The historical occurrences of piping plover and seabeach amaranth on Delaware beaches will need to be accounted for and surveys for the species will need to be conducted prior to construction beginning. If beach surveys turn out to be negative, the U.S. Fish and Wildlife Service (FWS) believes that no threatened or endangered species under their jurisdiction are likely to occur in the project impact area (G.Ruddy, Personal Communication, 2013). Should either species be found, buffer zones will be erected to create a protective area as per Federal regulation. Coordination under Section 7 of the Endangered Species Act with NMFS is in process and will be completed prior to project construction.

6.6 Cultural Resources

Prior to the dredging of the flood shoal in 2010, maintenance dredging of the IRI federal channel has not been completed by the USACE in 25 years. The flood shoal area proposed for dredging at IRI has been dredged, in whole or in part, on six occasions since 1970 for purposes of obtaining sandy beachfill for the chronically eroding ocean beach north of IRI or for filling in deep scour holes, but not for purposes of improving navigation through IRI. The dates and dredged quantities of these five operations are: 1973 ~774,000 cy, 1975 ~143,000 cy, 1978 ~700,000 cy, 1984 ~468,000 cy, and 1990 ~175,000 cy, and 2010 ~220,000 cy . The typical dredged depth of these previous dredging operations was -20 ft MLW. The proposed depth for this action is -24 ft. NAVD. Since this is deeper than what was previously dredged, there is a possibility of buried shipwrecks within the APE; however, based on the results of previous surveys of the area, the probability is relatively low.

There are no recorded archaeological sites along the 5,200-ft stretch of shoreline eligible for or listed on the National Register of Historic Places. The placement of sand along this stretch of shoreline will have no effect on historic properties.

Based on the above information and the historical dredging that has occurred in the project APE, the USACE has determined that the selected alternative will have no adverse effect on historic properties eligible for or listed on the National Register of Historic Places. Since there is a potential for submerged cultural resources below the previously dredged depth of -20 ft MLW, the USACE recommends using an Archaeological Monitor during all beach fill activities.

The selected alternative APE, the USACE determination and the archaeological monitoring plan will be coordinated with the Delaware State Historic Preservation Office, the Delaware Nation, the Delaware Tribe, the Eastern Shawnee, the Oneida Nation, the Stockbridge Munsee Community of Mohican Indians, and other consulting parties.

6.7 Recreation

Impacts to recreation in the area will be moderate to severe during construction, but short term in nature. Fishing from the jetty will be temporarily impacted due to construction activity. Beach goers who utilize the beach north of the jetty for recreation will need to relocate as sands are distributed and the dune system is rebuilt. Sand distribution and dune rebuilding take place during daylight hours when tides allow and it is unsafe for recreational enthusiasts to be in close proximity to the equipment being used to conduct such work. To minimize construction hazards, beachfill segments are typically fenced off to the public in sections of about 1,000 ft. Once the beachfill operation in a segment is completed (typically in 1-2 weeks), the fencing is removed, and recreational activities may resume. The addition of sands to the beach will also impact artifact collectors that use this area for the collection of colonial half pennies. This area is also known as “coin beach” and regularly draws enthusiasts looking for the coins. Surfing is a popular activity in this area. Surfers will not be impacted by construction activities other than accessing the beach as the nature of surfing leaves surfers in the off shore environment. It is worthy of note that there is a concern for the potential to affect the surf break on the north shore. Based on the quantities of sand to be placed and the method of placement, a temporary shore break may exist within this area immediately after construction. However, this shore break is expected to adjust and flatten out as the waves and currents re-shape the beach profile. This is supported by the fact that the construction template will not exceed previous beachfills in the area, and that the grain sizes of the beachfill (fine to medium sands) will favor a flatter beach profile. Based on the time constraints allotted for the project and the time frame given for completion, impacts to recreation will be short term and have no long term effects.

7.0 Relationship of Selected Plan to Environmental Requirements, Protection Statutes, and Other Requirements

In accordance with Section 401 of the Clean Water Act, a Water Quality Certification has been requested from DNREC. Based on the information gathered during the preparation of the Environmental Assessment, and the application of appropriate measures to minimize project impacts, USACE judges that the project is in accordance with

Section 307(C) of the Coastal Zone Management Act of 1972 and that the plan complies with and can be conducted in a manner that is consistent with the approved Coastal Zone Management Program of Delaware. A CZM determination has been requested from the Delaware Coastal Zone Management Program to determine if the project is consistent with the State Coastal Zone Plan. In addition, no cumulative impacts are anticipated to the environment as a result of this project.

TABLE 6. Compliance with Appropriate Environmental Quality Protection Statues and Other Environmental Review Requirements.

STATUTE	COMPLIANCE STATUS
Clean Water Act	Partial
Coastal Zone Management Act	Partial
Endangered Species Act	Partial
Fish and Wildlife Coordination Act	Partial
National Historic Preservation Act	Partial
National Environmental Policy Act	Partial
Magnuson-Stevens Act (Essential Fish Habitat)	Partial
Clean Air Act	Partial

NOTE:
Full Compliance: Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.
Partial Compliance: Some requirements of the statute, E.O., or other policy and related regulations remain to be met.
*All applicable laws and regulations will be fully complied with upon completion of the environmental review, obtaining State water quality certification, coastal zone consistency determination, and concurrence with our determination on cultural resources.
Noncompliance: None of the requirements of the statute, E.O., or other policy and related regulations remain to be met.

8.0 Public Coordination

During preparation of the Draft Environmental Assessment, several agencies were contacted and provided information. This draft Environmental Assessment is being circulated to various state and federal agencies for comments. Discussions concerning the project have been conducted with the USFWS, NMFS, and DNREC as well as other agencies and individuals with interests in the project.

9.0 References

Bowen, Phillip R., and Marsh, G. Alex. 1988. Benthic Faunal Colonization of an Offshore Borrow Pit in Southeastern Florida, Miscellaneous Paper D-88-5, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Ruddy, George. U.S. Fish and Wildlife Service. Personal Communication. 2013.

U.S. Army Corps of Engineers (USACE). 1971. Final Environmental Statement – Delaware Coast Protection – Delaware. Philadelphia District – U.S. Army Corps of Engineers.

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U.S. Army Corps of Engineers (USACE) 1975b. Final Environmental Impact Statement – Indian River Inlet Project Maintenance, Sussex County, Delaware. Philadelphia District – U.S. Army Corps of Engineers.

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U.S. Army Corps of Engineers (USACE). 2001 The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project Final Report. Prepared by M. Burlas, G. Ray, and D. Clarke.U.S. Army Corps of Engineers Engineer Research and Development Center, Vicksburg, MS.

U.S. Army Corps of Engineers (USACE). 2010. Draft Final Site Inspection Report for Delaware Target Areas, Sussex County, DE. DERP FUDS Project No. C03DE006402. Prepared under Contract # W912DY-04-D-0017 T.O 00170001 by Alion Science and Technology.

10.0 Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States for the Indian River flood shoal dredging and Delaware Seashore State Park beach nourishment project, Sussex County, Delaware is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

I. Project Description

A. Location. The project area is located in Sussex County, Delaware (Figure 1).

B. General Description. Indian River is located in Sussex County, Delaware (Figure 1). The goals of the project are to conduct dredging in the Indian River Inlet flood shoal area and beneficially use the dredged material to replenish sands on the Delaware State Park beach, and rebuild dunes, along the Northern Shoreline of Indian River Inlet.

C. Purpose. Hurricane Sandy accelerated the depletion of sand on Delaware State Park beach, DNREC operates a sand bypass system to replenish beach sands, but after the storm event the volume of sand needed for replenishment is beyond the scope of the single pump station to achieve in any relative amount of time preceding the next storm event.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: sand (94%).

2. Quantity of Discharge (estimated): sand {520,000 cubic yards (cy)}.

3. Source of Material: flood shoal.

E. Description of Discharge Site.

1. Location: The location of the discharge site will be along the Delaware State Park beach for a distance of 5,200 ft. Approximately 383,000 cy of the total fill volume (520,000 cy) will be placed seaward of MHW.

2. Size (acres): 30 acres (the approximate footprint of fill below MHW)

3. Type of Site: aquatic/shoreline.

4. Type of Habitat: tidal/estuarine/beach.

5. Timing and Duration of Discharge: approximately 2-3 months for total project construction.

F. Description of Discharge Method. Material will be placed using a hydraulic pipeline dredge.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: The beachfill construction template will have a berm elevation of +9.2 ft NAVD with a foreshore slope of 5 Horizontal:1 Vertical. This slope is expected to become flatter as wave action redistributes the beachfill, which will change the profile after construction.

2. Sediment Type: > 90% sand.

3. Fill Material Movement: sand will move with tide.

4. Physical Effects on Benthos: temporary, major effect.

5. Actions taken to Minimize Impacts: based on previous projects, benthos will recover in the intertidal and subtidal area quickly (< 1 year).

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:

a. Salinity - no effect.

b. Water Chemistry – no significant effect.

c. Clarity - short-term increase in suspended particles.

d. Color - no effect.

e. Odor – no effect.

f. Taste - no effect.

g. Dissolved Gas Levels – minor short-term effect.

h. Nutrients – no effect

I. Eutrophication - no effect.

j. Temperature- no effect.

2. Current Patterns and Circulation:

a. Current Patterns and Flow – Minor impacts to circulation patterns and flow in the

beach zone and nearshore where the existing circulation pattern and flow would be offset seaward the width of the beachfill placement.

b. Velocity – No effects on tidal velocity and longshore current velocity regimes

c. Stratification – Thermal stratification normally occurs beyond the mixing region created by the surf zone. The normal pattern should continue after construction.

3. Normal Water Level Fluctuations – semi-diurnal tidal changes, mean tidal range of 3.6 ft

4. Salinity Gradients - isohaline

5. Actions That Will Be Taken To Minimize Impacts: Construction best management practices will be used to minimize impacts.

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of dredge site: Minor effect. There is the potential for a short-term increase in suspended particles/turbidity levels during construction.

2. Effects on Chemical and Physical Properties of the Water Column:

a. Light Penetration: temporary, major effect.

b. Dissolved Oxygen: minor effect.

c. Toxic Metals and Organics: no effect.

d. Pathogens: no effect.

e. Aesthetics: Minor adverse and temporary effects limited to the construction period.

f. Temperature: no effect.

3. Effects on Biota:

a. Primary Production, Photosynthesis: Minor, short-term effects related to increases in turbidity during dredging activity.

b. Suspension/Filter Feeders: Minor, short-term effects related to increases in turbidity during dredging activity.

c. Sight feeders: no effect.

4. Actions Taken to Minimize Impacts: Due to the coarse nature of the material (sand), none are required.

D. Contaminant Determinations.

N/A

E. Aquatic Ecosystem and Organism Determinations.

1. Effects on Plankton: no effect.

2. Effects on Benthos: Major effect on benthos in construction area.

3. Effects on Nekton: no effect

4. Effects on Aquatic Food Web: temporary, minor effect.

5. Effects on Special Aquatic Sites:
   (a) Sanctuaries and Refuges: none.

   (b) Wetlands: none.

   (c) Tidal flats: none.

   (d) Vegetated Shallows: None.

6. Threatened and Endangered Species: Possible effect to be determined by survey prior to construction

7. Other Wildlife: Temporary, minor effect.

8. Actions to Minimize Impacts: Attempt to complete project as quickly as possible (emergency action). Direct effect to larval and young of the year life stages waived by DNREC and NMFS

F. Proposed Disposal Site Determinations.

1. Mixing Zone Determinations:
   a. Depth of water: 0 ft.
   b. Current velocity: none
   c. Degree of turbulence: none
   d. Stratification: None
   e. Discharge vessel speed and direction: N/A
   f. Rate of discharge: Continuous during construction
   g. Fill material characteristics: Sand

2. Determination of Compliance with Applicable Water Quality Standards:
   A section 401 Water Quality Certificate has been requested from DNREC.

3. Potential Effects on Human Use Characteristics:

   a. Municipal and Private Water Supply: No effect.

   b. Recreational and Commercial Fisheries: Temporary, minor effect during construction, and permanent loss of flood shoal habitat.

   c. Water Related Recreation: Temporary effect during construction and relocation of surf break.

   d. Aesthetics: Temporary, minor effect.

e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: Temporary effect during const.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.
No significant adverse effects are anticipated.

H. Determination of Secondary Effects on the Aquatic Ecosystem.
No significant secondary effects are anticipated.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this evaluation - No significant adaptation of the guidelines were made relative to this evaluation.

B. Compliance With Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in Delaware.

C. Compliance With Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act - The proposed discharge is not anticipated to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

D. Compliance With Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. Informal Section 7 consultation will be completed with the U.S. Fish and Wildlife Service for this the project prior to project construction.

E. Compliance With Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the project area.

F. Evaluation of Extent of Degradation of Waters of the United States - The proposed project will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The long-term life stages of aquatic life and wildlife will not be adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project.

G. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem – The use of best management construction practices will be used to minimize potential adverse impacts of discharging material on the shoreline ecosystem.

10.0 CLEAN AIR ACT STATEMENT OF CONFORMITY

CLEAN AIR ACT STATEMENT OF CONFORMITY
INDIAN RIVER INLET MAINTENANCE DREDGING AND BENEFICIAL USE OF DREDGED MATERIAL
SUSSEX COUNTY, DELAWARE

I have determined that the selected plan conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. No comments from the State air quality management district were received during coordination of the draft environmental assessment. The selected plan would comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

_____ _____

Date

John C. Becking
Lieutenant Colonel, Corps of Engineers
District Engineer

Appendix A

Clean Air Assessment

DELAWARE COAST, INDIAN RIVER INLET NORTH SHORE PROTECTION EMISSION INVENTORY

TABLE 1 - PROJECT EMISSION SOURCES AND ESTIMATED POWER

Equipment/Engine Category	Task	# of Engines	HP	Load Factor (LF)	Hrs/Day	days of operation*
24" dia. pipeline dredge, prime engine	Mob/Demob	1	3400	0.10	24	24
24" dia. pipeline dredge, electric generator	Mob/Demob	1	480	0.80	24	24
24" dia. pipeline dredge, dredge pump	Mob/Demob	1	1900	0.10	24	2
Tugboat, prime engine	Mob/Demob	1	250	0.80	24	20
Tugboat, 2nd engine	Mob/Demob	1	50	0.20	24	20
24" dia. pipeline dredge, prime engine	Beachfill	1	3400	0.40	16	63
24" dia. pipeline dredge, electric generator	Beachfill	1	480	0.40	16	63
24" dia. pipeline dredge, dredge pump	Beachfill	1	1900	0.80	16	63
Tugboat, prime engine	Beachfill	1	250	0.40	16	63
Tugboat, 2nd engine	Beachfill	1	50	0.20	16	63
Crew/survey boat, prime engine	Beachfill	1	100	0.40	16	63
Crew/survey boat, 2nd engine	Beachfill	1	40	0.20	16	63
Derrick barge, prime engine	Beachfill	1	200	0.40	16	63
Derrick barge, 2nd engine	Beachfill	1	40	0.20	16	63
Fuel/water barge	Beachfill	1	10	0.50	16	63
Floating booster pump, prime engine	Beachfill	0	3000	0.80	16	63
Floating booster pump, 2nd engine	Beachfill	0	150	0.40	16	63
Truck (Suburban), 4x4, 2-axle	Shore Crew	1	165	0.57	16	63
Dozer crawler, D-9H	Shore Crew	2	410	0.64	16	63
Loader, front end, wheeled, 1.75 CY bucket	Shore Crew	1	95	0.57	16	63
Loader, front end, wheeled, 2.75 CY bucket	Shore Crew	0	145	0.57	16	63

Mob/demob Crew: Crew of 45 will travel to work 1 day. Crew of 45 will travel from work 1 day.

Beachfill Crew: Crew of 45 will travel to work 63 days. Crew of 45 will travel from work 63 days.
Shore Crew: Crew of 3 will travel to work 3 days. Crew of 3 will travel from work 3 days.
Shore Crew: Crew of 6 will travel to work 63 days. Crew of 6 will travel from work 63 days.

* Dredge time = 2.06 mo x 30.42 day/mo = 62.66 days, Use 63 days

TABLE 1 - PROJECT EMISSION SOURCES AND ESTIMATED POWER (Continued)

Equipment/Engine Category	task	# of engines	hp	load factor (LF)	hrs/day	days of operation*
Truck, highway, 6x4, 3-axle	Dune work	1	350	0.57	8.00	63
Truck, highway, 4x4, 2-axle, 3/4 ton pickup	Dune work	1	165	0.57	8.00	63
Loader, front end, wheeled, 2.75 CY bucket	Dune work	1	145	0.57	8.00	63
Crane, hyd, rough terrain, 20T, 70' boom	Dune work	1	105	0.57	8.00	63

Dune Work Crew: Crew of 5 will travel to work 63 days. Crew of 5 will travel from work 63 days.

Load Factor represents the average percentage of rated horsepower used during a source's operational profile.
hp-hr = # of engines x hp x LF x hrs/day x days of operation

Table 2. Emission Factors

Emission Factors taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. (May 2003). Prepared for the U.S. Army Corps of Engineers, Philadelphia District by Moffatt & Nichol Engineers.

Equipment/Engine Category	NOx Emission Factors (g/hp-hr)	VOC Emission Factors (g/hp-hr)
24" dia. pipeline dredge, prime engine	8.162	0.197
24" dia. pipeline dredge, electric generator	8.839	0.556
24" dia. pipeline dredge, dredge pump	7.923	0.7
Tugboat, prime engine	8.162	0.197
Tugboat, 2nd engine	8.839	0.556
24" dia. pipeline dredge, prime engine	8.162	0.197
24" dia. pipeline dredge, electric generator	8.839	0.556
24" dia. pipeline dredge, dredge pump	7.923	0.7
Tugboat, prime engine	8.162	0.197
Tugboat, 2nd engine	8.839	0.556

Crew/survey boat, prime engine	8.162	0.197
Crew/survey boat, 2nd engine	8.839	0.556
Derrick barge, prime engine	8.162	0.197
Derrick barge, 2nd engine	8.839	0.556
Fuel/water barge	8.839	0.556
Floating booster pump, prime engine	7.923	0.07
Floating booster pump, 2nd engine	8.162	0.197
Truck (Suburban), 4x4, 2-axle	9.2	1.3
Dozer crawler, D-9H	9.2	1.3
Loader, front end, wheeled, 1.75 CY bucket	9.2	1.3
Loader, front end, wheeled, 2.75 CY bucket	9.2	1.3
Truck, highway, 6x4, 3-axle	9.2	1.3
Truck, highway, 4x4, 2-axle, 3/4 ton pickup	9.2	1.3
Loader, front end, wheeled, 2.75 CY bucket	9.2	1.3
Crane, hyd, rough terrain, 20T, 70' boom	9.2	1.3

Table 3. Emission Estmates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

Equipment/Engine Category	**hp-hr**	**EF (g/hp-hr)**
24" dia. pipeline dredge, prime engine	195840	8.162
24" dia. pipeline dredge, electric generator	221184	8.839
24" dia. pipeline dredge, dredge pump	9120	7.923

Tugboat, prime engine	96000	8.162
Tugboat, 2nd engine	4800	8.839
24" dia. pipeline dredge, prime engine	1370880	8.162
24" dia. pipeline dredge, electric generator	193536	8.839
24" dia. pipeline dredge, dredge pump	1532160	7.923
Tugboat, prime engine	100800	8.162
Tugboat, 2nd engine	10080	8.839
Crew/survey boat, prime engine	40320	8.162
Crew/survey boat, 2nd engine	8064	8.839
Derrick barge, prime engine	80640	8.162
Derrick barge, 2nd engine	8064	8.839
Fuel/water barge	5040	8.839
Floating booster pump, prime engine	0	7.923
Floating booster pump, 2nd engine	0	8.162
Truck (Suburban), 4x4, 2-axle	94802	9.2
Dozer crawler, D-9H	528998	9.2
Loader, front end, wheeled, 1.75 CY bucket	54583	9.2
Loader, front end, wheeled, 2.75 CY bucket	0	9.2
Truck, highway, 6x4, 3-axle	100548	9.2
Truck, highway, 4x4, 2-axle, 3/4 ton pickup	47401	9.2
Loader, front end, wheeled, 2.75 CY bucket	41656	9.2
Crane, hyd, rough terrain, 20T, 70' boom	30164	9.2

Total NOx Project Emissions (tons) =

Table 4. Emission Estmates (VOCs)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

Equipment/Engine Category	hp-hr	EF (g/hp-hr)
24" dia. pipeline dredge, prime engine	195840	0.197
24" dia. pipeline dredge, electric generator	221184	0.556
24" dia. pipeline dredge, dredge pump	9120	0.7
Tugboat, prime engine	96000	0.197
Tugboat, 2nd engine	4800	0.556
24" dia. pipeline dredge, prime engine	1370880	0.197
24" dia. pipeline dredge, electric generator	193536	0.556
24" dia. pipeline dredge, dredge pump	1532160	0.7
Tugboat, prime engine	100800	0.197
Tugboat, 2nd engine	10080	0.556
Crew/survey boat, prime engine	40320	0.197
Crew/survey boat, 2nd engine	8064	0.556
Derrick barge, prime engine	80640	0.197
Derrick barge, 2nd engine	8064	0.556
Fuel/water barge	5040	0.556
Floating booster pump, prime engine	0	0.07
Floating booster pump, 2nd engine	0	0.197
Truck (Suburban), 4x4, 2-axle	94802	1.3
Dozer crawler, D-9H	528998	1.3
Loader, front end, wheeled, 1.75 CY bucket	54583	1.3
Loader, front end, wheeled, 2.75 CY bucket	0	1.3
Truck, highway, 6x4, 3-axle	100548	1.3
Truck, highway, 4x4, 2-axle, 3/4 ton pickup	47401	1.3

Loader, front end, wheeled, 2.75 CY bucket	41656	1.3
Crane, hyd, rough terrain, 20T, 70' boom	30164	1.3

Total VOCs Project Emissions (tons) =

Table 5. Pollutant Emissions from Employee Vehicles

Assumptions:

Average trip distance (1 way) is 25 miles.
Average NOx vehicle emission factor is 0.96 g/mile.
Average VOC vehicle emission factor is 0.84 g/mile.
Work crew comprised of 72 people
Every member of the work crew drives their own vehicle.
Project construction period is 2 months.
Project construction occurs 7 days per week.

Actual work days during construction: 365 days / year * 1 year / 12 months * 2 months of construction

Actual work days during construction = 63

NOx Calculation: 57 workers * 2 trips/work day * 64 work days * 25 miles/trip * 0.96 g of NOx/mile*1 Ton/907200 g

Total NOx resulting from employee vehicles = 0.19 tons.

VOC Calculation: 57 workers * 2 trips/work day * 64 work days * 25 miles/trip * 0.84 g of VOCs/mile*1 Ton/907200 g

Total VOCs resulting from employee vehicles = 0.17 tons.

Pollutant emissions associated with employee vehicles derived from data found in: Marine and Land-Based Mobile Source Emission Estimates for 50-Foot Deepening Project. January 2002. Prepared for The Port Authority of New York and New Jersey by Killam Associates and Starcrest Consulting Group, LLC.