US Army Corps of Engineers
Philadelphia District

DRAFT ENVIRONMENTAL ASSESSMENT

Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material Salem County, New Jersey New Castle County, Delaware

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February 2023

*Photo on cover courtesy of Jim Feaga, Ducks Unlimited

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers, Philadelphia District, (USACE) has prepared this draft Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, for the Salem River Maintenance Dredging and Beneficial Use of Dredged Material Project in Salem County, New Jersey.

The Salem River Federal Navigation Project was adopted in 1925 (HD 68-110) and provides for an entrance channel 16 feet deep and 150 to 250 feet wide in the Delaware River across Salem Cove to the mouth thence 16 feet deep and 100 feet wide to the fixed highway bridge (Route 49) in Salem. The channel transitions to 9 feet deep and 100 feet wide upstream of Route 49 and terminates at Route 45 (Market Street) (Figure 1). The navigation channel also provides for a cutoff between the mouth and the City of Salem. The project length is approximately 5 miles. Within the last 25 years, disposal of dredged material has occurred at the Killcohook Confined Disposal Facility (CDF). Dredging of the Salem River federal navigation channel (FNC) last occurred in 2022 where approximately 13,000 cubic yards of sand dredged from the bend in the FNC were beneficially placed along the nearshore subtidal shoreline of Oakwood Beach.

Maintenance dredging of a portion of the Salem River federal navigation channel to authorized depth of -16 ft MLLW with 1 ft allowable over-depth will be conducted initially in 2023. Dredging will remove critical shoaling in priority areas identified by channel users to maintain a safe and reliable navigation channel for commercial and recreational vessels. A secondary objective is to beneficially use the sediments removed from the channel to rebuild and bolster a nearby inter-tidal mudflat and brackish marsh located in the Goose Pond area of the Supawna Meadows National Wildlife Refuge (SMNWR) in partnership with the U.S. Fish and Wildlife Service (USFWS). The infusion of sediments from the Salem River FNC supports SMNWR's efforts to re-create a mosaic of intertidal habitats with a focus on shallow mudflats and low marsh habitat in the Goose Pond area of the refuge. The sediment needs of the Goose Pond area to restore and maintain historical tidal marsh greatly exceed a one-time placement of dredged material therefore, it is proposed that the Goose Pond area be included as an alternate location in addition to the existing Killcohook CDF for the disposal of Salem River entrance channel sediments from future maintenance dredging operations. Additionally, the preferred alternative includes the periodic beneficial use of dredged material (sand only) placement within the nearshore subtidal area along Oakwood Beach using a split-hull hopper dredge and/or hydraulic dredge in the nearshore, intertidal and directly on the beach.

Tidal wetlands provide some of the most productive natural ecosystems in the world and are widely recognized for their important ecological functions. The services they provide include flood protection for coastal communities, maintenance of water quality, habitat for many species of fish and wildlife, and carbon sequestration. This draft EA evaluates a No Action alternative and alternative placement plans to restore protective marsh habitat within an area that is now flooded marsh. Excessive inundation within a marsh over time results in the loss of vegetation. Normally, tidal wetlands build vertically (accrete) through the accumulation of organic matter from autochthonous below-ground root production and the importation and trapping of suspended sediments in tidal flow by brackish marsh vegetation. The importation and deposition of new sediments is essential to the long-term sustainability of coastal wetlands. Once inundated long-term vegetation dies off, the extensive mudflats and open water areas can no longer accrete sediments to counter land subsidence or sea level rise.

The preferred alternative plan entails placing dredged channel sediments to restore habitat in a rapidly degrading (flooded) marsh in the Goose Pond area of the USFWS's SMNWR. The operation will utilize a series of pipes and Y-valves to distribute predominantly fine-grained but mixed sediments throughout the placement area. The initial sediment placement will be monitored to observe sediment properties and behavior which will inform the second placement operation scheduled to occur approximately 1 to 2 years later. Building elevation with mixed sediments will create a varied landscape that will enhance the mudflats, intertidal shallows, and may lead to the re-establishment of brackish marsh vegetation.

This project is a channel maintenance dredging project with a beneficial use component in support of ecosystem restoration and Regional Sediment Management (RSM) and Engineering with Nature (EWN) best practices. The initial operation will use a hydraulic pipeline dredge to pump approximately 200,000 cubic yards of dredged sediments into a flooded marsh area that will provide a myriad of environmental benefits including, but not limited, to storm surge protection for the refuge, improvement of water quality through the reduction of erosion, sediment enhancement and wetland habitat restoration.

Impacts associated with implementing the maintenance dredging/ecosystem restoration project include short-term impacts from construction such as temporary impacts to approximately 42 acres in existing mudflat/wetlands; increased turbidity and noise; temporary impacts to aesthetics, and the temporary displacement of wildlife from the area.

Through the NEPA process every effort has been made to maximize environmental and ecosystem benefits while minimizing impacts. The proposed plan incorporates lessons learned from projects of the Seven Mile Island Innovation Laboratory (SMIIL) that have beneficially placed mixed and fine-grained sediments in or adjacent to wetlands. Primary partners in the SMIIL include the USACE including both the Philadelphia District and the Engineering Research and Development Center (ERDC), the New Jersey Department of Environmental Protection, and The Wetlands Institute. Environmental compliance coordination is ongoing with responsible resource agencies as documented in the EA.

ENVIRONMENTAL ASSESSMENT
SALEM RIVER CHANNEL MAINTENANCE DREDGING
AND
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ACRONYMS

BU	Beneficial Use
BUDM	Beneficial Use of Dredged Material
°C	Degrees Celsius
CCP	Comprehensive Conservation Plan
CDF	Confined (Dredged Material) Disposal Facility
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CSRM	Coastal Storm Risk Management
CY	Cubic yards
DA	Design Alternative
dB	Decibels
dBA	A weighted sound level measured in decibels
dBC	C weighted sound level measured in decibels
DE	State of Delaware
DEBI	Delaware Estuary Benthic Inventory
DFW	Division of Fish and Wildlife
DLUR	Division of Land Use Regulation
DNREC	Delaware Department of Natural Resources and Environmental Control
DO	Dissolved oxygen
DU	Ducks Unlimited
DuPont	E.I. DuPont de Nemours and Company
EA	Environmental Assessment
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Area
EIS	Environmental Impact Statement
ERDC	Engineering Research and Development Center
ESA	Endangered Species Act
EWN	Engineering With Nature
FID	Federal Interest Determination
FMP	Fishery Management Plan
FNC	Federal Navigation Channel
FONSI	Finding of No Significant Impact
GARFO	Greater Atlantic Regional Fisheries Office
HAPC	Habitat Areas of Particular Concern
HD	House Document
Hz	Hertz
IPaC	Information, Planning, and Conservation (USFWS)
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detection and Ranging
MBTA	Migratory Bird Treaty Act
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter

ACRONYMS

MHHW	Mean Higher High Water
MHW	Mean High Water
Mid-TRAM	Mid-Atlantic Tidal Rapid Assessment Method
MLLW	Mean Lower Low Water
MLW	Mean Low Water
msl	Mean sea level
NAAQS	National Ambient Air Quality Standards
NAP	North Atlantic Philadelphia (Philadelphia District USACE)
NAVD 88	North American Vertical Datum 1988
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJ	State of NJ
NJAAQS	New Jersey Ambient Air Quality Standards
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJIWW	New Jersey Intracoastal Waterway
N.J.S.A.	New Jersey Statutes Annotated
NJSM	New Jersey State Museum
NMFS	National Marine Fisheries Service
NO	Nitric oxide
NO2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O3	Ozone
OSHA	Occupational Safety and Health Administration
PDE	Partnership for the Delaware Estuary
PL	Public Law
PM10	Particulate matter less than 10 micrometers in diameter
PM2.5	Particulate matter less than 2.5 micrometers in diameter
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per thousand
RHA	Rivers and Harbors Act
RSM	Regional Sediment Management
SAV	Submerged Aquatic Vegetation
Service	United States Fish and Wildlife Service
SHPO	State Historic Preservation Office
SILs	Significant Impact Levels
SLAMM	Sea Level Affecting Marshes Model
SLR	Sea Level Rise
SMA	Special Management Area
SMIIL	Seven Mile Island Innovation Lab

ACRONYMS

SMNWR	Supawna Meadows National Wildlife Refuge
SWQS	Surface Water Quality Standards
TSS	Total Suspended Solids
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	Wildlife Management Area
WOTUS	Waters of the United States
WRDA	Water Resources Development Act

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, for the Salem River Maintenance Dredging and Beneficial Use of Dredged Material Project in Salem County, New Jersey. The recommended plan is to conduct maintenance dredging of the approach channel to the lower Salem River federal navigation channel (FNC) to the authorized depth of 16 ft MLLW with a 1 ft allowable over-depth. Dredging will remove critical shoaling in the authorized channel to maintain safe and reliable navigation for commercial and recreational vessels. Maintenance dredging of the Salem River has occurred six times since the project was deepened to present dimensions in 1996. O&M quantities have been in the range of 100,000 cubic yards (CY) to a little over 200,000 CY, depending on the dredging intervals and the channel limits in which dredging was performed. The designated disposal area for maintenance dredging is the Killcohook Confined Disposal Facility (CDF).The most recent complete maintenance dredging of the entire channel occurred in late 2012. Surveys obtained since 2012 indicate that the lower one mile of channel shoaled by about 75,000 CY in the first 20 months after dredging.

Subsequent to 2012, two smaller maintenance dredging actions were conducted. In 2017, approximately 52,000 CY of dredged sediment were removed from shoals and placed in the Killcohook CDF, and in February 2022, approximately, 13,000 CY of sandy material were dredged with a government-owned split-hull hopper dredge (*Dredge Murden*) and beneficially deposited along the nearshore subtidal shoreline of Oakwood Beach.

Based on November 2022 survey data, it is estimated that the entrance channel south of the channel bend will require removal of approximately 158,000 CY to restore the project depth to 16 ft MLLW, with an additional 51,000 CY in overdepth dredging to 17 ft MLLW. Additional maintenance dredging of 50,000 to 75,000 CY may be conducted to remove infilling within the subsequent 1 to 2 years after the 2023 dredging operation.

A secondary objective is to beneficially use the dredged channel sediments in the vicinity to provide an ecological restorative purpose and for Coastal Storm Risk Management (CSRM) purpose. The selected placement location of the beneficial use dredged material at Goose Pond within the Supawna Meadows National Wildlife Refuge (SMNWR) would restore a mosaic of shallow open water, intertidal low marshes and mudflat habitats experiencing significant habitat losses due to erosion and sea level rise. The project is being conducted in partnership with the U.S. Fish and Wildlife Service (USFWS) and Ducks Unlimited (DU). Another selected placement location is the subtidal nearshore of Oakwood Beach, which would introduce sandy material into the littoral zone of an existing federal CSRM beach nourishment project located there.

1.1 Federal Navigation Channel Authority

The Salem River Federal Navigation Project was adopted in 1925 (HD 68-110) and provides for an entrance channel 16 feet deep and 150 to 250 feet wide in the Delaware River across Salem Cove to the mouth thence 16 feet deep and 100 feet wide to the fixed highway bridge (Route 49) in Salem. The channel transitions to 9 feet deep and

100 feet wide upstream of Route 49 and terminates at Route 45 (Market Street) (Figure 1). The navigation channel also provides for a cutoff between the mouth and the City of Salem. The project length is approximately 5 miles. Within the last 25 years, disposal of dredged material has occurred at the Killcohook CDF. The federal channel requires periodic maintenance dredging to authorized depth. A portion of the channel was last dredged in February 2022.

The regulation of dredged material disposal within waters of the United States is a shared responsibility of the U.S. Environmental Protection Agency (USEPA) and USACE. The Water Resources Act of 1992, Section 204 Beneficial Use of Dredged Material (Public Law (PL) 102-580) first established the authority for USACE to implement ecosystem restoration projects in connection with dredging. The USEPA (2007) prepared a national guidance document that explains the role of the Federal Standard in implementing beneficial uses of dredged material from USACE maintenance dredging projects. It serves as a companion document to the joint USEPA/USACE (2007) Beneficial Use Planning Manual. USACE strives to implement best Regional Sediment Management (RSM) and Engineering with Nature (EWN) practices in order to keep dredged sediments within the natural system rather than removing the much-needed sediments from eroded areas to be placed upland in confined disposal facilities (CDFs).

1.2 Supawna Meadows National Wildlife Refuge (NWR)

The Supawna Meadows NWR was officially established in 1974 and is currently 3,016 acres in size consisting of tidal waters and marsh, grassland, shrubland, and forested habitats.

In 1934, the Killcohook Migratory Bird Refuge was established along the Delaware River. For many years, the site was used by the U. S. Army Corps of Engineers to deposit dredged materials. The dredged materials built up elevation on the site, decreasing Killcohook's value for wildlife, which had spurned local conservationists to pursue the purchase of adjacent lands to create a wildlife refuge with greater habitat value.

In 1971, The USFWS purchased the first 653 acres of refuge land from the Philadelphia Conservationists (now known as Natural Lands Trust). In 1974, the Service subsequently named the site “Supawna Meadows National Wildlife Refuge” to make it distinct and separate from Killcohook. The Service then exercised its secondary jurisdiction over the Killcohook Migratory Bird Refuge until it was revoked by Congress in October 1998. Killcohook is still used as a CDF by the USACE.

The Delaware Bay and estuary is designated a Wetland of International Importance by the Ramsar Convention. Coastal salt marsh habitats of the mid-upper Atlantic coast, including the Delaware Bay marshes and Supawna Meadows MWR, have been identified by the Black Duck Joint Venture as the most important habitat for wintering American black ducks. Pea Patch Island and the surrounding area, including the refuge, have been designated a Special Management Area by the States of New Jersey and

Delaware in accordance with the Coastal Zone Management Act (Information retrieved from https://www.fws.gov/refuge/supawna-meadows/about-us on 10/20/2022).

1.3 Project Location and Setting

1.3.1. Salem River Navigation Dredging

The Salem River is located in western Salem County, New Jersey (Figures 1 and 2). The Salem River drains approximately 113.6 square miles, ultimately discharging into the Delaware River at approximately River Mile Point 59. The existing authorized channel is approximately 5 miles long and stretches downstream from the Route 49 Bridge in the City of Salem to Elsinboro at the southwest corner of Salem Cove in the Delaware River. The midpoint of the maintenance dredging activity of the entrance channel is located at N39.55706º, W75.52662º. Most of the entrance channel at Salem Cove from the Delaware River to the Salem River proper lies in Delaware territorial waters.

The existing dredged material disposal location is at the Killcohook CDF (N 39.618425°, W 75.556180°) located approximately 3.8 miles NNW of the Salem River entrance channel at the Delaware River Mile Point 61.5. The Killcohook CDF occurs within the boundaries of both New Jersey and Delaware. The westernmost portion of the site occupies over 500 acres in New Castle County, Delaware while the eastern portion of the site occurs in Pennsville Township, Salem County, New Jersey. This site is bounded by Finn's Point National Cemetery, Fort Mott State Park and Supawna Meadows NWR to the south and Finn's Point Lighthouse to the east, and it once served a dual purpose as a refuge (Killcohook National Wildlife Refuge) and as a CDF. Its status as a refuge was revoked in 1998 by Congress, but it continues to be used as a CDF by USACE for the disposal of dredged sediments.

1.3.2. Goose Pond/Mill Creek BUDM Location

The Supawna Meadows NWR boundaries include the Delaware River to the southwest, Salem River to the southeast, Lighthouse Road to the northeast, and Fort Mott State Park to the northwest (Figures 1 and 2). It is located in the Service's Northeast Region 5. The Supawna Meadows NWR Proposed Action (Goose Pond) area (N39.586840º, W75.52619º) consists of an old stone breakwater along the Delaware River and approximately 262 acres of open water and marsh complexes located around it. These marsh complexes are reclaimed agricultural land, having been abandoned sometime after 1938 due to significant inundation. These fields likely lost value as salt hay farming declined and soils became too saturated for other crops. The Goose Pond affected area is primarily contained within Block 5501, Lot 17 and the Delaware River, and meanders through both New Jersey state-owned lands and Delaware state-owned lands (USFWS, 2017).

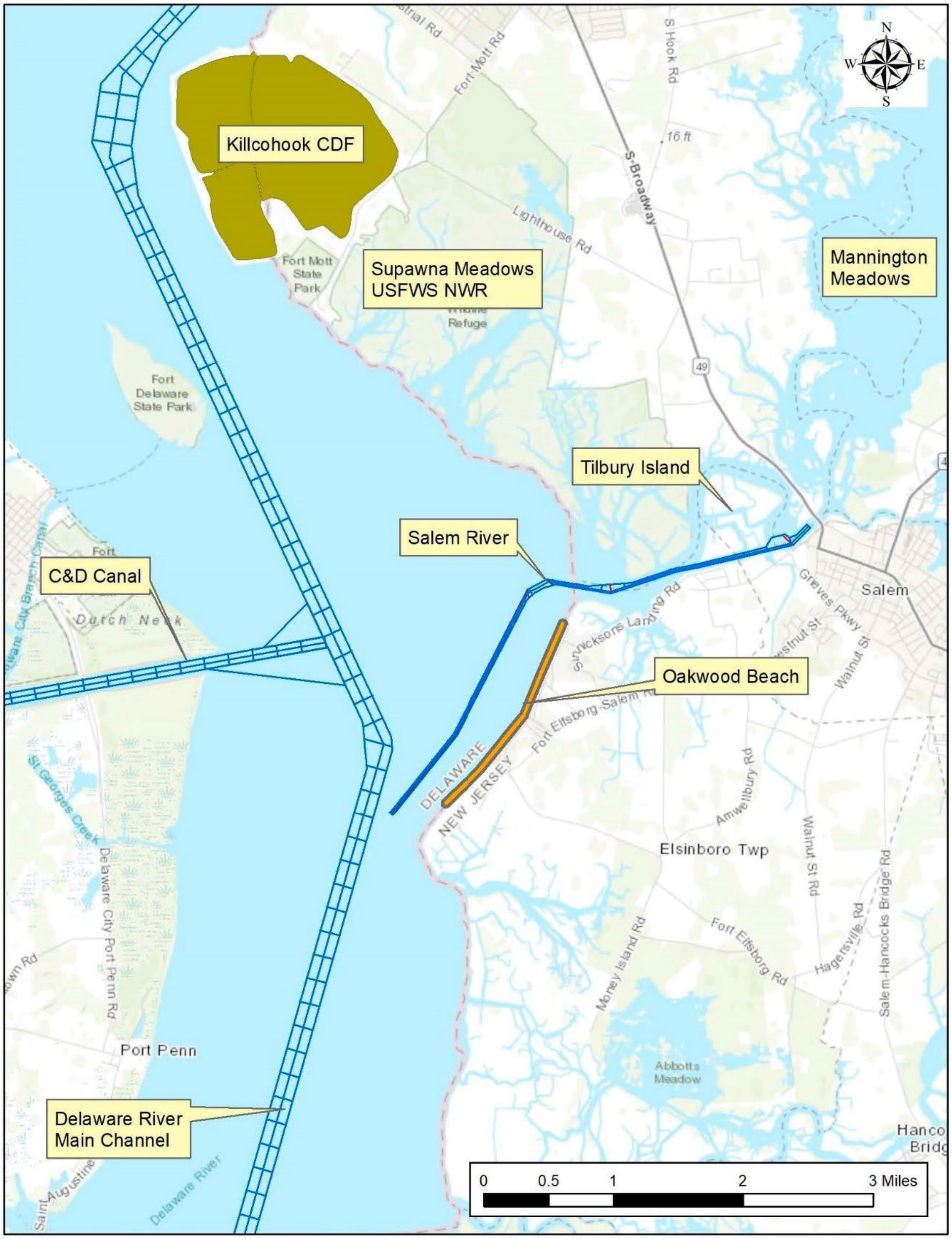


Figure 1. Salem River Vicinity Map

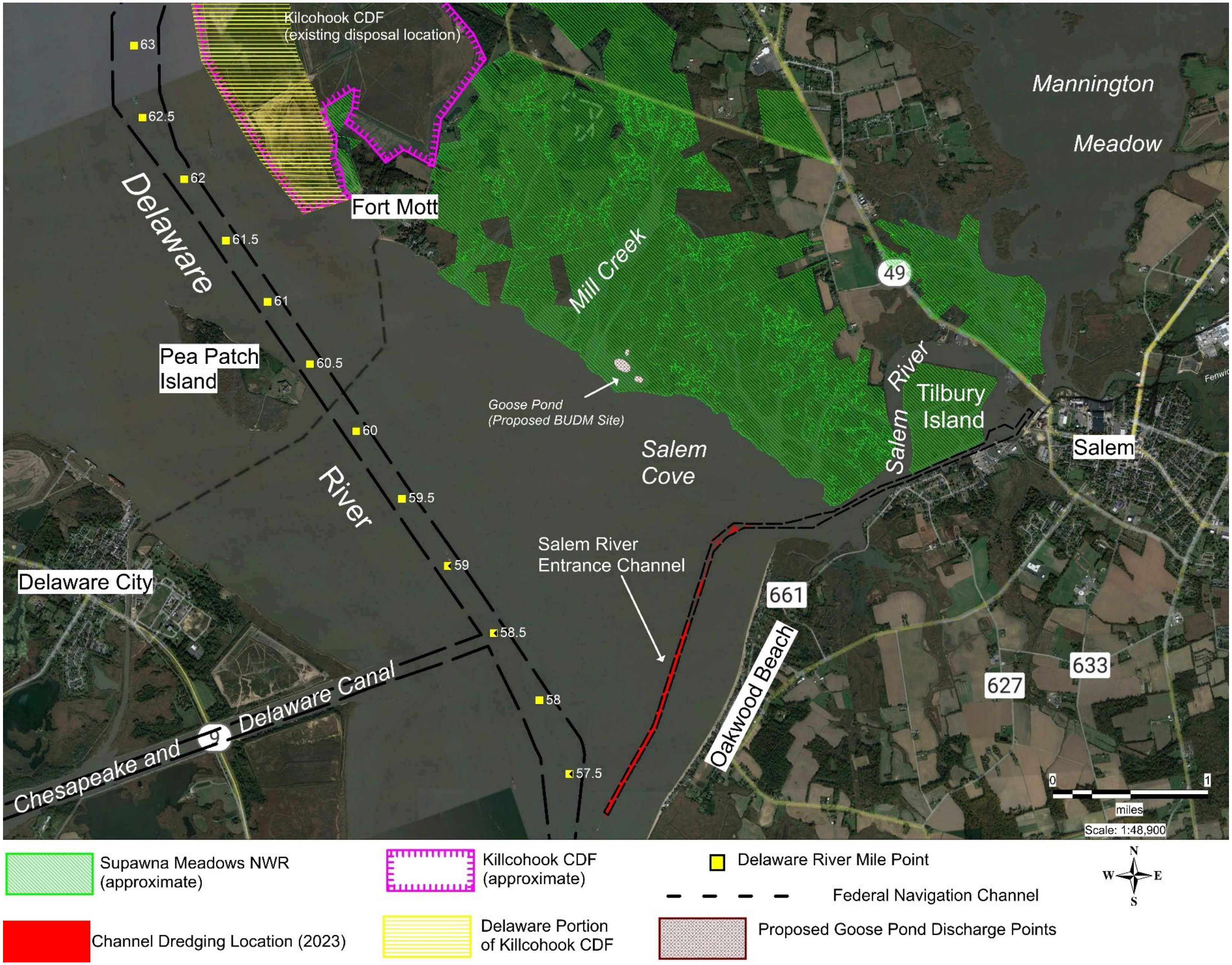


Figure 2. Action Areas and Vicinity

1.3.1. Tillbury Island BUDM Location

Tilbury Island (N39.578059°, W 75.488861) was formed in 1929 when the Salem River navigation project dredged the "New Cut" channel through a marsh peninsula at a bend in the river. Since that time, the New Cut has expanded in width from approximately 100 feet to 350 feet. Increased tidal flow through the Cut, which previously followed the natural meander, has resulted in Tilbury Island eroding on the south side. Mosquito control ditches that were cut through the island in the early 20th century, and have since been used for recreational boating, are also expanding due to their exposure to increased tidal velocities and boat wakes. Tilbury Island is eroding from both the exterior and interior due to incision by high velocity tidal channels.

1.3.2. Mannington Meadows BUDM Location

Mannington Meadows (N39.610410°, W75.474682°) is located upstream of the Salem River navigation project and consists of about 2,000 acres of shallow open tidewater. Historically the area consisted of tidal wetlands that were diked and utilized for agriculture until the early 20th century. After the dikes were allowed to fall into disrepair the former agricultural land reverted to shallow open water with a significant long-term potential for tidal wetland restoration.

1.3.3. Oakwood Beach BUDM Location

Oakwood Beach (39.555446°, W 75.522952°) is a bayfront community located in Elsinboro Township, Salem County, New Jersey in the upper region of the Delaware Bay (Figure 1). Oakwood Beach is located near the mouth of the Salem River within the transitional area of the Delaware River and Bay. Although the project is located along the New Jersey shoreline, the affected area is within State of Delaware waters up to the mean low water line of Oakwood Beach. The project area limits extend from the Salem River southwest to Elsinboro Point, a distance of approximately 2.3 miles (Figure 2).

1.4 Scope of Action

The scope of action for this project is maintenance dredging of the Salem River federally authorized navigation channel and utilizing the dredged material beneficially to increase substrate elevations within a flooded marsh area to restore an intertidal mudflat that has been degraded through inundation and erosion. A study conducted by Rutgers University researchers concluded that Delaware Bay wetlands are eroding and converting to open water at a rate of 1.1% to 1.9%/decade (Weis et al. 2021). Wetlands in the Supawna Meadows NWR have been severely impacted as a result of flooding, erosion, and subsidence.

Tidal marshes are critical habitats for wildlife. They sequester pollutants and nutrients from the water and provide protection for interior upland habitats from storm surges by attenuating floodwaters. New Jersey's tidal marshes are rapidly disappearing due to sea level rise (SLR), which is estimated to be between 5 and 6 mm/year. Parts of New

Jersey's baycoast are sinking (subsidence) due to geological factors, which compounds wetland losses due to SLR. Saltmarshes must accrete sediments in order to keep pace with the rate of SLR. Excessive flooding of salt marshes prevents the vegetation from thriving, which in turn, renders them unable to trap sediments. Frequent inundation due to large storms and high erosion rates due to SLR over the past 50 years have resulted in extensive losses of tidal marshes.

The Salem River project is designed to beneficially use dredged sediments as a resource to raise elevations of a subtidal and intertidal area that once supported valuable marsh habitat of Supawna Meadows NWR. Dredged sediments will be placed in the area to assist in the re-establishment of valuable mudflats and vegetated wetlands.

1.5 Relevant Prior Actions Near the Salem River Project Area

The Salem River Federal Navigation Project was originally adopted in 1925 (HD 68-110) that provided and provides for an entrance channel 16 feet deep and 150 to 250 feet wide in the Delaware River across Salem Cove to the mouth thence 16 feet deep and 100 feet wide to the fixed highway bridge (Route 49) in Salem. While various physical and environmental conditions along the Salem River and the surrounding area have been in flux for over 100 years, a number of efforts have been undertaken more recently to improve the health and sustainability of this region against further degradation. The following sections briefly summarize a selection of various actions undertaken by federal, state, and other entities to manage the health of the region in the face of shoaling, erosion, subsidence, flooding, sea level rise, and other ongoing threats.

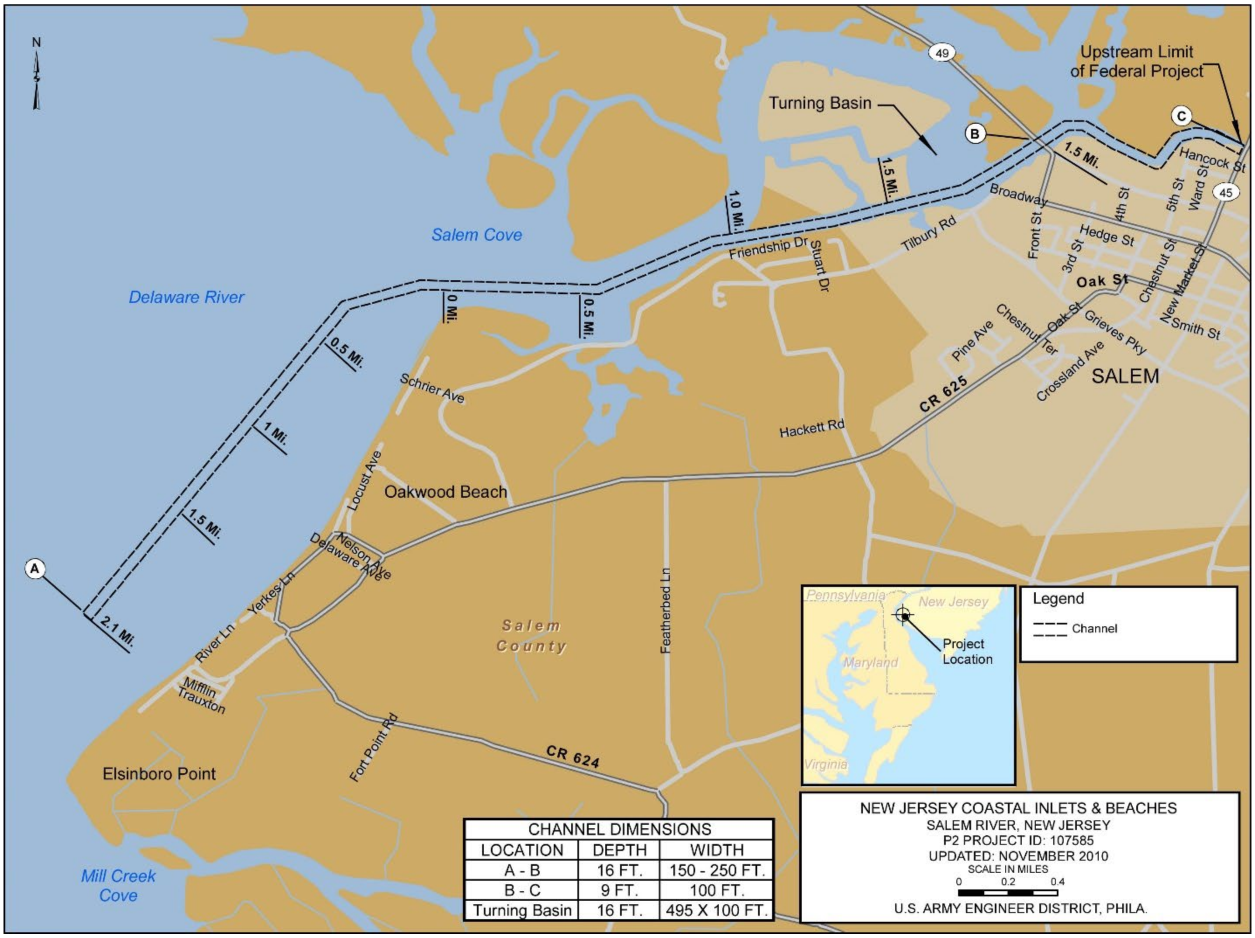
1.5.1. Prior USACE Actions

1.5.1.1 Salem River Federal Navigation Channel Maintenance

The River and Harbor Act of July 11,1870 provided for the first Federal survey of the Salem River. Subsequently, a nine-foot MLW channel was adopted in 1907. The authorized width was 100 feet. This project later became a 12-foot project, adopted as HD 68-110 in 1925, for five miles long and provided for an entrance channel from the Delaware River to the Route 49 highway bridge in Salem, south of the Little Salem River. The improved draft from 9 to 12 feet was recommended to accommodate vessels utilizing the Chesapeake and Delaware Canal which was under reconstruction at the time. The Salem River dimensions were 150 feet wide from the Delaware River through Salem Cove and 100 feet wide along the cutoff from the "Horseshoe Bend" near Sinnickson Landing to the port. This cutoff, constructed as part of the 1925 authorization, saves vessels one mile travelling from Salem to deep water in the Delaware River. Dredged material disposal was overboard adjacent to the entrance channel in the Delaware River.

The current authorized Salem River project was evaluated in the *Delaware River*

Comprehensive Navigation Study Final Interim Feasibility Study for Salem River and Environmental Assessment (USACE 1991). In March 1995, the Secretary of the Army approved a modification to the previous project deepening the channel to 16 feet below mean lower low water (MLLW) between the Route 49 highway bridge and the Delaware River, a distance of about 5 miles (Figure 3). The channel was widened to 150-250 feet and a trapezoidal shaped turning basin with a width of 495 feet and average length of 1000 feet was provided (Figure 3). Dredged material disposal occurs in the designated Killcohook CDF where hydraulically dredged material is pumped into the CDF. The project also provides for 15.6 acres of wetland mitigation at Supawna Meadows NWR to replace the loss of wetlands and shallow water habitat associated with these modifications. The dredging portion of the project was completed in November 1996. The wetland mitigation portion of the project was completed in June 1997. Since 1996, maintenance dredging has occurred six times.



CHANNEL DIMENSIONS

LOCATION	DEPTH	WIDTH
A - B	16 FT.	150 - 250 FT.
B - C	9 FT.	100 FT.
Turning Basin	16 FT.	495 X 100 FT.

Figure 3. Salem River Federal Navigation Project

The Port of Salem is a shallow-draft port located in the vicinity of the Salem River Cut-Off on the Salem River in Salem, New Jersey. The Port is located approximately 2 miles east of the Delaware River, and 54 miles from the Atlantic Ocean. The Port became a foreign trade zone in 1987. Commodities include bulk cargo (construction aggregate), break bulk cargo, containers (clothing, agricultural produce). Port activity also has at times involved lighterage.

1.5.1.2 Oakwood Beach Coastal Storm Risk Management Project

The Oakwood Beach, NJ project (Figure 4) was authorized for construction by Title I, Section 101 (b) (5) of Water Resources Development Act of 1999 and was constructed in 2015 under the P.L. 113-2 2013 Disaster Relief Appropriations Act (Hurricane Sandy).

The purpose of this project is to provide hurricane and coastal storm damage reduction for the community of Oakwood Beach, which includes a suitable advance beachfill and periodic nourishment every eight years.

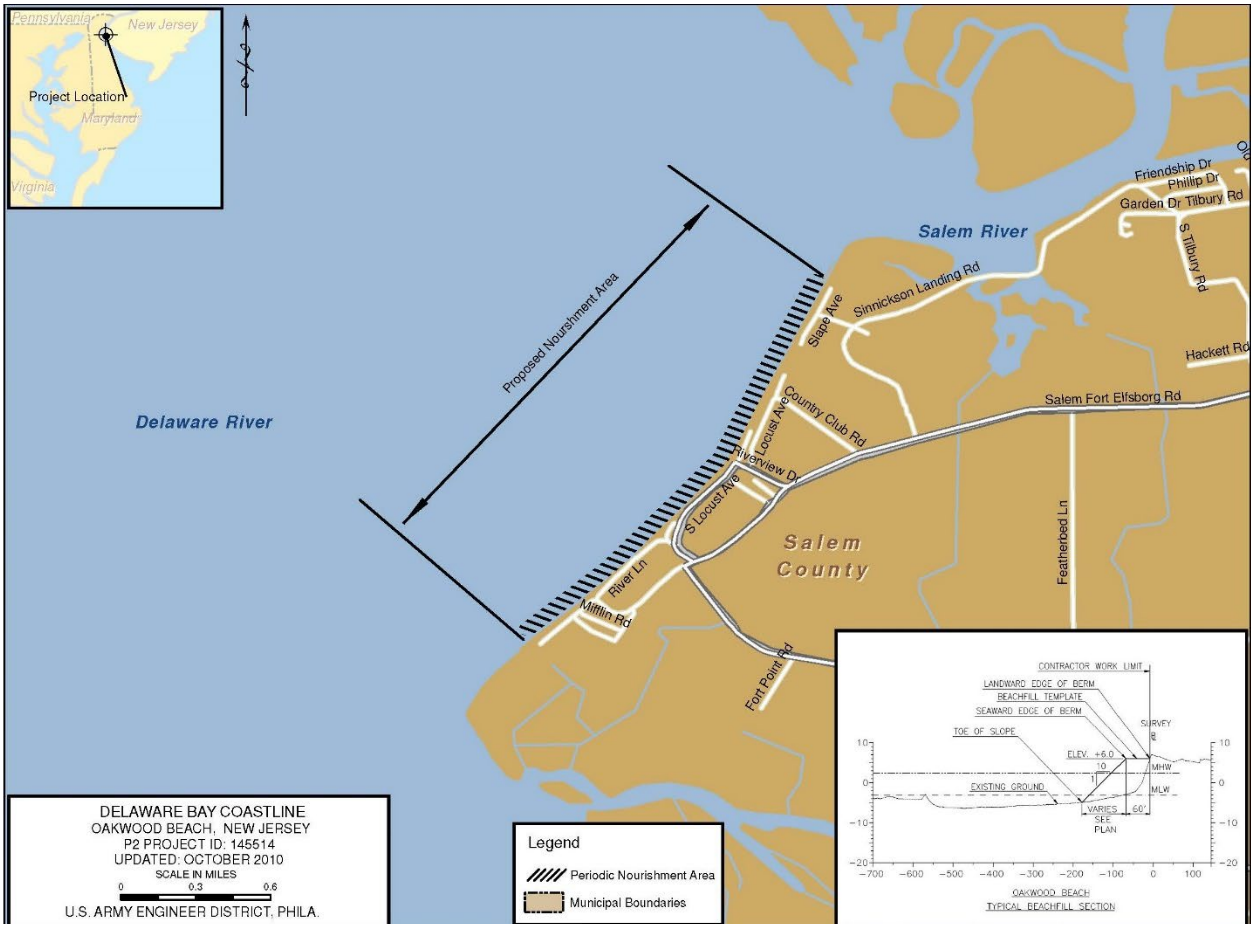


Figure 4. Oakwood Beach Coastal Storm Risk Management Project

The plan at Oakwood Beach includes a 50-foot-wide berm at an elevation of +6.0 feet NAVD over a project length of 9,500 lineal feet. The initial construction required the placement of approximately 353,000 cubic yards of sand with projected periodic nourishment every of 33,000 cubic yards every 8 years. The source of sand for the initial construction and periodic nourishment is the Delaware River Main channel. This project is not a component of the Delaware River Main Channel Deepening project.

1.5.2. Prior USFWS Actions

1.5.2.1 Supawna Meadows NWR Design/Build Marsh Restoration Project

In 2017, the USFWS evaluated alternatives to restore tidal marshes in the Goose Pond area of the refuge along the Delaware River (USFWS 2017). The Proposed Action includes the restoration of tidal marsh hydrology at the Supawna Meadows Project Area through the implementation of the following restoration techniques:

- Removal of portions of an offshore stone breakwater dike in select areas to improve tidal exchange

- Enhancement of the stone breakwater dike in select areas to provide shoreline protection

The purpose of the stone breakwater modifications is to increase the resiliency of degraded salt marshes within the Supawna Meadows NWR in response to ecosystem stressors, through a viable and cost-effective manner that upholds the USFWS and Supawna Meadows NWR's missions, purposes, and goals. This action is based on the following needs:

- Loss of coastal wetlands within the Delaware Estuary has been documented to be occurring and are predicted to increase in the near future;

- Resulting vegetation die-back, or changes in vegetative community structure and reduction in rates of salt marsh accretion may lead to permanent loss of marsh land and conversion to open water, thereby exacerbating the vulnerability these critical wetlands have to sea level rise and coastal storm surge events; and

- Primary productivity of the marsh is critical in maintaining the role that these wetlands play in providing the necessary feeding, nesting, and resting habitat for coastal wildlife, particularly shorebirds, waterfowl, and migratory birds.

The Proposed Action will result in resilient wetlands that function as healthy living resources that provide ecosystem value, specifically by the following:

- Facilitating a more natural hydrologic regime;

- Enhancing salt marsh resilience from the impacts of sea level rise, large storm events, and other ecosystem stressors; and

- Improving rates of sediment accretion

Specifically, the proposed project will entail the removal of stone from some portions of the existing breakwater and the addition of stone in other portions (Figure 5), which would enhance stabilization and growth of the existing marsh platform. The breakwater modifications are proposed for 2,506 linear feet. The total area of the breakwater is 12,900 square feet (0.29 acres) of impact. This project is also likely to include future sediment enhancement which will restore the marsh platform to low marsh habitat. To facilitate sediment enhancement, the project proponent and a federal partner, the USFWS, requested that the USACE provide sediment within the Goose Pond area as part of the maintenance dredging of the Salem River instead of placement in the Kilcohook CDF.

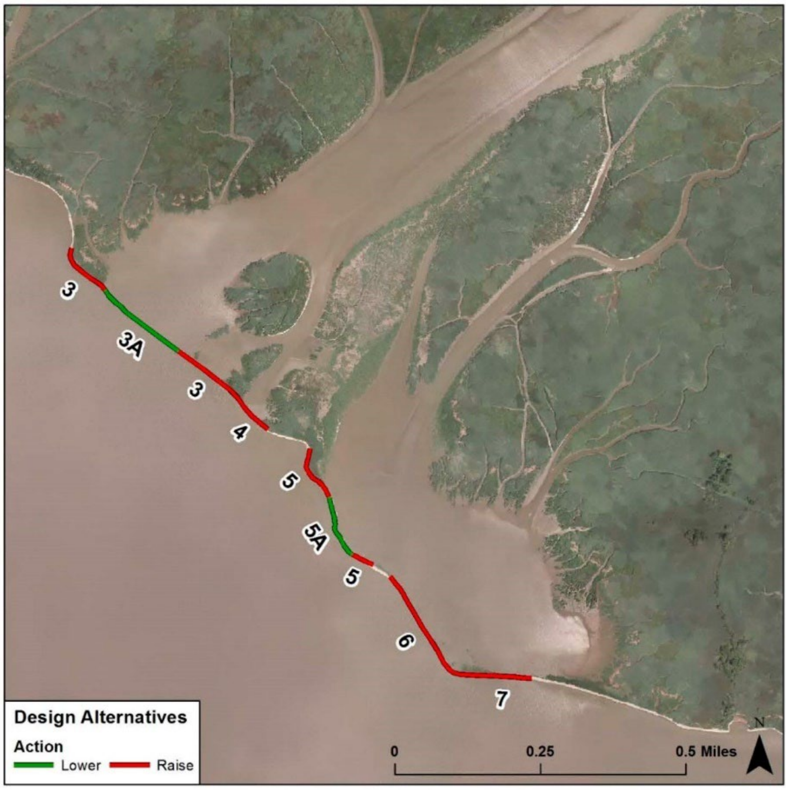


Figure 5. Concept of Mill Creek/Goose Pond Stone Breakwater Modifications (Source: USFWS, 2017)

In a letter from USFWS to NOAA Fisheries, the workplan is described as: “There will be mechanical removal of excess stone from stations STA 0+74.78 to 5+17.49 (see attached construction drawings). A crane barge will be used to pick up existing stone that was used to create the original breakwater and restore it to other locations along the breakwater. Additional stone (in addition to the stone that is re-added from the original breakwater) will be brought in by barge and added to the existing breakwater. 4088 cubic yards of stone will be placed along the breakwater. This additional stone (4,088 cubic yards of stone in total, along ~715 feet of the breakwater) will be brought in to raise the breakwater to elevation mean high water (MHW), +2.56 feet NAVD88 along Areas 5, 6, and 7 and the stone will extend to 20' at the base. The total area where stone will be placed is 0.168 acres. Pile driving will not occur as part of this project. By increasing the elevation of the breakwater in Areas 5, 6, and 7, the impacts of waves will be greatly reduced. Stone will be placed on top of the existing breakwater. Range and elevation markers for control of stone placement in accordance with the plans will be installed. Turbidity curtains will be placed around the area of excavation and area of unsuitable soil placement. In addition to the use of layout markers, a record of stone quantity placed in each sector will be maintained to insure the proper distribution of material on the project. Under Design Phase 2, this project, rock will be removed at Area 5A, along ~330 feet of the breakwater to deepen existing breaches in the stone breakwater to the elevation of the existing mud line (-5.15 feet NAVD88). The rock that will be removed along this ~330 feet will be used in locations along the breakwater that will be receiving additional rock.

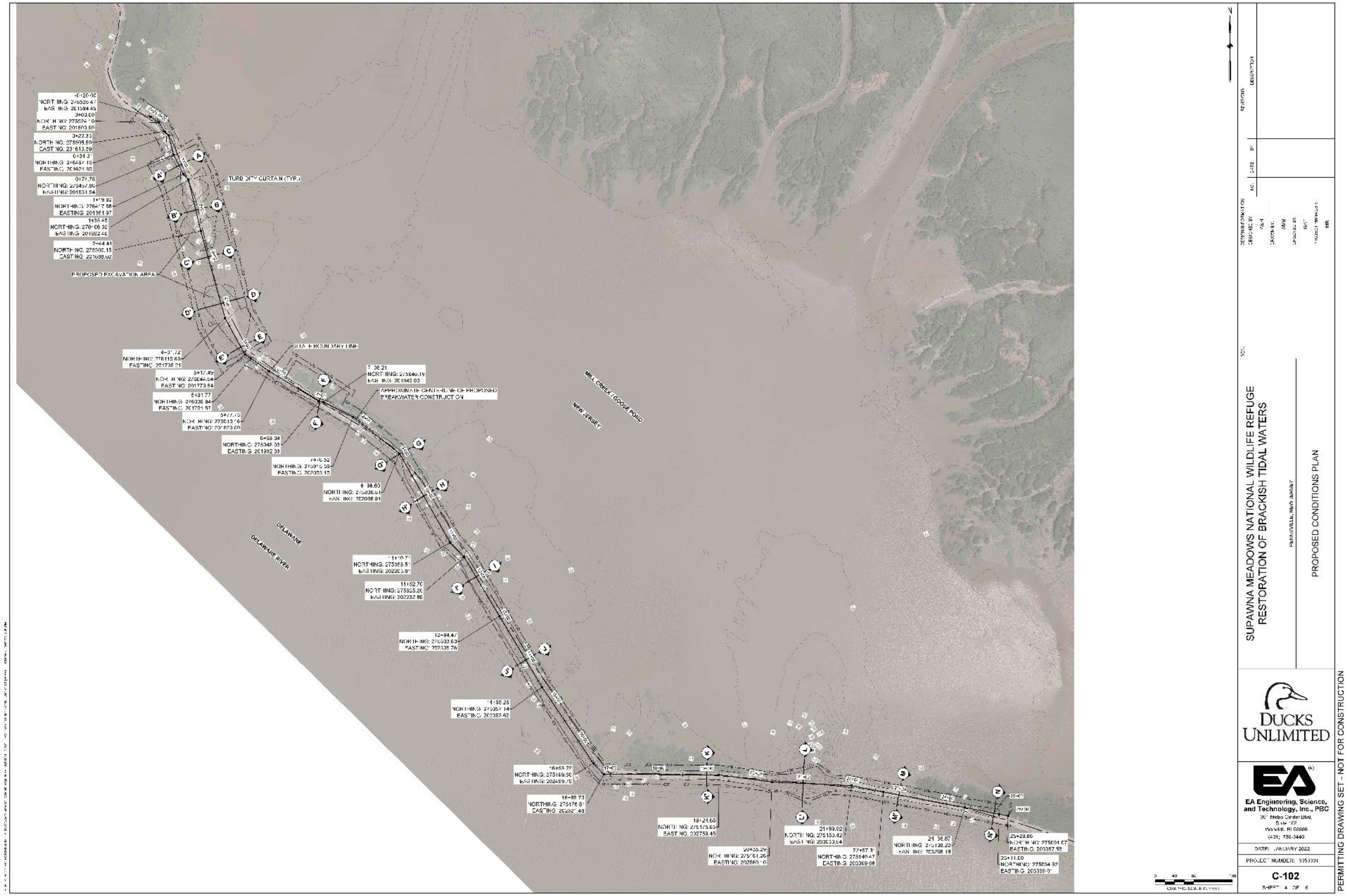


Figure 6. Draft USFWS Stone Breakwater Plan

2.0 PURPOSE AND NEED

2.1 Purpose

The purpose of the proposed action is to: 1) Maintain safe navigation within the Salem River Federal Navigation Channel; 2) Restore critical intertidal marsh and mudflat habitats within the Goose Pond/Mill Creek area of USFWS's Supawna Meadows NWR; and 3) Provide an alternate BUDM location for sandy material from the FNC for placement along the nearshore-subtidal and intertidal shoreline of Oakwood Beach.

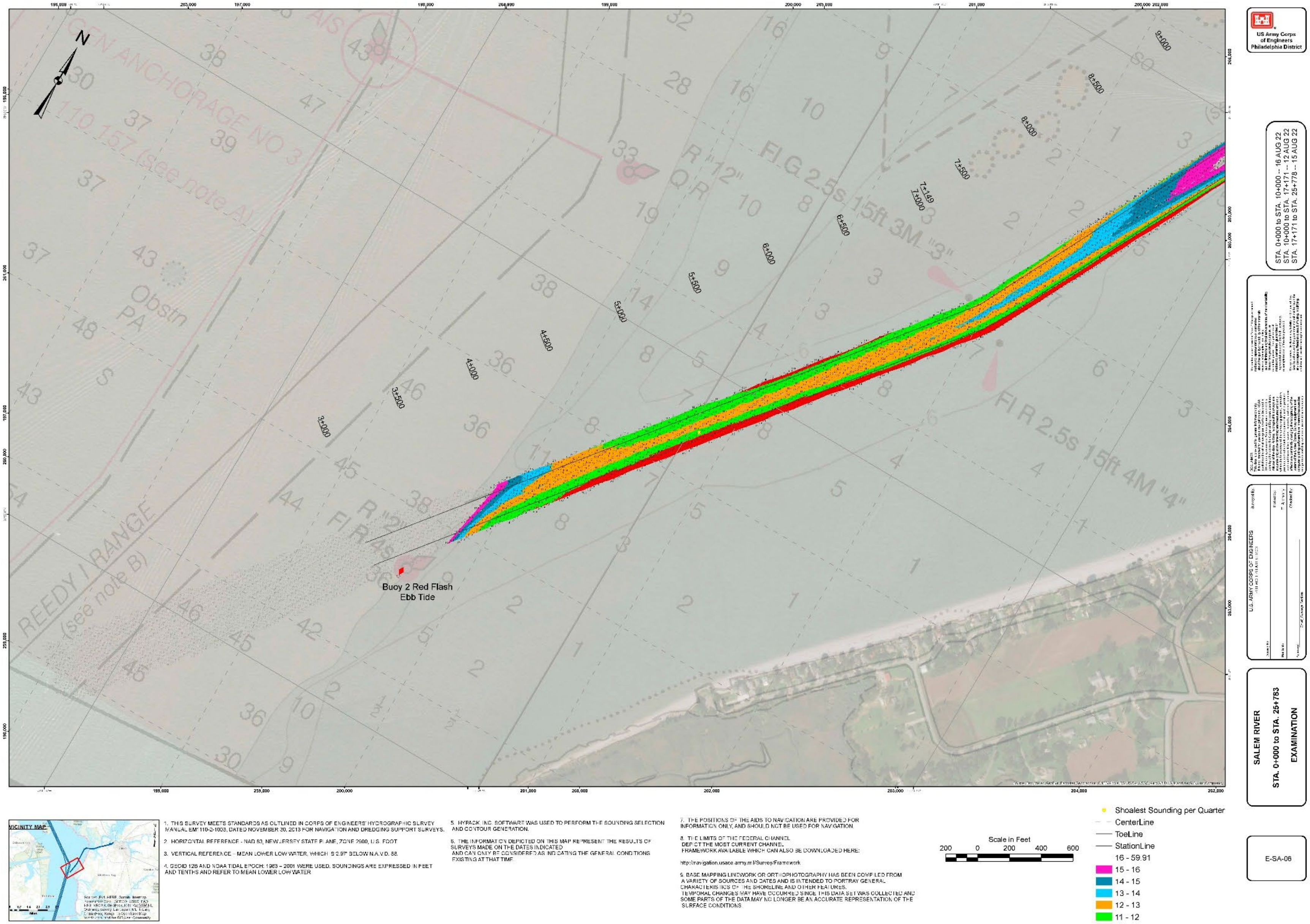
The Salem River Federal channel maintenance dredging will remove shoals to maintain safe navigable depths to -16 feet MLLW plus up to 2 feet over-depth in areas determined by channel surveys in accordance with the authorized project dimensions. The initial operation will generate approximately 158,000 CY to the authorized project depth of 16 ft MLLW plus a 1 ft over-depth allowance of an additional 51,000 CY (approximate total of 209,000 CY of silty dredged material). Channel infilling will be monitored and an additional 50,000 to 75,000 CY of maintenance material may be removed in the subsequent 1 to 2 years following the initial operation.

The dredged material placement design plan has been developed in coordination with the USFWS – Supawna Meadows NWR and other project partners and stakeholders. Placement operations of the dredged material are a beneficial use for the purpose of restoring a mosaic of intertidal mudflat and vegetated marsh habitat within eroded areas of former but now flooded marsh.

2.2 Need

The major stakeholder user of the Salem River Federal Navigation Channel is the Port of Salem. The Port of Salem is a deep-draft port located in the vicinity of the Salem River Cut-Off on the Salem River in Salem, New Jersey. The Port is located approximately 2 miles east of the Delaware River, and 54 miles from the Atlantic Ocean. The Port became a foreign trade zone in 1987. Commodities include bulk cargo (construction aggregate), break bulk cargo, containers (clothing, agricultural produce). Port activity also has at times involved lighterage.

Periodic maintenance dredging is needed in the lower portion of the Federal channel to remove sediments for navigation safety for commercial and recreational users. The authorized channel depths are 16 feet deep and 150 to 250 feet wide from the Route 49 bridge to the entrance channel in the Delaware River where the proposed maintenance dredging will occur in 2023 (**Figure 3**). The entire Salem River channel from the entrance in the Delaware River to the Rt. 49 bridge in Salem is approximately 91 acres of subtidal soft bottom. Maintenance dredging will disturb smaller components of the channel based on shoaled areas. Sections of the entrance channel are less than the authorized depth of 16 feet MLLW between Stations 3+000 and 15+000. (**Figures 7 -9**). The current shoaled areas that require dredging would disturb approximately 30 acres of soft bottom in the approach channel. Maintenance dredging will generate a need to dispose of up to 285,000 CY of silty dredged materials with 2 maintenance cycles.



1. THIS SURVEY MEETS STANDARDS AS OUTLINED IN CORPS OF ENGINEERS' HYDROGRAPHIC SURVEY MANUAL EM1110-2-1003, DATED NOVEMBER 30, 2013 FOR NAVIGATION AND DREDGING SUPPORT SURVEYS.

2. HORIZONTAL REFERENCE - NAD 83, NEW JERSEY STATE PLANE, ZONE 2900, U.S. FOOT

3. VERTICAL REFERENCE – MEAN LOWER LOW WATER, WHICH IS 2.97' BELOW N.A.V.D. 88.

4. GEOID 12B AND NOAA TIDAL EPOCH: 1983 – 2001 WERE USED. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO MEAN LOWER LOW WATER.

5. HYPACK, INC. SOFTWARE WAS USED TO PERFORM THE SOUNDING SELECTION AND CONTOUR GENERATION.

6. THE INFORMATION DEPICTED ON THIS MAP REPRESENT THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.

7. THE POSITIONS OF THE AIDS TO NAVIGATION ARE PROVIDED FOR INFORMATION ONLY, AND SHOULD NOT BE USED FOR NAVIGATION.

8. THE LIMITS OF THE FEDERAL CHANNEL DEPICT THE MOST CURRENT CHANNEL FRAMEWORK AVAILABLE WHICH CAN ALSO BE DOWNLOADED HERE:

http://navigation.usace.army.mil/Survey/Framework

9. BASE MAPPING LINEWORK OR ORTHOPHOTOGRAPHY HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND DATES AND IS INTENDED TO PORTRAY GENERAL CHARACTERISTICS OF THE SHORELINE AND OTHER FEATURES. TEMPORAL CHANGES MAY HAVE OCCURRED SINCE THIS DATA SET WAS COLLECTED AND SOME PARTS OF THE DATA MAY NO LONGER BE AN ACCURATE REPRESENTATION OF THE SURFACE CONDITIONS.

Figure 7. Salem River Channel Examination (Lower)

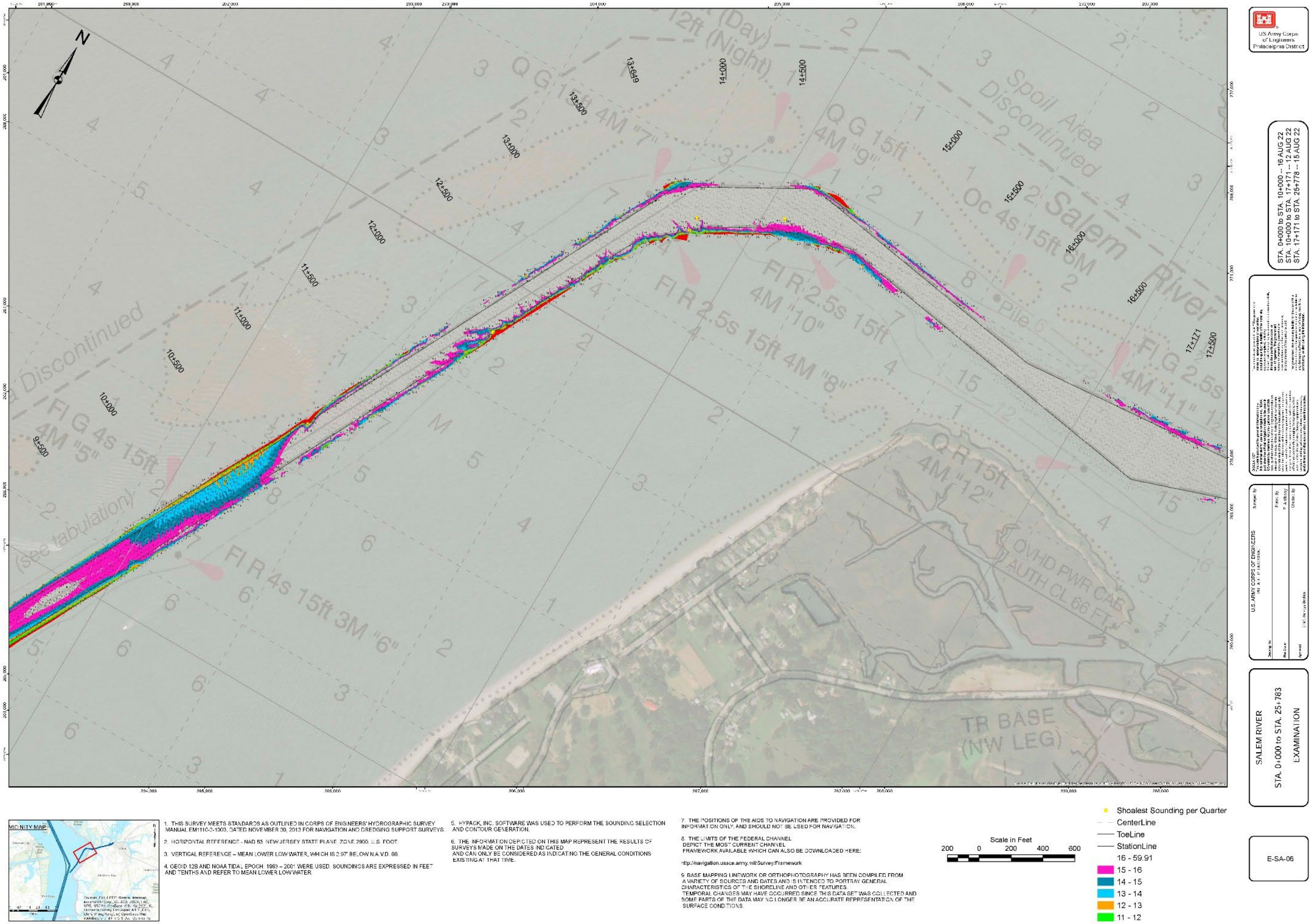


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Figure 8. Salem River Channel Examination (Middle)

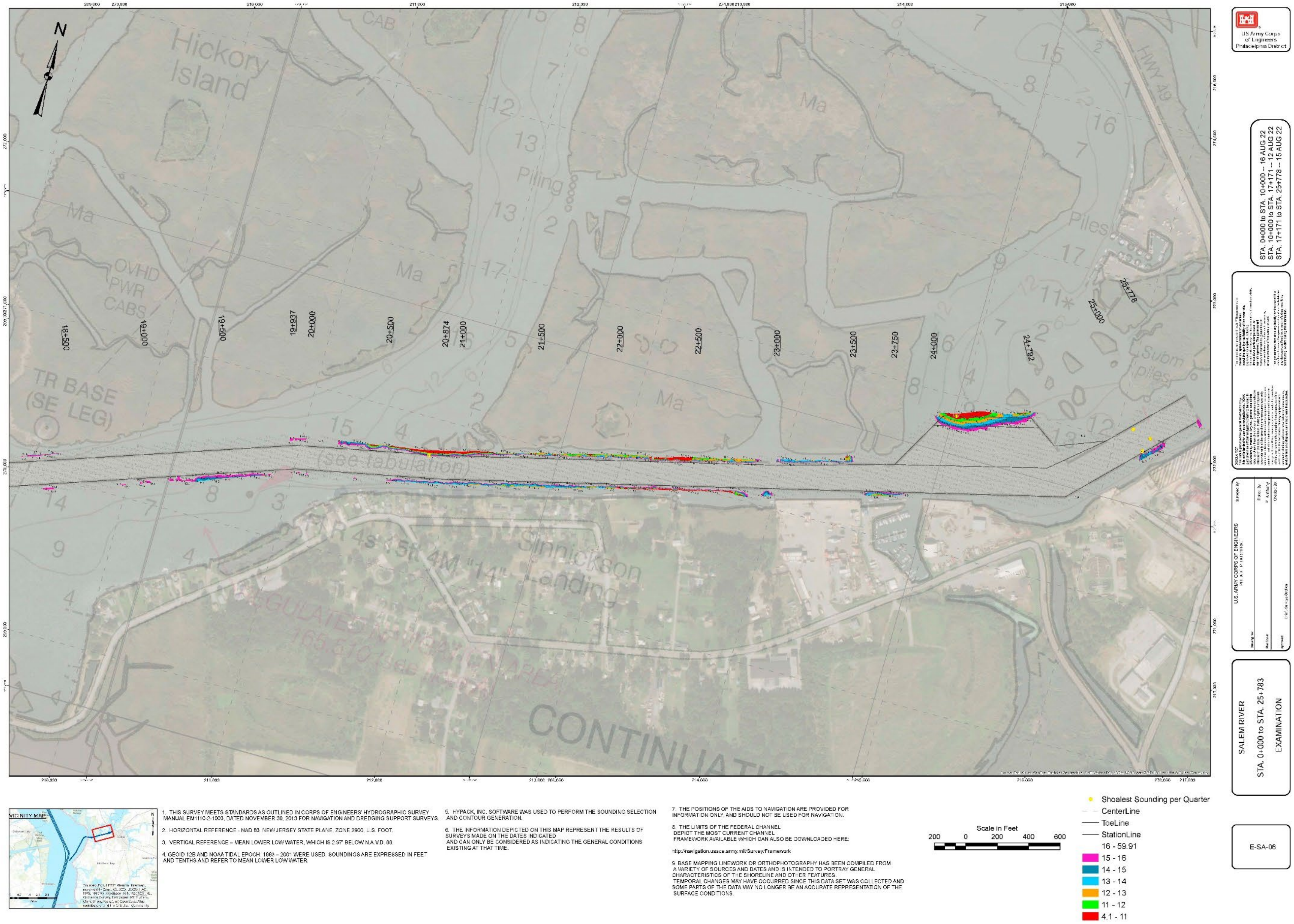

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Figure 9. Salem River Channel Examination (Upper)

The Supawna Meadows NWR in partnership with Ducks Unlimited (DU) is currently undertaking efforts to restore intertidal mudflats and wetlands along the Delaware River shoreline that has experienced significant losses through erosion and inundation since the 1930's. These losses are the result of past diking practices for salt hay farming and the concomitant effects of sea level rise and storms both associated with the effects from climate change. The refuge has invested in a project to modify the stone breakwater in the Mill Creek/Goose Pond Area of the refuge along the Delaware River to protect intertidal habitats, promote better tidal flushing, and to accrete sediments to build up and maintain intertidal habitats that have been lost. This is identified as "Phase 1" of their restoration efforts (personal communication with Jim Feaga, DU). However, despite the implementation of the stone breakwater modifications, the accretion of sediments is expected to occur slowly over decades, and accretion would be counteracted with the effects of sea level rise. Therefore, infusions of dredged material would significantly kick-start intertidal mudflat and marsh building processes and promote natural geomorphic accretion processes. This would result in net conversions of open water areas to intertidal estuarine mudflats and brackish marshes. Infusions of sediment into the Goose Pond/Mill Creek has been identified by the USFWS Supawna Meadows NWR managers as the second phase ("Phase 2") for restoration and have sought USACE, a federal partner, to supply this sediment as a BUDM project using Salem River FNC sediments.

3.0 PROBLEMS, OPPORTUNITIES AND OBJECTIVES

3.1 PROBLEMS

The problems of wetland losses experienced at the Supawna Meadows NWR were addressed in the Environmental Assessment for the Supawna Meadows NWR: Design/Build Marsh Restoration Project *(USFWS, 2017)* as: "*Global climate change is threatening our nation's coastal environments, producing a number of far-reaching environmental effects of which sea level rise is one of the most pronounced (Climate Institute 2010). Small increases in sea level dramatically affects the world's coastlines, physically, biogeochemically, and economically through impacts such as erosion, flooding, salinization, and habitat transformation for wildlife and plants (Climate Institute 2010, UCS 2013). Although coastlines are naturally dynamic, being shaped and re-shaped through the actions of ocean waves, currents, and tides, rising sea levels alter these dynamics by amplifying their effects. Thus, large storm surges such as those caused by Hurricane Sandy can have catastrophic effects upon the coastline (UCS 2013).*

These impacts are a substantial and growing threat in the coastal region of New Jersey, which contains some of the most valuable estuarine and wetland ecosystems in the United States (Cooper et al. 2005). The degradation of coastal wetlands within the Delaware Estuary has been documented to be rapidly occurring. A 2012 report by the Partnership of the Delaware Estuary (PDE) estimated that between 1996 and 2006, the rate of loss was approximately one acre per day, with the expectation of that rate increasing due to climate change and sea level rise. In 2010, another paper by PDE *projected the future acreage of tidal wetland will decrease by approximately two-thirds of its current (2006) acreage by 2100.*

In addition to increased water levels from sea level rise, the widespread practice of grid ditching, used to increase the production of salt marsh hay and control mosquitoes, has altered the natural salt marsh hydro-period (depth and duration of inundation) and caused the loss of important associated functions and the loss of vegetation. Inadequate tidal flushing and man-made barriers to tidal flow (e.g., roads, berms, dikes, under-sized culverts, etc.) have also added to the degraded condition and productivity of the tidal marshes, further impacting wetlands at the refuge.

The resulting vegetation die-back, or changes in vegetative community structure, and reduction in rates of salt marsh accretion may lead to permanent loss of marsh land and conversion to open water, thereby exacerbating the vulnerability these critical wetlands have to sea level rise and coastal storm surge events. Such degradation and loss runs counter to the mission of the National Wildlife Refuge System, the refuge, and the refuge's Comprehensive Conservation Plan (CCP) (USFWS 2004).

The importance of wetlands is well understood for providing fish and wildlife habitat, natural water quality improvement, flood storage, shoreline erosion protection, opportunities for recreation and aesthetic appreciation, and for the production of natural products (USEPA 2016). Wetlands are generally considered to be the major contributor to primary production within an ecosystem, and coastal wetlands, primarily salt marshes, are among the most productive ecosystems in the world (Tiner 1987). However, salt marshes only exist within a narrow range of elevations that bracket mean sea level (msl) (USFWS 2015). Because salt marshes only exist within this narrow range of elevation, they are highly susceptible to the effects of sea level rise and extensive drainage caused by anthropogenic stressors, such as the extensive dikes and ditches that were dug to covert the marshland in the refuge to salt hayfields and those dug for mosquito control (USFWS 2004).

Salt marshes normally keep pace with sea level rise through a process of vertical accretion and inland migration. Salt marsh accretion is a process by which the deposition of sediment and the accumulation of organic matter collectively raise the marsh elevation incrementally over time (Zhigang et al. 2014). However, due to extensive anthropogenic effects the marsh has either stopped or decreased its accretion rates. Today, New Jersey's salt marshes such as the Project area cannot keep pace with the rate of sea level rise. Therefore, these salt marshes risk permanent inundation (i.e. loss) if the sea level rises faster than the rate by which the marsh can accrete (Cooper et al. 2005). Global climate change has already had an observable impact in the Northeastern United States.

According to the Intergovernmental Panel on Climate Change (IPCC), sea level has risen worldwide approximately 4.8 to 8.8 inches during the last century and will continue to rise an additional 7.1 to 23.2 inches between 1999 and 2099 at a rate of *approximately 0.07 to 0.23 inches per year (IPCC 2007). The historic trend for sea level rise within the refuge is 0.136 inches per year, about twice the global average for the last 100 years (USFWS 2011).*

The refuge is located along the Delaware Bay, an area that is threatened by the effects of sea level rise. In 2010, a report by the PDE projected the future acreage of tidal wetland in the Delaware Estuary will decrease by approximately two-thirds by the year 2100 due to the rapid changes in sea levels. NOAA's SLAMM predictive tool indicated that saltwater intrusion is predicted to increase salinity within the refuge boundary by the year 2025, thereby increasing the amount of saltmarsh between 140 and 200 percent (adding between 219 and 300 acres). However, other tidal marsh habitats are predicted to decrease between 14 and 18 percent (losing about 300 to 400 acres).

Over this same time span, tidal creeks are predicted to increase between 22 and 31 percent (between 150 and 220 acres). Because much of the habitat is tidally influenced, sea level rise will likely change the species composition and associated habitat management for much of the refuge (USFWS 2011).

The rock dike that was built in 1900 along the marsh edge to prevent erosion failed early in the 1930s, re-flooding the tidal marsh. Remains of the dike are still present between the marsh and the Delaware Bay Estuary, which may be leading to restricted tidal flow and decreased quality of the marsh habitat. Drainage ditches and earthen dikes are also still present within the tidal marsh, altering hydrology. Data suggests it is possible that water moving into the Supawna Meadows Marsh Complex on flood tides is unable to escape on ebb tide and is being confined within the intra-marsh creek system and in pools in the interior of the marsh platform (Haaf et al. 2015b).

The Marsh Futures Field Study Assessment performed by Haaf et al. (2015b) summarized that there is potential for marsh expansion from sediment collecting along the interior edges and fringes of the marsh islands. However, the lack of accretion along the main river channel edge indicates that the historical stone breakwater system is currently contributing to the prevention of lateral change along this edge.

Increased water levels, inadequate tidal flushing, historical impacts (mosquito control and salt hay farming), erosion, and man-made barriers to tidal flow have degraded the condition and productivity of the tidal marshes within the refuge. The resulting vegetation die-back and reduction in rates of salt marsh accretion may lead to permanent loss of marsh land and conversion to open water, thereby exacerbating the vulnerability these critical wetlands have to sea level rise and coastal storm surge events. Therefore, the Service believes the Project area would benefit from various modifications to the existing breakwater dike to combat future impacts to the Supawna Meadows Marsh Complex.

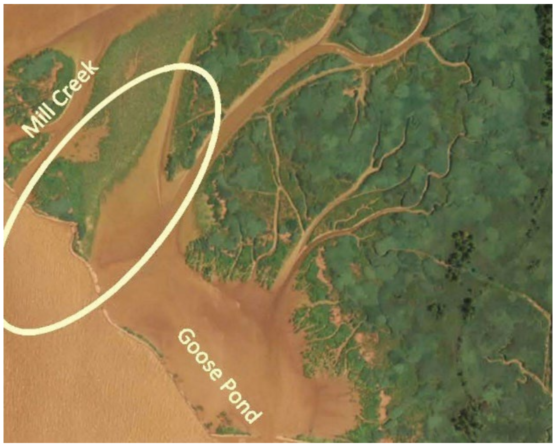
The Delaware Bay coastline is under threat of permanent changes from the loss of salt marshes and subsequently, a loss of wetland function. These changes will reduce the quality of habitat for fish, birds, invertebrates, and plants that use rely on salt marshes *along the Delaware Bay. The Service is concerned that these changes will result in conversion of the marsh to mudflat and open water. Since marshes provide storm and flood protection, these changes in the landscape could exacerbate the frequency and intensity of inland flooding from coastal storm surge events (Haaf et al. 2015a).*

Photograph 1. 1931 Aerial Photography of a portion of Supawna Meadows NWR (NJGIN 1930-1939)

Photograph 2. 1939 Aerial Photography of a portion of Supawna Meadows NWR (NJGIN 1930-1939)

At the refuge, natural processes (e.g., sea level rise and erosion) began to damage the original dike system. Therefore, a more than 2-mile-long stone breakwater was constructed circa 1900 along the marsh edge for the purposes of protecting the marsh and the original failing dike and ditch system (USFWS 2011). However, during the early 1930s, likely during Hurricane #6 of 1933, the stone breakwater breached in a number of locations (Mitchell 1933). As can be deduced from historical aerial photography, many of the salt hayfields flooded. This conversion of tidal marshes to open water and mudflats likely occurred for the following reasons: (1) a century's worth of agricultural practices that did not let these areas accrete the natural biomass necessary to help keep up with rising sea levels; (2) the agricultural practices that eliminated much of the micro-topography, leaving the marsh susceptible to wave scouring; (3) the breaches that did not support proper tidal flushing; and (4) the remaining earthen dikes and ditch system behind the failed stone breakwater that did not allow for natural drainage patterns. During this time Mill Creek moved south hundreds of feet and Goose Pond greatly enlarged (see Photographs 1 and 2). Since then, it seems the Supawna Meadows Marsh Complex has been slowly returning to a state of equilibrium. From 2001 aerial imagery, it can be deduced that more natural dendritic patterns of channels are beginning to re-establish at the major breaches near the mouths of tributaries, Mill Creek has returned to a more traditional location in the marsh, and the marsh is slowly encroaching on Goose Pond. By 2006, the most notable observation is that large areas *of formerly unvegetated open water became densely vegetated (mud flat/low marsh), primarily in the areas between Mill Creek and Goose Pond (see Photographs 3 and 4).*

Photograph 3. 2001 Aerial Photography of a portion of Supawna Meadows NWR (Google Earth 2001).



Photograph 4. 2006 Aerial Photography of a portion of Supawna Meadows NWR (NJGIN 2006).

This observed marsh rejuvenation trend has slowly continued since that time. Photograph 5 appears to depict further indication of sediment retention and marsh expansion over the past decade, suggesting the existing portions of the stone breakwater are providing some level of protection to the marsh behind it. However, review of recent imagery suggests the rate of marsh formation is slowing, indicating that the current stone breakwater configuration can no longer support further marsh expansion."

Photograph 5. 2013 Aerial Photography of a portion of Supawna Meadows NWR (Post Hurricane Sandy) (Google Earth 2012-2013).

3.2 Opportunities

Weinstein and Weishar (2002) found that the beneficial use of dredged materials fulfills several aspects of the marsh restoration process: it enhances the sediment budget at low elevations; it accelerates the restoration trajectory that would have most likely not have initiated naturally; it improves the geomorphology of the marsh platform; and reduces erosion and further stabilizes shorelines, providing habitat for wetland species as well as increased protection to nearby infrastructure. Saltwater marshes along the New Jersey coastline have been disappearing over the past hundred years due to sea level rise, lower accretion rates, land subsidence, and higher rates of anthropogenic erosion. The U.S. EPA estimates that 35% of Delaware Bay's rare species and 70-90% of the Estuary's fish and shellfish depend on wetland habitats.

The abundance of dredged materials from channel maintenance provides a valuable and needed resource as well as opportunities to combine dredging needs with coastal marsh rehabilitation and restoration. Beneficial use of dredged material removed from navigation channels is preferrable to disposal of the sediments in upland CDFs. The USFWS supports the implementing positive and sustainable measures to meet the needs of the living resources and communities of the Salem River because of the area's increased rates of erosion, sea level rise, loss of living (fish, shellfish, invertebrates, vegetation) resources and habitat. Placement of the dredged material on former but now flooded marsh is needed in order to raise the elevation to re-create intertidal mudflats accessible to avian species for foraging and re-establish vegetated brackish marsh habitat such that they are able to perform their ecological services. Commercially and recreationally important living resources (i.e. waterfowl, fish, etc.) are dependent upon tidal marshes for foraging, spawning and nursery areas. Wetlands represent a defining characteristic of a healthy estuarine ecosystem and help to maintain water quality through the interception of and filtering of upland runoff and tidal flushing.

3.3 Objectives

USACE's Engineering Manual (EM 1110-5025) Dredging and Dredged Material Management provides guidance on implementing Beneficial Use (BU) of Dredged Material (BUDM). A companion guide, prepared in collaboration with the USEPA, provides practical guidance in further support of BUDM. The manual is titled "*Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material*" (USEPA/USACE, 2007). Interest in using dredged material as a manageable beneficial resource as an alternative to conventional disposal practices has increased. BU reduces the adverse effects of both land and water dredged material placement. By considering dredged material as a resource, a dual objective is achieved. BUDM is strongly supported by USACE command. On January 25, 2023, Lieutenant General Spellmon issued a "Beneficial Use of Dredged Material Command Philosophy Notice", which outlines a vision for expanding the U.S. Army Corps of Engineers beneficial use of dredged material (BUDM) program. This document includes a framework for achieving the goal of 70% BUDM by the year 2030.

The objective of the Salem River dredging project and BUDM is to maintain channel depths for navigation safety while restoring flooded wetland areas to re-establish intertidal mudflats and salt marsh vegetation where open shallow water areas currently exist. The Supawna Meadows NWR provides valuable remote brackish marsh habitat for wildlife and flood water attenuation. Healthy brackish marshes within the Supawna Meadows NWR are in need of a supplemental sediment source to re-establish the ecological services that they provide (USFWS, 2017).

Infusions of sediments from BUDM and the use of natural geomorphological depositional processes would build sufficient elevation within existing mudflat and open water for the establishment of brackish low marsh within the NWR to create conditions to expand/establish existing low marsh habitat as depicted in Figures 10 and 11.

The Salem River dredging project aligns with the objectives of the Delaware Estuary Regional Sediment Management Plan (RSMP Workgroup, 2013), which provides a comprehensive master plan that addresses the economic benefits and long-term needs of sediment quality, sediment quantity, dredged material management and beneficial use within the Delaware Estuary.

The Philadelphia District USACE has been participating in the national Regional Sediment Management (RSM) and Engineering with Nature (EWN) Programs with considerable lessons learned developed for navigation dredging and placement activities in New Jersey, especially since Superstorm Sandy in 2012. Navigation managers from the Philadelphia District continue to partner with USACE's ERDC, the State of New Jersey, various stakeholders, and the dredging industry to utilize EWN and RSM strategies in an innovative regional approach to restore navigation as well as enhance coastal resilience.

Figure 10. Existing Brackish Intertidal Low Marsh at Supawna Meadows NWR Wood Tract (Photo courtesy of Jim Feaga, DU)

Figure 11. Existing Low Marsh and Phragmites Wetlands at High Tide Along the Southern End of Goose Pond Area (Wood Tract) of Supawna Meadows NWR (Photo courtesy of Jim Feaga, DU; annotations by USACE).

Over the last decade, beneficial use placements involving shoreline stabilization and marsh restoration have significantly increased in our region, helping to advance practices and policies that keep dredged material in the natural sediment system.

The Philadelphia District USACE is embracing a new goal of beneficially using 100% of clean New Jersey coastal channel sediments and developing cost effective ways to do so. USACE is a provider when it comes to sediment, a much-needed currency in the natural coastal system in the New Jersey Back Bays and Delaware Estuary.

In April 2019, USACE, the state of New Jersey, and the Wetlands Institute launched the Seven Mile Island Innovation Lab (SMIIL) as detailed in Chasten et al., 2022. The SMIIL encompasses about 24 square miles of tidal marshes, coastal lagoons, tidal channels and bays between the Cape May County mainland and the barrier island communities of Stone Harbor and Avalon, NJ. The New Jersey Intracoastal Waterway (NJIWW) is a federal channel maintained by USACE and bisects the SMIIL. The initiative is designed to advance and improve dredging and marsh restoration through innovative research, collaboration, knowledge-sharing, and practical application.

Under the SMIIL, USACE and partners completed dredging and habitat creation projects at Ring Island and Great Flats near Stone Harbor, NJ in 2014 and 2018. The work entailed dredging the NJIWW and using the sandy dredged material to create elevated nesting habitats in the adjacent water/saltmarsh complex, specifically colonial nesting bird habitat for black skimmers, common and least terns, and American oystercatchers-all state-listed endangered bird species or species of concern. In 2020 through 2022, subsequent projects at Gull Island and Sturgeon Island, part of the Cape May Wetlands State Wildlife Management Area (WMA) placed material dredged from the NJIWW to create natural and nature-based features (NNBF). These projects a) enhance and fortify inundated marsh elevation; b) restore unvegetated marsh interior mud flats to low marsh habitat; c) create high marsh areas suitable for salt marsh sparrow and wading bird colonies; d) reduce marsh edge erosion; and e) enhance tidal flats and shallows for submerged aquatic vegetation (SAV) and fish habitat.

The collaborative team have developed and implemented a comprehensive monitoring program at the project sites to assess sediment behavior and, material placement evolution work, turbidity monitoring, as-built surveys, colonial nesting bird assessments and other factors. Monitoring parameters also help evaluate dredge technology innovation effectiveness, develop lessons learned for dredging and placement practices and plan adaptive management approaches. With ongoing partnerships, coordination at all levels, improvements to design and project implementation and strong science to support innovation, USACE proposes to conduct similar efforts along with project partners within the lower Salem River/Supawna Meadows NWR region and will continue to work to advance best practices through strategies and solutions that address the long-term issues and sustainability of the coastal region.

4.0 ALTERNATIVES

4.1 Alternative 1: No Action

The No Action Alternative would entail that no maintenance dredging of the Salem River federal navigation channel would occur. A small portion of the navigation channel was last dredged in 2022. No longer maintaining the authorized navigation depths would result in the channel continuing to shoal-in and pose navigation hazards to vessels traversing the river. A lack of access for commercial shipping and recreational boating would result in significant local and regional adverse economic consequences.

There is currently no feasible substitute action in lieu of maintenance dredging. Periodic dredging is necessary to maintain sufficient navigable depths for vessels to transit the Salem River safely. Portions of the lower channel are currently at less than authorized depths and require dredging.

4.2 Alternative 2 – Killcohook CDF (Preferred Plan as default)

Maintenance dredging would continue to periodically occur in portions of the Salem River Federally authorized channel as needed and as funding is available. The channel has been dredged six times periodically since 1996 when the channel was modified to the authorized depth of 16 feet MLLW. The authorized designated dredged material disposal area since 1996 has been the Killcohook CDF where material is hydraulically pumped approximately 3 miles from the channel dredging locations. CDFs provide an environmentally acceptable means to dispose of dredged sediments due to their ability to contain contaminated sediments and allow for fine-grained sediments to settle-out and de-water to minimize turbidity introduced into the waterways. It is expected that the Killcohook CDF can remain as a primary alternate disposal site as it contains sufficient capacity at this time. Therefore, the continued use of Killcohook CDF would be the “fall back” location if any BUDM options are not available for the maintenance dredging of the Salem River Federal Navigation Channel at the time of need.

4.3 Alternative 3 – Oakwood Beach Nourishment BUDM (Preferred w/conditions)

In 2015, the Oakwood Beach CSRM project (USACE, 1999 and USACE, 2014) utilized over 353,000 cubic yards of sand to initially construct a 50-foot-wide berm at an elevation of +6.0 Feet NAVD. Periodic nourishment occurs about every 8 years with an estimated volume of approximately 33,000 CY per nourishment cycle. The designated sand source for the CSRM project is from the Reedy Island Range of the Delaware River Federal Main Navigation Channel, which is estimated to have sufficient sand quantities for the project life. The utilization of the Salem River channel sediments for the Oakwood Beach was initially considered in both the 1991 *Delaware River Comprehensive Navigation Study Final Interim Feasibility Study for Salem River and Environmental Assessment* (USACE, 1991) and the 1999 *Oakwood Beach Integrated Feasibility Study and Environmental Assessment* (USACE 1999) but was determined to have insufficient quantities of suitable sand for the project initial construction and periodic nourishment since the majority of the sediments are composed of fine-grained silts, and was found not to be economically feasible.

In February 2022, approximately 13,000 CY of sand were removed from shoals as part of a limited maintenance dredging project at the bend of the Salem River. This project utilized the split-hull hopper dredge, *Murden,* owned and operated by the Federal government. The sandy material was placed within the nearshore zone, fronting the previously approved Oakwood Beach Coastal Storm Risk Management (CSRM) beachfill project at around the -4 to -8-foot MLLW contours within Delaware jurisdictional waters (**Figure 12**). The objective of this beneficial use operation was to provide a supplemental source of material through natural littoral transport to the nearshore Oakwood Beach area.

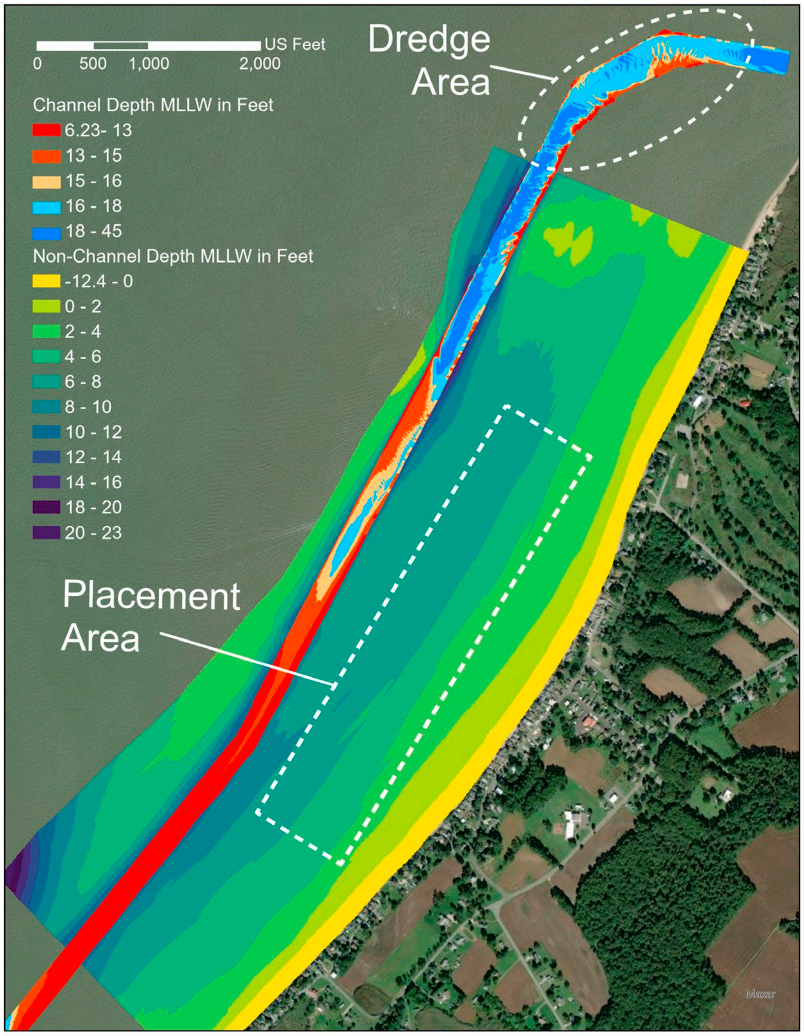


Figure 12. BUDM Placement Location in Nearshore of Oakwood Beach in 2022

As stated previously, spot shoals consisting of sandy material were removed from the Salem River Federal Navigation Channel in February 2022 utilizing the split-hull hopper dredge *Murden* and sand was placed beneficially within the subtidal nearshore of Oakwood Beach in depths ranging from -2 to -8 feet MLLW. The *Murden* is a small self-propelled seagoing, steel hull shallow-draft special purpose trailing-suction hopper dredge with a capacity of 512 cubic yards. Because it has a shallow draft and can dump with a split hull that can open along the center line, it can dredge and transport material to a designated disposal location and operate within the surf zone to nourish beaches. **Figure 13** shows the sequence of the operation of a split hull hopper dredge.

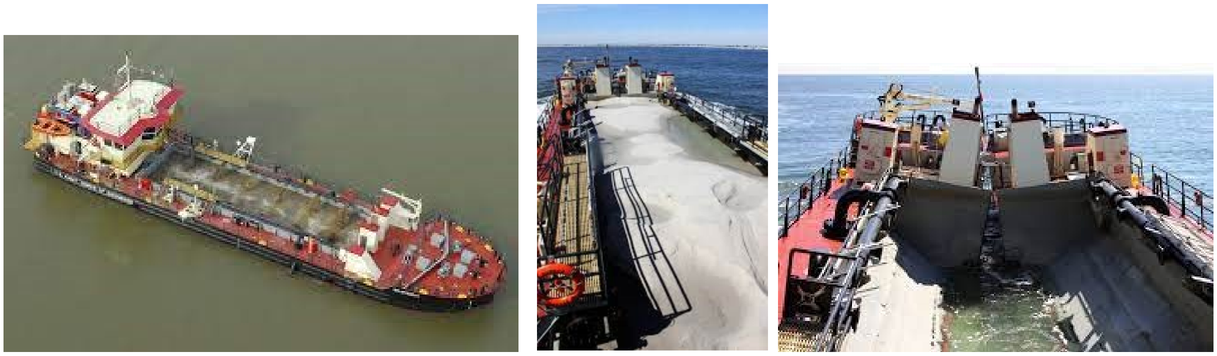


Figure 13. The Dredge *Murden* In-Filling (left), Laden with Sand in Transport (center), and Split-Hull Bottom Dumping (right). Photos are from Wilmington District USACE (left) and Philadelphia District USACE (center and right).

For the Salem River Federal Navigation Channel, the *Murden* or a similar style of dredge would only be utilized for limited shoals consisting of sandy material ≥75% sands (with testing as per NJDEP, 1997). In 2022, this only amounted to approximately 13,000 cubic yards of sandy material dredged from the channel and deposited in a 90-acre area within the nearshore of Oakwood Beach. Following the bottom placements, the sand thicknesses did not modify the tidal regime of the nearshore bottom as it remained shallow subtidal; however, the existing CSRM project benefitted by the addition of sand into the littoral system. Future placements would occur as frequently as annually (depending on the availability of the dredge and sandy spot shoals in the navigation channel) within the area depicted in **Figure 12**. as determined by bathymetry of the placement location and safe access for the dredge.

The *Dredge* Murden is anticipated to remove approximately 5,000 CY of sand from the bend in the Salem River channel with placement in the nearshore of Oakwood Beach in February 2023. Given the experience with the *Dredge Murden* in 2022, the beneficial use of newly shoaled sand, though limited in quantity to maintain the full Oakwood Beach template, is a viable consideration for future BUDM placement directly on the beach or in the nearshore of Oakwood Beach where sand is needed within the littoral system to help maintain the CSRM project template. Disposal at Oakwood Beach is contingent on the basis that the dredged material meets sediment quality objectives where material for nearshore placement is ≥75% sand (with testing as per NJDEP, 1997) and/or directly on the beach upper berm and intertidal zone is ≥90% sand.

4.4 Alternative 4-Overboard Disposal at Salem Cove

Unconfined overboard disposal was considered in USACE (1991) for the deepening of the Salem River Federal Navigation Channel. Prior to USACE (1991), overboard disposal was the common practice for the maintenance of the Salem River channel. This resulted in the creation of a number of mounds on the north side of the approach channel adjacent to Salem Cove (**Figure 14**). These mounds can be visible at mean lower low water conditions. Overboard disposal was discontinued because these areas were reaching full capacity at the time of evaluation. An expansion of these areas into the Salem Cove area was screened out in USACE (1991) because of losses of shallow fish habitat and water quality concerns with unconfined disposal of fine-grained materials in open water.

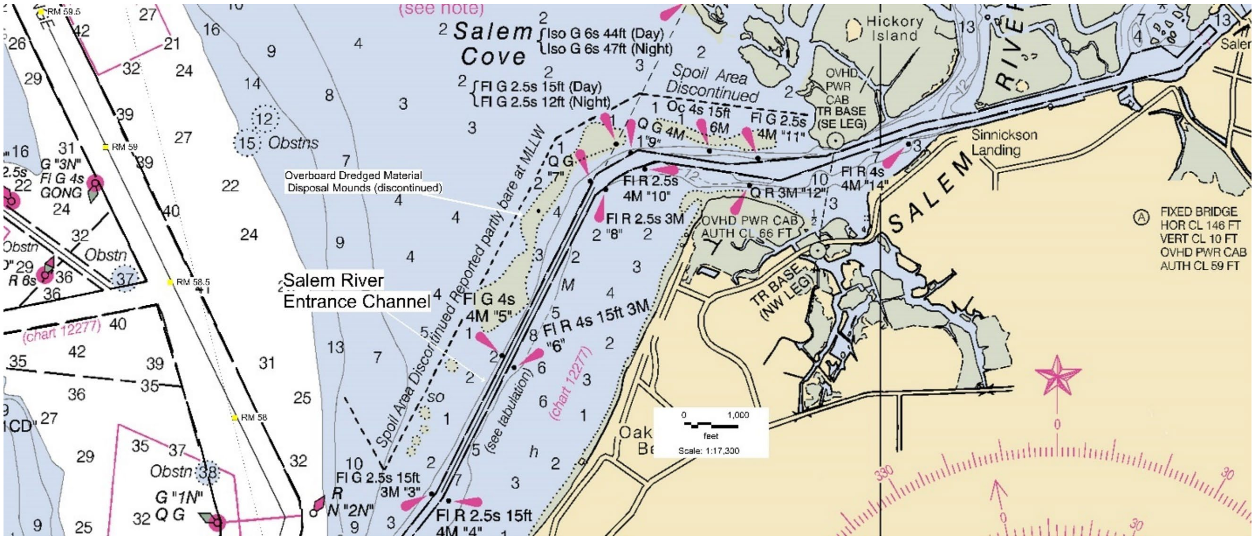


Figure 14. Salem River Discontinued Overboard Disposal Area

4.5 Alternative 5-Tilbury Island BUDM

Tilbury Island is located adjacent to the north side of the Salem River Navigation Channel across from Sinnickson Landing and downstream of Route 49 (**Figure 15**). The Tilbury Island site is an approximate 150-acre island that was formed when USACE created a cutoff channel for the Salem River navigation project. USACE constructed the navigation channel to follow the Salem River with dimensions of 9 ft MLW deep by 100 ft wide. In 1929, USACE deepened the channel to a depth of 12 ft MLW and dug a cutoff channel into a peninsula that extended into the Salem River separating it from the mainland, thus creating Tilbury Island. The channel was more recently deepened to 16 ft MLLW in 1996.

Changes in land use and construction of the navigation channel converted Tilbury Island from what was once a farmed peninsula in Elsinboro Township (Heite et al. 1986) into an island that is suitable for fish and wildlife conservation. Tilbury Island possesses ecological conditions and habitats similar to other parts of the nearby Supawna Meadows NWR. However, Tilbury Island has been eroding from both the exterior and interior due to increased tidal flow and incision by high velocity tidal channels and has lost intertidal wetland habitat. In the past decade, USFWS has conducted several investigations into potential wetland restoration strategies for Supawna Meadows. Additionally, for the past several years staff from USFWS has participated with USACE and the non-profit organization, DU, as stakeholders regarding ecosystem restoration at Tilbury Island through beneficial use of dredged material. Each of these stakeholders views that reducing risk to Tilbury Island provides an opportunity to create a larger habitat for wading birds, waterfowl and other species targeted for preservation at SMNWR.

Figure 15. Tilbury Island Location

Additionally, Tilbury Island contains habitat of NJDEPs Natural Heritage Priority Macrosites established to protect important bird species and native stands of wild rice (*Zizania aquatica*) and other species.

Tilbury Island was considered in the Federal Interest Determination (FID) investigation under the Section 111 Section 111, Rivers and Harbors Act (RHA) of 1968 as amended – Shore Damage Prevention or Mitigation of Damages Caused by Federal Navigation Projects, P.L. 90-483, as amended by Section 940 of the Water Resources Development Act (WRDA) 1986 (P.L. 99-662); and Section 214, WRDA 1999 (P.L. 106-53) authorities, but was later found to be ineligible because these authorities cannot provide shore damage control measures on Federally owned property when the Federal Government would be the primary beneficiary (Tilbury Island became part of the Supawna Meadows NWR in 2022). However, based upon findings during the FID investigation, further study under the Section 1135 authority will be pursued for this general area.

Additionally, Tilbury Island is a location investigated as part of the Regional Sediment Management (RSM) program that takes dredged materials from the Federal navigation projects along the Delaware River and repurposes it for various beneficial uses. RSM is also considering the use of dredged material to reduce risk to tidal wetlands in the vicinity. Use of dredged material to reduce risk to tidal wetlands from erosion damage has several potential advantages:

- Potential lower cost alternative than other erosion control measures
- Establishment of new locations for discharge of dredged materials
- Reduction in transit distance needed for dredged material
- Reduction in dredging costs, increases in dredging program efficiency

The placement of Salem River Federal Navigation Channel dredged materials would have beneficial effects on the stability of Tilbury Island by raising the elevation of the channels that cross through the island, and thus, reducing tidal flow velocities that contribute to the internal erosion of the tidal marsh platform. At this time, no strategies have been developed to contain fine-grained dredged materials pumped into Tilbury Island and mitigating high velocity flows that could transport sediments back into the adjacent Salem River navigation channel. However, Tilbury Island remains an important candidate site by stakeholders such as Supawna Meadows NWR and DU and is a viable alternative for consideration in future BUDM efforts.

4.6 Alternative 6 – Goose Pond/Mill Creek Area (Preferred BUDM Plan)

For maintenance dredging operations, USACE utilizes Regional Sediment Management (RSM) and Engineering with Nature (EWN) principles and practices in a natural infrastructure approach. Since 1996 and especially post-Hurricane Sandy, technical advancements in design and construction of natural and nature-based features using dredged sediments in other areas such as the Cape May Wetlands WMA continue and have led to advancing BU implementation in New Jersey through the SMIIL with the same principles for Salem River. Alternative placement actions entailing BUDM were developed and evaluated in collaboration with coastal engineers, scientists, landscape architects, and resource managers from the Philadelphia District USACE, NJDEP, the U.S. Army's ERDC, and local officials.

Maintenance dredging of the authorized Salem River federal channel will likely continue to occur periodically. This alternative involves dredging the lower navigation channel and the placement of the dredged material within the Goose Pond/Mill Creek area of Supawna Meadows NWR (Figure 16). This placement location was chosen as the selected plan to beneficially use the Salem River dredged material for the restoration of

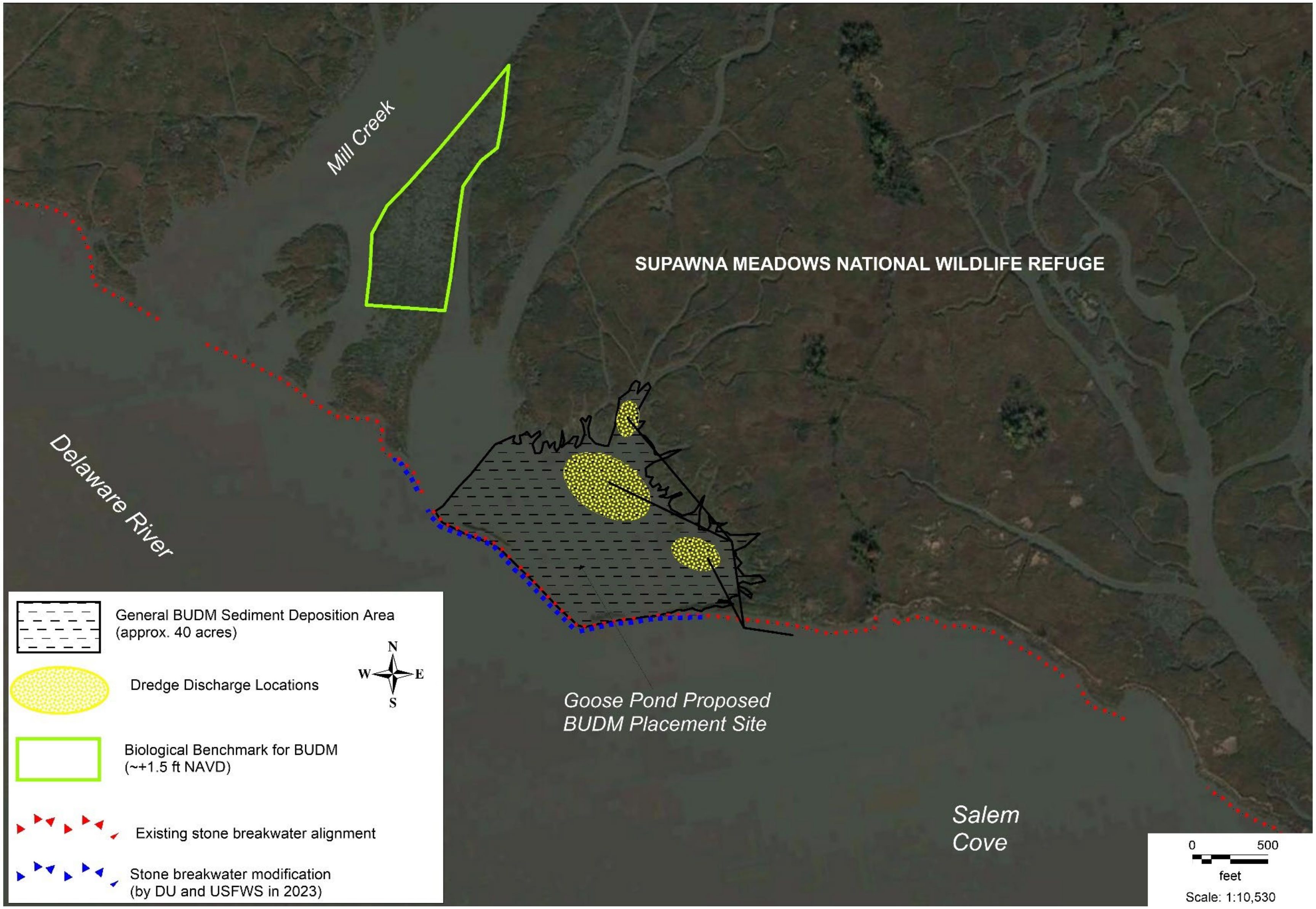


Figure 16. Goose Pond Beneficial Use of Dredged Material Affected Area

a mosaic of intertidal mudflat and low marsh habitats and complements the Supawna Meadows NWR efforts to restore low tidal marsh habitat through sediment enrichment/accretion (Phase 2). The target low intertidal marsh habitat occurs at elevation +1.5 ft. NAVD based on a nearby biological benchmark area along the Mill Creek area emptying into Goose Pond. This benchmark is based on recent sediment accretions where new low marsh has become established (personal communication with Jim Feaga, DU). The Goose Pond placement area is approximately one-third less of a pump distance than the Kilcohook CDF.

BUDM will employ the direct placement to build marsh elevation within an area experiencing marsh degradation through erosion, subsidence, and low sediment accretion rates. Direct placement of fine sand and muddy sediments are pumped into a placement area to uplift an area of unvegetated mudflat or open water to create the desired low marsh elevations. Muddy sediment is placed at the base of the elevated area, composed mostly of fine sand or existing muds. The muddy sediment at the base protects the elevated area from erosion when direct method is used in open water or near a marsh edge. For the Goose Pond area, this measure is best suited for unvegetated tidal mudflats, shallow open water, or in open areas within marshlands that have developed within tidal marshlands due to insufficient sediment or organic matter accretion (Brinson, 1993; Stevenson et al. 1986). Direct placement to build marsh elevation creates mudflats as a secondary effect at the boundaries of the existing tidal marsh area when tidal flooding naturally distributes sediments across portions of the marsh platform and the edges of land margins (USACE, Philadelphia District, 2019). The resulting mudflats can become good locations for ecological succession of new tidal marsh to begin (Castillo et al. 2021).

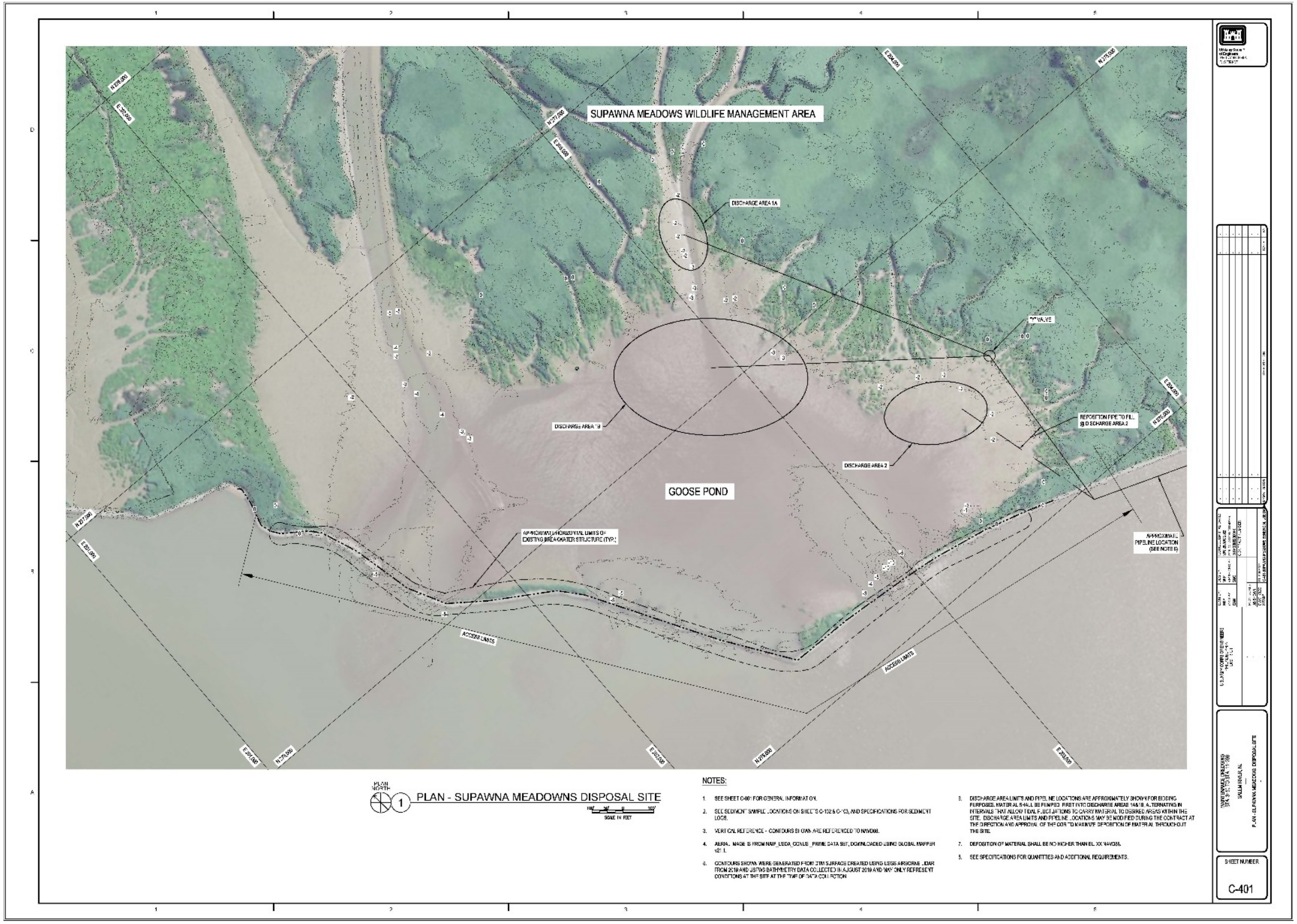
Based on lessons learned in the SMIIL, marsh edge protection, marsh elevation enhancement, and resilient intertidal shallows can be achieved using fine-grained material. Restoring the intertidal mudflat and marsh habitats will likely require repetitive placements where the sediments consolidate over time. Each successive placement will allow sediments to consolidate and contribute to bolstering the mudflat elevation and the potential re-establishment of intertidal vegetated brackish marsh habitat for bivalves, fish, and birds. This will also create natural infrastructure that improves resilience against storms and climate change impacts. This alternative promotes sediment retention within the local system while enhancing natural habitat.

Similar technical advancements in wetland restoration design and construction and monitoring have been ongoing at the Cape May Wetlands WMA. Alternative 6 will utilize the lessons learned on creating natural infrastructure with cohesive sediments at the Cape May Wetlands WMA in collaboration with NJDEP, one of the co-leaders in the SMIIL. A primary success of these efforts has been a paradigm shift leading to momentum for advanced science and improved practices for BU implementation in New Jersey and supports the BU placement project proposed herein for the Salem River navigation project.

4.6.1. Alternative 6 Construction

The initial BUDM placement will occur within the primary placement locations shown on **Figure 17**, the majority of which is within the old marsh platform behind the existing stone breakwater, which is expected to be enhanced by USFWS concurrently with the placement of dredged sediments. Dredging placement at these locations would be distributed by a series of “Y” valve pipelines where a slurry of dredged material would be pumped in from a hydraulic cutterhead suction dredge operating in the navigation channel. Here, sediments would be distributed through the pumping action along with natural flood and ebb tidal currents throughout the Goose Pond/Mill Creek area and will build elevation. Containment will be incorporated into the placement and to settle out sediments utilizing the stone breakwater and surrounding landscape of higher marsh areas with higher elevations. The stone breakwater will provide semi-confinement of suspended sediments and act as a baffle that will promote settling of any sediment that would possibly reach it, minimizing sediment from entering the Delaware River. Likewise, the existing surrounding marsh vegetation will promote the settlement of sediments on the landward side of the discharges. The “Y” valves would be used interchangeably to manage sediment build-up rates and turbidity while working with the tides. Discharges further up into the tidal creek would occur at area 1A, whereas areas 1B and 2 are closer to the breakwater for Goose Pond to promote a more even distribution of sediment within the 40-acre affected area.

The initial dredging and placement operation is anticipated to occur over a period of approximately 16 weeks in the July 2023 thru February 2024 timeframe, with an initial placement of up to 200,000 CY of predominantly fine-grained sediments. The target elevation is at +1.5 ft. NAVD to establish desirable low intertidal marsh habitat. This area has a tidal range of 5.3 feet with MLLW occurring at -2.97 ft NAVD and MHHW occurring at +2.87 ft NAVD. Intertidal mudflat conditions generally occur between elevations -2.97 ft NAVD and approximately +1.0 ft NAVD. Low marsh conditions exist above +1.38 ft. NAVD to a maximum of +1.62 feet NAVD (personal communication with Jim Feaga, DU). Based on the modeling of settlement rates for Salem River silty material, it is assumed that a maximum elevation of +1.9 would be necessary to produce a desired finished elevation of +1.5 feet NAVD after consolidation occurs (will be monitored) However, it is likely that most areas that gain elevation would be below +1.5 ft NAVD after the initial placement and subsequent placements will be needed to achieve the desired elevations. Sediment would be delivered to three discharge points in a slurry form using a “Y” valve in the pipeline. Monitoring of the placement elevations and sediment consolidation via traditional and remote sensing techniques will be conducted by USACE, ERDC, USFWS – Supawna Meadows NWR and stakeholders such as DU, and will occur prior to, during, and post-placement operations. Lessons learned from the first placement will inform the design and construction of the second placement operation approximately 1 to 2 years later and any subsequent dredging cycles if marsh elevation targets are not reached. The operation will be adaptively managed during the second placement based on elevation and consolidation data from initial placement. The Monitoring and Adaptive Management Plan is presented in Section 8.



NOTES:

1. SEE SHEET C-001 FOR GENERAL INFORMATION.
2. SEE SEDIMENT SAMPLE LOCATIONS ON SHEETS C-102 & C-103, AND SPECIFICATIONS FOR SEDIMENT LOGS.
3. VERTICAL REFERENCE - CONTOURS SHOWN ARE REFERENCED TO NAVD88.
4. AERIAL IMAGE IS FROM NAIP_USDA_CONUS_PRIME DATA SET, DOWNLOADED USING GLOBAL MAPPER v21.1.
5. CONTOURS SHOWN WERE GENERATED FROM DTM SURFACE CREATED USING USGS AIRBORNE LIDAR FROM 2019 AND USFWS BATHYMETRY DATA COLLECTED IN AUGUST 2019 AND MAY ONLY REPRESENT CONDITIONS AT THE SITE AT THE TIME OF DATA COLLECTION.
6. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS ARE APPROXIMATELY SHOWN FOR BIDDING PURPOSES. MATERIAL SHALL BE PUMPED FIRST INTO DISCHARGE AREAS 1A&1B, ALTERNATING IN INTERVALS THAT ALLOW TIDAL FLUCTUATIONS TO CARRY MATERIAL TO DESIRED AREAS WITHIN THE SITE. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS MAY BE MODIFIED DURING THE CONTRACT AT THE DIRECTION AND APPROVAL OF THE COR TO MAXIMIZE DEPOSITION OF MATERIAL THROUGHOUT THE SITE.
7. DEPOSITION OF MATERIAL SHALL BE NO HIGHER THAN EL. XX NAVD88.
8. SEE SPECIFICATIONS FOR QUANTITIES AND ADDITIONAL REQUIREMENTS.

Figure 17. Goose Pond BUDM Disposal Plan

4.7 Preferred Plan

The preferred plan is the combination of alternatives 2 (Killcohook CDF), 3 (Oakwood Beach), and 6 (Goose Pond), which allow for greater flexibility in disposal needs while providing for the beneficial use of dredged material opportunities that provide ecological benefits (Goose Pond) or Coastal Storm Risk Management (CSRM) benefits (Oakwood Beach project). The utilization of the existing Killcohook CDF allows for disposal if the other BUDM options are not available at the time of need. Oakwood Beach allows for the beneficial placement of sandy material in either the nearshore (≥75% sand with testing as per NJDEP, 1997) or directly on the beach (≥90% sand) provided that the dredged sediments meet sediment quality objectives appropriate for these uses. **Table 1** provides a summary of the preferred plan options.

Table 1. Summary of Proposed Salem River Federal Navigation Channel Maintenance Disposal Options

Maintenance Action	**Disposal Option**	**Frequency**	**Quantity**	**Dredged Material**
Hydraulic Dredge Salem River Nav. Channel	SOP-Upland CDF (Killcohook CDF)	As needed (perpetual)	50,000 to 200,00 CY (at a time)	Silts/Clays and Sands
Hydraulic Dredge Salem River Nav. Channel	BUDM- Marsh restoration at Goose Pond (Supawna Meadows NWR)	Every 2-6 years (1-3 times total)	150,000 to 300,000 CY (total)	Primarily Silts/Clays, some fine sands
Split-Hull Hopper Dredge Spot Shoals of Salem River Nav. Channel	BUDM – Nearshore Placement (Oakwood Beach)	Every 1 to 3 years (perpetual)	5,000 to 20,000 CY (at a time)	Sands

5.0 AFFECTED ENVIRONMENT

The Affected Environment of the project area are the same physical, biological and social environments as evaluated in USFWS (2017) and are hereby incorporated by reference (where indicated) in the following sections.

5.1 Physical Environment

5.1.1. Topography, Physiography, Geology, and Soils

The topography of the affected area is relatively flat and is situated between 0 and 10 feet above mean sea level (msl (**Figure 17**). Net local surface water drainage from the marsh in this area drains into unnamed tributaries of the Delaware River, Mill Creek, Baldridge Creek, or the Salem River, which ultimately flow into the adjacent Delaware River to the southwest (USFWS, 2017).

The Project area is located within the outer Coastal Plain Physiographic section of New Jersey (USFWS 2017 and NJDEP 2014). The unconsolidated deposits of this province range in age from the Cretaceous to the Miocene (135 to 5.3 million years old) and gently dip to the southeast, towards the coast and extend beneath the Atlantic Ocean to the edge of the Continental Shelf (Dalton 2003; NJDEP 1999). The topography of the Coastal Plain is relatively flat to very gently undulating. The sediments consist of alternately-deposited layers of sand, silt, and clay which outcrop in irregular bands that trend northeast to southwest within deltaic and marine environments occurring at sea level (USFWS 2017; NJDEP 1999).

The bedrock geology of the Project area is made up primarily of the Marshalltown Formation (USFWS 2017; NJDEP 2014). The Marshalltown Formation is described as an upper Cretaceous to upper and medium Campanian Era aged unit that is composed primarily of a dark gray, fine- to medium grained, quartz and glauconite sand that weathers to light brown or pale red (USFWS 2017; USGS 2016).

The surficial geology within the Project area is primarily composed of Salt Marsh and Estuarine Deposits. These soils are described as dark in color, ranging from brown, dark brown, gray, or black, and composed of silt, sand, peat, and clay with minor pebble gravel. They contain abundant organic matter and were deposited during the Holocene Era in salt marshes, estuaries, and tidal channels and can be as thick as 300 feet in some areas (USFWS 2017; NJDEP 2014).

The Project area occurs in open-water, intertidal mudflat and intertidal low marsh areas. Portions of the affected area occur over Transquaking mucky peat, very frequently flooded soils with 0 to 1 percent slopes (**Figure 18**). This soil is described as mucky silt

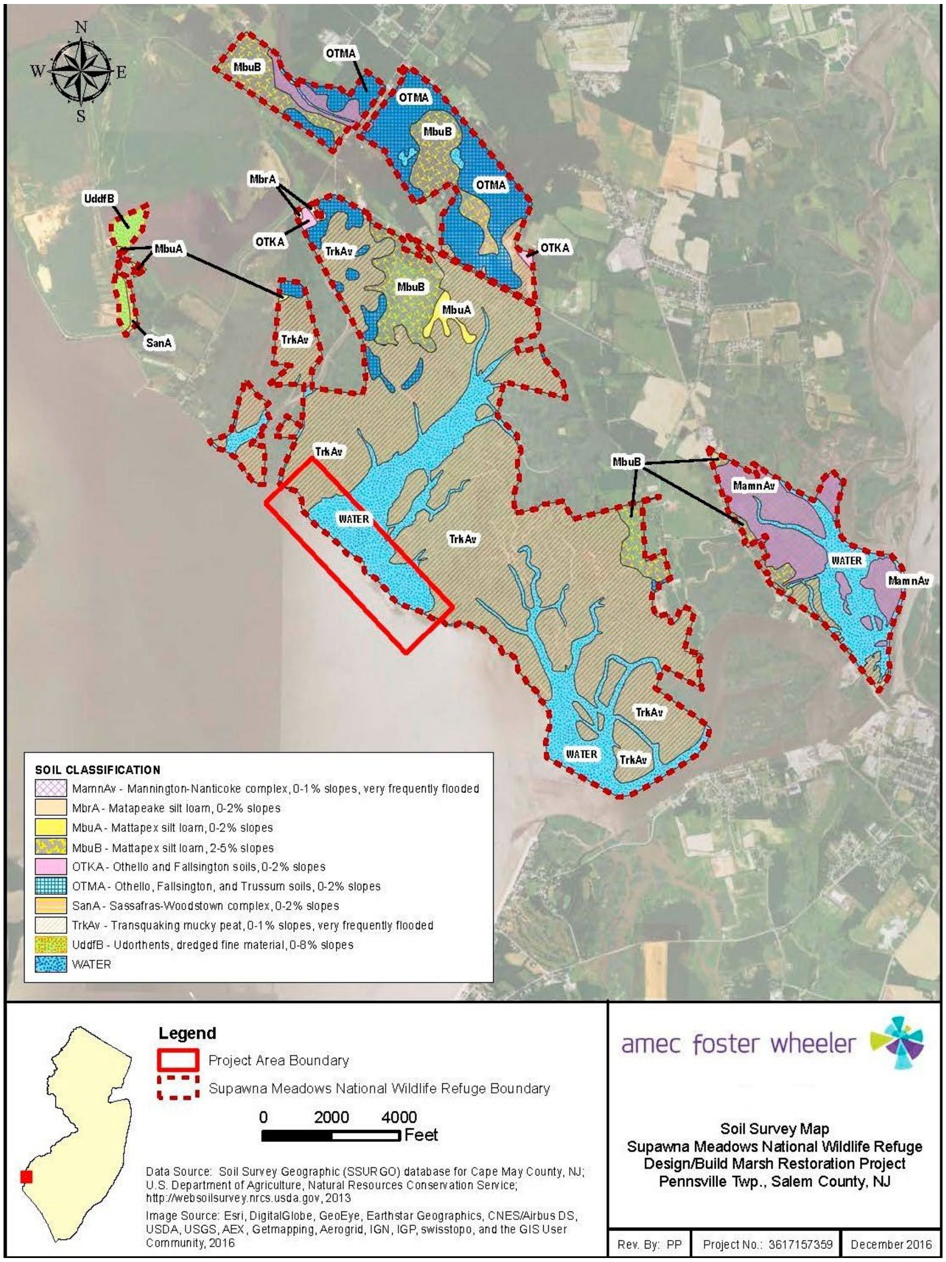


Figure 18. Soil Survey Map of BUDM Area at Goose Pond (Source: USFWS, 2017)

loam, silt loam and mucky peat associated with tidal marshes (USFWS 2017; Maser 2012).

5.1.2. Groundwater

Quaternary formations surficially underlie the Salem River area. These formations include Holocene alluvium and Pleistocene Cape May deposits. Holocene Alluvium deposits consisting of undifferentiated silt, clay, and organic material, sand and gravel are found in the vicinity of stream corridors. The Pleistocene Cape May Formation consists of floodplain deposits in low terraces and plains consisting of organically rich gravel and sand with some clay.

Several unconsolidated outcrop areas of geologic formation exist within the affected areas. These unconsolidated formations comprising of the coastal plain of New Jersey dip to the southeast, with outcrop areas oriented along a southwest to northeast axis. The Vincentown Formation is a major aquifer consisting of medium grained slightly clayey sand. Hornerstown Sand and the Navesink Formation form a leaky aquiclude consisting of glauconitic sand, silt and clay, light to dark green and weathered brown in color. This aquiclude underlies and outcrops north of the Vincentown formation. The Mount Laurel Sand, Wenonah Formation, is another major aquifer that entirely underlies the Lower Salem River area. This aquifer consists of glauconitic, lignitic, micaceous, and fossiliferous fine-to-coasrse grained quartz sand.

5.1.3.Climate and Sea Level Rise

Climate. The Salem River region experiences a moderate climate (*i.e.* primarily humid subtropical) associated with the low elevations of the Coastal Plain region and the presence of the Delaware Bay and Atlantic Ocean. The climate during winter months is moderate as a result of winds heated by warmer bay and ocean water temperatures in summer. The summer season is moderate as well, due to sea breezes. Temperatures within the state average -1C (30F) in winter and 23C (74F) in summer. Average annual precipitation along the southeast coast is about 40 inches and well distributed throughout the year. Tropical storms and hurricanes occasionally bring excessive rainfall to the area. The bulk of winter precipitation results from storms that move northeastward along the east coast of the United States.

Climate Change. Despite the historic moderate climate experienced within the Coastal Zone of New Jersey, the Earth's surface temperature has risen by 1.3 ^{o}F over the last century, which is attributed to the anthropogenic introduction of carbon dioxide and other greenhouse gases (NJDEP, 2013). In New Jersey, the New Jersey State Climatologist reports a statistically significant rise in average statewide temperature over the last 118 years. Also, during this period, New Jersey has experienced a significant increase of the departure from normal indicating that average annual temperatures are consistently greater than the longer-term average. This temperature trend coincides with an increase in precipitation due to more moisture in the atmosphere. However, despite a trend toward more precipitation, the Northeast is seeing longer periods without rainfall and longer growing seasons (NJDEP, 2013 and O'Neill, 2009).

As stated in NJDEP (2013): "Sea levels are rising at a rate of 3.5 millimeters per year (Cooper et al. 2005), and this rate is projected to increase into the 21st Century (Climate Institute 2010, UCS 2013). The global average of sea level change is approximately 8 inches since the Industrial Revolution, but other areas of the world, particularly the East Coast and Gulf Coast are experiencing some of the highest rates of sea level rise (UCS 2013). Small increases in sea level dramatically affects the world's coastlines, physically, biogeochemically, and economically through impacts such as erosion, flooding, salinization, and habitat transformation for wildlife and plants (Climate Institute 2010; UCS 2013)."

Other impacts of climate change may include increased intensity of hurricanes; however, climate science projections for intensity and intense hurricane numbers suggest relatively large uncertainty at present (NOAA 2012). High magnitude storm events such as hurricanes and nor'easters could have extensive direct and indirect impacts to habitat, ranging from erosion from wave attack, saltwater intrusion from inundation, as well as water quality impacts from developed areas experiencing inundation from floodwaters. Additionally, temporary, and permanent impacts to habitat could occur across a broad temporal reference along the North Atlantic Coast. Some habitat areas could be exposed to different impacts based on the time of the year the storm occurs. Combined with sea level rise, extreme water levels may exacerbate coastal storm impacts to habitats over the long-term planning horizon (USACE 2014).

The Fourth National Climate Assessment (Dupigny-Giroux et al. 2018) describes a range of effects of climate change that are currently observed and future trends in the Northeast region, which include:

- Under both lower and higher climate change scenarios (RCP4.5 and RCP8.5), the Northeast is projected to be more than 3.6°F (2°C) warmer on average by 2035 than the preindustrial era.
- Rainfall intensity has been trending upward and further increases are expected, with increases in precipitation during the winter and spring. For heavy precipitation events above the 99th percentile of daily values, observed changes for the Northeast average 55% when measured from 1958.
- Seasonality is decreasing and changing, impacting both water quality and forests. In recent years, winters have warmed three times faster than summers. By midcentury, winters are projected to be even milder, with fewer cold extremes.
- Warmer late-winter and early-spring temperatures have resulted in trends towards an increase in growing season length. By mid-century, the frost-free period in the Northeast is expected to lengthen by 2-3 weeks. Forests are responding to this shift, which has implications in plant–animal interactions and other ecosystem processes. Warmer winters are expected to contribute to earlier insect emergence and expansion of geographic ranges of tree pests.
- Observed and projected increases in temperature, acidification, storm frequency and intensity, and sea levels are of particular concern for coastal and ocean ecosystems
- Freshwater aquatic ecosystems are vulnerable to increases in high flows and decreases in low flows, higher temperatures, and reduced water quality. The projected changes in precipitation intensity and temperature seasonality is expected to affect streams and their biological communities. Late-summer warming could lead to flow decreases in the late summer and early fall by mid-century.

- Increasing temperatures threatens coldwater fisheries; coldwater fish, stream invertebrates, freshwater mussels, and amphibians are particularly susceptible to higher temperatures and flow changes.

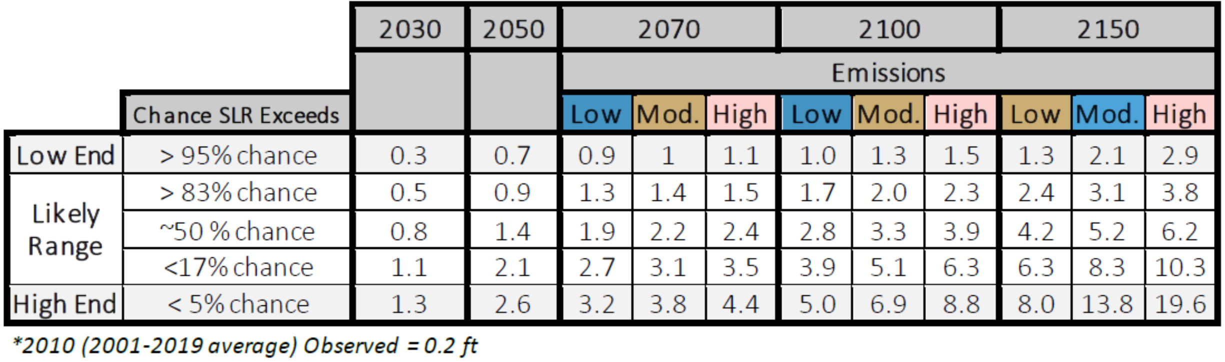
Within the Delaware Estuary, Kreeger et al. (2010) assessed the averages of 14 models and conclude that local climate changes over the next century may result in increases in air temperature by 1.9-3.7°C, a 7-9 percent increase in precipitation, increase in the frequency of short-term drought, a decline in the number of frost days, and an increase in growing season length (NMFS, 2019).

Sea Level Rise. Research by climate scientists predict continued or accelerated climate induced sea level rise (SLR) for the 21st century and possibly beyond, which would cause a continued or accelerated rise in global mean sea level. NOAA (2022) provides updates to the 2017 Task Force report (Sweet et al. 2017) on global mean sea level rise scenarios. The report provides information for Federal agencies, state and local governments, and stakeholders in coastal communities about current and future SLR. One of four key messages provided is as follows:

> *"By 2050, the expected relative SLR will cause tide and storm surge heights to increase and will lead to a shift in U.S. coastal flood regimes, with major moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today. Without additional risk-reduction measures, U.S. coastal infrastructure, communities, and ecosystems will face significant consequences."*

Table 2 is from New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel and suggests that New Jersey will likely face a rise of 0.9 to 2.1 ft of sea level rise above 2000 levels. The same report suggests that under moderate emissions scenarios, by 2050 areas along South Jersey will see 40 to 260 high tide flooding days on average as a result.

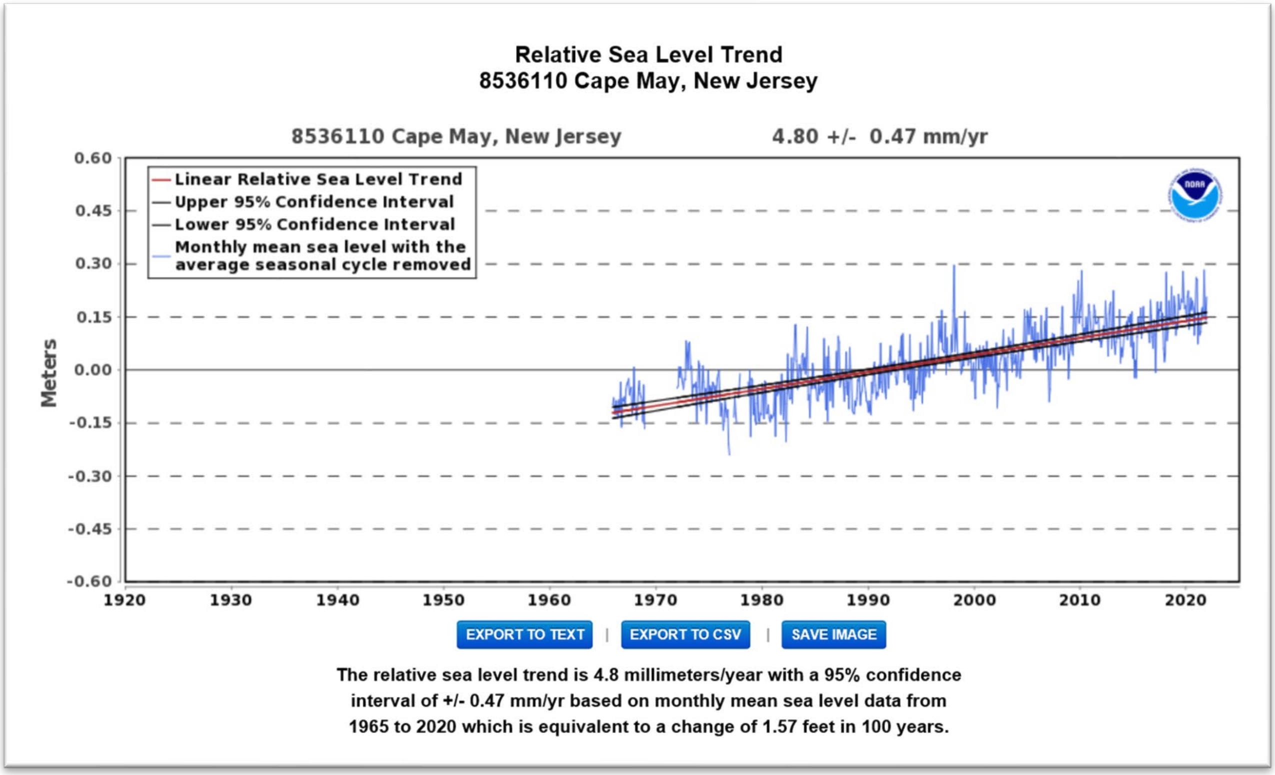
Table 2. New Jersey's Sea Level Rise Above the Year 2000 (1991-2009 average) baseline (ft)*



		2030	2050	2070			2100			2150		
				Emissions								
	Chance SLR Exceeds			Low	Mod.	High	Low	Mod.	High	Low	Mod.	High
Low End	> 95% chance	0.3	0.7	0.9	1	1.1	1.0	1.3	1.5	1.3	2.1	2.9
Likely Range	> 83% chance	0.5	0.9	1.3	1.4	1.5	1.7	2.0	2.3	2.4	3.1	3.8
	~50 % chance	0.8	1.4	1.9	2.2	2.4	2.8	3.3	3.9	4.2	5.2	6.2
	<17% chance	1.1	2.1	2.7	3.1	3.5	3.9	5.1	6.3	6.3	8.3	10.3
High End	< 5% chance	1.3	2.6	3.2	3.8	4.4	5.0	6.9	8.8	8.0	13.8	19.6

**2010 (2001-2019 average) Observed = 0.2 ft*

In addition to flood impacts affecting communities and infrastructure, the rate of these rising water levels will interact with sediment availability, coastal storms, nutrients, development, and other forces to impact the sustainability of marshes and other coastal ecosystems within low-lying coastal regions, such as that of the Supawna Meadows NWR and Salem River. South Jersey has already been experiencing significant sea level rise. The plot illustrated in **Figure 19** shows the monthly mean sea level without regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents at Cape May. The relative SLR trend is 4.8 millimeters/year with a 95% confidence interval of +/- 0.47 mm/yr based on mean month sea level data from 1965 to 2020 which is equivalent to a change of 1.57 feet in 100 years.



The relative sea level trend is 4.8 millimeters/year with a 95% confidence interval of +/- 0.47 mm/yr based on monthly mean sea level data from 1965 to 2020 which is equivalent to a change of 1.57 feet in 100 years.

Figure 19. Relative Sea Level Trend at Cape May, New Jersey

5.1.4. Wind and Wave Climate

While limited wind data exists for Goose Pond and Supawna Meadows National Wildlife Refuge, winds at NOAA's Delaware City Tide Gauge are available, which is slightly over 3 miles directly west of Goose Pond. During the course of the year, the strongest winds generally originate from the NW (**Figure 20**). This predominant wind direction varies by season, swinging to the south during summer (Figure 20).

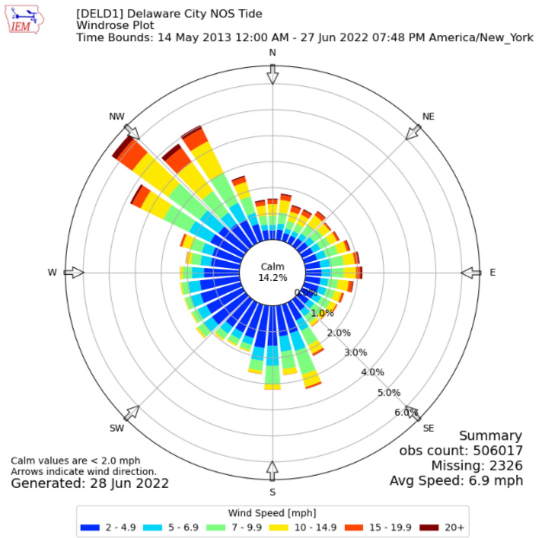


Figure 20. Annual Wind Rose for winds at Delaware City NOS Gauge, 3 miles east of Maurice River mouth for 2013 -2022. Data based on National Data Buoy Center. Wind Rose Generated by Iowa State University's Environmental Mesonet 2022.

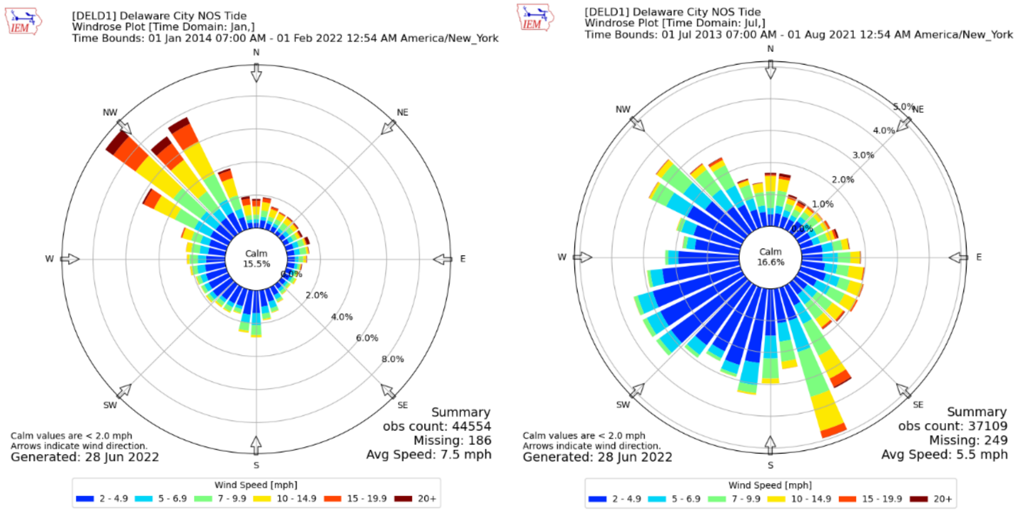


Figure 21. Wind Roses for January and July winds at Delaware City NOS Gauge, 3 miles east of Maurice River mouth for 2013 -2022. Data based on National Data Buoy Center. Wind Rose Generated by Iowa State University's Environmental Mesonet (2022).

Waves along this section of the Delaware River predominantly derive from winds and ship wakes. Ruggiero's (2021) analysis of wave conditions at nearby Pea Patch island notes the persistent nature of moderately high wake and wind-driven wave energy, the latter being short and choppy. The bathymetry of the river between Goose Pond and the main Delaware River channel is also shallow (**Figure 22**), thereby constraining any significant wave size that could be present within this part of the estuary under typical water level conditions.

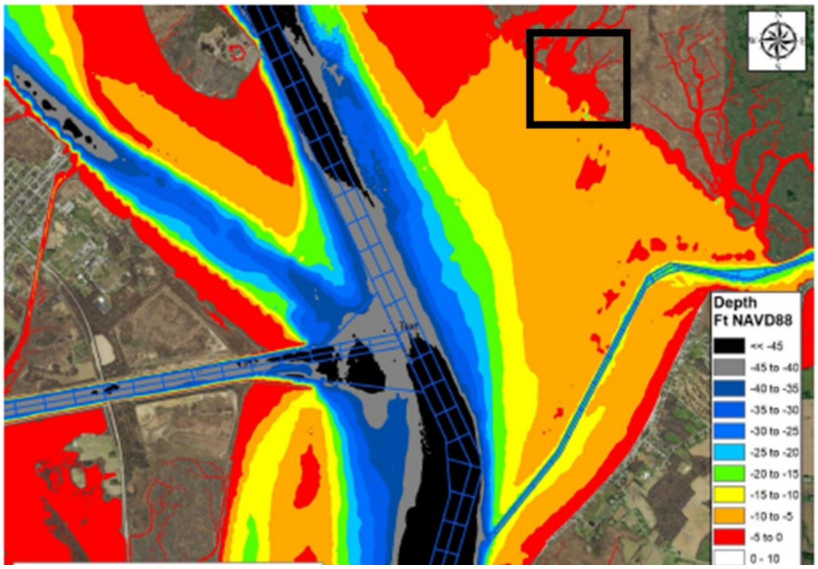


Figure 22. Regional bathymetry by Salem Cove. Darker colors indicate greater depths. Black box indicates Goose Pond within Supawna Meadows.

Previous wave data were as part of past modeling efforts along Supawna Meadows identified frequent small wave events with limited large wave events (AMEC Foster Wheeler 2016). The greatest observed significant wave heights observed were approximately 2 ft (**Figure 23**). Once a CMS-Wave model based on wind data was calibrated to these data, wave heights in Goose Pond calculated during larger events, which suggests wave heights reach approximately 4 ft within Goose Pond under current conditions (**Figure 24**). These might be decreased with the elevation of the current degraded wall along Goose Pond's western edge.

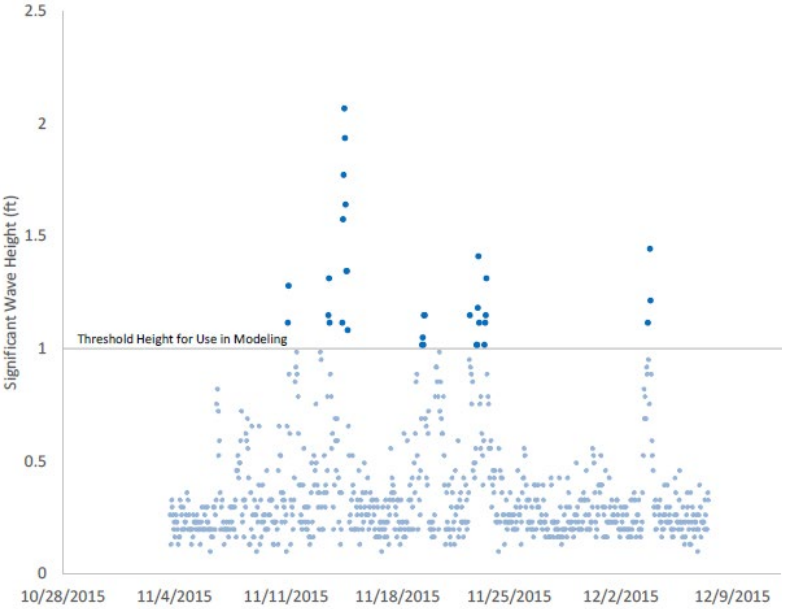


Figure 23. Significant Wave Height Observations collected 1.7 miles offshore from Supawna Meadows in approximately 26’ of water (Amec Foster Wheeler/WHG 2016)

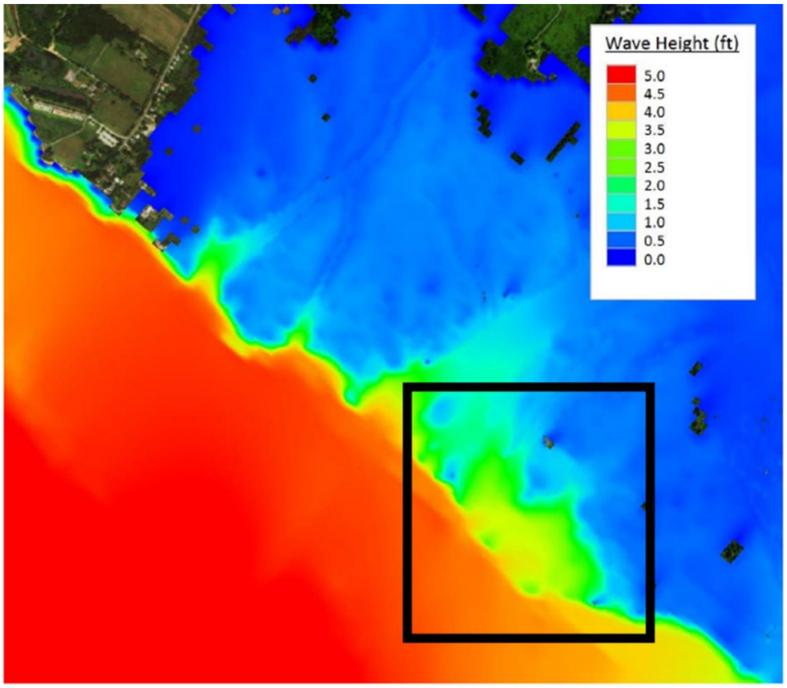


Figure 24. Modeling of waves during storm event involving surge and high winds from the southwest (Hurricane Sandy equivalent) at Goose Pond with existing conditions (no rock wall or sediment). (Amec Foster Wheeler/Woods Hole Group 2016)

5.1.5. Tides and Currents

5.1.5.1 Tides

The tides affecting the study area are semi-diurnal with two nearly equal high tides and two nearly equal low tides per day (or approximately 12 hrs and 25 minutes per tidal period, as shown in **Figure 25**. The closed control tide gauge is located across the Delaware River (~ 3 miles away) at Reedy Point, where the mean range is 5.34' while the Diurnal Range is 5.84 ft. Additional analyses by other studies suggest that the Goose Pond area closely mirrors the tidal ranges present at Reedy Point (Amec Foster Wheeler/WHG 2016).

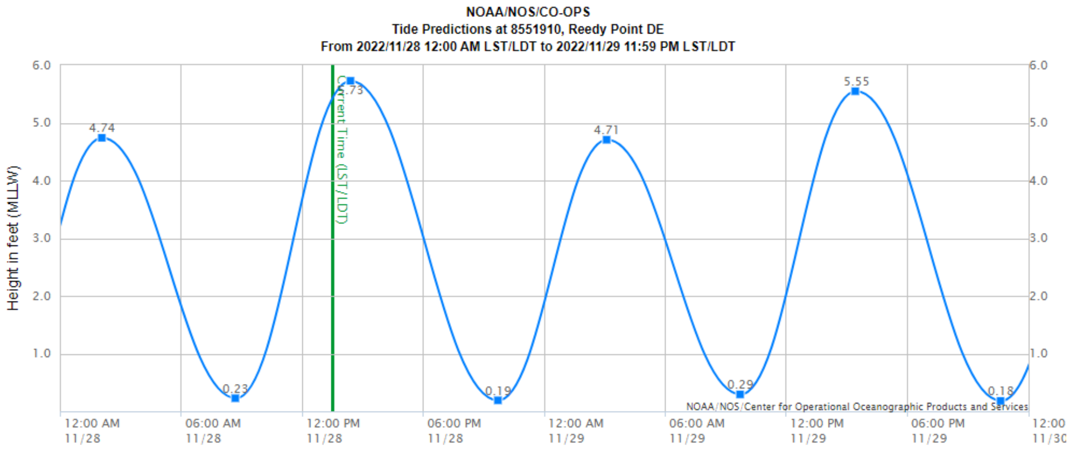


Figure 25. Example of Tide Predictions for Reedy Point, DE.

Table 3 summarizes the 1983 – 2001 tidal epoch datums relative to MLLW and NAVD88 from NOAA's Tide and Currents (2022).

Table 3. Tidal Datum Values for Reedy Point Tide Gauge (NOS 8551910)

Datum	Description	Elevation (ft. MLLW)	Elevation (ft. NAVD88)
MHHW	Mean Higher-High Water	5.84	2.87
MHW	Mean High Water	5.52	2.55
MTL	Mean Tide Level	2.85	-0.05
MLW	Mean Low Water	0.18	-2.79
MLLW	Mean Lower-Low Water	0.00	-2.97

5.1.5.2 Currents

Currents within the Goose Pond itself is limited. Multiple efforts have examined current speeds there, including USACE. Given the shallow depths within Goose Pond, USACE deployed tilt-meters in 2021 to confirm past characterizations of currents within Goose Pond. During a full July tidal cycle, these tilt meters were deployed in some of the greatest depths of Goose Pond, towards its northwest entrance. As shown in **Figure 26**, current velocities generally peaked between 10 to 30 cm/s during neap tides.

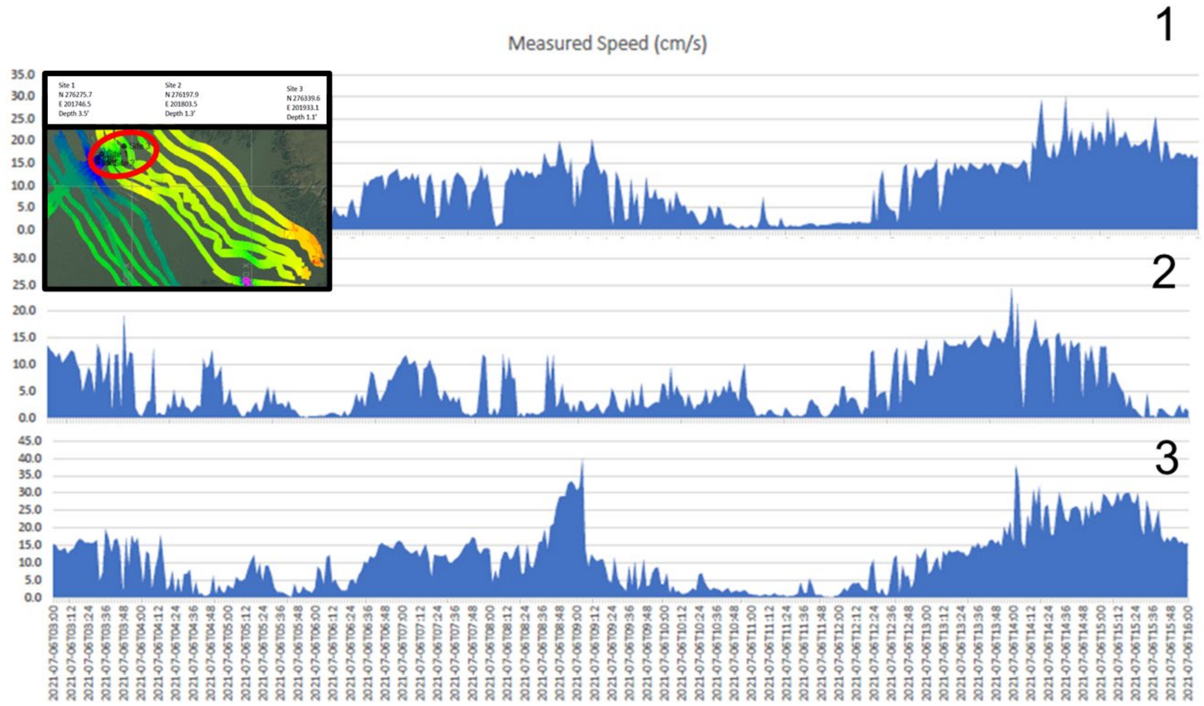


Figure 26. Tilt meter velocities at Neap tide withing Goose Pond entrance. Inset figure shows tilt meter locations (within red circle) and depths within Goose Pond (Magenta 5 ft US ft to Red -2 MLLW).

These tilt meter results showed generally good agreement with the WHS CMS Flow model, and thereby suggests significantly lesser maximum current velocity magnitudes within the rest of Goose Pond (**Figure 26**). These lower current magnitudes overlap within the likely placement areas. The WHG CMS Flow modeling suggests that velocities within the placement area (SE area of Goose Pond) would generally fall below 10 cm/s.

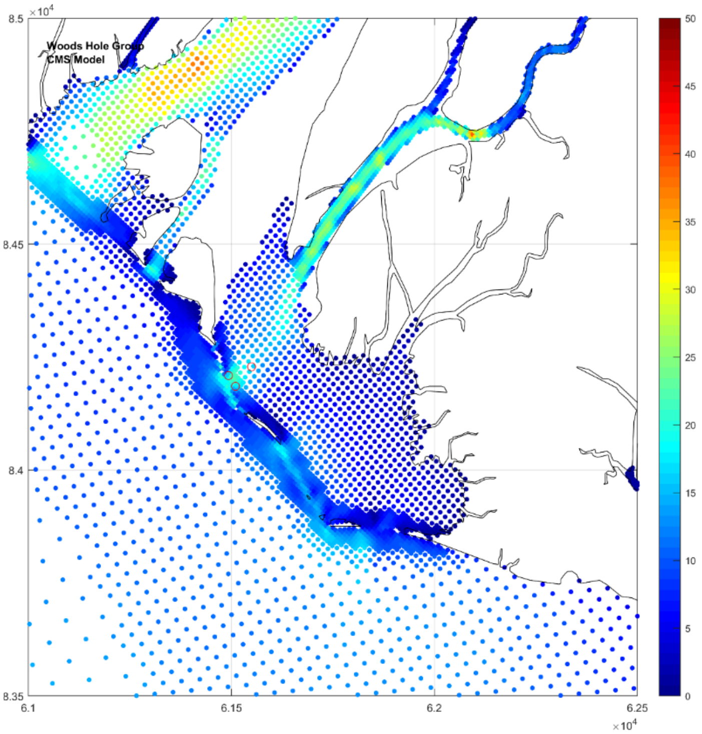


Figure 27. Maximum current magnitude within Goose Pond Area according to Woods Hole Group CMS Flow modeling (Amec Foster Wheeler/ Woods Hole Group 2016). Cooler approaches 0 cm/s vs 50 cm/s warmer. Red circles indicate locations of tilt meters deployed by USACE during July 2021.

WHG's analysis (2016) suggested that the potential for these currents to mobilize sediment within the Goose Pond area is limited (**Figure 27**). Their report defined sediment transport potential for current velocities to subject sediment grains within the channels and marsh beds to significant enough forces to lift and move these sediment grains. These same force characterizations likely apply to any material placed within the Supawna Meadows environment as well. Mobility beyond the principal NW channel entrance and within the vicinity of the old Goose Pond dike wall is particularly limited during high and low tides. Within the study area, this sediment mobility remains limited towards the SE half of the pond (likely placement area) for flood and ebb tides. Even during a Hurricane Sandy type flood scenario, the former perimeter wall should provide some limits to sediment transport potential compared to much of the rest of Supawna Meadows (**Figure 28)**.

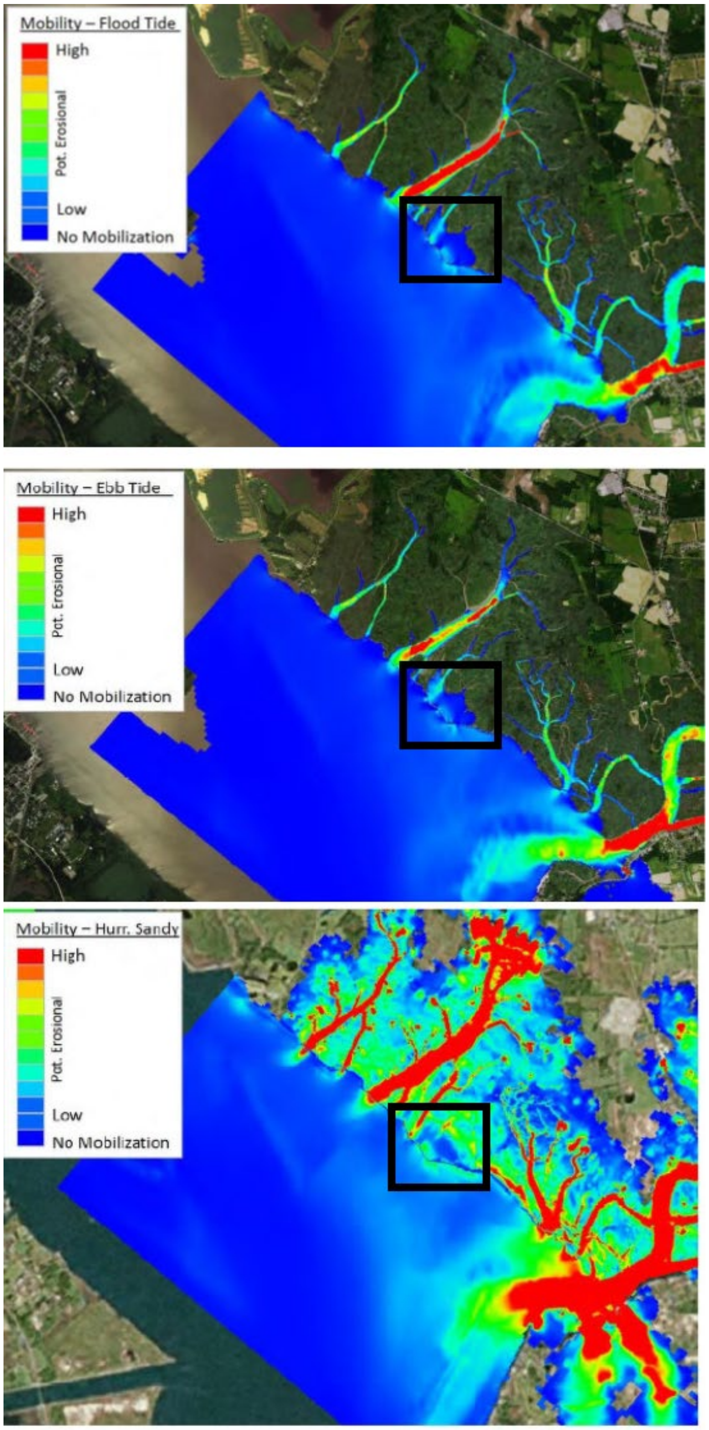


Figure 28. Sediment mobility potential (blue signifies low, red signifies high). Goose Pond Area outlined in black box. Figures modified from Amec Foster Wheeler/Woods Hole Group (2016).

5.1.6. Air Quality

As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for six (6) common air pollutants known as “criteria pollutants” (*i.e.* ozone (O3), carbon monoxide (CO), sulfur dioxide (SO2), nitrogen dioxide (NO2), particulate matter (PM10 and PM 2.5), and lead (Pb). After the EPA sets the NAAQS, it determines which areas of the country meets those standards. If the air quality in a geographic area meets or is cleaner than the standard, it is called an attainment area. Areas that do not meet a standard are called nonattainment areas.

Air quality is generally good in the Delaware Bay region, however, the Supawna Meadows NWR and Salem River project area (New Castle County, Delaware and Salem County, New Jersey) is located within the Philadelphia-Wilmington-Atlantic City, PA- NJ-MD-DE nonattainment area for the 8-hour ozone NAAQS and is classified as “marginal.” “Marginal” is the lowest classification, meaning that the ozone levels in this area are closer to the standard than in those areas with a higher classification. Therefore, Salem County, along with the rest of New Jersey, is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2016). As required by the Clean Air Act, the State of New Jersey has a State Implementation Plan (SIP) in place describing how the 8-hour ozone NAAQS will be achieved and maintained in nonattainment areas.

General Conformity is a process to implement Section 176(c) of the Clean Air Act to ensure actions conducted or sponsored by Federal agencies in nonattainment or maintenance areas are consistent with the SIP. General Conformity requires that reasonably foreseeable emissions from Federal actions will not cause or contribute to new violations of a NAAQS, increase the frequency or severity of existing NAAQS violations, or delay timely attainment of the NAAQS or any interim milestone towards achieving attainment. However, a General Conformity determination is not required if the emissions from the federal action will fall below the *de minimis* levels set forth in the Clean Air Act regulations. The *de minimis* emission threshold for a Marginal ozone nonattainment area is 100 tons/year of NOx or 50 tons/year VOC.

Greenhouse gases (GHG) trap heat in the atmosphere. Carbon dioxide is the most abundant GHG and enters the atmosphere through burning fossil fuels (coal, natural gas and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g. manufacture of cement). Carbon dioxide is removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle. Methane is emitted during the production and transport of coal, natural gas and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for stratospheric ozone-depleting substance (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons) (USEPA, 2016). The largest source of GHG emissions from human activities in the United States is from burning fossil fuels for electricity, heat and transportation. The USEPA tracks total U.S. emissions and reports the total national GHG emissions and removals associated with human activities.

5.1.7. Water and Sediment Quality

Water levels in the Salem River/Goose Pond area are predominately driven by astronomical tides; however, other factors such as sustained wind (*i.e.,* fetch), freshwater inflow from the river, rainwater runoff, and strong tides driven by storms can also affect water levels in the project area. The affected waters are considered brackish and are either oligohaline (0.5 to 5 ppt), which occurs generally between Delaware River Mile 75 (Claymont, DE/Pedricktown, NJ) and 58.3 (near the entrance to the Salem River), or a transitional oligohaline to mesohaline (0.5 to 15 ppt) zone downstream of Salem River to River Mile 57.1 (near Elsinboro Point) (PDE, 2017). These zones represent wide fluctuations in salinity between oligohaline to mesohaline within the affected areas.

Due to the brackish nature of the waters in the vicinity of the Salem River/Goose Pond area, this area falls within the Delaware estuary turbidity maximum zone, which results in normal background turbidity to be significantly higher than other salinity zones of the basin. According to Standard Methods (2005), “Turbidity in water is caused by suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms.” These factors determine the amount of clarity in a water body. **Figure 29** displays the Salem River/Goose Pond area (between River Miles 57 and 60) and the distribution of turbidity levels within the Delaware River between 1999 and 2016, which shows the average turbidity within the Delaware River system is highest in this area (DRBC, retrieved from website: https://johnyagecic.shinyapps.io/BoatRunExplorer/ on 12/5/2022).

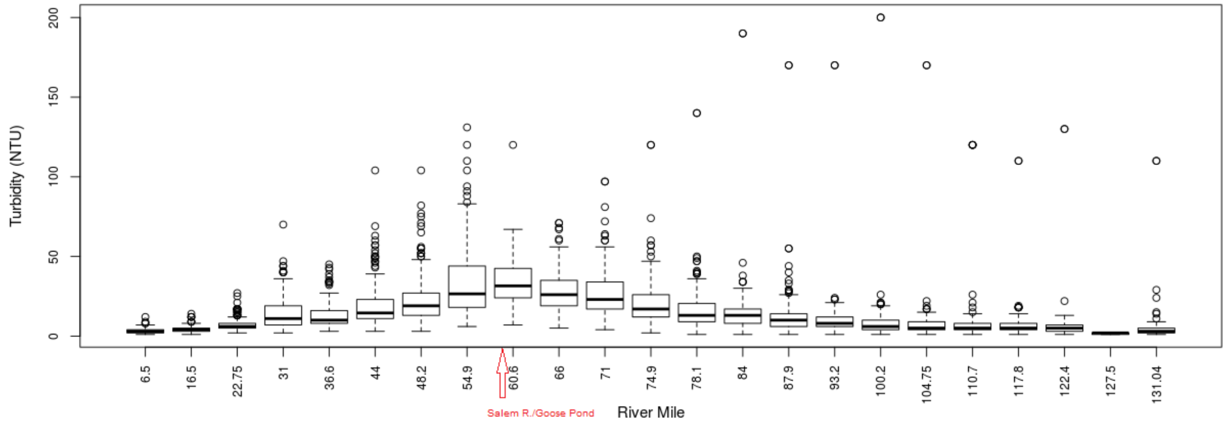


Figure 29. Turbidity in Box-Plot Distribution of the Delaware River (Source: DRBC Delaware Estuary Water Quality (Boat Run) Explorer retrieved from internet website https://johnyagecic.shinyapps.io/BoatRunExplorer/ on 12/5/2022).

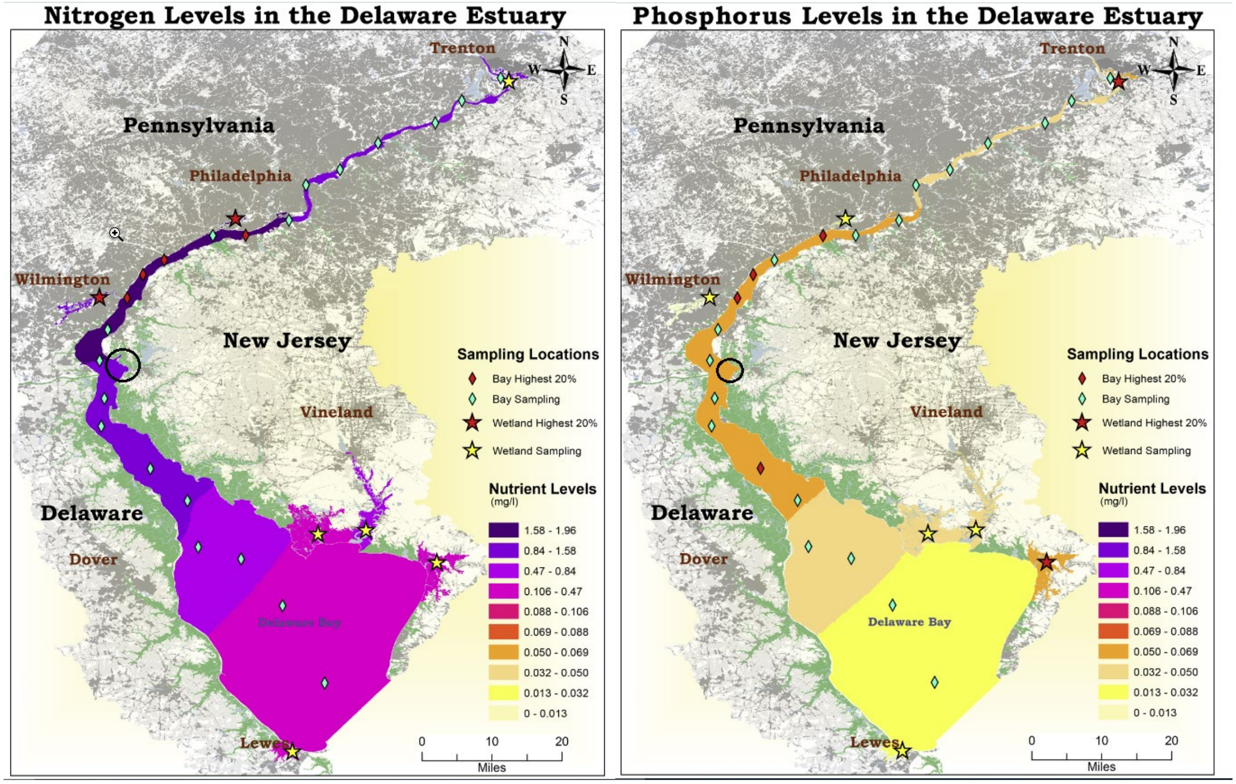
All waters within the Project area are classified as FW2-NT/SE1 waters according to New Jersey SWQS (NJDEP 2011). The FW2-NT/SE1 classification indicates a waterway in which there may be a freshwater/saltwater interface between a non-trout, freshwater stream (category 2) and a saline estuary with shellfish harvesting as a designated use.

The Salem River/Goose Pond Area falls within Zone 5 of the Delaware River Basin Commission's Delaware River Main Stem Interstate Zones. Zone 5 occurs between river miles 48.2 on the southern end upstream to River Mile 78.8 on the northern end. The affected area occurs in the vicinity of River Mile 61. DRBC designates Zone 5 for the following water uses: Aquatic Life, Primary Contact Recreation, and Fish Consumption. As an interstate waterway, Zone 5 also functions as a water quality Assessment Unit (AU). Specifically these uses include:

- Industrial water supplies after reasonable treatment.
- Maintenance of resident fish and other aquatic life.
- Propagation of resident fish from river mile 70.0 to river mile 48.2.
- Passage of anadromous fish.
- Wildlife.
- Recreation.
- Navigation.

Zone 5 did not meet Water Quality Criteria in the 2020 assessment for Aquatic Life and was assigned as not supporting ("NS^E"), but this is "based primarily on fewer than 10% exceedances of criteria". This was due to both Dissolved oxygen (DO) and temperature did not achieve 100% daily measurement criteria. However, DO and temperature did meet 96.9% and 98.9% of the daily observation criteria (DRBC, 2020). Criteria were met for pH, alkalinity, turbidity and toxic pollutants. Total dissolved solids are not assessed in this zone due to natural high background levels from higher salinities.

Nutrient levels of Zone 5 are elevated with respect to the surrounding Delaware Estuary waters where nitrogen ranges from 0.84 to 1.96 mg/l and phosphorous ranges from 0.05 to 0.069 mg/l (Figure 30).



Nitrogen Levels in the Delaware Estuary

Phosphorus Levels in the Delaware Estuary

Figure 30. Nutrient Levels in the Delaware River and Bay based on samples collected by the Delaware River Basin Commission between 2008 and 2018. Data and figures are from The Partnership for the Delaware Estuary story map (O'Hara and Haaf 2020). The Salem River project area is depicted in the black circles.

Although toxic pollutants observation criteria were met for Aquatic Life for Zone 5, DRBC (2020) discusses that multiple exceedances were observed of DRBC acute and chronic marine stream quality objectives for copper in Zone 5. However, they note that assessment was complicated by factors such as field sampling and analytical issues with contamination, a need to assess revisions to current criteria, and the influence of other water quality attributes that influence the partitioning and toxicity of copper.

Data showed numerous exceedances of aluminum acute and chronic freshwater objectives for the support of aquatic life over multiple years. With enhanced monitoring in 2017, the chronic criterion was exceeded in Zones 2, 3 4, and 5 and acute criterion was exceeded in Zones 4 and 5.

Exceedance of dieldrin human health objectives (carcinogens) were observed in Zones 2, 3, 4, 5 and 6 in as part of a single enhanced monitoring survey. Additional monitoring and assessment of pesticides is recommended in Zones 2 through 6.

As reported in DRBC (2020), the exceedances of toxic pollutants criteria are indicated by the presence of fish consumption advisories and are further supported by the presence of measurable PCB concentrations in the water column in excess of the applicable surface water quality PCB criterion. Twenty-two main stem channel sites in the tidal Estuary were sampled in 2015 for PCBs and analyzed using EPA method 1668 Rev A. Sampling stations, which were located from Biles Channel near Trenton NJ to the ocean boundary between Cape May and Lewes. Whole water samples were analyzed for all 209 PCB congeners. Results indicated that whole water concentrations ranged from approximately 400 pg/L near the ocean to a maximum of 17,700 pg/L in Zone 5 (the project area) and decreasing to an average concentration of 2,000 pg/L in Zone 2. All PCB concentrations exceed the current PCB water quality criterion for the protection of human health from carcinogenic effects at 16 pg/L.

Because of persistent bioaccumulation of toxic pollutants, the States of Delaware and New Jersey have adopted fish consumption advisories for Zone 5 north of C&D Canal, where both states advise only 3 meals per year for all finfish due to PCBs, dioxins/furans and dieldrin. Specific advisories for various fish species in both states are also in place for waters south of the C&D Canal.

Because of the persistence of PCBs in the Delaware estuary, DRBC developed and EPA established total maximum daily loads (TMDLs) for PCBs for Zones 2 through 5 in December 2003 (http://www.nj.gov/drbc/library/documents/TMDL/FinalRptDec2003.pdf), and a PCB TMDL for Zone 6 in December 2006 (https://www.nj.gov/drbc/library/documents/TMDL/Zone6final-rpt_Dec2006.pdf).

The State of Delaware imposes a prohibition on shellfish harvesting along the entire Delaware River mainstem to just below Augustine Creek/Artificial Island.

In August 2020, baseline water and sediment sampling were conducted within the Salem River Federal Navigation Entrance Channel in the Delaware River to determine dredging effects on water quality (Tetra Tech, 2020) (Summary tables in Appendix B).

Surface water. Background surface water was sampled in the Salem River approach channel near the confluence of the Salem River and the Delaware River. The inorganic analysis results of the background Delaware River water sample (SW-1) did not show any exceedances of the DRBC, Delaware and New Jersey marine acute and chronic objectives/criteria for aquatic life, with the exception of copper and zinc in sample SW-1T where copper exceeded DRBC, DE, and NJ chronic criteria and zinc exceeded both acute and chronic criteria for DRBC, DE, and NJ. Total and dissolved Arsenic exceeded NJ human health (fish ingestion) (Tetra Tech 2020).

For semi-volatile organic compounds (SVOCs), no marine acute or chronic aquatic life objectives/criteria for DRBC, DE and NJ were exceeded (including Polynuclear Aromatic Hydrocarbons – PAHs) in the background water sampling analyses. Bis(2-ethylhexyl) phthalate, a component of plastics exceeded human health criteria for fish ingestion. A number of pesticides were detected in the background water. Endrin aldehyde (0.0028 ug/L) slightly exceeded Delaware marine chronic criteria for aquatic life. Three pesticides in the background water analyses exceed human health criteria for fish ingestion that included: 4,4'-DDD (0.0019 ug/L), Dieldrin (0.00075 ug/L) , and Heptachlor (0.00055 ug/L). Total Polychlorinated biphenyls (PCBs) (1.4 ng/L) in background water did not exceed any of the marine water quality acute and chronic criteria, but they did exceed human health criteria for fish ingestion. Total dioxins (210 pg/L) when adjusted to Toxicity Equivalents (WHO, 2005) of 2,3,7,8-TCDD at (0.17 pg/L) exceeded DRBC, DE and NJ marine human health criteria for fish ingestion.

Bulk Sediment. Bulk sediment analyses were conducted at seven locations of areas that have experienced shoaling within the navigation channel. Six cores (SR1 – SR6) were collected from the approach channel and one (SR7) was collected in the Salem River turning basin (**Figure B-1 of Appendix B**). Bulk sediment analyses included sediment grain sizes and all of the same parameters measured for background water samples. Because sediment grain sizes were expected to be composed of greater than 10% fine-grained sediments, the sediments did not meet contaminant testing exemptions in accordance with the NJDEP - Chapter II-Section C Case 1 of the New Jersey Department of Environmental Protection dredging guidance manual (NJDEP, 1997). The results of the analyses were compared to Delaware soil screening, NJ remediation, and ecological criteria for soils and sediments, where appropriate.

Grain size distribution analyses resulted in cores exhibiting a mixture of fines (silts and clays) and coarse materials (gravel and sands) within the approach channel and turning basin. Cores SR1, SR2 and SR3 located furthest into the Delaware River had the highest percentage of fine-grained sediments 67%, 65% and 43%, respectively. SR1 and SR2 were also highest in total organic carbon (1.9% and 2.2%, respectively). Inorganic analyses of sediment cores resulted in exceedances of several soil and sediment screening and objectives. Arsenic ranged from 2 mg/kg to 15 mg/kg among the seven cores where three cores exceeded the Effects Range – Low (ERL) (Long et al. 1995), two exceeded Delaware Marine Sediment Screening and one exceeding Delaware HSCA soil screening level of 11 mg/kg.

A number of SVOC’s were detected in the sediment cores, principally PAH’s, but none exceeded any of the screening criteria. Four pesticides were detected in the sediments. 4,4'-DDT (8.8 ug/kg) and 4,4'-DDE (3.6 ug/kg) slightly exceeded ER-L’s and Delaware Ecological Marine Sediment screening for these constituents. A total of 209 PCB congeners were analyzed in the sediment cores resulting in multiple detections of individual congeners. Total PCBs (when accounting for coeluters) resulted in four of the sediment cores (29.6 ug/kg – 43 ug/kg) exceeding the ER-L of 22.7 ug/kg and two cores slightly exceeding the Delaware Ecological Marine Sediment screening of 40 ug/kg. These were far below the ER-M levels of 180 ug/kg. Total dioxins when adjusted to Toxicity Equivalents (WHO, 2005) of 2,3,7,8-TCDD at (0.7 to 9.8 pg/g) slightly exceeded in four cores the Delaware HSCA screening level for soils of 2,3,7,8 – TCDD of 4.8 pg/g.

Elutriate Analyses. Sediment samples were also used to prepare unfiltered (total) and filtered (dissolved) modified elutriate samples. Elutriate testing involves the mixing of dredged material (channel sediment cores) with dredging-site water and allowing the mixture to settle where the potential release of dissolved chemical constituents from the dredged material is determined by chemical analysis of the supernatant (elutriate) remaining after undisturbed settling (NJDEP 1997). The modified elutriate samples were analyzed for total and dissolved TCL SVOCs; total and dissolved TCL pesticides; total and dissolved TAL inorganics, including total cyanide and total mercury; and total PCB congeners/dioxins and furans; and total suspended solids (TSS). The surface water samples used to prepare the elutriates were analyzed for total (unfiltered) concentrations of these parameters. Dissolved (filtered) concentrations were not evaluated for every parameter.

For TSS, except for SR7, all of the other unfiltered elutriates were less than the background unfiltered surface water sample at 60 mg/l TSS suggesting that the channel sediments do not remain suspended for a long period.

Contaminants in the elutriates were compared to DRBC, Delaware, and New Jersey aquatic life marine acute and chronic criteria. Since dredging and placement activities are temporary, acute criteria is the most appropriate comparison. However, chronic criteria are more stringent and offer a conservative comparison. The dissolved (filtered) elutriate provides an estimate of a constituent's bioavailability. In addition, it should be noted that the elutriate analyses conducted for this analysis do not take into account mixing zones which are variable upon site conditions at the time of placement.

Inorganic contaminants and cyanide analyses had a number of detections in both unfiltered (total dissolved + undissolved) and filtered (dissolved only). Copper in unfiltered elutriate exceeded the chronic criteria for DRBC, DE, and NJ at SR7 (3.5 ug/l) and exceeded acute and chronic criteria in the filtered elutriate at SR6 (22 ug/l). Inorganics detected in elutriates generally were at similar levels to the background surface water samples. Cyanide in filtered elutriate exceeded both acute and chronic criteria in four samples (SR 3, 4, 5, and 6) (5.5-8.1 ug/l), but was not detected in any of the unfiltered samples or background surface water samples and had very low level detections in the bulk sediment samples.

SVOC's (including PAH's) were detected in both unfiltered and filtered elutriates. There are no published criteria for aquatic life in the DRBC, DE and NJ regulations for SVOC, except Pentachlorophenol (not detected in any elutriates). Several PAH's did exceed marine human health criteria for fish ingestion in the unfiltered elutriate, however, a number of these PAHs were detected in the background surface water sample.

Several TCL pesticides were detected in both filtered and unfiltered elutriates. None exceeded acute or chronic aquatic life criteria. Heptachlor exceeded marine human health (fish ingestion) at SR3 (filtered and unfiltered). Pesticide detections were within the range of the background surface water sample.

PCB congeners were evaluated for unfiltered elutriates only, which captures sediment-sorbed PCB contaminants in suspended particles. A number of congeners were detected in the parts per trillion range (ng/l) and then summed (excluding co-eluters) to compare to criteria in the parts per billion range (ug/l) for total PCBs. None of the elutriates exceeded DRBC, DE, and NJ marine chronic aquatic life criteria. Exceedances of marine human health (fish ingestion) criteria were observed for all of the samples. Congeners of dioxins and furans were also in elutriates were calculated using total toxicity equivalence (TEQ's) (WHO, 2005) relative to the most toxic form (2,3,7,8 – TCDD). No aquatic life water quality criteria are available for dioxins/furans, but all unfiltered samples exceeded marine human health (fish ingestion) criteria in the parts per quadrillion (pg/l) range. Both PCBs and Dioxin/ Furan elutriates were within the same concentration range of the background surface water sample.

Equilibrium partitioning. To further understand the potential ecological effects of sediment contaminant concentrations and bioavailability to aquatic life, USACE employed the equilibrium partitioning approach. Equilibrium partitioning theory is a simple mathematical method of estimating the proportion a chemical sorbed to sediment to the chemical dissolved in water. With a known concentration of chemical per unit weight of sediment/soil, and a known weight of total sediment/soil, this method can be used to determine the concentration of the chemical in the water. Assuming linear relationships between sediment concentration, fraction of organic carbon, and the octanol/water partition coefficient, concentrations of organic chemicals in sediment can be multiplied by a factor to yield a concentration of that chemical in the water column. The partitioning between sorbed and dissolved metals, PAH's and PCBs was modeled using data from the Tetra Tech (2020) bulk sediment analyses. These outputs were computed as ratios with chronic and/or acute water quality criteria for Delaware, which is, in most cases, very similar to New Jersey and DRBC.

For heavy metals, the ratio of the inorganic metal concentration in the porewater to the applicable criterion was expressed as toxic units (TUs), where ratios greater than 1 suggest exposure concentrations in excess of the criterion and, additionally, the chronic toxic units for cadmium, copper, lead, nickel, silver and zinc were summed to produce an interstitial water benchmark unit (IWBU) as described in EPA, 2005b. With the exception of Arsenic, no metals had acute or chronic TU's exceed the 1.0 ratio. Arsenic exceeded the chronic TU for SR2 (1.09) and SR7 (1.77). Both these sample locations had the highest bulk sediment concentrations of 9.9 and 15 mg/kg, respectively. The results for the IWBU metals did not exceed 1.0 all of the composite samples from sediment cores collected from the Salem River Federal Navigation Channel had a chronic IWBU value less than 1. The composite samples from also had IWBU values for acute toxicity less than 1.

For SVOCs, the method used to evaluate toxicity of most of the SVOCs detected was to compare organic carbon normalized concentrations to literature derived EqP based mechanistic sediment quality guidelines called Equilibrium Partitioning Sediment Benchmarks (ESBs) (Burgess et. al. 2013). Sediment concentrations less than or equal to the ESB values may result in adverse effects to benthic organisms. The results are expressed as a ratio of the organic carbon normalized concentration to the ESB with ratios greater than 1 indicating an increased likelihood of risk to ecological receptors. None of the SVOCs (including PAHs) detected in Salem River Federal navigation channel sediment samples exceeded compound specific ESBs. Additionally, the assessment of 2-methylnaphthalene, dibenzofuran and carbazole indicate that there is no expected chronic toxicity at any of the locations where these compounds were detected. Therefore, potential toxicity to aquatic life from SVOCs in Salem River Federal navigation channel sediments is not expected.

For PCBs, the approach used to evaluate potential toxicity of PCBs to benthic organisms followed that of Fuchsman et al. (2006), with minor modification. The aim of the approach is to determine an organic carbon normalized concentration in the sediments in equilibrium with a porewater concentration equal to a chronic aquatic life criterion. Fuchsman (2006) refers to such an organic carbon normalized sediment concentration as a Sediment Quality Benchmark (SQB). Similar to those methods employed for metals and SVOCs, if the ratio of the measured organic carbon normalized concentration in the sediment to the SQB is less than 1, then chronic aquatic life toxicity in the sediments is unlikely. Ratios greater than 1 indicate that the pore water exposure may be high enough to cause toxicity to benthic organisms. This would provide an indication that the narrative criteria for water quality standards was not being met, with the understanding that sediments and their associated pore waters are an integral part of Delaware's surface water environment. For the Salem River sediment samples, however, the largest chronic toxicity unit value was 0.037 (SR3), which is well below 1, thereby indicating that aquatic toxicity due to PCBs is not expected.

The following general conclusions were made with respect to the chemical analysis of the sediment samples:

- All New Jersey residential and non-residential soil cleanup criteria were met. Several Delaware soil screening levels were exceeded, but not significantly higher.

- there were few exceedances of ER-L and DNREC marine ecological screening criteria. Some parameters that exceeded values were also present in laboratory control samples or surface water collected from the sites, which indicates that the sediment was not solely responsible for the exceedances;

- for most parameters exceeding ER-L levels, sample concentrations were only slightly above the ER-L and well below the ER-M. This suggests that the potential for the sediment to have an adverse effect on ecological resources is small;

- the sediment elutriate samples had few exceedances of surface water quality criteria. Most parameters exceeding criteria were also detected in laboratory control samples or surface water collected from the sites. Because of the low concentrations, many exceedances were reported by the laboratory as approximate;

- most elutriate sample contaminant concentrations above chronic protection of aquatic life criteria were below acute criteria;
- and the elutriate data is conservative because it does not consider dilution within a mixing zone as provided by surface water quality regulations.

5.2 Biological Environment

5.2.1. Wetlands and Intertidal Mudflat Habitats

The affected area includes extensive brackish open water, intertidal mudflats, tidal marshes including low marsh and common reed wetlands, scrub-shrub and forested wetlands (**Figures 31 and 32**).

Wetlands play a vital role in the overall well-being of coastal ecosystems. Slightly elevated adjacent areas that undergo intertidal flushing contain low marsh, high marsh and common reed (*Phragmites)*. Many plants and animals depend on wetlands and intertidal vegetated habitat for survival, including threatened and endangered species. Wetlands provide a nursery habitat for many commercially and recreationally important fish species that are harvested outside the wetland. Wetlands also play an important role in flood protection. The roots of wetland plants help bind the shoreline together, encourage sediment accretion and resist erosion by wind and waves by providing a physical barrier that slows down storm surges and tidal waves, thereby reducing their height and destructive power.

The main waterbodies in or near the refuge include the Delaware and Salem Rivers, Mill Creek, Baldridge Creek, other unnamed tributaries to the Delaware River, and an area impounded by the breakwater referred to as Goose Pond. The majority of the wetlands in the general project surroundings are emergent intertidal estuarine brackish wetlands.

The Service's National Wetlands Inventory (NWI) indicates that the wetlands within the Project area boundaries are classified including the following (**Figures 31 and 32**):

- Estuarine, subtidal, unconsolidated bottom, subtidal, habitat (E1UBL).
- Estuarine, intertidal, emergent, persistent, regularly flooded habitat (E2EM1N).
- Estuarine, intertidal, emergent, *Phragmites australis*/persistent, irregularly flooded habitat (E2EM5P).
- Estuarine, intertidal, emergent, persistent, irregularly flooded habitat (E2EM1P).

The NJDEP indicates that the Project area is mapped as containing the following wetland habitats (**Figures 31 and 32**):

- Freshwater tidal marshes.
- Tidal rivers, inland bays, and other tidal waters.
- Tidal mud flat.
- *Phragmites* dominant coastal wetlands

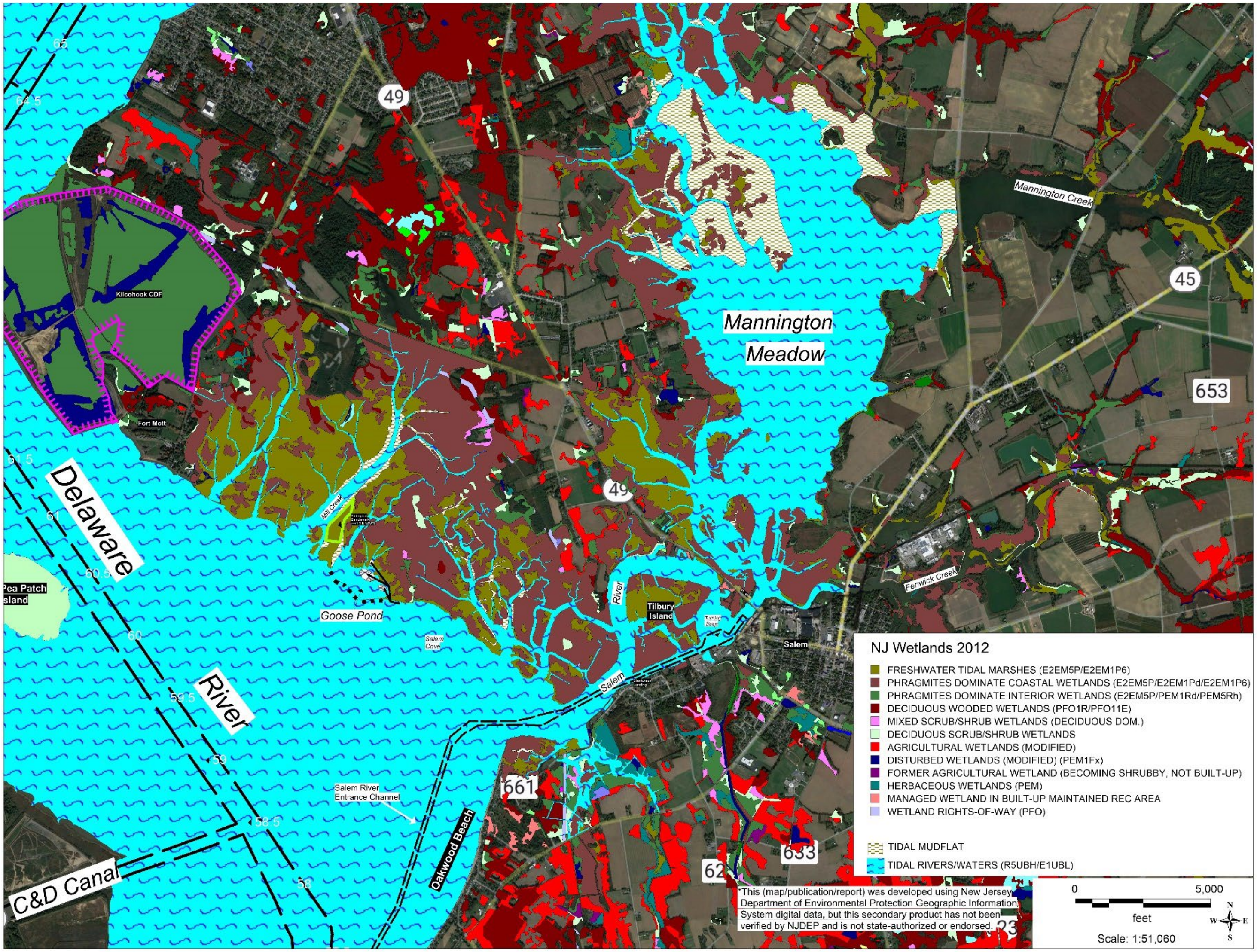
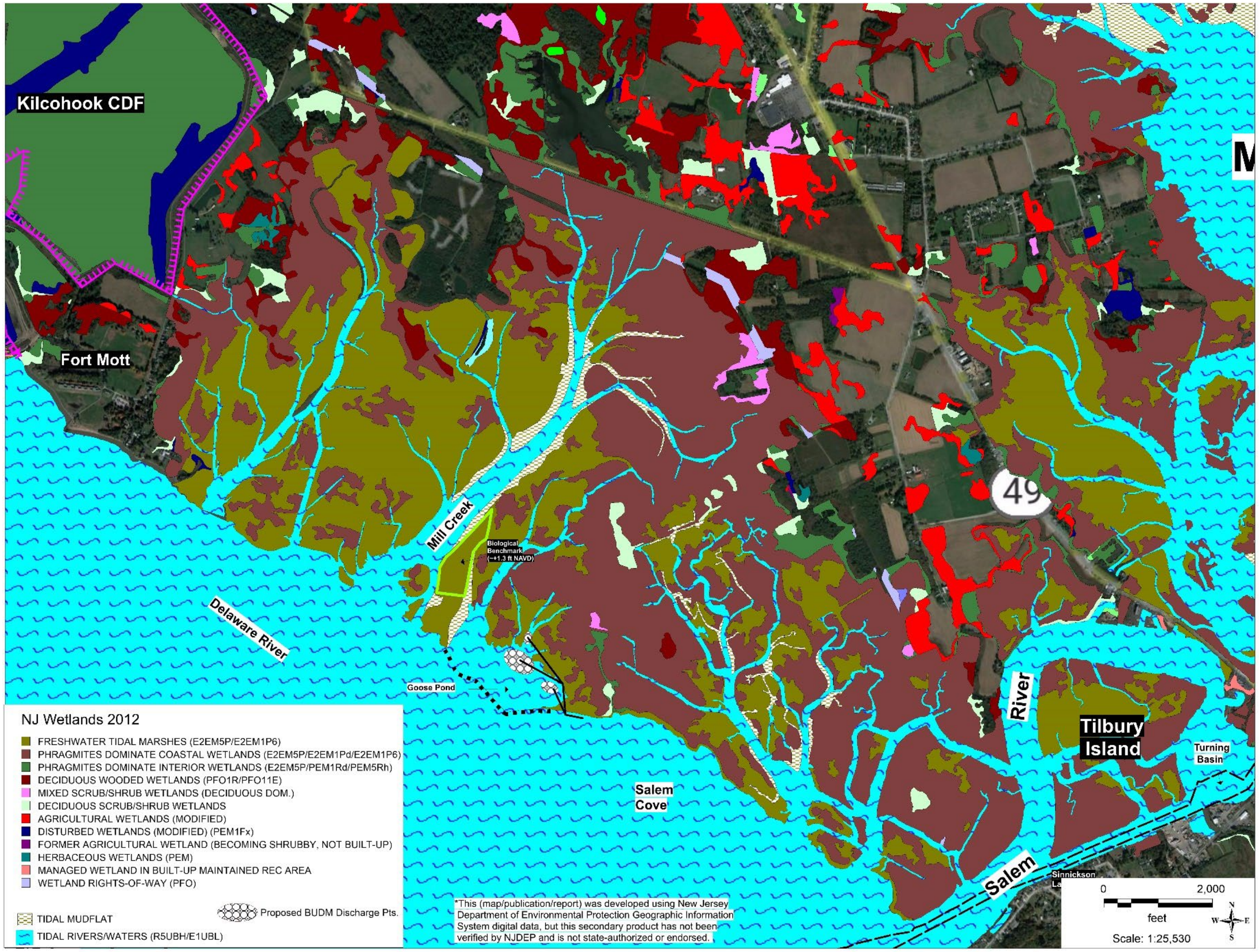


Figure 31. New Jersey Mapped Wetlands in Vicinity of Salem River Action Area



*This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

Figure 32. New Jersey Mapped Wetlands within Goose Pond/Mill Creek and Vicinity

The largest single habitat type within the Supawna Meadows NWR is slightly brackish tidal marsh (0 to 8 ppt), which composes 2,423 acres, or approximately 80 percent of the refuge. This habitat type includes both marsh habitat (1,931 acres) and open water tidal rivers and creeks (492 acres). The marshes associated with Baldridge Creek in the southwestern portion of the refuge contain a diversity of vegetation including species such as smooth cordgrass (*Spartina alterniflora*), pickerelweed (*Pontederia cordata*), water hemp (*Amaranthus cannabinus*), wild rice (*Zizania aquatica*), rice cutgrass (*Leersia oryzoides*), and common reed (*Phragmites australis*). The marshes associated with Mill Creek in the northwestern portion of the refuge are extensively dominated by common reed, which is the most prevalent invasive plant found within the Project area boundaries. There are a few rare plant species that occur within the tidal marshes, such as seashore mallow (*Kosteletzkya virginica*) and long-awned sprangletop (*Leptochloa fascicularis* var. *maritima*) (USFWS 2011; USFWS 2017).

Forested wetlands in the refuge area are closed canopy swamps interspersed with permanent and vernal ponds. These wetlands cover approximately 182 acres of the refuge and are dominated by deciduous species such as red maple (*Acer rubrum*), willow oak (*Quercus phellos*), sweetgum (*Liquidambar styraciflua*), and black gum (*Nyssa sylvatica*). Upland forested areas cover approximately 240 acres with at least 75 percent of the canopy coverage from deciduous trees. Dominant species include sweetgum, black gum, black cherry (*Prunus serotina*), black oak (*Quercus velutina*), southern red oak (*Quercus falcata*), American persimmon (*Diospyros virginiana*), American holly (*Ilex opaca*), and red maple (USFWS 2011; USFWS 2017). There are no forested wetlands within the affected areas.

Intertidal and subtidal unvegetated flats are vitally important habitats for various fish and invertebrates. Surficial sediments are inhabited by a benthic microalgal community, which typically consists of benthic diatoms, cyanobacteria, and unicellular algae. Primary production of this community can equal or exceed phytoplankton primary production in the water column and can represent a significant portion of overall primary productivity in a system (Pinckney and Zingmark 1993; Buzzelli et al. 2002). Both plankton and benthic feeding herbivorous fish are found in abundance on these flats where schools of baitfish are common over subtidal soft bottom and very abundant on shallow tidal/intertidal flats (NOAA Fisheries 2020a).

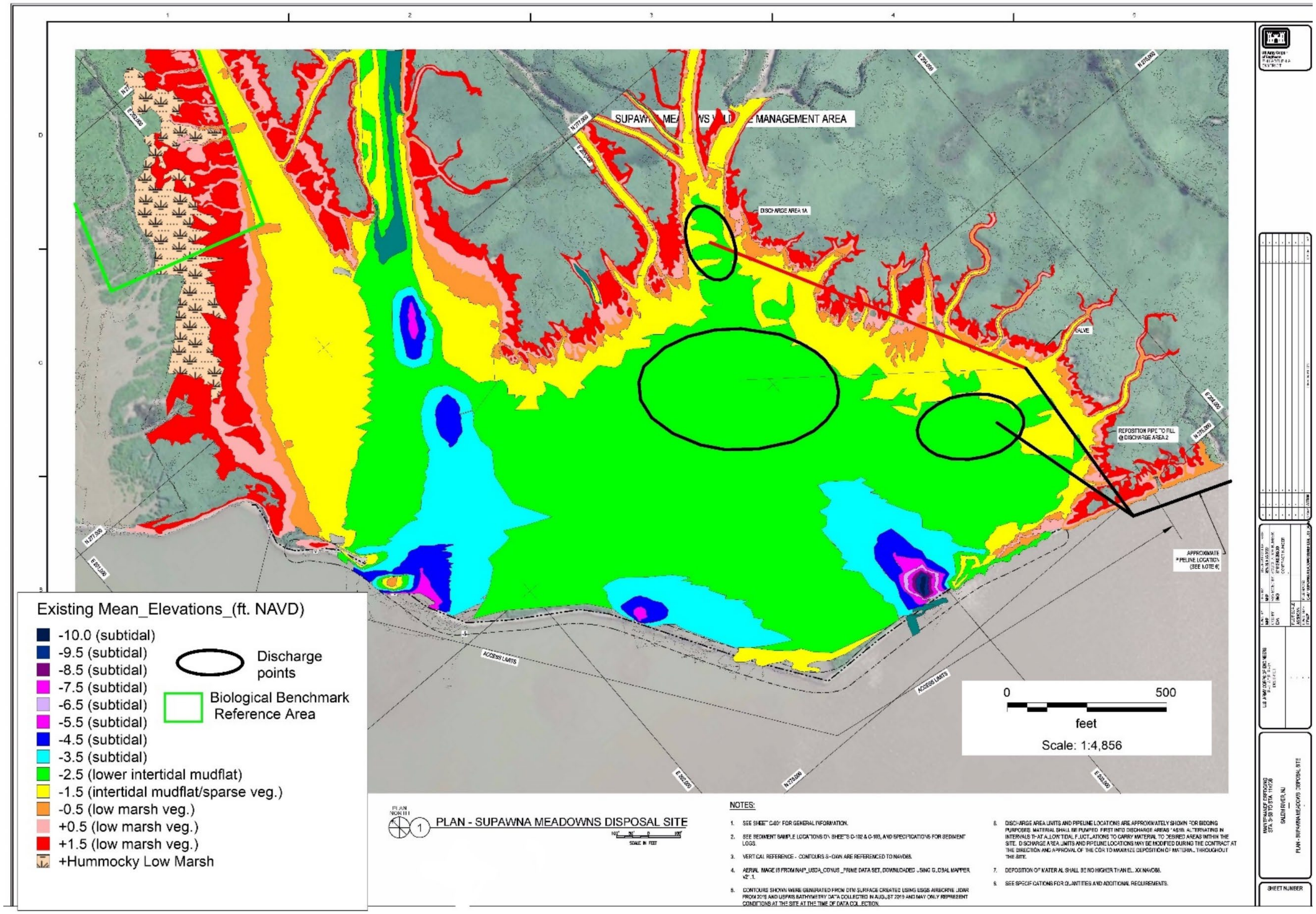
Approximately 12 species of Submerged Aquatic Vegetation (SAV) have been observed in the tidal portions of the Delaware Estuary since 1970. These species include eelgrass (*Vallisneria americana*), Eurasian watermilfoil (*Myriophyllum spicatum*), Nuttall's waterweed (*Elodea nuttallii*), nodding waternymph (*Najas flexillis*), pondweed (*Potamogeton* sp.), and others (Schuyler 1988). However, SAV has not been documented within the affected area boundaries (USFWS 2017).

The affected portion of the Goose Pond area consists of a rock breakwater along the Delaware River shoreline with a top crest that is generally below MHW. Three small openings allow for greater tidal exchange in this area. This breakwater will be repaired in 2023 by USFWS and Ducks Unlimited where one opening will be maintained but will still have a crest below MHW. The landward side consists of extensive intertidal and subtidal flats. The intertidal flats occur between elevations -2.8 ft. NAVD and -1 ft. NAVD where sparse vegetation begins to occur. The area includes a number of shallow tidal creeks that drain into the area with bottom elevations ranging from -2.5 ft. NAVD to -1.5 ft. NAVD. Brackish intertidal low marshes dominated by smooth cordgrass, pickerelweed and wild rice generally occur between -0.5 ft. and +1.5 ft. NAVD. Thick expanses of common reed occur generally above the +2.0 ft NAVD elevation. **Figure 33** provides elevation zones within the Goose Pond area.

5.2.2.Plankton

Phytoplankton production in the Delaware Estuary is heavily dependent on light penetration. Pennock and Sharp (1986) note that despite the occurrence of maximum nutrient concentrations in the freshwater regions of the estuary, the highest annual production occurred in the lower estuary, down-stream from the turbidity maximum (approximately between river miles 46 and 68). The affected area is between river miles 57 and 61. They found that the presence of the turbidity maximum immediately downstream from major anthropogenic nutrient sources restricts phytoplankton growth, and limits biomass accumulation below nuisance levels.

Historic records of zooplankton species within the Delaware Estuary include 11 primary species, including *Acartia tonsa* (copepod), *Pseudodiaptomos coronatus* (copepod), *Neomysis americana* (mysid shrimp), *Labidocera aestiva* (copepod), *Sagitta elegans* (arrow worm), *Temora longicornis* (copepod), *Eurytemora hirundoides* (copepod), *Eurytemora affinis* (copepod), *Nemopsis bachei* (ctenophore, comb jelly), *Cyclops viridis* (cyclopoid copepod), and *Balanus* sp. (common barnacle) larvae (Kreeger et al. 2011; USFWS 2017).



NOTES:

1. SEE SHEET C-001 FOR GENERAL INFORMATION.
2. SEE SEDIMENT SAMPLE LOCATIONS ON SHEETS C-102 & C-103, AND SPECIFICATIONS FOR SEDIMENT LOGS.
3. VERTICAL REFERENCE - CONTOURS SHOWN ARE REFERENCED TO NAVD88.
4. AERIAL IMAGE IS FROM NAIP_USDA_CONUS_PRIME DATA SET, DOWNLOADED USING GLOBAL MAPPER v21.1.
5. CONTOURS SHOWN WERE GENERATED FROM DTM SURFACE CREATED USING USGS AIRBORNE LIDAR FROM 2015 AND USFWS BATHYMETRY DATA COLLECTED IN AUGUST 2019 AND MAY ONLY REPRESENT CONDITIONS AT THE SITE AT THE TIME OF DATA COLLECTION.
6. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS ARE APPROXIMATELY SHOWN FOR BIDDING PURPOSES. MATERIAL SHALL BE PUMPED FIRST INTO DISCHARGE AREAS 1A&1B, ALTERNATING IN INTERVALS THAT ALLOW TIDAL FLUCTUATIONS TO CARRY MATERIAL TO DESIRED AREAS WITHIN THE SITE. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS MAY BE MODIFIED DURING THE CONTRACT AT THE DIRECTION AND APPROVAL OF THE COR TO MAXIMIZE DEPOSITION OF MATERIAL THROUGHOUT THE SITE.
7. DEPOSITION OF MATERIAL SHALL BE NO HIGHER THAN EL. XX NAVD88.
8. SEE SPECIFICATIONS FOR QUANTITIES AND ADDITIONAL REQUIREMENTS.

Figure 33. Elevation and Tidal Regimes within the Affected Goose Pond/Mill Creek Area

In the Delaware Estuary, copepods provide the major food for developing fishes, including the larval stage of economically important species. The following copepods are known to tolerate oligohaline waters and are found in abundance around Oakwood Beach: *Halicyclops fosteri*, *Eurytemora affinis*, *Acaryia tonsa*, *A. hudsonica*, and *Pseudodiaptomus pelagicus* . Another important food item for juvenile fish are mysid shrimp. The mysid shrimp (*Neomysis americana*) is omnivorous, consuming algae, plankton, and plant detritus. Other ecologically important crustaceans that can be found in the surrounding waters are grass shrimp (*Palaemonetes* spp.), and fiddler crabs (*Uca minax*, *U. pugnax*, and *U. pugilator*) (USACE 1999).

5.2.3. Benthic Macroinvertebrates

Benthic macroinvertebrates living in the substrate (infauna) and on the substrate (epifauna) are an important link in the food chain and nutrient cycling in the estuary. In 2008, the Partnership for the Delaware Estuary (PDE) began an extensive program called the Delaware Estuary Benthic Inventory (DEBI) to document and inventory the benthic community in the Delaware Estuary. From a set of 230 sampling stations, results indicated that there are 235 benthic species present in 112 families and 9 phyla within the Delaware tidal system. The mean species richness (number of species) at each station was 14 with a mean abundance of 9,000 individuals per square meter. The most diverse groups were polychaetes (27 families, 79 species), amphipods (15 families, 35 species), bivalves (17 families, 27 species), and gastropods (15 families, 25 species). The dominance by polychaetes, bivalves and amphipods was expected for the estuary's mixed sand-silt sediment as well as from previously published studies (Kreeger et al. 2011). The DEBI sampling demonstrated that the low salinity sites (including the affected area) were found to be dominated by relatively few species as compared to polyhaline. Consistent evidence also shows that benthic assemblages are driven by salinity, and not by sediments (USFWS 2017).

The intertidal flats and shallows in the affected area are habitat to a number of benthic invertebrates, which include ciliates, rotifers, nematodes, copepods, annelids, amphipods, bivalves and gastropods, which are preyed upon by mobile predators that move onto the flats with the flood tides.

Based on previous benthic sampling associated with the Salem River Federal navigation channel in the 1970's and 1980's, the brackish waters and substrates of the lower Salem River and entrance channel in the Delaware River contain a benthic community of lower diversity consisting predominantly of the tube-building amphipod (*Corophium* sp). Other benthic species found within the area include other amphipods, isopods, oligochaetes and the polychaete (*Polydora* sp.). The amphipods and isopods are generally epifaunal in nature and are detritus and deposit feeders.

The Salem Cove and vicinity waters are inhabited by blue crabs (*Callinectes sapidus*), an important commercial and recreational shellfish that migrate into the area in early fall. The lower portion of the Salem River and Cove, and Delaware River is used for recreational crabbing.

Oysters are an important commercial resource in the Delaware Bay region. Substantial preserved natural seed beds of the American oyster (*Crassostrea vigrinica*) are located in the Delaware River about 13 miles downstream from Salem Cove. These beds are harvested for seed during May and June for planting in leased areas. No oyster beds occur within the Salem River navigation channel or the Goose Pond placement area.

5.2.4. Fish

The estuarine waters, subtidal and intertidal flats, and tidal marshes along the Delaware River, Salem River, and tributaries provide important spawning, nursery, feeding and migratory pathways for a host of finfish species. Finfish represent a major resource group in the Salem River area and the Delaware River. The finfish population of the Delaware Estuary is extensive and diverse. Because of the large salinity range within the affected area, both freshwater and marine species utilize these habitats. Some of the species spend only part of their life cycle in the area, others just migrate through, and finally some spend their whole life in this part of the estuary. **Table 4** provides a list of common fish and their scientific names that utilize the estuary between Wilmington and Liston Point, Delaware at some point in their life cycle. In the spring of 1987, the USFWS and NJDEP conducted sampling activities in the Salem River and Cove where a total of 1,130 fish were collected and identified representing 20 different species. Ninety percent of the species were represented by bay anchovy (*Anchoa mitchilli*) (69%), striped killifish (*Fundulus majalis*) (8%) Atlantic silverside (*Menidia menidia*) (7.7%) and white perch (*Morone americana*)(6%). The remaining species include carp (*Cyprinus carpio*), bluefish (*Pomatomus saltatrix*), pumpkinseed (*Lepomis gibbosus*), mummichog (*Fundulus heteroclitus*), white catfish (*Ameiurus catus*), Atlantic menhaden (*Brevoortia tyrannus*), gizzard shad (*Dorosoma cepedianum*), alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidisima*), blueback herring (*Alosa aestivalis*), channel catfish (*Ictalurus punctatus*), white crappie (*Pomoxis annularis*), American eel (*Anguilla rostrata*), windowpane (*Scopthalmus aquosus*), golden shiner (*Notemigonus crysoleucas*) and brown bullhead (*I. nebulosus*). Also identified were grass shrimp (*Palaemonetes vulgaris*) and various species of crabs.

Species of current recreational and commercial importance that can be found within the affected areas include weakfish (*Cynoscion regalis*), American shad, white perch, striped bass, windowpane flounder, summer flounder, and spot. The State of New Jersey, Department of Environmental Protection, Bureau of Marine Fisheries stated that the nearshore area of Oakwood Beach location is a nursery area for many fish species, including striped bass (*Morone saxatilis)*, bluefish, Atlantic silverside, bay anchovy, spot (*Leiostomus xanthurus*), and Atlantic menhaden. Commercially valuable fish in the project area include American shad, weakfish, Atlantic menhaden, blueback herring (*Alosa aestivalis*), bluefish, summer flounder (*Paralichthys dentatus*), striped anchovy (*Anchoa hepsetus*), bay anchovy, alewife, and white perch (*Morone americana*). Important recreational fish in the project area include bluefish, striped bass, spot, and weakfish.

Table 4. Common Fish Species That Utilize the Delaware Estuary Between Wilmington and Liston Point, Delaware (USACE, 1999)

Species	Common Residence	Migrate Anadromous or Catadromous	Spawn in Area	Nursery in Area
Atlantic sturgeon *Acipenser oxyrhnchus*		Anadromous (spring)	March - May	?
American eel *Anquilla rostrata*		Catadromous (adults in fall)		Feb. - April
Blueback herring *Alosa aestivalis*		Anadromous (Mar. - May)		late April - Nov.
Alewife *Alosa pseudoharengus*		Anadromous (Mar. - May)		April - Nov.
American shad *Alosa sapidissima*		Anadromous (Mar. - May)		
Atlantic menhaden *Brevoortia tyrannus*				summer - early fall
Bay anchovy *Anchoa mitchilli*	year round		May - Sept.	May - Nov.
Carp *Cyprinus carpio*	year round			May – fall
Silvery minnow *Hybognathus nuchalis*	year round			
Spottail shiner *Notropis hudsonius*				April – fall

Table 4. Common Fish Species That Utilize the Delaware Estuary Between Wilmington and Liston Point, Delaware (USACE, 1999)

Species	Common Residence	Migrate Anadromous or Catadromous	Spawn in Area	Nursery in Area
White catfish *Ictalurus catus*	year round			May – fall
Brown bullhead *Ictalurus nebulosus*	year round			
Channel catfish *Ictalurus punctatus*	year round			
Banded killifish *Fundulus diaphanus*	year round			
Mummichog *Fundulus heteroclitus*	year round		April - Sept.	May - Dec.
Atlantic silverside *Menidia menidia*	year round		April - Aug.	
White perch *Morone americana*	winter			April. - Oct.
Striped Bass *Morone saxatilis*	year round		Early April - Early July	Early April - Fall
Weakfish *Cynoscion regalis*				mid May – Fall
Spot *Leiostomus xanthurus*	year round			June - Dec.
Summer flounder *Paralichtys dentatus*				fall – spring

Table 4. Common Fish Species That Utilize the Delaware Estuary Between Wilmington and Liston Point, Delaware (USACE, 1999)				
Species	Common Residence	Migrate Anadromous or Catadromous	Spawn in Area	Nursery in Area
Windowpane flounder *Scophthalumus aquosus*	year round		late April - Dec.	late summer - fall
Hogchoker *Trinactes maculatus*	year round		May - Aug.	May – fall

5.2.4.1 Essential Fish Habitat

Under provisions of the reauthorized Magnuson-Stevens Fishery Conservation and Management Act of 1996, the entire affected area including the dredging area, and subtidal and intertidal placement areas were designated as Essential Fish Habitat (EFH) for species with Fishery Management Plans (FMP's), and their important prey species. This includes EFH for various life stages for 12 species of managed fish and shellfish. **Table 5** presents the managed species and their life stage that EFH is identified for within the affected geographic area as searched in the EFH mapper (https://www.habitat.noaa.gov/apps/efhmapper/efhreport/). This encompasses locations in the Delaware Bay that the National Marine Fisheries Service has identified as the biosalinity mixing zone.

Table 5. Summary of EFH Designated Species and Their Life Stages within the Delaware Estuary Mixing Zone EFH					
Managed Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**	**Spawning Adults**
Windowpane flounder *(Scopthalmus aquosus)*			X	X	
Atlantic sea herring *(Clupea harengus)*			X	X	
Bluefish *(Pomatomus saltatrix)*			X	X	

Table 5. Summary of EFH Designated Species and Their Life Stages within the Delaware Estuary Mixing Zone EFH

Long finned squid *(Loligo pealei)*	X				
Atlantic butterfish *(Peprilus tricanthus)*		X		X	
Summer flounder *(Paralicthys dentatus)*			X	X	
Scup *(Stenotomus chrysops)*			X	X	
Black sea bass *(Centropristus striata)*			X		
Red hake *(Rachycentron canadum)*				X	
Clearnose skate (*Raja eglantteria*)			X	X	
Little skate (*Leucoraja erinacea*)			X	X	
Winter skate (*Leucoraja ocellata*)			X	X	

There are no Habitat Areas of Particular Concern (HAPC) or EFH Areas Protected from Fishing (EFHA) documented within the Goose Pond area. A HAPC for summer flounder exists in the channel dredging area contingent on the presence of SAV or macroalgae, which do not exist in this area.

5.2.5.Terrestrial Resources

5.2.5.1 Terrestrial Habitats

Grassland habitat within the refuge composes approximately 86 acres and includes a diversity of grasses and forbs. Important grassland plant species include cool season grasses, such as orchard grass (*Dactylis glomerata*), warm season grasses, such as switch grass (*Panicum virgatum*), and forbs, such as goldenrods (*Euthamia* spp. and *Solidago* spp.), and eupatoriums (*Eupatorium* spp.) (USFWS 2011).

The approximately 122 acres of scrub/shrub and early successional habitats spread across the refuge are dominated by a mixture of native plants (e.g., blackberry (*Rubus* sp), goldenrod, grape (*Vitis* sp.), bayberry (*Myrica pensylvanica*)) and invasive plants (e.g., multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), Japanese honeysuckle (*Lonicera japonica*), mile-a-minute (*Persicaria perfoliata*), and common reed) (USFWS 2011).

5.2.5.2 Avifauna

The Delaware Estuary lies along the Mid-Atlantic Flyway, a major migratory corridor for north and southbound birds including waterfowl, wading birds, raptors, shorebirds, and songbirds. Saltmarshes and tidal wetlands meet coastal shrub and forested habitats in the project area.

Over 300 species of birds can be observed throughout the year in Salem County. The refuge is located in the Atlantic Flyway and serves not only as an important migration stop, but also habitat for regionally and nationally significant species such as rails, neotropical migrants, and raptors (USFWS 2011; USFWS 2005).

The refuge also provides habitat for thousands of waterfowl that use the tidal marshes through winter and during migration (USFWS 2011). Coastal salt marsh wetland habitat, such as that found at the refuge, has been identified by the Black Duck Joint Venture as the most important habitat for wintering American black duck (*Anas rubripes*), annually wintering 34 percent of the entire Atlantic Flyway American black duck population (Black Duck Joint Venture 2008). During the 2009 midwinter count, inventory flights for the Salem River watershed averaged more than 2,000 dabbling ducks and more than 11,500 Canada geese (*Branta canadensis*) (USFWS 2009).

Additional waterfowl species that can be found within the refuge include American widgeon (*Anas americana*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), snow goose (*Chen caerulescens*), and tundra swan (*Cygnus columbianus*) (USFWS 2005).

Raptor species that have been observed at the refuge include sharp-shinned hawk (*Accipter striatus*), Cooper's hawk (*Accipter cooperii*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and peregrine falcon (*Falco peregrinus*). Cooper’s hawks have also been noted within the forested areas of refuge. The forest also supports breeding populations of wood thrush (*Hylocichla mustelina*), eastern wood pewee (*Contopus virens*), northern flicker (*Colaptes auratus*), and Baltimore oriole (*Icterus galbula*) as well as migrating populations of black-and-white warbler (*Mniotilta varia*), hooded warbler (*Wilsonia citrina*), and Kentucky warbler (*Oporornis formosus*) (USFWS 2011).

The refuge’s grassland habitat supports migrating and wintering songbirds, including the bobolink (*Dolichonyx oryzivorus*), vesper sparrow (*Pooecetes gramineus*), eastern meadowlark (*Sturnella magna*), and savannah sparrow (*Passerculus sandwichensis*), as well as raptor species such as northern harrier and short-eared owl (*Asio flammeus*) (USFWS 2011).

Pea Patch Island, one of the largest rookeries on the East Coast, is located in the center of the Delaware River, approximately 1.5 miles offshore of the Project area. The refuge provides foraging habitat for the more than 6,000 pairs (9 species) of wading birds that nest on the island, including black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nyctanassa violacea*), great egret (*Ardea alba*), and little blue heron (*Egretta caerulea*). These waders forage in the tidal marsh within the refuge boundaries throughout the breeding season.

Because of its importance, Pea Patch Island and the surrounding area, including the refuge, have been designated as a Special Management Area (SMA) by the States of New Jersey and Delaware in accordance with the Coastal Zone Management Act (USFWS 2011).

Shorebirds also use the marshes within the refuge during spring and fall migrations, including species such as the least sandpiper (*Calidris minutilla*) and semipalmated sandpiper (*Calidris pusilla*). Species such as the king rail (*Rallus elegans*) and least bittern (*Ixobrychus exilis*) use the marshes for breeding. Based on the importance of the Delaware estuary to migrating shorebirds, both the New Jersey and Delaware shores of the Delaware Bay are designated as International Shorebird Preserves (USFWS 2011).

5.2.5.3 Mammals

According to the USDA Natural Resources Conservation Service (NRCS) only 8 out of 23 wetland species found in North America have the potential to be found in southern New Jersey's saltwater marshes (NRCS 2001). This includes seven rodent species (masked shrew (*Sorex cinereus*), meadow vole (*Microtis pennsylvanicus*), meadow jumping mouse (*Zapus hudsonisu*), marsh rice rat (*Oryzomys palustris*), beaver (*Castor canadensis*), invasive nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*)) and mink (*Mustela vison*). (USFWS 2011; NRCS 2001). Many of these rodents are a good food source to the raptors within the refuge.

Specific to the Supawna Meadows NWR there is a large maternity colony of more than 1,500 bats that roost in a barn on the refuge. This roost is primarily composed of little brown bats (*Myotis lucifugus*). Bats may tend to come to these areas looking for insects, which are abundant within the marshes. The federally listed Indiana bat (*Myotis sodalis*) may be found in these little brown bat colonies however, the Service has not surveyed for their presence in the refuge. Other bats species found within the refuge include the eastern small-footed myotis (*Myotis leibii*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silverhaired bat (*Lasionycteris noctivagans*). (USFWS 2011). Species that may be found in the marsh but typically stay in the upland habitats include the raccoon (*Procyon lotor*), black bear (*Ursus americanus*), and white tailed deer (*Odocoileus virginianus*) (USFWS 2011, NRCS 2001). There is a large white-tailed deer population within the refuge, with an estimated density around Salem County Hunting Management Zone 63 to be 41 deer per square mile. (USFWS 2011).

Other mammalian species that can be commonly found within the refuge include the white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), eastern cottontail (*Sylvilagus floridana*), groundhog (*Marmota monax*), opossum (*Didelphis virginiana*), skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), long-tailed weasel (*Mustela frenata*), river otter (*Lontra canadensis*) and the southern bog lemming (*Synaptomys cooperi*). (USFWS 2011).

5.2.5.4 Reptiles and Amphibians

A variety of amphibians and reptiles are found within the refuge, including the eastern painted turtle (*Chrysemys picta*), common snapping turtle (*Chelydra serpentina*), eastern garter snake (*Thamnophis sirtalis*), black rat snake (*Elaphe obsoleta*), southern leopard frog (*Lithobates sphenocephalus*), green frog (*Rana clamitans melanota*), and American bullfrog (*Rana catesbeiana*) (USFWS 2011; USFWS 2017). However, the affected area contains brackish water where the presence of amphibians is dependent on their tolerance for salinity and are limited to areas with freshwater availability.

5.2.6. Rare, Threatened and Endangered Species

The Endangered Species Act (ESA) provides a program for the conservation of threatened and endangered species and a means for conserving the ecosystems upon which those species depend. Section 7 (a)(2) of the ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to ensure their activities are not likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat. Under the ESA, an endangered species is in danger of extinction and a threatened species is likely to become endangered within the foreseeable future.

The New Jersey Endangered Species Act (NJESA) is designed to protect species whose survival in New Jersey is imperiled by loss of habitat, over-exploitation, pollution, or other impacts. Under the NJESA, endangered species are those whose prospects for survival in New Jersey are in immediate danger because of a loss or change of habitat, over-exploitation, predation, competition, or disease. Threatened species are those that may become endangered if conditions surrounding the species begin or continue to deteriorate.

The unique habitats of the Supawna Meadows NWR attract a wide variety of wildlife including threatened and endangered species, and species of conservation concern. Sensitive mammalian species include the northern long-eared bat (*Myotis septentrionalis*), eastern small-footed myotis (*Myotis leibii*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silverhaired bat (*Lasionycteris noctivagans*), and southern bog lemming (*Synaptomys cooperi*). Federally listed endangered fish species recorded near the refuge include the short-nosed sturgeon (*Acipenser brevirostrum*), and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*).

The refuge also contains habitat to support reptilian and amphibian species of conservation concern, including northern diamondback terrapin (*Malaclemys terrapin*), eastern box turtle (*Terrapene carolina carolina*), spotted turtle (*Clemmys guttata*), and Fowler's toad (*Anaxyrus fowleri*). A number of State-listed endangered northern harriers (*Circus cyaneus*) and State-listed threatened osprey (*Pandion haliaetus*) have nested in the tidal marsh within the refuge and a pair of bald eagles (*Haliaeetus leucocephalus*) has nested there since 1998 (USFWS 2011).

The USFWS Information for Planning and Consultation (IPaC) was queried on 10 January 2023, to determine the potential occurrence of federally listed threatened, endangered, or candidate species within the project area encompassing the proposed channel dredging area and adjacent proposed beneficial use placement areas.

The IPaC online system provides a list of species and critical habitats under the purview of the U.S. Fish and Wildlife Service's Ecological Services Program that are known or expected to occur in the project vicinity. **Table 6** provides the results of this query. Six species (and one proposed endangered and one candidate species) identified include the endangered northern long-eared bat (*Myosis septentrionalis*), the threatened red knot (*Calidris canutus rufa*), the threatened bog turtle (*Glyptemys muhlenbergii*), the proposed endangered tricolored bat (*Perimyotis subflavus),* the candidate species, the monarch butterfly (*Danaus plexippus*), and one threatened plant species: sensitive joint-vetch (*Aeschynomene virginica*). No critical habitats for any listed species were observed in the project vicinity.

<u>Rufa red knot:</u> The rufa red knot (*Calidris canutus*) is listed as Federally threatened (2015) and state listed as endangered (2007). Red knots are primarily found along the Delaware Bay shorelines, where they occur in large numbers during the spring (mid-May through early June) and fall (late July through November) migration periods. Red knots feed on invertebrates, especially horseshoe crab eggs during the spring migration. The NJDEP reports that both horseshoe crab and red knot numbers have declined by over 75 percent since the early 1990's. According to IPaC, "this activity area is upstream of red knot habitat. Consultation is needed only for proposed new or changed petroleum product."

Table 6. IPaC Findings for Potential Federally Listed Threatened and Endangered Species in or Near the Project Area

Common Name	Scientific Name	Federal Status	Critical Habitat in Affected Area?
Northern Long-eared Bat	*Myotis septentrionalis*	FE DE	No
Tricolored Bat	*Perimyotis subflavus*	PFE	No
Red Knot	*Calidris canutus rufa*	FT	No
Bog Turtle	*Glyptemys muhlenbergii*	FT DE/NJE	No

Table 6. IPaC Findings for Potential Federally Listed Threatened and Endangered Species in or Near the Project Area			
Common Name	Scientific Name	Federal Status	Critical Habitat in Affected Area?
Monarch Butterfly	*Danaus plexippus*	FC	No
Sensitive Joint-vetch	*Aeschynomene virginica*	FT NJE/DESH	No
FT=Federally Threatened; FE=Federally Endangered; FC=Federal Candidate; PFE=Proposed Federal Endangered; DE=Delaware Endangered; NJE=New Jersey Endangered; DESH=Delaware Historically occurring.			

Northern Long-eared Bat and Tricolored Bat: Northern long-eared bats spend their winters hibernating in hibernaculums such as caves and mines. There are no hibernaculums within the affected areas. In the spring and summers, and into the fall, they move into forested areas and would be found roosting singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags, or dead trees. Since the affected areas do not contain trees, these species are not expected to be affected. The tricolored bat has similar seasonal habitat requirements and is not expected to be roosting within the affected area.

Bog Turtle: Bog turtles inhabit open-canopy herbaceous sedge bogs, fens or wet meadows, with few trees present that would shade out plants that bog turtles like, such as the tussock sedges that form hummocks used for basking and nesting, shrubby cinquefoil, poison sumac, grass-of-parnassus, and cattail, among many other plant species. The affected intertidal marshes, mudflats and open-water areas are not suitable habitat for bog turtles and are not expected to be within the affected areas.

Sensitive Joint-Vetch: The sensitive joint-vetch is an annual legume plant that typically grows in the intertidal zone of coastal marshes where plants are flooded twice daily. The species seems to prefer the marsh edge at an elevation near the upper limit of tidal fluctuation, where soils may be mucky, sandy, or gravelly. It is usually found in areas where plant diversity is high (50 species per acre) and annual species predominate. Bare to sparsely vegetated substrates appear to be of critical importance to this plant. As an annual, it requires such microhabitats to establish and grow. Such areas may include areas along rivers with new deposits of soil that have not yet been colonized by perennial species, low swales within extensive marshes, or areas where muskrats have eaten most of the vegetation. It appears to remain at a particular site for a relatively short period of time, and maintains itself by colonizing new, recently disturbed habitats where it may compete successfully among other early-successional species. It is frequently found in the estuarine meander zone of tidal rivers where sediments transported from upriver settle out and extensive marshes are formed. The substrate may be sandy, muddy, gravelly, or peaty. In North Carolina, sensitive joint-vetch is most often found in roadside ditches, often with some connection to nearby brackish marshes. Although, sensitive joint-vetch has been observed within the affected area, the Goose Pond area contains suitable habitat.

Monarch Butterfly: Monarch butterflies migrate to a mountainous region in Mexico to spend their winters but can be found throughout the area from spring through fall feeding on flower nectar and specifically utilize the milkweed plants: swamp milkweed *(Asclepias incarnata)* and common milkweed *(A. syriaca)* to lay eggs. The common milkweed would not tolerate the intertidal conditions in the affected area. Although the swamp milkweed is an obligate wetland plant that can be found in marshes, the salinity of the affected area may be limiting as these plants are not very salt tolerant. Therefore, the affected areas are not expected to be a significant breeding area for monarchs. The flowering plants within in the brackish marshes including pickerel weed are likely to attract monarchs for feeding.

Saltmarsh Sparrow: The salt marsh sparrow (*Ammodramus caudacutus*) is currently being evaluated by the USFWS to determine if listing under the ESA is warranted and it is listed as a species of Special Concern in the State of New Jersey. The salt marsh sparrow is a year-round resident in New Jersey, favoring coastal saltmarsh habitat. Nests consist of plant material and can be constructed directly on the ground or about 2 feet above the ground, among the stems of tall marsh grasses.

Bald Eagle: The bald eagle (*Haliaeetus leucocephalus*) is listed as endangered in New Jersey and Delaware and nests at Supawna Meadows National Wildlife Refuge. The NJDEP reported that there were 247 active bald eagles nests within the state of New Jersey in 2021. Although the bald eagle was removed from the Endangered Species list in 2007, it is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. These laws prohibit killing, selling or otherwise harming eagles, their nests, or eggs.

The species listed in **Table 7** are USFWS' Birds of Conservation Concern that may occur in the project vicinity. Birds of Conservation Concern was developed based on the 1988 amendment to the Fish and Wildlife Conservation Act, which mandates the U.S. Fish and Wildlife Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973.

Table 7. Birds of Conservation Concern (BCC)	
American oyster catcher (Haematopus pilliatus)	Breeds April 15 to August 31
Bald Eagle (*Haliaeetus leucocephalus*)	Breeds Oct 15 to Aug 31
Black skimmer (*Rynchops niger*)	Breeds May 20 to September 15
Black-billed cuckoo (*Coccyzus erythropthalmus*)	Breeds May 15 to October 10
Blue-winged warbler (*Vermivora pinus*)	Breeds May 1 to June 30
Bobolink	Breeds May 20 to July 31

Table 7. Birds of Conservation Concern (BCC)	
(*Dolichonyx orizyvorus*)	
Canada warbler (*Cardellina canadensis*)	Breeds May 20 to August 10
Chimney swift (*Chaetura pelagica*)	Breeds Mar 15 to Aug 25
Gull-billed tern (*Gelochelidon nilotica*)	Breeds May 1 to July 31
Hudsonian godwit (*Limosa haemastica*)	Breeds elsewhere
Kentucky warbler (*Oporornis formosus*)	Breeds April 20 to August 20
King rail (*Rallus elegans*)	Breeds May 1 to September 15
Lesser yellowlegs (*Tringa flavipes*)	Breeds elsewhere
Prairie warbler (*Dendroica discolor*)	Breeds May 1 to July 31
Prothonotary warbler (*Protonotaria citrea*)	Breeds April 1 to July 31
Red-headed woodpecker (*Melanerpes erythrocephalus*)	Breeds May 10 to September 10
Ruddy turnstone (*Arenaria interes morinella*)	Breeds elsewhere
Rusty blackbird (*Euphagus carolinus*)	Breeds elsewhere
Short-billed dowitcher (*Limnodromus griseus*)	Breeds elsewhere
Willet (*Tringa semipalmata*)	Breeds April 20 to August 5
Wood thrush (*Hylocichia mustelina*)	Breeds May 10 to August 31

Populations of osprey *(Pandion haliaetus),* a state-listed threatened species, are also growing in New Jersey. As of 2017, NJDEP's Endangered and Nongame Species program has recorded 668 osprey nests in the state. Unlike the bald eagle, ospreys migrate out of the project area in winter.

The northern diamondback terrapin (*Malaclemys terrapin*) is considered a New Jersey species of Special Concern and occupies brackish tidal marshes and nests on sandy bay beaches.

The Greater Atlantic Regional Fisheries Office (GARFO) ESA mapper was accessed on 15 September 2022 to determine the presence of Federally listed threatened or endangered species and critical habitat within the affected areas (dredging and placement). The search of the dredging location and placement of Goose Pond area identified six Federally-listed threatened or endangered species including: Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), and four sea turtle species have the potential to occur in the affected area (**Table 8**). The turtle species include the endangered Kemp's ridley turtle (*Lepidochelys kempii*) and leatherback turtle (*Dermochelys coriacea*) and the threatened green (*Chelonia mydas*) and loggerhead *(Caretta caretta*) turtles (NMFS 2020b).

Table 8. Threatened and Endangered Species Under NOAA Fisheries Jurisdiction

SPECIES	STATUS	ZONE	LIFE STAGE	BEHAVIOR	DATES	CRITICAL HABITAT
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)	FE DE/NJE	Del. River	Post yolk sack larvae	Migrating and Foraging	04/01-09/30	Yes
	FT/FE DE/NJE	Del. River	Subadult	Migrating and Foraging	03/15-11/30	
	FE DE/NJE	Del. River	Young of year	Migrating and Foraging	01/01-1/31	
	FT/FE DE	Del. River	Adult	Migrating and Foraging	03/15-11/30	
	FE DE/NJE	Del. River	Juvenile	Migrating and Foraging	01/01-12/31	
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE DE/NJE	Del. River	Young of year	Migrating and Foraging	01/01-12/31	No
	FE DE/NJE	Del. River	Post yolk sack larvae	Migrating and Foraging	03/15-07/31	
	FE DE/NJE	Del. River	Juvenile	Overwintering	11/01-3/31	
	FE DE/NJE	Del. River	Juvenile	Migrating and Foraging	01/01-12/31	
	FE DE/NJE	Del. River	Adult	Migrating and Foraging	01/01-12/31	
Green sea turtle (*Chelonia mydas*)	FT DE/NJE	MA-VA	Adults & Juveniles	Migrating and Foraging	05/01-11/30	No
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	FE DE/NJE	MA-VA	Adults & Juveniles	Migrating and Foraging	05/01-11/30	
Leatherback sea turtle (*Dermochelys coriacea*)	FE DE/NJE	MA-VA	Adults & Juveniles	Migrating and Foraging	05/01-11/30	
Loggerhead sea turtle *(Caretta caretta*)	FT DE/NJE	MA-VA	Adults & Juveniles	Migrating and Foraging	05/01-11/30	

FT=Federally Threatened; FE=Federally Endangered; DE=Delaware Endangered; NJE=NJ Endangered

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) was listed as Federally endangered and threatened in 2012 and is listed as endangered in New Jersey. Atlantic sturgeon spawn in the freshwater regions of the Delaware River. By the end of their first summer the majority of young-of-the-year Atlantic sturgeon remain in their natal river while older subadults begin to migrate to the lower Delaware Bay or nearshore Atlantic Ocean.

Older subadult Atlantic sturgeon are known to undertake extensive marine migrations, returning to their natal river in the late spring, summer, and early fall months (Dovel and Berggren, 1983). Early (eggs, larvae, young-of-year) and juvenile life stages of Atlantic sturgeon will not likely present in the project area as they are not able to tolerate the high salinity. While sub-adult and adult Atlantic sturgeon use of marine habitat is not completely understood, they are known to use nearshore coastal waters for their marine migration (NOAA Fisheries, 2020b). The shortnose sturgeon has been found throughout the estuary though spawning is thought to be limited to areas well upstream from the project area. The sea turtles are known to use the estuary as far upriver as the Delaware Memorial Bridge (about 11 miles upstream of the Oakwood Beach area) during the summer.

Sea turtles are known to use the estuary as far upriver as the Delaware Memorial Bridge (about 11 miles upstream of the Salem River Cove area) during the summer. All four species of sea turtles are also listed in the States of Delaware and New Jersey and could potentially forage in the Delaware River cove area.

Although not likely to occur in the Delaware River, on rare occasions, two species of whale have been known to venture into the Delaware Bay from the Atlantic Ocean: adult and juvenile fin whales (*Balaenoptera physalusand*) and North Atlantic right whales (*Eubalaena glacialis*). Other marine mammals that have been observed on occasion in the lower Delaware Bay include the harbor seal (*Phoca vitulina*), bottle-nosed dolphin (*Tursiops truncates*), and harbor porpoise (*Phocoena phocoena*). These marine mammals are unlikely to occur in the project area due to insufficient depths.

USFWS (2017) identified three rare plants species as potentially occurring within the affected area of Goose Pond that include: coast flat sedge (*Cyperus polystachyos* var. *texensis*), New England bulrush (*Schoenoplectus angliae*), and floating marsh pennywort (*Hydrocotyle ranunculoides*).

5.3 Social, Economic and Cultural Resources

5.3.1. Land Use

Salem County has managed to maintain its traditional industries and land use patterns. It contains a significant amount of low-lying land, with 30 percent of its land covered by wetlands, and 5 percent covered by open waters. Upland forests (17 percent) and urban areas (10 percent) compose the remainder of the land use in Salem County. Approximately 25 percent of the 216,320 acres in in Salem County contains permanently protected open space lands, such as national wildlife refuges, wildlife management areas, and state, county, and local parks (AKRF 2015; USFWS 2017). Adjacent land uses to the channel dredging include wetland tidal marshes, recreational land, residential single and multiple dwellings, transportation/communication/utilities, and industrial zones. Adjacent land uses within the Goose Pond placement area includes tidal open waters, and tidal marshes within the Supawna Meadows National

Wildlife Refuge. The land use of the affected areas within Delaware, New Castle County is solely open tidal waters of the Delaware River.

5.3.2. Socioeconomics

Salem County has a land area of 338 square miles of relatively flat to rolling land interspersed with lakes, streams and meadows that drain into the Delaware River. There are 65,774 residents living within the County. The County's workforce numbers 31,100 and there are 28,300 housing units within the County. There are 18,486 school children enrolled in local schools. The County's median household income is $57,174 and the median value of a residential property is $196,000. Salem County has a diversified work force. The County currently has a total manufacturing work force of 4,769, which is 16.2 percent of the Salem County work force of 31,100 in the year 2010. Education, health and social service workers make up more of the employment base of the County than manufacturing, with 5,868 employees. Retail trade generates 3,587 jobs and transportation, warehousing and utilities create 2,925 jobs and construction provides 1,934 employment opportunities (Economic Development Associates 2017).

Agriculture has played an important role in Salem County, both prior to European settlement and through the 17th Century (Salem County Visitors Center 2010). Lumber and grain mills were established among the major creeks as early industry was supported by timber and agriculture. Today, approximately 40 percent of Salem County contains productive farmland (USFWS 2011).

Representing more than 10 percent of the State's agricultural market, Salem ranks first in the State for wheat, barley, sweet corn, and potatoes, and second for milk production, soybeans, asparagus, and corn harvested for grain (USDA 2002). While agriculture is the mainstay of the eastern and central sections, western Salem County remains home to the county's major employer, industry. By the 1960s, E.I. DuPont de Nemours and Company (DuPont) employed 25 percent of Salem County households. Since then, the manufacturing industry in the United States has declined, including the outputs of DuPont and other companies in Salem County. The corresponding reduction in the industrial tax base, diminished employment opportunities, and significant loss of disposable income in the community has led to a compromise in the high quality of life associated with Salem County (USFWS 2011).

By 2000, the county's per capita income was 23 percent lower than the state's per capita income (US Census 2000). The commercial fishing industry within the Delaware Estuary has had a long and profitable history (USFWS 2017; Speiser 2013). By the end of the 19th century, the estuary supported the largest commercial American shad and Atlantic sturgeon fisheries along the east coast (USFWS 2017; Speiser 2013; DNREC n.d.). Today, commercial sturgeon fishing no longer exists. However, the estuary contains over 200 species of other resident and migrant fish and shellfish with commercial landings contributing $34 million annually to the Delaware Estuary's regional economy (USFWS 2017; Speiser 2013). Other traditional uses of the area include boat building and repair, muskrat (*Ondatra zibethicus*) trapping, and waterfowl hunting (USFWS 2011; USFWS 2017).

The City of Salem has a shallow-draft port that is operated by the South Jersey Port Corporation that provides limited service to ports throughout the eastern United State and Caribbean ports. The Salem Port is part of a Foreign Trade Zone (#142) that provides advantages to certain business that qualify for the federal tax incentives of operating their business in the zone.

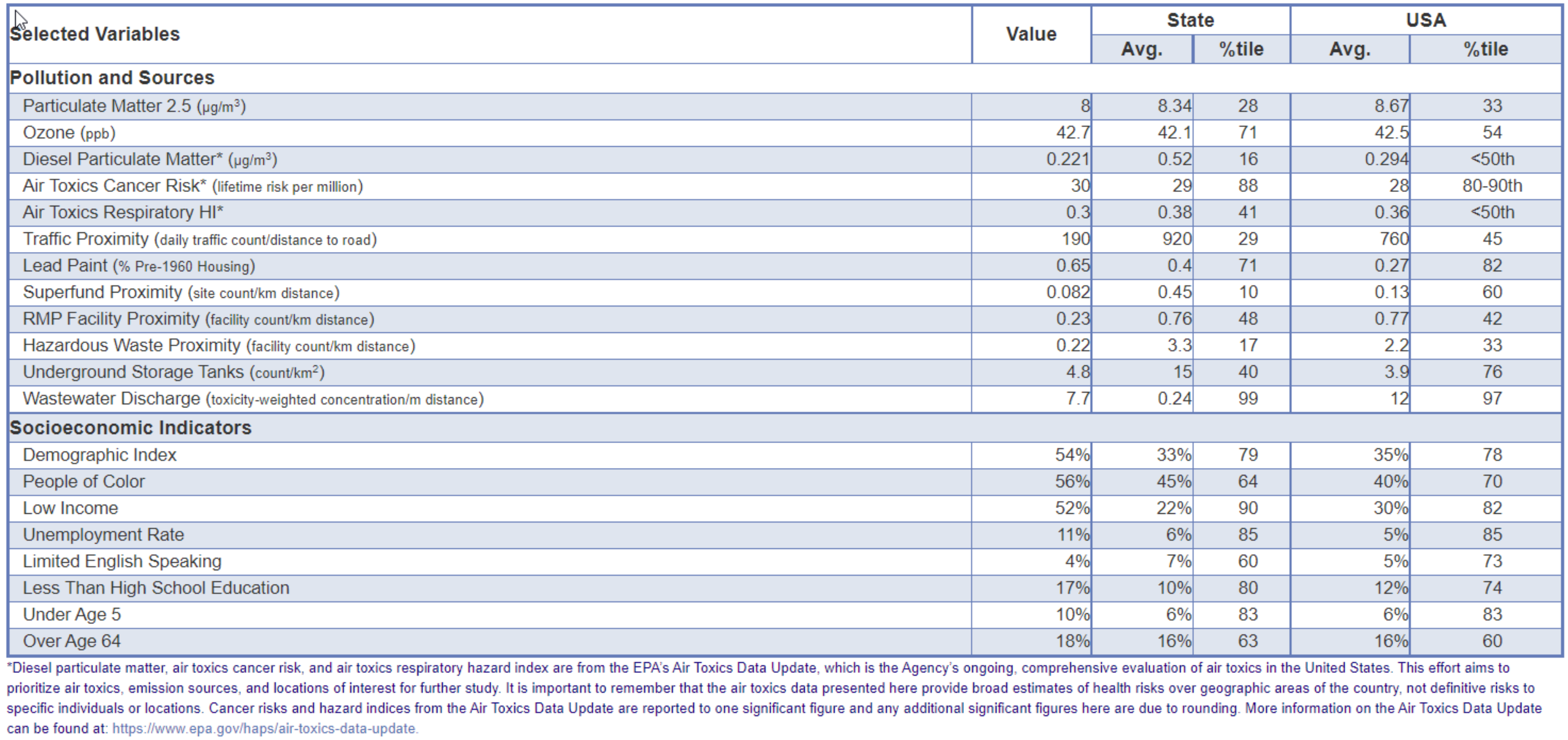
5.3.3. Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. This order requires that “each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations” (Executive Order 12898, 59 Federal Register 7629 [Section 1-201]).

The USEPA’s Environmental Justice website EJScreen: (https://www.epa.gov/ejscreen) was used to evaluate indicators for the project area to gauge if there would be potential to EJ communities in the area. Based on the Environmental Justice (EJ) indices from EJScreen for the project area, there are EJ communities within two miles of the affected areas. Within a 4-mile radius of the dredging location and BUDM at Goose Pond, the search area resulted in an overall demographic score of 54% (**Table 9**). The demographic index is based on the average of two socioeconomic indicators: low-income and people of color within the defined search radius. This area is in the 79th and 78th percentile of New Jersey and nationally, respectively for the demographic index. **Figure 34**. shows higher percentile areas in the City of Salem and vicinity suggesting EJ vulnerability. The other EJ indices consider air pollutant levels; respiratory hazards; cancer risk; traffic levels; lead paint; proximity to Superfund sites, hazardous waste, and wastewater discharge; as well as demographic indicators such as minority populations, low income, linguistic isolation, education level, and age (under 5 and over 64 years of age). These results are given in percentiles relative to the state and national averages. For example, the national percentile tells you what percent of the US population has an equal or lower value, meaning less potential for exposure/ risk/ proximity to certain facilities, or a lower percent minority. The results of the 4-mile radius search are presented in **Table 9**.

Vulnerabilities of EJ communities within the 4-mile radius of the dredging and placement activity are highest for ozone, air toxics cancer risk, lead paint, and wastewater.

Table 9. Results of EJ Screen for Salem River Dredging and BUDM at Goose Pond 4-Mile Radius from the action areas where the area is greater than the 70th percentile for these variables when compared to the State of New Jersey and nationally.



Selected Variables	Value	State		USA	
		Avg.	%tile	Avg.	%tile
Pollution and Sources					
Particulate Matter 2.5 (μg/m³)	8	8.34	28	8.67	33
Ozone (ppb)	42.7	42.1	71	42.5	54
Diesel Particulate Matter* (μg/m³)	0.221	0.52	16	0.294	<50th
Air Toxics Cancer Risk* (lifetime risk per million)	30	29	88	28	80-90th
Air Toxics Respiratory HI*	0.3	0.38	41	0.36	<50th
Traffic Proximity (daily traffic count/distance to road)	190	920	29	760	45
Lead Paint (% Pre-1960 Housing)	0.65	0.4	71	0.27	82
Superfund Proximity (site count/km distance)	0.082	0.45	10	0.13	60
RMP Facility Proximity (facility count/km distance)	0.23	0.76	48	0.77	42
Hazardous Waste Proximity (facility count/km distance)	0.22	3.3	17	2.2	33
Underground Storage Tanks (count/km²)	4.8	15	40	3.9	76
Wastewater Discharge (toxicity-weighted concentration/m distance)	7.7	0.24	99	12	97
Socioeconomic Indicators					
Demographic Index	54%	33%	79	35%	78
People of Color	56%	45%	64	40%	70
Low Income	52%	22%	90	30%	82
Unemployment Rate	11%	6%	85	5%	85
Limited English Speaking	4%	7%	60	5%	73
Less Than High School Education	17%	10%	80	12%	74
Under Age 5	10%	6%	83	6%	83
Over Age 64	18%	16%	63	16%	60

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

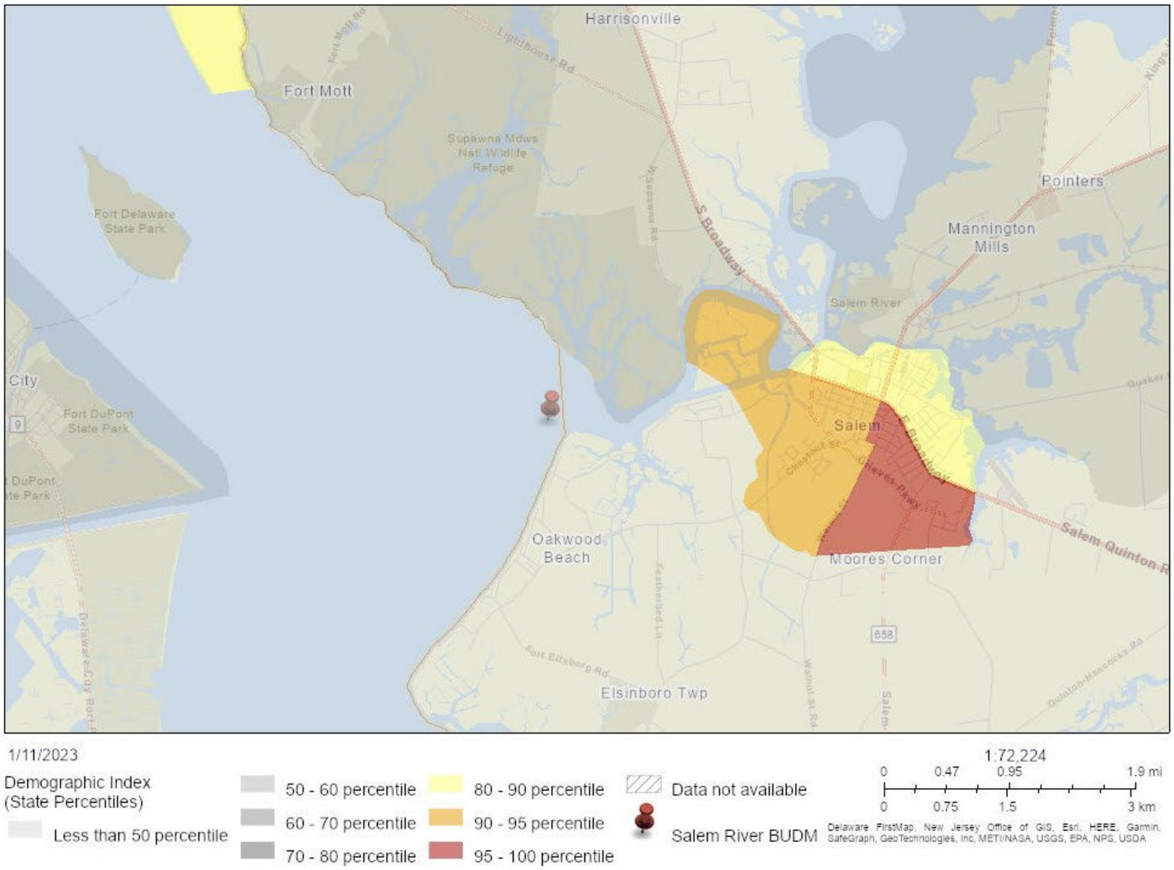


Figure 34. Results of EJ Screen for Salem River Dredging and BUDM at Goose Pond and Oakwood Beach within a 4-mile Radius for Demographic Index.

5.3.4.Recreation

From 2005 to 2010, visitation to the refuge ranged from 15,000 to 20,000 visits per year. Visitors participated in many USFWS-approved refuge activities including hunting, fishing, crabbing, wildlife observation, photography, and interpretation (USFWS 2011; USFWS 2017).

The majority of the refuge is currently open for deer hunting for all four of New Jersey's bow hunting seasons, as per the State Deer Management Zone 63 regulations. Limited portions of the refuge are also open to waterfowl hunting, fishing, and crabbing. Aquatic species are primarily hunted by boat entry to the refuge from the Delaware River and Salem River using the tidal streams. While boating is prohibited on all of the freshwater ponds and impoundments, a youth fishing event is authorized on one of the freshwater tidal ponds on an annual basis (USFWS 2011; USFWS 2017).

There are two walking trails for visitors to enjoy wildlife observation, photography, and interpretation. The Grassland Trail offers visitors the opportunity to view grassland, forest, and tidal marsh habitat. The Forest Habitat Trail meanders through a forested upland and wetland section of the refuge, as well as through scrub/shrub habitat, to surround the Tract 11D impoundment. Wildlife observation, photography, and interpretation at the refuge can also be enjoyed by boat (USFWS 2011; USFWS 2017).

5.3.5.Cultural and Historic Resources

As a Federal agency, the USACE has certain responsibilities for the identification, protection and preservation of cultural resources that may be located within the Area of Potential Effect (APE) associated with any proposed undertaking. Current statutes and regulations governing the identification, protection, and preservation of these resources include the NHPA; NEPA; Executive Order 11593; and the regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties, August 2004). The NHPA and its implementing regulations requires Federal decision makers to consider historic properties in their evaluation of effects associated with an undertaking. Under the NHPA, historic property means any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the NRHP maintained by the Secretary of the Interior (SOI). Under NEPA Federal agencies are charged with considering impacts to cultural and historic resources which encompasses a broader range of resources, including archaeological collections, sacred sites and some resources that may not meet the SOI's criteria for eligibility to the National Register of Historic Places (NRHP).

The NRHP is administered by the National Park Service (NPS) and is the official list of the properties in the United States that are significant in terms of prehistory, history, architecture, or engineering. Generally, resources must be more than 50 years old to be considered eligible for the NRHP. To meet the evaluation criteria for eligibility to the NRHP, a property needs to be significant under one or more NRHP evaluation criteria (36 CFR Part 60.4) and retain historic integrity expressive of the significance. More recent structures might be eligible for listing in the NRHP if they are of exceptional importance or if they have the potential to gain significance in the future per special NRHP considerations.

A review of the New Jersey State Historic Preservation Office (NJSHPO) Cultural Resources Geographic Information System (CRGIS) database, accessed through LUCY, an ArcGIS Online Web Mapping application was conducted to identify known recorded sites within the Salem River APE.

Reports of previous historic and archaeological surveys conducted within the study area, available from the Philadelphia District, were also examined to determine the current sensitivity of the project area for historic and cultural resources. Recorded NRHP properties and historic districts within Salem County were identified and are presented here along with the site information and sensitivity analysis.

5.3.5.1 Area of Potential Effect

The Area of Potential Effect (APE) currently includes: 1) maintenance dredging of the lowermost portion of the Salem River Federal Navigation Channel to authorized depth of -16 ft MLLW with 2 ft allowable overdepth (Prior Federal Action); 2) the Killcohook Confined Disposal Facility (CDF) (Prior Federal Action); 3) the placement of sediments on an eroding natural system within the Mill Creek/Goose Pond Beneficial Use Dredged Material (BUDM) of the Supawna Meadows National Wildlife Refuge (SMNWR) (Prior action by USFWS for stone breakwater and new federal action for BUDM fill placement); 4) the placement of sediments on an eroding natural system in the Tilbury Island BUDM location (Proposed Federal Action Alternative); 5) the placement of sediments on an eroding natural system in the Mannington Meadows BUDM location (Proposed Federal Action Alternative); and, 6) the placement of sediments along the shoreline at Oakwood Beach bayfront community (Prior Federal Action).

5.3.5.2 Pre-Contact Period Context

The Pre-Contact history of North America is divided up into cultural periods, beginning with the Paleo-Indian Period (12,000 – 8,000 BC), the Archaic Period (8,000 – 1,000 BC), and the Woodland Period (1,000 – European Contact).

The Paleo-Indian cultures arose following the glaciation of the Late Pleistocene Period and were adaptable to the tundra environment in place at the time. These cultures are characterized as highly mobile people who traveled great distance in pursuit of food and lithic materials. The environment 12,000 years ago in New Jersey is characterized by tundra and forest environments composed of pine, spruce and fir, and later, birch and oak. The increase in oak stands and greater resource availability later in the Paleo-Indian period allowed for greater human population density (Scarpa 2019).

The characteristic diagnostic artifact of the Paleo-Indian period is the chipped stone, fluted projectile point. Although rare in New Jersey and composed mostly of occasional, isolated finds, examples have been found in sites from Middlesex and Somerset Counties (Marshall 1982, 13). As large game moved to the north or became extinct, the fluted points were gradually replaced by triangular, stemmed, and lanceolate-shaped points without flutes, known as Plano points during the onset of the Archaic Period. Late Paleo-Indian artifacts were found in Monmouth County at the Turkey Swamp site (Marshall 1982; Scarpa 2019).

The Archaic Period (8,000 – 1,000 BC) followed the Paleo-Indian Period and is characterized by greater resource availability and what is typically known as a hunting and gathering economy supplemented with fishing. The entire range of Archaic Period artifacts have been identified from sites and excavations in southern New Jersey, as well as in unreported archaeological collections from the area. Most of the known Archaic sites are located along streams and bodies of water where hunting, fishing, and gathering can be conducted. While Archaic sites usually contain evidence of later and earlier periods of occupation, single component sites have been identified in Cumberland County in the town of Bridgeton and at the Fralinger Site beneath later cultural material (Kraft and Mounier 1982a).

The Archaic Period is further subdivided into three separate components: Early, Middle, and Late Archaic based upon artifact type, chronology and other characteristics relating to social organization and adaptation (Kraft and Mounier 1982a). The Early Archaic Period generally refers to the period from 8,000 to 6,000 BC and is characterized by stemmed and notched projectile points, especially bifurcate-based points. Most of the sites from this period are typically small encampments occupied by mobile bands of people. Early Archaic sites in southern New Jersey are located near rivers or along ponds and bogs on the coast. Seeds, nuts, shellfish and small reptiles were likely exploited and a greater range of stone tools (knives, scrapers and choppers) and bone and woodworking tools (celts and drills) indicate a greater diversity in resource availability and procurement (Kraft and Mounier 1982a).

Middle Archaic Period (6,000 – 4,000 BC) sites indicate an environmental setting similar to the present day and are reflected in larger and more numerous locations in more diverse ecological settings. In addition to riverine and lacustrine sites, estuarine settings were occupied, and quarry sites began to be exploited. Projectile points consist more of a stemmed, similar variety along with the stone and bone tool implements of earlier periods. Sites of Middle Archaic chronology in New Jersey contain artifacts that have similarities to stratified sites in North Carolina and southern New England. Sites from the Maurice River drainage in southern New Jersey recovered by Mounier contain projectile points that correspond with the Stanly Stemmed type in North Carolina and the Neville type in New Hampshire along with scrapers and hammerstones (Kraft and Mounier 1982a).

The most common Middle Archaic representation in southern New Jersey is what is known as the Poplar Island complex, with diagnostic artifacts consisting of long, slender points with tapered stems. However, sites in the Middle Atlantic Region containing Poplar Island points in stratigraphic context are relatively few; where found, they are usually associated with scrapers, hammerstones and similar implements. Poplar Island projectile points have been found frequently throughout the coastal plains of New Jersey (Kraft and Mounier 1982a).

During the Late Archaic Period (4,000 – 2,000 BC), population densities increased and there is a greater emphasis on small game, shellfish, seeds and nuts and the presence of pestles and other milling implements during this time. A wider range of habitats and a greater diversity of resources were exploited, primarily with a riverine focus along with coastal, estuarine, springs, and other bodies of water including drainage basins (Kraft and Mounier 1982a).

There is also an increasing emphasis on elaborate ceremonialism as seen in mortuary practices during the period, which indicate the presence of stratification in these cultures. The two cultural traditions of note during this period include the Small Stemmed Point tradition and the Susquehanna Tradition. The former is characterized by a variety of small, slender stemmed and triangular projectile points, ground stone tools, and weights, choppers, knives, scrapers, pestles, and paint stones. The Susquehanna Tradition artifacts include a series of broad stemmed and notched and narrow notched points known as “fishtail” points. Elaborate mortuary practices include the practice of cremation with the ritual use of red ocher and the placement of grave goods with the burial (Kraft and Mounier 1982a). Most Late Archaic sites in New Jersey have been excavated by Kraft and Kinsey in the Upper Delaware Valley (Shelton and Baumgardt 1986).

The Woodland Period (2,000 BC – 1700 AD) is characterized by the presence of pottery throughout the region which increased in sophistication and design over time. In addition, the cultivation of plants, elaborate ceremonial ritual, and a rise in sedentism towards settled villages are also major characteristics (Williams and Thomas 1982). Early and Middle Woodland Period populations in southern New Jersey engaged primarily in fishing, shellfishing, hunting, gathering, and the practice of subsistence horticulture. The site types include fishing stations, shellfish middens, hunting and gathering camps, base camps and mortuary sites (Williams and Thomas 1982). The major sites from this period in southern New Jersey include the Abbott Farm Site along the Delaware River, the Raccoon Point Site in Gloucester County, and the Cadwallader Complex investigated by Mounier in the Outer Coastal Plain of the Delaware Bay drainage (Williams and Thomas 1982).

The Late Woodland Period (ca. 1,000 AD) is noted by increased populations and horticulture along major river drainages along with seasonal occupation of interior and coastal areas for hunting and gathering, with evidence of extensive trade and contact throughout the region and beyond. Archaeological excavations of Late Woodland sites on and near the Salem River area are available in the literature (Kraft and Mounier 1982b). One cultural complex of related artifacts centered around southwestern New Jersey including the Salem River drainage is known as the Riggins Complex and consists of fabric-impressed and incised ceramic vessels, plain and decorated tobacco pipes, small triangular projectile points, and chipped stone tools. Other artifact assemblages identified in the Salem River area are said to represent the aboriginal cultures encountered by Europeans, likely the ancestral groups of the Unami Delaware or Lenni Lenape who occupied southern New Jersey during the early contact period (Kraft and Mounier 1982b).

5.3.5.3 Early European Contact Period (1,600 – 1,800 AD)

Historic references indicate that the Indian populations of central and southern New Jersey were decimated by disease and warfare with the Susquehannock of eastern Pennsylvania. By the 1700's, small groups of Native peoples were clustered in missionary groups at Cranbury, Crosswicks, and at Brotherton near the town of Indian Mills. Brotherton is known as one of the first Indian reservations in North America (Williams and Kardas 1982).

A characteristic feature of Contact Period archaeological sites is the introduction of European trade goods and artifacts. In southern New Jersey during the 1600's, contact sites are usually villages located along the Delaware River and its tributaries. Along the southern New Jersey coast and along rivers flowing into the Atlantic Ocean, there is evidence of Native American settlements. By 1740, there were few aboriginal sites still occupied in New Jersey. Many Native groups had moved west by this point in time. Missionary settlements were established for Indians during this period at Vincentown as well as the Brotherton (Williams and Kardas 1982).

5.3.5.4 Historic Context

Salem County is bordered by the Delaware River to the south and west, and Gloucester County and Cumberland County to the north and east. Swedish settlers, expanding their control of the Delaware Bay from Wilmington, were among the first Europeans to inhabit the Salem area. Nearby Fort Elfsborg was established at present day Elsinboro Point in 1648, several miles south of the project area. The region later came under the control of the Dutch in New Amsterdam in 1655. After the Dutch defeat in 1664, the area became part of the British colony of West Jersey (Thompson and Dickey 1984).

The first European settlements in the area were established by Finnish settlers who crossed to the New Jersey side of the Delaware River from New Sweden around 1660 (Harper 1978). The Finns had previously arrived in Delaware near present day Wilmington with Peter Minuit, founder of New Sweden, and were looking to escape Swedish persecution. Finnish settlers were attracted to the area's fertile farmlands and the transportation access afforded by various waterways and the Delaware River. Their success in establishing communities in the region is attested by such place names as Finns Point and the Finnish River located just west and northwest of the project area. During this time, landholdings acquired a characteristic pattern with long narrow tracts extending from bank to bank.

A small group of Englishmen from New Haven, Connecticut established a settlement called the New Haven Colony around 1641 along the Salem River. However, the first permanent English-speaking settlement in the colony was established at Salem by Quakers headed by John Fenwick in 1675 (Cushing and Sheppard 1883). Fenwick was the first settler to negotiate a peace treaty with the local Indigenous peoples, which was ratified in the shade of a giant oak tree known as the Salem Oak. The Salem Oak stood for over 500 years in the Friends Burial Ground within the Broadway Historic District in downtown Salem until it fell on June 6, 2019 (Salem Oak Website 2023).

Salem County was created in 1682 and became a legal port of entry for the colony of West Jersey and was ranked in importance with Boston and New York. The colony grew slowly in part due to competition from settlers among contemporary colonies in Pennsylvania, East Jersey and the town of Burlington. Fenwick’s insistence on establishing a proprietary colony in an age of opposition to feudalism may have contributed to the slow growth of the colony (Thompson and Dickey 1984).

Despite its slow growth, the town of Salem was incorporated in 1965 (Cushing and Sheppard 1883). The shipping industry based on the wharves along Market Street expanded throughout the next century with shipments received from Philadelphia, New York, Boston and the Caribbean. Merchants specialized in the sale of dry goods, groceries, provisions, household goods and liquors (Cushing and Sheppard 1883). After the Revolutionary War, a ferry service was established between Market Street and the Delaware River shore. The City of Salem continued to serve as an important depot for imports as well as an outlet from the county’s agricultural and manufactured products until the late nineteenth century.

In 1820, Col. Robert Johnson, a life-long resident of Market Street, introduced the growing of tomatoes, which became one of the county's staple crops. The success of the tomato crop was largely due to the sandy soils in the region. Johnson, who is considered the father of the tomato industry in the state, also began the county's rust agricultural and horticultural society in 1826. By the late nineteenth century, Salem supported extensive factories devoted exclusively to the canning of tomatoes. One of these was the Fogg and Hires Canhouse, which operated in Pennsville from 1887-1925 (Blakely 1991).

Shipbuilding has been an important component of the Salem economy since the seventeenth century. Shipbuilding activities have been documented along the Delaware River by Swedish settlers in 1644 and by English settlers during the 1670s and 1680s. There were four commercial shipyards in operation along the Delaware River by 1700. Several family shipyards were responsible for producing most of the vessels in the Delaware Valley during the early eighteenth century. In the nineteenth century Delaware River shipyards were prominent in the production of iron-hulled vessels. During the Civil War at least 36 naval vessels were constructed at Delaware Valley yards (Cox 1988).

The earliest Euro-American shipping in the Delaware River/Bay was associated with the seventeenth-century fur trade. During the eighteenth century, trade became integrated into a more complex colonial and international system. With the rise of Philadelphia as the major commercial port by 1772, smaller ports along the Delaware River, like Salem, declined. As a result, Salem became almost exclusively engaged in ferrying goods between Philadelphia and other New Jersey ports. Regular steamboat service reached

Salem during the nineteenth century. Most of Salem's waterborne trade was connected with Philadelphia and was associated with the Pennsylvania Railroad (Cox 1988).

The project area is located in Lower Penns Neck, which along with Upper Penns Neck was originally part of the township known as West Fenwick (Everts and Stewart 1876). The name was changed circa 1721 to honor William Penn, one of the proprietary management members of Fenwick's Salem Colony. Historically, this area contained some of the finest marsh meadows and cattle in the county, and by the late nineteenth century containe4 over 100 farms. Lower Penns Neck is bounded on the north by Upper Penns Neck, on the west by the Delaware River, and on the east and south by the Salem River. In 1965 the name of Lower Penn's Neck was changed to Pennsville, following its principal town located several miles north of the project area.

Given its location, it is easy to see that water played an important part in the history of Pennsville Township. A ferry operated from the town of Pennsville to New Castle, Delaware, from the time of its founding until 1951, when the Delaware Memorial Bridge was constructed (Blakely 1991). Present-day Route 49 was in use by 1810 following the completion of the Penn's Neck Bridge. Until that time, it was necessary to take a ferry into downtown Salem. Although originally conceived in 1800, the Deepwater or Salem Canal, extending from the Salem River to Delaware River in the northern portion of the township, was not completed until 1872. Its original purpose was to provide farmers with an east-west route to transport their crops to such places as Wilmington, Delaware; Baltimore, Maryland; and Philadelphia, Pennsylvania. However, by the time of its completion, other more efficient modes of transportation were available, including the railroad; consequently, the canal was never used to its fullest extent. During the nineteenth and early twentieth century, fishing was an important part of the local economy. The predominant species were sturgeon and shad, with the latter providing caviar which was cured and packed for market.

As early as the late eighteenth century, farmers in Pennsville Township cultivated the valuable meadows or marshlands located along the Delaware River. Marshlands were a valuable source of hay and pasture. Whereas the higher elevations provided freshwater marsh grasses for grazing cattle, salt hay was used for packing and bedding. The method of diking and draining lands for cultivation began following the enacting of legislation which permitted local farmers to incorporate "meadow companies" in order to reclaim area swamps. Each affected farmer was assessed a fee for the construction and maintenance of dikes (banks) and sluice gates (ditches). Over 70 "meadow bank companies" were eventually located in Salem County, the earliest established in 1794. These companies managed to reclaim thousands of acres of swampland. Meadow bank farming continued until the 1930s when the banks began to wash out owing to heavy rains and high tides. Due to the great expense of maintaining the banks and the lack of qualified laborers, bank companies went out of business and the banks were never rebuilt. Consequently, wetlands eventually inundated the former fields and settlements as well as the roads which led to them (Heite and Heite 1986).

It should be mentioned that a U.S. government battery was planned at Finns Point as early as 1870, west of the project area. Although construction of the batteries began in 1875, it was not until 1896, during the Spanish-American War, that the construction of the existing gun emplacements and associated buildings was begun. The system of defensive earthworks came to be known as Fort Mott and was part of a master planned defense of the Delaware River that included Fort Delaware, located on nearby Pea Patch Island, and Fort DuPont, located on the Delaware mainland. Fort Mott was decommissioned after World War II. It should be noted that Fort Delaware served as a prisoner of war camp for confederate soldiers during ·the Civil War. Over 2,000 Confederate soldiers are buried at Finns Point National Cemetery located just north of Fort Mott.

5.3.5.5 Archaeological Sites

Based on the database search of the New Jersey Cultural Resources GIS Online Map Viewer, known as LUCY, that most of the Tilbury Island BUDM, and a majority of the Mannington Meadow BUDM are within the identified archaeological sensitivity grid, indicating the presence of NRHP potentially eligible recorded sites are within their boundaries. The Miller Creek/Goose Pond BUDM is not within the identified archaeological sensitivity grid.

5.3.5.6 Historic Resources

Mill Creek/Goose Pond BUDM

An examination of the LUCY database indicates that there are two sites listed on the NRHP located within one mile of the Mill Creek/Goose Pond BUDM: Fort Mott and Finn’s Point National Cemetery Historic District and Finn’s Point Rear Range Light. Both historic properties were listed in 1978.

Tilbury Island BUDM

The City of Salem, just south across the river from Tilbury Island has seven historic districts (Table 10). The Penns Neck Bridge, Route 49 over the Salem River is individually eligible for listing on the NRHP.

Table 10. City of Salem Historic Districts

Resource Name	Resource Type	NRHP Status	Determination Year
Broadway	Historic District	Listed	1992
Salem Working Class	Historic District	Eligible	1999
Hedge-Carpenter-Thompson	Historic District	Listed	2001
Market Street	Historic District	Listed	2009
Walnut Street	Streetscape	Eligible	1991
Oak Street	Streetscape	Eligible	1991

Table 10. City of Salem Historic Districts

Resource Name	Resource Type	NRHP Status	Determination Year
Chestnut Street	Streetscape	Eligible	1991

Mannington Meadow BUDM

There are eleven historic properties in the vicinity of Mannington Meadow BUDM (Table 11). The resources are focused along the eastern banks of the Salem River.

Table 11. Historic Properties in the Vicinity of Mannington Meadows

Resource Name	Resource Type	NRHP Status	Determination Year
Mannington Mills	Property	Eligible	2018
Abbotts Tide Mill Farm	Farmstead	Eligible	2016
130 Harris Road	Structure	Eligible	2016
John & Charlotte Wistar Farm	Farmstead	Listed	2016
Caspar & Rebecca Wistar Farm	Farmstead	Listed	2016
Joseph Bassett Jr House	Structure	Eligible	2007
Zerns-Write Farm/Lydia & John Zerns Farm	Farmstead	Eligible	2017
Marshalltown	Historic District	Listed	2013
Mt. Sion African Union Methodist Protestant Church and Cemetery	Property and Structure	Listed	2013
Minks Meadow	Historic District	Listed	2013
Thomas & Mary Marshall/Charles Ceaser Meadow	Historic District	Listed	2013

5.3.6.Visual and Aesthetic Resources

Visual and aesthetic resources refer to the sensory quality of the resources (sight, sound, smell, taste, and touch) of the project area, especially with respect to judgment about their pleasurable qualities (Canter 1993; Smardon et al. 1986). The aesthetic quality of the area is influenced by the natural and developed environment. Visual resources include the natural and man-made features that comprise the visual qualities of a given area, or “viewshed.” These features form the overall impression that an observer receives of an area or its landscape character. The project area is aesthetically appealing due to its predominant coastal water environment surrounded by natural undeveloped green marshes, wharves, boats, and maritime businesses.

5.3.7.Hazardous, Toxic, and Radioactive Waste

For Civil Works projects, Engineer Regulation (ER) 1165-2-132 provides guidance on evaluating Hazardous, Toxic, and Radioactive Waste (HTRW) and requires that a site investigation be conducted as early as possibly to identify and evaluate potential HTRW problems. The definition of HTRW according to ER 1165-2-132, page 1, paragraph 4(a) is as follows: "Except for dredged material and sediments beneath navigable waters proposed for dredging, for purposes of this guidance, HTRW includes any material listed as 'hazardous substance' under the Comprehensives Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq (CERCLA). (See 42 U.S.C. 9601(14).) Hazardous substances regulated under CERCLA include 'hazardous wastes' under Sec. 3001 of the Resource Conservation and Recovery Act, 42 U.S.C. 6921 et seq; 'hazardous substances' identified under Section 311 of the Clean Air Act, 33 U.S.C. 1321, 'toxic pollutants' designated under Section 307 of the Clean Water Act, 33 U.S.C. 1317, 'hazardous air pollutants' designated under Section 112 of the Clean Air Act 42 U.S.C. 7412; and 'imminently hazardous chemical substances or mixtures' on which EPA has taken action under Section 7 of the Toxic Substance Control Act, 15 U.S.C. 2606; these do not include petroleum or natural gas unless already included in the above categories (See 42 U.S.C. 9601(14)." As noted in 42 U.S.C. 9601(14), the term "hazardous substance" does not include crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance, nor does the term include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel. Underground storage tanks (USTs) are federally regulated under 40 CFR Part 280, which includes technical standards and corrective action requirements for owners and operators of USTs.

A Hazardous, Toxic, Radioactive Waste (HTRW) review for locations around the Salem River navigation channel area was conducted in support of the planned maintenance dredging of the Federal navigation channel. The preferred placement area for the dredged material is the flooded marsh area within the Goose Pond/Mill Creek area of Supawna Meadows National Wildlife Refuge. A New Jersey Department of Environmental Protection (NJDEP) Site Remediation Profile (SRP) website was queried for various facilities or materials surrounding the dredging area. Searches included:

- Areas of Historic Fill;
- Immediate Environmental Concern Sites;
- Deed Notice Areas;
- Known Contaminated Sites List;
- Site Remediation Professional (SRP) Preferred Identification (ID) List; and
- Underground Storage Tank (UST) List.

A number of sites were identified within the City of Salem under the aforementioned queries (Figures 33 and 34). Several sites were located along the City of Salem riverfront adjacent to the channel and turning basin (Table 12). These sites consisted of areas of historic fill, groundwater contaminated sites, deed notice areas, and SRP sites.

No sites were identified in the immediate vicinity of the approach channel or Goose Pond BUDM placement area.

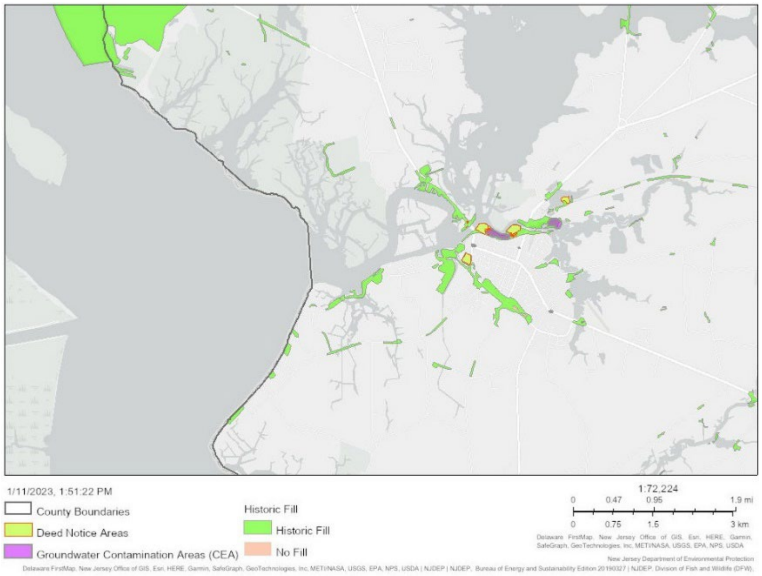


Figure 35. Results of NJDEP SRP Sites in Vicinity of Affected Areas

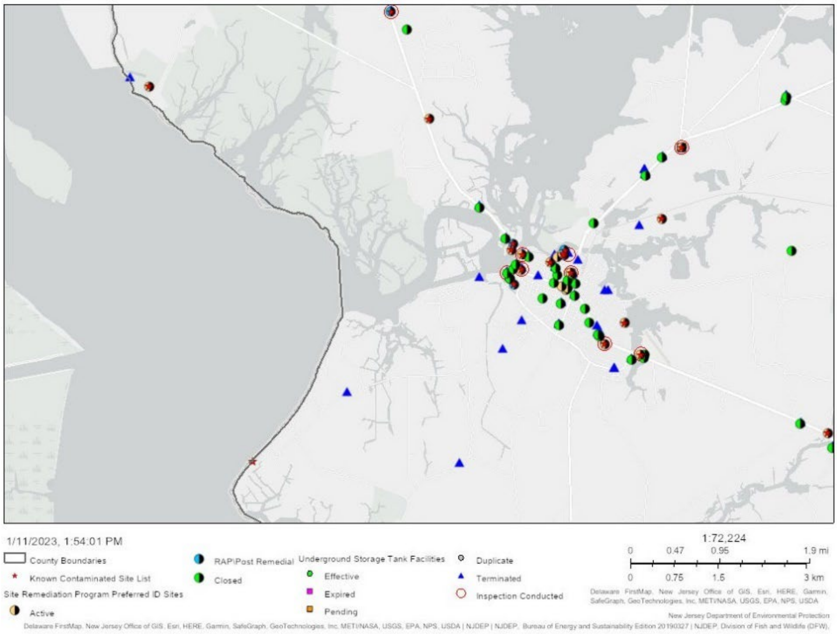


Figure 36. Results of NJDEP SRP Sites in Vicinity of Affected Areas

Table 12. NJDEP Site Remediation Profile Sites Adjacent to Salem River

Site Name	Program	Address	Notes
National Freight Terminal	-Deed Notice	Hancock Street, Salem	PAH's
Anchor Glass Container	-Deed Notice	83 Griffith Street, Salem	PAH's, Lead

Table 12. NJDEP Site Remediation Profile Sites Adjacent to Salem River			
Site Name	Program	Address	Notes
	-GW Contaminated Sites List		
L.S. Riggins Oil Co.	-Deed Notice -Known Contaminated Sites List	Rt. 49 S. Pennsville	Multi-phasted RA multiple source/Release to multiple media including GW. Benzene, Xylenes, Arsenic, Lead
City of Salem	-SRP Preferred	19 Front St., Salem	UST-contamination not found
GE Fabricators	-SRP Preferred	35 W. Broadway & Front St., Salem	UNK or uncontrolled discharge to soil or GW
ALU CHEM	SRP Preferred	Front St. & Broadway, Salem	Known source or release w/ GW contamination
Salem Amoco	-SRP -Known Contaminated Sites	1 Front St., Salem	Known source or release w/ GW contamination
Salem Boat Basin	-UST	Tilbury Road, Salem	UST registration

5.3.8. Noise

Noise is of environmental concern because it can cause annoyance and adverse health effects to humans and animal life. Noise can impact such activities as conversing, reading, recreation, listening to music, working, and sleeping. Wildlife behaviors can be disrupted by noises also, which can disrupt feeding and nesting activities.

As stated in USFWS (2017), Noise can be characterized by the following four factors: frequency, intensity, duration, and distance. Each of these factors is described below:

• Frequency – Sound travels in waves, and the frequency of a sound is the number of wave cycles per second, measured in hertz (Hz). High frequency sounds have many cycles per second; low frequency sounds have fewer.

• Intensity – Noise intensity is the power (average energy per unit time) transmitted through a unit area in a specific direction. Sound intensity (i.e. loudness) is measured in decibels (dB). The dB is a relative unit of measure describing the logarithm of the ratio of a sound's intensity to a reference intensity. Because of the logarithmic scale, decibels are not directly additive (e.g. two 70 dB sounds results in 73 dB cumulative sound, but not a doubling, or 140 dB sound). For broadband sounds, a 3 dB change is the minimum change perceptible to the human ear.

• Duration – The duration of a sound affects its potential impact. Generally, long-term sounds are considered more harmful than short bursts of sound. “Masking” occurs when the pressure of a sound masks a sound of interest, by being equal to or greater in sound.

• Distance – Sound radiates in all directions from the source, in a spherical pattern. As the sound radiates, the pressure wave increases in size and the power of the wave dissipates.

The two most common types of noise are point source and line source. This Proposed Action would generate point source noise, that is, noise associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). Equipment associated with point sources associated with the preferred action include:

- Hydraulic cutterhead dredge (~85 dBA at 50 feet/~55 dBA at 50 feet with vessel enclosures and isolators)
- Tug/push boat (~87 dBA at 50 feet)
- Revolving barge crane (~77 dBA at 50 feet)

Although material barges will also be used for the Project, these are not powered and will not generate point source noise.

The Occupational Safety and Health Administration (OSHA) regulations state that workers must not be exposed to noise levels above 85 dBA as a 8-hour noise exposure level (A-weighted sound levels (dBA) are dB scale readings adjusted for the varying sensitivity of the human ear to different frequencies of sound) or to 140 dBC as a peak sound level (C-weighted sound levels (dBC) are dB scale readings used for specifying peak or impact noise levels). The New Jersey law allows a maximum of 90 dB for watercraft motors measured at idle.

Existing noise in the vicinity of the Port of Salem is dominated by industrial process machinery and transportation ship on and off noise loading operations. Existing noise in the vicinity of the Goose Pond area of the Supawna Meadows National Wildlife Refuge and Oakwood Beach is mainly attributed to commercial and recreational boating activity along the Delaware River and Salem River Navigation Channel.

6.0 ENVIRONMENTAL EFFECTS

This section evaluates the No Action alternative and the Preferred alternative in terms of their potential impacts to natural and socioeconomic resources in the project area. The preferred alternative contains aspects that were evaluated in previous documents such as the inclusion of Oakwood Beach and continued use of Killcohook CDF as disposal options. Therefore, the environmental effects will focus mainly on No action and the Goose Pond alternative as this includes a new project footprint area. All other placement alternatives evaluated were eliminated from further consideration at this time but may be considered in the future. As presented in Section 4, the No Action Alternative would entail no longer maintaining the Salem River channel for navigation through maintenance dredging. The preferred alternative is a combination of disposal options that entails dredging shoaled portions of the navigation channel to maintain authorized depths and two BUDM options including placement of the dredged material in the Oakwood Beach nearshore (Alt. 3) and Goose Pond (Alt. 6) in order to keep the sediments within the natural system versus disposal in an upland CDF. However, it also includes retaining the use of the existing Killcohook CDF (Alt. 2) as previously authorized to allow for long-term flexibility in dredged material disposal options at the time of need. Portions of the federal channel in the Salem River and approach channel will be dredged to the authorized depth (16 feet MLLW) with up to one foot of over-depth dredging (approximately 200,000 cy of predominantly fine-grained sediment) using a cutterhead hydraulic pipeline dredge beginning in July 2023. The operation is expected to take approximately 16 weeks in 2023. Since dredging the channel and placement of material were evaluated in USACE (1991) and beachfill placement for CSRM along Oakwood Beach were evaluated in USACE (1999 and 2014), these documents are incorporated by reference. Periodic maintenance dredging would result in successive material placement within the Goose Pond/Mill Creek area adjacent to the stone breakwater, which would serve to incrementally increase the substrate elevation for the establishment of intertidal mudflats and brackish marsh vegetation. The target elevation is +1.5 feet NAVD, which correlates to nearby biological benchmarks of low marsh habitat. The project includes pre-, during, and post-placement monitoring to document project development, effects, and lessons learned for adaptive management as well as for EWN applications in coastal areas.

6.1 Physical Environment

6.1.1. Topography, Physiography, and Geology

<u>No Action.</u> The No Action alternative will continue to influence the topography and physiography of the project area. Continued flooding and erosion of the saltmarshes will result in more wetlands becoming inundated, submerged, and converted to shallow water. Normally, tidal wetlands build vertically (accrete) in order to compensate for subsidence and/or sea level rise. This accretion occurs through the accumulation of organic matter (peat) from autochthonous below-ground root production as well as the importation and trapping of suspended sediments washing in with tidal or storm flows by saltmarsh vegetation. The importation and deposition of new sediments is essential to the long-term sustainability of coastal wetlands. Once the vegetation is lost, the mudflat

no longer accretes sediments. Geology is not anticipated to be affected under the No Action alternative.

Preferred Alternative. The preferred alternative will result in minor positive effects to topography and physiography of the area. Dredging will remove shoals within the channel. The Goose Pond placement area is comprised of similar sediments (i.e. predominantly fines) as those materials that will be dredged from the river channel. The Goose Pond area will continually be tidally influenced and connected to the Delaware River. The action alternative to pump dredged sediments into the flooded (former) salt marsh will raise the elevation of the substrate within a 40+-acre area to encourage intertidal wetland vegetation to re-establish. The area will require multiple placement operations in order to achieve elevations resilient to storm impacts and marsh enhancement. Target elevations are at +1.5 feet NAVD, which could result in filling in the deepest subtidal area from -10.0 ft. NAVD to +1.5 feet, which could result in a cumulative consolidated fill thickness of 11.5 feet at that location. The majority of the area is at -2.5 feet (about 27 acres), which would result in an elevation change of about 3 feet after the dredged material consolidates. Tidal marsh perennial vegetation contributes persistent below-ground organic matter and greater vertical accretion of sediments (Cahoon *et al*. 2009).   The selected plan is not anticipated to affect area geology in the dredging area nor at the placement area. The subtidal and intertidal aquatic placement of dredged material is not expected to introduce contaminants or adversely affect groundwater resources.

6.1.2. Climate and Sea Level Rise

Under both the No Action alternative as well as the preferred alternative, the Salem River region will continue to experience a moderate climate due to the area's Coastal Plain low elevation and the presence of the nearby Delaware Bay and Atlantic Ocean. Sea level rise is predicted to continue under both alternative scenarios. The selected alternative to keep the dredged sediments within the system through BUDM practices (i.e*.,* by placing the dredged material within a portion of the flooded marsh) will serve to reduce the adverse effects of sea level rise on brackish marsh habitats and adjacent infrastructure in the vicinity of the Goose Pond/Mill Creek portion of the Supawna Meadows NWR.

It is difficult to predict the impact of climate change on species that inhabit the project area. Climate change and SLR will likely result in species shifts due to temperature changes favoring expansion of southern species into northern areas. The mid-Atlantic region contains considerable overlap of southern and northern species distributions, but climate change could result in losses of northern species in favor or more southern species. There is significant uncertainty in the rate and timing of climate change as well as the effects that may result. Increased rainfall, as predicted by some climate models, along with SLR may increase water levels, marsh flooding and erosion, thereby exacerbating poor water quality conditions by increasing turbidity and loss of brackish marsh habitat as well as less protection to coastal upland habitats. Warmer water temperatures can impact dissolved oxygen levels, particularly during summer months in shallow waters, decreasing water quality. Rising sea levels are anticipated to continue to affect coastal fish and wildlife habitats, including those utilized by waterfowl, wading birds, and shorebirds. The selected plan provides a proven conservation strategy to beneficially use dredged channel sediments to address the impacts of climate change and sea level rise.

6.1.3.Tides and Currents

No Action. The No Action alternative will have no impacts on tides and currents. The tides will remain as semi-diurnal with nearly equal tides each day where the mean range is 5.34’ while the Diurnal Range is 5.84 ft. Sea level rise will continue with significant increases in the upper limit of the MHW and MHHW lines.

Preferred Alternative. The selected action alternative will build elevation in subtidal and intertidal portions of the Goose Pond area. There would be conversions of subtidal to intertidal regimes based on rate and retention (build-up) of sediments being deposited. On-site monitoring during placement will ensure that target elevations are not exceeded that could potentially result in attaining elevations higher than the target intertidal elevation. Implementation of the preferred alternative is expected to have a direct and long-term positive impact to the area by re-establishing substrate elevations conducive to intertidal wetland vegetative growth that will in turn serve to reduce wave energies coming into the flooded marsh from the Delaware Bay and Goose Pond area. Elevating the marsh platform will contribute to the potential for brackish marsh vegetation to re-establish. The preferred alternative is projected to reduce water velocities by creating more intertidal habitat in an area becoming increasingly inundated by subsidence and sea level rise.

The placement of sandy material in the nearshore or directly on the beach at Oakwood Beach would benefit the authorized CSRM project by promoting the resiliency of the beach template to tides and currents.

6.1.4. Wind, Wave, and Storm Surge Conditions

The No Action alternative will pose no effects to wind and wave conditions. The selected alternative will pose no effects to wind conditions in the project area but may contribute to reducing wave conditions and storm surges within the flooded marsh adjacent to the stone breakwater by reducing water depths and slowing water velocities.

6.1.5. Air Quality

No Action. The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no short-term direct impacts to air quality. Under the No Action Scenario, air quality would continue in the current regional condition. Over the past couple of decades, emissions reductions have resulted in a relatively steady lowering of ozone levels in New Jersey. There are no air quality monitoring stations in Salem County, and the nearest station is in Millville (Cumberland County). The CDC National Public Health Tracking Network (2018 data) indicate that Cumberland County residents were not exposed to any days of unhealthy levels of ozone. The national standard for annual particulate matter ($PM_{2.5}$) is 12 micrograms/meter^3. When $PM_{2.5}$ levels are above 12, air quality is more likely to adversely affect human health. In 2018, the annual level of $PM_{2.5}$ in nearby Cumberland County was 8.8 micrograms/meter^3. The No Action Plan would pose no additional impact on GHG emissions.

Preferred Alternative. The preferred alternative would result in the maintenance of existing regional air quality conditions in both Delaware (New Castle County) and New Jersey (Salem County), which are both part of the Philadelphia-Wilmington-Atlantic City, PA- NJ-MD-DE nonattainment area for the 8-hour ozone NAAQS. There would be some minor, short-term effects during dredging operations. The use of diesel engines on a hydraulic dredge and associated construction equipment will produce temporary localized increases in NOx, VOCs, CO and $PM_{2.5}$ emissions. This effort would be similar to the existing maintenance dredging practices or even a slight reduction since pumping distances to Goose Pond are less than the standard dredged material disposal CDF at Killcohook. Based on the size of the operation and duration, air emissions are expected to be below the *de minimus* threshold for a marginal ozone nonattainment area. Therefore, a General Conformity determination is not required based on the expected de minimus level emissions along with the proposed action meeting the exemption for maintenance dredging under 40 CFR § 93.153 (c)(2)(ix).

Maintenance dredging will continue to occur with or without the current proposed plan. However, the future implications of climate change will likely pose significant adverse effects in the affected area on both coastal storm risk to communities and loss of beach and wetland habitat within the Delaware Estuary under the No Action scenario. The continued dredging and BUDM placement would contribute to emissions of GHG, which would be minimized by the project's increase of brackish marsh habitat that would be beneficial for the sequestration of carbon.

6.1.6. Water and Sediment Quality

No Action. Under the No Action alternative, water levels will continue to gradually rise in the project area as more wetlands are flooded and eroded during storm events and SLR. Significant effects to water levels are anticipated from continued loss of wetland acreage. Elevated turbidity levels will result from continued flooding and erosion of marsh sediments. Sea level rise is expected to have increases in salinity in the Delaware River. USACE (2009) summarized CH3 modeling conducted in 2003 and 2004 to assess the potential for salinity increases in the Delaware River as a result of deepening the Delaware River Main Channel form 40 ft. to 45 ft. (completed). This modeling utilized conditions of the 1965 drought of record, which is the worst-case scenario for hydrologic conditions of the Delaware River, sea level rise projected from 1996 to 2040, and projected consumptive uses over this period. By 2040, the model predicted a Peak 7-Day-Avg. Change salinity increase of 0.5 ppt due to SLR at the Delaware Memorial Bridge. When considering all three factors, a total salinity change increase of 0.9 ppt was observed compared to background range of salinity in 1965. Sediment quality is not anticipated to be affected under the No Action alternative.

Preferred Alternative. The Salem River/Goose Pond area is located in the Delaware Estuary turbidity maximum zone. Under the selected action alternative, water quality impacts are anticipated to be minor, temporary, and localized in the form of turbidity from the in-water dredging and placement action. Dredge cutterhead movement can create a turbidity plume in the river. Increased turbidity results from the resuspension of sediments during operations and can impact primary productivity and respiration of organisms in the immediate project area. Increased turbidity can also impact prey species' predator avoidance ability due to decreased clarity in the water column. Turbidity levels decrease exponentially with increasing distance from the dredge due to settling, dispersion and tidal flushing. At the placement site, the silty dredged sediments would temporarily increase turbidity, but are expected to settle out in the immediate area quickly. Fall et al. (2022) evaluated strategic BU placement operations under the SMIIL at Gull Island in Great Sound. They observed that turbidity plumes were localized even for predominantly fine-grained material. Monitoring has shown that near-bed turbidities during active placement were temporarily greater than background conditions but were often less than those observed during high wind or storm events. Post-placement monitoring just one week after dredging had ceased showed that turbidity levels in the area were similar to levels documented for an area where no placement had occurred.

Best Management Practices that are already in place for maintenance dredging would be used to further minimize water quality impacts during dredging and placement operations. The stone breakwater will provide semi-confinement of suspended sediments and act as a baffle that will promote settling of any sediment that would possibly reach it, minimizing sediment from entering the Delaware River. In order to evaluate the project's intended objective to enhance wetlands and system resilience at the placement site, monitoring will occur before, during, and post-construction. Information gathered will provide opportunities to apply adaptive management to future placements both here and at other estuarine saltmarshes with comparable hydrodynamic and morphologic conditions. No long-term adverse effects are anticipated in this eroding marsh system. Overall, the project will have a positive impact on water quality by furthering re-establishment of elevations suitable for saltmarsh vegetation that in turn, reduces erosion. Vegetative wetlands are highly effective at trapping particulates and removing excess nutrients (i.e. nitrogen and phosphorus) from the water through absorption by the plant systems. Sediments within the project area have been tested and determined to be acceptable for beneficial use placement within the local system.

Pre-dredge sediment testing of channel sediments evaluated sediment grain sizes, total organic carbon, and organic and inorganic contaminants. Inorganic and organic contaminants were detected in pre-dredge sediments and elutriates. Most elutriate results were close to background surface water concentrations. Although a few exceedances of ecological screening criteria and Delaware soil screening criteria, the dredging and placement of sediments in the Goose Pond area is not expected to result in significant increases or introduce contaminants or toxicity above background levels in the area or significantly increase the bioavailability of these contaminants.

Oakwood Beach allows for the beneficial placement of sandy material in either the nearshore (≥75% sand with testing as per NJDEP, 1997) or directly on the beach

(≥90% sand) provided that the dredged sediments meet sediment quality objectives appropriate for these uses.

The continued use of the Killcohook CDF for the disposal of Salem River Federal Navigation Channel dredged material was evaluated in USACE (1991) and discharge effluents from the CDF are expected to meet State and DRBC water quality criteria.

6.2 Biological Environment

6.2.1. Wetlands and Intertidal Mudflats

No Action. Under the No Action alternative, tidal wetlands within the project area will continue to be subjected to erosion, subsidence, and flooding and would further convert to shallow water and unvegetated mudflats. Although intertidal flats are valuable habitat for numerous benthic macroinvertebrates, fish, wading birds and migratory shorebirds, SLR is expected to further increase conversions of these habitats into subtidal open water as mudflats, which do not support sediment accretion as marsh vegetation does. Since the 1930's, the expansion of Goose Pond has consumed more than 40 acres of vegetated tidal wetlands that were converted into shallow water intertidal and subtidal habitat due to excessive inundation. These impacts are direct and long-term in the face of SLR.

Preferred Alternative. The placement at Goose Pond would provide a direct positive impact by raising the substrate elevation in a small area (approximately 40 acres) behind the Goose Pond/Mill Creek stone breakwater to bolster intertidal mudflats and elevate the substrate to a level suitable for wetland vegetation to expand. The target substrate elevation is +1.5 ft. NAVD for low marsh establishment, which would consist of brackish marsh plants tolerant of oligohaline conditions such as big cordgrass (*Spartina cynosuroides*), pickerel weed, arrow arum, wild rice and smooth cordgrass. This would be accomplished by several incremental BUDM placement cycles where subtidal open water would be converted to intertidal mudflat or low intertidal vegetated marsh. The first placement would occur in 2023 with an initial infusion of up to approximately 260,000 cubic yards of predominantly fine-grained sediment. Monitoring before, during and after BUDM placement will ensure that maximum sediment retention is achieved and that the target elevation of +1.5 ft. NAVD is not exceeded. Once established, vegetated intertidal wetlands would be able to accrete sediments and filter nutrients from the water to increase elevation naturally, reduce erosion and water turbidity while acting as a sponge to absorb flood waters. As has been observed in the biological benchmark reference area, marsh vegetation establishment would occur naturally, and it is expected that post placement conditions would result in a mosaic of marsh, mudflats and tidal channels within the affected area of Goose Pond.

Prior to the establishment of marsh vegetation, the placement of fill will disrupt existing drainage patterns, and may smother existing vegetation in the lower intertidal elevations. This would result in a temporary adverse impact, but in the long-term, a more stable intertidal marsh platform with greater resiliency to sea level rise will be established.

Table 13. provides estimates of consolidated fill quantities, elevation changes and tidal regime changes in the subtidal and intertidal affected zones of the Goose Pond area. The wetland target elevations are at +1.5 feet NAVD, which could result in filling in the deepest subtidal area from -10.0 ft. NAVD to +1.5 feet, which could result in a cumulative consolidated fill thickness of 11.5 feet at that location and would permanently convert approximately 4.2 acres of subtidal bottom to an intertidal regime (Figure 35).

Table 13. Estimates of Fill Placement Quantities and Effects on Elevation and Tidal Regime within the Goose Pond Affected Area

			Elevation Change Scenario							
Zone	Elev. Zone (ft NAVD)	Zone Acres	Fill thickness (ft.) to Raise to: 0.0’ (NAVD)	CY*	Fill thickness (ft.) to Raise to: +0.5’ (NAVD)	CY*	Fill thickness (ft.) to Raise to: +1.0’ (NAVD)	CY*	Fill thickness (ft.) to Raise to: +1.5’ (NAVD)	CY*
Intertidal Low Marsh	-0.5 to +1.5	3.0	0.5	1436	≤1	2872	≤1.5	5276	≤2	7679
Intertidal Mudflat-Marsh and stream channels	-1.5 to -0.5	7.43	1.5	17981	2	23974	2.5	29968	3	35961
Intertidal Mudflat (lower)	-2.5 to -1.5	27.4	2.5	110554	3	132664	3.5	154775	4	176886
TOTAL INTER-TIDAL		**37.8**		**129,970**		**159,510**		**190,018**		**220,527**
Subtidal	-3.5	3.23	3.5	18239	4	20844	4.5	23450	5	26055
	-4.5	0.57	4.5	4138	5	4598	5.5	5058	6	5518
	-5.5	0.17	5.5	1508	6	1646	6.5	1783	7	1920
	-6.5	0.06	6.5	629	7	678	7.5	726	8	774
	-7.5	0.05	7.5	605	8	645	8.5	686	9	726
	-8.5	0.04	8.5	549	9	581	9.5	613	10	645
	-9.5	0.04	9.5	613	10	645	10.5	678	11	710
	-10	0.02	10	323	10.5	339	11.5	371	12	387
TOTAL SUBTIDAL		**4.2**		**26,604**		**29,976**		**33,364**		**36,736**
TOTAL		**42.0**		**156,574**		**189,486**		**223,382**		**257,262**

CY*=volumetric fill quantity (in cubic yards) after consolidation occurs within an elevation zone required to raise the bottom substrate to a specified elevation

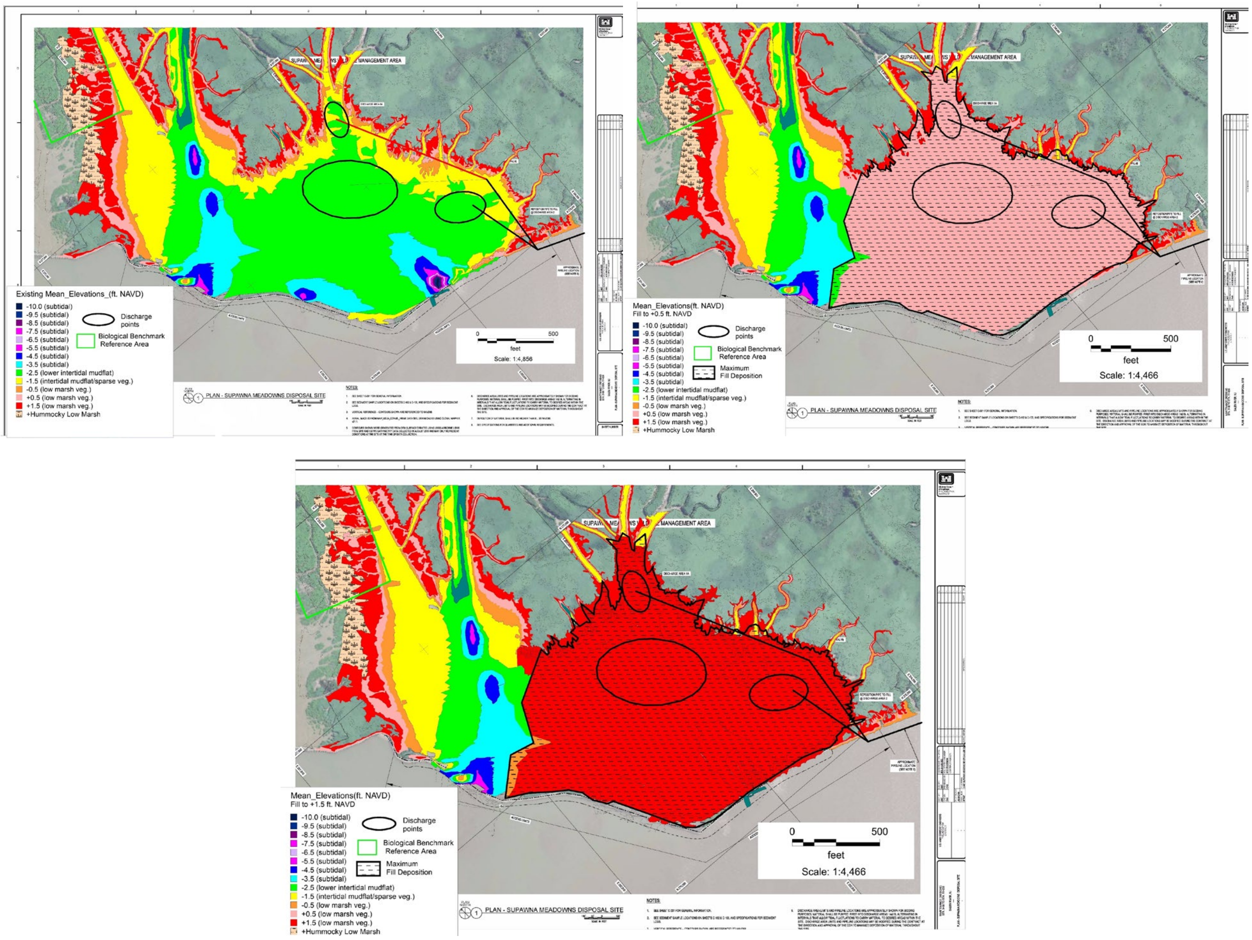


Figure 37. Goose Pond BUDM Affected Fill Area Scenarios for Existing, Fill to +0.5 ft. NAVD and Fill to +1.5 ft. NAVD.

No further tidal regime changes would occur as the majority of the rest of the affected intertidal area (about 38 acres) would remain intertidal. However, within the intertidal zone conversions of intertidal mudflat to brackish tidal marsh would occur around the -1.5ft. NAVD contour. Therefore, areas between -2.9 ft. NAVD elevation and -1.5 ft. NAVD could experience conversion from mudflat to vegetated marsh, which would affect approximately 27 acres. The majority of the affected area is at elevation -2.5 feet NAVD (about 27 acres of intertidal mudflat), which would result in an elevation change of about +3 feet to attain a final elevation of +1.5 ft. NAVD after the dredged material consolidates, and after subsequent incremental placement cycles. The rate of sediment build-up is dependent on a lot of factors such as dredging in-flow velocities, material characteristics (variabilities of sediment grain sizes within channel sediments), settlement rates of the sediments, the location and movement of distribution pipelines, and tidal currents at the placement site. Therefore, it is anticipated that post-placement elevations could be variable and would result in a mosaic of intertidal mudflats with intertidal marshes. One control would be to ensure that elevations do not exceed +1.5 ft. NAVD. Elevations higher than 2.0 ft. NAVD are likely to result in the recruitment of

Phragmites autstralis, which would not meet project objectives of low marsh establishment and would be avoided through monitoring during placement and after placement. It is expected that once the sediment settles and consolidates after each placement cycle, a dendritic pattern of tidal channels would naturally establish to promote flooding and drainage during each tide cycle and brackish marsh plants would colonize and naturally establish within the filled areas.

Because this action would enhance and preserve critical wetland resources within the affected Goose Pond area and would not result in a net loss of wetland and special aquatic sites in accordance with the Clean Water Act Section 404(b)(1) guidelines, compensatory mitigation is not required.

The nearshore placement of sandy material along Oakwood Beach would minimally affect subtidal soft unconsolidated bottom habitat (E1UBL), with minor changes in elevation. No change in tidal regime would occur. The placement of sand directly on Oakwood Beach (intertidal and nearshore) was evaluated in USACE (1999) and USACE (2014) and impacts are not significant to aquatic resources.

6.2.2. Benthic Macroinvertebrates

No action. Under the No Action alternative there would be no impacts to benthic macroinvertebrates in the channel or in the placement area as no dredging or placement action would occur.

Preferred Alternative. There would be a direct but temporary impact to benthic macroinvertebrates in both the channel and in the placement area as a result of the selected alternative. The entire Salem River channel from the entrance in the Delaware River to the Rt. 49 bridge in Salem contains approximately 91 acres of subtidal soft bottom. Dredging would likely disturb smaller components of the channel based on shoaling. The current shoaled areas that require dredging in 2023 would disturb approximately 30 acres of soft bottom in the approach channel. In both the channel and placement areas, mobile species would likely move from the action area during dredging and placement operations. In the channel, nonmotile infaunal benthic organisms would be directly impacted by the dredging action through removal. In the placement areas, macroinvertebrates would likely experience a short-term minor and direct impact due to increased water turbidity, with some species will be subject to smothering. The impact would be expected to subside quickly following completion of placement operations. In similar BUDM placement operations, monitoring has shown turbidity plumes to be of short-duration and localized. Macrofaunal recovery is usually rapid after placement operations cease. Maurer et al. (1981a) found that vertical migration of macroinvertebrates through the newly placed sediments is a viable means to accelerate habitat rehabilitation, particularly since deposition to enhance intertidal habitat within the proposed placement area will not require significant elevation changes. Recovery may occur within a few months to one or two seasons through larval transport and recruitment from neighboring non-dredged areas (Maurer et al. 1981a,b; 1982; Maurer et al. 1986; Saloman et al. 1982; Van Dolah et al. 1984).

6.2.3. Fish

No Action: Under the No Action alternative, erosion and excessive inundation of the brackish marsh will continue. The erosion increases turbidity in the water column and may degrade water quality. As more brackish marsh acreage is lost due to flooding, less habitat is available for larval and juvenile species of fish.

Preferred Alternative: The preferred alternative to dredge the channel and pump the dredged material into an area of the flooded brackish marsh at Goose Pond will have limited and short-term impacts on fish. The majority of fish, with the exception of young life stages and demersal fishes, are highly mobile and capable of leaving the areas during the dredging and placement operations. Because dredging and placement activities would generate turbidity above ambient conditions (even in the turbidity maximum zone), increases in turbidity would have temporary adverse effects on respiration and sight feeding during this disturbance. These effects are expected to be short-term and localized until dredging and placement activities cease. The existing and proposed breakwater repairs that would divide the Goose Pond area and the Delaware River would promote the retention of sediments within the Goose Pond area and minimize turbidity entering the Delaware River. However, because of the temporary disturbance caused by the dredging and placement in Goose Pond and Oakwood Beach, a seasonal dredging/placement restriction will be in place from March 1 to June 30th to avoid adverse effects on migratory finfish ascending the Delaware River to spawn. Larval and young life stages of various finfish are not expected to be in the area during the fall/wintertime of year dredging but may be present in the area for several months after the migratory fish restriction period. At Goose Pond, these effects would be repeated over several dredging cycles (every 2-6 years) until desired elevations are achieved informed by monitoring before, during and after each dredging/placement cycle.

Dredging within the navigation channel will result in the temporary loss of benthos that may be prey items for benthic fish species. Macroinvertebrate benthic organisms in the placement areas will be smothered by pumping the dredged material into the Goose Pond and/or Oakwood Beach areas, resulting in a temporary disruption of the food chain within the footprint of the area. Overall, elevating the substrate in the Goose Pond brackish marsh is expected to have long-term positive impacts on fish by enhancing the marsh platform and providing a mosaic of marsh and intertidal mudflat, which would serve as habitat for feeding, refuge and nursery areas for a number of important finfish.

Essential Fish Habitat.

No Action: The No Action alternative will affect essential fish habitat in several ways. Although not significant, the No-Action alternative will result in continued erosion of marshes, converting them to shallow water habitat while increasing total suspended solids concentrations in the water. These conditions currently exist in the project area. Continued subsidence, coupled with sea level rise would result in an increase in acres of shallow open water habitat but will simultaneously reduce intertidal mudflat and vegetated wetland habitats that are important as nursery areas for managed fish species. Continued erosion of marshes reduces water quality.

<u>Preferred Alternative:</u> For the preferred alternative to dredge a portion of the Salem River Federal Navigation Channel and pump the material into a 40+ acre area within the Goose Pond area of the Supawna Meadows National Wildlife Refuge, impacts to EFH will be temporary. As with excessive marsh erosion, dredging will cause a temporary elevation of turbidity in the immediate project area during the construction period. Elevated turbidity dissipates quickly once construction operations cease. Adult and juvenile fish are mobile and expected to leave the area of temporary disturbance. In the dredging area, Salem River navigation channel is expansive and directly connected to the Delaware Bay. Fish would be expected to avoid the dredging area temporarily. Based on the completed Essential Fish Habitat assessment (Appendix C), most designated EFH species may not be found in the immediate placement area due to limited water depths. Most fish species are migratory and therefore not likely to be present in the project area at the time of the operation, such as windowpane founder, summer flounder, and scup. Most of the fish species known to occur in the area are not estuarine resident species and only utilize the area on a seasonal basis, primarily in the warmer summer months. Impacts to larval fish species are not expected to occur as the operation would not take place during the time of year that larval fish would be present.

As in the channel dredging area, managed fish species as well as EFH fish prey species would be expected to temporarily leave the dredged material placement area due to elevated water turbidity. Dredged material placement would directly affect 40-50 acres of intertidal and subtidal areas resulting in a conversion of approximately 4.2 acres of soft subtidal bottom and approximately 35 acres of intertidal mudflat into a mosaic of intertidal mudflat and brackish low marsh.

Mobile species, such as fish and crabs in marine environments have been shown through video monitoring to leave an area of disturbance and elevated turbidity temporarily, returning shortly after placement operations cease. These impacts would cease when construction is over. Indirect, short-term, and minor negative impacts could result from disruptions to foraging during construction due to increased turbidity and the possibility that infaunal prey may leave the immediate area. As noted, burial of some benthic prey species will occur within the placement site, however, benthic species are capable of recolonizing their populations rapidly through recruitment from neighboring areas. Additionally, depending on the thickness of the fill placed, many infaunal macroinvertebrates are capable of migrating through the placed sediments (Bolam, 2010; Hinchey et al. 2006; Maurer et al. 1981a; OSPAR Commission 2008). While turbidity will temporarily increase at the placement site, turbidity levels are typically naturally elevated in this area due to currents and wave action.

Habitat Area of Particular Concern (HAPC) for summer flounder has been identified within the Salem River navigation channel and Goose Pond area. For summer flounder HAPC was identified as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC. None of these features are known to exist within the navigation channel or Goose Pond areas.

The re-establishment of substrate elevations conducive to brackish marsh vegetative growth within the intertidal zone will provide additional nursery habitat for several fish species. USACE has concluded that the selected plan will have a minimal direct effect on EFH and will result in an overall benefit to EFH species and EFH habitat.

For BUDM placement of sandy material at Oakwood Beach, an EFH assessment was completed for the CSRM project in USACE (2014) including periodic nourishment, which resulted in conservation recommendations (CR's) provided by NOAA Fisheries. The proposed nearshore placement using a split hull hopper dredge, like the *Murden*, at Oakwood Beach in 2022, would cumulatively affect approximately 90 acres of subtidal soft bottom with placements of sandy material within the nearshore area. The placements will not change the tidal regime or significantly change the substrate by remaining a soft bottom area. The water column will temporarily experience an increase in turbidity during placement activities, but the utilization of sandy material will minimize the duration of turbidity as sand will rapidly settle out.

6.2.4.Terrestrial Habitats

No Action: Neighboring terrestrial habitats will continue to be subjected to the adverse effects of coastal flooding and sea level rise as more adjacent brackish marshes continue to become excessively inundated by flood waters.

Preferred Alternative: No negative impacts are anticipated to terrestrial habitats resulting from implementation of the selected alternative. Increasing the elevation of submerged mudflats through deposition of dredged sediments will allow for conditions suitable for intertidal brackish marsh vegetation to establish and thereby enhance storm protection to adjacent terrestrial habitat as well as infrastructure. Wetlands provide disaster protection, including surge protection from hurricanes for inland habitats.

6.2.5. Avifauna and Other Wildlife

No Action: Under the No Action scenario, avifauna and other wildlife species would continue to incur further losses in habitat quality and quantity in the project area due to losses of intertidal habitats within the Goose Pond area. All species are mobile and will leave as water depths render more brackish marsh and open water areas inaccessible for foraging.

Preferred Alternative: With the preferred alternative, avifauna and other wildlife are expected to leave the immediate impact area temporarily during construction but will return once operations cease. Foraging macrobenthic prey species will be temporarily impacted as noted above by elevated turbidity and removal and smothering of nonmotile organisms. These species will recolonize intertidal areas once operations cease. Recovery may occur within a few months to one or two seasons through larval transport and recruitment from neighboring undisturbed areas (Maurer *et al*. 1981a,b; 1982, Maurer *et al.* 1986; Saloman *et al*. 1982; Van Dolah *et al*. 1984). The objective of the Goose Pond alternative is to restore elevations suitable for enhanced resilience for intertidal mudflats and re-establishment of former wetland habitat that provides a benefit to bird and other wildlife species that occur in the area.

6.2.6. Rare, Threatened and Endangered Species

No Action: Under the No Action alternative, federally listed species may be adversely affected by the continued loss of brackish marsh habitat through erosion, flooding, and SLR. Minimal impacts to sea turtles and sturgeon would result from elevated turbidity due to existing conditions of erosion and flooding of the surrounding salt marshes. Sea turtles may occur in the area where water depths are sufficient.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the Goose Pond marsh. However, leaving the marsh in its current condition would lead to a further reduction of brackish marsh surface area which is needed for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species. A long-term consequence of the No Action Alternative is the eventual conversion of the brackish marsh to open water, thereby eliminating this necessary habitat.

Preferred Alternative: There is one federally threatened plant species, sensitive joint-vetch, reported as having the potential to be within the Supawna Meadows Marsh Complex. Sensitive joint-vetch, an annual legume, grows in fresh to slightly brackish tidal river systems within the intertidal zone, where populations are subject to flooding twice daily. It typically occurs at the outer fringe of marshes in localities where plant diversity is high and annual species are prevalent. Establishment and growth of this species relies on habitat containing bare to sparsely vegetated substrates (USFWS 2016a). There are only two documented populations of this species still in existence within southern New Jersey, one on the Wading River in Burlington County and one on the Manumuskin River in Cumberland County (USFWS 2012). Goose Pond has some sparsely vegetated intertidal areas that could potentially provide suitable habitat for this species. No surveys for this plant have been conducted within the affected area. Therefore, prior to undertaking any sediment filling activities, a survey for the presence of this plant within the affected areas would be conducted. Any plants identified within the impact area would be reported to the USFWS to avoid adverse impacts to this species. Therefore, the preferred alternative will not have significant long-term environmental impacts to this federally listed sensitive plant species.

The preferred alternative will also not have significant environmental impacts to the three federally listed threatened animal species. The federally threatened northern long-eared bat uses mines and caves in the winter to hibernate and uses upland forests to forage and roost throughout the rest of the year. Bog turtles (threatened) usually inhabit open-canopy emergent and scrub/shrub wetlands, such as shallow spring-fed fens, sphagnum bogs, swamps, marshy meadows, and wet pastures, bordered by wooded areas. They depend upon micro-habitats of interspersed wet and dry pockets, with soft, muddy bottoms, vegetation dominated by low grasses and sedges, and a low volume of standing or slow-moving water (USFWS 2016). The Project area does not contain habitat sufficient to support these two species. Data records from the International Shorebird Survey eBird website on red knots (ACLO 2016) revealed the nearest sighting was from Pea Patch Island, which is over 1.5 miles west of the Project area. This record was from a single survey day in which the observers documented them migrating overhead. They were not recorded as foraging or nesting in the area.

With the preferred alternative, dredging and placement operations within the shallow waters of Salem River navigation channel, the Goose Pond area, and Oakwood Beach can pose a temporary, minor effect on wildlife in the area. The red knot, Atlantic sturgeon, shortnose sturgeon and the four species of listed sea turtles (Kemp's ridley turtle (*Lepidochelys kempii*), leatherback turtle (*Dermochelys coriacea*), green (*Chelonia mydas*) and loggerhead *(Caretta caretta*) turtle) are known to occur in the vicinity but are not expected to be present at the time of construction. However, for Atlantic sturgeon, the action area does not support spawning, is not a known overwintering area, and that early life stages are not expected to be present, the risk of effects to sturgeon is greatly reduced. As noted, macroinvertebrate prey species will be impacted by the operation, but recovery is usually rapid after placement operations cease.

Migratory shorebirds and wading birds will not be in the dredging area but may occur in the general vicinity of the project placement areas. As noted in Section 5.2.6, several of these avian species are state listed in New Jersey as threatened, endangered or species of concern. While there may be some temporary disturbance to bird species during construction activities, it is anticipated that they will move away from the dredge material placement area temporarily. The operation will not be conducted during the breeding season. The proposed placement area is a flooded marsh and unlikely to offer suitable habitat for the saltmarsh sparrow. The resulting project is expected to be beneficial to these listed avian species by establishing increased nesting and foraging habitat area.

Although no longer listed under the Endangered Species Act, bald eagles occur year-round in large-wooded areas associated with the marshes of the affected area. The species is still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act and are listed endangered in both states. The osprey, a State-listed species, also occurs in adjacent wooded areas seasonally. Both osprey and the bald eagle prey on fish and are expected to temporarily leave the immediate vicinity of the dredging and placement operation.

Sea turtles may be in the Salem River entrance channel area from May through November in the vicinity where dredging will take place, but likewise, are expected to migrate out of the area prior to dredging and placement operations. Generally, implementation of the selected plan to dredge a lower section of the channel may impact listed species due to a minor temporary elevation of water turbidity and loss of potential benthic prey species. The dredging for placement within Goose Pond or within the Killcohook CDF will be conducted by a hydraulic cutterhead type dredge which poses a low probability of impingement or entrainment of sea turtles or sturgeon. However, dredging for nearshore placement at Oakwood Beach could utilize a small split-hull hopper dredge such as the *Murden*, which could impinge or entrain these species. Therefore, seasonal restrictions for hopper dredges would be required. These species are unlikely to occur in the shallow water habitat of the proposed placement areas in Goose Pond or along Oakwood Beach due to insufficient water depths. Sea turtles do not nest in the state of New Jersey and sturgeon do not spawn in the project area so no young (i.e. less mobile life stages) of any of these species will be present during construction. Due to currents and tidal action, turbidity will dissipate quickly once dredging and placement operations cease. Although foraging capacity within the immediate placement area will be temporarily impacted, the project is expected to improve the wetland habitat in a relatively short period of time as elevated intertidal mudflat become recolonized by prey species and eventual brackish marsh vegetation re-establishes.

Based on the available information, the proposed project is not likely to adversely affect the above-listed threatened and endangered species. This determination is being coordinated with the NMFS and USFWS. In addition, the project is expected to have no adverse effects on state-listed species of birds. The project is intended to protect and restore important resting, feeding and nesting habitat for these species.

The Federal candidate species, monarch butterfly, could be found within the placement areas foraging on a number of flowering plants. However, milkweeds (*Asclepias* sp.), which are important host plants for eggs and larvae are not expected to be present or concentrated within the affected areas.

The additional NJ State-listed threatened and endangered animal species or species of special concern that have the potential to be on or near the Project area (i.e., 5 bird species, 1 invertebrate, 1 fish), would also be expected to avoid the Project area due to the presence of the work crew and construction equipment. This indirect impact would be temporary, as the action is expected to take approximately 100 working days to complete. In addition, the ecological uplift resulting from the restoration of healthy salt marsh habitat within their home range would have an indirect, long-term, and beneficial impact to these species, as well as other threatened and endangered wildlife living on or near the Project area.

The Supawna Meadows NWR may contain suitable habitat for the three State-listed plant species documented as having the potential to be in or near the area (i.e., coast flat sedge, New England bulrush, and floating marsh-pennywort), a survey prior to placement activities at Goose Pond would determine the presence of these species and if avoidance measures could be implemented.

6.3 Social, Economic, and Cultural Resources

6.3.1. Land Use and Socioeconomic Conditions

No Action: With the No Action alternative, the Salem River navigation channel would continue to shoal. This would result in an indirect negative effect on socioeconomic resources such as commercial and recreational fisheries and ship repair businesses. These are not only economically important to the local region, but to the economy of the State of New Jersey.

Preferred Alternative: With the preferred alternative, maintenance dredging practices would not adversely affect socioeconomic resources, land use, infrastructure, or utilities. Maintenance dredging of the Salem River Federal Navigation Channel is needed to provide a safe, reliable navigation channel for waterborne commercial and recreational users. The selected alternative provides socioeconomic benefits by utilizing the dredged material beneficially by restoring wetland habitat lost to erosion, flooding and storm damage that serves as a frontline defense for infrastructure.

6.3.2. Environmental Justice

In accordance with Executive Order (Environmental Justice in Minority Populations) 12989 dated 11 February 1994, a review was conducted of the populations within the affected area. The Executive Order requires that "each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations." The U.S. Environmental Protection Agency definition for Environmental Justice is: "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

No Action: The No Action alternative provides no benefits to the area's population regardless of race, color, national origin or income levels.

Preferred Alternative: The proposed project is not expected to result in disproportionately high or adverse human health or environmental effects on minority or low-income populations. The project goal to beneficially use dredged material to restore natural brackish marsh habitats by increasing substrate elevations within a flooded marsh area of the Goose Pond area of Supawna Meadows National Wildlife Refuge. The project is anticipated to provide a direct benefit not only to wetland habitat but also to area community by enhancing recreation opportunities and aesthetics in the general area.

6.3.3. Recreation

No Action: The No Action Alternative would not have any direct impacts on recreation, as no work would be performed in the Project area. However, this alternative would perpetuate the conditions leading to brackish marsh degradation and loss in the Goose Pond area of Supawna Meadows National Wildlife Refuge. This would have a long-term adverse impact upon waterfowl and other coastal wildlife, leading to a diminished use of the refuge by nature enthusiasts and hunters in the future.

Preferred Alternative: Maintenance dredging within the navigation channel will temporarily restrict access to recreational boaters, fishers and crabbers within the work areas, but will restore access upon cessation of dredging activities. In the long-term, maintenance of the channel will benefit recreational boating through maintaining safe, navigable access to the Salem waterfront and Delaware River.

The placement of beachfill on the beach (including nearshore) at Oakwood Beach was evaluated in USACE (1999) for the CSRM project. Public access along the beach would be temporarily restricted in work zones along the beach where beachfill placement is occurring. These areas would be opened up within days once work is done in a segment. For nearshore placement with a split hull dredge, recreational access to the beach will not be impeded to the public. The placement of sandy sediments at Oakwood Beach would have a long-term positive effect by providing a recreational beach, which was severely degraded from erosion prior to initial construction of the Federal CSRM project in 2015.

For the Goose Pond area, the refuge is open to the public and receives 15,000 to 20,000 visitors each year participating in recreational activities such as hunting, fishing, crabbing, wildlife observation, photography, and interpretation (USFWS 2011). There will be some minor and temporary disruptions in the use of the Goose Pond area by visitors. Disruptions may include the public avoiding the area during construction in response to construction activities and noise. Disruption to hunters, fishermen, crabbers, and wildlife observers may also occur due to construction activities causing some wildlife to temporarily move out of the area.

However, visitation also has the potential to increase as the public becomes aware of, and curious about, the marsh restoration activities, which in turn also presents an educational opportunity for the public. Furthermore, the long-term benefit of the placement of sediment in the Goose Pond area is to enhance the marsh system, which in turn provides for better habitat for wildlife and, subsequently, better opportunities for the viewing and hunting public in the future. In addition, the work is scheduled to only take about 100 work days to complete. Therefore, recreational disruptions will be minimized further.

6.3.4.Cultural and Historic Resources

The Salem River Federal Navigation Channel maintenance dredging, the use of Killcohook CDF, and the placement of sediments in the nearshore of Oakwood Beach are all previously approved Federal Actions. These portions of the APE have been previously approved and will not impact historic properties.

The use of sediments at the Goose Pond/Mill Creek area is a new proposed federal Action. The Goose Pond/Mill Creek area proposed for sediment placement has been inundated since the 1930s. Although this area is within the archaeology sensitivity grid, the deposition of sediments in this area would only serve to stabilize, cover, and protect if any archaeological resources are within this area. Furthermore, none of the above-ground resources will be impacted by the proposed action.

Therefore, USACE has determined that the proposed action will have *No Adverse Effect* on historic properties eligible for or listed on the National Register of Historic Places pursuant to 36CFR800.5(b).

6.3.5.Visual and Aesthetic Resources

No Action: No significant effect. The area's undeveloped natural lands and community infrastructure would continue to be vulnerable to flooding and wetland losses under the No Action alternative. However, more open water is not considered an adverse visual impact.

Preferred Alternative: The natural areas and maritime communities of the Salem River and Supawna Meadows National Wildlife Refuge are considered to have high aesthetic value. Low levels of development, low topographic relief, extensive open water features, wetlands with natural vegetation, and diverse wildlife make this area of the Delaware River visually pleasing and attractive to the public.

Under the preferred alternative, there would be short-term negative impacts to aesthetics during construction with an increase in water turbidity. Discharges of sediments originating from an oxygen-poor environment could produce temporary odor issues such as hydrogen sulfide odors, which should subside a short time after construction. Over time, and with the development of wetland vegetation, the aesthetics would improve. Implementation of the preferred alternative would have a direct positive impact on the aesthetic value and viewshed by increasing the acreage of intertidal mudflats and vegetated wetlands utilized by water birds, migratory shorebirds, and other wildlife.

6.3.6. Hazardous, Toxic, and Radioactive Wastes

No Action: The No Action Alternative will pose no impacts from HTRW.

Preferred Alternative: For the preferred plan, both the NJDEP SRP website were queried for various facilities or materials in the area surrounding the proposed dredging and placement areas. All noted SRP sites are land-based and not within the proposed action area and do not pose a significant concern. It is unlikely that releases would have significantly impacted the affected areas. There may have been some unnoted releases due to boats, ships or other vessels in, or transiting the project area that may result in sediment contamination. In addition to fuels and oils, flaking bottom paint from vessels may have released metals such as copper or zinc. Sediment and water quality sampling were performed on Salem River and entrance channel sediments, and several inorganic and organic contaminants were detected. None of the sediments exceeded the New Jersey residential or non-residential remediation standards for soils.

The dredging contractor would be responsible for proper storage and disposal of any hazardous material such as oils and fuels used during dredging. The US EPA and U.S. Coast Guard regulations required the treatment of waste (e.g. vessels and prohibit the disp sewage, gray water) from dredge plants and tender/service disposal of debris into the marine environment. The dredge contractor will be required to implement a marine pollution control plan to minimize any direct impacts to water quality from construction activity.

6.3.7. Noise

No Action: The No Action Alternative would not result in noise-related impacts, as no Project activities would be performed and the use of mechanized equipment within the Project area would not be necessary.

Preferred Alternative: The noise generated from the dredging operation within the Salem River Federal Navigation Channel was evaluated in USACE (1991), and the use of hydraulic dredging equipment to deepen and maintain the Salem River navigation channel is not expected to significantly elevate local noise levels. Hydraulic pipeline dredging is not considered a noisy operation. The approach channel to the Salem River accounts for approximately 2.6 miles of the 4-mile channel. This portion of the project area is located approximately 2,000 feet off of the Delaware River shoreline including Oakwood Beach. Residences located along the shoreline would not be disrupted by a dredge working this far away. The remaining 1.4 miles of the channel is located within the Salem River proper. There are residences located along the shoreline between Sinnickson Landing and approximately half-way through the cutoff area, a distance of about 3,500 feet. Above this area, residences are located further from the shoreline, and much of the area is dedicated to port activities.

A conservative estimate that dredging noises would reach 85 dBA at 50 feet from the source. This sound level is reduced to 55 dBA from enclosures and isolators. Using the inverse square law, sound levels would drop to 49 dBA at 100 feet and 43 dBA at 200 feet, which are within acceptable levels. Since there are no residences nearby, noise impacts are not significant to residences.

Noise has also been documented to influence fish behavior (Thomsen et al. 2009). Fish detect and respond to sound utilizing cues to hunt for prey, avoid predators, and for social interaction (LFR, 2004). High intensity sounds can also permanently damage fish hearing (Nightingale and Simenstad 2001). It is likely that at close distances to the dredge vessel, the noise may produce a behavioral response in mobile marine species, with individuals moving away from the disturbance, thereby reducing the risk of physical or physiological damage. Accordingly, any resulting effects would be negligible.

The Goose Pond affected area includes typical ambient noise from a park environment located on or near the water, such as boat or vehicular traffic and local pedestrian or trespasser activity. Principal noise emissions would occur at the discharge end of the pipeline dredge. Although the noise generated from the equipment used during the construction are expected to be close to 8-hour threshold levels set for humans, the construction crew will wear any necessary hearing protection. In addition, the boat noise will be typical of area activities and the heavy equipment noise will be typical of any small construction project. The construction is also expected to require up to 4 months to complete, therefore, the noise will be temporary in nature. Wildlife that are present within the Project area during construction are expected to temporarily relocate due to the physical disruption. In addition, there are no humans living within the Goose Pond area. Therefore, construction-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

6.4 Cumulative Effects

As stated in USFWS (2017), a cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the Preferred Alternative when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The methodology for performing such analyses is set forth in *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997), and includes the following:

1. Identification of the geographic area in which effects of the action may be felt.
2. Assessment of the impacts that are expected in that area from the action.
3. Identification of other actions (past, present, and reasonably foreseeable) that have had or are expected to have impacts in the same geographic area.
4. Assessment of the impacts or expected impacts from these other actions.
5. Assessment of the overall impact that can be expected if the individual impacts are allowed to accumulate.

<u>No Action:</u> The No Action alternative will not impose additional adverse impacts on affected resources. However, with climate change and sea level rise, projections for losses of valuable tidal marsh habitats are expected to increase. This would have

cumulative impacts on fish and wildlife resources that depend on these habitats for critical life stages.

Goose Pond BUDM Placement: BUDM placement at Goose Pond would help preserve the capacity of the Killcohook CDF by utilizing the dredged sediment from the Salem River navigation channel as a resource for beneficial use placement for ecosystem restoration purposes. Since the Goose Pond BUDM action is part of a larger plan to restore brackish tidal marsh wetlands at Supawna Meadows including the integration of BUDM with the restoration/modification of the Goose Pond/Mill Creek breakwater. The following is adopted from USFWS (2017): With the exception of two Service projects located at other refuges, the geographic area for the assessment of cumulative impacts from the Proposed Action at the refuge was primarily identified as the Pennsville/Penns Grove tributaries watershed. This watershed includes the municipalities of Oldmans Township, Carney's Point Township, Penns Grove Borough, and Pennsville Township. All of these municipalities are located in Salem County. However, Pennsville Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Project area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the creation of ditches for agricultural purposes (salt mash hay farming) and mosquito control. Additionally, other land use changes to the watershed have increased impervious surface area resulting in an increase in stormwater quantity and a subsequent decrease in stormwater quality. The Proposed Action is intended to provide long-term improvement to the environment through the restoration of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the refuge.

Overall, the Proposed Action will serve to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired hydrologic function. The positive consequences of the preferred alternative include sustainment and/or improvement of the salt marshes' ability to provide water quality services, increased vegetative vigor which will create the conditions for marsh accretion to occur, minor economic benefits through personnel increasing spending near the Project location, and the restoration of healthy salt marsh habitat. These changes would lead to higher quality habitat for waterfowl, migratory birds, threatened and endangered species, and other wildlife as well as create a net positive impact for recreational hunters and nature observers. In addition, The Service would be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

A review of the Pennsville Master Plan (RRA 2002) revealed that there are no known present or future projects that are anticipated to impact or be impacted by the Proposed Action. One of the goals listed in the Pennsville Township's Master Plan is "to protect sensitive environmental resources from destruction or degradation, including…rivers, wetlands, stream corridors, potable water supplies, and aquifers." The Proposed Action would be in line with this goal.

A review of the *Salem County Growth Management Element of the Comprehensive County Master Plan* (SCPB 2016) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Master Plan presents a number of improvements, past and planned, within an area designated as the “Smart Growth Zone” located within the northwestern portion of the county, none are anticipated to adversely affect or be affected by the Proposed Action. One of the goals listed in the Growth Management Element of the Comprehensive County Master Plan is to “preserve and protect the County’s valued resources including air and water quality, agricultural lands, historic areas, natural features such as floodplains, wetlands, woodlands, wildlife habitat areas, greenways, and scenic views.” The Proposed Action would be in line with this goal.

The Supawna Meadows Project (modification/restoration of the Goose Pond/Mill Creek Breakwater) is one of two phases of the Service’s Design/Build Marsh Restoration at the Cape May National Wildlife Refuge Complex (Resiliency Project #37) – the other project being the Reeds Beach Design/Build Marsh Restoration Project. Similar to the Supawna Meadows Project, the Reeds Beach Project consists of the restoration and enhancement of portions of an existing stone breakwater in order to facilitate a more natural hydrologic regime, enhance marsh resilience, and improve rates of accretion. These two projects are anticipated to work in concert with each other to improve marsh resiliency in two different areas of the Delaware Bay coastline.

Similarly, a number of Service projects currently underway at the Edwin B. Forsythe Refuge Complex along the Atlantic coastline are also designed to increase marsh resiliency in response to sea level rise and other anthropogenic effects. These projects, the Marsh Enhancement Design/Build Project, the Pole Removal Project component of the Marsh Enhancement Design/Build Project, and the Headquarters Impoundment Design/Build Project, are all intended to increase marsh resiliency, counter anthropogenic effects, and provide ecological uplift to the refuge. All of the above Service projects will have a combined positive impact upon each other.

In summary, there would not be any substantial cumulative adverse environmental impacts from the Marsh Restoration Project at the Supawna Meadows NWR when considered together with other past, present, and reasonably foreseeable future projects in the area.

Oakwood Beach Nearshore and Beach Placement: For placement at Oakwood Beach, cumulative impacts of the project were assessed in USACE (1999) and USACE (2014) as part of the existing Federal CSRM project. The utilization of sandy material from the Salem River navigation project would be considered a beneficial use of dredged material that would benefit the beachfill template existing CSRM project either by functioning as a sediment “feeder” source within the nearshore littoral zone or through direct placement on the beach. Although, the quantities of sand from the Salem River navigation channel are generally low for CSRM re-nourishments, they would help reduce the amount of material required for periodic nourishment of Oakwood Beach (about 33,000 cubic yards every 8 years). Since sand placement in the nearshore and on the beach are periodic, impacts to water quality, benthic resources, fisheries and wildlife, are temporary and localized. Therefore, the cumulative adverse impacts of the action of using Oakwood Beach as a BUDM placement location are not considered significant.

<u>Salem River Federal Navigation Channel Dredging and Disposal at Killcohook CDF:</u>

The Salem River Federal Navigation was first constructed in 1907 and has been modified several times in its channel dimensions. The most current dimensions were authorized in 1995 and constructed in 1996. This modification included a compensatory wetland mitigation project for unavoidable adverse impacts to wetlands and aquatic resources, which was completed in 1997. Since 1996, maintenance dredging has occurred six times with dredged material disposal occurring in the Federally owned Killcohook CDF. This CDF is also used for maintenance dredging of the Delaware River Main Navigation Channel (Philadelphia to the Sea). Periodic input of the Salem River navigation channel sediments, although, a much smaller amount than the Delaware River Main Channel sediments, into the Killcohook CDF would decrease (cumulatively) the existing capacity of the CDF. However, current capacity estimates of the Killcohook CDF do not indicate any issues within the near future. Continued maintenance dredging of the Salem River navigation channel and disposal operations at the Killcohook CDF would have temporary and localized adverse impacts on water quality (turbidity), fisheries, and wildlife, but would not result in an expansion or increase the magnitude of these impacts. Therefore, the cumulative effects of continued maintenance dredging and disposal at the Killcohook CDF would be minimal.

<u>Delaware River Main Channel Deepening:</u> A number of related activities have occurred or are in the planning stages within the Delaware Estuary. One of the biggest changes recently was the completion of the Delaware River Main Channel Deepening (DRMCD) project from Philadelphia to the Sea, which is now in the Operations and Maintenance (O&M) phase.

Construction of the DRMCD involved the deepening of the previous Federal channel depth of 40 feet to the new 45-foot depth. Most of the completed dredging within the DRMCD reaches was accomplished by the pumping of the dredged material into upland CDFs. The deepening also involved the blasting of bedrock in the Marcus Hook Range, where this material was mechanically dredged from the channel. The lower portion of Reach E (Brandywine Range) utilized sand dredged from within this area that was beneficially used as beachfill for the eroding beach at Broadkill Beach on the Delaware side of the lower Delaware Bay.

<u>Dredged Material Utilization (DMU) Study – NJ and DE</u>: Approximately 3,000,000 cubic yards of sediment are dredged annually from the ‘Delaware River, Philadelphia to the Sea’ and ‘Delaware River, Philadelphia to Trenton’ projects. Essentially all of the sediment is removed from the estuary system and placed in upland Confined Disposal

Facilities. Two separate feasibility studies were conducted for each state that explored innovative methods for the management and reuse of dredged material in order to improve flood risk management. In these studies, dredged material was considered for projects that will reduce flood damage from coastal storms, promote coastal resilience and sustainability and create opportunities for restoration of the estuary's functions. For New Jersey, the final report had favorable recommendations for the following sites: Gandy's Beach, Fortescue, and Villas (South). For Delaware, the final report had favorable recommendations for the following sites: Pickering Beach, Kitts Hummock, Bowers Beach, South Bowers Beach, Slaughter Beach, Prime Hook Beach, and Lewes Beach. Subsequently, a Chief's Report was signed for each study in March and April 2020, respectively, and both projects were subsequently authorized by Congress in WRDA 2020. The next step is to move forward through pre-construction engineering, design, and eventual construction.

Other USACE - planned projects in the Delaware Bay include two ecosystem restoration projects at Cape May Villas and Reeds Beach. These small beach communities are located along the New Jersey side of the lower Delaware Bay, and their purpose is to restore horseshoe crab spawning habitat and migratory shorebird resting and feeding habitat. Currently, there are no Federal funds to construct these areas. These projects make use of nearby offshore sand borrow areas in the Delaware Bay to supply the sand to restore the beach habitats.

As part of the Prime Hook National Wildlife Refuge Comprehensive Conservation Plan, the Prime Hook National Wildlife Refuge recently completed a large tidal marsh and beach restoration project, one of the largest ever in the eastern U.S. The project restored a highly damaged tidal marsh/barrier beach ecosystem covering about 4,000 acres within the former freshwater impoundment system on the refuge. This coastal wetland restoration improves the ability of the refuge marshes to withstand future storms and sea level rise and improves habitat for migratory birds and other wildlife. The restoration project is supported by funding from the Hurricane Sandy Disaster Relief Act (retrieved from https://www.fws.gov/refuge/prime-hook/what-we-do/projects-research on 1/23/23).

The Partnership for the Delaware Estuary (PDE) has partnered with a number of stakeholders in both states of Delaware and New Jersey to install living shoreline projects within the Delaware Estuary. Completed projects that include the use of oyster castles, oyster shell bags, coir logs and plantings in NJ are at the Lower Maurice River, Matts Landing, Upper Maurice River, Gandy's Beach, Money Island and Nantuxent Cove. In Delaware, living shoreline projects were completed along the Lewes and Rehoboth Canal and the Mispillion River (Dupont Nature Center).

The proposed project evaluated in this EA focuses primarily on the implementation of beneficial use of dredged material for sustainable ecological solutions (Goose Pond/Oakwood Beach). The proposed placement plan meets the unique wetland restoration needs and conditions specific to the Goose Pond area of Supawna

Meadows National Wildlife Refuge. The Goose Pond area's connection with the energy of the Delaware River's waters under SLR conditions necessitates the urgency in keeping the sediments within the aquatic system rather than disposing of dredged sediments in upland CDFs. The placement plan addresses the area's imminent need, the benefits to living resources, future sustainability (i.e. channel maintenance), projections of SLR and other climate change impacts (*e.g*. increasing frequency and intensity of storms).

The restoration of inundated marshes will enhance intertidal brackish marsh and mudflat habitats that will serve a diverse assemblage of species including nesting and foraging birds and finfish that utilize the tidal waters and wetlands. The placement of dredged sediments to raise the substrate elevation within the flooded marsh will be conducted in a manner that will not impact other shoreline protection or wetland restoration projects in the vicinity. The proposed project will potentially establish added storm protection to communities and infrastructure from storm surge and nuisance flooding, and aid in their resilience to SLR and climate impacts. The beneficial use of dredge material is a sustainable approach as there is a current and future ready supply of material, as dredging for navigation purposes is ongoing. The implementation of this dredged material placement approach will provide cumulative positive benefits to the area as well as inform future beneficial use projects as a strategy to restore ecosystem function and restore fish and shellfish habitat.

6.5 Short-term Uses of the Environment and Long-term Productivity

No Action: No short-term uses of the environment or long-term productivity would result.

Preferred Alternative: The proposed action will ensure that a valuable resource of channel sediments will remain in the river/bay system and be put to productive use. Placements within the Goose Pond area of SMNWR will potentially increase/restore habitat suitable for intertidal mudflat and brackish marsh development within an impoundment experiencing marsh losses and increasing open water. The Service will conduct monitoring of this placement, which will provide valuable information for potential future beneficial use that use Regional Sediment Management (RSM) and Engineering with Nature (EWN)-based applications in the project area, but also in other parts of coastal NJ and Delaware. Adverse impacts to the placement area are short-term and minimal as marsh vegetation and benthic fauna will re-establish.

6.6 Irreversible and Irretrievable Commitments of Resources

No Action: No commitment of resources. For Service staff administration, no commitment of funds beyond current spending levels would be needed to implement this alternative. Staff would continue to monitor water levels and marsh vegetation over time.

Preferred Alternative: The maintenance dredging of the Salem River Federal Navigation Channel and beneficial use placement within the Goose Pond area of SMNWR utilizes time and fossil fuels, which are irreversible and irretrievable. Impacts to the benthic community would not be irreversible, as benthic communities recolonize through recruitment from neighboring areas with cessation of dredging/placement activities.

7.0 ENVIRONMENTAL COMPLIANCE

Compliance with applicable Federal Statutes, Executive Orders, and Executive Memoranda is ongoing and is summarized in Table 12. This is a complete listing of compliance status relative to environmental quality protection statutes and other environmental review requirements.

The proposed maintenance dredging and beneficial use of dredged material project provides for safe navigation, flood risk reduction and ecosystem restoration. The project complies with and will be conducted in a manner consistent with Delaware and New Jersey's requirements with regard to Section 401 of the Clean Water Act and the Coastal Zone Management Act. Water Quality Certification and concurrence with a Federal Coastal Zone Consistency Determination are being requested from both the Delaware Department of Natural Resources and Environmental Control (DNREC) and the NJDEP with the circulation of this EA.

The proposed action has been coordinated with the USFWS and NOAA Fisheries pursuant to the Fish and Wildlife Coordination Act, the Endangered Species Act, and the Magnuson Stevens Fishery Conservation and Management Act. The proposed action requires State approval pursuant to Section 401 of the Clean Water Act, Section 307 of the Coastal Zone Management Act, and Section 106 of the National Historic Preservation Act. The Corps has applied for these approvals. All approvals will be obtained prior to initiation of construction. A Federal consistency evaluation is presented in Appendix E. The dredging and placement operations described in this document are not expected to have significant changes in air quality impacts and complies with Section 176(c)(1) of the Clean Air Act amendments of 1990.

Table 14. Compliance with Environmental Quality Protection Statutes and Other Environmental Review Requirements

FEDERAL STATUTES	**COMPLIANCE STATUS**
Archeological - Resources Protection Act of 1979, as amended	Full
Bald and Golden Eagle Protection Act	Full
Clean Air Act, as amended	Full
Clean Water Act of 1977	Partial
Coastal Barrier Resources Act	N/A
Coastal Zone Management Act of 1972, as amended	Partial
Endangered Species Act of 1973, as amended	Partial
Estuary Protection Act	Full
Federal Water Project Recreation Act, as amended	N/A
Fish and Wildlife Coordination Act	Partial

Table 14. Compliance with Environmental Quality Protection Statutes and Other Environmental Review Requirements

FEDERAL STATUTES	**COMPLIANCE STATUS**
Land and Water Conservation Fund Act, as amended	N/A
Marine Protection, Research and Sanctuaries Act	Full
Magnuson-Stevens Fishery Conservation and Management Act	Partial
Migratory Bird Treaty Act	Full
National Historic Preservation Act of 1966, as amended	Full
National Environmental Policy Act, as amended	Partial
National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee (Refuge Administration Act)	Partial
Rivers and Harbors Act	Full
Watershed Protection and Flood Prevention Act	N/A
Wild and Scenic River Act	Full
Executive Orders, Memorandums, etc.	
Executive Order 11988, Floodplain Management	Full
EO 11990, Protection of Wetlands	Full
EO12114, Environmental Effects of Major Federal Actions	Full
EO 12989, Environmental Justice in Minority Populations and Low-Income Populations	Full
EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	Full
County Land Use Plan	Full

Full Compliance - Requirements of the statute, EO, or other environmental requirements are met for the current stage of review.
Partial Compliance - Some requirements and permits of the statute, E.O., or other policy and related regulations remain to be met and coordination is ongoing.
Noncompliance - None of the requirements of the statute, E.O., or other policy and related regulations have been met.
N/A - Statute, E.O. or other policy and related regulations are not applicable.

Pertinent public laws applicable to the Salem River Maintenance Dredging and Beneficial Use of Dredged Material are presented below:

National Environmental Policy Act of 1970, As Amended, 42 U.S.C. 4321, *et seq.*

NEPA requires that all federal agencies use a systematic, interdisciplinary approach to protect the human environment. NEPA requires the preparation of an EIS for any major federal action that could have a significant impact on quality of the human environment or the preparation of an EA for those federal actions that do not cause a significant impact but do not qualify for a categorical exclusion. Section 102 of the Act authorized and directed that, to the fullest extent possible, the policies, regulations and public law of the United States shall be interpreted and administered in accordance with the policies of the Act. This EA was prepared as a full-disclosure document in accordance with NEPA. Previous EAs were circulated for public and agency that resulted in signing Finding of No Significant Impact (FONSI) for: Salem River Navigation Dredging and Disposal at Killcohook CDF (USACE 1991) and Oakwood Beach CSRM project (USACE 1999 and USACE 2014).

Clean Air Act, as amended, 42 U.S.C. 7401, *et seq.*

The Clean Air Act regulates air emissions from stationary and mobile sources. The law authorizes USEPA to establish NAAQS to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Based on ambient levels of a pollutant compared with the established national standards for that pollutant, regions are designated as either being in attainment or non-attainment. Cumberland County is in attainment for all priority pollutants. The draft EA will be forwarded to the USEPA and NJDEP for their review to confirm compliance with Section 309 of the Clean Air Act.

Clean Water Act, 33 U.S.C. 1251, et seq.

Previous Section 401 Water Quality Certifications were made for the Salem River Navigation Dredging and Disposal at Killcohook CDF, Oakwood Beach CSRM project and nearshore placement with a split-hull hopper dredge. Coordination is underway to ensure the preferred alternative is in compliance with the Clean Water Act of 1977 and subsequent amendments (a 404(b)(1) evaluation is included as Appendix A). A Section 401 Water Quality Certification is required for the project and is part of an application submitted to DNREC and NJDEP. Upon completion of the States' permitting process, implementation of the preferred alternative would not result in permanent negative changes in water quality. Following construction activities, additional wetland habitat is expected to establish with marsh vegetative growth and will provide long-term positive impacts to water quality in the area. All state water quality standards will be met.

Coastal Zone Management Act of 1972

Previous Federal consistency determinations were made for the Salem River Navigation Dredging and Disposal at Killcohook CDF, Oakwood Beach CSRM project and nearshore sand placement with a split-hull hopper dredge. The proposed action at Goose Pond is within the coastal zone, which is managed under both Delaware's and New Jersey's Coastal Zone Management Programs (CZMP). Although dredging and dredged material placement impact shallow water habitat, which is protected under both Coastal Zone programs, beneficial effects from the proposed action are consistent with other goals of their CZMP's. The CZMP's include goals to protect coastal land and water habitat. Construction of the project would beneficially use dredged material removed from the navigation channel to retain it in the local natural system and improve the resiliency of adjacent brackish marsh that has been inundated with flood waters and protection from erosion. A Federal consistency determination in accordance with 15 CFR 930 Subpart C has been made stating that the preferred alternative is consistent with the enforceable policies of both Delaware and New Jersey's federally approved coastal management programs. DNREC and NJDEP must review USACE's determination of consistency with their CZMP enforceable policies. The draft EA will be submitted for review by the State concurrent with public review.

Endangered Species Act of 1973

The preferred alternative will be in compliance with the Endangered Species Act of 1973 (ESA) upon completion of consultation with the natural resource regulatory agencies. The preferred alternative is not anticipated to adversely affect rare, threatened, or endangered species and is expected to provide a positive impact through the development of additional valuable habitat used by threatened and endangered species.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires Federal agencies to consult with the USFWS, NMFS, and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted or otherwise controlled or modified" by any agency under a federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects.

USFWS and NOAA Fisheries have been provided the draft EA for review, pursuant to the FWCA in fulfillment of Section 2(b) of the FWCA (48 Stat.401, as amended, 16 U.S.C. 661 *et seq.*). Coordination with USFWS and NOAA Fisheries will be ongoing through construction and post-construction monitoring.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation & Management Act (MSA) is the primary law governing marine fisheries management in U.S. federal waters. Pursuant to Section 305 (b)(2) of this act, the USACE is required to prepare an Essential Fish Habitat [EFH] Assessment for the proposed maintenance dredging and BUDM placement operation in the Goose Pond area. The draft EA has been submitted to NMFS for their review. Compliance with the MSA will be met upon completion of the consultation process. Coordination with NMFS for EFH is ongoing through construction and monitoring.

Migratory Bird Treaty Act, 16 U.S.C. 715-715s and Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

The Migratory Bird Treaty Act (MBTA) prohibits the taking or harming of any migratory bird, its eggs, nests, or young without an appropriate federal permit. Almost all native birds, including any bird listed in wildlife treaties between the United States and several other countries are covered by this Act. A “migratory bird” includes the living bird, any parts of the bird, its nest, or eggs. The take of migratory birds is governed by the MBTA’s regulation of taking migratory birds for educational, scientific, and recreation purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of the MBTA states that the Secretary of the Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. Disturbance of the nest of a migratory bird requires a permit issued by the USFWS pursuant to Title 50 of the CFR. Construction is scheduled to occur during the December through March period. The preferred alternative is in compliance with the MBTA and Executive Order 13186.

National Wildlife Refuge System Administration Act as amended by the National Wildlife Refuge Improvement Act of 1997(16 U.S.C. 668dd-668ee)

The National Wildlife Refuge System Administration Act provides authority, guidelines and directives for the Service to improve the National Wildlife Refuge System; administers a national network of lands and waters for the conservation, management, and restoration of fish, wildlife and plant resources and habitat; ensures the biological integrity, diversity, and environmental health of refuges is maintained; defines compatible wildlife-dependent recreation as appropriate general public use of refuges; establishes hunting, fishing, wildlife observation and photography, and environmental education as priority uses; establish a formal process for determining compatible uses of refuges; and provide for public involvement in developing comprehensive conservation plans for refuges. The proposed BUDM placement at the Goose Pond area within the Supawna Meadows NWR would require USACE to obtain a Special Use Permit (SUP) from the USFWS prior to undertaking any action.

Section 106 of the National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (NHPA) of 1966, as amended (54 U.S.C. § 306108), and its implementing regulations require USACE, in consultation with the NJDEP State Historic Preservation Office (SHPO), to consider the effects of the undertaking on historic properties in the project area. If any historic properties listed on or eligible for inclusion in the National Register of Historic Places were to be adversely affected, USACE must develop mitigation measures in coordination with the NJ SHPO. Coordination with the SHPO and tribal nations has determined that the project will not result in any adverse effect on cultural or historical resources within the project area.

Resource Conservation and Recovery Act, as amended, 43 U.S. C. 6901, *et seq.*

The Resource Conservation and Recovery Act (RCRA) controls the management and disposal of hazardous waste. “Hazardous and/or toxic wastes”, classified by RCRA, are materials that may pose a potential hazard to human health or the environment due to quantity, concentration, chemical characteristics, or physical characteristics. This applies to discarded or spent materials that are listed in 40 CFR 261.31-.34 and/or that exhibit one of the following characteristics: ignitable, corrosive, reactive, or toxic. Radioactive wastes are materials contaminated with radioactive isotopes from anthropogenic sources (e.g., generated by fission reactions) or naturally occurring radioactive materials (e.g., radon gas, uranium ore). There are no hazardous materials concerns associated with the preferred alternative. The preferred alternative is in compliance with the RCRA.

Executive Order 11990, Protection of Wetlands

This Executive Order directs federal agencies to avoid undertaking or assisting in new construction located in wetlands unless no practicable alternative is available. The preferred alternative is in compliance with Executive Order 11990. Approximately 75,000 cy of dredged material will be placed in approximately 30 acres of inundated (former) marsh to raise the substrate elevation to strengthen the resilience of intertidal mudflats and to allow for marsh vegetation to re-establish in a former but now flooded marsh. The preferred alternative would result in a temporary impact to wetlands during placement operations but would enable restoration of vegetated wetlands and intertidal mudflats. The project is in compliance with the E.O.

Executive Order 11988, Floodplain Management

Executive Order 11988 directs federal agencies to evaluate the potential effects of proposed actions on floodplains. Such actions should not be undertaken that directly or indirectly induce growth in the floodplain unless there is no practicable alternative. The preferred alternative will not place fill within areas designated as floodplains, and will not affect flooding in floodplains, and is therefore in compliance with Executive Order 11988 and would have no effect on development within floodplains.

Executive Order 12898, Environmental Justice

This Executive Order directs Federal agencies to determine whether a federal action would have a disproportionate adverse impact on minority or low-income population groups within the project area. The preferred alternative is not expected to result in disproportionately high or adverse human health or environmental effects on minority or low-income populations.

Executive Order 13045, Protection of Children from Environmental and Safety Risks

This Executive Order requires federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that policies, programs, activities, and standards address these risks. No risks to children are expected from the preferred alternative.

8.0 MONITORING AND ADAPTIVE MANAGEMENT

The goal of adaptive management of the BUDM placement of dredged material within the Goose Pond area of Supawna Meadows National Wildlife Refuge is to assist in preserving, protecting and restoring the brackish marsh habitat by raising the substrate elevation to levels suitable for re-establishment of marsh vegetation and intertidal mudflats where they previously existed.

In order to determine performance of the BUDM for future placements and effectiveness in enhancing valuable resilient wetland habitat, the placement site will be monitored before, during, and after placement operations. Monitoring will provide information essential to assessing ways in which adaptive management can be applied to future placements both here and other estuarine saltmarsh with comparable hydrodynamic and morphological conditions.

Monitoring efforts and adaptive management are adopted as part of ongoing research being conducted in partnership with USACE's ERDC conjunction with the maintenance dredging and BUDM placement plan for the Salem River federal navigation channel. The monitoring plan and adaptive management opportunities have been developed through lessons learned from SMIIL projects and other beneficial use projects by the Philadelphia District in New Jersey and Delaware as well as across USACE nationally.

During construction, dredged material will be placed in the intertidal mudflat areas along the eastern portion of Goose Pond between existing low marsh areas and the stone breakwater along the Delaware River shoreline. The placement of this predominantly fine-grained sediment will need time to consolidate and build elevation over several dredging cycles and will be monitored with each successive placement. This intertidal mudflat/marsh edge protection plan will provide a natural infrastructure solution to restore substrate elevations necessary to provide protection to the vulnerable brackish marshes within the Supawna Meadows NWR and adjacent natural habitat.

The initial placement will be monitored to observe sediment properties and will inform the second placement operation scheduled to occur approximately 1 to 2 years later and any subsequent placement cycles thereafter (if required). Building with mixed sediments will create protective natural and nature-based features adjacent to the existing marsh in a varied landscape approach that will include mudflats and intertidal shallows and may also lead to the re-establishment of brackish marsh vegetation in the area. This dredging and BUDM placement project for the Salem River and Goose Pond area is based on RSM and EWN principles and practices and employs a science-based approach for creating and optimizing natural infrastructure in the Delaware Bay region experiencing devastating erosion. Keeping sediment in this eroding system is critical to the future of habitats and overall resilience of this important system. The proposed BUDM placement is considered to be low risk and high yield for creating, protecting, and restoring varied habitats to build a more resilient system. Monitoring before, during, and after placement operations will document the outcome of the BUDM for the Salem River/Goose Pond area. Monitoring studies at other beneficial use placement locations in SMIIL and other areas within New Jersey as well as nationally are evidence that dredged sediments are a valuable resource for creating natural infrastructure and natural and nature-based features.

A significant component of the monitoring at the Goose Pond is the partnership with USFWS and DU. As part of the National Fish and Wildlife Federation (NFWF) grant, the following core metrics have and will be monitored by USFWS/DU beginning August 2021-23:

- Tidal marsh plant community monitoring (e.g., species composition, percent cover, areal coverage);
- Water quality;
- Marsh surface elevation change trend; and
- Marsh accretion and erosion.

Table 13. provides a summary of monitoring commitments for the Goose Pond BUDM, which includes monitoring tasks accomplished by project partners for related efforts at Supawna Meadows but separate from the dredging and placement operations.

Table 15. Goose Pond BUDM Monitoring Tasks by Phase

Monitoring Task	**POC** (references)	**Pre**	**During**	**Post**
Evaluation of local hydrodynamics (waves & currents) and sediment mobility.	USFWS (via Woods Hole Group)[1] USACE NAP	X		
Evaluation of sediments from borrow area and placement.	USACE ERDC	X		
Topographic and Bathymetric Surveys	USFWS (via Woods Hole Group, pre)[1] NAP (pre & post)	X		X
Turbidity monitoring via roving surveys with meter and fixed meter prior to and during initial construction	NAP & ERDC[2,3]	X	X	
High Resolution photography and video footage	NAP & ERDC		X	X
Post placement sediment follow-up consolidation work including modeling. Collect samples as needed.	ERDC			X
Nekton abundance, species richness	USFWS	X	X	X

Table 15. Goose Pond BUDM Monitoring Tasks by Phase				
Monitoring Task	**POC** $^{\text{(references)}}$	**Pre**	**During**	**Post**
Tidal marsh plant community monitoring (e.g., species composition, percent cover, areal coverage*)*	USFWS	X	X	X
Water Quality (temperature, pH, salinity, DO, specific conductance alkalinity, ammonia, nitrate, nitrite, & phosphorus).	USFWS	X	X	X
Marsh surface elevation change	USFWS	X	X	X
Marsh accretion and erosion	USFWS	X	X	X

9.0 CONCLUSIONS AND RECOMMENDATIONS

The selected plan supports the beneficial use of dredged material removed from an authorized navigation channel. Approximately 200,000 CY of dredged material will be obtained during the initial periodic maintenance dredging of the Salem River FNC and placed within the Goose Pond area of the Supawna Meadows National Wildlife Refuge. Maintenance dredging of a portion of the Salem River federal navigation channel to authorized depth of 16 ft MLLW with 1 ft allowable over-depth will be conducted initially in 2023 and periodically thereafter. Dredging will remove critical shoaling to maintain a safe and reliable navigation channel for commercial and recreational vessels. As part of the selected plan, placement operations will be monitored prior, during and after the operation is complete to provide information that will further inform future placements with a continued objective to utilize a valuable sediment source (i.e. dredged material) to restore intertidal mudflats and salt marsh habitat in an area that has endured excessive inundation and erosion for many decades. The selected plan is compliant with all Federal applicable environmental laws (See Table 8).

This EA concludes that the proposed maintenance of the Salem River Federal Navigation Channel and beneficial use placement of dredged material within the Goose Pond area of the Supawna Meadows National Wildlife Refuge for ecosystem restoration purposes, beneficial use placement of sandy dredged material within the nearshore, intertidal, and beach of Oakwood Beach, and the retention of the existing Killcohook CDF as a disposal option is not a major Federal action significantly affecting the human environment. Therefore, it has been determined that preparation of an Environmental Impact Statement (EIS) is not warranted for the project as identified herein, and a Finding of No Significant Impact (FONSI) for the proposed project is appropriate.

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APPENDIX A

Clean Water Act Section 404(B)(1) Analysis

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Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States (WOTUS) for Channel Maintenance of the Salem River Federal Navigation Channel in both Salem County, New Jersey and New Castle County, Delaware & Beneficial Use of Dredged Material Project at Goose Pond- Supawna Meadows National Wildlife Refuge Salem County, New Jersey and Oakwood Beach Nearshore Placement in New Castle County, Delaware is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

A Section 404(b)(1) evaluation was previously performed for the dredging and disposal within the existing disposal location at Killcohook CDF located in both Salem County, NJ and New Castle County, Delaware, and is incorporated by reference (USACE 1991).

I. PROJECT DESCRIPTION

A. Location. The project area is located in Salem County, New Jersey and New Castle County, Delaware. Salem River Channel midpoint: N39.55706°, W75.52662°; Goose Pond (center): N39.586840°, W75.52619°; and Oakwood Beach: N39.555446°, W75.522952°.

B. General Description. Project descriptions and objectives are provided in Sections 1.0, 2.0, 3.0, and 4.0 of the EA.

C. Purpose. The purpose of this project is to maintain the authorized navigation channel and remove critical shoals from the Salem River Federal Navigation Channel that pose a hazard to navigation and public safety. A secondary purpose is to utilize the dredged material beneficially for restoration of degraded and eroding coastal habitats at Goose Pond in Supawna Meadows National Wildlife Refuge and Oakwood Beach.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: >60% silt/clay for Goose Pond and >75% sand for Oakwood Beach nearshore placement.
2. Quantity of Discharge: Goose Pond: 150,000 to 209,000 cubic yards initially and with subsequent dredging cycles. Oakwood Beach: 5,000 to 20,000 cubic yards periodically.
3. Source of Material: All material would be obtained from the existing authorized Salem River Federal navigation channel.

E. Description of Discharge Sites.

1. Location: For Salem River Federal Navigation Channel: see Figures 3, and 7-9; for Goose Pond: see Figures 15, 16, 30, 31, and 35; and for Oakwood Beach: see Figures 4 and 12 in the EA.

2. Size (acres): The Goose Pond area is approximately 60 acres in size. Discharge is expected to impact approximately 40 acres from unconfined placement within the intertidal and subtidal mudflat area. The Oakwood Beach nearshore discharge area is approximately 90 acres in size in a soft subtidal bottom.

3. Type of Sites: The Goose Pond area is predominantly an intertidal brackish area consisting of mudflats and low marsh semi-confined by a stone breakwater along the Delaware River, which has 3 tidal inlets. The Oakwood Beach nearshore placement area is a brackish subtidal soft bottom area within the Delaware River.

4. Type of Habitat: Goose Pond: estuarine intertidal and subtidal mudflat; Oakwood Beach: estuarine subtidal unconsolidated bottom.

5. Timing and Duration of Discharge: 16 weeks between July 1 and March 1.

F. Description of Discharge Method. Goose Pond: Hydraulic pipeline dredging with a Y valve discharge. Oakwood Beach nearshore: split hull hopper dredge.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: Goose Pond: -10 ft. NAVD to +1.5 ft. NAVD. Predominantly an intertidal mudflat at -2.5 ft. NAVD with slopes <1%. Oakwood Beach nearshore: -2 MLLW to -8 ft. MLLW in subtidal soft bottom with slopes <1%.

2. Sediment Type: variable-sandy/silty bottoms. The Goose Pond area is predominantly silts/clays while Oakwood Beach nearshore has a higher sand component.

3. Fill Material Movement: Goose Pond: Fill movement will affect approximately 1,000 ft. radius from pipe discharge and would predominantly occur within the area on the landward side of the stone breakwater with minimal transport through the tidal inlet openings in the stone breakwater. Sandy material would drop immediately out at location of discharge points, but fine-grained materials may transport and settle 20 m to 100m (Fall et al. 2022) from discharge. Oakwood Beach: Sandy fill material movement would be localized in the nearshore at location of split-hull placement 200-500 cubic yards at a time.

4. Physical Effects on Benthos: Temporary, loss through burial or displacement of existing benthos during dredging and placement

actions. The areas should reach a stabilized equilibrium subsequent to construction. <u>Goose Pond:</u> A permanent conversion of open water to intertidal mudflat, and low marsh habitat would occur at discharge locations. <u>Oakwood Beach:</u> discharge location would remain as subtidal.

5. Actions taken to Minimize Impacts: The placement behind the stone breakwater at Goose Pond will be semi-confined to promote sediment settlement within the desired locations.

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:
    a. Salinity – No effect
    b. Water Chemistry – Temporary, minor effect.
    c. Clarity – Temporary, minor effect.
    d. Color - No effect.
    e. Odor – Temporary, minor effect.
    f. Taste – N/A.
    g. Dissolved Gas Levels – temporary reduction of DO at Goose Pond during discharge.
    h. Nutrients – No effect.
    i. Eutrophication - No effect.
    j. Temperature- No effect.
2. Current Patterns and Circulation:
    a. Current Patterns and Flow – No significant effect.
    b. Velocity – No significant effect on tidal velocity.
    c. Stratification – Normal stratification patterns would continue.
    d. Hydrologic Regime – The regime would remain estuarine, but bottom would be converted from subtidal open water to intertidal regimes at <u>Goose Pond</u>.
3. Normal Water Level Fluctuations – No effect on tidal regime.
4. Salinity Gradients – No effect on existing salinity gradients.
5. Actions That Will Be Taken to Minimize Impacts: N/A

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Sites: Temporary effects when the dredged material is being placed. The areas should reach a stabilized equilibrium in a relatively short time period.

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

    a. Light Penetration: Short-term, limited reductions during dredging and placement activities. No long-term effects.

    b. Dissolved Oxygen: There is a potential for decreased dissolved oxygen levels during dredging and placement activities. No long- term effects.

    c. Toxic Metals and Organics: Bulk sediment, elutriate and partition analyses do not indicate significant exceedances of acute or chronic water quality criteria/objectives.

    d. Pathogens: No effect.

    e. Aesthetics: Minor, temporary effects of odor and visual effects limited to the construction period.

    f. Temperature: No effect.

3. Effects on Biota:

    a. Primary Production, Photosynthesis: Temporary, minor effect during dredging and placement activities. The areas should reach a stabilized equilibrium in a relatively short time period.

    b. Suspension/Filter Feeders: Temporary, minor effect on suspension feeders during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

    c. Sight feeders: Temporary, minor effect on sight feeders during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

4. Actions Taken to Minimize Impacts: Best management practices will be used to minimize turbidity.

D. Contaminant Determinations:

No significant contaminants were found at the project sites that would impact the project area. See Appendix B of the EA for recent sediment data (Tetra Tech, 2020).

E. Aquatic Ecosystem and Organism Determinations:

1. Effects on Plankton: Temporary, minor effect on plankton during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.
2. Effects on Benthos: Temporary, minor effect on benthos during dredging and placement activities. Placement of dredged material will bury benthos resulting in mortalities within affected areas. Recolonization by benthic macroinvertebrates from adjacent areas is expected once disposal activities are completed. The area should reach a stabilized equilibrium in a relatively short time period.
3. Effects on Nekton: Temporary minor effect. Mobile nekton would move out of turbidity and return upon cessation of construction.
4. Effects on Aquatic Food Web: Temporary, minor effect on the aquatic food web during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.
5. Effects on Special Aquatic Sites:

    (a) Sanctuaries and Refuges: The Goose Pond area is located on the Supawna Meadows National Wildlife Refuge. Discharge of dredged material into the Goose Pond area is desired to build up a subsiding marsh platform to restore marsh bottom. This practice was found to be consistent with Refuge mission by USFWS.

    (b) Wetlands: Restoration of approximately 42 acres of eroding and subsiding intertidal brackish marsh habitats.

    (c) Tidal flats: There would be some conversion of tidal mudflats into vegetated brackish marsh, but net result would be a mosaic of these two intertidal habitats.

    (d) Vegetated Shallows: None.

6. Threatened and Endangered Species: Not likely to adversely effect (NLAA). This determination will be confirmed with NOAA Fisheries and U.S. Fish and Wildlife Service prior to undertaking action.

7. Other Wildlife: Temporary, minor effects during construction.

8. Actions to Minimize Impacts: Best management construction practices will be used to minimize any disturbance.

F. Proposed Disposal Site Determinations.

1. Mixing Zone Determinations: The following factors have been considered in evaluating the placement sites.

    a. Depth of water.

    b. Current velocity.

    c. Degree of turbulence.

    d. Stratification.

    e. Discharge vessel speed and direction.
    f. Rate of discharge.
    g. Dredged material characteristics.

2. Determination of Compliance with Applicable Water Quality Standards: A section 401 Water Quality Certificate will be obtained from both the DE DNREC and NJDEP prior to construction.

3. Potential Effects on Human Use Characteristics:

    a. Municipal and Private Water Supply: No anticipated effect.

    b. Recreational and Commercial Fisheries: Temporary, minor effect during construction.

    c. Water Related Recreation: Temporary, minor effect. The public will be excluded from work areas during construction.

    d. Aesthetics: Temporary, minor effect.

e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: <u>Goose Pond:</u> Temporary adverse effects on human use of this area during construction and subsequent BUDM placement cycles.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.

No significant adverse effects are anticipated. Beneficial cumulative effect is expected by increasing brackish marsh within an area affected by marsh degradation/loss.

H. Determination of Secondary Effects on the Aquatic Ecosystem.

No significant secondary effects are anticipated.

III. <u>FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE</u>

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

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - The selected plan was determined to be the best alternative for restoring the habitat at the <u>Goose Pond</u> placement site and placement within the <u>Oakwood Beach</u> nearshore would add sand into the system to benefit the existing CSRM project.

C. Compliance with Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in New Jersey and Delaware.

D. 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.

E. Compliance with Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. It is anticipated that the activities will not likely to adversely affect species within the affected areas. Informal Section 7 consultation will be completed with the U.S. Fish and Wildlife Service and National Marine Fisheries Service prior to initiation of construction.

F. 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.

G. 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, and recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be adversely affected over the long-term. 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.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem – Timing of discharge – imposing a seasonal restriction from March 1 to July 1 for migratory fish. The Goose Pond placement would occur behind the stone breakwater, which would provide a semi-confined environment to retain sediments.

APPENDIX B

Pre-dredge Sediment Analyses

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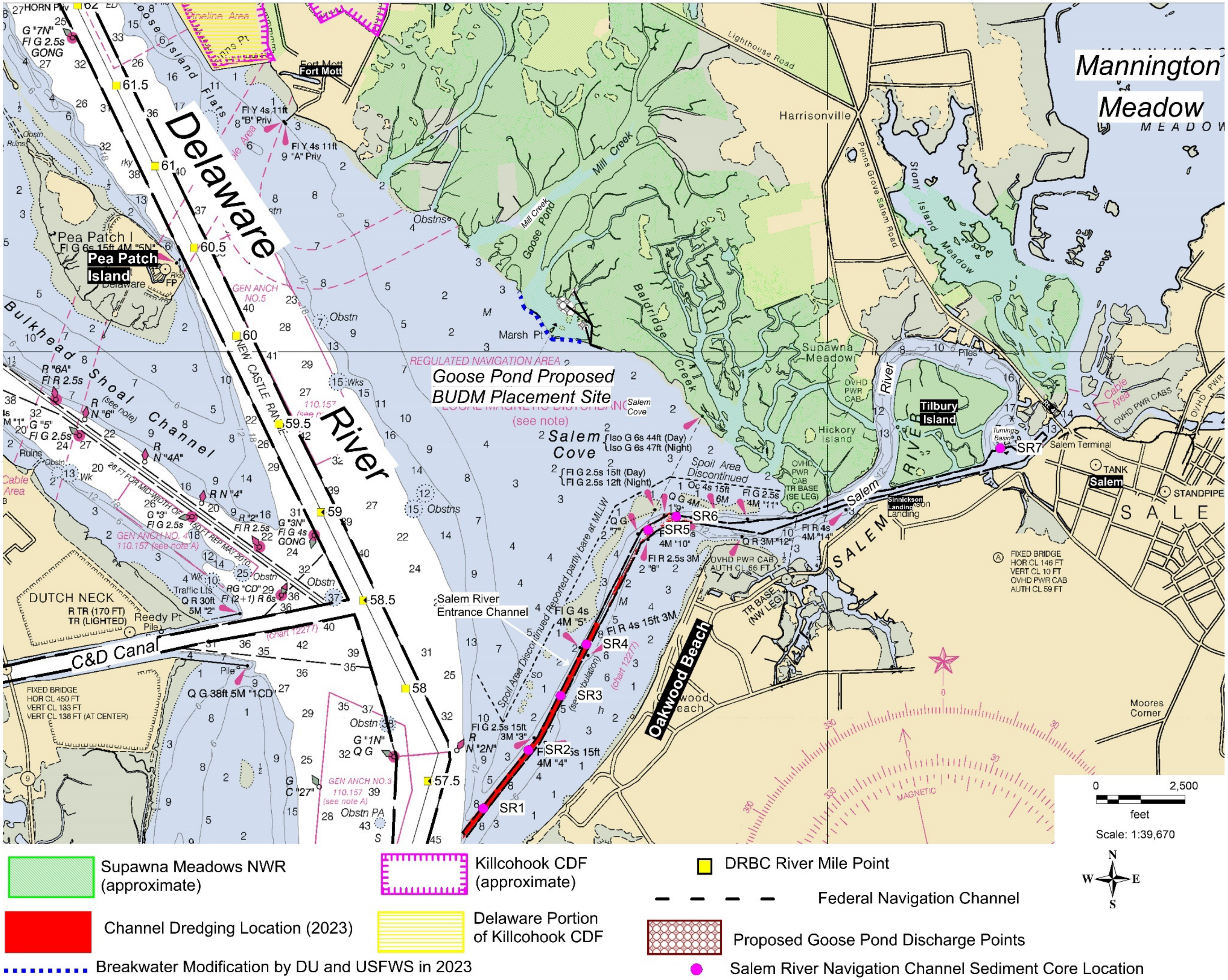
Mannington Meadow
Delaware River
Pea Patch Island
Fort Mott
Harrisonville
Lighthouse Road
Penns Grove Salem Road
Mill Creek
Goose Pond
Baldridge Creek
Stony Island Meadow
Supawna Meadow
Marsh Pt
Goose Pond Proposed BUDM Placement Site
REGULATED NAVIGATION AREA
Salem Cove
Spoil Area Discontinued
Salem River Entrance Channel
Spoil Area Discontinued Reported partly bare at MLLW
Tilbury Island
Hickory Island
Salem River
Salem Terminal
Turning Basin
Salem
Sinnickson Landing
Oakwood Beach
Moores Corner
Bulkhead Shoal Channel
Dutch Neck
Reedy Pt
C&D Canal
NEW CASTLE RANGE
GEN ANCH NO.5
GEN ANCH NO. 4
GEN ANCH NO.3
SR1
SR2
SR3
SR4
SR5
SR6
SR7
62
61.5
61
60.5
60
59.5
59
58.5
58
57.5
FIXED BRIDGE HOR CL 450 FT VERT CL 133 FT VERT CL 136 FT (AT CENTER)
FIXED BRIDGE HOR CL 146 FT VERT CL 10 FT OVHD PWR CAB AUTH CL 59 FT
0
2,500
feet
Scale: 1:39,670
N
W
E
S
🟩 Supawna Meadows NWR (approximate)
🟥 Channel Dredging Location (2023)
Breakwater Modification by DU and USFWS in 2023
Killcohook CDF (approximate)
Delaware Portion of Killcohook CDF
DRBC River Mile Point
Federal Navigation Channel
Proposed Goose Pond Discharge Points
Salem River Navigation Channel Sediment Core Location

SEDIMENT GRAIN SIZE AND TOC	METHOD	CORES						
		SR1	SR2	SR3	SR4	SR5	SR6	SR7
Gravel (%)	ASTM D422	0	0	0	0.4	0.2	0	0
Coarse Sand (%)		0.2	2.3	1.5	0.9	0.6	0.4	0.9
Medium Sand (%)		6.2	10.8	20.3	31	19.4	18.1	24.1
Fine Sand (%)		26.5	22.4	34.8	58.7	58.5	58.5	52.1
Fines (%)		67.1	64.5	43.4	9	21.3	23	22.9
TOC (%)	Lloyd Kahn	1.9	2.2	1.4	0.27	0.47	0.29	1.7
TOC (mg/kg)		19,000	22,000	14,000	2,700	4,700	2,900	17,000

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Cyanide, Total					47	680	0.3	J	0.12	0.38	J	0.14	0.24	J	0.11	0.099	J	0.08	0.14	J B	0.1	0.1	J B	0.08	0.3	J B	0.1
INORGANICS																											
Aluminum			51,200		78,000	---	8,700		5.7	11,000		6.2	9,400		5.5	2,000		3.7	5,000		3.9	4,500		3.7	9,500		4.6
Antimony			3.1		31	520	0.16	J	0.043	0.33		0.05	0.17	J	0.04	0.13		0.03	0.23	F1	0	0.35		0.03	0.5		0.04
Arsenic	8.3	70	11	7.24	19	19	6.3		0.032	9.9		0.03	7.2		0.03	2		0.02	6.7		0	4.6		0.02	15		0.03
Barium			1,500		16,000	260,000	38		0.13	55		0.14	52		0.12	11		0.08	19		0.1	38		0.08	41		0.1
Beryllium			16		160	2,600	0.61		0.071	0.97		0.08	0.7		0.07	0.21		0.05	0.4		0	0.39		0.05	0.9		0.06
Cadmium	1.2	9.6	0.71	0.68	71	1,100	0.25		0.017	0.32		0.02	0.28		0.02	0.04	J	0.01	0.084		0	0.081		0.01	0.24		0.01
Calcium			---		---	---	1,600		7.5	2,000		8.1	1,700		7.2	210		4.9	710		5.1	410		4.8	2,300		6
Chromium	81	370	214	52.3	---	---	27		0.083	57		0.09	30		0.08	10		0.05	26	B	0.1	17	B	0.05	70	B	0.07
Cobalt			34		23	390	6.8		0.013	8.7		0.01	8.2		0.01	2.7		0.01	4.3		0	6.7		0.01	9		0.01
Copper	34	270	310	18.7	3,100	52,000	13		0.2	17		0.22	17		0.2	2.7		0.13	5		0.1	4		0.13	11		0.16
Iron			74,767		---	---	16,000		4.7	25000		5.1	17000		4.5	5000		3.1	15000		3.2	11000		3	34000		3.8
Lead	46.7	218	400	30.2	400	800	18		0.099	25		0.11	24		0.1	4.7		0.06	10	B	0.1	10	B	0.06	25	B	0.08
Magnesium			---		---	---	3,400		15	3,800		17	3,400		15	630		10	1,300		11	1,400		9.9	3,600		12
Manganese			2,100		1,900	31,000	640		0.42	810		0.46	720		0.41	160		0.27	290		0.3	690		0.27	950		0.34
Mercury	0.15	0.7	10	0.13	23	390	0.12		0.076	0.13		0.08	0.086		0.01	0.014		0	0.021		0	0.015		0	0.071		0.01

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Nickel	20.9	51.6	15	15.9	1,600	26,000	15		0.093	18		0.1	16		0.09	3.9		0.06	7.5		0.1	10		0.06	18		0.07
Potassium			---		---	---	1,400		40	2,000		43	1,500		38	520		26	1,000		27	890		25	4,100		32
Selenium			39		390	6,500	0.3	J	0.12	0.43	J	0.13	0.37	J	0.12	ND		0.08	0.19	J	0.1	0.16	J	0.08	0.41		0.1
Silver	1	3.7	39	0.73	390	6,500	0.12		0.028	0.13		0.03	0.14		0.03	ND		0.02	0.046	J	0	0.026	J	0.02	0.11		0.02
Sodium			---		---	---	540	B	20	660	B	21	690	B	19	320	B	13	530		13	540		12	950		16
Thallium			0.078		---	---	0.088	J	0.069	0.1	J	0.07	0.094	J	0.07	ND		0.05	0.06	J	0	0.074		0.04	0.1		0.06
Vanadium			134		390	6,500	26		0.093	49		0.1	28		0.09	8.7		0.06	21		0.1	16		0.06	48		0.07
Zinc	124	410	2,300	124	23,000	390,000	80		0.47	110		0.51	100		0.46	23		0.31	45		0.3	49		0.3	100		0.38

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	ug/kg	ug/kg	ug/kg		ug/kg	mg/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
1,1,1-Trichloroethane	---	---	810,000	856	160,000,000	---	ND		5	ND		5.4	ND		4.8	ND		3.3	ND		3.4	ND		3.2	ND		4
1,1,2,2-Tetrachloroethane	---	---	600	202	3,500	18,000	ND		6	ND		6.4	ND		5.7	ND		3.9	ND		4	ND		3.8	ND		4.8
1,1,2-Trichloro-1,2,2-trifluoroethane	---	---	670,000		---	---	ND		3.8	ND		4.1	ND		3.7	ND		2.5	ND		2.6	ND		2.4	ND		3.1
1,1,2-Trichloroethane	---	---	150	570	12,000	64,000	ND		4.8	ND		5.2	ND		4.6	ND		3.1	ND		3.2	ND		3.1	ND		3.9
1,1-Dichloroethane	---	---	3,600		120,000	640,000	ND		3.6	ND		3.9	ND		3.5	ND		2.4	ND		2.4	ND		2.3	ND		2.9
1,1-Dichloroethene	---	---	23,000	2,780	11,000	180,000	ND		5.7	ND		6.1	ND		5.5	ND		3.7	ND		3.9	ND		3.6	ND		4.6
1,2,4-Trichlorobenzene	---	---	5,800	473	780,000	1,300,000	ND		7.4	ND		8	ND		7.1	ND		4.9	ND		5	ND		4.8	ND		6
1,2-Dibromo-3-Chloropropane	---	---	5		870	4,500	ND		6.1	ND		6.6	ND		5.9	ND		4	ND		4.2	ND		3.9	ND		4.9
1,2-Dibromoethane	---	---	36		350	1,800	ND		5.5	ND		5.9	ND		5.2	ND		3.6	ND		3.7	ND		3.5	ND		4.4
1,2-Dichlorobenzene	---	---	180,000	989	6,700,000	110,000,000	ND		4	ND		4.3	ND		3.8	ND		2.6	ND		2.7	ND		2.6	ND		3.2
1,2-Dichloroethane	---	---	460		5,800	30,000	ND		2.9	ND		3.1	ND		2.8	ND		1.9	ND		2	ND		1.9	ND		2.3
1,2-Dichloroethene, Total	---	---	7,000		780,000	13,000,000	ND		8	ND		8.6	ND		7.6	ND		5.2	ND		5.4	ND		5.1	ND		6.4
1,2-Dichloropropane	---	---	1,600		19,000	98,000	ND		4.9	ND		5.3	ND		4.7	ND		3.2	ND		3.3	ND		3.1	ND		3.9
1,3-Dichlorobenzene	---	---	---		6,700,000	110,000,000	ND		3.2	ND		3.4	ND		3.1	ND		2.1	ND		2.2	ND		2	ND		2.6
1,4-Dichlorobenzene	---	---	2,600	460	780,000	13,000,000	ND		2	ND		2.2	ND		2	ND		1.3	ND		1.4	ND		1.3	ND		1.6
2-Butanone (MEK)	---	---	2,700,000		47,000,000	780,000,000	ND		5.8	ND		6.3	ND		5.6	ND		3.8	ND		3.9	ND		3.7	ND		4.7

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	ug/kg	ug/kg	ug/kg		ug/kg	mg/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
2-Hexanone	---	---	20,000		390,000	6,500,000	ND		8.4	ND		9	ND		8	ND		5.5	ND		5.7	ND		5.4	ND		6.7
4-Methyl-2-pentanone (MIBK)	---	---	3,300,000		---	---	ND		3.7	ND		4	ND		3.6	ND		2.4	ND		2.5	ND		2.4	ND		3
Acetone	---	---	6,100,000		70,000,000	---	ND		6.3	ND		6.8	ND		6	ND		4.1	ND		4.3	ND		4	ND		5.1
Benzene	---	---	1,200	137	3,000	16,000	ND		3.9	ND		4.2	ND		3.8	ND		2.6	ND		2.7	ND		2.5	ND		3.2
Bromoform	---	---	19,000	1,310	88,000	460,000	ND		5.2	ND		5.6	ND		5	ND		3.4	ND		3.5	ND		3.3	ND		4.2
Bromomethane	---	---	680		110,000	1,800,000	ND		9	ND		9.7	ND		8.6	ND		5.9	ND		6.1	ND		5.8	ND		7.2
Carbon disulfide	---	---	77,000		---	---	ND		6	ND		6.5	ND		5.8	ND		3.9	ND		4.1	ND		3.9	ND		4.8
Carbon tetrachloride	---	---	650	724	7,600	40,000	ND		6.6	ND		7.2	ND		6.4	ND		4.3	ND		4.5	ND		4.2	ND		5.3
Chlorobenzene	---	---	28,000	162	510,000	8,400,000	ND		3.1	ND		3.4	ND		3	ND		2.1	ND		2.1	ND		2	ND		2.5
Chlorodibromomethane	---	---	290		8,300	43,000	ND		4.8	ND		5.2	ND		4.6	ND		3.1	ND		3.3	ND		3.1	ND		3.9
Chloroethane	---	---	1,400,000		---	---	ND		5.2	ND		5.6	ND		5	ND		3.4	ND		3.5	ND		3.3	ND		4.2
Chloroform	---	---	320		780,000	13,000,000	ND		4.2	ND		4.6	ND		4.1	ND		2.8	ND		2.9	ND		2.7	ND		3.4
Chloromethane	---	---	11,000		---	---	ND		7.7	ND		8.3	ND		7.4	ND		5	ND		5.2	ND		4.9	ND		6.2
cis-1,2-Dichloroethene	---	---	16,000		780,000	13,000,000	ND		3.1	ND		3.4	ND		3	ND		2.1	ND		2.1	ND		2	ND		2.5
cis-1,3-Dichloropropene	---	---	1,800	7.31	7,000	36,000	ND		3.2	ND		3.4	ND		3.1	ND		2.1	ND		2.2	ND		2	ND		2.6
Cyclohexane	---	---	650,000		---	---	ND		2.4	ND		2.6	ND		2.3	ND		1.6	ND		1.7	ND		1.6	ND		2
Dichlorobromomethane	---	---	290		---	59,000	ND		4.7	ND		5.1	ND		4.5	ND		3.1	ND		3.2	ND		3	ND		3.8
Dichlorodifluoromethane	---	---	8,700		16,000,000	260,000,000	ND		5.8	ND		6.3	ND		5.6	ND		3.8	ND		3.9	ND		3.7	ND		4.7
Ethylbenzene	---	---	5,800	305	7,800,000	130,000,000	ND		4.3	ND		4.6	ND		4.1	ND		2.8	ND		2.9	ND		2.8	ND		3.5
Isopropylbenzene	---	---	190,000		7,800,000	130,000,000	ND		4.6	ND		5	ND		4.4	ND		3	ND		3.1	ND		3	ND		3.7
Methyl acetate	---	---	7,800,000		78,000,000	---	ND		12	ND		13	ND		11	ND		7.7	ND		8	ND		7.5	ND		9.5
Methyl tert-butyl ether	---	---	47,000		780,000	13,000,000	ND		7.4	ND		7.9	ND		7.1	ND		4.8	ND		5	ND		4.7	ND		5.9
Methylcyclohexane	---	---	---		---	---	ND		4.2	ND		4.5	ND		4	ND		2.8	ND		2.8	ND		2.7	ND		3.4
Methylene Chloride	---	---	35,000		50,000	260,000	**12**	B	7.7	**15**	B	8.3	**14**	B	7.4	**10**	B	5	**13**	B	5.2	**13**	B	4.9	**16**	B	6.2
m-Xylene & p-Xylene	---	---	55,000		12,000,000	190,000,000	ND		3.7	ND		4	ND		3.6	ND		2.5	ND		2.5	ND		2.4	ND		3
o-Xylene	---	---	65,000		12,000,000	190,000,000	ND		4.9	ND		5.3	ND		4.7	ND		3.2	ND		3.3	ND		3.1	ND		3.9
Styrene	---	---	600,000	7,070	16,000,000	260,000,000	ND		2.7	ND		2.9	ND		2.6	ND		1.7	ND		1.8	ND		1.7	ND		2.1
Tetrachloroethene	---	---	8,100	190	330,000	1,700,000	ND		4	ND		4.3	ND		3.8	ND		2.6	ND		2.7	ND		2.6	ND		3.2
Toluene	---	---	490,000	1,090	6,300,000	100,000,000	ND		3.4	ND		3.6	ND		3.2	ND		2.2	ND		2.3	ND		2.2	ND		2.7
trans-1,2-Dichloroethene	---	---	7,000		1,300,000	110,000,000	ND		5.1	ND		5.5	ND		4.9	ND		3.3	ND		3.4	ND		3.2	ND		4.1
trans-1,3-Dichloropropene	---	---	470		7,000	36,000	ND		3.5	ND		3.7	ND		3.3	ND		2.3	ND		2.3	ND		2.2	ND		2.8
Trichloroethene	---	---	410	8,950	15,000	79,000	ND		3	ND		3.2	ND		2.9	ND		2	ND		2	ND		1.9	ND		2.4

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	ug/kg	ug/kg	ug/kg		ug/kg	mg/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
Trichlorofluoromethane	---	---	2,300,000		23,000,000	390,000,000	ND		2.9	ND		3.1	ND		2.8	ND		1.9	ND		2	ND		1.9	ND		2.3
Vinyl chloride	---	---	59		970	5,000	ND		7.3	ND		7.9	ND		7	ND		4.8	ND		5	ND		4.7	ND		5.9
Xylenes, Total	---	---	58,000		12,000,000	190,000,000	ND		8.6	ND		9.3	ND		8.3	ND		5.6	ND		5.8	ND		5.5	ND		6.9

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMI-VOLATILES	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
1,1'-Biphenyl	---	---	4,700		87,000	450,000	ND		1.4	ND		1.5	**1.3**	J	1.3	ND		0.91	ND		0.94	ND		0.88	**2.2**	J	1.1
2,2'-oxybis[1-chloropropane]	---	---	310,000		---	---	ND		2.4	ND		2.6	ND		2.3	ND		1.6	ND		1.7	ND		1.6	ND		2
2,4,5-Trichlorophenol	---	---	630,000	819	6,300,000	190,000,000	ND		2.3	ND		2.5	ND		2.2	ND		1.6	ND		1.6	ND		1.5	ND		1.9
2,4,6-Trichlorophenol	---	---	6,300	2,650	49,000	230,000	ND		1.8	ND		1.9	ND		1.7	ND		1.2	ND		1.2	ND		1.2	ND		1.5
2,4-Dichlorophenol	---	---	19,000		190,000	2,700,000	ND		2.5	ND		2.7	ND		2.4	ND		1.7	ND		1.7	ND		1.6	ND		2.1
2,4-Dimethylphenol	---	---	130,000		1,300,000	18,000,000	ND		2	ND		2.2	ND		2	ND		1.4	ND		1.4	ND		1.3	ND		1.7
2,4-Dinitrophenol	---	---	13,000		130,000	1,800,000	ND		180	ND		200	ND		170	ND		120	ND		120	ND		120	ND		150
2,4-Dinitrotoluene	---	---	1,700		800	3,800	ND		4.9	ND		5.4	ND		4.7	ND		3.3	ND		3.4	ND		3.2	ND		4
2,6-Dinitrotoluene	---	---	360		800	3,800	ND		2	ND		2.2	ND		1.9	ND		1.3	ND		1.4	ND		1.3	ND		1.6
2-Chloronaphthalene	---	---	480,000		4,800,000	67,000,000	ND		1.5	ND		1.6	ND		1.4	ND		1	ND		1	ND		0.96	ND		1.2
2-Chlorophenol	---	---	39,000	344	390,000	6,500,000	ND		1.5	ND		1.7	ND		1.5	ND		1	ND		1	ND		0.98	ND		1.2
2-Methylnaphthalene	70	670	24,000	20.2	240,000	3,300,000	**1.8**	J	1.6	ND		1.7	**1.9**	J	1.5	ND		1	**1.7**	J	1.1	ND		1	**6.7**		1.3
2-Methylphenol	---	---	320,000		320,000	4,600,000	ND		9.4	ND		10	ND		9	ND		6.2	ND		6.4	ND		6	ND		7.7
2-Nitroaniline	---	---	63,000		---	---	ND		15	ND		16	ND		14	ND		9.9	ND		10	ND		9.6	ND		12
2-Nitrophenol	---	---	---		---	---	ND		5.2	ND		5.7	ND		5	ND		3.5	ND		3.6	ND		3.3	ND		4.3
3,3'-Dichlorobenzidine	---	---	1,200	2,060	1,200	5,700	ND		31	ND		33	ND		29	ND		20	ND		21	ND		20	ND		25
3-Nitroaniline	---	---	---		---	---	ND		8.3	ND		9	ND		8	ND		5.5	ND		5.7	ND		5.3	ND		6.8
4,6-Dinitro-2-methylphenol	---	---	510		---	---	ND		56	ND		61	ND		54	ND		38	ND		39	ND		36	ND		46
4-Bromophenyl phenyl ether	---	---	---		---	---	ND		2.3	ND		2.5	ND		2.2	ND		1.5	ND		1.6	ND		1.5	ND		1.9
4-Chloro-3-methylphenol	---	---	630,000		---	---	ND		1.5	ND		1.7	ND		1.5	ND		1	ND		1.1	ND		0.99	ND		1.3
4-Chloroaniline	---	---	2,700		2,700	13,000	ND		2.2	ND		2.4	ND		2.1	ND		1.5	ND		1.5	ND		1.4	ND		1.8
4-Chlorophenyl phenyl ether	---	---	---		---	---	ND		2	ND		2.2	ND		1.9	ND		1.3	ND		1.4	ND		1.3	ND		1.6
4-Nitroaniline	---	---	25,000		27,000	130,000	ND		1.6	ND		1.7	ND		1.5	ND		1.1	ND		1.1	ND		1	ND		1.3
4-Nitrophenol	---	---	---		---	---	ND		23	ND		25	ND		22	ND		15	ND		16	ND		15	ND		19

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMI-VOLATILES	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
Acenaphthene	16	500	360,000	6.71	3,600,000	50,000,000	ND		1.9	ND		2	ND		1.8	ND		1.3	ND		1.3	ND		1.2	**7.2**		1.5
Acenaphthylene	44	640	---		---	---	**1.7**	J	1.4	ND		1.6	**2**	J	1.4	ND		0.95	ND		0.98	ND		0.92	**2.2**	J	1.2
Acetophenone	---	---	780,000		7,800,000	130,000,000	ND		1.8	ND		1.9	ND		1.7	ND		1.2	ND		1.2	ND		1.1	ND		1.4
Anthracene	85.3	1100	1,800,000	46.9	18,000,000	250,000,000	**2.2**	J	1.7	**2.2**	J	1.8	**2.4**	J	1.6	**1.2**	J	1.1	ND		1.2	ND		1.1	**15**		1.4
Atrazine	---	---	2,400		220,000	3,200,000	ND		14	ND		16	ND		14	ND		9.5	ND		9.8	ND		9.2	ND		12
Benzaldehyde	---	---	170,000		170,000	910,000	ND		4.1	ND		4.4	ND		3.9	ND		2.7	ND		2.8	ND		2.6	ND		3.3
Benz[a]anthracene	261	1600	1,100	74.8	5,100	23,000	**5.6**	J	2.9	**5.8**	J	3.2	**6.6**		2.8	**3**	J	2	ND		2	ND		1.9	**26**		2.4
Benzo[a]pyrene	430	1600	240	88.8	510	2,300	**5.8**	J	2.8	**6**	J	3.1	**6.8**		2.7	**3.2**	J	1.9	ND		1.9	ND		1.8	**23**		2.3
Benzo[b]fluoranthene	---	---	1,100		5,100	23,000	**7.2**		1.6	**6.8**	J	1.7	**8.5**		1.5	**3.5**	J	1.1	ND		1.1	ND		1	**27**		1.3
Benzo[g,h,i]perylene	---	---	---		---	---	**4.8**	J	1.4	**5**	J	1.5	**6.4**		1.4	**2.3**	J	0.94	ND		0.97	ND		0.91	**17**		1.2
Benzo[k]fluoranthene	---	---	11,000		51,000	230,000	**2.5**	J	2	**2.5**	J	2.1	**2.9**	J	1.9	**1.7**	J	1.3	ND		1.3	ND		1.3	**11**		1.6
Bis(2-chloroethoxy)methane	---	---	19,000		190,000	2,700,000	ND		1.6	ND		1.7	ND		1.5	ND		1	ND		1.1	ND		1	ND		1.3
Bis(2-chloroethyl)ether	---	---	230		630	3,300	ND		1.2	ND		1.3	ND		1.1	ND		0.79	ND		0.81	ND		0.76	ND		0.97
Bis(2-ethylhexyl) phthalate	---	---	39,000	182	39,000	180,000	ND		35	ND		38	ND		33	ND		23	ND		24	ND		22	ND		29
Butyl benzyl phthalate	---	---	290,000	16,800	290,000	1,300,000	ND		23	ND		25	ND		22	ND		15	ND		15	ND		14	ND		18
Caprolactam	---	---	3,100,000		32,000,000	460,000,000	ND		21	ND		23	ND		20	ND		14	ND		15	ND		14	ND		17
Carbazole	---	---	---		---	---	ND		1.5	ND		1.7	ND		1.5	ND		1	ND		1	ND		0.98	**3.7**	J	1.2
Chrysene	384	2800	110,000	108	510,000	2,300,000	**6.9**		3.6	**6.5**	J	3.9	**7.9**		3.5	**3.4**	J	2.4	ND		2.5	ND		2.3	**30**		3
Dibenz(a,h)anthracene	63.4	260	170	6.2	510	2,300	ND		4.2	ND		4.5	ND		4	ND		2.8	ND		2.9	ND		2.7	**5.9**		3.4
Dibenzofuran	---	---	7,800	7,300	---	---	ND		1.4	ND		1.6	ND		1.4	ND		0.95	ND		0.98	ND		0.92	**2.9**	J	1.2
Diethyl phthalate	---	---	5,100,000	218	51,000,000	730,000	ND		11	ND		12	ND		11	ND		7.6	ND		7.9	ND		7.4	ND		9.4
Dimethyl phthalate	---	---	---		---	---	ND		2.4	ND		2.6	ND		2.3	ND		1.6	ND		1.7	ND		1.6	ND		2
Di-n-butyl phthalate	---	---	630,000	1,160	6,300,000	91,000,000	ND		14	ND		16	ND		14	ND		9.5	ND		9.8	ND		9.2	ND		12
Di-n-octyl phthalate	---	---	63,000		630,000	9,100,000	ND		19	ND		21	ND		18	ND		13	ND		13	ND		12	ND		16
Fluoranthene	600	5100	240,000	113	2,400,000	33,000,000	**9**		1.7	**9.2**		1.9	**10**		1.7	**4.8**		1.1	**6.5**		1.2	**2.2**	J	1.1	**39**		1.4
Fluorene	19	540	240,000	21	2,400,000	33,000,000	**1.7**	J	1.3	ND		1.4	**1.4**	J	1.2	ND		0.85	ND		0.88	ND		0.83	**5.5**		1
Hexachlorobenzene	---	---	78		430	2,300	ND		2.3	ND		2.6	ND		2.3	ND		1.6	ND		1.6	ND		1.5	ND		1.9
Hexachlorobutadiene	---	---	1,200		8,900	47,000	ND		1.9	ND		2.1	ND		1.8	ND		1.3	ND		1.3	ND		1.2	ND		1.6
Hexachlorocyclopentadiene	---	---	180	139	470,000	7,800,000	ND	*	3.3	ND	*	3.6	ND	*	3.2	ND	*	2.2	ND		2.3	ND		2.1	ND		2.7
Hexachloroethane	---	---	1,800	804	17,000	91,000	ND		1.7	ND		1.8	ND		1.6	ND		1.1	ND		1.2	ND		1.1	ND		1.4
Indeno[1,2,3-cd]pyrene	---	---	1,300		5,100	23,000	**4.8**	J	3.3	**4.1**	J	3.5	**5**	J	3.1	ND		2.2	ND		2.2	ND		2.1	**14**		2.7
Isophorone	---	---	570,000		570,000	2,700,000	ND		1.7	ND		1.8	ND		1.6	ND		1.1	ND		1.1	ND		1.1	ND		1.4

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMI-VOLATILES	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
Methylphenol, 3 & 4	---	---	130,000		320,000	4,600,000	ND		9.6	ND		10	ND		9.2	ND		6.4	ND		6.6	ND		6.2	ND		7.8
Naphthalene	160	2100	2,000	34.6	2,500,000	34,000,000	**3.6**	J	1.3	**3**	J	1.4	**3.8**	J	1.2	**1.3**	J	0.85	ND		0.87	ND		0.82	**5.5**		1
Nitrobenzene	---	---	5,100		160,000	2,600,000	ND		12	ND		13	ND		11	ND		8	ND		8.2	ND		7.7	ND		9.8
N-Nitrosodi-n-propylamine	---	---	78		170	360	ND		2.2	ND		2.4	ND		2.1	ND		1.5	ND		1.5	ND		1.4	ND		1.8
N-Nitrosodiphenylamine	---	---	110,000	422,000	110,000	520,000	ND		11	ND		12	ND		10	ND		7.2	ND		7.5	ND		7	ND		8.9
Pentachlorophenol	---	---	1,000		1,000	4,400	ND		52	ND		57	ND		50	ND		35	ND		36	ND		34	ND		43
Phenanthrene	240	1500	180,000	86.7	---	---	**5.3**	J	1.8	**5.2**	J	1.9	**5.3**	J	1.7	**3.1**	J	1.2	**5.3**		1.2	**1.1**	J	1.1	**52**		1.4
Phenol	---	---	1,900,000		19,000,000	270,000,000	ND		9.9	ND		11	ND		9.5	ND		6.6	ND		6.8	ND		6.4	ND		8.1
Pyrene	665	2600	180,000	153	1,800,000	25,000,000	**9.8**		1.5	**9.5**		1.7	**11**		1.5	**5.5**		1	**7.3**		1.1	**3**	J	1	**39**		1.3

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PESTICIDES	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
4,4'-DDD	---	---	190	1.22	2,300	11,000	**1.9**		0.18	**1.5**		0.19	**0.49**	p	0.17	**0.34**		0.11	**0.42**		0.024	**0.2**		0.023	**1.8**	p	0.14
4,4'-DDE	2.2	27	2,000	2.07	2,000	11,000	**1.7**		0.083	**1.8**		0.091	**0.72**		0.08	**0.27**		0.055	**0.48**		0.011	**0.26**		0.011	**3.6**	p	0.068
4,4'-DDT	1.58	46.1	1,900	1.19	1,900	9,500	ND		0.16	ND		0.18	ND		0.16	ND		0.11	ND		0.022	ND		0.021	**8.8**	p	0.13
Aldrin	---	---	39		41	210	ND		0.13	ND		0.14	ND		0.12	ND		0.083	ND		0.018	ND		0.017	ND		0.1
alpha-BHC	---	---	86	1,360	86	410	ND		0.1	ND		0.11	ND		0.097	ND		0.066	ND		0.014	ND		0.013	ND		0.082
beta-BHC	---	---	300		300	1,400	ND		0.11	ND		0.12	ND		0.11	ND		0.074	ND		0.015	**0.088**	p	0.015	**0.82**	p	0.092
cis-Chlordane (alpha)	---	---	3,600		270	1,400	ND		0.1	ND		0.11	ND		0.099	ND		0.067	ND		0.014	ND		0.013	ND		0.084
delta-BHC	---	---	---		---	---	ND		0.13	ND		0.14	ND		0.12	ND		0.085	ND		0.018	ND		0.017	ND		0.11
Dieldrin	---	---	34		---	---	ND		0.1	ND		0.11	ND		0.099	ND		0.067	ND		0.014	ND		0.013	**0.99**		0.084
Endosulfan I	---	---	47,000	0.11	470,000	7,800,000	ND		0.11	ND		0.12	ND		0.11	ND		0.073	ND		0.015	ND		0.014	ND		0.091
Endosulfan II	---	---	47,000		470,000	7,800,000	ND		0.09	ND		0.099	ND		0.087	ND		0.059	ND		0.012	ND		0.012	ND		0.074
Endosulfan sulfate	---	---	38,000		---	---	ND		0.11	ND		0.12	ND		0.1	ND		0.07	ND		0.015	ND		0.014	ND		0.087
Endrin	---	---	1,900	2.67	19,000	270,000	**0.23**	J p	0.077	**0.22**	J p	0.084	**0.26**	J	0.074	ND		0.05	**0.062**	p	0.011	**0.034**	J p	0.01	**8.3**		0.063
Endrin aldehyde	---	---	---		---	---	ND		0.15	ND		0.16	ND		0.14	ND		0.096	ND		0.02	ND		0.019	ND		0.12
Endrin ketone	---	---	---		---	---	ND		0.056	ND		0.062	ND		0.054	ND		0.037	ND		0.008	ND		0.007	ND		0.046
gamma-BHC (Lindane)	---	---	570	0.32	570	2,800	ND		0.11	ND		0.12	ND		0.1	ND		0.069	ND		0.015	ND		0.014	ND		0.086
Heptachlor	---	---	130		150	810	ND		0.13	ND		0.14	ND		0.12	ND		0.084	ND		0.018	ND		0.017	ND		0.1

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PESTICIDES	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg			ug/kg		
Heptachlor epoxide	---	---	70	0.6	76	400	ND		0.1	ND		0.11	ND		0.1	ND		0.069	ND		0.014	ND		0.014	ND		0.086
Methoxychlor	---	---	32,000	29.6	320,000	4,600,000	ND		0.16	ND		0.17	ND		0.15	ND		0.1	ND		0.022	ND		0.021	ND		0.13
Toxaphene	---	---	490	536	490	2,300	ND		11	ND		12	ND		11	ND		7.3	ND		1.5	ND		1.4	ND		9.1
trans-Chlordane (gamma)	---	---	3,600		270	1,400	ND		0.095	ND		0.1	ND		0.092	ND		0.062	ND		0.013	ND		0.012	ND		0.078

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PCB Congeners	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g			ng/g			ng/g			ng/g			ng/g			ng/g			ng/g		
PCB-001	---	---	---	---	---	---	0.027	B	4E-04	0.08	B	6E-04	0.019	J q B	5E-04	0.0049	J q B	4E-04	0.0052	J B	2E-04	0.004	J q B	1E-04	0.016	J q B	6E-04
PCB-002	---	---	---	---	---	---	0.05	B	5E-04	0.073	B	7E-04	0.046	B	6E-04	0.01	B	4E-04	0.0096	J q B	2E-04	0.0051	J q B	2E-04	0.044	B	8E-04
PCB-003	---	---	---	---	---	---	0.045	B	6E-04	0.069	B	7E-04	0.041	B	8E-04	0.014	B	5E-04	0.0089	J q B	2E-04	0.0065	J B	2E-04	0.046	B	9E-04
PCB-004	---	---	---	---	---	---	0.05	B	7E-04	0.073	B	9E-04	0.048	B	0.002	0.013	J B	0.002	0.01	J B	8E-04	0.0066	J q B	8E-04	0.045	B	0.002
PCB-005	---	---	---	---	---	---	0.0038	J	5E-04	0.0051	J	6E-04	0.0031	J q	0.001	ND		0.002	0.00076	J q	6E-04	0.001	J	6E-04	0.0021	J q	0.002
PCB-006	---	---	---	---	---	---	0.073		5E-04	0.074		6E-04	0.06		0.001	0.015		0.002	0.011		6E-04	0.0057	J q	6E-04	0.063		0.002
PCB-007	---	---	---	---	---	---	0.0063	J	4E-04	0.012		6E-04	0.0079	J	0.001	0.0031	J q	0.001	0.0017	J	6E-04	0.0014	J q	6E-04	0.008	J	0.002
PCB-008	---	---	---	---	---	---	0.1	B	4E-04	0.15	B	6E-04	0.099	B	0.001	0.025	B	0.002	0.023	B	6E-04	0.018	J B	6E-04	0.1	B	0.002
PCB-009	---	---	---	---	---	---	0.0066	J q	5E-04	0.014		7E-04	0.0084	J	0.001	0.0032	J	0.002	0.0012	J q	7E-04	0.0026	J	7E-04	0.0071	J q	0.002
PCB-010	---	---	---	---	---	---	0.0041	J q	5E-04	0.0069	J	7E-04	0.0041	J q	0.001	ND		0.002	0.00088	J q	6E-04	ND		6E-04	ND		0.002
PCB-011	---	---	---	---	---	---	0.2	B	0.0	0.25	B	6E-04	0.2	B	0.0	0.031	B	0.001	0.026	B	6E-04	0.0	J B	0.0	0.16	B	0.002
PCB-012	---	---	---	---	---	---	0.069	C	4E-04	0.084	C	6E-04	0.068	C	0.001	0.015	J q C	0.001	0.01	J q C	6E-04	0.0077	J C	6E-04	0.069	C	0.002
PCB-013	---	---	---	---	---	---	0.069	C12	4E-04	0.084	C12	6E-04	0.068	C12	0.001	0.015	J q C12	0.001	0.01	J q C12	6E-04	0.0077	J C12	6E-04	0.069	C12	0.002
PCB-014	---	---	---	---	---	---	0.0023	J q	4E-04	0.0039	J	5E-04	0.003	J q	0.001	ND		0.001	ND		5E-04	ND		5E-04	0.0023	J q	0.002
PCB-015	---	---	---	---	---	---	0.21	B	4E-04	0.26	B	6E-04	0.21	B	0.001	0.038	B	0.002	0.041	B	6E-04	0.023	B	6E-04	0.2	B	0.002
PCB-016	---	---	---	---	---	---	0.062	B	6E-04	0.067	B	8E-04	0.052	B	0.001	0.016	B	8E-04	0.012	B	8E-04	0.0078	J q B	6E-04	0.04	q B	0.002
PCB-017	---	---	---	---	---	---	0.094		4E-04	0.11		7E-04	0.08		1E-03	0.019		7E-04	0.018		6E-04	0.013		5E-04	0.086		0.002
PCB-018	---	---	---	---	---	---	0.15	C	4E-04	0.16	C	6E-04	0.12	C	8E-04	0.037	C	6E-04	0.026	C	5E-04	0.021	C	4E-04	0.11	C	0.001
PCB-019	---	---	---	---	---	---	0.028		5E-04	0.033		8E-04	0.027		0.001	0.0068	J	8E-04	0.0058	J	8E-04	0.0033	J	6E-04	0.02		0.002
PCB-020	---	---	---	---	---	---	0.47	C B	0.002	0.57	C B	0.003	0.44	C B	0.002	0.081	C B	0.001	0.083	C B	8E-04	0.052	C B	7E-04	0.4	C B	0.004
PCB-021	---	---	---	---	---	---	0.13	C B	0.002	0.16	C B	0.003	0.13	C B	0.002	0.029	C B	0.001	0.034	C B	8E-04	0.028	C B	6E-04	0.14	C B	0.004
PCB-022	---	---	---	---	---	---	0.075	B	0.002	0.096	B	0.003	0.072	B	0.002	0.01	q B	0.001	0.014	B	9E-04	0.01	B	7E-04	0.059	B	0.004
PCB-023	---	---	---	---	---	---	ND		0.002	ND		0.003	ND		0.002	ND		0.001	ND		9E-04	ND		7E-04	ND		0.004
PCB-024	---	---	---	---	---	---	0.0033	J q	3E-04	0.0045	J	5E-04	0.0042	J	7E-04	ND		5E-04	0.00047	J q	5E-04	0.00089	J	4E-04	ND		0.001
PCB-025	---	---	---	---	---	---	0.13	B	0.002	0.12	B	0.003	0.099	B	0.002	0.023	B	0.001	0.016	B	8E-04	0.0081	J B	7E-04	0.096	B	0.004
PCB-026	---	---	---	---	---	---	0.15	C B	0.002	0.14	C B	0.003	0.13	C B	0.002	0.027	C B	0.001	0.022	C B	8E-04	0.012	J C B	7E-04	0.11	C B	0.004
PCB-027	---	---	---	---	---	---	0.041		3E-04	0.044		5E-04	0.033		7E-04	0.0091	J	5E-04	0.006	J q	5E-04	0.004	J q	4E-04	0.033		0.001
PCB-028	---	---	---	---	---	---	0.47	B C20	0.002	0.57	B C20	0.003	0.44	C20 B	0.002	0.081	C20 B	0.001	0.083	C20 B	8E-04	0.052	C20 B	7E-04	0.4	C20 B	0.004
PCB-029	---	---	---	---	---	---	0.15	C26 B	0.002	0.14	C26 B	0.003	0.13	C26 B	0.002	0.027	C26 B	0.001	0.022	C26 B	8E-04	0.012	J C26 B	7E-04	0.11	C26 B	0.004

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PCB Congeners	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g			ng/g			ng/g			ng/g			ng/g			ng/g			ng/g		
PCB-030	---	---	---	---	---	---	0.15	C18	4E-04	0.16	C18	6E-04	0.12	C18	8E-04	0.037	C18	6E-04	0.026	C18	5E-04	0.021	C18	4E-04	0.11	C18	0.001
PCB-031	---	---	---	---	---	---	0.31	B	0.002	0.36	B	0.003	0.29	B	0.002	0.058	B	0.001	0.054	B	8E-04	0.034	B	6E-04	0.27	B	0.004
PCB-032	---	---	---	---	---	---	0.093	B	3E-04	0.096	B	4E-04	0.082	B	6E-04	0.018	q B	4E-04	0.017	B	4E-04	0.012	B	3E-04	0.071	B	0.001
PCB-033	---	---	---	---	---	---	0.13	B C21	0.002	0.16	B C21	0.003	0.13	C21 B	0.002	0.029	C21 B	0.001	0.034	C21 B	8E-04	0.028	C21 B	6E-04	0.14	C21 B	0.004
PCB-034	---	---	---	---	---	---	0.0071	J B	0.002	0.0072	J B	0.003	0.0065	J B	0.002	0.0017	J B	0.001	0.0024	J B	9E-04	0.00079	J q B	7E-04	0.0062	J q B	0.004
PCB-035	---	---	---	---	---	---	0.03		0.002	0.043		0.003	0.031		0.002	0.012		0.001	0.0061	J	9E-04	0.0034	J q	7E-04	0.035		0.004
PCB-036	---	---	---	---	---	---	0.0052	J q	0.002	0.0061	J q	0.003	0.0039	J q	0.002	ND		0.001	0.00096	J q	8E-04	ND		7E-04	ND		0.004
PCB-037	---	---	---	---	---	---	0.15	B	0.002	0.2	B	0.003	0.15	B	0.002	0.025	B	0.001	0.031	B	9E-04	0.019	B	7E-04	0.14	B	0.004
PCB-038	---	---	---	---	---	---	ND		0.002	ND		0.003	ND		0.002	ND		0.001	ND		8E-04	ND		7E-04	ND		0.004
PCB-039	---	---	---	---	---	---	0.0048	J	0.002	0.0053	J q	0.003	0.0044	J q	0.002	ND		0.001	0.0012	J q	8E-04	0.00082	J	6E-04	0.0053	J	0.004
PCB-040	---	---	---	---	---	---	0.57	C	0.001	0.56	C	0.002	0.47	C	0.003	0.13	C	0.003	0.1	C	0.001	0.063	C	7E-04	0.53	C	0.004
PCB-041	---	---	---	---	---	---	0.57	C40	0.001	0.56	C40	0.002	0.47	C40	0.003	0.13	C40	0.003	0.1	C40	0.001	0.063	C40	7E-04	0.53	C40	0.004
PCB-042	---	---	---	---	---	---	0.23		0.002	0.24		0.002	0.19		0.003	0.049		0.003	0.037		0.001	0.026		8E-04	0.19		0.005
PCB-043	---	---	---	---	---	---	0.024	C	0.001	0.022	C q	0.002	0.021	J q C	0.003	0.008	J C	0.003	0.005	J C	0.001	0.0017	J q C	7E-04	0.022	J q C	0.004
PCB-044	---	---	---	---	---	---	0.73	C B	0.001	0.79	C B	0.001	0.62	C B	0.002	0.15	C B	0.003	0.12	C B	0.001	0.086	C B	6E-04	0.62	C B	0.004
PCB-045	---	---	---	---	---	---	0.12	C	0.001	0.13	C	0.002	0.11	C	0.003	0.025	C	0.003	0.021	C	0.001	0.014	J C	7E-04	0.12	C	0.005
PCB-046	---	---	---	---	---	---	0.042		0.002	0.04		0.002	0.032		0.003	0.0079	J q	0.004	0.0068	J	0.001	0.0052	J	9E-04	0.03		0.005
PCB-047	---	---	---	---	---	---	0.73	B C44	0.001	0.79	B C44	0.001	0.62	C44 B	0.002	0.15	C44 B	0.003	0.12	C44 B	0.001	0.086	C44 B	6E-04	0.62	C44 B	0.004
PCB-048	---	---	---	---	---	---	0.047		0.001	0.054		0.002	0.042		0.003	0.01		0.003	0.0085	J	0.001	0.0083	J	7E-04	0.032	q	0.004
PCB-049	---	---	---	---	---	---	0.72	C	0.001	0.71	C	0.001	0.6	C	0.002	0.16	C	0.003	0.12	C	1E-03	0.074	C	6E-04	0.61	C	0.004
PCB-050	---	---	---	---	---	---	0.12	C	0.001	0.12	C	0.002	0.1	C	0.003	0.026	C	0.003	0.018	J C	0.001	0.013	J C	7E-04	0.11	C	0.004
PCB-051	---	---	---	---	---	---	0.12	C45	0.001	0.13	C45	0.002	0.11	C45	0.003	0.025	C45	0.003	0.021	C45	0.001	0.014	J C45	7E-04	0.12	C45	0.005
PCB-052	---	---	---	---	---	---	0.97		0.001	0.98		0.002	0.8		0.003	0.21		0.003	0.17		0.001	0.11		7E-04	0.79		0.005
PCB-053	---	---	---	---	---	---	0.12	C50	0.001	0.12	C50	0.002	0.1	C50	0.003	0.026	C50	0.003	0.018	J C50	0.001	0.013	J C50	7E-04	0.11	C50	0.004
PCB-054	---	---	---	---	---	---	0.0084	J B	5E-05	0.0091	J B q	8E-05	0.0061	J q B	1E-04	ND		2E-04	0.0013	J q B	6E-05	0.00029	J B	1E-04	0.0075	J B	3E-04
PCB-055	---	---	---	---	---	---	0.013	q	1E-03	0.016		0.001	0.01	J q	0.002	0.0029	J q	0.002	0.0034	J	8E-04	0.00093	J q	5E-04	0.0089	J	0.003
PCB-056	---	---	---	---	---	---	0.18	B	0.001	0.22	B	0.001	0.16	B	0.002	0.031	B	0.002	0.035	B	9E-04	0.026	B	5E-04	0.14	B	0.003
PCB-057	---	---	---	---	---	---	0.0034	J	1E-03	0.0038	J	0.001	ND		0.002	ND		0.002	ND		9E-04	ND		5E-04	ND		0.003
PCB-058	---	---	---	---	---	---	0.0058	J	1E-03	0.0075	J	0.001	0.0054	J	0.002	ND		0.002	0.001	J q	8E-04	0.00051	J	5E-04	ND		0.003
PCB-059	---	---	---	---	---	---	0.053	C	9E-04	0.056	C	0.001	0.043	J C	0.002	0.011	J C	0.002	0.009	J C	8E-04	0.0068	J C	5E-04	0.039	J C	0.003
PCB-060	---	---	---	---	---	---	0.043		1E-03	0.056		0.001	0.041		0.002	0.0066	J q	0.002	0.008	J q	8E-04	0.0052	J	5E-04	0.037		0.003
PCB-061	---	---	---	---	---	---	0.74	C B	9E-04	0.88	C B	0.001	0.65	C B	0.002	0.14	C B	0.002	0.13	C B	8E-04	0.088	C B	5E-04	0.6	C B	0.003
PCB-062	---	---	---	---	---	---	0.053	C59	9E-04	0.056	C59	0.001	0.043	J C59	0.002	0.011	J C59	0.002	0.009	J C59	8E-04	0.0068	J C59	5E-04	0.039	J C59	0.003
PCB-063	---	---	---	---	---	---	0.012		9E-04	0.017		0.001	0.015	J	0.002	ND		0.002	0.0025	J q	7E-04	0.002	J	5E-04	0.0089	J q	0.003
PCB-064	---	---	---	---	---	---	0.21		9E-04	0.23		0.001	0.18		0.002	0.042		0.002	0.035		8E-04	0.027		5E-04	0.16		0.003
PCB-065	---	---	---	---	---	---	0.73	B C44	0.001	0.79	B C44	0.001	0.62	C44 B	0.002	0.15	C44 B	0.003	0.12	C44 B	0.001	0.086	C44 B	6E-04	0.62	C44 B	0.004
PCB-066	---	---	---	---	---	---	0.58	B	1E-03	0.73	B	0.001	0.53	B	0.002	0.11	B	0.002	0.11	B	9E-04	0.075	B	5E-04	0.5	B	0.003
PCB-067	---	---	---	---	---	---	0.018		9E-04	0.022		0.001	0.019	J	0.002	ND		0.002	0.0031	J q	8E-04	0.0018	J	5E-04	0.012	J q	0.003
PCB-068	---	---	---	---	---	---	0.02	B	9E-04	0.022	B	0.001	0.02	B	0.002	0.0044	J B	0.002	0.0039	J B	7E-04	0.0022	J q B	4E-04	0.022	B	0.003
PCB-069	---	---	---	---	---	---	0.72	C49	0.001	0.71	C49	0.001	0.6	C49	0.002	0.16	C49	0.003	0.12	C49	1E-03	0.074	C49	6E-04	0.61	C49	0.004
PCB-070	---	---	---	---	---	---	0.74	C61 B	9E-04	0.88	C61 B	0.001	0.65	C61 B	0.002	0.14	C61 B	0.002	0.13	C61 B	8E-04	0.088	C61 B	5E-04	0.6	C61 B	0.003

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PCB Congeners	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g			ng/g			ng/g			ng/g			ng/g			ng/g			ng/g		
PCB-071	---	---	---	---	---	---	0.57	C40	0.001	0.56	C40	0.002	0.47	C40	0.003	0.13	C40	0.003	0.1	C40	0.001	0.063	C40	7E-04	0.53	C40	0.004
PCB-072	---	---	---	---	---	---	0.033		1E-03	0.035		0.001	0.029		0.002	0.0088	J	0.002	0.0055	J	8E-04	0.0026	J	5E-04	0.028		0.003
PCB-073	---	---	---	---	---	---	0.024	C43	0.001	0.022	C43 q	0.002	0.021	J q C43	0.003	0.008	J C43	0.003	0.005	J C43	0.001	0.0017	J q C43	7E-04	0.022	J q C43	0.004
PCB-074	---	---	---	---	---	---	0.74	C61 B	9E-04	0.88	C61 B	0.001	0.65	C61 B	0.002	0.14	C61 B	0.002	0.13	C61 B	8E-04	0.088	C61 B	5E-04	0.6	C61 B	0.003
PCB-075	---	---	---	---	---	---	0.053	C59	9E-04	0.056	C59	0.001	0.043	J C59	0.002	0.011	J C59	0.002	0.009	J C59	8E-04	0.0068	J C59	5E-04	0.039	J C59	0.003
PCB-076	---	---	---	---	---	---	0.74	C61 B	9E-04	0.88	C61 B	0.001	0.65	C61 B	0.002	0.14	C61 B	0.002	0.13	C61 B	8E-04	0.088	C61 B	5E-04	0.6	C61 B	0.003
PCB-077	---	---	38	---	---	---	0.077		1E-03	0.11		0.001	0.085		0.002	0.021		0.002	0.017		8E-04	0.011		5E-04	0.081		0.003
PCB-078	---	---	---	---	---	---	ND		1E-03	ND		0.001	ND		0.002	ND		0.002	ND		8E-04	ND		5E-04	ND		0.003
PCB-079	---	---	---	---	---	---	0.0093	J	8E-04	0.013		1E-03	0.012	J	0.002	ND		0.002	0.0015	J q	7E-04	0.00065	J q	4E-04	0.009	J	0.003
PCB-080	---	---	---	---	---	---	ND		9E-04	ND		0.001	ND		0.002	ND		0.002	ND		7E-04	ND		5E-04	ND		0.003
PCB-081	---	---	12	---	---	---	0.0019	J q	1E-03	0.0021	J q	0.001	ND		0.002	ND		0.002	ND		9E-04	ND		5E-04	ND		0.003
PCB-082	---	---	---	---	---	---	0.064		4E-04	0.076		7E-04	0.064		9E-04	0.011	q	0.002	0.012		5E-04	0.012		7E-04	0.05		0.002
PCB-083	---	---	---	---	---	---	1	C B	3E-04	1.2	C B	6E-04	0.89	C B	8E-04	0.2	C B	0.001	0.18	C B	5E-04	0.11	C B	6E-04	0.95	C B	0.002
PCB-084	---	---	---	---	---	---	0.26		4E-04	0.29		7E-04	0.22		9E-04	0.057		0.002	0.045		5E-04	0.031		7E-04	0.21		0.002
PCB-085	---	---	---	---	---	---	0.095	C B	3E-04	0.13	C B	5E-04	0.087	C B	7E-04	0.017	J C B	0.001	0.018	J C B	4E-04	0.014	J C B	5E-04	0.075	C B	0.001
PCB-086	---	---	---	---	---	---	0.43	C B	3E-04	0.53	C B	5E-04	0.4	C B	7E-04	0.082	C B	0.001	0.08	C B	4E-04	0.059	C B	5E-04	0.36	C B	0.001
PCB-087	---	---	---	---	---	---	0.43	B C86	3E-04	0.53	B C86	5E-04	0.4	C86 B	7E-04	0.082	C86 B	0.001	0.08	C86 B	4E-04	0.059	C86 B	5E-04	0.36	C86 B	0.001
PCB-088	---	---	---	---	---	---	0.4	C	3E-04	0.4	C	6E-04	0.31	C	8E-04	0.087	C	0.001	0.072	C	4E-04	0.038	C	6E-04	0.37	C	0.002
PCB-089	---	---	---	---	---	---	ND		3E-04	0.0054	J q	7E-04	0.0059	J q	9E-04	ND		0.001	ND		5E-04	ND		6E-04	ND		0.002
PCB-090	---	---	---	---	---	---	0.98	C B	3E-04	1.2	C B	5E-04	0.87	C B	7E-04	0.2	C B	0.001	0.19	C B	4E-04	0.13	C B	5E-04	0.85	C B	0.002
PCB-091	---	---	---	---	---	---	0.4	C88	3E-04	0.4	C88	6E-04	0.31	C88	8E-04	0.087	C88	0.001	0.072	C88	4E-04	0.038	C88	6E-04	0.37	C88	0.002
PCB-092	---	---	---	---	---	---	0.18		3E-04	0.22		6E-04	0.17		8E-04	0.034		0.001	0.037		5E-04	0.027		6E-04	0.14		0.002
PCB-093	---	---	---	---	---	---	0.07	C	3E-04	0.073	C	6E-04	0.059	C	8E-04	0.012	J q C	0.001	0.011	J q C	4E-04	0.0069	J C	6E-04	0.076	C	0.002
PCB-094	---	---	---	---	---	---	0.013		3E-04	0.014		7E-04	0.008	J q	9E-04	ND		0.001	0.0017	J	5E-04	0.0015	J	6E-04	0.007	J q	0.002
PCB-095	---	---	---	---	---	---	0.92	B	3E-04	1	B	6E-04	0.76	B	8E-04	0.19	B	0.001	0.18	B	5E-04	0.11	B	6E-04	0.75	B	0.002
PCB-096	---	---	---	---	---	---	0.013		3E-04	0.014		5E-04	0.01	J q	7E-04	0.0026	J q	0.001	0.0035	J	4E-04	0.0018	J	5E-04	0.013	J	0.001
PCB-097	---	---	---	---	---	---	0.43	B C86	3E-04	0.53	B C86	5E-04	0.4	C86 B	7E-04	0.082	C86 B	0.001	0.08	C86 B	4E-04	0.059	C86 B	5E-04	0.36	C86 B	0.001
PCB-098	---	---	---	---	---	---	0.072	C	3E-04	0.079	C	6E-04	0.059	C	8E-04	0.015	J q C	0.001	0.014	J C	4E-04	0.0082	J C	6E-04	0.068	C	0.002
PCB-099	---	---	---	---	---	---	1	C83 B	3E-04	1.2	C83 B	6E-04	0.89	C83 B	8E-04	0.2	C83 B	0.001	0.18	C83 B	5E-04	0.11	C83 B	6E-04	0.95	C83 B	0.002
PCB-100	---	---	---	---	---	---	0.07	C93	3E-04	0.073	C93	6E-04	0.059	C93	8E-04	0.012	J q C93	0.001	0.011	J q C93	4E-04	0.0069	J C93	6E-04	0.076	C93	0.002
PCB-101	---	---	---	---	---	---	0.98	B C90	3E-04	1.2	B C90	5E-04	0.87	C90 B	7E-04	0.2	C90 B	0.001	0.19	C90 B	4E-04	0.13	C90 B	5E-04	0.85	C90 B	0.002
PCB-102	---	---	---	---	---	---	0.072	C98	3E-04	0.079	C98	6E-04	0.059	C98	8E-04	0.015	J q C98	0.001	0.014	J C98	4E-04	0.0082	J C98	6E-04	0.068	C98	0.002
PCB-103	---	---	---	---	---	---	0.072	B	3E-04	0.069	B	6E-04	0.058	B	8E-04	0.014	B	0.001	0.011	B	4E-04	0.0069	J B	6E-04	0.072	B	0.002
PCB-104	---	---	---	---	---	---	0.0024	J q	2E-04	0.0021	J q	4E-04	ND		6E-04	ND		9E-04	ND		3E-04	ND		4E-04	0.0047	J	0.001
PCB-105	---	---	120	---	---	---	0.17	B	0.001	0.22	B	0.002	0.17	B	0.002	0.025	B	9E-04	0.031	B	5E-04	0.021	B	5E-04	0.15	B	0.002
PCB-106	---	---	---	---	---	---	ND		0.0	ND		0.002	ND		0.0	ND		1E-03	ND		6E-04	ND		0.0	ND		0.002
PCB-107	---	---	---	---	---	---	0.1		0.0	0.091		0.002	0.1		0.0	0.013		9E-04	0.013		5E-04	0.0	J	0.0	0.058		0.002
PCB-108	---	---	---	---	---	---	0.0	J C	0.0	0.023	C	0.002	0.0	J q C	0.0	0.0026	J q C	1E-03	0.0038	J C	6E-04	0.0	J q C	0.0	0.015	J C	0.002

	SEDIMENT EFFECTS LEVELS^2		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L^2	ER-M^2	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PCB Congeners	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g			ng/g			ng/g			ng/g			ng/g			ng/g			ng/g		
PCB-109	---	---	---	---	---	---	0.4	B C86	0.0	0.53	B C86	5E-04	0.4	C86 B	0.0	0.082	C86 B	0.001	0.08	C86 B	4E-04	0.1	C86 B	0.0	0.36	C86 B	0.001
PCB-110	---	---	---	---	---	---	1.1	C B	2E-04	1.3	C B	4E-04	0.97	C B	6E-04	0.19	C B	1E-03	0.2	C B	3E-04	0.13	C B	4E-04	0.86	C B	0.001
PCB-111	---	---	---	---	---	---	0.0069	J	2E-04	0.005	J	4E-04	ND		6E-04	ND		9E-04	0.001	J q	3E-04	ND		4E-04	0.0066	J	0.001
PCB-112	---	---	---	---	---	---	0.0075	J	2E-04	0.0052	J q	4E-04	0.0049	J	6E-04	0.0021	J q	1E-03	0.0016	J q	3E-04	0.0013	J	4E-04	0.0034	J q	0.001
PCB-113	---	---	---	---	---	---	0.98	B C90	3E-04	1.2	B C90	5E-04	0.87	C90 B	7E-04	0.2	C90 B	0.001	0.19	C90 B	4E-04	0.13	C90 B	5E-04	0.85	C90 B	0.002
PCB-114	---	---	120	---	---	---	0.0099	B	0.001	0.012	B	0.002	0.013	J B	0.002	ND		9E-04	0.002	J B	5E-04	0.0012	J q B	5E-04	0.0038	J q B	0.002
PCB-115	---	---	---	---	---	---	1.1	B C110	2E-04	1.3	B C110	4E-04	0.97	C110 B	6E-04	0.19	C110 B	1E-03	0.2	C110 B	3E-04	0.13	C110 B	4E-04	0.86	C110 B	0.001
PCB-116	---	---	---	---	---	---	0.095	C85 B	3E-04	0.13	C85 B	5E-04	0.087	C85 B	7E-04	0.017	J C85 B	0.001	0.018	J C85 B	4E-04	0.014	J C85 B	5E-04	0.075	C85 B	0.001
PCB-117	---	---	---	---	---	---	0.095	C85 B	3E-04	0.13	C85 B	5E-04	0.087	C85 B	7E-04	0.017	J C85 B	0.001	0.018	J C85 B	4E-04	0.014	J C85 B	5E-04	0.075	C85 B	0.001
PCB-118	---	---	120	---	---	---	0.59	B	0.001	0.79	B	0.002	0.57	B	0.002	0.1	B	9E-04	0.11	B	5E-04	0.065	B	5E-04	0.51	B	0.002
PCB-119	---	---	---	---	---	---	0.43	B C86	3E-04	0.53	B C86	5E-04	0.4	C86 B	7E-04	0.082	C86 B	0.001	0.08	C86 B	4E-04	0.059	C86 B	5E-04	0.36	C86 B	0.001
PCB-120	---	---	---	---	---	---	0.02		2E-04	0.02		4E-04	0.017	J q	5E-04	ND		9E-04	0.0033	J q	3E-04	0.0016	J q	4E-04	0.021		0.001
PCB-121	---	---	---	---	---	---	ND		2E-04	0.0018	J	4E-04	ND		6E-04	ND		9E-04	ND		3E-04	ND		4E-04	ND		0.001
PCB-122	---	---	---	---	---	---	0.012	B	0.001	0.015	B	0.002	0.012	J q B	0.002	ND		0.001	0.0027	J q B	6E-04	ND		6E-04	0.009	J q B	0.002
PCB-123	---	---	120	---	---	---	0.0093	J	0.001	0.011	q	0.002	0.014	J	0.002	0.0016	J q	9E-04	0.0024	J	5E-04	0.0014	J q	5E-04	0.009	J q	0.002
PCB-124	---	---	---	---	---	---	0.017	J C108	0.001	0.023	C108	0.002	0.016	J q C108	0.002	0.0026	J q C108	1E-03	0.0038	J C108	6E-04	0.0021	J q C108	5E-04	0.015	J C108	0.002
PCB-125	---	---	---	---	---	---	0.43	B C86	3E-04	0.53	B C86	5E-04	0.4	C86 B	7E-04	0.082	C86 B	0.001	0.08	C86 B	4E-04	0.059	C86 B	5E-04	0.36	C86 B	0.001
PCB-126	---	---	0.036	---	---	---	0.003	J q	0.001	0.0045	J	0.002	0.0045	J	0.002	ND		0.001	ND		5E-04	ND		5E-04	ND		0.002
PCB-127	---	---	---	---	---	---	0.0013	J q	0.001	ND		0.002	ND		0.002	ND		9E-04	ND		5E-04	ND		5E-04	ND		0.002
PCB-128	---	---	---	---	---	---	0.14	C B	0.002	0.19	C B	0.002	0.13	C B	0.002	0.021	q C B	8E-04	0.027	C B	8E-04	0.017	J C B	4E-04	0.12	C B	0.002
PCB-129	---	---	---	---	---	---	0.91	C B	0.002	1.2	C B	0.003	0.82	C B	0.002	0.14	C B	9E-04	0.17	C B	9E-04	0.11	C B	5E-04	0.74	C B	0.002
PCB-130	---	---	---	---	---	---	0.073		0.003	0.1		0.003	0.071		0.002	0.014		0.001	0.015		0.001	0.01		6E-04	0.065		0.003
PCB-131	---	---	---	---	---	---	0.007	J	0.003	0.011		0.003	0.0058	J q	0.002	ND		0.001	ND		0.001	0.0011	J q	6E-04	0.0077	J	0.003
PCB-132	---	---	---	---	---	---	0.24	B	0.003	0.33	B	0.003	0.23	B	0.002	0.038	B	0.001	0.045	B	0.001	0.035	B	6E-04	0.19	B	0.003
PCB-133	---	---	---	---	---	---	0.041		0.003	0.054		0.003	0.039		0.002	0.0079	J	0.001	0.0079	J	0.001	0.0042	J	5E-04	0.034		0.003
PCB-134	---	---	---	---	---	---	0.051	C	0.003	0.071	C	0.003	0.049	C	0.002	0.0079	J q C	0.001	0.0098	J C	0.001	0.0076	J C	6E-04	0.043	q C	0.003
PCB-135	---	---	---	---	---	---	0.38	C	3E-04	0.48	C	6E-04	0.38	C	5E-04	0.073	C	2E-04	0.094	C	2E-04	0.053	C	2E-04	0.34	C	1E-03
PCB-136	---	---	---	---	---	---	0.24	B	2E-04	0.27	B	5E-04	0.23	B	4E-04	0.054	B	2E-04	0.049	B	2E-04	0.028	B	1E-04	0.23	B	7E-04
PCB-137	---	---	---	---	---	---	0.026		0.002	0.034		0.003	0.021		0.002	0.0034	J	9E-04	0.0032	J q	9E-04	0.0022	J q	5E-04	0.017	J q	0.003
PCB-138	---	---	---	---	---	---	0.91	B C129	0.002	1.2	B C129	0.003	0.82	C129 B	0.002	0.14	C129 B	9E-04	0.17	C129 B	9E-04	0.11	C129 B	5E-04	0.74	C129 B	0.002
PCB-139	---	---	---	---	---	---	0.021	C	0.002	0.028	C	0.003	0.018	J q C	0.002	0.0049	J C	9E-04	0.0049	J C	9E-04	0.0033	J C	5E-04	0.019	J q C	0.003
PCB-140	---	---	---	---	---	---	0.021	C139	0.002	0.028	C139	0.003	0.018	J q C139	0.002	0.0049	J C139	9E-04	0.0049	J C139	9E-04	0.0033	J C139	5E-04	0.019	J q C139	0.003
PCB-141	---	---	---	---	---	---	0.12		0.002	0.16		0.003	0.11		0.002	0.02		1E-03	0.023		1E-03	0.018		5E-04	0.093		0.003
PCB-142	---	---	---	---	---	---	ND		0.003	ND		0.003	ND		0.002	ND		0.001	ND		0.001	ND		6E-04	ND		0.003
PCB-143	---	---	---	---	---	---	0.051	C134	0.003	0.071	C134	0.003	0.049	C134	0.002	0.0079	J q C134	0.001	0.0098	J C134	0.001	0.0076	J C134	6E-04	0.043	q C134	0.003
PCB-144	---	---	---	---	---	---	0.029	B	3E-04	0.037	B	6E-04	0.029	q B	4E-04	0.004	J q B	2E-04	0.0048	J q B	2E-04	0.0047	J B	2E-04	0.034	B	9E-04
PCB-145	---	---	---	---	---	---	0.0011	J B	2E-04	ND		4E-04	ND		3E-04	0.00056	J q B	2E-04	0.0002	J q B	2E-04	ND		1E-04	0.0011	J B	7E-04

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	ER-L[2]	ER-M[2]	HSCA Screen Level for Soil	HSCA Screen Level for Ecological Marine Sediment	Residential Soil	Non-Residential Soil	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:							8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PCB Congeners	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g			ng/g			ng/g			ng/g			ng/g			ng/g			ng/g		
PCB-146	---	---	---	---	---	---	0.29		0.002	0.38		0.003	0.27		0.002	0.055		9E-04	0.057		9E-04	0.034		5E-04	0.26		0.003
PCB-147	---	---	---	---	---	---	1.4	C B	0.002	1.7	C B	0.003	1.2	C B	0.002	0.26	C B	1E-03	0.25	C B	1E-03	0.15	C B	5E-04	1.2	C B	0.003
PCB-148	---	---	---	---	---	---	0.02		3E-04	0.023		6E-04	0.021		4E-04	0.0041	J q	2E-04	0.0025	J q	2E-04	0.0015	J q	2E-04	0.022		9E-04
PCB-149	---	---	---	---	---	---	1.4	B C147	0.002	1.7	B C147	0.003	1.2	C147 B	0.002	0.26	C147 B	1E-03	0.25	C147 B	1E-03	0.15	C147 B	5E-04	1.2	C147 B	0.003
PCB-150	---	---	---	---	---	---	0.048		2E-04	0.048		4E-04	0.043		3E-04	0.01	q	2E-04	0.0072	J	2E-04	0.0034	J	1E-04	0.055		7E-04
PCB-151	---	---	---	---	---	---	0.38	C135	3E-04	0.48	C135	6E-04	0.38	C135	5E-04	0.073	C135	2E-04	0.094	C135	2E-04	0.053	C135	2E-04	0.34	C135	1E-03
PCB-152	---	---	---	---	---	---	0.0013	J q	2E-04	0.002	J	4E-04	0.001	J q	3E-04	ND		1E-04	0.00048	J q	2E-04	0.00019	J q	1E-04	ND		7E-04
PCB-153	---	---	---	---	---	---	1.2	C B	0.002	1.6	C B	0.002	1.1	C B	0.002	0.21	C B	8E-04	0.23	C B	8E-04	0.14	C B	4E-04	1.1	C B	0.002
PCB-154	---	---	---	---	---	---	0.17		3E-04	0.19		5E-04	0.17		4E-04	0.036		2E-04	0.029		2E-04	0.013		2E-04	0.21		8E-04
PCB-155	---	---	---	---	---	---	0.027		2E-04	0.028		4E-04	0.023		3E-04	0.0058	J q	1E-04	0.0032	J	2E-04	0.0013	J q	1E-04	0.033		7E-04
PCB-156	---	---	120	---	---	---	0.083	C B	0.002	0.11	C B	0.003	0.077	C B	0.002	0.013	J C B	9E-04	0.014	J C B	9E-04	0.011	J C B	5E-04	0.069	C B	0.002
PCB-157	---	---	120	---	---	---	0.083	C156 B	0.002	0.11	C156 B	0.003	0.077	C156 B	0.002	0.013	J C156 B	9E-04	0.014	J C156 B	9E-04	0.011	J C156 B	5E-04	0.069	C156 B	0.002
PCB-158	---	---	---	---	---	---	0.061	B	0.002	0.087	B	0.002	0.059	B	0.001	0.0073	J q B	7E-04	0.011	B	7E-04	0.0077	J B	4E-04	0.055	B	0.002
PCB-159	---	---	---	---	---	---	0.012		0.002	0.016		0.002	0.0095	J q	0.001	ND		7E-04	0.0021	J q	7E-04	0.0016	J	4E-04	0.0092	J	0.002
PCB-160	---	---	---	---	---	---	0.91	B C129	0.002	1.2	B C129	0.003	0.82	C129 B	0.002	0.14	C129 B	9E-04	0.17	C129 B	9E-04	0.11	C129 B	5E-04	0.74	C129 B	0.002
PCB-161	---	---	---	---	---	---	ND		0.002	ND		0.002	ND		0.001	ND		7E-04	ND		7E-04	ND		4E-04	ND		0.002
PCB-162	---	---	---	---	---	---	0.0055	J B q	0.002	0.01	J B q	0.002	0.0063	J q B	0.001	0.0018	J B	7E-04	0.001	J q B	7E-04	0.0012	J B	4E-04	0.0057	J B	0.002
PCB-163	---	---	---	---	---	---	0.91	B C129	0.002	1.2	B C129	0.003	0.82	C129 B	0.002	0.14	C129 B	9E-04	0.17	C129 B	9E-04	0.11	C129 B	5E-04	0.74	C129 B	0.002
PCB-164	---	---	---	---	---	---	0.073		0.002	0.1		0.002	0.071		0.001	0.013		8E-04	0.016		7E-04	0.01		4E-04	0.067		0.002
PCB-165	---	---	---	---	---	---	ND		0.002	ND		0.002	ND		0.002	ND		8E-04	ND		8E-04	ND		4E-04	ND		0.002
PCB-166	---	---	---	---	---	---	0.14	C128 B	0.002	0.19	C128 B	0.002	0.13	C128 B	0.002	0.021	q C128 B	8E-04	0.027	C128 B	8E-04	0.017	J C128 B	4E-04	0.12	C128 B	0.002
PCB-167	---	---	120	---	---	---	0.039	B	0.001	0.052	B	0.002	0.036	B	0.001	0.0057	J q B	6E-04	0.0066	J B	6E-04	0.0038	J q B	3E-04	0.036	B	0.002
PCB-168	---	---	---	---	---	---	1.2	B C153	0.002	1.6	B C153	0.002	1.1	C153 B	0.002	0.21	C153 B	8E-04	0.23	C153 B	8E-04	0.14	C153 B	4E-04	1.1	C153 B	0.002
PCB-169	---	---	0.12	---	---	---	0.0027	J B	0.002	0.0023	J B q	0.002	ND		0.001	ND		7E-04	ND		6E-04	ND		3E-04	ND		0.002
PCB-170	---	---	---	---	---	---	0.31	B	3E-04	0.4	B	7E-04	0.28	B	4E-04	0.049	B	1E-03	0.051	B	4E-04	0.041	B	2E-04	0.27	B	6E-04
PCB-171	---	---	---	---	---	---	0.1	C B	3E-04	0.13	C B	6E-04	0.099	C B	4E-04	0.018	J C B	9E-04	0.019	J C B	4E-04	0.014	J C B	2E-04	0.091	C B	6E-04
PCB-172	---	---	---	---	---	---	0.068	B	3E-04	0.09	B	6E-04	0.063	B	4E-04	0.011	B	9E-04	0.012	B	4E-04	0.0091	J B	2E-04	0.059	B	6E-04
PCB-173	---	---	---	---	---	---	0.1	C171 B	3E-04	0.13	C171 B	6E-04	0.099	C171 B	4E-04	0.018	J C171 B	9E-04	0.019	J C171 B	4E-04	0.014	J C171 B	2E-04	0.091	C171 B	6E-04
PCB-174	---	---	---	---	---	---	0.36	B	3E-04	0.47	B	6E-04	0.36	B	4E-04	0.058	B	9E-04	0.065	B	4E-04	0.05	B	2E-04	0.34	B	6E-04
PCB-175	---	---	---	---	---	---	0.023	B	2E-04	0.029	B	6E-04	0.019	J q B	3E-04	0.0038	J q B	8E-04	0.0056	J B	3E-04	0.0027	J B	2E-04	0.023	B	5E-04
PCB-176	---	---	---	---	---	---	0.047	B	2E-04	0.061	B	4E-04	0.047	B	2E-04	0.0061	J q B	6E-04	0.0089	J B	2E-04	0.0063	J B	1E-04	0.044	B	4E-04
PCB-177	---	---	---	---	---	---	0.25	B	3E-04	0.33	B	7E-04	0.24	B	4E-04	0.04	B	1E-03	0.042	B	4E-04	0.031	B	2E-04	0.23	B	6E-04
PCB-178	---	---	---	---	---	---	0.12	B	2E-04	0.15	B	6E-04	0.11	B	3E-04	0.018	B	9E-04	0.018	B	4E-04	0.013	B	2E-04	0.098	B	5E-04
PCB-179	---	---	---	---	---	---	0.19	B	2E-04	0.25	B	4E-04	0.18	B	3E-04	0.032	B	6E-04	0.033	B	3E-04	0.024	B	1E-04	0.17	B	4E-04
PCB-180	---	---	---	---	---	---	0.72	C B	2E-04	0.92	C B	5E-04	0.69	C B	3E-04	0.11	C B	7E-04	0.13	C B	3E-04	0.1	C B	2E-04	0.67	C B	5E-04
PCB-181	---	---	---	---	---	---	0.0039	J	2E-04	0.0034	J	6E-04	ND		3E-04	ND		8E-04	ND		3E-04	ND		2E-04	0.004	J q	5E-04
PCB-182	---	---	---	---	---	---	0.021	B	2E-04	0.024	B	5E-04	0.018	J B	3E-04	0.0045	J q B	8E-04	0.0036	J B	3E-04	0.0021	J B	2E-04	0.027	B	5E-04

	SEDIMENT EFFECTS LEVELS[2]		DELAWARE		NEW JERSEY		BULK SEDIMENT																				
Sample ID:	**ER-L[2]**	**ER-M[2]**	**HSCA Screen Level for Soil**	**HSCA Screen Level for Ecological Marine Sediment**	**Residential Soil**	**Non-Residential Soil**	**SR1**		**MDL**	**SR2**		**MDL**	**SR3**		**MDL**	**SR4**		**MDL**	**SR5**		**MDL**	**SR6**		**MDL**	**SR7**		**MDL**
Sample Date:							**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/26/2020**			**8/26/2020**			**8/26/2020**		
PCB Congeners	**ng/g**	**ng/g**	**ng/g**	**ng/g**	**ng/g**	**ng/g**	**ng/g**			**ng/g**			**ng/g**			**ng/g**			**ng/g**			**ng/g**			**ng/g**		
PCB-183	---	---	---	---	---	---	0.26	C B	2E-04	0.33	C B	5E-04	0.24	C B	3E-04	0.039	C B	8E-04	0.047	C B	3E-04	0.036	C B	2E-04	0.27	C B	5E-04
PCB-184	---	---	---	---	---	---	0.015		2E-04	0.021		4E-04	0.014	J	2E-04	0.0028	J	6E-04	0.0021	J q	3E-04	0.00086	J q	1E-04	0.025		4E-04
PCB-185	---	---	---	---	---	---	0.26	B C183	2E-04	0.33	B C183	5E-04	0.24	C183 B	3E-04	0.039	C183 B	8E-04	0.047	C183 B	3E-04	0.036	C183 B	2E-04	0.27	C183 B	5E-04
PCB-186	---	---	---	---	---	---	ND		2E-04	ND		4E-04	ND		2E-04	ND		6E-04	ND		3E-04	ND		1E-04	ND		4E-04
PCB-187	---	---	---	---	---	---	0.67	B	2E-04	0.85	B	6E-04	0.63	B	3E-04	0.11	B	8E-04	0.11	B	3E-04	0.079	B	2E-04	0.58	B	5E-04
PCB-188	---	---	---	---	---	---	0.045		2E-04	0.052		4E-04	0.037		2E-04	0.0068	J q	6E-04	0.0065	J	2E-04	0.0031	J	1E-04	0.042		4E-04
PCB-189	---	---	130	---	---	---	0.014	B	1E-03	0.016	B q	0.002	0.011	J q B	0.001	0.0027	J q B	7E-04	0.002	J q B	3E-04	0.0014	J q B	2E-04	0.012	J B	0.002
PCB-190	---	---	---	---	---	---	0.059	B	2E-04	0.076	B	5E-04	0.057	B	3E-04	0.0086	J B	7E-04	0.01	B	3E-04	0.0077	J B	1E-04	0.052	B	4E-04
PCB-191	---	---	---	---	---	---	0.013	B	2E-04	0.014	B	4E-04	0.012	J B	3E-04	0.0022	J B	7E-04	0.0024	J B	3E-04	0.0018	J q B	1E-04	0.015	J B	4E-04
PCB-192	---	---	---	---	---	---	ND		2E-04	ND		5E-04	ND		3E-04	ND		7E-04	ND		3E-04	ND		1E-04	ND		4E-04
PCB-193	---	---	---	---	---	---	0.72	C180 B	2E-04	0.92	C180 B	5E-04	0.69	C180 B	3E-04	0.11	C180 B	7E-04	0.13	C180 B	3E-04	0.1	C180 B	2E-04	0.67	C180 B	5E-04
PCB-194	---	---	---	---	---	---	0.28	B	0.002	0.32	B	0.002	0.24	B	0.002	0.039	B	0.001	0.041	B	7E-04	0.031	B	4E-04	0.23	B	0.002
PCB-195	---	---	---	---	---	---	0.098	B	0.002	0.11	B	0.002	0.09	B	0.002	0.011	q B	0.001	0.015	B	9E-04	0.011	B	5E-04	0.079	B	0.003
PCB-196	---	---	---	---	---	---	0.35	B	3E-04	0.35	B	0.001	0.28	B	4E-04	0.048	B	8E-04	0.049	B	4E-04	0.026	B	4E-04	0.36	B	0.001
PCB-197	---	---	---	---	---	---	0.057	B	2E-04	0.069	B	8E-04	0.055	B	3E-04	0.0097	J q B	6E-04	0.01	q B	3E-04	0.0046	J B	3E-04	0.1	B	9E-04
PCB-198	---	---	---	---	---	---	0.88	C B	4E-04	0.92	C B	0.001	0.71	C B	4E-04	0.11	C B	8E-04	0.11	C B	4E-04	0.072	C B	5E-04	0.64	C B	0.001
PCB-199	---	---	---	---	---	---	0.88	C198 B	4E-04	0.92	C198 B	0.001	0.71	C198 B	4E-04	0.11	C198 B	8E-04	0.11	C198 B	4E-04	0.072	C198 B	5E-04	0.64	C198 B	0.001
PCB-200	---	---	---	---	---	---	0.038		3E-04	0.035	q	8E-04	0.042		3E-04	0.0032	J q	6E-04	0.006	J	3E-04	0.0039	J	3E-04	0.033	q	1E-03
PCB-201	---	---	---	---	---	---	0.15	B	3E-04	0.16	B	8E-04	0.13	B	3E-04	0.02	B	6E-04	0.023	B	3E-04	0.012	B	3E-04	0.15	B	9E-04
PCB-202	---	---	---	---	---	---	0.32		3E-04	0.34		9E-04	0.25		3E-04	0.042		6E-04	0.042		3E-04	0.024		4E-04	0.23		0.001
PCB-203	---	---	---	---	---	---	0.32	B	3E-04	0.33	B	0.001	0.27	B	4E-04	0.038	B	7E-04	0.042	B	4E-04	0.029	B	4E-04	0.24	B	0.001
PCB-204	---	---	---	---	---	---	0.0089	J B	3E-04	0.0093	J B	8E-04	0.0057	J q B	3E-04	0.0016	J q B	6E-04	0.0014	J q B	3E-04	0.0006	J q B	4E-04	0.015	J B	0.001
PCB-205	---	---	---	---	---	---	0.017	B	0.001	0.017	B	0.001	0.014	J B	0.001	0.0026	J B	9E-04	0.0024	J B	6E-04	0.0016	J q B	3E-04	0.011	J B	0.002
PCB-206	---	---	---	---	---	---	4.4		0.003	3.9		0.004	2.7		0.005	0.52		0.005	0.45		0.002	0.25	q	0.003	2.4		0.008
PCB-207	---	---	---	---	---	---	0.52		0.002	0.43		0.003	0.31		0.003	0.048		0.003	0.052		0.002	0.024		0.002	0.37		0.006
PCB-208	---	---	---	---	---	---	2.2		0.002	1.8		0.003	1.2		0.004	0.19		0.003	0.2		0.002	0.11		0.002	1.1		0.006
PCB-209	---	---	---	---	---	---	7.4	B	9E-04	5.6	B	9E-04	3.8	B	8E-04	0.6	B	0.001	0.64	B	5E-04	0.32	B	5E-04	3.1	B	0.001
Total PCBS (ng/g)							62.75			69.19			50.90			10.22			9.96			6.39			48.51		
Total PCBS (co-eluters and "q" values removed)	22.7	180	230	40	250	1,100	**40.9**			**43.0**			**31.3**			**5.9**			**5.9**			**3.5**			**29.6**		
TEQ (WHO)					1(1)	5(1)	0.0004192			0.0005703			0.000488			0.00000693			0.00000716			0.000004574			0.000033864		

	SEDIMENT EFFECTS LEVELS[2]			DELAWARE		NEW JERSEY		BULK SEDIMENT													
Sample ID: **Sample Date:**	**ER-L[2]**	**ER-M[2]**	**PEL[3]**	**HSCA Screen Level for Soil**	**HSCA Screen Level for Ecological Marine Sediment**	**Residential Soil**	**Non-Residential Soil**	**SR1** **8/25/2020**		**SR2** **8/25/2020**		**SR3** **8/25/2020**		**SR4** **8/25/2020**		**SR5** **8/26/2020**		**SR6** **8/26/2020**		**SR7** **8/26/2020**	
DIOXINS/FURANS	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**		**pg/g**		**pg/g**		**pg/g**		**pg/g**		**pg/g**		**pg/g**	
1,2,3,4,6,7,8-HpCDD	---	---	---	---	---	---	---	160		190		120		22		42		29		110	
1,2,3,4,6,7,8-HpCDF	---	---	---	---	---	---	---	27		32		21		3.6	J	3.9	J	1.5	J	18	
1,2,3,4,7,8,9-HpCDF	---	---	---	---	---	---	---	1.8	J	2.2	J	1.3	J	0.24	J q	0.22	J q	0		1.4	J
1,2,3,4,7,8-HxCDD	---	---	---	---	---	---	---	2.9	J	3.5	J	0		0.4	J	0		0.51	J q	1.9	J
1,2,3,4,7,8-HxCDF	---	---	---	---	---	---	---	4.9	J	5.5		4.2	J	1.3	J	0.77	J q	0.43	J	3.4	J
1,2,3,6,7,8-HxCDD	---	---	---	---	---	---	---	5.9		6.4		4.2	J	0.76	J	1.3	J	0.93	J	3.7	J
1,2,3,6,7,8-HxCDF	---	---	---	---	---	---	---	2.5	J I	3	J I	2.2	J I	0.6	J	0.46	J q	0.24	J	2	J I
1,2,3,7,8,9-HxCDD	---	---	---	---	---	---	---	8.8		11		6.5		1.5	J	3	J	0		6.5	
1,2,3,7,8,9-HxCDF	---	---	---	---	---	---	---	0		0.23	J q	0.2	J	0		0		0		0	
1,2,3,7,8-PeCDD	---	---	---	---	---	---	---	1.5	J q	1.7	J q	1	J q	0.21	J q	0.26	J q	0		1	J q
1,2,3,7,8-PeCDF	---	---	---	---	---	---	---	1.6	J	1.8	J	1.3	J	0.35	J q	0		0		1	J
2,3,4,6,7,8-HxCDF	---	---	---	---	---	---	---	1.3	J	1.7	J	1.2	J	0.32	J	0.21	J q	0		0.89	J
2,3,4,7,8-PeCDF	---	---	---	---	---	---	---	2.1	J	2.6	J	1.7	J	0.51	J	0.3	J	0.21	J	1.6	J
2,3,7,8-TCDD	---	---	21.5	4.8	---	51	810	0.44	J	0.43	J q	0.51	J	0.16	J q	0.16	J q	0		0.35	J
2,3,7,8-TCDF	---	---	---	---	---	---	---	3.8		4.7		3.2		0.59	J	0.71	J q	0		3	
OCDD	---	---	---	---	---	---	---	2900	B	3300	B	2300	B	430	B	630	B	410	B	1900	B
OCDF	---	---	---	---	---	---	---	77	B	95	B	67	B	11	B	13	B	4.2	J B	57	B
Total Dioxins/Furans	---	---	---	---	---	---	---	3201.54		3661.76		2535.51		473.54		696.29		447.02		2111.74	
TEQ (WHO)	---	---	---	---	---	1000 (1)	5000 (1)	8.41		9.83		6.36		1.47		1.81		0.70		5.88	

Notes:

Results compared to NJ DEP Soil Remediation Residential and Non-Residential Standards

ND -- Not Detected

yellow shaded--Exceeds or equals one or more criteria or objectives

orange shaded - One or more analyte MDL's equal or exceed one or more criteria or objectives

(2) Long, E.R et al. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments.

--- No standard available

TEQ -- Toxic equivalence in terms of the dioxin 2,3,7,8-TCDD using WHO 2005 TEFs.

(1) US EPA residential or non-residential soil objective

MDL--Method Detection Limit

Data Qualifiers:

B -- Analyte was found in the blank and sample.

C--The compound co-eluted with other compounds

C108--The compound co-eluted with PCB-108

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
I -- Value is Estimated maximum possible concentration (EMPC)
q -- Estimated maximum possible concentration (EMPC).
p -- The % Relative Percent Difference between the primary and confirmation column/detector is > 40%. The lower value has been reported.
* -- LCS or LCSD is outside acceptance limits.

TOTAL SUSPENDED SOLIDS (TSS) SM 2540D	**SURFACE WATER* (UNFILTERED)**		**ELUTRIATE (UNFILTERED)**													
Sample ID:	**SW-1T**	**MDL**	**SR1**	**MDL**	**SR2**	**MDL**	**SR3**	**MDL**	**SR4**	**MDL**	**SR5**	**MDL**	**SR6***	**MDL**	**SR7**	**MDL**
Sample Date:	**8/26/2020**		**8/25/2020**		**8/25/2020**		**8/25/2020**		**8/25/2020**		**8/26/2020**		**8/26/2020**		**8/26/2020**	
Total Suspended Solids (mg/L)	60	1.4	26	1	18	0.8	17	1.1	32	1.1	32	1	36	0.9	91	1.4
Elutriate % Difference from Background			-57%		-70%		-72%		-47%		-47%		-40%		52%	

	DRBC			**DELAWARE**				**NEW JERSEY**			**SURFACE WATER (Background)**					
Sample ID:	**DRBC Marine, Acute, Aquatic Life (1)**	**DRBC Marine, Chronic, Aquatic Life (1)**	**DRBC System Toxicnts Fish Ingestion**	**DE Marine Acute**	**DE Marine Chronic**	**DE System Toxicnts Fish Ingestion**	**DE Carcinogenic Fish Ingestion**	**NJ Marine Acute**	**NJ Marine Chronic**	**NJ Human Health**	**SW1-T (un-filtered)**		**MDL**	**SW1-Dissolved (filtered)**		**MDL**
Sample Date:											**8/26/2020**			**8/26/2020**		
PARAMETER	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**		**ug/L**	**ug/L**		**ug/L**
Cyanide (total)	1	1	140		1	2,400		2.7	2.7	140	ND		4.4	ND		4.4
INORGANICS																
Aluminum	---	---	---	---	---	---	---	---	---	---	1700	B	13	96	B	13
Antimony	---	---	640	---	---	1,600	---	---	---	640	0.73	J	0.38	0.71	J	0.38
Arsenic	69	36	---	69	36	---	---	69	36	0.061	4.2		0.31	1.7		0.31
Barium	---	---	---	---	---	---	---	---	---	---	37		1.6	39		1.6
Beryllium	---	---	420	---	---	420	0.024	---	---	42	ND		0.18	ND		0.18
Cadmium	40	8.8	16	40	8.8	31	---	40	8.8	---	ND		0.22	ND		0.22
Calcium	---	---	---	---	---	---	---	---	---	---	52000	B	130	50000	B	130
Chromium	1,100	50	750	1100	50	750	---	1,100	50	---	4.6		1.5	ND		1.5
Cobalt	---	---	---	---	---	---	---	---	---	---	1.2		0.13	0.13	J	0.13
Copper	4.8	3.1	---	4.8	3.1	---	---	4.8	3.1	---	4.4		0.63	1.9	J	0.63
Iron	---	---	---	---	---	---	---	---	---	---	2600		20	120		20
Lead	210	8.1	---	210	8.1	---	---	210	24	---	3.7	B	0.13	0.15	J B	0.13
Magnesium	---	---	---	---	---	---	---	---	---	---	87000		83	83000		83
Manganese	---	---	---	---	---	---	---	---	---	100	110		0.87	5.3		0.87
Mercury (ng/L)	1800	940	0.051	1800	940	---	---	1,800	940	51	9		1.4	0.73	H B	0.14
Nickel	64	22	1,700	74	8.2	1,700	---	64	22	1,700	4		0.34	1.2		0.34
Potassium	---	---	---	---	---	---	---	---	---	---	28000		160	26000		160
Selenium	290	71	4,200	290	71	---	---	290	71	4,200	ND		1.5	ND		1.5
Silver	1.9	---	40,000	1.9	---	---	---	1.9	---	40,000	ND		0.18	ND		0.18
Sodium	---	---	---	---	---	---	---	---	---	---	700000		350	680000		350
Thallium	---	---	0.47	---	---	18	---	---	---	0.47	ND		0.15	ND		0.15
Vanadium	---	---	---	---	---	---	---	---	---	---	5.6		0.99	1.8		0.99
Zinc	90	81	26,000	90	81	26,000	---	90	81	26,000	750		3.2	7.7		3.2

	DRBC			DELAWARE				NEW JERSEY			ELUTRIATE (TOTAL - UNFILTERED)																				
Sample ID:	**DRBC Marine, Acute, Aquatic Life (1)**	**DRBC Marine, Chronic, Aquatic Life (1)**	**DRBC System Toxicnts Fish Ingestion**	**DE Marine Acute**	**DE Marine Chronic**	**DE System Toxicnts Fish Ingestion**	**DE Carcinogenic Fish Ingestion**	**NJ Marine Acute**	**NJ Marine Chronic**	**NJ Human Health**	**SR1**		**MDL**	**SR2**		**MDL**	**SR3**		**MDL**	**SR4**		**MDL**	**SR5**		**MDL**	**SR6**		**MDL**	**SR7**		**MDL**
Sample Date:											**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/26/2020**			**8/26/2020**			**8/26/2020**		
PARAMETER	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**		
Cyanide (total)	1	1	140		1	2,400		2.7	2.7	140	ND		4.4	ND		4.4	ND		4.4	ND		4.4	ND		4.4	ND		4.4	ND		4.4
INORGANICS																															
Aluminum	---	---	---	---	---	---	---	---	---	---	720		13	480		13	420		13	930		13	840		13	1300		13	2600		13
Antimony	---	---	640	---	---	1,600	---	---	---	640	1.2	J	0.38	0.73	J	0.38	0.91	J	0.38	0.93	J	0.38	0.98	J	0.38	0.94	J	0.38	1.5	J	0.38
Arsenic	69	36	---	69	36	---	---	69	36	0.061	9.1		0.31	8.3		0.31	7.3		0.31	1.9		0.31	2		0.31	2.5		0.31	4.4		0.31
Barium	---	---	---	---	---	---	---	---	---	---	160		1.6	150		1.6	140		1.6	150		1.6	92		1.6	220		1.6	92		1.6
Beryllium	---	---	420	---	---	420	0.024	---	---	42	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18
Cadmium	40	8.8	16	40	8.8	31	---	40	8.8	---	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22
Calcium	---	---	---	---	---	---	---	---	---	---	59000		130	48000		130	45000		130	41000		130	45000		130	44000		130	37000		130
Chromium	1,100	50	750	1100	50	750	---	1,100	50	---	ND		1.5	1.8	J	1.5	ND		1.5	1.5	J	1.5	ND		1.5	2.8		1.5	6.2		1.5
Cobalt	---	---	---	---	---	---	---	---	---	---	1.5		0.13	1.4		0.13	1.4		0.13	1.7		0.13	1.4		0.13	4.7		0.13	2.1		0.13
Copper	4.8	3.1	---	4.8	3.1	---	---	4.8	3.1	---	1.2	J	0.63	0.77	J	0.63	1.5	J B	0.63	1.6	J B	0.63	1	J	0.63	1.7	J	0.63	3.5		0.63
Iron	---	---	---	---	---	---	---	---	---	---	650		20	810		20	750		20	870		20	920		20	1600		20	3600		20
Lead	210	8.1	---	210	8.1	---	---	210	24	---	1.2		0.13	0.94	J	0.13	1	B	0.13	1.1	B	0.13	0.96	J	0.13	1.8		0.13	4.9		0.13
Magnesium	---	---	---	---	---	---	---	---	---	---	100000		83	79000		83	69000		83	80000		83	84000		83	83000		83	74000		83
Manganese	---	---	---	---	---	---	---	---	---	100	1300		0.87	2400		0.87	2200	B	0.87	2600	B	0.87	2100		0.87	5400		0.87	960		0.87
Mercury (ng/L)	1800	940	0.051	1800	940	---	---	1,800	940	51	4.7	B	0.14	3.7	B	0.14	3.7	B	0.14	4.3	B	0.14	3.3	B	0.14	4.3	B	0.14	14	B	0.14
Nickel	64	22	1,700	74	8.2	1,700	---	64	22	1,700	2.7		0.34	2.5		0.34	2.7		0.34	2.9		0.34	2.4		0.34	4.3		0.34	4.7		0.34
Potassium	---	---	---	---	---	---	---	---	---	---	30000		160	21000		160	23000		160	25000		160	26000		160	26000		160	22000		160
Selenium	290	71	4,200	290	71	---	---	290	71	4,200	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5
Silver	1.9	---	40,000	1.9	---	---	---	1.9	---	40,000	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18
Sodium	---	---	---	---	---	---	---	---	---	---	800000		350	590000		350	550000		350	680000		350	690000		350	690000		350	610000		350
Thallium	---	---	0.47	---	---	18	---	---	---	0.47	ND		0.15	ND		0.15	0.49	J B	0.15	0.18	J B	0.15	ND		0.15	ND		0.15	ND		0.15
Vanadium	---	---	---	---	---	---	---	---	---	---	3.7		0.99	3.5		0.99	2		0.99	2.5		0.99	2.5		0.99	4.2		0.99	7.3		0.99
Zinc	90	81	26,000	90	81	26,000	---	90	81	26,000	6.2		3.2	3.8	J	3.2	5.1		3.2	6.3		3.2	6.6		3.2	10		3.2	31		3.2

	DRBC			DELAWARE				NEW JERSEY			ELUTRIATE (DISSOLVED - FILTERED)																				
Sample ID:	**DRBC Marine, Acute, Aquatic Life (1)**	**DRBC Marine, Chronic, Aquatic Life (1)**	**DRBC System Toxicnts Fish Ingestion**	**DE Marine Acute**	**DE Marine Chronic**	**DE System Toxicnts Fish Ingestion**	**DE Carcinogenic Fish Ingestion**	**NJ Marine Acute**	**NJ Marine Chronic**	**NJ Human Health**	**SR1**		**MDL**	**SR2**		**MDL**	**SR3**		**MDL**	**SR4**		**MDL**	**SR5**		**MDL**	**SR6**		**MDL**	**SR7**		**MDL**
Sample Date:											**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/26/2020**			**8/26/2020**			**8/26/2020**		
PARAMETER	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**		
Cyanide (total)	1	1	140		1	2,400		2.7	2.7	140	ND		4.4	ND		4.4	7.9	J	4.4	6.1	J	4.4	5.5	J	4.4	8.1	J	4.4	ND		4.4
INORGANICS																															
Aluminum	---	---	---	---	---	---	---	---	---	---	ND		13	ND		13	ND		13	ND		13	ND		13	ND		13	13	J	13
Antimony	---	---	640	---	---	1,600	---	---	---	640	1.2	J	0.38	0.72	J	0.38	1.1	J	0.38	1	J	0.38	1	J	0.38	0.7	J	0.38	1.3	J	0.38
Arsenic	69	36	---	69	36	---	---	69	36	0.061	8		0.31	7.5		0.31	6		0.31	1.9		0.31	1.5		0.31	1.7		0.31	2.7		0.31
Barium	---	---	---	---	---	---	---	---	---	---	150		1.6	150		1.6	150		1.6	140		1.6	85		1.6	200		1.6	75		1.6
Beryllium	---	---	420	---	---	420	0.024	---	---	42	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18

	DRBC			DELAWARE				NEW JERSEY			ELUTRIATE (DISSOLVED - FILTERED)																				
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DE Marine Acute	DE Marine Chronic	DE System Toxicnts Fish Ingestion	DE Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:											8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
PARAMETER	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
Cadmium	40	8.8	16	40	8.8	31	---	40	8.8	---	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22	ND		0.22
Calcium	---	---	---	---	---	---	---	---	---	---	59000		130	48000		130	47000		130	40000		130	42000		130	42000		130	35000		130
Chromium	1,100	50	750	1100	50	750	---	1,100	50	---	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5
Cobalt	---	---	---	---	---	---	---	---	---	---	1.3		0.13	1.2		0.13	1.2		0.13	1.3		0.13	0.85		0.13	3.7		0.13	0.43	J	0.13
Copper	4.8	3.1	---	4.8	3.1	---	---	4.8	3.1	---	ND		0.63	ND		0.63	ND		0.63	1.1	J B	0.63	ND		0.63	22		0.63	ND		0.63
Iron	---	---	---	---	---	---	---	---	---	---	ND		20	ND		20	ND		20	ND		20	ND		20	41	J	20	ND		20
Lead	210	8.1	---	210	8.1	---	---	210	24	---	ND		0.13	ND		0.13	ND		0.13	ND		0.13	ND		0.13	ND		0.13	ND		0.13
Magnesium	---	---	---	---	---	---	---	---	---	---	100000		83	77000		83	71000		83	78000		83	80000		83	79000		83	71000		83
Manganese	---	---	---	---	---	---	---	---	---	100	1200		0.87	2300		0.87	2200	B	0.87	2500	B	0.87	2000		0.87	5100		0.87	790		0.87
Mercury (ng/L)	1800	940	0.051	1800	940	---	---	1,800	940	51	1.9	B	0.14	1.4	B	0.14	1.6	B	0.14	1.3	B	0.14	1.3	B	0.14	1.1	B	0.14	1.3	B	0.14
Nickel	64	22	1,700	74	8.2	1,700	---	64	22	1,700	2.1		0.34	2		0.34	2.1		0.34	2.2		0.34	1.6		0.34	3.8		0.34	1.2		0.34
Potassium	---	---	---	---	---	---	---	---	---	---	30000		160	21000		160	24000		160	25000		160	25000		160	25000		160	21000		160
Selenium	290	71	4,200	290	71	---	---	290	71	4,200	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5	ND		1.5
Silver	1.9	---	40,000	1.9	---	---	---	1.9	---	40,000	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18	ND		0.18
Sodium	---	---	---	---	---	---	---	---	---	---	780000		350	580000		350	570000		350	660000		350	660000		350	670000		350	590000		350
Thallium	---	---	0.47	---	---	18	---	---	---	0.47	ND		2E-01	ND		2E-01	0.21	J B	2E-01	ND		2E-01	ND		2E-01	ND		2E-01	ND		2E-01
Vanadium	---	---	---	---	---	---	---	---	---	---	2.3		0.99	1.7		0.99	ND		0.99	ND		0.99	ND		0.99	1		0.99	1.1		0.99
Zinc	90	81	26,000	90	81	26,000	---	90	81	26,000	ND		3.2	ND		3.2	3.2	J	3.2	ND		3.2	ND		3.2	ND		3.2	ND		3.2

	DRBC				DELAWARE				NEW JERSEY			BACKGROUND SURFACE WATER					
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1D		MDL	SW-1T		MDL
Sample Date:												8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L		
1,1'-Biphenyl	---	---	---	---	---	---	---	---	---	---	---	0.092	J	0.1	ND		0.06
2,2'-oxybis[1-chloropropane]	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05
2,4,5-Trichlorophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
2,4,6-Trichlorophenol	---	---	---	2.4	---	---	---	2.4	---	---	1	ND		0.1	ND		0.06
2,4-Dichlorophenol	---	---	290	---	---	---	290	---	---	---	290	ND		0.1	ND		0.05
2,4-Dimethylphenol	---	---	850	---	---	---	850	---	---	---	850	ND		0	ND	F1	0.04
2,4-Dinitrophenol	---	---	5,300	---	---	---	5,300	---	---	---	5,300	ND		1.5	ND		1.4
2,4-Dinitrotoluene	---	---	2,100	3.4	---	---	2,100	3.4	---	---	3.4	ND		0.1	ND		0.05
2,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
2-Chloronaphthalene	---	---	1,600	---	---	---	1,600	---	---	---	1,600	ND		0.1	ND		0.06
2-Chlorophenol	---	---	150	---	---	---	150	---	---	---	150	ND		0.1	ND		0.06
2-Methylnaphthalene	---	---	---	---	---	---	---	---	---	---	---	0.19		0.1	ND	F1	0.06
2-Methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.3	ND	F1	0.28
2-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.51
2-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06

	DRBC				DELAWARE				NEW JERSEY			BACKGROUND SURFACE WATER					
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1D		MDL	SW-1T		MDL
Sample Date:												8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L		
3,3'-Dichlorobenzidine	---	---	---	0.028	---	---	---	0.028	---	---	0.028	ND		0.6	ND	F1	0.54
3-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND	F1	0.06
4,6-Dinitro-2-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		1.5	ND		1.4
4-Bromophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
4-Chloro-3-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
4-Chloroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0	ND	F1	0.04
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
4-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND	F1	0.05
4-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.13
Acenaphthene	---	---	990	---	---	---	990	---	---	---	990	0.54		0.1	ND		0.06
Acenaphthylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
Acetophenone	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
Anthracene	---	---	40,000	---	---	---	40,000	---	---	---	40,000	ND		0	ND		0.05
Atrazine	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.59
Benzaldehyde	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.1
Benzo[a]anthracene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.07
Benzo[a]pyrene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0.1	ND		0.05
Benzo[b]fluoranthene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.09
Benzo[g,h,i]perylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
Benzo[k]fluoranthene	---	---	---	1.8	---	---	---	---	---	---	1.8	ND		0.1	ND		0.08
Bis(2-chloroethoxy)methane	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06
Bis(2-chloroethyl)ether	---	---	---	0.53	---	---	---	0.53	---	---	0.53	ND		0	ND		0.04
Bis(2-ethylhexyl) phthalate	---	---	620	2.2	---	---	620	2.2	---	---	---	11		6.2	ND	F1	5.8
Butyl benzyl phthalate	---	---	1,900	---	---	---	1,900	---	---	---	190	ND		0.5	ND		0.43
Caprolactam	---	---	---	---	---	---	---	---	---	---	---	0.86	J	0.5	1.9	J	0.44
Carbazole	---	---	---	---	---	---	---	---	---	---	---	0.33		0.1	ND		0.05
Chrysene	---	---	---	18	---	---	---	0.18	---	---	18	ND		0.1	ND		0.08
Dibenz(a,h)anthracene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0.1	ND		0.07
Dibenzofuran	---	---	---	---	---	---	---	---	---	---	---	0.38	J	0.1	ND		0.07
Diethyl phthalate	---	---	44,000	---	---	---	44,000	---	---	---	44,000	ND		0.6	ND		0.53
Dimethyl phthalate	---	---	1,100,000	---	---	---	110,000	---	---	---	---	ND		0.1	ND		0.05
Di-n-butyl phthalate	---	---	4,500	---	---	---	4,500	---	---	---	4,500	ND		0.7	ND		0.69
Di-n-octyl phthalate	---	---	---	---	---	---	---	---	---	---	---	ND		0.7	ND		0.63
Fluoranthene	---	---	140	---	---	---	140	---	---	---	140	0.15	J	0.1	ND		0.06
Fluorene	---	---	5,300	---	---	---	5,300	---	---	---	5,300	0.36		0.1	ND		0.06
Hexachlorobenzene	---	---	0.36	0.00029	---	---	0.36	0.00028	---	---	0.00029	ND		0.1	ND		0.05
Hexachlorobutadiene	---	---	---	18	---	---	2,900	18	---	---	18	ND		0.1	ND	F1	0.06
Hexachlorocyclopentadiene	---	---	1,100	---	---	---	5,500	---	---	---	1,100	ND		0.5	ND	F1	0.46
Hexachloroethane	---	---	46	3.3	---	---	32	1.1	---	---	3.3	ND		0.1	ND	F1	0.06
Indeno[1,2,3-cd]pyrene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.08
Isophorone	---	---	180,000	960	---	---	180,000	960	---	---	960	ND		0.1	ND		0.05

	DRBC				DELAWARE				NEW JERSEY			BACKGROUND SURFACE WATER					
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1D		MDL	SW-1T		MDL
Sample Date:												8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L		
Methylphenol, 3 & 4	---	---	---	---	---	---	---	---	---	---	---	ND		0.4	ND		0.34
Naphthalene	---	---	---	---	---	---	---	---	---	---	---	0.52		0.1	ND	F1	0.06
Nitrobenzene	---	---	690	---	---	---	---	---	---	---	690	ND		0.5	ND		0.46
N-Nitrosodi-n-propylamine	---	---	---	0.51	---	---	---	0.51	---	---	0.51	ND		0.1	ND		0.07
N-Nitrosodiphenylamine	---	---	---	6	---	---	---	6	---	---	6	ND		0.1	ND	F1	0.11
Pentachlorophenol	13	7.9	11,000	3	13	7.9	1,800	0.9	13	7.9	3	ND		0.9	ND		0.78
Phenanthrene	---	---	---	---	---	---	---	---	---	---	---	0.73		0.1	ND		0.05
Phenol	---	---	860,000	---	---	---	860,000	---	---	---	860,000	ND		0.5	ND	F1	0.45
Pyrene	---	---	4,000	---	---	---	4,000	---	---	---	4,000	0.078	J	0.1	ND		0.05

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (UNFILTERED)																				
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:												8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
1,1'-Biphenyl	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND	0.9	0.055	ND		0.055	ND		0.06
2,2'-oxybis[1-chloropropane]	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05	ND		0.054	ND		0.05	ND	0.2	0.054	ND		0.054	ND		0.05
2,4,5-Trichlorophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND	0.9	0.056	ND		0.056	ND		0.06
2,4,6-Trichlorophenol	---	---	---	2.4	---	---	---	2.4	---	---	1	ND		0.1	ND		0.06	ND		0.063	ND		0.06	ND	0.9	0.063	ND		0.063	ND		0.06
2,4-Dichlorophenol	---	---	290	---	---	---	290	---	---	---	290	ND		0	ND		0.05	ND		0.047	ND		0.05	ND	0.2	0.047	ND		0.047	ND		0.05
2,4-Dimethylphenol	---	---	850	---	---	---	850	---	---	---	850	ND		0	ND		0.04	ND		0.038	ND		0.04	ND	0.9	0.038	ND		0.038	ND		0.04
2,4-Dinitrophenol	---	---	5,300	---	---	---	5,300	---	---	---	5,300	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND	9.3	1.4	ND		1.4	ND		1.4
2,4-Dinitrotoluene	---	---	2,100	3.4	---	---	2,100	3.4	---	---	3.4	ND		0	ND		0.05	ND		0.047	ND		0.05	ND	0.9	0.047	ND		0.047	ND		0.05
2,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND	0.9	0.056	ND		0.056	ND		0.06
2-Chloronaphthalene	---	---	1,600	---	---	---	1,600	---	---	---	1,600	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND	0.2	0.055	ND		0.055	ND		0.06
2-Chlorophenol	---	---	150	---	---	---	150	---	---	---	150	ND		0.1	ND		0.06	ND		0.059	ND		0.06	ND	0.9	0.059	ND		0.059	ND		0.06
2-Methylnaphthalene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND	0.2	0.057	ND		0.057	ND		0.06
2-Methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.3	ND		0.28	ND		0.28	ND		0.28	ND	0.9	0.28	ND		0.28	ND		0.28
2-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND	*	0.5	ND	*	0.51	ND	*	0.51	ND	*	0.51	ND	4.6	0.51	ND	*	0.51	ND	*	0.51
2-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND	0.9	0.056	ND		0.056	ND		0.06
3,3'-Dichlorobenzidine	---	---	---	0.028	---	---	---	0.028	---	---	0.028	ND		0.5	ND		0.54	ND		0.54	ND		0.54	ND	0.9	0.54	ND		0.54	ND		0.54
3-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.062	ND		0.06	ND	4.6	0.062	ND		0.062	ND		0.06

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (UNFILTERED)																				
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:												8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
4,6-Dinitro-2-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND	4.6	1.4	ND		1.4	ND		1.4
4-Bromophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.058	ND		0.06	ND	0.9	0.058	ND		0.058	ND		0.06
4-Chloro-3-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND	0.9	0.056	ND		0.056	ND		0.06
4-Chloroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0	ND		0.04	ND		0.041	ND		0.04	ND	0.9	0.041	ND		0.041	ND		0.04
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND	0.9	0.056	ND		0.056	ND		0.06
4-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05	ND		0.054	ND		0.05	ND	4.6	0.054	ND		0.054	ND		0.05
4-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.13	ND		0.13	ND		0.13	ND	4.6	0.13	ND		0.13	ND		0.13
Acenaphthene	---	---	990	---	---	---	990	---	---	---	990	ND		0.1	ND		0.06	ND		0.06	ND		0.06	ND	0.2	0.06	ND		0.06	ND		0.06
Acenaphthylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.06	ND		0.06	ND	0.2	0.06	ND		0.06	ND		0.06
Acetophenone	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND	0.9	0.057	ND		0.057	ND		0.06
Anthracene	---	---	40,000	---	---	---	40,000	---	---	---	40,000	ND		0	ND		0.05	ND		0.045	ND		0.05	ND	0.2	0.045	ND		0.045	ND		0.05
Atrazine	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.59	ND		0.59	ND		0.59	ND	0.9	0.59	ND		0.59	ND		0.59
Benzaldehyde	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.1	ND		0.1	ND		0.1	ND	0.9	0.1	ND		0.1	ND		0.1
Benzo[a]anthracene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.07	0.45		0.069	0.1	J	0.07	0.16	0.2	0.069	ND		0.069	ND		0.07
Benzo[a]pyrene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0	ND		0.05	0.29		0.049	ND		0.05	ND	0.2	0.049	ND		0.049	ND		0.05
Benzo[b]fluoranthene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.09	0.61		0.09	0.16	J	0.09	0.25	0.2	0.09	ND		0.09	ND		0.09
Benzo[g,h,i]perylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	0.61		0.064	0.1	J	0.06	ND	0.2	0.064	ND		0.064	ND		0.06
Benzo[k]fluoranthene	---	---	---	1.8	---	---	---	---	---	---	1.8	ND		0.1	ND		0.08	0.59		0.081	0.14	J	0.08	0.2	0.2	0.081	ND		0.081	ND		0.08
Bis(2-chloroethoxy)methane	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.062	ND		0.06	ND	0.9	0.062	ND		0.062	ND		0.06
Bis(2-chloroethyl)ether	---	---	---	0.53	---	---	---	0.53	---	---	0.53	ND		0	ND		0.04	ND		0.037	ND		0.04	ND	0.2	0.037	ND		0.037	ND		0.04
Bis(2-ethylhexyl) phthalate	---	---	620	2.2	---	---	620	2.2	---	---	---	ND	*	5.8	ND	*	5.8	8.4	J *	5.8	11	*	5.8	11	9.3	5.8	7.9	J *	5.8	ND	*	5.8
Butyl benzyl phthalate	---	---	1,900	---	---	---	1,900	---	---	---	190	ND	*	0.4	ND	*	0.43	ND	*	0.43	ND	*	0.43	0.47	0.9	0.43	ND	*	0.43	ND	*	0.43
Caprolactam	---	---	---	---	---	---	---	---	---	---	---	ND		0.4	ND		0.44	ND		0.44	ND		0.44	ND	4.6	0.44	ND		0.44	ND		0.44
Carbazole	---	---	---	---	---	---	---	---	---	---	---	ND		0	ND		0.05	ND		0.047	ND		0.05	ND	0.2	0.047	ND		0.047	ND		0.05
Chrysene	---	---	---	18	---	---	---	0.18	---	---	18	ND		0.1	ND		0.08	0.57		0.075	0.12	J	0.08	0.21	0.2	0.075	ND		0.075	ND		0.08
Dibenz(a,h)anthracene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0.1	ND		0.07	0.65		0.067	ND		0.07	0.12	0.2	0.067	ND		0.067	ND		0.07
Dibenzofuran	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.07	ND		0.068	ND		0.07	ND	0.9	0.068	ND		0.068	ND		0.07
Diethyl phthalate	---	---	44,000	---	---	---	44,000	---	---	---	44,000	ND		0.5	ND		0.53	ND		0.53	ND		0.53	ND	0.9	0.53	ND		0.53	ND		0.53
Dimethyl phthalate	---	---	1,100,000	---	---	---	110,000	---	---	---	---	ND		0.1	ND		0.05	ND		0.052	ND		0.05	ND	0.9	0.052	ND		0.052	ND		0.05

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (UNFILTERED)																				
Sample ID:	**DRBC Marine, Acute, Aquatic Life (1)**	**DRBC Marine, Chronic, Aquatic Life (1)**	**DRBC System Toxicnts Fish Ingestion**	**DRBC Carcinogenic Fish Ingestion**	**Delaware Marine Acute**	**Delaware Marine Chronic**	**Delaware System Toxicnts Fish Ingestion**	**Delaware Carcinogenic Fish Ingestion**	**NJ Marine Acute**	**NJ Marine Chronic**	**NJ Human Health**	**SR1**		**MDL**	**SR2**		**MDL**	**SR3**		**MDL**	**SR4**		**MDL**	**SR5**		**MDL**	**SR6**		**MDL**	**SR7**		**MDL**
Sample Date:												**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/26/2020**			**8/26/2020**			**8/26/2020**		
SEMIVOLATILES	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**		
Di-n-butyl phthalate	---	---	4,500	---	---	---	4,500	---	---	---	4,500	0.7	J	0.7	ND		0.69	ND		0.69	ND		0.69	ND	0.9	0.69	ND		0.69	ND		0.69
Di-n-octyl phthalate	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.63	ND		0.63	ND		0.63	ND	0.9	0.63	ND		0.63	ND		0.63
Fluoranthene	---	---	140	---	---	---	140	---	---	---	140	ND		0.1	ND		0.06	0.12	J	0.056	0.13	J	0.06	ND	0.2	0.056	ND		0.056	ND		0.06
Fluorene	---	---	5,300	---	---	---	5,300	---	---	---	5,300	ND		0.1	ND		0.06	ND		0.064	ND		0.06	ND	0.2	0.064	ND		0.064	ND		0.06
Hexachlorobenzene	---	---	0.36	0.00029	---	---	0.36	0.00028	---	---	0.00029	ND		0.1	ND		0.05	ND		0.052	ND		0.05	ND	0.2	0.052	ND		0.052	ND		0.05
Hexachlorobutadiene	---	---	---	18	---	---	2,900	18	---	---	18	ND		0.1	ND		0.06	ND		0.064	ND		0.06	ND	0.2	0.064	ND		0.064	ND		0.06
Hexachlorocyclopentadiene	---	---	1,100	---	---	---	5,500	---	---	---	1,100	ND		0.5	ND		0.46	ND		0.46	ND		0.46	ND	0.9	0.46	ND		0.46	ND		0.46
Hexachloroethane	---	---	46	3.3	---	---	32	1.1	---	---	3.3	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND	0.9	0.057	ND		0.057	ND		0.06
Indeno[1,2,3-cd]pyrene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.08	0.65		0.079	0.11	J	0.08	0.18	0.2	0.079	ND		0.079	ND		0.08
Isophorone	---	---	180,000	960	---	---	180,000	960	---	---	960	ND		0.1	ND		0.05	ND		0.05	ND		0.05	ND	0.9	0.05	ND		0.05	ND		0.05
Methylphenol, 3 & 4	---	---	---	---	---	---	---	---	---	---	---	ND		0.3	ND		0.34	ND		0.34	ND		0.34	ND	0.9	0.34	ND		0.34	ND		0.34
Naphthalene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND	0.2	0.055	ND		0.055	ND		0.06
Nitrobenzene	---	---	690	---	---	---	---	---	---	---	690	ND		0.5	ND		0.46	ND		0.46	ND		0.46	ND	1.9	0.46	ND		0.46	ND		0.46
N-Nitrosodi-n-propylamine	---	---	---	0.51	---	---	---	0.51	---	---	0.51	ND		0.1	ND		0.07	ND		0.066	ND		0.07	ND	0.2	0.066	ND		0.066	ND		0.07
N-Nitrosodiphenylamine	---	---	---	6	---	---	---	6	---	---	6	ND		0.1	ND		0.11	ND		0.11	ND		0.11	ND	0.9	0.11	ND		0.11	ND		0.11
Pentachlorophenol	13	---	11,000	3	13	7.9	1,800	0.9	13	7.9	3	ND		0.8	ND		0.78	ND		0.78	ND		0.78	ND	4.6	0.78	ND		0.78	ND		0.78
Phenanthrene	---	---	---	---	---	---	---	---	---	---	---	0.13	J	0.1	0.078	J	0.05	0.07	J	0.051	0.071	J	0.05	ND	0.2	0.051	0.063	J	0.051	0.11	J	0.05
Phenol	---	---	860,000	---	---	---	860,000	---	---	---	860,000	ND		0.5	ND		0.45	ND		0.45	ND		0.45	ND	0.9	0.45	ND		0.45	ND		0.45
Pyrene	---	---	4,000	---	---	---	4,000	---	---	---	4,000	ND		0.1	ND		0.05	0.1	J	0.05	0.11	J	0.05	ND	0.2	0.05	ND		0.05	ND		0.05

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (FILTERED)																				
Sample ID:	**DRBC Marine, Acute, Aquatic Life (1)**	**DRBC Marine, Chronic, Aquatic Life (1)**	**DRBC System Toxicnts Fish Ingestion**	**DRBC Carcinogenic Fish Ingestion**	**Delaware Marine Acute**	**Delaware Marine Chronic**	**Delaware System Toxicnts Fish Ingestion**	**Delaware Carcinogenic Fish Ingestion**	**NJ Marine Acute**	**NJ Marine Chronic**	**NJ Human Health**	**SR1**		**MDL**	**SR2**		**MDL**	**SR3**		**MDL**	**SR4**		**MDL**	**SR5**		**MDL**	**SR6**		**MDL**	**SR7**		**MDL**
Sample Date:												**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/25/2020**			**8/26/2020**			**8/26/2020**			**8/26/2020**		
SEMIVOLATILES	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**			**ug/L**		
1,1'-Biphenyl	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND		0.055	ND		0.055	ND		0.06
2,2'-oxybis[1-chloropropane]	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05	ND		0.054	ND		0.05	ND		0.054	ND		0.054	ND		0.05
2,4,5-Trichlorophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (FILTERED)																				
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:												8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
2,4,6-Trichlorophenol	---	---	---	2.4	---	---	---	2.4	---	---	1	ND		0.1	ND		0.06	ND		0.063	ND		0.06	ND		0.063	ND		0.063	ND		0.06
2,4-Dichlorophenol	---	---	290	---	---	---	290	---	---	---	290	ND		0	ND		0.05	ND		0.047	ND		0.05	ND		0.047	ND		0.047	ND		0.05
2,4-Dimethylphenol	---	---	850	---	---	---	850	---	---	---	850	ND		0	ND		0.04	ND		0.038	ND		0.04	ND		0.038	ND		0.038	ND		0.04
2,4-Dinitrophenol	---	---	5,300	---	---	---	5,300	---	---	---	5,300	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4
2,4-Dinitrotoluene	---	---	2,100	3.4	---	---	2,100	3.4	---	---	3.4	ND		0	ND		0.05	ND		0.047	ND		0.05	ND		0.047	ND		0.047	ND		0.05
2,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06
2-Chloronaphthalene	---	---	1,600	---	---	---	1,600	---	---	---	1,600	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND		0.055	ND		0.055	ND		0.06
2-Chlorophenol	---	---	150	---	---	---	150	---	---	---	150	ND		0.1	ND		0.06	ND		0.059	ND		0.06	ND		0.059	ND		0.059	ND		0.06
2-Methylnaphthalene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND		0.057	ND		0.057	ND		0.06
2-Methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.3	ND		0.28	ND		0.28	ND		0.28	ND		0.28	ND		0.28	ND		0.28
2-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.5	ND		0.51	ND		0.51	ND		0.51	ND		0.51	ND		0.51	ND		0.51
2-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06
3,3'-Dichlorobenzidine	---	---	---	0.028	---	---	---	0.028	---	---	0.028	ND		0.5	ND		0.54	ND		0.54	ND		0.54	ND		0.54	ND		0.54	ND		0.54
3-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.062	ND		0.06	ND		0.062	ND		0.062	ND		0.06
4,6-Dinitro-2-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4
4-Bromophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.058	ND		0.06	ND		0.058	ND		0.058	ND		0.06
4-Chloro-3-methylphenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06
4-Chloroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0	ND		0.04	ND		0.041	ND		0.04	ND		0.041	ND		0.041	ND		0.04
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06
4-Nitroaniline	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05	ND		0.054	ND		0.05	ND		0.054	ND		0.054	ND		0.05
4-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.13	ND		0.13	ND		0.13	ND		0.13	ND		0.13	ND		0.13
Acenaphthene	---	---	990	---	---	---	990	---	---	---	990	ND		0.1	ND		0.06	ND		0.06	ND		0.06	ND		0.06	ND		0.06	ND		0.06
Acenaphthylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.06	ND		0.06	ND		0.06	ND		0.06	ND		0.06
Acetophenone	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND		0.057	ND		0.057	ND		0.06
Anthracene	---	---	40,000	---	---	---	40,000	---	---	---	40,000	ND		0	ND		0.05	ND		0.045	ND		0.05	ND		0.045	ND		0.045	ND		0.05
Atrazine	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.59	ND		0.59	ND		0.59	ND		0.59	ND		0.59	ND		0.59
Benzaldehyde	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.1	ND		0.1	ND		0.1	ND		0.1	ND		0.1	ND		0.1
Benzo[a]anthracene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.07	ND		0.069	ND		0.07	ND		0.069	ND		0.069	ND		0.07
Benzo[a]pyrene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0	ND		0.05	ND		0.049	ND		0.05	ND		0.049	ND		0.049	ND		0.05
Benzo[b]fluoranthene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.09	ND		0.09	ND		0.09	ND		0.09	ND		0.09	ND		0.09
Benzo[g,h,i]perylene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.064	ND		0.06	ND		0.064	ND		0.064	ND		0.06
Benzo[k]fluoranthene	---	---	---	1.8	---	---	---	---	---	---	1.8	ND		0.1	ND		0.08	ND		0.081	ND		0.08	ND		0.081	ND		0.081	ND		0.08

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (FILTERED)																				
Sample ID:	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
Sample Date:												8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
SEMIVOLATILES	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
Bis(2-chloroethoxy)methane	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.062	ND		0.06	ND		0.062	ND		0.062	ND		0.06
Bis(2-chloroethyl)ether	---	---	---	0.53	---	---	---	0.53	---	---	0.53	ND		0	ND		0.04	ND		0.037	ND		0.04	ND		0.037	ND		0.037	ND		0.04
Bis(2-ethylhexyl) phthalate	---	---	620	2.2	---	---	620	2.2	---	---	---	ND		5.8	ND		5.8	ND		5.8	ND		5.8	ND		5.8	ND		5.8	ND		5.8
Butyl benzyl phthalate	---	---	1,900	---	---	---	1,900	---	---	---	190	0.46	J	0.4	0.44	J	0.43	0.45	J	0.43	0.52	J	0.43	0.46	J	0.43	0.44	J	0.43	0.44	J	0.43
Caprolactam	---	---	---	---	---	---	---	---	---	---	---	0.86	J	0.4	ND		0.44	ND		0.44	ND		0.44	ND		0.44	ND		0.44	ND		0.44
Carbazole	---	---	---	---	---	---	---	---	---	---	---	ND		0	ND		0.05	ND		0.047	ND		0.05	ND		0.047	ND		0.047	ND		0.05
Chrysene	---	---	---	18	---	---	---	0.18	---	---	18	ND		0.1	ND		0.08	ND		0.075	ND		0.08	ND		0.075	ND		0.075	ND		0.08
Dibenz(a,h)anthracene	---	---	---	0.018	---	---	---	0.018	---	---	0.018	ND		0.1	ND		0.07	ND		0.067	ND		0.07	ND		0.067	ND		0.067	ND		0.07
Dibenzofuran	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.07	ND		0.068	ND		0.07	ND		0.068	ND		0.068	ND		0.07
Diethyl phthalate	---	---	44,000	---	---	---	44,000	---	---	---	44,000	ND		0.5	ND		0.53	ND		0.53	ND		0.53	ND		0.53	ND		0.53	ND		0.53
Dimethyl phthalate	---	---	1,100,000	---	---	---	110,000	---	---	---	---	ND		0.1	ND		0.05	ND		0.052	ND		0.05	ND		0.052	ND		0.052	ND		0.05
Di-n-butyl phthalate	---	---	4,500	---	---	---	4,500	---	---	---	4,500	ND		0.7	ND		0.69	ND		0.69	ND		0.69	ND		0.69	ND		0.69	ND		0.69
Di-n-octyl phthalate	---	---	---	---	---	---	---	---	---	---	---	ND		0.6	ND		0.63	ND		0.63	ND		0.63	ND		0.63	ND		0.63	ND		0.63
Fluoranthene	---	---	140	---	---	---	140	---	---	---	140	ND		0.1	ND		0.06	ND		0.056	ND		0.06	ND		0.056	ND		0.056	ND		0.06
Fluorene	---	---	5,300	---	---	---	5,300	---	---	---	5,300	ND		0.1	ND		0.06	ND		0.064	ND		0.06	ND		0.064	ND		0.064	ND		0.06
Hexachlorobenzene	---	---	0.36	0.00029	---	---	0.36	0.00028	---	---	0.00029	ND		0.1	ND		0.05	ND		0.052	ND		0.05	ND		0.052	ND		0.052	ND		0.05
Hexachlorobutadiene	---	---	---	18	---	---	2,900	18	---	---	18	ND		0.1	ND		0.06	ND		0.064	ND		0.06	ND		0.064	ND		0.064	ND		0.06
Hexachlorocyclopentadiene	---	---	1,100	---	---	---	5,500	---	---	---	1,100	ND		0.5	ND		0.46	ND		0.46	ND		0.46	ND		0.46	ND		0.46	ND		0.46
Hexachloroethane	---	---	46	3.3	---	---	32	1.1	---	---	3.3	ND		0.1	ND		0.06	ND		0.057	ND		0.06	ND		0.057	ND		0.057	ND		0.06
Indeno[1,2,3-cd]pyrene	---	---	---	0.18	---	---	---	0.18	---	---	0.18	ND		0.1	ND		0.08	ND		0.079	ND		0.08	ND		0.079	ND		0.079	ND		0.08
Isophorone	---	---	180,000	960	---	---	180,000	960	---	---	960	ND		0.1	ND		0.05	ND		0.05	ND		0.05	ND		0.05	ND		0.05	ND		0.05
Methylphenol, 3 & 4	---	---	---	---	---	---	---	---	---	---	---	ND		0.3	ND		0.34	ND		0.34	ND		0.34	ND		0.34	ND		0.34	ND		0.34
Naphthalene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.06	ND		0.055	ND		0.06	ND		0.055	ND		0.055	ND		0.06
Nitrobenzene	---	---	690	---	---	---	---	---	---	---	690	ND		0.5	ND		0.46	ND		0.46	ND		0.46	ND		0.46	ND		0.46	ND		0.46
N-Nitrosodi-n-propylamine	---	---	---	0.51	---	---	---	0.51	---	---	0.51	ND		0.1	ND		0.07	ND		0.066	ND		0.07	ND		0.066	ND		0.066	ND		0.07
N-Nitrosodiphenylamine	---	---	---	6	---	---	---	6	---	---	6	ND		0.1	ND		0.11	ND		0.11	ND		0.11	ND		0.11	ND		0.11	ND		0.11
Pentachlorophenol	13	---	11,000	3	13	7.9	1,800	0.9	13	7.9	3	ND		0.8	ND		0.78	ND		0.78	ND		0.78	ND		0.78	ND		0.78	ND		0.78
Phenanthrene	---	---	---	---	---	---	---	---	---	---	---	ND		0.1	ND		0.05	ND		0.051	ND		0.05	ND		0.051	ND		0.051	ND		0.05
Phenol	---	---	860,000	---	---	---	860,000	---	---	---	860,000	ND		0.5	ND		0.45	ND		0.45	ND		0.45	ND		0.45	ND		0.45	ND		0.45
Pyrene	---	---	4,000	---	---	---	4,000	---	---	---	4,000	ND		0.1	ND		0.05	ND		0.05	ND		0.05	ND		0.05	ND		0.05	ND		0.05

	DRBC				DELAWARE				NEW JERSEY			BACKGROUND SURFACE WATER					
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1D 8/26/2020		MDL	SW-1T 8/26/2020		MDL
PESTICIDEs	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L		
4,4'-DDD	0.13	0.001	0.037	0.00031	0.13	0.001	0.037	0.00022	---	---	0.00031	0.0019		0.00051	ND		0.00051
4,4'-DDE	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	---	---	0.00022	ND		0.00028	ND		0.00028
4,4'-DDT	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	0.13	0.001	0.00022	ND		0.00029	ND		0.00028
Aldrin	1.3	---	0.025	0.00005	1.3	---	0.025	0.00005	1.3	---	0.00005	ND		0.00034	ND		0.00034
alpha-BHC	0.16	---	---	0.0049	0.16	---	---	0.0048	---	---	0.0049	0.00039	J	0.00023	ND		0.00023
beta-BHC	0.16	---	---	0.017	0.16	---	---	0.017	---	---	0.017	0.00076	Jp	0.00035	ND		0.00035
cis-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		0.00035	ND		0.00035
delta-BHC	0.16	---	---	---	0.16	---	---	---	---	---	---	ND		0.00062	ND		0.00061
Dieldrin	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.000054	ND		0.00026	0.00075	J	0.00026
Endosulfan I	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		0.00066	ND		0.00065
Endosulfan II	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		0.0003	ND		0.0003
Endosulfan sulfate	---	---	89	---	0.034	0.0087	89	---	---	---	89	ND		0.00061	ND		0.00061
Endrin	0.037	0.0023	0.06	---	0.037	0.0023	0.3	---	0.037	0.0023	0.06	ND		0.00022	ND		0.00022
Endrin aldehyde	---	---	0.3	---	0.037	0.0023	0.3	---	---	---	0.06	ND		0.0005	0.0028		0.00049
Endrin ketone	---	---	---	---	0.037	0.0023	0.3	---	---	---	---	ND		0.00038	ND		0.00038
gamma-BHC (Lindane)	0.16	---	1.8	---	0.16	---	9.2	0.23	0.16	---	1.8	ND		0.00028	ND		0.00028
Heptachlor	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.000079	ND		0.00043	0.00055	J	0.00043
Heptachlor epoxide	0.053	0.0036	0.0046	0.000039	---	---	0.0046	0.000039	0.053	0.0036	0.000039	ND		0.00033	ND		0.00032
Methoxychlor	---	---	---	---	---	0.03	---	---	---	0.03	---	ND		0.00075	ND		0.00074
Toxaphene	0.21	0.0002	---	0.00028	0.21	0.0002	---	0.00028	0.21	0.0002	0.00028	ND		0.047	ND		0.047
trans-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		0.00039	ND		0.00039

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Chronic, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PESTICIDEs	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
4,4'-DDD	0.13	0.001	0.037	0.00031	0.13	0.001	0.037	0.00022	---	---	0.00031	ND		5E-04	ND		5E-04	ND		5E-04	ND		5E-04	ND		5E-04	ND		5E-04	ND		5E-04
4,4'-DDE	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	---	---	0.00022	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
4,4'-DDT	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	0.13	0.001	0.00022	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
Aldrin	1.3	---	0.025	0.00005	1.3	---	0.025	0.00005	1.3	---	0.00005	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
alpha-BHC	0.16	---	---	0.0049	0.16	---	---	0.0048	---	---	0.0049	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04
beta-BHC	0.16	---	---	0.017	0.16	---	---	0.017	---	---	0.017	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04
cis-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04
delta-BHC	0.16	---	---	---	0.16	---	---	---	---	---	---	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PESTICIDEs	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L			ug/L			ug/L			ug/L		
Dieldrin	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.000054	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
Endosulfan I	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04
Endosulfan II	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
Endosulfan sulfate	---	---	89	---	0.034	0.0087	89	---	---	---	89	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04	ND		6E-04
Endrin	0.037	0.0023	0.06	---	0.037	0.0023	0.3	---	0.037	0.0023	0.06	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		2E-04
Endrin aldehyde	---	---	0.3	---	0.037	0.0023	0.3	---	---	---	0.06	ND		5E-04	0.00089	Jp	5E-04	ND		5E-04	0.0011	J	5E-04	0.0011	J	5E-04	ND		5E-04	ND		5E-04
Endrin ketone	---	---	---	---	0.037	0.0023	0.3	---	---	---	---	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04
gamma-BHC (Lindane)	0.16	---	1.8	---	0.16	---	9.2	0.23	0.16	---	1.8	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
Heptachlor	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.000079	ND		4E-04	ND		4E-04	0.00044	Jp	4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04
Heptachlor epoxide	0.053	0.0036	0.0046	0.000039	---	---	0.0046	0.000039	0.053	0.0036	0.000039	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04	ND		3E-04
Methoxychlor	---	---	---	---	---	0.03	---	---	---	0.03	---	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04	ND		7E-04
Toxaphene	0.21	0.0002	---	0.00028	0.21	0.0002	---	0.00028	0.21	0.0002	0.00028	ND		5E-02	ND		5E-02	ND		5E-02	ND		5E-02	ND		5E-02	ND		5E-02	ND		5E-02
trans-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04	ND		4E-04

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (FILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
PESTICIDEs	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
4,4'-DDD	0.13	0.001	0.037	0.00031	0.13	0.001	0.037	0.00022	---	---	0.00031	ND		0.0005	ND		0.0005	ND		5E-04	ND		5E-04	ND		5E-04	ND		0	ND		5E-04
4,4'-DDE	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	---	---	0.00022	ND		0.00028	ND		0.00028	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
4,4'-DDT	0.13	0.001	0.037	0.00022	0.13	0.001	0.037	0.00022	0.13	0.001	0.00022	ND		0.00028	ND		0.00028	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
Aldrin	1.3	---	0.025	0.00005	1.3	---	0.025	0.00005	1.3	---	0.00005	ND		0.00034	ND		0.00034	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
alpha-BHC	0.16	---	---	0.0049	0.16	---	---	0.0048	---	---	0.0049	ND		0.00022	ND		0.00022	ND		2E-04	ND		2E-04	ND		2E-04	ND		0	ND		2E-04
beta-BHC	0.16	---	---	0.017	0.16	---	---	0.017	---	---	0.017	ND		0.00035	0.0016	p	0.00035	0.0012	p	4E-04	0.0011	Jp	4E-04	0.0014	p	4E-04	0.00082	Jp	0	ND		4E-04
cis-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		0.00035	ND		0.00035	ND		4E-04	ND		4E-04	ND		4E-04	ND		0	ND		4E-04
delta-BHC	0.16	---	---	---	0.16	---	---	---	---	---	---	ND		0.00061	ND		0.00061	ND		6E-04	ND		6E-04	ND		6E-04	ND		0	ND		6E-04
Dieldrin	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.043	0.000054	0.71	0.0019	0.000054	ND		0.00026	ND		0.00026	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
Endosulfan I	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		0.00065	ND		0.00065	ND		7E-04	ND		7E-04	ND		7E-04	ND		0	ND		7E-04
Endosulfan II	0.034	0.0087	89	---	0.034	0.0087	89	---	0.034	0.0087	89	ND		0.0003	ND		0.0003	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04

	DRBC				DELAWARE				NEW JERSEY			ELUTRIATE (FILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicnts Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicnts Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SR1		MDL	SR2		MDL	SR3		MDL	SR4		MDL	SR5		MDL	SR6		MDL	SR7		MDL
PESTICIDEs	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	8/25/2020			8/25/2020			8/25/2020			8/25/2020			8/26/2020			8/26/2020			8/26/2020		
Endosulfan sulfate	---	---	89	---	0.034	0.0087	89	---	---	---	89	ND		0.0006	ND		0.0006	ND		6E-04	ND		6E-04	ND		6E-04	ND		0	ND		6E-04
Endrin	0.037	0.0023	0.06	---	0.037	0.0023	0.3	---	0.037	0.0023	0.06	ND		0.00022	ND		0.00022	ND		2E-04	ND		2E-04	ND		2E-04	ND		0	ND		2E-04
Endrin aldehyde	---	---	0.3	---	0.037	0.0023	0.3	---	---	---	0.06	0.0006	J p	0.00049	ND		0.00049	ND		5E-04	0.0016		5E-04	ND		5E-04	ND		0	0.0007	J p	5E-04
Endrin ketone	---	---	---	---	0.037	0.0023	0.3	---	---	---	---	ND		0.00037	ND		0.00037	ND		4E-04	ND		4E-04	ND		4E-04	ND		0	ND		4E-04
gamma-BHC (Lindane)	0.16	---	1.8	---	0.16	---	9.2	0.23	0.16	---	1.8	ND		0.00028	ND		0.00028	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
Heptachlor	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.18	0.000079	0.053	0.0036	0.000079	ND		0.00043	ND		0.00043	0.00068	J	4E-04	ND		4E-04	ND		4E-04	ND		0	ND		4E-04
Heptachlor epoxide	0.053	0.0036	0.0046	0.000039	---	---	0.0046	0.000039	0.053	0.0036	0.000039	ND		0.00032	ND		0.00032	ND		3E-04	ND		3E-04	ND		3E-04	ND		0	ND		3E-04
Methoxychlor	---	---	---	---	---	0.03	---	---	---	0.03	---	ND		0.00073	ND		0.00073	ND		7E-04	ND		7E-04	ND		7E-04	ND		0	ND		7E-04
Toxaphene	0.21	0.0002	---	0.00028	0.21	0.0002	---	0.00028	0.21	0.0002	0.00028	ND		0.046	ND		0.046	ND		0.046	ND		0.046	ND		0.046	ND		0.05	ND		0.046
trans-Chlordane	0.09	0.004	0.14	0.00081	0.09	0.004	0.14	0.00081	0.09	0.004	0.00011	ND		0.00039	ND		0.00039	ND		4E-04	ND		4E-04	ND		4E-04	ND		0	ND		4E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-001	---	---	---	---	---	---	---	---	---	---	---	ND		1.90E-04	0.0033	J q	4E-04	0.0035	J	3E-04	0.0023	J	4E-04	0.0021	J	5E-04	0.0022	J q	4E-04	0.0041	J	3E-04	0.0031	J q	3E-04
PCB-002	---	---	---	---	---	---	---	---	---	---	---	0.0021	J q	2.30E-04	0.0028	J B q	5E-04	0.0023	J B	3E-04	0.0023	J B q	4E-04	0.0019	J B q	5E-04	0.002	J B	4E-04	0.0019	J q B	3E-04	0.0044	J q B	4E-04
PCB-003	---	---	---	---	---	---	---	---	---	---	---	0.002	J q	2.60E-04	0.0022	J q	5E-04	0.0019	J q	3E-04	ND		5E-04	0.0026	J	6E-04	0.0022	J q	5E-04	0.0033	J q	4E-04	0.0044	J	4E-04
PCB-004	---	---	---	---	---	---	---	---	---	---	---	0.011	J q	2.30E-03	0.026	J	2E-03	0.022	J	1E-03	0.023	J	2E-03	0.022	J	2E-03	0.012	J q	2E-03	0.021	J	3E-03	0.022	J q	2E-03
PCB-005	---	---	---	---	---	---	---	---	---	---	---	0.0056	J q	1.90E-03	ND		2E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		2E-03	ND		1E-03
PCB-006	---	---	---	---	---	---	---	---	---	---	---	0.0032	J q	1.70E-03	0.012	J	2E-03	0.0048	J q	1E-03	0.011	J	1E-03	0.0056	J	1E-03	ND		1E-03	0.006	J	2E-03	0.0074	J	1E-03
PCB-007	---	---	---	---	---	---	---	---	---	---	---	ND		1.70E-03	ND		1E-03	ND		9E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		2E-03	ND		1E-03
PCB-008	---	---	---	---	---	---	---	---	---	---	---	0.0061	J q B	1.60E-03	0.011	J B	2E-03	0.008	J B q	9E-04	0.0076	J B q	1E-03	0.0062	J B q	1E-03	0.0059	J q B	1E-03	0.019	J q B	2E-03	0.013	J B	1E-03
PCB-009	---	---	---	---	---	---	---	---	---	---	---	ND		1.80E-03	ND		2E-03	ND		1E-03	0.002	J	1E-03	ND		1E-03	ND		2E-03	ND		2E-03	ND		2E-03
PCB-010	---	---	---	---	---	---	---	---	---	---	---	ND		1.90E-03	0.0049	J	2E-03	ND		1E-03	0.0023	J q	1E-03	ND		1E-03	ND		2E-03	ND		2E-03	ND		2E-03

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-011	---	---	---	---	---	---	---	---	---	---	---	0.026	J q B	1.70E-03	0.047	J B q	1E-03	0.027	J B	9E-04	0.029	J B	1E-03	0.026	J B	1E-03	0.016	J q B	1E-03	0.084	B	2E-03	0.042	J B	1E-03
PCB-012	---	---	---	---	---	---	---	---	---	---	---	0.0051	J q C	1.70E-03	0.0042	J C q	1E-03	ND	C	9E-04	0.0051	J C q	1E-03	0.0033	J C q	1E-03	ND	C	1E-03	0.0044	J q C	2E-03	0.0067	J q C	1E-03
PCB-013	---	---	---	---	---	---	---	---	---	---	---	0.0051	J q C12	1.70E-03	0.0042	J C12 q	1E-03	ND	C12	9E-04	0.0051	J C12 q	1E-03	0.0033	J C12 q	1E-03	ND	C12	1E-03	0.0044	J q C12	2E-03	0.0067	J q C12	1E-03
PCB-014	---	---	---	---	---	---	---	---	---	---	---	ND		1.50E-03	ND		1E-03	ND		8E-04	ND		9E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		1E-03
PCB-015	---	---	---	---	---	---	---	---	---	---	---	0.0087	J q	1.90E-03	0.0092	J	1E-03	0.0079	J	9E-04	0.008	J q	1E-03	0.0073	J q	1E-03	0.0073	J	1E-03	0.012	J q	2E-03	0.014	J	1E-03
PCB-016	---	---	---	---	---	---	---	---	---	---	---	0.0025	J q	2.50E-04	0.0088	J	1E-03	0.0054	J q	7E-04	0.011	J q	2E-03	0.0076	J q	1E-03	0.0076	J q	9E-04	0.012	J q	1E-03	0.0084	J q	1E-03
PCB-017	---	---	---	---	---	---	---	---	---	---	---	0.0042	J q	2.30E-04	0.012	J q	1E-03	0.013	J	6E-04	0.02	J	1E-03	ND		1E-03	0.011	J q	7E-04	0.015	J	9E-04	0.017	J q	1E-03
PCB-018	---	---	---	---	---	---	---	---	---	---	---	0.0087	J q C	2.00E-04	0.024	J C B q	9E-04	0.02	J C B	5E-04	0.031	J C B	1E-03	0.021	J C B	9E-04	0.015	J q C B	6E-04	0.023	J C B	8E-04	0.027	J C B	9E-04
PCB-019	---	---	---	---	---	---	---	---	---	---	---	0.0074	J q	2.80E-04	0.012	J q	1E-03	0.0086	J	7E-04	0.01	J q	2E-03	0.0048	J q	1E-03	0.0057	J q	9E-04	0.0046	J q	1E-03	0.0068	J	1E-03
PCB-020	---	---	---	---	---	---	---	---	---	---	---	0.024	J C B	4.00E-04	0.035	J C B	1E-03	0.02	J C B	7E-04	0.027	J C B	1E-03	0.021	J C B	9E-04	0.017	J C B	9E-04	0.025	J C B	8E-04	0.037	J C B	8E-04
PCB-021	---	---	---	---	---	---	---	---	---	---	---	0.0044	J q C B	3.90E-04	0.014	J C B	1E-03	0.0089	J C B	7E-04	0.011	J C B	9E-04	0.0095	J C B	9E-04	0.0057	J q C B	9E-04	0.015	J C B	7E-04	0.016	J C B	8E-04
PCB-022	---	---	---	---	---	---	---	---	---	---	---	0.0035	J B	4.10E-04	0.0075	J B q	1E-03	0.0043	J B	8E-04	0.0062	J B	1E-03	0.0046	J B	1E-03	0.0028	J B	1E-03	0.0063	J q B	8E-04	0.0069	J B	8E-04
PCB-023	---	---	---	---	---	---	---	---	---	---	---	ND		4.10E-04	ND		1E-03	ND		7E-04	ND		1E-03	ND		9E-04	ND		1E-03	ND		8E-04	ND		8E-04
PCB-024	---	---	---	---	---	---	---	---	---	---	---	ND		1.90E-04	ND		8E-04	ND		4E-04	ND		1E-03	0.0014	J q	8E-04	ND		6E-04	ND		7E-04	ND		8E-04
PCB-025	---	---	---	---	---	---	---	---	---	---	---	0.0031	J	3.70E-04	0.011	J	1E-03	0.0055	J q	7E-04	0.013	J	9E-04	0.0054	J q	9E-04	0.003	J q	9E-04	0.0043	J	7E-04	0.0083	J	8E-04
PCB-026	---	---	---	---	---	---	---	---	---	---	---	0.0037	J C	4.00E-04	0.016	J C	1E-03	0.0086	J C	7E-04	0.023	J C	1E-03	0.0074	J C q	9E-04	0.0047	J q C	9E-04	0.0057	J C	8E-04	0.012	J q C	8E-04
PCB-027	---	---	---	---	---	---	---	---	---	---	---	0.0031	J q	1.70E-04	0.0064	J q	8E-04	0.0064	J	4E-04	0.0069	J q	9E-04	0.0049	J	8E-04	0.0025	J q	5E-04	0.0037	J q	7E-04	0.0061	J q	8E-04
PCB-028	---	---	---	---	---	---	---	---	---	---	---	0.024	J C20 B	4.00E-04	0.035	J B C20	1E-03	0.02	J B C20	7E-04	0.027	J B C20	1E-03	0.021	J B C20	9E-04	0.017	J C20 B	9E-04	0.025	J C20 B	8E-04	0.037	J C20 B	8E-04
PCB-029	---	---	---	---	---	---	---	---	---	---	---	0.0037	J C26	4.00E-04	0.016	J C26	1E-03	0.0086	J C26	7E-04	0.023	J C26	1E-03	0.0074	J C26 q	9E-04	0.0047	J q C26	9E-04	0.0057	J C26	8E-04	0.012	J q C26	8E-04
PCB-030	---	---	---	---	---	---	---	---	---	---	---	0.0087	J q C18	2.00E-04	0.024	J C18 B q	9E-04	0.02	J C18 B	5E-04	0.031	J C18 B	1E-03	0.021	J C18 B	9E-04	0.015	J q C18 B	6E-04	0.023	J C18 B	8E-04	0.027	J C18 B	9E-04
PCB-031	---	---	---	---	---	---	---	---	---	---	---	0.014	J B	3.90E-04	0.027	J B	1E-03	0.017	J B	7E-04	0.023	J B	9E-04	0.017	J B	9E-04	0.013	J B	9E-04	0.022	J B	7E-04	0.027	J B	8E-04
PCB-032	---	---	---	---	---	---	---	---	---	---	---	0.0054	J q	1.60E-04	0.015	J q	7E-04	0.011	J	4E-04	0.014	J q	9E-04	0.0088	J q	7E-04	0.0095	J	5E-04	0.012	J	6E-04	0.015	J	7E-04
PCB-033	---	---	---	---	---	---	---	---	---	---	---	0.0044	J q C21 B	3.90E-04	0.014	J B C21	1E-03	0.0089	J B C21	7E-04	0.011	J B C21	9E-04	0.0095	J B C21	9E-04	0.0057	J q C21 B	9E-04	0.015	J C21 B	7E-04	0.016	J C21 B	8E-04
PCB-034	---	---	---	---	---	---	---	---	---	---	---	ND		4.30E-04	ND		1E-03	ND		8E-04	0.0013	J	1E-03	ND		1E-03	ND		1E-03	ND		8E-04	ND		9E-04
PCB-035	---	---	---	---	---	---	---	---	---	---	---	0.0016	J	4.10E-04	0.0027	J q	1E-03	0.0013	J q	8E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		8E-04	0.0033	J	9E-04
PCB-036	---	---	---	---	---	---	---	---	---	---	---	ND		4.00E-04	ND		1E-03	ND		7E-04	0.00096	J q	9E-04	ND		9E-04	ND		9E-04	ND		7E-04	ND		8E-04
PCB-037	---	---	---	---	---	---	---	---	---	---	---	0.0049	J	4.10E-04	0.006	J B q	1E-03	0.0039	J B q	7E-04	0.0057	J B	1E-03	0.0047	J B	9E-04	0.004	J q B	9E-04	0.004	J q B	8E-04	0.011	J B	8E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-038	---	---	---	---	---	---	---	---	---	---	---	ND		4.30E-04	ND		1E-03	ND		7E-04	ND		1E-03	ND		9E-04	ND		9E-04	ND		8E-04	ND		8E-04
PCB-039	---	---	---	---	---	---	---	---	---	---	---	ND		3.80E-04	ND		1E-03	ND		7E-04	ND		9E-04	ND		9E-04	ND		9E-04	ND		7E-04	ND		8E-04
PCB-040	---	---	---	---	---	---	---	---	---	---	---	0.016	J C	5.90E-04	0.066	J C B	1E-03	0.039	J C B	1E-03	0.069	J C B	1E-03	0.037	J C B	9E-04	0.029	J C B	9E-04	0.019	J q C B	1E-03	0.073	J C B	1E-03
PCB-041	---	---	---	---	---	---	---	---	---	---	---	0.016	J C40	5.90E-04	0.066	J B C40	1E-03	0.039	J B C40	1E-03	0.069	J B C40	1E-03	0.037	J B C40	9E-04	0.029	J C40 B	9E-04	0.019	J q C40 B	1E-03	0.073	J C40 B	1E-03
PCB-042	---	---	---	---	---	---	---	---	---	---	---	0.0056	J	5.90E-04	0.025	J	2E-03	0.015	J	1E-03	0.024	J	1E-03	0.012	J	1E-03	0.011	J	9E-04	0.0092	J	1E-03	0.021	J	1E-03
PCB-043	---	---	---	---	---	---	---	---	---	---	---	ND	C	5.60E-04	ND	C	1E-03	ND	C	1E-03	ND	C	1E-03	0.0026	J C	8E-04	ND	C	8E-04	ND	C	1E-03	0.0045	J q C	1E-03
PCB-044	---	---	---	---	---	---	---	---	---	---	---	0.035	J C B	5.20E-04	0.091	J C B	1E-03	0.11	C B	1E-03	0.13	C B	1E-03	0.17	C B	8E-04	0.071	J C B	8E-04	0.13	C B	1E-03	0.11	J C B	1E-03
PCB-045	---	---	---	---	---	---	---	---	---	---	---	0.0066	J C	6.20E-04	0.022	J C	1E-03	0.021	J C	1E-03	0.028	J C q	1E-03	0.033	J C	9E-04	0.012	J q C	9E-04	0.025	J C	1E-03	0.028	J C	1E-03
PCB-046	---	---	---	---	---	---	---	---	---	---	---	ND		7.50E-04	0.0056	J q	2E-03	0.0041	J	2E-03	0.0081	J	2E-03	0.0033	J	1E-03	0.0024	J q	1E-03	ND		1E-03	0.0052	J	2E-03
PCB-047	---	---	---	---	---	---	---	---	---	---	---	0.035	J C44 B	5.20E-04	0.091	J B C44	1E-03	0.11	B C44	1E-03	0.13	B C44	1E-03	0.17	B C44	8E-04	0.071	J C44 B	8E-04	0.13	C44 B	1E-03	0.11	J C44 B	1E-03
PCB-048	---	---	---	---	---	---	---	---	---	---	---	0.0017	J q	5.90E-04	0.0071	J	1E-03	0.0031	J q	1E-03	0.005	J q	1E-03	0.0028	J	9E-04	0.0033	J q	8E-04	0.0043	J q	1E-03	0.0059	J q	1E-03
PCB-049	---	---	---	---	---	---	---	---	---	---	---	0.023	J C	4.80E-04	0.077	C	1E-03	0.047	J C	1E-03	0.079	C	1E-03	0.04	J C	7E-04	0.03	J C	7E-04	0.025	J C	1E-03	0.089	C	1E-03
PCB-050	---	---	---	---	---	---	---	---	---	---	---	0.0054	J q C	5.70E-04	0.02	J C	1E-03	0.012	J C	1E-03	0.018	J C q	1E-03	0.011	J C	9E-04	0.0073	J q C	8E-04	0.0064	J C	1E-03	0.021	J q C	1E-03
PCB-051	---	---	---	---	---	---	---	---	---	---	---	0.0066	J C45	6.20E-04	0.022	J C45	1E-03	0.021	J C45	1E-03	0.028	J C45 q	1E-03	0.033	J C45	9E-04	0.012	J q C45	9E-04	0.025	J C45	1E-03	0.028	J C45	1E-03
PCB-052	---	---	---	---	---	---	---	---	---	---	---	0.041		5.90E-04	0.11	B	1E-03	0.066	B	1E-03	0.12	B	1E-03	0.058	B	9E-04	0.042	q B	9E-04	0.04	B	1E-03	0.14	B	1E-03
PCB-053	---	---	---	---	---	---	---	---	---	---	---	0.0054	J q C50	5.70E-04	0.02	J C50	1E-03	0.012	J C50	1E-03	0.018	J C50 q	1E-03	0.011	J C50	9E-04	0.0073	J q C50	8E-04	0.0064	J C50	1E-03	0.021	J q C50	1E-03
PCB-054	---	---	---	---	---	---	---	---	---	---	---	0.001	J q	1.20E-04	0.0019	J	2E-04	0.0011	J	1E-04	0.0013	J q	3E-04	ND		1E-04	0.00024	J q	2E-04	0.00054	J q	2E-04	0.0014	J q	2E-04
PCB-055	---	---	---	---	---	---	---	---	---	---	---	0.00066	J q	4.30E-04	ND		1E-03	ND		9E-04	ND		9E-04	ND		6E-04	ND		6E-04	ND		8E-04	ND		9E-04
PCB-056	---	---	---	---	---	---	---	---	---	---	---	0.0062	J q	4.30E-04	0.011	J q	1E-03	0.007	J	1E-03	0.008	J	1E-03	0.0065	J	7E-04	0.0034	J q	6E-04	0.0046	J q	9E-04	0.014	J q	1E-03
PCB-057	---	---	---	---	---	---	---	---	---	---	---	ND		4.40E-04	ND		1E-03	ND		9E-04	ND		1E-03	ND		7E-04	ND		6E-04	ND		9E-04	ND		9E-04
PCB-058	---	---	---	---	---	---	---	---	---	---	---	ND		4.40E-04	ND		1E-03	ND		9E-04	ND		9E-04	ND		6E-04	ND		6E-04	ND		8E-04	ND		9E-04
PCB-059	---	---	---	---	---	---	---	---	---	---	---	0.0025	J q C	4.20E-04	0.0077	J C	9E-04	0.0053	J C	9E-04	0.0046	J C q	9E-04	0.0031	J C	6E-04	0.0026	J q C	6E-04	0.004	J C	8E-04	0.0068	J C	9E-04
PCB-060	---	---	---	---	---	---	---	---	---	---	---	0.003	J	4.40E-04	0.0032	J	1E-03	0.0019	J	9E-04	ND		9E-04	0.0012	J q	6E-04	0.0022	J q	6E-04	0.0019	J	8E-04	0.0052	J	9E-04
PCB-061	---	---	---	---	---	---	---	---	---	---	---	0.031	J C	4.10E-04	0.056	J C B	9E-04	0.03	J C B	9E-04	0.035	J C B	9E-04	0.025	J C B	6E-04	0.025	J C B	6E-04	0.02	J C B	8E-04	0.065	J C B	9E-04
PCB-062	---	---	---	---	---	---	---	---	---	---	---	0.0025	J q C59	4.20E-04	0.0077	J C59	9E-04	0.0053	J C59	9E-04	0.0046	J C59 q	9E-04	0.0031	J C59	6E-04	0.0026	J q C59	6E-04	0.004	J C59	8E-04	0.0068	J C59	9E-04
PCB-063	---	---	---	---	---	---	---	---	---	---	---	ND		4.00E-04	0.0014	J q	9E-04	ND		8E-04	0.0018	J	8E-04	0.00086	J q	6E-04	ND		5E-04	ND		7E-04	ND		8E-04
PCB-064	---	---	---	---	---	---	---	---	---	---	---	0.01	J	4.00E-04	0.025	J	9E-04	0.014	J	9E-04	0.018	J	9E-04	0.012	J	6E-04	0.0099	J	6E-04	0.0099	J	8E-04	0.022	J	9E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-065	---	---	---	---	---	---	---	---	---	---	---	0.035	J C44 B	5.20E-04	0.091	J B C44	1E-03	0.11	B C44	1E-03	0.13	B C44	1E-03	0.17	B C44	8E-04	0.071	J C44 B	8E-04	0.13	C44 B	1E-03	0.11	J C44 B	1E-03
PCB-066	---	---	---	---	---	---	---	---	---	---	---	0.024	J	4.10E-04	0.04	B	1E-03	0.02	J B	1E-03	0.019	J B	1E-03	0.017	J B	7E-04	0.017	J B	6E-04	0.012	J B	9E-04	0.049	B	9E-04
PCB-067	---	---	---	---	---	---	---	---	---	---	---	0.00064	J	3.80E-04	ND		9E-04	0.0011	J	9E-04	ND		9E-04	ND		6E-04	ND		6E-04	ND		8E-04	ND		9E-04
PCB-068	---	---	---	---	---	---	---	---	---	---	---	0.00087	J	3.90E-04	0.0039	J B q	9E-04	0.0091	J B	8E-04	0.0096	J B	8E-04	0.017	J B	6E-04	0.004	J q B	5E-04	0.011	J q B	7E-04	0.0058	J q B	8E-04
PCB-069	---	---	---	---	---	---	---	---	---	---	---	0.023	J C49	4.80E-04	0.077	C49	1E-03	0.047	J C49	1E-03	0.079	C49	1E-03	0.04	J C49	7E-04	0.03	J C49	7E-04	0.025	J C49	1E-03	0.089	C49	1E-03
PCB-070	---	---	---	---	---	---	---	---	---	---	---	0.031	J C61	4.10E-04	0.056	J C61 B	9E-04	0.03	J C61 B	9E-04	0.035	J C61 B	9E-04	0.025	J C61 B	6E-04	0.025	J C61 B	6E-04	0.02	J C61 B	8E-04	0.065	J C61 B	9E-04
PCB-071	---	---	---	---	---	---	---	---	---	---	---	0.016	J C40	5.90E-04	0.066	J B C40	1E-03	0.039	J B C40	1E-03	0.069	J B C40	1E-03	0.037	J B C40	9E-04	0.029	J C40 B	9E-04	0.019	J q C40 B	1E-03	0.073	J C40 B	1E-03
PCB-072	---	---	---	---	---	---	---	---	---	---	---	0.00097	J	4.30E-04	0.0041	J	1E-03	0.002	J	9E-04	0.0035	J	9E-04	0.0011	J q	6E-04	0.0011	J q	6E-04	ND		8E-04	0.0045	J	9E-04
PCB-073	---	---	---	---	---	---	---	---	---	---	---	ND	C43	5.60E-04	ND	C43	1E-03	ND	C43	1E-03	ND	C43	1E-03	0.0026	J C43	8E-04	ND	C43	8E-04	ND	C43	1E-03	0.0045	J q C43	1E-03
PCB-074	---	---	---	---	---	---	---	---	---	---	---	0.031	J C61	4.10E-04	0.056	J C61 B	9E-04	0.03	J C61 B	9E-04	0.035	J C61 B	9E-04	0.025	J C61 B	6E-04	0.025	J C61 B	6E-04	0.02	J C61 B	8E-04	0.065	J C61 B	9E-04
PCB-075	---	---	---	---	---	---	---	---	---	---	---	0.0025	J q C59	4.20E-04	0.0077	J C59	9E-04	0.0053	J C59	9E-04	0.0046	J C59 q	9E-04	0.0031	J C59	6E-04	0.0026	J q C59	6E-04	0.004	J C59	8E-04	0.0068	J C59	9E-04
PCB-076	---	---	---	---	---	---	---	---	---	---	---	0.031	J C61	4.10E-04	0.056	J C61 B	9E-04	0.03	J C61 B	9E-04	0.035	J C61 B	9E-04	0.025	J C61 B	6E-04	0.025	J C61 B	6E-04	0.02	J C61 B	8E-04	0.065	J C61 B	9E-04
PCB-077	---	---	---	---	---	---	---	---	---	---	---	0.0033	J	4.20E-04	0.0046	J B	1E-03	0.0033	J B	9E-04	0.0021	J B q	9E-04	0.0025	J B	6E-04	0.0014	J q B	6E-04	0.0016	J q B	8E-04	0.0078	J B	9E-04
PCB-078	---	---	---	---	---	---	---	---	---	---	---	ND		4.40E-04	ND		1E-03	ND		9E-04	ND		9E-04	ND		6E-04	ND		6E-04	ND		8E-04	ND		9E-04
PCB-079	---	---	---	---	---	---	---	---	---	---	---	ND		3.80E-04	0.0011	J B q	8E-04	ND		8E-04	ND		8E-04	0.00096	J B q	5E-04	ND		5E-04	ND		7E-04	0.0016	J q B	8E-04
PCB-080	---	---	---	---	---	---	---	---	---	---	---	ND		3.80E-04	ND		9E-04	ND		8E-04	ND		8E-04	ND		6E-04	ND		5E-04	ND		7E-04	ND		8E-04
PCB-081	---	---	---	---	---	---	---	---	---	---	---	ND		4.00E-04	ND		1E-03	ND		9E-04	ND		9E-04	ND		6E-04	ND		6E-04	ND		8E-04	ND		9E-04
PCB-082	---	---	---	---	---	---	---	---	---	---	---	0.0035	J	2.60E-04	0.0061	J	2E-03	0.0037	J	1E-03	0.0042	J	2E-03	ND		2E-03	ND		3E-03	ND		1E-03	0.0049	J q	3E-03
PCB-083	---	---	---	---	---	---	---	---	---	---	---	0.033	J q C	2.30E-04	0.1	C	2E-03	0.05	J C q	1E-03	0.066	J C	2E-03	0.037	J C	2E-03	0.043	J C	2E-03	0.023	J C	1E-03	0.12	C	2E-03
PCB-084	---	---	---	---	---	---	---	---	---	---	---	0.0088	J q	2.60E-04	0.027	J	2E-03	0.014	J q	1E-03	0.021	J	2E-03	0.012	J q	2E-03	0.013	J q	3E-03	0.0054	J q	1E-03	0.034	J	3E-03
PCB-085	---	---	---	---	---	---	---	---	---	---	---	0.0032	J q C	1.90E-04	0.0083	J C q	1E-03	0.0045	J C q	9E-04	ND	C	2E-03	0.0053	J C	1E-03	ND	C	2E-03	0.0035	J q C	1E-03	0.013	J C	2E-03
PCB-086	---	---	---	---	---	---	---	---	---	---	---	0.022	J C	1.90E-04	0.044	J C B	1E-03	0.028	J C B	9E-04	0.028	J C B q	2E-03	0.02	J C B	1E-03	0.025	J C B	2E-03	0.012	J q C B	1E-03	0.054	J C B	2E-03
PCB-087	---	---	---	---	---	---	---	---	---	---	---	0.022	J C86	1.90E-04	0.044	J B C86	1E-03	0.028	J B C86	9E-04	0.028	J B C86 q	2E-03	0.02	J B C86	1E-03	0.025	J C86 B	2E-03	0.012	J q C86 B	1E-03	0.054	J C86 B	2E-03
PCB-088	---	---	---	---	---	---	---	---	---	---	---	0.0099	J C	2.30E-04	0.033	J C q	2E-03	0.023	J C q	1E-03	0.035	J C	2E-03	0.017	J C	2E-03	0.017	J C	2E-03	0.0095	J q C	1E-03	0.052	J C	2E-03
PCB-089	---	---	---	---	---	---	---	---	---	---	---	ND		2.50E-04	ND		2E-03	ND		1E-03	ND		2E-03	ND		2E-03	ND		2E-03	ND		1E-03	ND		3E-03
PCB-090	---	---	---	---	---	---	---	---	---	---	---	0.051	J C B	1.90E-04	0.096	J C B	2E-03	0.055	J C B	1E-03	0.071	J C B	2E-03	0.04	J C B	1E-03	0.046	J C B	2E-03	0.029	J C B	1E-03	0.11	J C B	2E-03
PCB-091	---	---	---	---	---	---	---	---	---	---	---	0.0099	J C88	2.30E-04	0.033	J C88 q	2E-03	0.023	J C88 q	1E-03	0.035	J C88	2E-03	0.017	J C88	2E-03	0.017	J C88	2E-03	0.0095	J q C88	1E-03	0.052	J C88	2E-03

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-092	---	---	---	---	---	---	---	---	---	---	---	0.0073	J q	2.20E-04	0.016	J q	2E-03	0.011	J	1E-03	0.01	J q	2E-03	0.0063	J q	2E-03	0.0082	J	2E-03	ND		1E-03	0.023	J	2E-03
PCB-093	---	---	---	---	---	---	---	---	---	---	---	0.0022	J C	2.20E-04	0.0091	J C q	2E-03	0.0049	J C q	1E-03	0.0076	J C	2E-03	0.0024	J C q	2E-03	0.0033	J C	2E-03	ND	C	1E-03	0.013	J q C	2E-03
PCB-094	---	---	---	---	---	---	---	---	---	---	---	ND		2.50E-04	ND		2E-03	ND		1E-03	ND		2E-03	ND		2E-03	ND		2E-03	ND		1E-03	ND		3E-03
PCB-095	---	---	---	---	---	---	---	---	---	---	---	0.042		2.40E-04	0.097		2E-03	0.062		1E-03	0.087		2E-03	0.043	q	2E-03	0.039		2E-03	0.033	J	1E-03	0.13		2E-03
PCB-096	---	---	---	---	---	---	---	---	---	---	---	ND		1.90E-04	ND		1E-03	0.0013	J q	9E-04	ND		2E-03	ND		1E-03	ND		2E-03	ND		9E-04	ND		2E-03
PCB-097	---	---	---	---	---	---	---	---	---	---	---	0.022	J C86	1.90E-04	0.044	J B C86	1E-03	0.028	J B C86	9E-04	0.028	J B C86 q	2E-03	0.02	J B C86	1E-03	0.025	J C86 B	2E-03	0.012	J q C86 B	1E-03	0.054	J C86 B	2E-03
PCB-098	---	---	---	---	---	---	---	---	---	---	---	0.0012	J q C	2.10E-04	0.0066	J C q	2E-03	ND	C	1E-03	0.0072	J C q	2E-03	ND	C	2E-03	0.0029	J q C	2E-03	0.0037	J C	1E-03	0.011	J C	2E-03
PCB-099	---	---	---	---	---	---	---	---	---	---	---	0.033	J q C83	2.30E-04	0.1	C83	2E-03	0.05	J C83 q	1E-03	0.066	J C83	2E-03	0.037	J C83	2E-03	0.043	J C83	2E-03	0.023	J C83	1E-03	0.12	C83	2E-03
PCB-100	---	---	---	---	---	---	---	---	---	---	---	0.0022	J C93	2.20E-04	0.0091	J C93 q	2E-03	0.0049	J C93 q	1E-03	0.0076	J C93	2E-03	0.0024	J C93 q	2E-03	0.0033	J C93	2E-03	ND	C93	1E-03	0.013	J q C93	2E-03
PCB-101	---	---	---	---	---	---	---	---	---	---	---	0.051	J C90 B	1.90E-04	0.096	J B C90	2E-03	0.055	J B C90	1E-03	0.071	J B C90	2E-03	0.04	J B C90	1E-03	0.046	J C90 B	2E-03	0.029	J C90 B	1E-03	0.11	J C90 B	2E-03
PCB-102	---	---	---	---	---	---	---	---	---	---	---	0.0012	J q C98	2.10E-04	0.0066	J C98 q	2E-03	ND	C98	1E-03	0.0072	J C98 q	2E-03	ND	C98	2E-03	0.0029	J q C98	2E-03	0.0037	J C98	1E-03	0.011	J C98	2E-03
PCB-103	---	---	---	---	---	---	---	---	---	---	---	0.0023	J	2.20E-04	0.007	J q	2E-03	0.0035	J q	1E-03	0.01	J	2E-03	0.0041	J q	2E-03	ND		2E-03	0.0015	J	1E-03	0.013	J	2E-03
PCB-104	---	---	---	---	---	---	---	---	---	---	---	ND		1.70E-04	ND		1E-03	ND		8E-04	ND		1E-03	ND		1E-03	ND		2E-03	ND		8E-04	ND		2E-03
PCB-105	---	---	---	---	---	---	---	---	---	---	---	0.0097	J	5.20E-04	0.012	J B	9E-04	0.0072	J B	1E-03	0.0072	J B	1E-03	0.0055	J B q	1E-03	0.0067	J q B	1E-03	0.0059	J B	9E-04	0.017	J B	1E-03
PCB-106	---	---	---	---	---	---	---	---	---	---	---	ND		5.30E-04	ND		9E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		9E-04	ND		1E-03
PCB-107	---	---	---	---	---	---	---	---	---	---	---	0.0024	J q	5.70E-04	0.0057	J q	9E-04	0.0028	J q	9E-04	0.0044	J	9E-04	ND		1E-03	0.0032	J	1E-03	ND		9E-04	0.0069	J	1E-03
PCB-108	---	---	---	---	---	---	---	---	---	---	---	ND	C	5.50E-04	0.0027	J C	9E-04	ND	C	1E-03	0.0023	J C q	1E-03	ND	C	1E-03	ND	C	1E-03	ND	C	9E-04	ND	C	1E-03
PCB-109	---	---	---	---	---	---	---	---	---	---	---	0.022	J C86	1.90E-04	0.044	J B C86	1E-03	0.028	J B C86	9E-04	0.028	J B C86 q	2E-03	0.02	J B C86	1E-03	0.025	J C86 B	2E-03	0.012	J q C86 B	1E-03	0.054	J C86 B	2E-03
PCB-110	---	---	---	---	---	---	---	---	---	---	---	0.056	J q C B	1.60E-04	0.1	C B	1E-03	0.052	J C B	8E-04	0.069	J C B	1E-03	0.04	J C B	1E-03	0.05	J C B	2E-03	0.028	J C B	9E-04	0.12	C B	2E-03
PCB-111	---	---	---	---	---	---	---	---	---	---	---	ND		1.60E-04	ND		1E-03	ND		8E-04	ND		1E-03	ND		1E-03	ND		2E-03	ND		8E-04	ND		2E-03
PCB-112	---	---	---	---	---	---	---	---	---	---	---	ND		1.60E-04	ND		1E-03	ND		8E-04	ND		1E-03	ND		1E-03	ND		2E-03	ND		8E-04	ND		2E-03
PCB-113	---	---	---	---	---	---	---	---	---	---	---	0.051	J C90 B	1.90E-04	0.096	J B C90	2E-03	0.055	J B C90	1E-03	0.071	J B C90	2E-03	0.04	J B C90	1E-03	0.046	J C90 B	2E-03	0.029	J C90 B	1E-03	0.11	J C90 B	2E-03
PCB-114	---	---	---	---	---	---	---	---	---	---	---	ND		5.00E-04	ND		9E-04	ND		9E-04	0.0019	J	9E-04	ND		1E-03	ND		1E-03	ND		9E-04	0.0014	J q	1E-03
PCB-115	---	---	---	---	---	---	---	---	---	---	---	0.056	J q C110 B	1.60E-04	0.1	B C110	1E-03	0.052	J B C110	8E-04	0.069	J B C110	1E-03	0.04	J B C110	1E-03	0.05	J C110 B	2E-03	0.028	J C110 B	9E-04	0.12	C110 B	2E-03
PCB-116	---	---	---	---	---	---	---	---	---	---	---	0.0032	J q C85	1.90E-04	0.0083	J C85 q	1E-03	0.0045	J C85 q	9E-04	ND	C85	2E-03	0.0053	J C85	1E-03	ND	C85	2E-03	0.0035	J q C85	1E-03	0.013	J C85	2E-03
PCB-117	---	---	---	---	---	---	---	---	---	---	---	0.0032	J q C85	1.90E-04	0.0083	J C85 q	1E-03	0.0045	J C85 q	9E-04	ND	C85	2E-03	0.0053	J C85	1E-03	ND	C85	2E-03	0.0035	J q C85	1E-03	0.013	J C85	2E-03
PCB-118	---	---	---	---	---	---	---	---	---	---	---	0.034	J	5.10E-04	0.047	B	9E-04	0.025	J B	9E-04	0.024	J B q	9E-04	0.019	J B	1E-03	0.02	J B	1E-03	0.015	J B	9E-04	0.058	B	1E-03

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-119	---	---	---	---	---	---	---	---	---	---	---	0.022	J C86	1.90E-04	0.044	J B C86	1E-03	0.028	J B C86	9E-04	0.028	J B C86 q	2E-03	0.02	J B C86	1E-03	0.025	J C86 B	2E-03	0.012	J q C86 B	1E-03	0.054	J C86 B	2E-03
PCB-120	---	---	---	---	---	---	---	---	---	---	---	0.0007	J q	1.60E-04	0.002	J	1E-03	0.0022	J	8E-04	0.0025	J	1E-03	ND		1E-03	ND		1E-03	ND		8E-04	0.0022	J q	2E-03
PCB-121	---	---	---	---	---	---	---	---	---	---	---	ND		1.60E-04	ND		1E-03	ND		8E-04	ND		1E-03	ND		1E-03	ND		2E-03	ND		8E-04	ND		2E-03
PCB-122	---	---	---	---	---	---	---	---	---	---	---	ND		6.20E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		2E-03	ND		1E-03	ND		1E-03	ND		1E-03
PCB-123	---	---	---	---	---	---	---	---	---	---	---	ND		5.30E-04	0.0013	J q	9E-04	ND		1E-03	0.0015	J q	9E-04	ND		1E-03	ND		1E-03	ND		9E-04	ND		1E-03
PCB-124	---	---	---	---	---	---	---	---	---	---	---	ND	C108	5.50E-04	0.0027	J C108	9E-04	ND	C108	1E-03	0.0023	J q C108	1E-03	ND	C108	1E-03	ND	C108	1E-03	ND	C108	9E-04	ND	C108	1E-03
PCB-125	---	---	---	---	---	---	---	---	---	---	---	0.022	J C86	1.90E-04	0.044	J B C86	1E-03	0.028	J B C86	9E-04	0.028	J B C86 q	2E-03	0.02	J B C86	1E-03	0.025	J C86 B	2E-03	0.012	J q C86 B	1E-03	0.054	J C86 B	2E-03
PCB-126	---	---	---	---	---	---	---	---	---	---	---	ND		5.60E-04	0.0016	J q	1E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		9E-04	ND		1E-03
PCB-127	---	---	---	---	---	---	---	---	---	---	---	ND		5.30E-04	ND		9E-04	ND		1E-03	ND		1E-03	ND		1E-03	ND		1E-03	ND		9E-04	ND		1E-03
PCB-128	---	---	---	---	---	---	---	---	---	---	---	0.0052	J C	6.00E-04	0.014	J C B	6E-04	0.0065	J C B q	5E-04	0.0055	J C B q	8E-04	0.0037	J C B q	5E-04	0.0067	J q C B	7E-04	0.0025	J C B	4E-04	0.017	J C B	1E-03
PCB-129	---	---	---	---	---	---	---	---	---	---	---	0.049	J q C B	6.20E-04	0.076	J C B	7E-04	0.05	J C B	6E-04	0.049	J C B	8E-04	0.032	J C B	6E-04	0.043	J C B	8E-04	0.027	J C B	4E-04	0.11	J C B	1E-03
PCB-130	---	---	---	---	---	---	---	---	---	---	---	0.0031	J q	8.10E-04	0.007	J q	9E-04	0.0038	J q	7E-04	0.0041	J	1E-03	0.0027	J q	7E-04	0.0029	J q	1E-03	0.0017	J q	5E-04	0.0089	J	1E-03
PCB-131	---	---	---	---	---	---	---	---	---	---	---	ND		8.50E-04	ND		8E-04	ND		7E-04	ND		1E-03	ND		7E-04	ND		1E-03	ND		5E-04	ND		1E-03
PCB-132	---	---	---	---	---	---	---	---	---	---	---	0.011	J q	7.90E-04	0.023	J B	8E-04	0.012	J B	7E-04	0.013	J B	1E-03	0.0087	J B q	7E-04	0.013	J B	9E-04	0.0069	J q B	5E-04	0.032	J B	1E-03
PCB-133	---	---	---	---	---	---	---	---	---	---	---	ND		7.70E-04	0.0034	J	8E-04	0.0021	J q	7E-04	0.0027	J	9E-04	0.0019	J	7E-04	ND		9E-04	ND		5E-04	0.0053	J	1E-03
PCB-134	---	---	---	---	---	---	---	---	---	---	---	0.0019	J q C	8.00E-04	0.0039	J C B q	8E-04	ND	C	7E-04	ND	C	1E-03	0.0018	J C B q	7E-04	0.0019	J q C B	1E-03	0.0021	J q C B	5E-04	ND	C	1E-03
PCB-135	---	---	---	---	---	---	---	---	---	---	---	0.017	J q C B	1.50E-04	0.038	J C	3E-04	0.023	J C	2E-04	0.025	J C	3E-04	0.016	J C	2E-04	0.015	J q C	3E-04	0.012	J q C	2E-04	0.054	J C	3E-04
PCB-136	---	---	---	---	---	---	---	---	---	---	---	0.0071	J	1.00E-04	0.026	J	2E-04	0.013	J q	2E-04	0.016	J q	2E-04	0.0081	J q	1E-04	0.0097	J q	2E-04	0.0038	J q	2E-04	0.03	J q	2E-04
PCB-137	---	---	---	---	---	---	---	---	---	---	---	0.0014	J q	6.90E-04	ND		7E-04	0.0017	J q	6E-04	0.0012	J q	8E-04	0.00083	J q	6E-04	ND		8E-04	0.00091	J q	4E-04	0.0015	J q	1E-03
PCB-138	---	---	---	---	---	---	---	---	---	---	---	0.049	J q C129 B	6.20E-04	0.076	J B C129	7E-04	0.05	J B C129	6E-04	0.049	J B C129	8E-04	0.032	J B C129	6E-04	0.043	J C129 B	8E-04	0.027	J C129 B	4E-04	0.11	J C129 B	1E-03
PCB-139	---	---	---	---	---	---	---	---	---	---	---	ND	C	6.80E-04	0.0021	J C	7E-04	0.0024	J C	6E-04	0.0022	J C q	8E-04	0.00095	J C q	6E-04	ND	C	8E-04	0.00091	J q C	4E-04	0.0028	J q C	1E-03
PCB-140	---	---	---	---	---	---	---	---	---	---	---	ND	C139	6.80E-04	0.0021	J C139	7E-04	0.0024	J C139	6E-04	0.0022	J C139 q	8E-04	0.00095	J C139 q	6E-04	ND	C139	8E-04	0.00091	J q C139	4E-04	0.0028	J q C139	1E-03
PCB-141	---	---	---	---	---	---	---	---	---	---	---	0.0062	J	7.20E-04	0.012	J	7E-04	0.0063	J	6E-04	0.0065	J q	9E-04	0.0037	J	6E-04	0.0053	J q	9E-04	0.004	J	5E-04	0.011	J q	1E-03
PCB-142	---	---	---	---	---	---	---	---	---	---	---	ND		7.60E-04	ND		8E-04	ND		7E-04	ND		1E-03	ND		7E-04	ND		1E-03	ND		5E-04	ND		1E-03
PCB-143	---	---	---	---	---	---	---	---	---	---	---	0.0019	J q C134	8.00E-04	0.0039	J C134 B q	8E-04	ND	C134	7E-04	ND	C134	1E-03	0.0018	J C134 B q	7E-04	0.0019	J q C134 B	1E-03	0.0021	J q C134 B	5E-04	ND	C134	1E-03
PCB-144	---	---	---	---	---	---	---	---	---	---	---	0.0018	J q	1.30E-04	0.0046	J	3E-04	0.002	J q	2E-04	0.00085	J q	3E-04	0.00039	J	2E-04	0.00069	J q	3E-04	0.00083	J q	2E-04	0.0047	J q	3E-04
PCB-145	---	---	---	---	---	---	---	---	---	---	---	ND		1.00E-04	ND		2E-04	ND		2E-04	ND		2E-04	ND		1E-04	ND		2E-04	ND		2E-04	ND		2E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																					
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-146	---	---	---	---	---	---	---	---	---	---	---	0.013	J	6.80E-04	0.028	J	7E-04	0.017	J	6E-04	0.016	J	8E-04	0.0092	J q	6E-04	0.012	J	8E-04	0.0059	J	4E-04	0.036	J	1E-03
PCB-147	---	---	---	---	---	---	---	---	---	---	---	0.062	J C B	7.70E-04	0.13	C B	7E-04	0.084	C B	6E-04	0.096	C B	9E-04	0.052	J C B	6E-04	0.057	J C B	8E-04	0.03	J C B	5E-04	0.18	C B	1E-03
PCB-148	---	---	---	---	---	---	---	---	---	---	---	0.00093	J q	1.40E-04	0.00079	J q	3E-04	0.00072	J	2E-04	0.00076	J q	3E-04	0.00079	J q	2E-04	ND		3E-04	ND		2E-04	0.0013	J q	3E-04
PCB-149	---	---	---	---	---	---	---	---	---	---	---	0.062	J C147 B	7.70E-04	0.13	B C147	7E-04	0.084	B C147	6E-04	0.096	B C147	9E-04	0.052	J B C147	6E-04	0.057	J C147 B	8E-04	0.03	J C147 B	5E-04	0.18	C147 B	1E-03
PCB-150	---	---	---	---	---	---	---	---	---	---	---	0.00079	J q	9.60E-05	0.0044	J	2E-04	0.0023	J q	1E-04	0.0032	J q	2E-04	0.0006	J q	1E-04	0.00084	J q	2E-04	ND		2E-04	0.0086	J	2E-04
PCB-151	---	---	---	---	---	---	---	---	---	---	---	0.017	J q C135 B	1.50E-04	0.038	J C135	3E-04	0.023	J C135	2E-04	0.025	J C135	3E-04	0.016	J C135	2E-04	0.015	J q C135	3E-04	0.012	J q C135	2E-04	0.054	J C135	3E-04
PCB-152	---	---	---	---	---	---	---	---	---	---	---	ND		1.00E-04	ND		2E-04	ND		1E-04	0.00049	J	2E-04	ND		1E-04	ND		2E-04	ND		2E-04	ND		2E-04
PCB-153	---	---	---	---	---	---	---	---	---	---	---	0.058	J C B	5.40E-04	0.11	C B	6E-04	0.069	J C B	5E-04	0.07	J C B	7E-04	0.041	J C B	5E-04	0.052	J C B	7E-04	0.029	J C B	4E-04	0.15	C B	9E-04
PCB-154	---	---	---	---	---	---	---	---	---	---	---	0.0042	J	1.10E-04	0.016	J	3E-04	0.011	J	2E-04	0.016	J	3E-04	0.007	J	2E-04	0.0058	J	3E-04	0.0024	J q	2E-04	0.022	J q	2E-04
PCB-155	---	---	---	---	---	---	---	---	---	---	---	ND		9.60E-05	0.0027	J	2E-04	0.0017	J q	1E-04	0.0023	J q	2E-04	0.00071	J q	1E-04	0.00038	J q	2E-04	ND		2E-04	0.0044	J	2E-04
PCB-156	---	---	---	---	---	---	---	---	---	---	---	0.004	J C	6.80E-04	0.0052	J C B q	6E-04	0.0033	J C B q	5E-04	0.0054	J C B	8E-04	0.0023	J C B q	5E-04	0.0028	J q C B	7E-04	0.002	J q C B	4E-04	0.0079	J q C B	1E-03
PCB-157	---	---	---	---	---	---	---	---	---	---	---	0.004	J C156	6.80E-04	0.0052	J C156 B q	6E-04	0.0033	J C156 B q	5E-04	0.0054	J C156 B	8E-04	0.0023	J C156 B q	5E-04	0.0028	J q C156 B	7E-04	0.002	J q C156 B	4E-04	0.0079	J q C156 B	1E-03
PCB-158	---	---	---	---	---	---	---	---	---	---	---	0.0028	J q	4.80E-04	0.0065	J	5E-04	0.0032	J	4E-04	0.0037	J q	6E-04	0.0018	J q	4E-04	0.0033	J	6E-04	0.001	J q	3E-04	0.0064	J q	8E-04
PCB-159	---	---	---	---	---	---	---	---	---	---	---	ND		5.10E-04	0.0013	J q	5E-04	ND		5E-04	0.0013	J q	6E-04	ND		5E-04	ND		6E-04	ND		3E-04	ND		9E-04
PCB-160	---	---	---	---	---	---	---	---	---	---	---	0.049	J q C129 B	6.20E-04	0.076	J B C129	7E-04	0.05	J B C129	6E-04	0.049	J B C129	8E-04	0.032	J B C129	6E-04	0.043	J C129 B	8E-04	0.027	J C129 B	4E-04	0.11	J C129 B	1E-03
PCB-161	---	---	---	---	---	---	---	---	---	---	---	ND		5.10E-04	ND		5E-04	ND		5E-04	ND		6E-04	ND		5E-04	ND		6E-04	ND		3E-04	ND		9E-04
PCB-162	---	---	---	---	---	---	---	---	---	---	---	ND		5.00E-04	0.0011	J B	5E-04	0.00078	J B q	4E-04	ND		6E-04	0.0008	J B	5E-04	0.00062	J B	6E-04	ND		3E-04	0.00095	J q B	8E-04
PCB-163	---	---	---	---	---	---	---	---	---	---	---	0.049	J q C129 B	6.20E-04	0.076	J B C129	7E-04	0.05	J B C129	6E-04	0.049	J B C129	8E-04	0.032	J B C129	6E-04	0.043	J C129 B	8E-04	0.027	J C129 B	4E-04	0.11	J C129 B	1E-03
PCB-164	---	---	---	---	---	---	---	---	---	---	---	0.0029	J q	5.40E-04	0.0083	J B	6E-04	0.0041	J B	5E-04	0.0049	J B	7E-04	0.0029	J B	5E-04	0.0035	J B	7E-04	0.0018	J q B	4E-04	0.011	J B	9E-04
PCB-165	---	---	---	---	---	---	---	---	---	---	---	ND		5.80E-04	ND		6E-04	ND		5E-04	ND		8E-04	ND		5E-04	ND		7E-04	ND		4E-04	ND		1E-03
PCB-166	---	---	---	---	---	---	---	---	---	---	---	0.0052	J C128	6.00E-04	0.014	J C128 B	6E-04	0.0065	J C128 B q	5E-04	0.0055	J C128 B q	8E-04	0.0037	J C128 B q	5E-04	0.0067	J q C128 B	7E-04	0.0025	J C128 B	4E-04	0.017	J C128 B	1E-03
PCB-167	---	---	---	---	---	---	---	---	---	---	---	0.0024	J	3.90E-04	0.004	J	4E-04	0.0015	J q	4E-04	0.0023	J q	5E-04	0.001	J q	4E-04	0.0015	J q	5E-04	0.00068	J q	3E-04	0.0059	J	8E-04
PCB-168	---	---	---	---	---	---	---	---	---	---	---	0.058	J C153 B	5.40E-04	0.11	B C153	6E-04	0.069	J B C153	5E-04	0.07	J B C153	7E-04	0.041	J B C153	5E-04	0.052	J C153 B	7E-04	0.029	J C153 B	4E-04	0.15	C153 B	9E-04
PCB-169	---	---	---	---	---	---	---	---	---	---	---	ND		3.80E-04	ND		5E-04	ND		4E-04	ND		6E-04	ND		5E-04	ND		6E-04	ND		3E-04	ND		8E-04
PCB-170	---	---	---	---	---	---	---	---	---	---	---	0.011	J	3.20E-04	0.027	J B	9E-05	0.015	J B q	1E-04	0.013	J B q	4E-04	0.009	J B q	2E-04	0.012	J q B	3E-04	0.0067	J q B	1E-04	0.036	J B	5E-04
PCB-171	---	---	---	---	---	---	---	---	---	---	---	0.003	J q C	3.20E-04	0.0093	J C B q	9E-05	0.0048	J C B q	1E-04	0.0055	J C B	4E-04	0.0034	J C B q	2E-04	0.0043	J q C B	3E-04	0.0033	J q C B	1E-04	0.012	J q C B	5E-04
PCB-172	---	---	---	---	---	---	---	---	---	---	---	0.0012	J q	3.20E-04	0.0071	J	9E-05	0.0028	J q	1E-04	0.0033	J q	3E-04	0.002	J q	2E-04	0.0036	J q	3E-04	0.0012	J q	1E-04	0.007	J	5E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-173	---	---	---	---	---	---	---	---	---	---	---	0.003	J q C171	3.20E-04	0.0093	J C171 B q	9E-05	0.0048	J C171 B q	1E-04	0.0055	J C171 B	4E-04	0.0034	J C171 B q	2E-04	0.0043	J q C171 B	3E-04	0.0033	J q C171 B	1E-04	0.012	J q C171 B	5E-04
PCB-174	---	---	---	---	---	---	---	---	---	---	---	0.013	J q	3.00E-04	0.029	J B	9E-05	0.02	J B	1E-04	0.022	J B	4E-04	0.011	J B q	2E-04	0.018	J B	3E-04	0.01	J B	2E-04	0.053	B	5E-04
PCB-175	---	---	---	---	---	---	---	---	---	---	---	ND		2.90E-04	0.0024	J q	8E-05	0.0018	J	1E-04	ND		3E-04	0.00071	J q	2E-04	ND		2E-04	0.00027	J q	1E-04	0.0016	J q	5E-04
PCB-176	---	---	---	---	---	---	---	---	---	---	---	0.001	J q	2.20E-04	0.0052	J	6E-05	0.0036	J	8E-05	0.0029	J q	2E-04	0.00021	J q	1E-04	0.0022	J q	2E-04	0.0013	J	9E-05	0.0062	J q	3E-04
PCB-177	---	---	---	---	---	---	---	---	---	---	---	0.0094	J	3.10E-04	0.018	J B q	9E-05	0.013	J B	1E-04	0.012	J B q	4E-04	0.0081	J B	2E-04	0.0095	J q B	3E-04	0.0058	J q B	2E-04	0.03	J B	5E-04
PCB-178	---	---	---	---	---	---	---	---	---	---	---	0.0044	J	3.20E-04	0.013	J q	8E-05	0.0069	J	1E-04	0.0074	J q	3E-04	0.0033	J	2E-04	0.0048	J q	2E-04	0.0026	J	1E-04	0.015	J	5E-04
PCB-179	---	---	---	---	---	---	---	---	---	---	---	0.0066	J	2.30E-04	0.02	J B	6E-05	0.011	J B q	9E-05	0.014	J B	2E-04	0.0071	J B	1E-04	0.0063	J q B	2E-04	0.004	J B	1E-04	0.024	J B	3E-04
PCB-180	---	---	---	---	---	---	---	---	---	---	---	0.038	J C B	2.40E-04	0.065	J C B	7E-05	0.041	J C B	1E-04	0.038	J C B	3E-04	0.022	J C B	1E-04	0.029	J C B	2E-04	0.021	J C B	1E-04	0.089	C B	4E-04
PCB-181	---	---	---	---	---	---	---	---	---	---	---	ND		2.90E-04	ND		8E-05	0.00053	J q	1E-04	ND		3E-04	ND		2E-04	ND		2E-04	ND		1E-04	ND		4E-04
PCB-182	---	---	---	---	---	---	---	---	---	---	---	0.00084	J q	2.80E-04	0.001	J q	7E-05	0.0015	J q	1E-04	0.0015	J q	3E-04	ND		2E-04	ND		2E-04	ND		1E-04	0.0012	J q	4E-04
PCB-183	---	---	---	---	---	---	---	---	---	---	---	0.012	J C B	2.90E-04	0.025	J C	8E-05	0.018	J C	1E-04	0.016	J C q	3E-04	0.011	J C	2E-04	0.012	J C	2E-04	0.0067	J q C	1E-04	0.038	J C	4E-04
PCB-184	---	---	---	---	---	---	---	---	---	---	---	ND		2.40E-04	0.0014	J q	6E-05	0.0017	J	9E-05	0.0017	J q	2E-04	0.00062	J	1E-04	0.001	J q	2E-04	ND		1E-04	0.0039	J	3E-04
PCB-185	---	---	---	---	---	---	---	---	---	---	---	0.012	J C183 B	2.90E-04	0.025	J C183	8E-05	0.018	J C183	1E-04	0.016	J C183 q	3E-04	0.011	J C183	2E-04	0.012	J C183	2E-04	0.0067	J q C183	1E-04	0.038	J C183	4E-04
PCB-186	---	---	---	---	---	---	---	---	---	---	---	ND		2.30E-04	0.00045	J q	6E-05	ND		9E-05	ND		2E-04	ND		1E-04	ND		2E-04	ND		1E-04	ND		3E-04
PCB-187	---	---	---	---	---	---	---	---	---	---	---	0.032	J	2.70E-04	0.063	B	8E-05	0.04	B	1E-04	0.04	B	3E-04	0.025	J B	2E-04	0.029	J B	2E-04	0.017	J B	1E-04	0.084	B	4E-04
PCB-188	---	---	---	---	---	---	---	---	---	---	---	0.0011	J q	2.10E-04	0.0028	J q	5E-05	0.0043	J	8E-05	0.0033	J	2E-04	0.002	J q	1E-04	0.00058	J q	2E-04	0.00082	J	9E-05	0.0036	J q	3E-04
PCB-189	---	---	---	---	---	---	---	---	---	---	---	ND		6.50E-04	0.0011	J B q	4E-04	0.0012	J B q	3E-04	0.00071	J B q	2E-04	ND		2E-04	ND		5E-04	0.00037	J q B	2E-04	0.0025	J B	8E-04
PCB-190	---	---	---	---	---	---	---	---	---	---	---	0.0018	J q	2.10E-04	0.0059	J	6E-05	0.0028	J q	9E-05	0.0033	J q	3E-04	0.0017	J q	1E-04	0.00076	J q	2E-04	0.0024	J	1E-04	0.0053	J q	4E-04
PCB-191	---	---	---	---	---	---	---	---	---	---	---	ND		2.20E-04	0.00039	J B q	6E-05	ND		9E-05	ND		3E-04	ND		1E-04	0.0005	J q B	2E-04	0.00029	J B	1E-04	0.0015	J q B	4E-04
PCB-192	---	---	---	---	---	---	---	---	---	---	---	ND		2.50E-04	ND		7E-05	ND		1E-04	0.00066	J q	3E-04	ND		1E-04	ND		2E-04	ND		1E-04	ND		4E-04
PCB-193	---	---	---	---	---	---	---	---	---	---	---	0.038	J C180 B	2.40E-04	0.065	J C180 B	7E-05	0.041	J C180 B	1E-04	0.038	J C180 B	3E-04	0.022	J C180 B	1E-04	0.029	J C180 B	2E-04	0.021	J C180 B	1E-04	0.089	C180 B	4E-04
PCB-194	---	---	---	---	---	---	---	---	---	---	---	0.011	J	7.80E-04	0.022	J B	8E-04	0.015	J B q	4E-04	0.015	J B	6E-04	0.0079	J B q	3E-04	0.012	J q B	8E-04	0.0048	J q B	3E-04	0.026	J q B	1E-03
PCB-195	---	---	---	---	---	---	---	---	---	---	---	0.0033	J	8.50E-04	0.0069	J B	9E-04	0.004	J B q	5E-04	0.0041	J B q	7E-04	0.003	J B	4E-04	0.0041	J q B	1E-03	0.0023	J B	3E-04	0.011	J q B	1E-03
PCB-196	---	---	---	---	---	---	---	---	---	---	---	0.012	J	3.00E-04	0.028	J	3E-04	0.014	J q	3E-04	0.016	J q	2E-04	0.0063	J q	3E-04	0.011	J q	2E-04	0.0063	J	3E-04	0.053		3E-04
PCB-197	---	---	---	---	---	---	---	---	---	---	---	ND		2.30E-04	0.0046	J	2E-04	0.0032	J q	2E-04	0.0036	J q	2E-04	0.0018	J q	2E-04	0.001	J q	2E-04	0.00077	J q	2E-04	0.0097	J q	2E-04
PCB-198	---	---	---	---	---	---	---	---	---	---	---	0.031	J C	3.10E-04	0.064	J C B q	3E-04	0.038	J C B q	3E-04	0.039	J C B	2E-04	0.023	J C B	3E-04	0.03	J C B	3E-04	0.01	J q C B	4E-04	0.097	C B	3E-04
PCB-199	---	---	---	---	---	---	---	---	---	---	---	0.031	J C198	3.10E-04	0.064	J C198 B q	3E-04	0.038	J C198 B q	3E-04	0.039	J C198 B	2E-04	0.023	J C198 B	3E-04	0.03	J C198 B	3E-04	0.01	J q C198 B	4E-04	0.097	C198 B	3E-04

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER			ELUTRIATE (UNFILTERED)																				
	DRBC Marine, Acute, Aquatic Life (1)	DRBC Marine, Chronic, Aquatic Life (1)	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR 8/25/2020		MDL	SR1 8/25/2020		MDL	SR2 8/25/2020		MDL	SR3 8/25/2020		MDL	SR4 8/25/2020		MDL	SR5 8/26/2020		MDL	SR6 8/26/2020		MDL	SR7 8/26/2020		MDL
PCB CONGENER	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L			ng/L		
PCB-200	---	---	---	---	---	---	---	---	---	---	---	0.00088	J q	2.10E-04	0.0022	J B q	2E-04	0.0018	J B q	2E-04	0.0039	J B q	2E-04	0.0015	J B q	3E-04	0.0011	J q B	2E-04	0.0011	J q B	3E-04	0.0059	J B	2E-04
PCB-201	---	---	---	---	---	---	---	---	---	---	---	0.0038	J	2.10E-04	0.013	J	2E-04	0.0072	J	2E-04	0.0092	J q	2E-04	0.0039	J q	2E-04	0.0055	J q	2E-04	0.0021	J q	2E-04	0.021	J	2E-04
PCB-202	---	---	---	---	---	---	---	---	---	---	---	0.012	J	2.40E-04	0.026	J	3E-04	0.016	J	2E-04	0.016	J	2E-04	0.0068	J	3E-04	0.0089	J q	2E-04	0.0022	J q	3E-04	0.035	J	2E-04
PCB-203	---	---	---	---	---	---	---	---	---	---	---	0.012	J q	2.70E-04	0.026	J B	3E-04	0.016	J B	2E-04	0.017	J B	2E-04	0.007	J B q	3E-04	0.0096	J B	2E-04	0.0049	J q B	3E-04	0.036	J B	2E-04
PCB-204	---	---	---	---	---	---	---	---	---	---	---	ND		2.30E-04	0.00085	J q	3E-04	0.00024	J q	2E-04	0.0009	J q	2E-04	0.00029	J q	3E-04	ND		2E-04	ND		3E-04	0.0007	J q	2E-04
PCB-205	---	---	---	---	---	---	---	---	---	---	---	ND		6.60E-04	0.0025	J	6E-04	0.001	J q	3E-04	0.00085	J q	5E-04	0.0005	J q	2E-04	ND		6E-04	0.0004	J q	2E-04	0.00097	J q	8E-04
PCB-206	---	---	---	---	---	---	---	---	---	---	---	0.18		2.50E-03	0.3		4E-03	0.19	q	3E-03	0.17		3E-03	0.1		1E-03	0.12	q	5E-03	0.069	q	3E-03	0.43		5E-03
PCB-207	---	---	---	---	---	---	---	---	---	---	---	0.014	J	1.80E-03	0.038		3E-03	0.021	J q	2E-03	0.023	J	2E-03	0.011	J q	9E-04	0.019	J	3E-03	ND		2E-03	0.065		3E-03
PCB-208	---	---	---	---	---	---	---	---	---	---	---	0.079		1.80E-03	0.14		3E-03	0.085		2E-03	0.087		2E-03	0.046		1E-03	0.051		4E-03	0.019	J q	2E-03	0.19		3E-03
PCB-209	---	---	---	---	---	---	---	---	---	---	---	0.35		9.50E-04	0.63	B	1E-03	0.33	B	7E-04	0.33	B	9E-04	0.16	B	5E-04	0.18	B	7E-04	0.081	B	4E-04	0.83	B	1E-03
Total PCBS (ng/L)	---	---	---	---	---	---	---	---	---	---	---	2.75			5.7			3.6			4.3			2.8			2.6			2.1			7.3		
Total PCBS (co-eluters and "q" values removed)	5000	30	0.016	1.49	0	30	0	0.064	0	30	0.064	1.40			3.26			1.72			2.26			1.19			1.07			0.91			4.40		
TEQ (WHO)	---	---	---	---	---	---	---	---	---	---	---	1.95E-06			1.63E-04			1.58E-06			1.66E-06			1.15E-06			1.15E-06			9.39E-07			3.80E-06		

	DRBC (marine)				DELAWARE (marine)				NEW JERSEY (marine)			BACKGROUND SURFACE WATER	ELUTRIATE (UNFILTERED)															
	DRBC Marine, Acute, Aquatic Life [(1)]	DRBC Marine, Chronic, Aquatic Life [(1)]	DRBC System Toxicants Fish Ingestion	DRBC Carcinogenic Fish Ingestion	Delaware Marine Acute	Delaware Marine Chronic	Delaware System Toxicants Fish Ingestion	Delaware Carcinogenic Fish Ingestion	NJ Marine Acute	NJ Marine Chronic	NJ Human Health	SW-1T SR		SR1		SR2		SR3		SR4		SR5		SR6		SR7	
												8/25/2020		8/25/2020		8/25/2020		8/25/2020		8/25/2020		8/26/2020		8/26/2020		8/26/2020	
DIOXIN/FURANS	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**	**pg/L**		**pg/L**		**pg/L**		**pg/L**		**pg/L**		**pg/L**		**pg/L**		**pg/L**	
1,2,3,4,6,7,8-HpCDD	---	---	---	---	---	---	---	---	---	---	---	8.2	J	18	J	6.2	J	4.6	J q	7.7	J q	5.6	J q	1.7	J q	25	J
1,2,3,4,6,7,8-HpCDF	---	---	---	---	---	---	---	---	---	---	---	2.3	J B	4.4	J B	1.6	J B q	1.1	J B q	1.5	J B	1.2	J B q	0		5.1	J B
1,2,3,4,7,8,9-HpCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0.48	J B	0		0		0.36	J B	0		0.96	J q B
1,2,3,4,7,8-HxCDD	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0.69	J B q	1.1	J B q	0		0.88	J B	0	
1,2,3,4,7,8-HxCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
1,2,3,6,7,8-HxCDD	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0.28	J B q	0		0		0	
1,2,3,6,7,8-HxCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
1,2,3,7,8,9-HxCDD	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0.66	J B q	0.31	J B q	0		0.39	J B q	0	
1,2,3,7,8,9-HxCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
1,2,3,7,8-PeCDD	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
1,2,3,7,8-PeCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
2,3,4,6,7,8-HxCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
2,3,4,7,8-PeCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
2,3,7,8-TCDD	---	---	---	**0.0051**	---	---	**0.6**	**0.0051**	---	---	**0.0051**	0		0		0		0		0		0		0		0	
2,3,7,8-TCDF	---	---	---	---	---	---	---	---	---	---	---	0		0		0		0		0		0		0		0	
OCDD	---	---	---	---	---	---	---	---	---	---	---	190	B	620	B	170	B	150	B	390	B	200	B	46	J B	820	B
OCDF	---	---	---	---	---	---	---	---	---	---	---	10	J B	12	J B q	5.2	J B	4	J B	4.2	J B	3.7	J B q	1.3	J B	15	J B
Total Dioxin/Furans	---	---	---	---	---	---	---	---	---	---	---	210.5		654.4		183.48		161.05		405.09		210.86		50.27		866.06	
TEQ (WHO)	---	---	---	**0.0051**	---	---	**0.6**	**0.0051**	---	---	**0.0051**	0.17		0.41		0.14		0.24		0.38		0.13		0.16		0.56	

Notes

ND -- Not Detected

*Surface water (background) water sample collected at mid-depth near SR6 location

[(1)] -- Delaware River Basin Commission Freshwater or Marine Acute Objectives for Toxic Pollutants for the the Protection of Aquatic Life in the Delaware River Estuary and Bay (DRBC Administrative Manual – Part III Water Quality Regulations dated 4 December 2013)

yellow shaded--Exceeds or equals one or more criteria or objectives

orange shaded - One or more analyte MDL's equal or exceed one or more criteria or objectives

NA -- No result is available/applicable for this parameter in this sample.

TEQ -- Toxic equivalence in terms of the dioxin 2,3,7,8-TCDD using WHO 2005 TEFs.

MDL--Method Detection Limit

Data Qualifiers:

B -- Compound was found in the blank and sample.

C -- The compound co-eluted with other compounds

C108 -- The compound co-eluted with PCB-108

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

p -- The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
q -- Estimated maximum possible concentration (EMPC).
* -- LCS or LCSD is outside acceptance limits.

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APPENDIX C

Essential Fish Habitat Evaluation

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ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

Salem River Federal Navigation Channel Maintenance Dredging
and
Beneficial Use of Dredged Material
Salem County, New Jersey
New Castle County, Delaware

APPENDIX C

February 2023

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

BU	Beneficial Use
BUDM	Beneficial Use of Dredged Material
°C	Degrees Celsius
CCP	Comprehensive Conservation Plan
CDF	Confined (Dredged Material) Disposal Facility
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CSRM	Coastal Storm Risk Management
CY	Cubic yards
DA	Design Alternative
dB	Decibels
dBA	A weighted sound level measured in decibels
dBC	C weighted sound level measured in decibels
DE	State of Delaware
DEBI	Delaware Estuary Benthic Inventory
DFW	Division of Fish and Wildlife
DLUR	Division of Land Use Regulation
DNREC	Delaware Department of Natural Resources and Environmental Control
DO	Dissolved oxygen
DU	Ducks Unlimited
DuPont	E.I. DuPont de Nemours and Company
EA	Environmental Assessment
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Area
EIS	Environmental Impact Statement
ERDC	Engineering Research and Development Center
ESA	Endangered Species Act
EWN	Engineering With Nature
FID	Federal Interest Determination
FMP	Fishery Management Plan
FNC	Federal Navigation Channel
FONSI	Finding of No Significant Impact
GARFO	Greater Atlantic Regional Fisheries Office
HAPC	Habitat Areas of Particular Concern
HD	House Document
Hz	Hertz
IPaC	Information, Planning, and Conservation
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detection and Ranging
MBTA	Migratory Bird Treaty Act
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MHHW	Mean Higher High Water

ACRONYMS

MHW	Mean High Water
Mid-TRAM	Mid-Atlantic Tidal Rapid Assessment Method
MLLW	Mean Lower Low Water
MLW	Mean Low Water
msl	Mean sea level
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum 1988
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJ	State of NJ
NJAAQS	New Jersey Ambient Air Quality Standards
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJIWW	New Jersey Intracoastal Waterway
N.J.S.A.	New Jersey Statutes Annotated
NJSM	New Jersey State Museum
NMFS	National Marine Fisheries Service
NO	Nitric oxide
NO2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O3	Ozone
OSHA	Occupational Safety and Health Administration
PDE	Partnership for the Delaware Estuary
PL	Public Law
PM10	Particulate matter less than 10 micrometers in diameter
PM2.5	Particulate matter less than 2.5 micrometers in diameter
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per thousand
RHA	Rivers and Harbors Act
RSM	Regional Sediment Management
SAV	Submerged Aquatic Vegetation
Service	United States Fish and Wildlife Service
SHPO	State Historic Preservation Office
SILs	Significant Impact Levels
SLAMM	Sea Level Affecting Marshes Model
SLR	Sea Level Rise
SMA	Special Management Area
SMIIL	Seven Mile Island Innovation Lab
SMNWR	Supawna Meadows National Wildlife Refuge
SWQS	Surface Water Quality Standards

ACRONYMS

TSS	Total Suspended Solids
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	Wildlife Management Area
WOTUS	Waters of the United States
WRDA	Water Resources Development Act

1.0 INTRODUCTION

Pursuant to Section 305 (b)(2) of the Magnuson-Stevens Fishery Conservation & Management Act, the U.S. Army Corps of Engineers (USACE) is required to prepare an Essential Fish Habitat [EFH] Assessment for the maintenance of the Salem River Federal Navigation Channel (FNC), which includes dredging, disposal within the Federally-owned upland confined disposal facility (CDF) and beneficial use of dredged material for ecosystem restoration and coastal storm risk management (CSRM) purposes in Salem County, New Jersey and New Castle County, Delaware. The recommended plan is to conduct maintenance dredging of the approach channel to the lower Salem River federal navigation channel (FNC) to the authorized depth of 16 ft MLLW with a 1 ft allowable over-depth. Dredging will remove critical shoaling in the authorized channel to maintain safe and reliable navigation for commercial and recreational vessels. Maintenance dredging of the Salem River has occurred six times since the project was deepened to present dimensions in 1996. O&M quantities have been in the range of 100,000 CY to a little over 200,000 CY, depending on the dredging intervals and the channel limits in which dredging was performed. The designated disposal area for maintenance dredging is the Killcohook Confined Disposal Facility (CDF).The most recent complete maintenance dredging of the entire channel occurred in late 2012. Surveys obtained since 2012 indicate that the lower one mile of channel shoaled by about 75,000 CY in the first 20 months after dredging.

Subsequent to 2012, two smaller maintenance dredging actions were conducted. In 2017, approximately 52,000 CY of dredged sediment were removed from shoals and placed in the Killcohook CDF, and in February 2022, approximately, 13,000 CY of sandy material were dredged with a government-owned split-hull hopper dredge (*Dredge Murden*) and beneficially deposited along the nearshore subtidal shoreline of Oakwood Beach.

Based on November 2022 survey data, it is estimated that the entrance channel south of the channel bend will require removal of approximately 158,000 CY to restore the project depth to 16 ft MLLW, with an additional 51,000 CY in overdepth dredging to 17 ft MLLW. Additional maintenance dredging of 50,000 to 75,000 CY may be conducted to remove infilling within the subsequent 1 to 2 years after the 2023 dredging operation.

A secondary objective is to beneficially use the dredged channel sediments in the vicinity to provide an ecological restorative purpose and for Coastal Storm Risk Management (CSRM) purpose. The selected placement location of the beneficial use dredged material at Goose Pond within the Supawna Meadows National Wildlife Refuge (SMNWR) would restore a mosaic of shallow open water, intertidal marshes and mudflat habitats experiencing significant habitat losses due to erosion and sea level rise in partnership with the U.S. Fish and Wildlife Service (USFWS) and Ducks Unlimited (DU). Another selected placement location is the subtidal nearshore of Oakwood Beach, which would introduce sandy material into the littoral zone of an existing CSRM beach nourishment project there. **Table 1** provides a summary of all the activities associated with the proposed action.

Table 1. Summary of Proposed Salem River Federal Navigation Channel Maintenance Disposal Options

Maintenance Action	**Disposal Option**	**Frequency**	**Quantity**	**Dredged Material**
Hydraulic Dredge Salem River Nav. Channel	SOP-Upland CDF (Killcohook CDF)	As needed (perpetual)	50,000 to 200,000 CY (at a time)	Silts/Clays and Sands
Hydraulic Dredge Salem River Nav. Channel	BUDM- Marsh restoration at Goose Pond (Supawna Meadows NWR)	Every 2-6 years (1-3 times total)	150,000 to 300,000 CY (total)	Primarily Silts/Clays
Split-Hull Hopper Dredge Spot Shoals of Salem River Nav. Channel	BUDM – Nearshore Placement (Oakwood Beach)	Every 1 to 3 years (perpetual)	5,000 to 20,000 CY (at a time)	Sands

1.1 Role of National Marine Fisheries Service in Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (PL 94-265) in 1996 that established procedures for identifying EFH and required interagency coordination to further the conservation of federally managed fisheries. Rules published by the NMFS (50 CFR Sections 600.805–600.930) specify that any Federal agency that authorizes, funds, or undertakes, or proposes to authorize, fund, or undertake an activity that could adversely affect EFH is subject to the consultation provisions of the above-mentioned act and identifies consultation requirements. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH is separated into estuarine and marine components. The estuarine component is defined as “all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities); subtidal vegetation (seagrasses and algae); and adjacent intertidal vegetation (marshes and mangroves).” The marine component is defined as “all marine waters and substrates (mud, sand, shell, rock, and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone” (Gulf of Mexico Fisheries Management Council [GMFMC], 2004). Adverse effect to EFH is defined as, “any impact, which reduces quality and/or quantity of EFH…” and may include direct, indirect, site specific or habitat impacts, including individual, cumulative, or synergistic consequences of actions.

The affected area within the Salem River, Delaware River and vicinity of Delaware and New Jersey occurs within the estuarine mixing zone and has been designated as EFH for a variety of life stages of fish managed under the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council and National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS).

The NMFS and fishery management council roles in EFH are described in 67 FR 2343. Through Subpart J, fishery management councils must identify Fishery Management Plans (FMPs) EFH for each life stage of each managed species in the fishery management unit. The regulations also provide that councils: should organize information on the habitat requirements of managed species using a four-tier approach based on the type of information available, identify as EFH those habitats that are necessary to the species for spawning, breeding, feeding, or growth to maturity, describe EFH in text and must provide maps of the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage is found, identify EFH that is especially important ecologically or particularly vulnerable to degradation as "habitat areas of particular concern" (HAPC) to help provide additional focus for conservation efforts, and must evaluate the potential adverse effects of fishing activities on EFH and must include in FMPs management measures that minimize adverse effects to the extent practicable. Additionally, councils must identify other activities that may adversely affect EFH and recommend actions to reduce or eliminate these effects.

Through Subpart K, "NMFS will make available descriptions and maps of EFH to promote EFH conservation and enhancement. The regulations encourage Federal agencies to use existing environmental review procedures to fulfill the requirement to consult with NMFS on actions that may adversely affect EFH, and they contain procedures for abbreviated or expanded consultation in cases where no other environmental review process is available. Consultations may be conducted at a programmatic and/or project-specific level. In cases where adverse effects from a type of actions will be minimal, both individually and cumulatively, a General Concurrence procedure further simplifies the consultation requirements. The regulations encourage coordination between NMFS and the Councils in the development of recommendations to Federal or state agencies for actions that would adversely affect EFH. Federal agencies must respond in writing within 30 days of receiving EFH Conservation Recommendations (CRs) from NMFS. If the action agency's decision is inconsistent with NMFS' EFH CRs, the agency must explain its reasoning and NMFS may request further review of the decision. EFH CRs are non-binding."

1.2 Project Area

Salem River Federal Navigation Project: The Salem River is located in western Salem County, New Jersey (**Figures 1 - 3**). The Salem River drains approximately 113.6

square miles, ultimately discharging into the Delaware River at approximately River Mile Point 59. The existing authorized channel is approximately 5 miles long and stretches downstream from the Route 49 Bridge in the City of Salem to Elsinboro at the southwest corner of Salem Cove in the Delaware River.

The channel dimensions are -16 feet (MLLW) deep and 150 to 250 feet wide in the Delaware River across Salem Cove to the mouth thence -16 feet (MLLW) deep and 100 feet wide to the fixed highway bridge (Route 49) in Salem. The channel transitions to -9 feet (MLLW) deep and 100 feet wide upstream of Route 49 and terminates at Route 45 (Market Street) (Figure 1). The midpoint of the maintenance dredging activity of the entrance channel is located at N39.55706°, W75.52662°. Most of the entrance channel at Salem Cove from the Delaware River to the Salem River proper lies in Delaware territorial waters.

Killcohook CDF. The existing dredged material disposal location is at the Killcohook CDF (N 39.618425°, W 75.556180°) located approximately 3.8 miles NNW of the Salem River entrance channel at the Delaware River Mile Point 61.5 (**Figures 1 and 2**). The Killcohook CDF occurs within the boundaries of both New Jersey and Delaware. The westernmost portion of the site occupies over 500 acres in New Castle County, Delaware while the eastern portion of the site occurs in Pennsville Township, Salem County, New Jersey. This site is bounded by Finn's Point National Cemetery, Fort Mott State Park and Supawna Meadows NWR to the south and Finn's Point Lighthouse to the east, and it once served a dual purpose as a refuge (Killcohook National Wildlife Refuge) and as a CDF. Its status as a refuge was revoked in 1998 by Congress, but it continues to be used as a CDF by USACE for the disposal of dredged sediments.

Goose Pond BUDM: The Supawna Meadows NWR boundaries include the Delaware River to the southwest, Salem River to the southeast, Lighthouse Road to the northeast, and Fort Mott State Park to the northwest (**Figures 1, 2 and 4**). It is located in the Service's Northeast Region 5. The Supawna Meadows NWR Proposed Action (Goose Pond) area (N39.586840^{o}, W75.52619^{o}) consists of an old stone breakwater along the Delaware River and approximately 262 acres of open water and marsh complexes located around it. These marsh complexes are reclaimed agricultural land, having been abandoned sometime after 1938 due to significant inundation. These fields likely lost value as salt hay farming declined and soils became too saturated for other crops. The Goose Pond affected area is primarily contained within Block 5501, Lot 17 and the Delaware River, and meanders through both New Jersey state-owned lands and Delaware state-owned lands (USFWS, 2017).

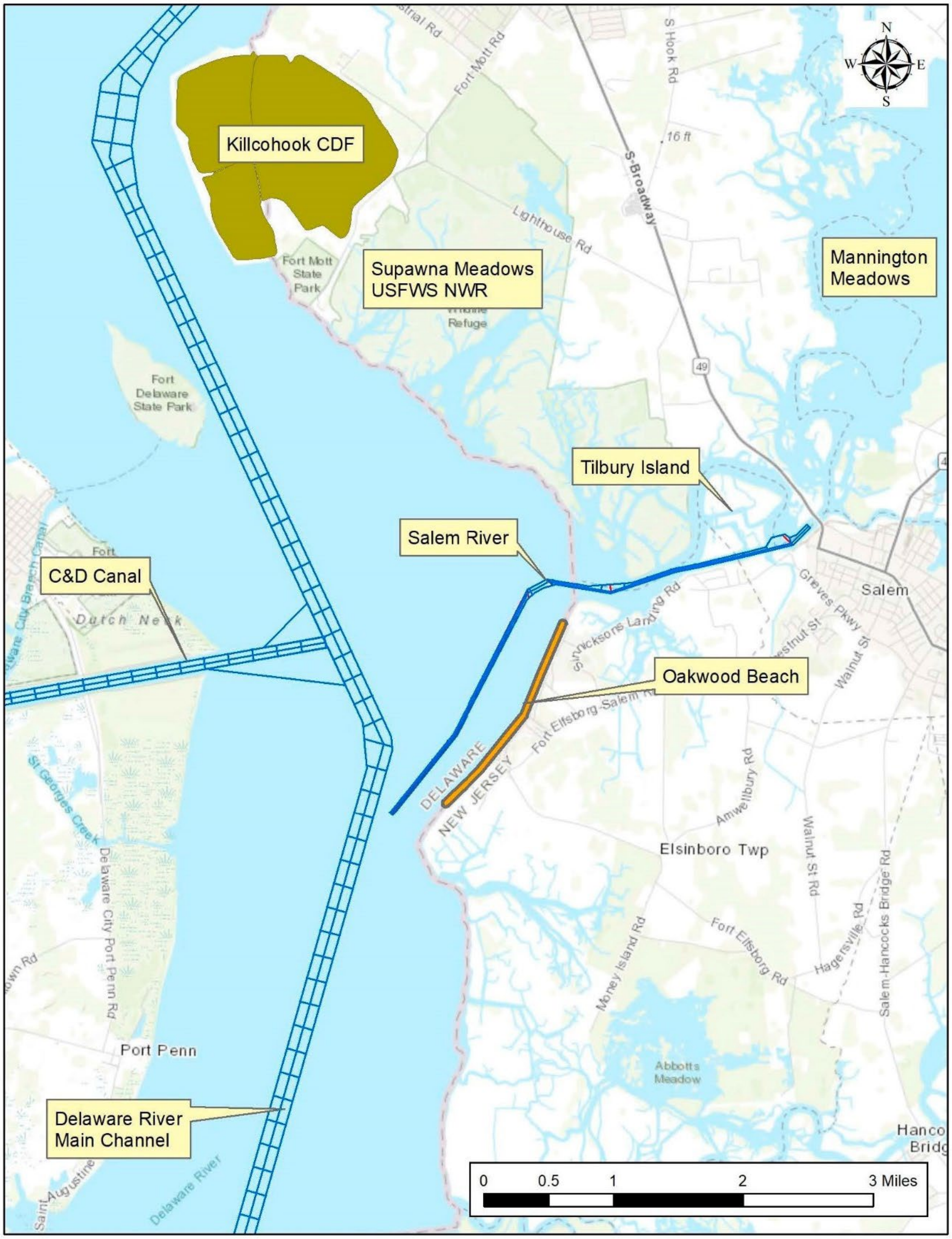


Figure 1. Salem River Vicinity Map

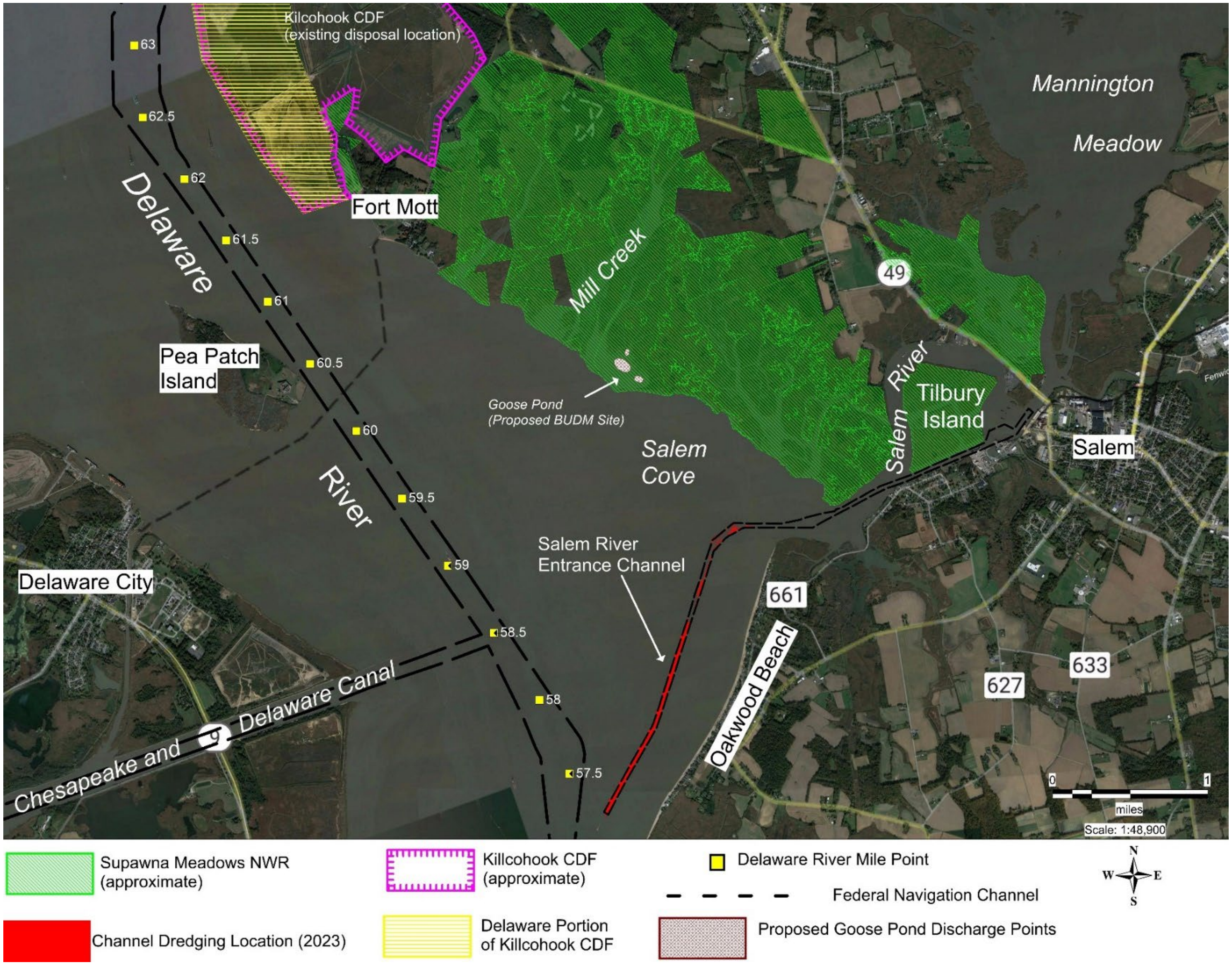
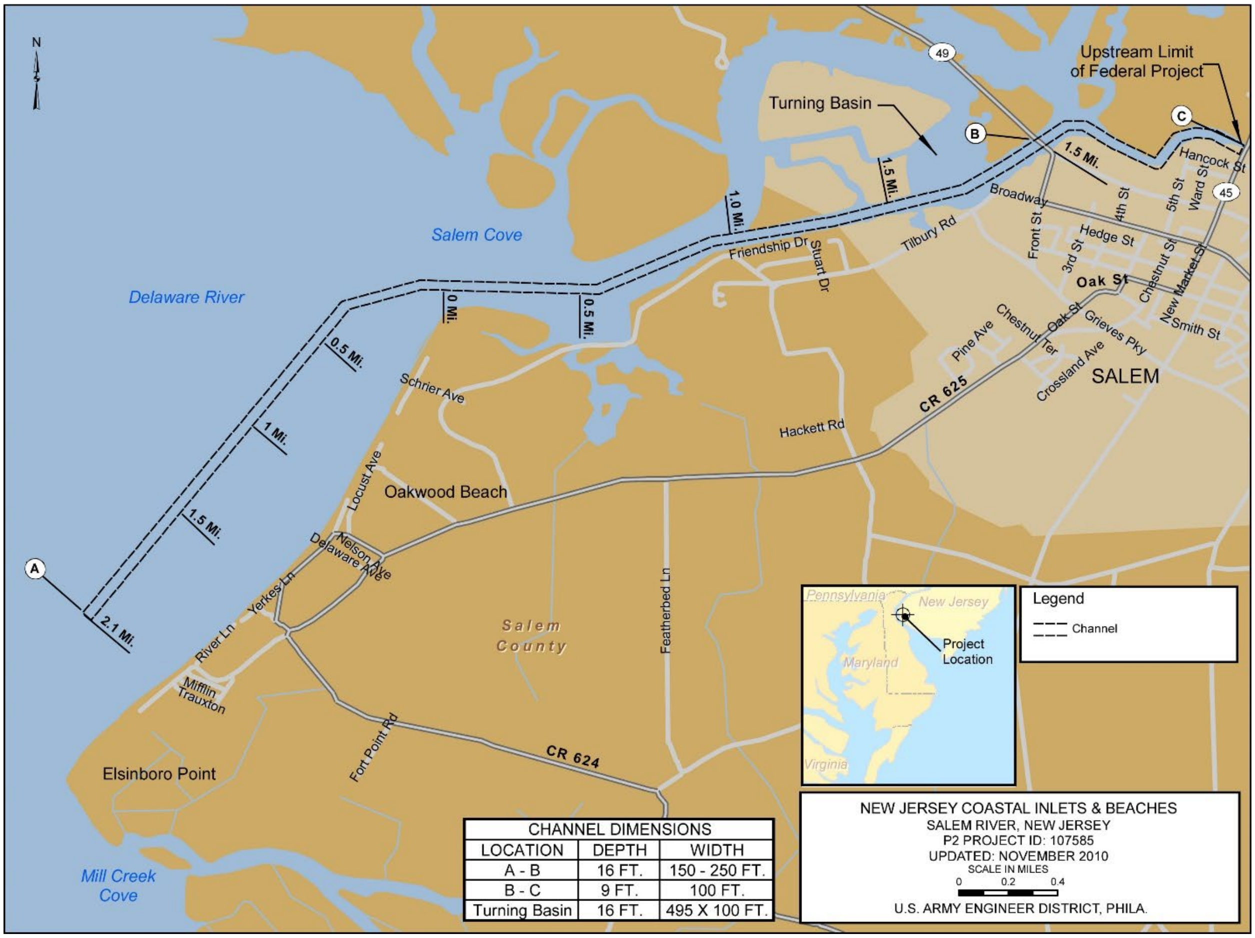


Figure 2. Action Areas and Vicinity



CHANNEL DIMENSIONS

LOCATION	DEPTH	WIDTH
A - B	16 FT.	150 - 250 FT.
B - C	9 FT.	100 FT.
Turning Basin	16 FT.	495 X 100 FT.

Figure 3. Salem River Federal Navigation Project

Oakwood Beach: Oakwood Beach (39.555446°, W 75.522952°) is a bayfront community located in Elsinboro Township, Salem County, New Jersey in the upper region of the Delaware Bay (Figure 1, 2, and 3). Oakwood Beach is located near the mouth of the Salem River within the transitional area of the Delaware River and Bay. Although the project is located along the New Jersey shoreline, the affected area is within State of Delaware waters up to the mean low water line of Oakwood Beach. An existing Federal Coastal Storm Risk Management (CSRM)(beach nourishment) project exists there that was initially constructed in 2015 with periodic nourishment. The plan at Oakwood Beach includes a 50-foot-wide berm at an elevation of +6.0 feet NAVD over a project length of 9,500 lineal feet. The initial construction required the placement of approximately 353,000 cubic yards of sand with projected periodic nourishment of 33,000 cubic yards every 8 years. The source of sand for the initial construction and periodic nourishment is the Delaware River Main channel. The project area limits extend from the Salem River southwest to Elsinboro Point, a distance of approximately 2.3 miles (Figure 2, 3 and 5).

This action will not change the periodic nourishment sand source or placement methods for the existing CSRM project but would provide a means for beneficial use nearshore placement of sand from the Salem River Federal Navigation Channel that would benefit the CSRM project.

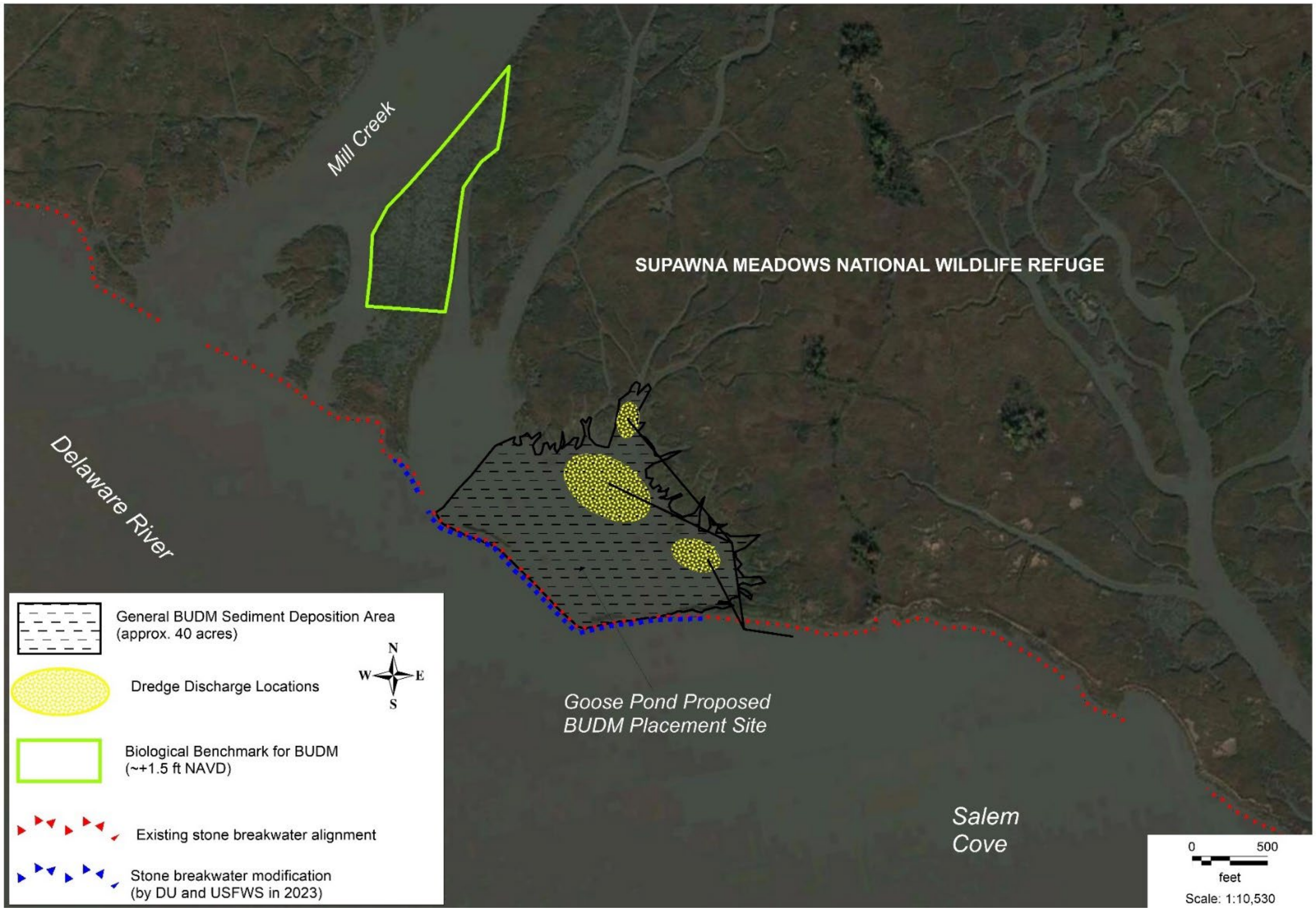


Figure 4. Goose Pond Beneficial Use of Dredged Material Affected Area

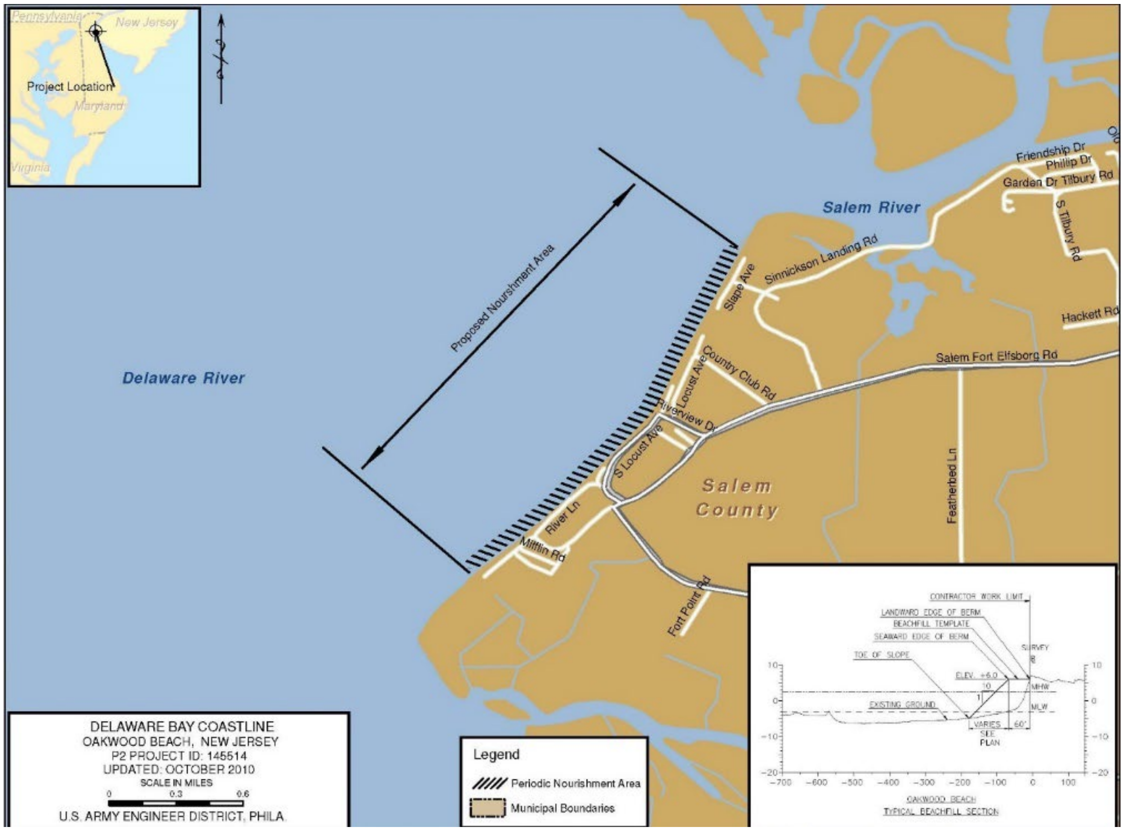


Figure 5. Oakwood Beach Coastal Storm Risk Management Project

1.3 Preferred Alternative

The preferred plan for maintenance dredging of the Salem River Navigation Channel is the combination of 3 disposal options: 1) Killcohook CDF, 2) Oakwood Beach, and 3) Goose Pond area of Supawna Meadows National Wildlife Refuge, which allow for the flexibility in disposal needs while providing for the beneficial use of dredged material opportunities that provide ecological benefits (Goose Pond) or Coastal Storm Risk Management (CSRM) benefits (Oakwood Beach project). The utilization of the existing Killcohook CDF allows for disposal if the other options are not available at the time of need. Oakwood Beach allows for the beneficial placement of sandy material in either the nearshore (≥75% sand) or directly on the beach (≥90% sand) provided that the dredged sediments meet sediment quality objectives (testing requirements as per NJDEP, 1997) appropriate for these uses.

1.3.1 Salem River Federal Navigation Project

The River and Harbor Act of July 11,1870 provided for the first Federal survey of the Salem River. Subsequently, a nine-foot MLW channel was adopted in 1907. The authorized width was 100 feet. This project later became a 12-foot project, adopted as HD 68-110 in 1925, for five miles long and provided for an entrance channel from the

Delaware River to the Route 49 highway bridge in Salem, south of the Little Salem River. The improved draft from nine to 12 feet was recommended to accommodate vessels utilizing the Chesapeake and Delaware Canal which was under reconstruction at the time. The Salem River dimensions were 150 feet wide from the Delaware River through Salem Cove and 100 feet wide along the cutoff from the "Horseshoe Bend" near Sinnicksons Landing to the port. This cutoff, constructed as part of the 1925 authorization, saves vessels one mile travelling from Salem to deep water in the Delaware River. Dredged material disposal was overboard adjacent to the entrance channel in the Delaware River.

The current authorized Salem River project was evaluated in the *Delaware River Comprehensive Navigation Study Final Interim Feasibility Study for Salem River and Environmental Assessment* (USACE 1991). In March 1995, the Secretary of the Army approved a modification to the previous project deepening the channel to 16 feet below mean lower low water between the Route 49 highway bridge and the Delaware River, a distance of about 5 miles (Figure 3). The channel was widened to 150- 250 feet and a trapezoidal shaped turning basin with a width of 495 feet and average length of 1000 feet was provided (Figure 3). Dredged material disposal occurs in the designated Killcohook CDF where hydraulically dredged material is pumped into the CDF. The project also provides for 15.6 acres of wetland mitigation at Supawna Meadows NWR to replace the loss of wetlands and shallow water habitat associated with these modifications. The dredging portion of the project was completed in November 1996. The wetland mitigation portion of the project was completed in June 1997. Since 1996, maintenance dredging has occurred six times.

The Port of Salem is a shallow-draft port located in the vicinity of the Salem River Cut-Off on the Salem River in Salem, New Jersey. The Port is located approximately 2 miles east of the Delaware River, and 54 miles from the Atlantic Ocean. The Port became a foreign trade zone in 1987. Commodities include bulk cargo (construction aggregate), break bulk cargo, containers (clothing, agricultural produce). Port activity also has at times involved lighterage.

1.3.2 Killcohook CDF

A CDF is simply a large settling basin designed to accept and dewater dredged material. When in operation, a mixture of dredged material and water is pumped into one end of the CDF. As the mixture flows through the CDF, the solids settle to the bottom and the water flows to the discharge location where it flows back into the river. Often baffle dikes are constructed within the cells of the CDF to lengthen the path the dredged material mixture must take to reach the discharge location. This increases the settling time and, thus, increases the efficiency of the CDF in dewatering the material. Water pumped with the dredged material must be contained in the CDF until sufficient solids settle out to allow the discharge to meet specified conditions. Heavier, coarser-grained sands and gravels drop out of the water column close to where material enters the CDF. As the water moves through the CDF it slows, allowing finer-grained sediment particles to settle out. Finally, water reaches the weir and is discharged from the site. The purpose of the weir structure is to regulate the release of ponded water from the

CDF. Proper weir design and operation can control potential resuspension and release of solids. As the height of the weir is increased, the depth of the pond increases and only the cleaner surface waters of the pond are released.

Maintenance dredging would continue to periodically occur in portions of the Salem River Federally authorized channel as needed and as funding is available. The channel has been dredged six times periodically since 1996 when the channel was modified to the authorized depth of -16 feet MLLW. The authorized designated dredged material disposal area since 1996 has been the Killcohook CDF where material is hydraulically pumped approximately 3 miles from the channel dredging locations. CDFs provide an environmentally acceptable means to dispose of dredged sediments due to their ability to allow for fine-grained sediments to settle-out and de-water to minimize turbidity introduced into the waterways. It is expected that the Killcohook CDF will remain as a primary alternate disposal site as it contains sufficient capacity well into the future. Therefore, the Killcohook CDF would be the “fall back” location if any BUDM options are not available for the maintenance dredging of the Salem River Federal Navigation Channel.

1.3.3 Goose Pond Area of Supawna Meadows NWR

For maintenance dredging operations, USACE utilizes Regional Sediment Management (RSM) and Engineering with Nature (EWN) principles and practices in a natural infrastructure approach. Since 1996 and especially post-Hurricane Sandy, technical advancements in design and construction of natural and nature-based features using dredged sediments in other areas such as the Cape May WMA continue and have led to advancing BU implementation in New Jersey through the SMIIL with the same principles for Salem River. Alternative placement actions entailing BUDM were developed and evaluated in collaboration with coastal engineers, scientists, landscape architects, and resource managers from the Philadelphia District USACE, NJDEP, the U.S. Army’s ERDC, the UP, and local officials.

Maintenance dredging of the authorized Salem River federal channel will likely continue to occur periodically. This alternative involves dredging the lower navigation channel and the placement of the dredged material within the Goose Pond/Mill Creek area of Supawna Meadows NWR (Figure 4). This placement location was chosen as the selected plan to beneficially use the Salem River dredged material for the restoration of a mosaic of intertidal mudflat and marsh habitats and complements the Supawna Meadows NWR efforts to restore tidal marsh habitat through sediment enrichment/accretion (Phase 2). The objectives for Goose Pond are:

- Implement BUDM principles to introduce sediment into an area experiencing tidal marsh habitat loss due to sea level rise, erosion, and subsidence
- Integrate BUDM with Supawna Meadows National Wildlife Refuge goals of re-establishing tidal marsh habitat within the Goose Pond area of the refuge

- Increase/build the elevation of the mudflat to create a marsh platform that would support a mosaic of intertidal mudflat and a low brackish marsh plant community.

- The target low intertidal marsh habitat occurs at elevation +1.5 ft. NAVD based on a nearby biological benchmark area along the Mill Creek area emptying into Goose Pond. This benchmark is based on recent sediment accretions where new low marsh has become established (personal communication with Jim Feaga, Ducks Unlimited).

1.3.4 Oakwood Beach

In 2015, the Oakwood Beach CSRM project (USACE, 1999 and USACE, 2014) utilized over 353,000 cubic yards of sand to initially construct a 50-foot-wide berm at an elevation of +6.0 Feet NAVD. Periodic nourishment occurs about every 8 years with an estimated volume of approximately 33,000 CY per nourishment cycle (**Figure 5**). The designated sand source for the CSRM project is from the Reedy Island Range of the Delaware River Federal Main Navigation Channel, which is estimated to have sufficient sand quantities for the project life. The utilization of the Salem River channel sediments for the Oakwood Beach was initially considered in both the 1991 *Delaware River Comprehensive Navigation Study Final Interim Feasibility Study for Salem River and Environmental Assessment* (USACE, 1991) and the 1999 *Oakwood Beach Integrated Feasibility Study and Environmental Assessment* (USACE 1999) but was determined to have insufficient quantities of suitable sand for the project initial construction and periodic nourishment since the majority of the sediments are composed of fine-grained silts, and was found not to be economically feasible.

In February 2022, approximately 13,000 CY of sand were removed from shoals as part of a limited maintenance dredging project of the Salem River. This project utilized the split-hull hopper dredge, *Murden,* owned and operated by the Federal government. The sandy material was placed within the nearshore zone, fronting the previously approved Oakwood Beach Coastal Storm Risk Management (CSRM) beachfill project at around the -4 to -8-foot MLW contours within Delaware jurisdictional waters (**Figure 6**). The objective of this beneficial use operation was to provide a supplemental source of material through natural littoral transport to the nearshore Oakwood Beach area.

The current maintenance dredging scheduled in 2023 for Salem River Federal Navigation Channel is expected to be mostly unsuitable fine-grained silts, and any placement at Oakwood Beach is not being considered. However, given the experience with the dredge *Murden* in 2022, the beneficial use of newly shoaled sand, though limited in quantity to maintain the full Oakwood Beach template, is a viable consideration for future BUDM placement directly on the beach or in the nearshore of Oakwood Beach where sand is needed within the littoral system to help maintain the CSRM project template. Disposal at Oakwood Beach is contingent on the basis that the dredged material meets sediment quality objectives where material for nearshore placement is >75% sand and/or directly on the beach upper berm and intertidal is >90% sand.

The objectives for Oakwood Beach are:

- Utilize BUDM principles to support the existing CSRM project at Oakwood Beach by introducing sand into the Oakwood Beach littoral system that could help minimize future re-nourishment needs of the CSRM project.

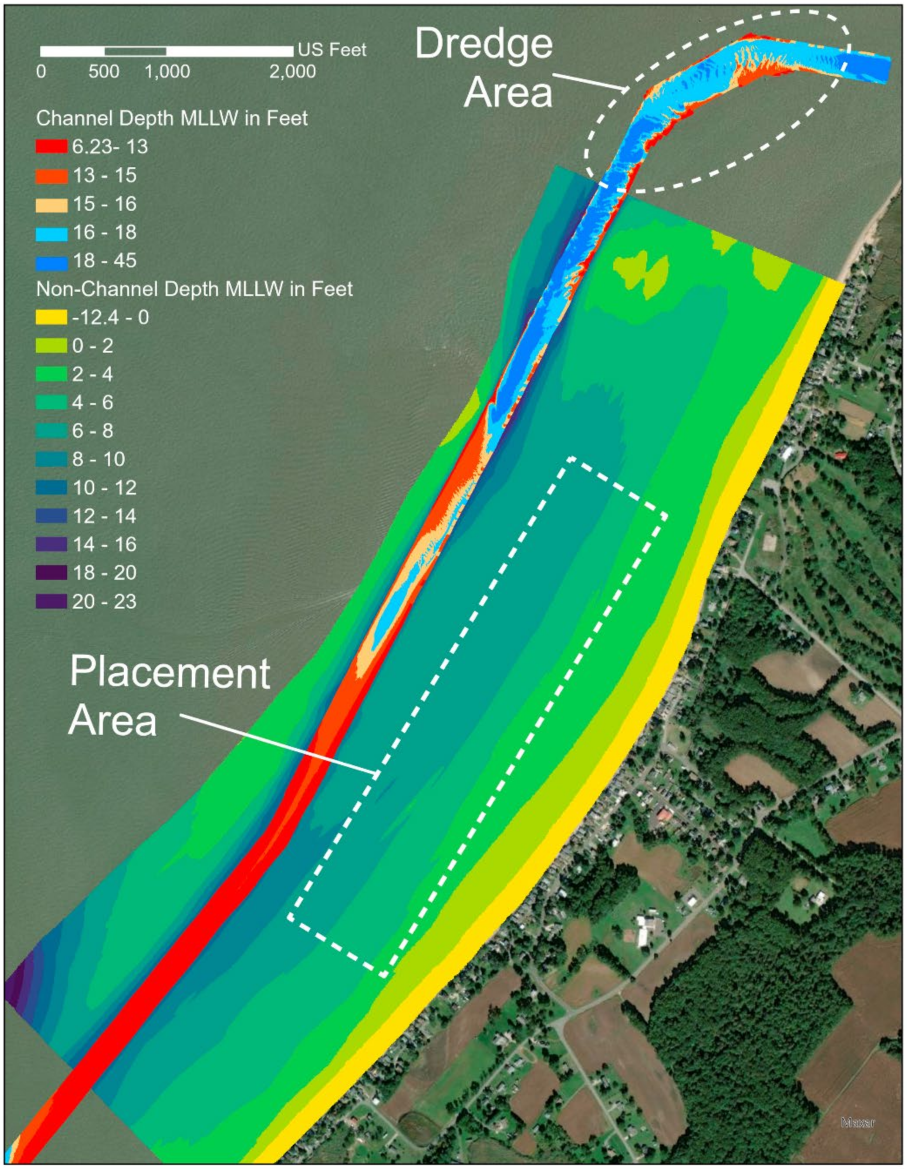


Figure 6. BUDM Placement Location in the Nearshore of Oakwood Beach Used in 2022 and Proposed for Future Placement

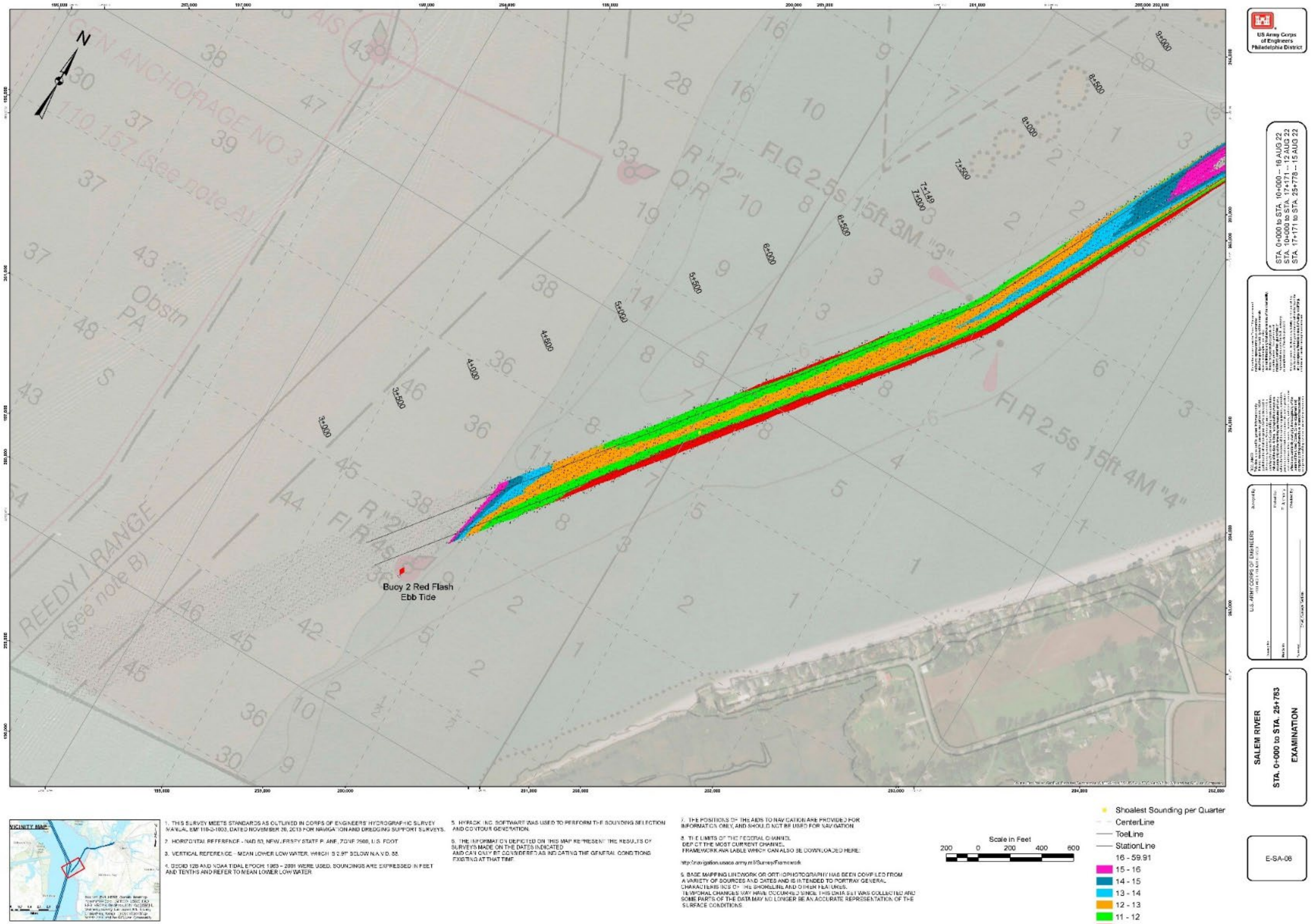
2.0 PROJECT CONSTRUCTION

2.1 Salem River Federal Navigation Channel Maintenance Dredging

Maintenance dredging of the Salem River Federal Navigation Channel typically utilizes a hydraulic cutter-suction dredge (CSD). A cutter suction dredge (CSD) moves dredged material (sediments) through the intake pipe at one end and then pushes it out the discharge pipeline directly into the placement site. Cutter suction or hydraulic cutterhead dredges are floating platforms equipped with a rotating cutter that excavates the river bottom, feeding the loosened material into a pipe (generally 24" diameter) and a suction- pump system that transports the material and water slurry for typical distances of up to five miles by pipeline to the disposal site. Cutterhead pipeline dredges work best in large areas with deep shoals, where the cutterhead is buried in the bottom. Transport distances can be extended by the addition of booster pumps in the pipeline route. CSD’s are mounted to barges and are not usually self-powered; rather they are towed to the dredging site where they will typically be anchored into the bottom with a spud and remain in a fixed spot and will excavate uniform deep pits along the arc of the cutterhead. Once the desired bathymetry is achieved, the dredge is towed into the next location and is secured in place by the spuds. CSDs can be very efficient dredges that can pump continuously of up to 2,000 cubic yards per hour depending on the size of dredge being used. A CSD dredging operation typically employs a system of floating pipelines to transport the slurry where they would make landfall into a confined disposal facility (CDF).

Killcohook CDF. The current authorized disposal site for the Salem River Federal Navigation Channel is the existing Federally-owned Killcohook CDF, which has been the designated disposal location for the Salem River channel maintenance since the 1990’s. The Killcohook CDF is also used for the maintenance of the Delaware River Main Navigation Channel – Philadelphia to the Sea project. The Kilcohook CDF is enclosed by a system of earthen dikes and internal baffle dikes, which encourage settling of sediments. Within the CDF, the slurry mixture of water and sediments is typically contained in the disposal site until the solids settle out. The excess water is then discharged as effluent through a controlled sluice gate (weir) back into the Delaware River.

Maintenance dredging of the Salem River Federal Navigation Channel typically occurs every 2 to 6 years, as needed. Dredging locations for 2023-cycle are presented in **Figures 7 through 9** based on the most current channel examination, which could affect up to 30 acres of subtidal bottom of the channel; however, these locations may be modified based on pre-dredge surveys at the time of commencement of work.



1. THIS SURVEY MEETS STANDARDS AS OUTLINED IN CORPS OF ENGINEERS' HYDROGRAPHIC SURVEY MANUAL EM 110-2-1003, DATED NOVEMBER 30, 2013 FOR NAVIGATION AND DREDGING SUPPORT SURVEYS.

2. HORIZONTAL REFERENCE - NAD 83, NEW JERSEY STATE PLANE, ZONE 2900, U.S. FOOT

3. VERTICAL REFERENCE - MEAN LOWER LOW WATER, WHICH IS 2.97' BELOW N.A.V.D. 88.

4. GEOID 12B AND NOAA TIDAL EPOCH: 1983 - 2001 WERE USED. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO MEAN LOWER LOW WATER.

5. HYPACK, INC. SOFTWARE WAS USED TO PERFORM THE SOUNDING SELECTION AND CONTOUR GENERATION.

6. THE INFORMATION DEPICTED ON THIS MAP REPRESENT THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.

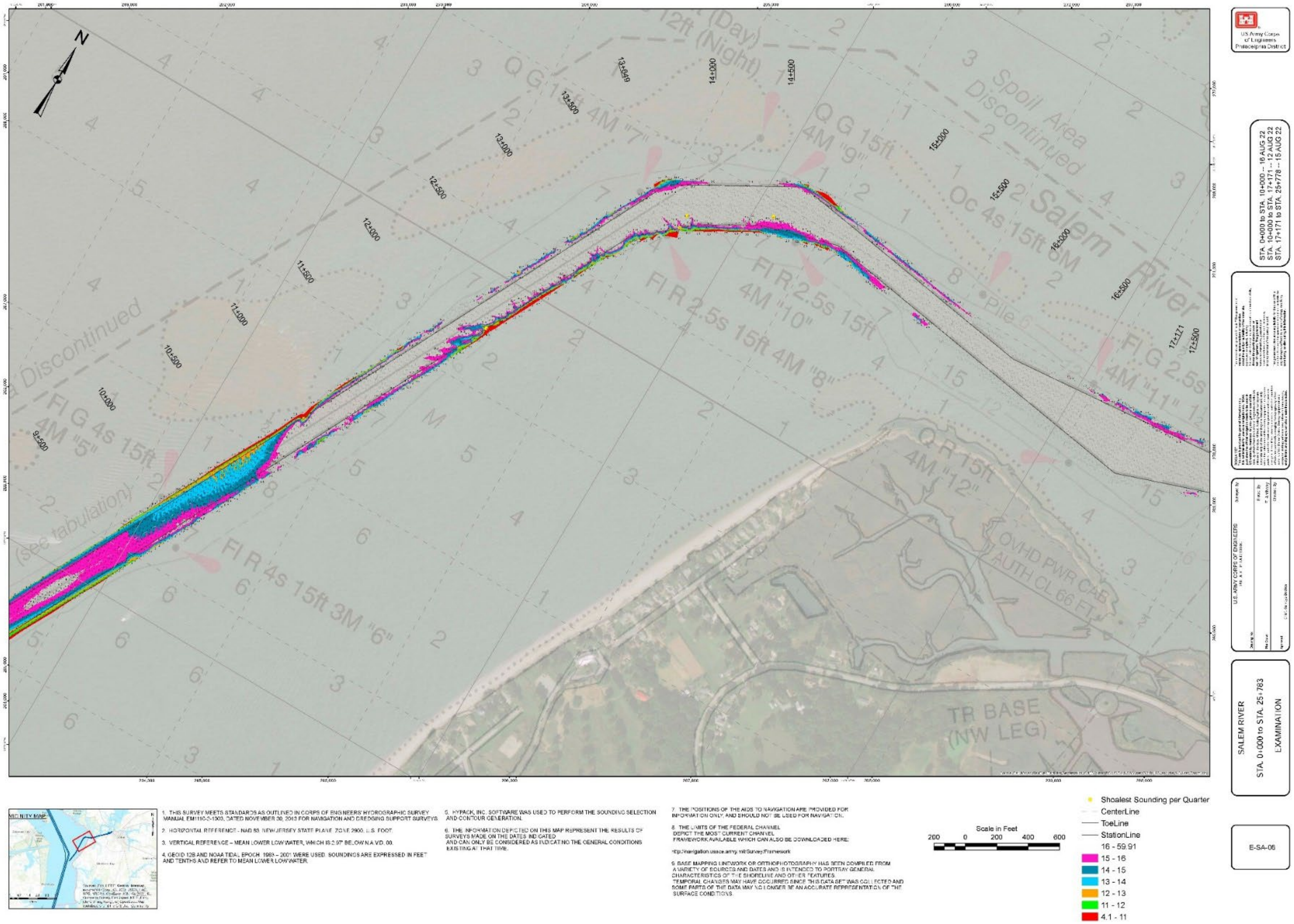
7. THE POSITIONS OF THE AIDS TO NAVIGATION ARE PROVIDED FOR INFORMATION ONLY, AND SHOULD NOT BE USED FOR NAVIGATION.

8. THE LIMITS OF THE FEDERAL CHANNEL DEPICT THE MOST CURRENT CHANNEL FRAMEWORK AVAILABLE WHICH CAN ALSO BE DOWNLOADED HERE:

http://navigation.usace.army.mil/Survey/Framework

9. BASE MAPPING LINEWORK OR ORTHOPHOTOGRAPHY HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND DATES AND IS INTENDED TO PORTRAY GENERAL CHARACTERISTICS OF THE SHORELINE AND OTHER FEATURES. TEMPORAL CHANGES MAY HAVE OCCURRED SINCE THIS DATA SET WAS COLLECTED AND SOME PARTS OF THE DATA MAY NO LONGER BE AN ACCURATE REPRESENTATION OF THE SURFACE CONDITIONS.

Figure 7. Salem River Channel Examination (Lower)



1. THIS SURVEY MEETS STANDARDS AS OUTLINED IN CORPS OF ENGINEERS' HYDROGRAPHIC SURVEY MANUAL EM1110-2-1003, DATED NOVEMBER 30, 2013 FOR NAVIGATION AND DREDGING SUPPORT SURVEYS.
2. HORIZONTAL REFERENCE - NAD 83, NEW JERSEY STATE PLANE, ZONE 2900, U.S. FOOT.
3. VERTICAL REFERENCE – MEAN LOWER LOW WATER, WHICH IS 2.97' BELOW N.A.V.D. 88.
4. GEOID 12B AND NOAA TIDAL EPOCH: 1983 – 2001 WERE USED. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO MEAN LOWER LOW WATER.
5. HYPACK, INC. SOFTWARE WAS USED TO PERFORM THE SOUNDING SELECTION AND CONTOUR GENERATION.
6. THE INFORMATION DEPICTED ON THIS MAP REPRESENT THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
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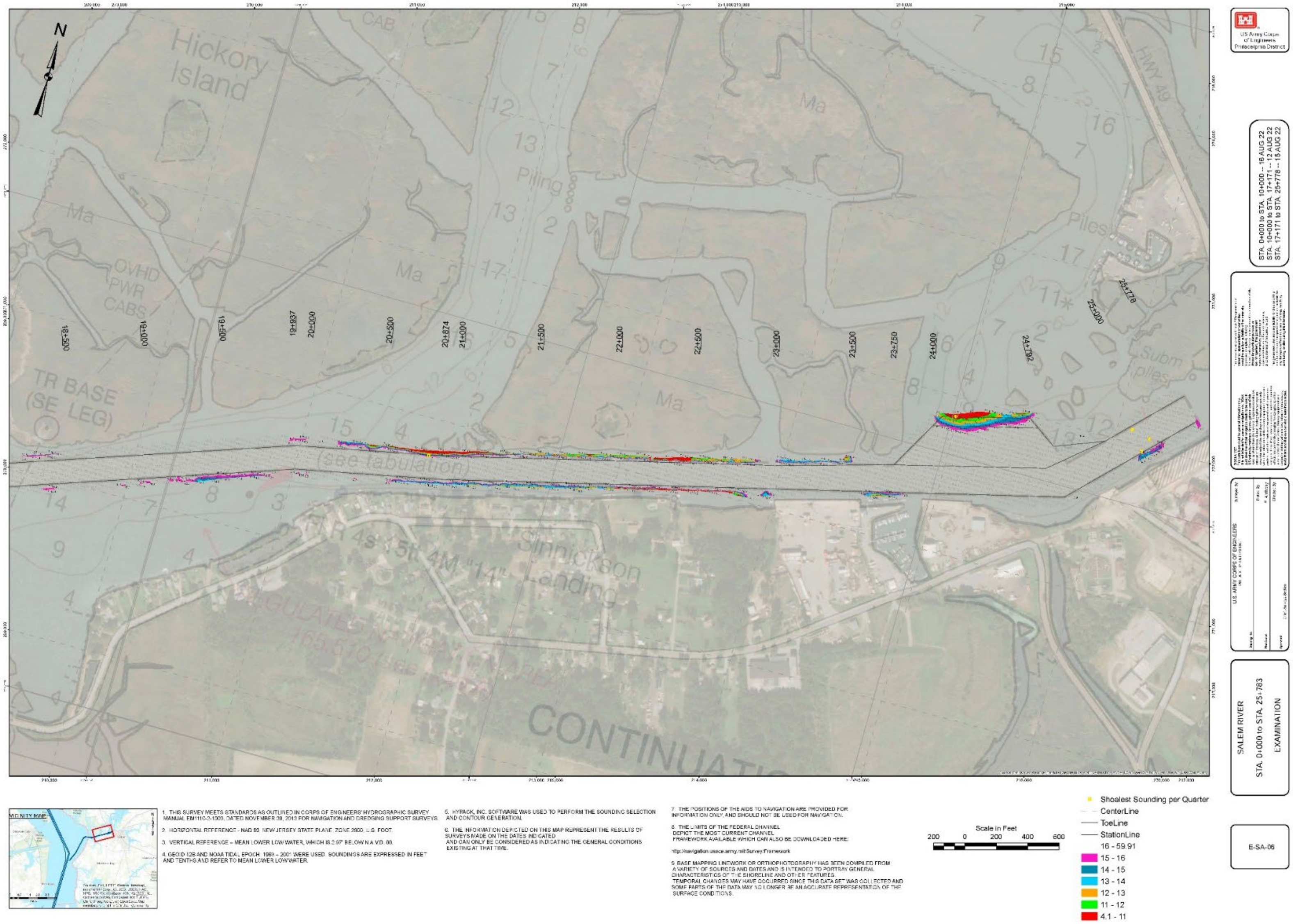
9. BASE MAPPING LINEWORK OR ORTHOPHOTOGRAPHY HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND DATES AND IS INTENDED TO PORTRAY GENERAL CHARACTERISTICS OF THE SHORELINE AND OTHER FEATURES. TEMPORAL CHANGES MAY HAVE OCCURRED SINCE THIS DATA SET WAS COLLECTED AND SOME PARTS OF THE DATA MAY NO LONGER BE AN ACCURATE REPRESENTATION OF THE SURFACE CONDITIONS.

Figure 8. Salem River Channel Examination (Middle)



1. THIS SURVEY MEETS STANDARDS AS OUTLINED IN CORPS OF ENGINEERS' HYDROGRAPHIC SURVEY MANUAL EM1110-2-1003, DATED NOVEMBER 30, 2013 FOR NAVIGATION AND DREDGING SUPPORT SURVEYS.

2. HORIZONTAL REFERENCE - NAD 83, NEW JERSEY STATE PLANE, ZONE 2900, U.S. FOOT.

3. VERTICAL REFERENCE – MEAN LOWER LOW WATER, WHICH IS 2.97' BELOW N.A.V.D. 88.

4. GEOID 12B AND NOAA TIDAL EPOCH: 1983 – 2001 WERE USED. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO MEAN LOWER LOW WATER.

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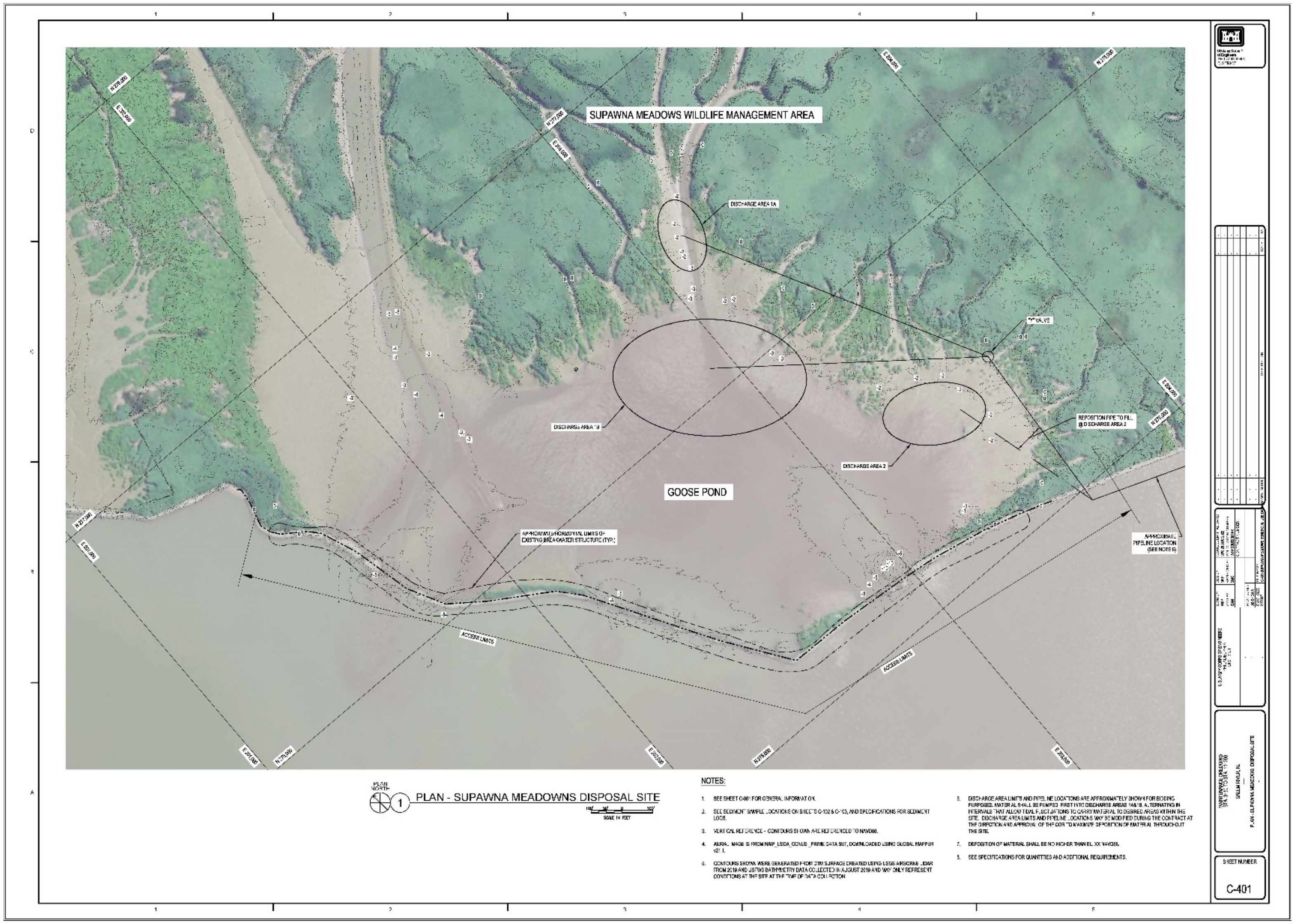
Figure 9. Salem River Channel Examination (Upper)

2.2 BUDM at Goose Pond Area of Supawna Meadows National Wildlife Refuge

The initial BUDM placement will occur within the primary placement locations shown on **Figure 10**, the majority of which is within the old marsh platform behind the existing stone breakwater, which is expected to be enhanced by USFWS in advancement of the BUDM action. Dredging placement at these locations would be distributed by a series of "Y" valve pipelines where a slurry of dredged material would be pumped in from a hydraulic cutterhead suction dredge (CSD) operating in the navigation channel to build elevation. Here, sediments would be distributed through the pumping action along with natural flood and ebb tidal currents throughout the Goose Pond/Mill Creek area. Containment will be incorporated into the design utilizing the stone breakwater and surrounding higher marsh areas with higher elevations. The stone breakwater will provide semi-confinement of suspended sediments and act as a baffle that will promote sediment-settling and minimize sediment from entering the Delaware River. Likewise, the existing surrounding marsh vegetation will promote the settlement of sediments on the landward side of the discharges. The "Y" valves would be used interchangeably to manage sediment build-up rates and turbidity while working with the tides. Discharges further up into the tidal creek would occur at area 1A, whereas, areas 1B and 2 are closer to the breakwater for Goose Pond to promote a more even distribution of sediment within the 42-acre affected area.

The initial dredging and placement operation is anticipated to occur over a period of approximately 16 weeks in the July 2023 thru March 2024 time-frame, with an initial placement of up to 260,000 CY of predominantly fine-grained sediments. The target elevation is at +1.5 ft. NAVD to establish desirable low marsh habitat. This area has a tidal range of 5.3 feet with MLLW occurring at -2.97 ft NAVD and MHHW occurring at +2.87 ft NAVD. Intertidal mudflat conditions generally occur between elevations -2.97 ft NAVD and approximately +1.0 ft NAVD. Low marsh conditions exist above +1.38 ft. NAVD to a maximum of +1.62 feet NAVD (personal communication with Jim Feaga, Ducks Unlimited). Based on the modeling of settlement rates for Salem River silty material, it is assumed that a maximum elevation of +1.9 would be necessary to produce a desired finished elevation of +1.5 feet NAVD after consolidation occurs (will be monitored) However, it is likely that most areas that gain elevation would be below +1.5 ft NAVD after the initial placement and subsequent placements will be needed to achieve the desired elevations. Sediment would be delivered to three discharge points in a slurry form using a "Y" valve in the pipeline. Monitoring of the placement elevations and sediment consolidation via traditional and remote sensing techniques will be conducted by USACE, ERDC, USFWS – Supawna Meadows NWR and stakeholders such as DU, and will occur prior to, during, and post-placement operations. Lessons learned from the first placement will inform the design and construction of the second placement operation approximately 1 to 2 years later and any subsequent dredging cycles if marsh elevation targets are not reached. The operation will be adaptively managed during the second placement based on elevation and consolidation data from initial placement. The Monitoring and Adaptive Management Plan is presented in Section 4.6.



NOTES:

1. SEE SHEET C-001 FOR GENERAL INFORMATION.
2. SEE SEDIMENT SAMPLE LOCATIONS ON SHEETS C-102 & C-103, AND SPECIFICATIONS FOR SEDIMENT LOGS.
3. VERTICAL REFERENCE - CONTOURS SHOWN ARE REFERENCED TO NAVD88.
4. AERIAL IMAGE IS FROM NAIP_USDA_CONUS _PRIME DATA SET, DOWNLOADED USING GLOBAL MAPPER v21.1.
5. CONTOURS SHOWN WERE GENERATED FROM DTM SURFACE CREATED USING USGS AIRBORNE LIDAR FROM 2019 AND USFWS BATHYMETRY DATA COLLECTED IN AUGUST 2019 AND MAY ONLY REPRESENT CONDITIONS AT THE SITE AT THE TIME OF DATA COLLECTION.
6. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS ARE APPROXIMATELY SHOWN FOR BIDDING PURPOSES. MATERIAL SHALL BE PUMPED FIRST INTO DISCHARGE AREAS 1A&1B, ALTERNATING IN INTERVALS THAT ALLOW TIDAL FLUCTUATIONS TO CARRY MATERIAL TO DESIRED AREAS WITHIN THE SITE. DISCHARGE AREA LIMITS AND PIPELINE LOCATIONS MAY BE MODIFIED DURING THE CONTRACT AT THE DIRECTION AND APPROVAL OF THE COR TO MAXIMIZE DEPOSITION OF MATERIAL THROUGHOUT THE SITE.
7. DEPOSITION OF MATERIAL SHALL BE NO HIGHER THAN EL. XX NAVD88.
8. SEE SPECIFICATIONS FOR QUANTITIES AND ADDITIONAL REQUIREMENTS.

Figure 10. Goose Pond BUDM Disposal Plan

2.3 BUDM at Oakwood Beach (Nearshore Placement)

As stated previously, spot shoals consisting of sandy material were removed from the Salem River Federal Navigation Channel in February 2022 utilizing the split-hull hopper dredge *Murden* and sand was placed beneficially within the subtidal nearshore of Oakwood Beach in depths ranging from -2 to -8 feet MLLW. The *Murden* is a small self-propelled seagoing, steel hull shallow-draft special purpose trailing-suction hopper dredge with a capacity of 512 cubic yards. Because it has a shallow draft and can dump with a split hull that can open along its center line, it can dredge and transport material to a designated disposal location and operate within the surf zone to nourish beaches.

For the Salem River Federal Navigation Channel, the *Murden* or a similar style of dredge would only be utilized for limited shoals consisting of sandy material ≥ 80% sands. In 2022, this only amounted to approximately 13,000 cubic yards of sandy material dredged from the channel and deposited in a 90-acre area within the nearshore of Oakwood Beach. Following the bottom placements, the sand thicknesses did not modify the tidal regime of the nearshore bottom as it remained shallow subtidal; however, the existing CSRM project benefitted by the addition of sand into the littoral system. Future placements would occur as frequently as annually (depending on the availability of the dredge and sandy spot shoals in the navigation channel) within the area depicted in **Figure 11**. as determined by bathymetry of the placement location and sufficient bottom depth for safe access for the dredge.

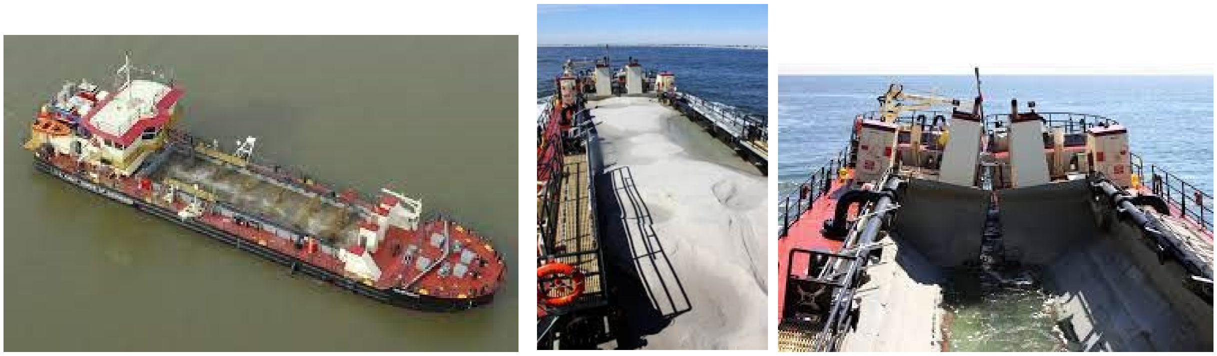


Figure 11. The Dredge *Murden* with in-filling (left), laden with sand in transport (center), and split-hull bottom dumping (right). Photos are from Wilmington District USACE (left) and Philadelphia District USACE (center and right).

3.0 ESSENTIAL FISH HABITAT

EFH is defined in the Magnuson-Stevens Fishery Conservation and Management Act, (PL 94-265 as amended through October 11, 1996 and 1998) as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”. Regulations further clarify EFH by defining “waters” to include aquatic areas that are used by fish and may include aquatic areas that were historically used by fish where appropriate. A purpose of the act is to “promote the protection of essential fish habitat in the review of projects conducted under federal permits, licenses, or other authorities that affect, or have the potential to affect such habitat”. An EFH assessment is required for a federal action that could potentially adversely impact essential fish habitat.

The EFH final rule published in the Federal Register on January 17, 2002 defines an adverse effect as: “any impact which reduces the quality and/or quantity of EFH.” The rule further states that: “An adverse effect may include direct or indirect physical, chemical or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts including individual, cumulative, or synergistic consequences of actions.

Managed fish species are those species that are managed under a federal fishery management plan. Managed fish species for the Delaware Estuary and the affected action areas in the NOAA Fisheries EFH mapper website at . This guide is often used to evaluate the fish species that might be adversely affected by proposed developments within a project area. The coastal estuarine habitats of the project area have been designated as habitat for a number of managed species and their specific life history stages of concern.

EFH assessments also examine the potential effects on prey species for the managed fish species potentially occurring within the area. Prey species are defined as being a forage source for one or more designated fish species. They are normally found at the bottom of the food web in a healthy environment. Prey species found in the project area estuaries include killifish, mummichogs, silversides and herrings. Actions that reduce the availability of prey species, either through direct harm or capture, or through adverse impacts to the prey species’ habitat may also be considered adverse effects on EFH.

The affected area is designated as Essential Fish Habitat (EFH) for species with Fishery Management Plans (FMPs) and their important prey species. The NOAA National Marine Fisheries EFH Mapper was utilized to identify EFH within the affected area of the dredging and placement areas. Point data and EFH species lists were generated by using both the EFH view tool and Data Query Tool. Other sources on EFH were obtained through the NOAA EFH portal or other outside sources. The entire affected area occurs within the bio salinity mixing zone of the Delaware Estuary. Salinities within the affected area range from oligohaline (0.5 to 5 ppt) to lower mesohaline (5 to 15 ppt).

The affected area includes EFH for various life stages for 12 species of managed fish species. **Table 2** presents the managed species and their life stage that EFH is identified for within the affected geographic area as searched in the EFH mapper (https://www.habitat.noaa.gov/apps/efhmapper/efhreport/). This encompasses locations in the Delaware Bay and River that the National Marine Fisheries Service has identified as the biosalinity mixing zone.

Table 2. Summary of EFH Designated Species and Their Life Stages within the Delaware Estuary Mixing Zone EFH

Managed Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**	**Spawning Adults**
Windowpane flounder *(Scopthalmus aquosus)*			X	X	
Atlantic sea herring *(Clupea harengus)*			X	X	
Bluefish *(Pomatomus saltatrix)*			X	X	
Long finned squid *(Loligo pealei)*	X				
Atlantic butterfish *(Peprilus tricanthus)*		X	X	X	
Summer flounder *(Paralicthys dentatus)*			X	X	
Scup *(Stenotomus chrysops)*			X	X	
Black sea bass *(Centropristus striata)*			X		
Red hake *(Rachycentron canadum)*				X	
Clearnose skate (*Raja eglantteria*)			X	X	
Little skate (*Leucoraja erinacea*)			X	X	
Winter skate (*Leucoraja ocellata*)			X	X	

There are no Habitat Areas of Particular Concern (HAPC) or EFH Areas Protected from Fishing (EFHA) documented within the Goose Pond area. A HAPC for summer flounder exists in the Salem River Federal Navigation Channel dredging area and Oakwood Beach areas contingent on the presence of SAV or macroalgae, which are not present at these locations.

Table 3. EFH Life Stages Identified in EFH Mapper

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic butterfish *(Peprilus tricanthus)*		**Habitat:** Pelagic waters in high salinity and mixed salinity zones of most estuaries and on continental shelf. **Prey:** Planktonic incl: thaliaceans, mollusks, crustaceans,copepods, amphipods,coelenterates, polychaetes, small fishes, & ctenophores	**Habitat:** Pelagic waters in high salinity and mixed salinity zones of most estuaries and on continental shelf.	**Habitat:** Pelagic waters, water depths between 10 and 365 meters, water temperatures between 3°C and 28°C, and a salinity range of 4 to 26%. **Prey:** Jellyfish, crustaceans, worms, small fish
Black sea bass *(Centropristus striata)*			**Habitat:** Demersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas	
Bluefish *(Pomatomus saltatrix)*			**Habitat:** Pelagic waters of continental shelf and in Mid Atlantic estuaries from May-Oct. **Prey:** Squid, smaller fish	**Habitat:** Pelagic waters; found in Mid Atlantic estuaries April – Oct. **Prey:** Squid, smaller fish
Longfin inshore squid *(Loligo pealeii)*	**Habitat:** Egg masses are demersal in polyhaline waters <50 m in depth and 10-23°C and are commonly found attached to rocks and small boulders on sandy/muddy bottom and on aquatic vegetation.			
Scup *(Stenotomus chrysops)*			**Habitat:** Demersal, prefer sands, mud, mussel, and eelgrass beds; present in spring and summer in estuaries and bay; water depths to 38 m **Prey**: bottom feeders – polychaetes, amphipods, small crustaceans,	**Habitat:** Demersal waters offshore from spring to fall; open sandy bottom to structured habitats such as mussel beds, reefs, or rough bottom; smaller scup in estuaries; larger in deeper waters; some winter offshore from November to April

Table 3. EFH Life Stages Identified in EFH Mapper

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			mollusks, fish eggs and larvae	**Prey:** Small benthic invertebrates, insect larvae, small fish
Summer flounder *(Paralicthys dentatus)*			**Habitat:** Demersal waters (mud and sandy substrates); water temperatures greater than 11°C, water depths from 0.5 to 5 m **Prey:** crustaceans, polychaetes, mysid shrimp; larger juveniles - fish	**Habitat:** Demersal waters (mud and sandy substrates). Shallow coastal waters (< 25 m) in warm months, offshore in cold months (> 150 m) **Prey:** opportunistic- fish, squid, shrimp, worms
Atlantic sea herring *(Clupea harengus)*			**Habitat:** Pelagic waters and bottom, < 10 C and 15-130 m depths **Prey:** zooplankton (copepods, decapod larvae, cirriped larvae, cladocerans, and pelecypod larvae)	**Habitat:** Pelagic waters and bottom habitats; **Prey:** fish eggs and larvae, chaetognath, euphausiids, pteropods and copepods.
Red hake *(Urophycis chuss)*				**Habitat:** Benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters and as shallow as 20 meters in a number of inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs, depressions in softer sediments or in shell beds and not on open sandy bottom. **Prey:** crustaceans, variety of demersal and pelagic fish and squid.
Windowpane flounder *(Scopthalmus aquosus)*			**Habitat:** Bottom (fine sands) 5-125m in depth, in nearshore bays and estuaries less than 75 m	**Habitat:** Bottom (fine sands), peak spawning in May , in nearshore bays and estuaries less than 75 m

Table 3. EFH Life Stages Identified in EFH Mapper

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
			Prey: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae	**Prey**: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae
Clearnose skate (*Raja egianteria*)			**Habitat:** shoreline to 30 meters, primarily on mud and sand, but also on gravelly and rocky bottom **Prey:** Amphipods, polychaetes, mysid shrimp, crabs, bivalves, squids, small fishes (soles, weakfish, butterfish, scup)	**Habitat:** shoreline to 40 meters, primarily on mud and sand, but also on gravelly and rocky bottom **Prey:** Amphipods, mysid shrimp, rock crabs, razor clams, juvenile flounder, croaker and spot
Little skate (*Raja erinacea*)			**Habitat:** Intertidal and sub-tidal benthic habitats in coastal waters extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH occurs on sand and gravel substrates, but they are also found on mud	**Habitat:** Intertidal and sub-tidal benthic habitats in coastal waters extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH occurs on sand and gravel substrates, but they are also found on mud
			Prey: Benthic macrofauna primarily decapod crustaceans, amphipods and polychaetes	**Prey:** Benthic macrofauna primarily decapod crustaceans, amphipods and polychaetes
Winter skate (*Raja ocellata*)			**Habitat:** Sub-tidal benthic habitats in coastal waters from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH occurs on sand and gravel substrates, but they are also found on mud	**Habitat:** Sub-tidal benthic habitats in coastal waters from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH occurs on sand and gravel substrates, but they are also found on mud
			Prey: Polychaetes and amphipods are the most important prey items in terms of numbers or occurrence, followed by decapods, isopods, bivalves, and fishes	**Prey:** Polychaetes and amphipods are the most important prey items in terms of numbers or occurrence, followed by decapods, isopods, bivalves, and fishes

3.1 Habitat Areas of Particular Concern

Habitat Areas of Particular Concern (HAPC) are areas of EFH that are judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation (NOAA, 1999a). A HAPC occurs within the study area for summer flounder (*Paralicthys dentatus*) in areas where “all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC.”

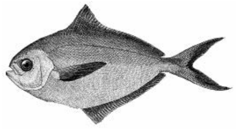
SAV habitats are among the most productive ecosystems in the world and perform a number of irreplaceable ecological functions which range from chemical cycling and physical modification of the water column and sediments to providing food and shelter for commercial, recreational, as well as economically important organisms (Stephan and Bigford, 1997). Larvae and juveniles of many important commercial and sport fish such as bluefish, summer flounder, spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*), herrings (Clupeidae) and many others appear in eelgrass beds in the spring and early summer (Fonseca et al, 1992 as reported in NMFS, 2016).

Studies from the lower Chesapeake Bay found that SAV beds are important for the brooding of eggs and for fishes with demersal eggs, and as habitat for the larvae of spring-summer spawners such as anchovies (*Anchoa* spp.), gobies (*Gobiosoma* spp.), weakfish and silver perch (*Bairdiella chrysoura*) (Stephan and Bigford 1997 as reported in NMFS, 2016). Heckman and Thoman (1984) concluded that SAV beds are also important nursery habitats for blue crabs. According to Perterson (1982), in Kentworthy (1988) (as reported in NMFS, 2016) shallow dwelling hard clams may be protected from predation by the rhizome layer of seagrass beds.

SAV beds exist in localized areas of the Delaware Estuary. The low salinity of the affected area does not support eel grass (*Zostera marina*), which is present in most mid-Atlantic estuaries. Species found in the more brackish waters of the estuary include widgeon grass (*Ruppia maritima*) and other more freshwater and slightly brackish species of pondweeds (*Zanichellia palustris* and *Potomogeton* spp.) and wild celery (*Vallisneria americana*) occur in the Delaware River and tributaries. The Salem River Navigation Channel is not likely to contain any SAV since it is maintained regularly, which would prevent the establishment of SAV. The Goose Pond area is predominantly intertidal mudflat and shallow subtidal bottom. No SAV have been identified in this area. The Oakwood Beach shoreline has not had any documented SAV in the intertidal or nearshore. Therefore, no HAPC for summer flounder occurs within the action area.

3.2 Mid-Atlantic Species

3.2.1 Atlantic Butterfish (*Peprilus triacanthus*)



The project site is designated as EFH for Atlantic butterfish larvae, juveniles, and adults. The habitat parameters for the applicable life stages are as follows.

Eggs and Larvae: Butterfish eggs and larvae are pelagic and occur from the outer continental shelf to the lower, high salinity parts of estuaries in the Middle Atlantic Bight. Eggs have been collected between 12 – 23ºC and larvae have been collected between 4 – 28ºC; eggs and larvae occur at salinities that range from estuarine to full strength seawater. No larvae EFH is identified within the affected areas.

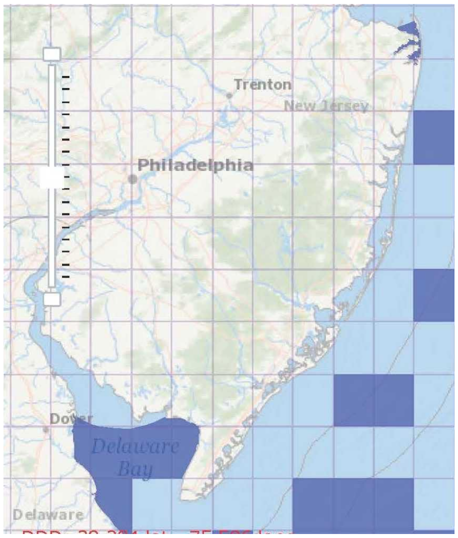


Figure 12. Atlantic Butterfish Larvae EFH

Adults: Juvenile and adult butterfish are pelagic and are common to abundant in the high salinity and mixing zones of estuaries from Massachusetts Bay to the mid-Atlantic. Generally, adult butterfish occur in water depths between 10 and 365 meters, water temperatures between 3°C and 28°C, and a salinity range of 4 to 26%. **Prey:** jellyfish, crustaceans, worms and small fishes.

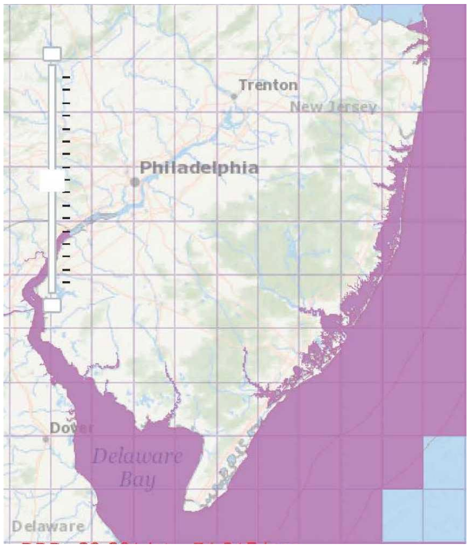


Figure 13. Atlantic Butterfish Juvenile EFH

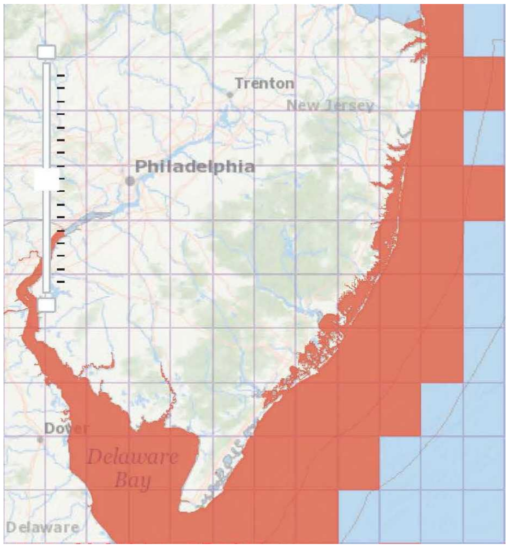
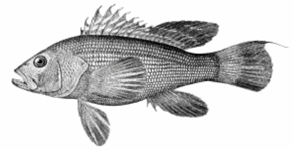


Figure 14. Atlantic Butterfish Adult EFH



3.2.2 Black sea bass (*Centropristus striata*) (NMFS, 2007)

The project site is designated as EFH for black sea bass juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Juvenile black sea bass are demersal, and are usually found in association with rough bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. Typical conditions are: water temperatures less than 6°C, water depths between 1 and 38 meters, and salinities less than 18%.

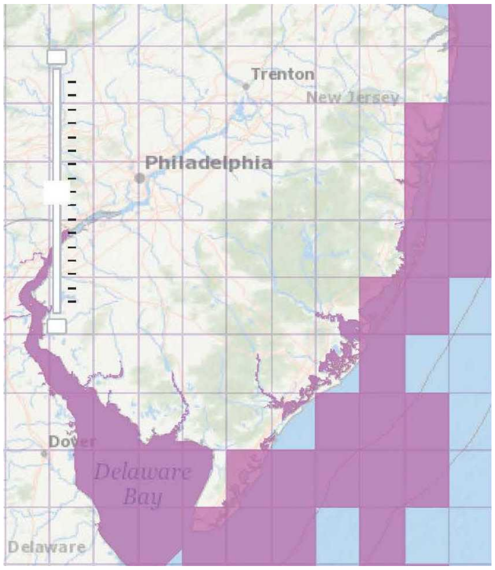
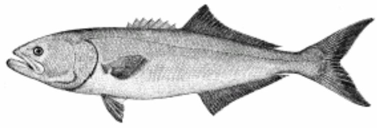


Figure 15. Black Seabass Juvenile EFH

Prey: Juveniles, which are diurnal, visual predators, prey on benthic and epibenthic crustaceans (isopods,amphipods, small crabs, sand shrimp, copepods, mysids) and small fish. Adult black sea bass are generalist carnivores that feed on a variety of infaunal and epibenthic invertebrates, especially crustaceans (including juvenile American lobster *Homarus americanus*, crabs, and shrimp) small fish, and squid.

3.2.3 Bluefish (*Pomatomus saltatrix*) (NMFS, 2006)



The project site is designated as EFH for bluefish juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Generally juvenile bluefish are pelagic in habits and occur in estuaries from May through October. Typical conditions for juveniles are water temperatures between 19°C and 24°C and salinities between 23 and 36%.

Adults: Adult bluefish are pelagic and found in Mid-Atlantic estuaries from April through October. Typical conditions for adults are water temperatures from 14°C to 16°C and salinities greater than 25%.

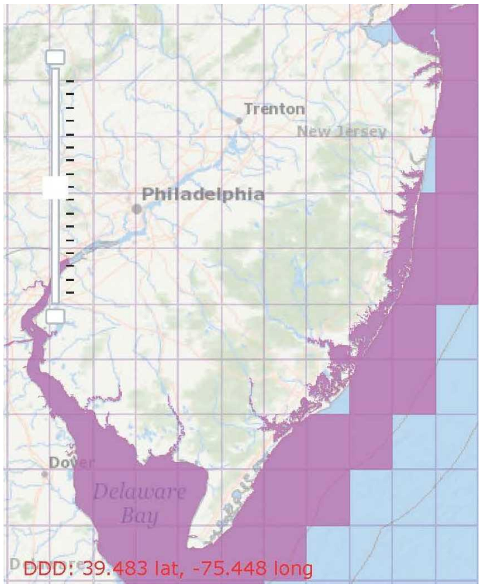
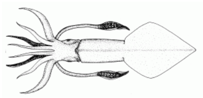


Figure 16. Bluefish Juvenile EFH

Figure 17. Bluefish Adult EFH

Prey: Juvenile and adult bluefish have a very widespread and varied diet of invertebrates and fishes.

Long finned inshore squid (*Loligo pealei*) (NMFS, 2005)



Eggs: Egg masses are demersal in polyhaline waters <50 m in depth and 10-23°C, and are commonly found attached to rocks and small boulders on sandy/muddy bottom and on aquatic vegetation.

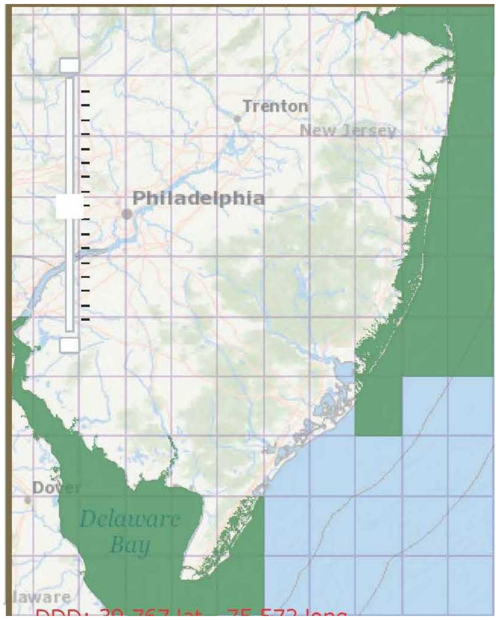
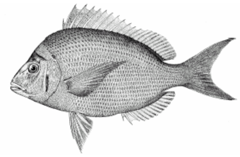


Figure 18. Long Finned Inshore Squid Egg EFH

3.2.4 Scup (*Stenotomus chrysops*) (NMFS, 1999)



The project site is designated as EFH for scup juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: In general, juvenile scup during the spring and summer are found in estuaries and bays, and are demersal in association with various sands, mud, mussel, and eelgrass bed type substrates, between the shore and water depths of 38 meters. Typical conditions are: water temperatures above 7°C (45°F) and salinities greater than 15%.

Adults: Adult scup are common residents in the Middle Atlantic Bight from spring to fall and are generally demersal, and found in schools on a variety of habitats, from open sandy bottom to structured habitats such as mussel beds, reefs or rough bottom. Smaller-sized adult scup are common in larger bays and estuaries but larger sizes tend to be in deeper waters. Generally, adult scup are found in water temperatures above

7°C, water depths between 2 and 185 meters, and salinities greater than 15%. Seasonally, wintering adults (November through April) are usually offshore.

Prey: Juveniles primarily eat: polychaetes (e.g., maldanids, nephthids, nereids, and flabelligerids), epibenthic amphipods and other small crustaceans, mollusks, and fish eggs and larvae. Adult scup are also benthic feeders and forage on a variety of prey, including small crustaceans (including zooplankton), polychaetes, mollusks, small squid, vegetable detritus, insect larvae, hydroids, sand dollars, and small fish.

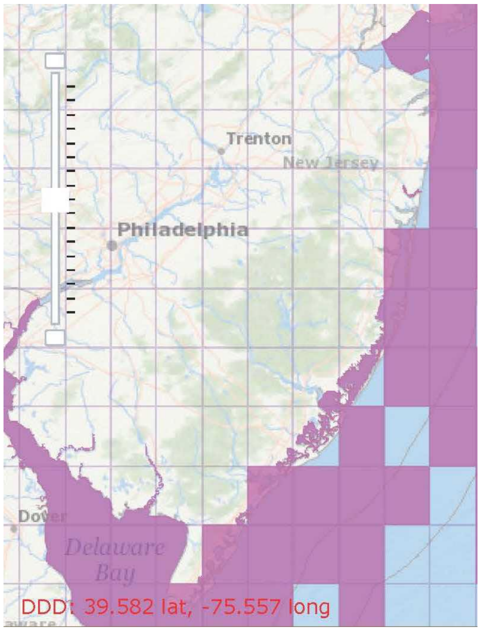


Figure 19. Scup Juvenile EFH

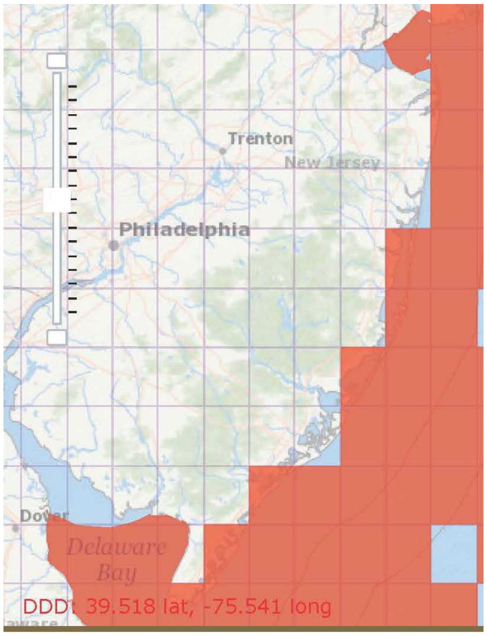
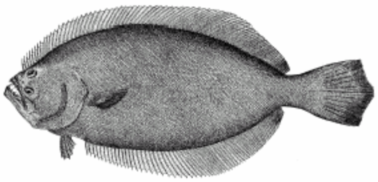


Figure 20. Scup Adult EFH

3.2.5 Summer flounder *(Paralicthys dentatus)* (NMFS, 1999)



The affected areas are designated as EFH for summer flounder juveniles, and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: In general, juveniles are demersal in habit (mud and sandy substrates), and use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 11°C (52°F), water depths from 0.5 to 5 meters, and salinities ranging from 10 to 30%.

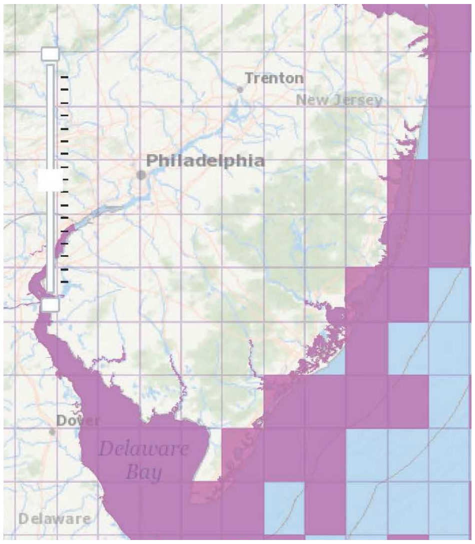


Figure 21. Summer Flounder Juvenile EFH

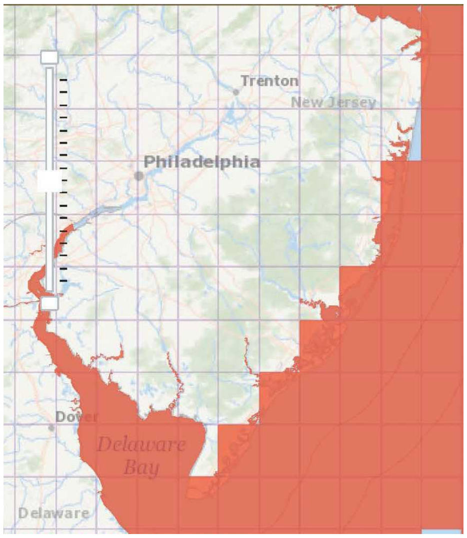


Figure 22. Summer Flounder Adult EFH

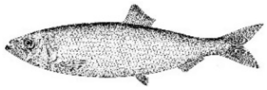
Adults: Generally, summer flounder are demersal in habit (mud and sandy substrates), and occur in water depths between the shore and 25 meters. Seasonally, they inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer Continental Shelf at depths of 150 meters in colder months.

Prey: Larval and postlarval summer flounder initially feed on zooplankton and small crustaceans**.** Smaller juvenile flounder (usually <100 mm) appear to focus on crustaceans and polychaetes while fish become a little more important in the diets of the larger juveniles. Adult summer flounder are opportunistic feeders with fish and crustaceans making up a large part of their diet, which include: windowpane, winter flounder, northern pipefish, Atlantic menhaden, bay anchovy, red hake, silver hake, scup, Atlantic silverside, sand lance, bluefish, weakfish, mummichog, rock crabs, squids, shrimps, small bivalves, small gastropods, sand dollars, and marine worms.

HAPC: HAPC for summer flounder was identified as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC. No SAV are present in the affected areas.

3.3 New England Species

3.3.1 Atlantic Sea Herring (*Clupea harengus*) (NMFS, 2005) (NEFMC, 2017)



The affected areas are designated as EFH for Atlantic sea herring juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Intertidal and sub-tidal pelagic habitats to 300 meters throughout the region including the NJ inland bays and estuaries. One and two-year old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 3 to 15°C (37 - 59°F) in the northern part of their range and as high as 22°C (72°F) in the Mid-Atlantic. Young-of-the-year juveniles can tolerate low salinities, but older juveniles avoid brackish water.

Adults: Sub-tidal pelagic habitats with maximum depths of 300 meters throughout the region including the NJ inland bays and estuaries. Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 100 meters and – unless they are preparing to spawn – usually remain near the surface. They generally avoid water temperatures above 10°C (50°F) and low salinities. Spawning takes place on the bottom, generally in depths of 5 – 90 meters on a variety of substrates.

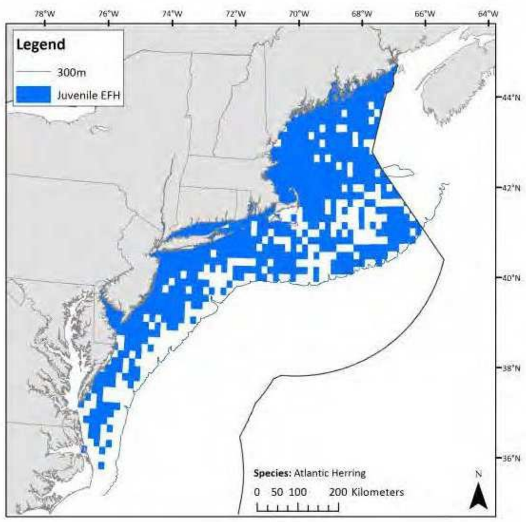


Figure 23. Atlantic Sea Herring Juvenile EFH

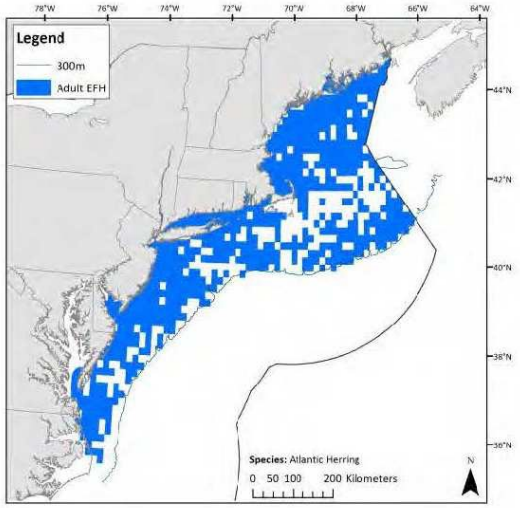
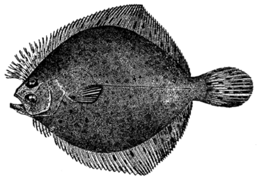


Figure 24. Atlantic Sea Herring Adult EFH

Prey: Juveniles feed on up to 15 different groups of zooplankton; the most common are copepods, decapod larvae, barnacle larvae, cladocerans, and molluscan larvae (Sherman and Perkins 1971). Adults have a diet dominated by euphausiids, chaetognaths, and copepods (Bigelow and Schroeder 1953; Maurer and Bowman 1975). In addition, adults also consume fish eggs and larvae, including larval herring, sand lance, and silversides.

3.3.2 Windowpane Flounder *(Scopthalmus aquosus)* (NMFS, 1999) (NEFMC, 2017)



The affected areas are designated as EFH for windowpane juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, including mixed and high salinity zones in the bays and estuaries. EFH for juveniles is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 60 meters. Young-of-the-year juveniles prefer sand over mud

Adults: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras including mixed and high salinity zones in the bays and estuaries. Essential fish habitat for adults is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 70 meters.

Prey: Small crustaceans (e.g., mysids and decapod shrimp) and various fish larvae including hakes and tomcod, as well as their own species.

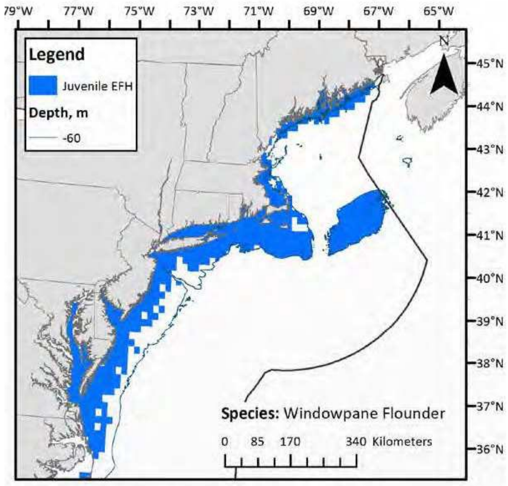


Figure 25. Windowpane Flounder Juvenile EFH

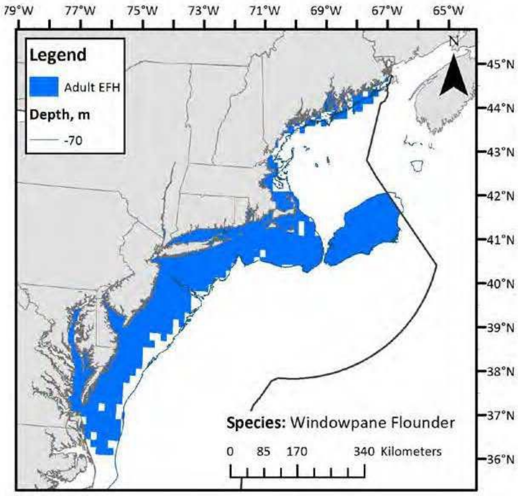
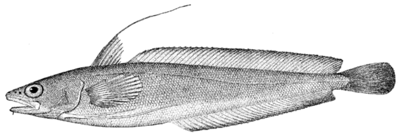


Figure 26. Windowpane Flounder Adult EFH

3.3.3 Red hake (*Urophycis chuss*) (NMFS, 1999) (NEFMC, 2017)



The affected areas are designated as EFH for red hake adults. The habitat parameters for the applicable life stages are as follows:

Adults: Benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters and as shallow as 20 meters in a number of inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. In the Gulf of Maine, they are much less common on gravel or hard bottom, but they are reported to be abundant on hard bottoms in temperate reef areas of Maryland and northern Virginia.

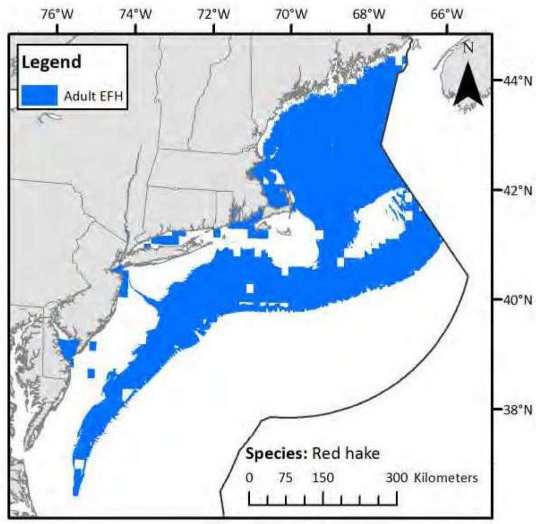
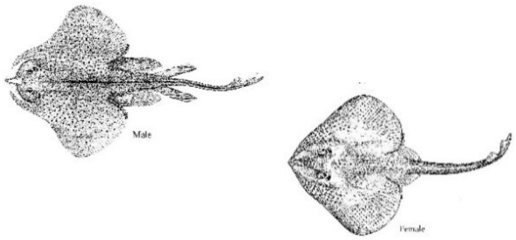


Figure 27. Red Hake Adult EFH

Prey: Larvae prey mainly on copepods and other microcrustaceans, and are sometimes found under floating eelgrass or algae looking for prey. Juveniles leave shelter at night and commonly prey on small benthic and pelagic crustaceans, including larval and small decapod shrimp and crabs, mysids, euphausiids, and amphipods. Adults prey upon crustaceans, but also consume a variety of demersal and pelagic fish and squid.



3.3.4 Little skate (*Raja erinacea*) (NMFS, 2003) (NEFMC, 2017)

The affected areas are designated as EFH for little skate juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

Adults: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries. EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

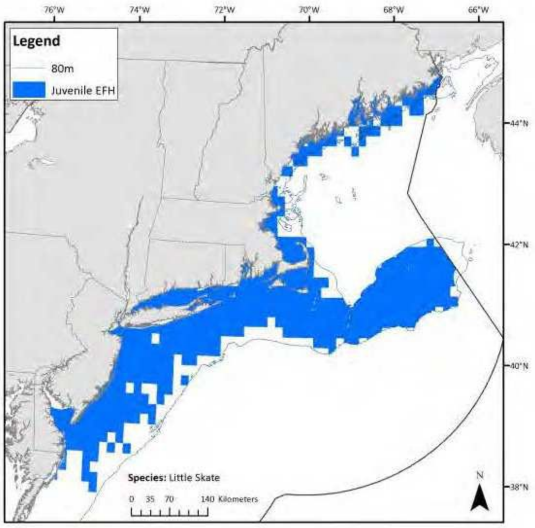


Figure 28. Little Skate Juvenile EFH

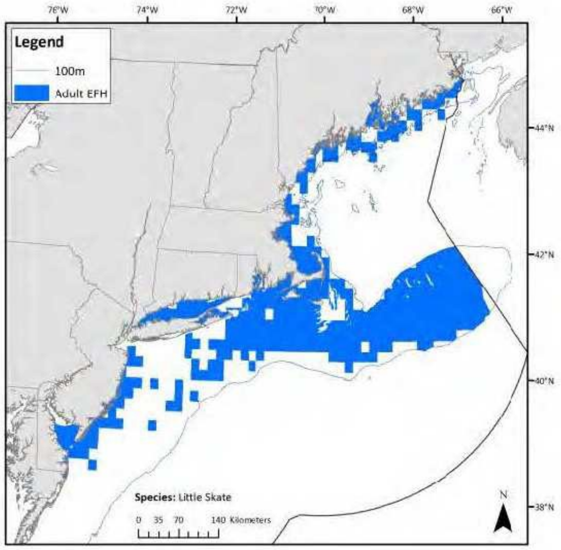
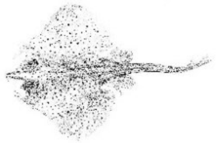


Figure 29. Little Skate Adult EFH

Prey: Benthic macrofauna primarily decapod crustaceans, amphipods and polychaetes.

3.3.5 Winter skate (*Raja ocellata*) (NMFS, 2003) (NEFMC, 2018)

The affected areas are designated as EFH for winter skate juveniles and adults. The habitat parameters for the applicable life stages are as follows:



Juveniles: Sub-tidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH for juveniles occurs on sand and gravel substrates, but they are also found on mud.

Adults: Sub-tidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 90 meters including the high salinity zones of the bays and estuaries. EFH for juveniles occurs on sand and gravel substrates, but they are also found on mud.

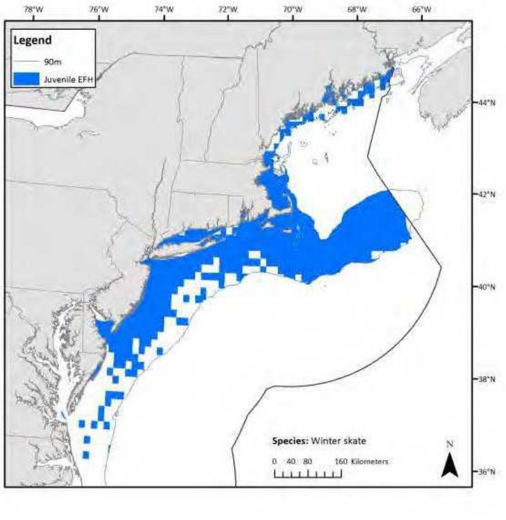


Figure 30. Winter Skate Juvenile EFH

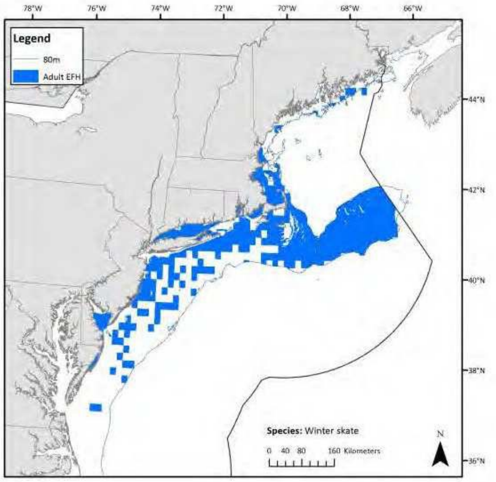
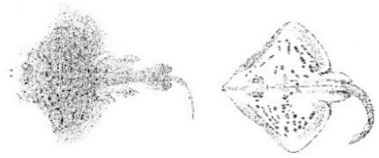


Figure 31. Winter Skate Adult EFH

Prey: Polychaetes and amphipods are the most important prey items in terms of numbers or occurrence, followed by decapods, isopods, bivalves, and fishes.

3.3.6 Clearnose skate (*Raja eglanteria*) (NMFS,2003)(NEFMC,2017)



The affected areas are designated as EFH for clearnose skate juveniles and adults. The habitat parameters for the applicable life stages are as follows:

Juveniles: Sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to the St. Johns River in Florida, including the high salinity zones of Chesapeake Bay, Delaware Bay, and the NJ inland bays and estuaries. Essential fish habitat for juvenile clearnose skates occurs from the shoreline to 30 meters, primarily on mud and sand, but also on gravelly and rocky bottom.

Adults: Sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to Cape Hatteras, including the high salinity zones of Chesapeake Bay, Delaware Bay, and the NJ inland bays and estuaries. Essential fish habitat for adult clearnose skates occurs from the shoreline to 40 meters, primarily on mud and sand, but also on gravelly and rocky bottom.

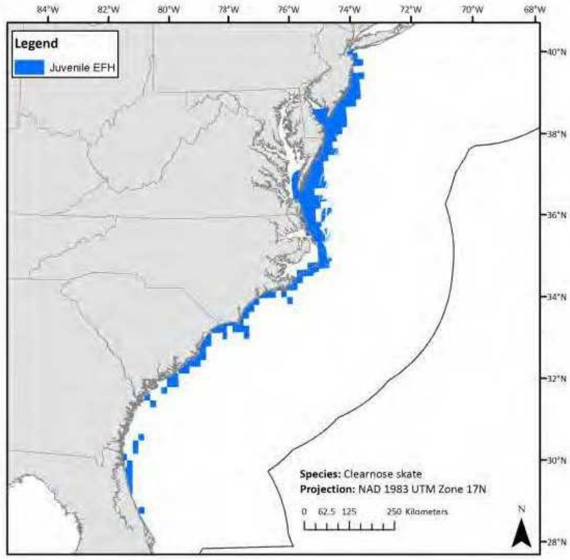


Figure 32. Clearnose Skate Juvenile EFH

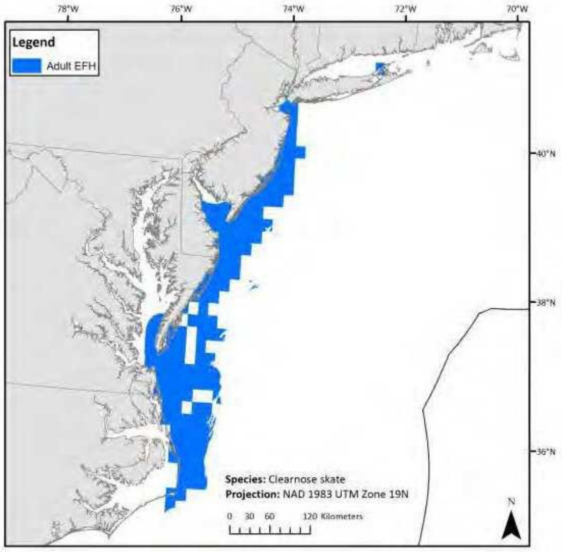


Figure 33. Clearnose Skate Adult EFH

Prey: Clearnose skates feed on polychaetes, amphipods, mysid shrimps (e.g. *Neomysis americana*), the shrimp, *Crangon septemspinosa*, mantis shrimps, crabs including *Cancer*, mud, hermit, and spider crabs, *Ovalipes ocellatus*, bivalves (e.g. *Ensis directus*), squids, and small fishes such as soles, weakfish, butterfish, and scup.

4.0 POTENTIAL IMPACTS TO EFH

The EFH final rule published in the Federal Register on January 17, 2002 defines an adverse effect as: “any impact which reduces the quality and/or quantity of EFH.” The rule further states that: “An adverse effect may include direct or indirect physical, chemical or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts including individual, cumulative, or synergistic consequences of actions.

Direct impacts are either temporary or permanent. For the purposes of this assessment, permanent impacts are assumed to be a permanent (or long-term) loss of a habitat or conversion to another habitat. Permanent losses of habitats may arise from direct displacement of a habitat resulting from construction activities such as filling in an aquatic habitat with permanent fill and/or a structure. This impact could extend horizontally (aerially) and vertically. For purposes of this impact assessment, direct impacts are quantified by the aerial displacement in acres, which includes the vertical water column (if applicable) above an affected substrate. **Table 5** summarizes the direct impacts from all of the preferred alternative. Alternatively, permanent habitat conversions could result from natural causes or management measures. For example, a tidal marsh could be converted to an intertidal mudflat stemming from erosion and/or sea level rise; or a physical change in grade such as a fill placement for a BUDM converting a subtidal environment into an intertidal environment.

Temporary direct impacts may occur during construction activities, which may include temporary de-watering, placement of de-watering structures, equipment access fills, temporary dredging, and other habitat disturbances where these disturbances may occur until the cessation of construction activities. In many cases, temporary direct impacts may require restoration such as return to original grades, substrates, vegetation, and implementing best management practices for sediment and erosion control.

Indirect impacts can be fairly complex as they may involve physical, chemical or biological alterations that may not necessarily be immediate or constant, but can result in cascading effects through an ecosystem. An example of this could be a physical change in flow patterns that cause a physical change in sediment deposition that results in a different tidal regime (subtidal to intertidal). A change in tidal regime could cause a shift in the benthic community that may affect predator/prey interactions of a higher consumer such as a fish.

4.1 No Action

Under the No-Action Alternative there would be no direct impacts to EFH resources. Existing EFH (including estuarine water column, estuarine mud and sand bottoms [unvegetated estuarine benthic habitats], estuarine shell substrate [oyster reefs and shell substrate], estuarine emergent wetlands, seagrasses, marine water column, unconsolidated marine water bottoms, and natural structural features) would continue and be available to Federally managed species for which EFH has been designated (managed species).

The main significance of the predicted global climate change is its possible contribution to increasing sea levels, coastal flooding, changing estuarine salinity regimes, and biological communities. Indirect impacts due to climate change stressors (sea level rise, temperature increases, salinity changes, and wind and water circulation changes), storm severity and frequency, and dredging and maintenance dredging operations would impact the aquatic communities. Trends of tidal wetland loss are expected to continue. Increased development, hydrologic alterations, drought, flooding, and temperature extremes could affect wetlands. Sea level rise and climate change, including changes to hydrology, nutrient inputs, and flood or tide timing and intensity could have a variety of impacts on wetlands.

Although marshes throughout the New Jersey coast are declining and would likely continue this trend as sea level rise continues, there is a potential for marshes to migrate farther inland where the elevation and topography are conducive for establishment in response to rising sea levels (Borchert et al., 2018; Guannel et al., 2014; Murdock and Brenner, 2016; Scavia et al., 2002).

4.2 Effects by Action

The measures that make up the preferred plan, which consists of a combination of maintenance dredging of the navigation channel, dredged material disposal at the existing Killcohook CDF and two BUDM options for Goose Pond and Oakwood Beach have the potential to result in direct and indirect effects to EFH. **Table 4** provides an estimate of habitats impacted by these options.

Table 4. Direct Impacts to EFH for the Preferred Alternative

	Salem River Dredging		**Killcohook CDF Disposal**		**Goose Pond BUDM Placement**		**Oakwood Beach BUDM Nearshore**	
	Acres Affected	**Permanent Conversion of Habitat?**	**Acres Affected**	**Permanent Conversion of Habitat?**	**Acres Affected**	**Permanent Conversion of Habitat?**	**Acres Affected**	**Permanent Conversion of Habitat?**
Habitat								
Pelagic Estuarine Open-Water	72*	No	0	NA	36*	No	72*	No
Estuarine Intertidal Marshes (acres)	0	NA	0	NA	+38	No	0	NA
Scrub Shrub Wetlands (acres)	0	NA	0	NA	0	NA	0	NA
Intertidal Sandy Beach	0	NA	0	NA	0	NA	0	NA
Intertidal Mudflat	0	NA	0	NA	-35**	Yes	0	NA
Intertidal Rocky SL (artificial) (linear feet)	0	NA	0	NA	0	0	0	NA
Subtidal Soft Bottom (acres)	30	No	0	NA	-5**	Yes	90	No
SAV Beds (subtidal)	0	NA	0	NA	0	0	0	NA
Total Acres and Linear Feet of Impacts *	**102**		**0**		**76**		**162**	

*assumes acreage of pelagic waters temporarily affected by turbidity within a 1,000 ft. radius from activity

**Intertidal mudflat and subtidal soft bottom permanently converted acres to estuarine intertidal marshes cumulatively over 2 to 3 placement cycles

4.2.1.1 Estuarine Open Waters and Subtidal Habitats

Salem River Navigation Channel: The existing navigation channel is disturbed from maintenance dredging and/or from prop wash from boat traffic. Adult and juveniles are mobile, and many would be able to move away from the dredge, but some mortality of eggs, larvae and juveniles would be expected by entrainment into the dredge.

The physical effects of dredging would be the removal of existing sediments to maintain the channel to the 16-foot design depth (plus 1-foot over dredge depth tolerance). Due to both the dynamics and the nature of the sediments there should be (1) negligible loss in the benthic invertebrate community as the substrate returns to a typical condition, and

(2) a minor localized increase in turbidity. The depths in the work area would remain within the same depth range that has been present for over thirty years. The substrate of the channel would show little or no change subsequent to dredging. Noise generated by the project would be typical of the normal traffic of commercial and recreational vessels using the existing channel.

Typically, turbidity associated with dredging will reach background levels within an hour or less after dredging stops, dependent upon the composition of the material being dredged. Bodily injury or entrainment of species in the channel may occur as a result of failure to leave the dredge area. However, the likelihood of this scenario occurring is unlikely due to several factors: 1) dredging is accomplished in a sequential manner, resulting in continuous dredging in one zone, rather than random operations, increasing the chance of escape; and 2) noise from vessels repetitively working in one area further increase the chance of flight from the area. Therefore, given the wide distribution of EFH species and the given population density in the channel, the possibility of dredge contact or entrainment during dredging is minimal. The existing channel is well-trafficked by both recreational and commercial vessels.

The disturbance created by daily operations during dredging should have no greater impact. After project construction is complete, the exposed substrate should present benthic habitat of no less quality than previously exposed substrate. For all species and respective EFHs, the impacts during dredging will be minimal. Best management practices will be used to minimize potential effects.

Hydraulic CSD or trailing hopper split hull dredging within the channel would periodically disturb about 30 acres of channel bottom at a time. Benthic-oriented estuarine species would be impacted directly. Based on their habitat needs, black sea bass, red hake, scup, summer flounder and skates (clearnose, winter, little) would be expected to be most susceptible to direct and indirect effects from dredging, and changes in bottom bathymetry. Indirect impacts would result in losses of benthic prey items such as amphipods, polychaetes and oligochaetes as the benthic macroinvertebrate community would be temporarily, but completely removed within segments of channel impacted by dredging. Smaller and less mobile species could become entrained into the dredge intakes, which would result in their mortality. A TSH dredge is more likely to have a higher impact on less mobile fish since it is in motion while it is dredging. Larger and more mobile fish would be capable of avoiding the dredge intakes.

Pelagic species would be affected by water quality impacts to estuarine open waters by affecting sight, olfactory and respiratory functions. Most highly mobile fish species juveniles and adults would be capable of moving away from the disturbance. This effect would be localized around the cutterhead of a CSD or draghead of a TSH dredge. The affected area is located within the turbidity maximum zone of the Delaware Estuary. However, localized increases (above background) in turbidity are still likely in the immediate vicinity of the dredging. Both CSD and TSH dredges utilize suction, which would minimize turbidity at the point of dredging and transport of dredged material.

Killcohook CDF. Effluent discharges from the CDF would affect EFH with increases in turbidity within the pelagic water column of the receiving Delaware River, which is within the turbidity maximum zone of the estuary. Monitoring of the Killcohook CDF in past maintenance dredging projects exhibited periodic increases in Total Suspended Solids (TSS) from the CDF effluent that are higher than the background Delaware River TSS. Generally, the TSS is highest in the weir, intermediate in the discharge plume, and lowest in the background (receiving) river samples. However, there were exceptions where background was higher than the weir or discharge plume, which are likely attributed to issues with the stop logs, influent rates or pulses of high sediment internally or externally within the river (Versar, 1999, 2003 and 2004). These effects are short-term and can be managed by effective operation of the weir discharges. Most finfish would be capable of avoiding the CDF discharge plume, which rapidly mixes with Delaware River flows.

BUDM at Goose Pond Area of Supawna Meadows NWR: The placement of dredged material into the Goose Pond Area would cumulatively result in the conversion of approximately 4 acres of estuarine subtidal bottom into a mosaic of intertidal mudflat and brackish marsh habitat.

BUDM at Oakwood Beach (nearshore placement): The nearshore placement of sandy material along Oakwood Beach would minimally affect subtidal soft unconsolidated bottom habitat (E1UBL), with minor changes in elevation. No change in tidal regime would occur. The placement of sand directly on Oakwood Beach (intertidal and nearshore) was evaluated in USACE (1999) and USACE (2014) and impacts are not significant to aquatic resources.

BUDM at Oakwood Beach would most likely require the use of a small split-hull dredge that would bottom dump sand within the nearshore area designated in **Figure 6**. The sandy material would be placed within the nearshore zone, fronting the previously approved Oakwood Beach beachfill project at around the 4-8-foot MLLW contours approximately 200 to 1,200 feet from the Oakwood Beach shoreline. The objective of this beneficial use operation is to provide a supplemental source of material through natural littoral transport to the nearshore Oakwood Beach. As is the case with the use of the *Murden* in February 2022, approximately 13,000 cubic yards of sandy material were dredged from the Salem River Navigation Channel and deposited in the nearshore. The maximum capacity of the *Murden* is 512 cubic yards, and assuming a typical load (from 13,000 CY in Feb. 2022) of 400 cubic yards would result in about 32 loads being deposited within a 90-acre area. Based on past experience with this type of placement, the sand fill leaves very small discernable features initially, and becomes reworked by bay and river currents where the material becomes dispersed into the littoral zone. To raise the 90-acre area by 1 foot, it would take approximately 145,200 cubic yards of sand. This would require about 363 loads (400 cubic yards each) over about 11 placement cycles assuming that all of the material stays within the 90-acre area.

4.2.1.2 Intertidal Habitats

Salem River Navigation Channel: Dredging activities within the Salem River Federal Navigation Channel occurs entirely within estuarine subtidal habitats at depths between -12 ft. MLLW and -16 ft. MLLW. Therefore, no direct or indirect effects are expected on intertidal habitats.

Killcohook CDF: The Killcohook CDF is an existing upland dredged material containment feature situated several feet above the MHW line. Discharges from the CDF outfall pipes are intended to mix with Delaware River flows in the subtidal zone, but there may be some effect of turbidity in the intertidal zone during flood tide stages. This would be temporary and dispersed.

BUDM at Goose Pond Area of Supawna Meadows NWR: The placement at Goose Pond would provide a direct positive impact by raising the substrate elevation in a small area (approximately 40 acres) behind the Goose Pond/Mill Creek stone breakwater to bolster intertidal mudflats and elevate the substrate to a level suitable for intertidal wetland vegetation to expand. The target substrate elevation is +1.5 ft. NAVD (MHW occurs at +2.55 feet NAVD) (**Table 5**) for low marsh establishment, which would consist of brackish marsh plants tolerant of oligohaline conditions such as big cordgrass (*Spartina cynosuroides*), pickerel weed, arrow arum, wild rice and smooth cordgrass. This would be accomplished by several incremental BUDM placement cycles where subtidal open water would be converted to intertidal mudflat or low intertidal vegetated marsh. The first placement would occur in 2023 with an initial infusion of up to approximately 209,000 cubic yards of predominantly fine-grained sediment. Monitoring before, during and after BUDM placement will ensure that maximum sediment retention is achieved and that the target elevation of +1.5 ft. NAVD is not exceeded. Once established, vegetated intertidal wetlands would be able to accrete sediments and filter nutrients from the water to increase elevation naturally, reduce erosion and water turbidity while acting as a sponge to absorb flood waters

Table 5. Tidal Datum Values for Reedy Point Tide Gauge (NOS 8551910)

Datum	Description	Elevation (ft. MLLW)	Elevation (ft. NAVD88)
MHHW	Mean Higher-High Water	5.84	2.87
MHW	Mean High Water	5.52	2.55
MTL	Mean Tide Level	2.85	-0.05
MLW	Mean Low Water	0.18	-2.79
MLLW	Mean Lower-Low Water	0.00	-2.97

As has been observed in the biological benchmark reference area, marsh vegetation establishment would occur naturally, and it is expected that post placement conditions would result in a mosaic of marsh, mudflats and tidal channels within the affected area of Goose Pond. Prior to the establishment of marsh vegetation, the placement of fill will disrupt existing drainage patterns, and may smother existing vegetation in the lower intertidal elevations. This would result in a temporary adverse impact, but in the long-term, a more stable intertidal marsh platform with greater resiliency to sea level rise will be established.

Table 6. provides estimates of consolidated fill quantities, elevation changes and tidal regime changes in the subtidal and intertidal affected zones of the Goose Pond area. The wetland target elevations are at +1.5 feet NAVD, which could result in filling in the deepest subtidal area from -10.0 ft. NAVD to +1.5 feet, which could result in a cumulative consolidated fill thickness of 11.5 feet at that location and would permanently convert approximately 4.2 acres of subtidal bottom to an intertidal regime (**Figure 34**).

No further tidal regime changes would occur as the majority of the rest of the affected intertidal area (about 38 acres) would remain intertidal. However, within the intertidal zone conversions of intertidal mudflat to brackish tidal marsh would occur around the -1.5ft. NAVD contour. Therefore, areas between -2.9 ft. NAVD elevation and -1.5 ft. NAVD could experience conversion from mudflat to vegetated marsh, which would affect approximately 27 acres. The majority of the affected area is at elevation -2.5 feet NAVD (about 27 acres of intertidal mudflat), which would result in an elevation change of about +3 feet to attain a final elevation of +1.5 ft. NAVD after the dredged material consolidates, and after subsequent incremental placement cycles (**Figure 34**). The rate of sediment build-up is dependent on a lot of factors such as dredging in-flow velocities, material characteristics (variabilities of sediment grain sizes within channel sediments), settlement rates of the sediments, the location and movement of distribution pipelines, and tidal currents at the placement site. Therefore, it is anticipated that post-placement elevations could be variable and would result in a mosaic of intertidal mudflats with intertidal marshes. One control would be to ensure that elevations do not exceed +1.5 ft. NAVD. Elevations higher than 2.0 ft. NAVD are likely to result in the recruitment of *Phragmites autstralis*, which would not meet project objectives of low marsh establishment and would be avoided through monitoring during placement and after placement. It is expected that once the sediment settles and consolidates after each placement cycle, a dendritic pattern of tidal channels would naturally establish to promote flooding and drainage during each tide cycle and brackish marsh plants would colonize and naturally establish within the filled areas.

Because this action would enhance and preserve critical wetland resources within the affected Goose Pond area and would not result in a net loss of wetland and special aquatic sites in accordance with the Clean Water Act Section 404(b)(1) guidelines, compensatory mitigation is not required.

Table 6. Estimates of Fill Placement Quantities and Effects on Elevation and Tidal Regime within the Goose Pond Affected Area

			Elevation Change Scenario							
Zone	Elev. Zone (ft NAVD)	Zone Acres	Fill thickness (ft.) to Raise to: 0.0' (NAVD)	CY*	Fill thickness (ft.) to Raise to: +0.5' (NAVD)	CY*	Fill thickness (ft.) to Raise to: +1.0' (NAVD)	CY*	Fill thickness (ft.) to Raise to: +1.5' (NAVD)	CY*
Intertidal Low Marsh	-0.5 to +1.5	3.0	0.5	1436	≤1	2872	≤1.5	5276	≤2	7679
Intertidal Mudflat-Marsh and stream channels	-1.5 to -0.5	7.43	1.5	17981	2	23974	2.5	29968	3	35961
Intertidal Mudflat (lower)	-2.5 to -1.5	27.4	2.5	110554	3	132664	3.5	154775	4	176886
TOTAL INTER-TIDAL		**37.8**		**129,970**		**159,510**		**190,018**		**220,527**
Subtidal	-3.5	3.23	3.5	18239	4	20844	4.5	23450	5	26055
	-4.5	0.57	4.5	4138	5	4598	5.5	5058	6	5518
	-5.5	0.17	5.5	1508	6	1646	6.5	1783	7	1920
	-6.5	0.06	6.5	629	7	678	7.5	726	8	774
	-7.5	0.05	7.5	605	8	645	8.5	686	9	726
	-8.5	0.04	8.5	549	9	581	9.5	613	10	645
	-9.5	0.04	9.5	613	10	645	10.5	678	11	710
	-10	0.02	10	323	10.5	339	11.5	371	12	387
TOTAL SUBTIDAL		**4.2**		**26,604**		**29,976**		**33,364**		**36,736**
TOTAL		**42.0**		**156,574**		**189,486**		**223,382**		**257,262**

CY*=volumetric fill quantity (in cubic yards) after consolidation occurs within an elevation zone required to raise the bottom substrate to a specified elevation

Species such as summer flounder juveniles can be found at the mouths of tidal creeks and flooded intertidal mudflats and prefer salinities greater than 15 ppt but can be found in lower salinities such as the Goose Pond area. EFH would be periodically disturbed (every 1 to 5 years) with each dredging cycle until the target elevation is reached. Macroinvertebrate benthic organisms in the placement areas will be smothered by pumping the dredged material into the Goose Pond and/or Oakwood Beach areas, resulting in a temporary disruption of the food chain within the footprint of the area. Overall, elevating the substrate in the Goose Pond brackish marsh is expected to have long-term positive impacts on fish by enhancing the marsh platform and providing a mosaic of marsh and intertidal mudflat, which would serve as habitat for feeding, refuge and nursery areas for a number of important finfish. The majority of the affected Goose Pond area is lower intertidal mudflat generally at -2.5 feet NAVD would cumulatively be filled (after consolidation) a thickness of 3 feet for a final target elevation

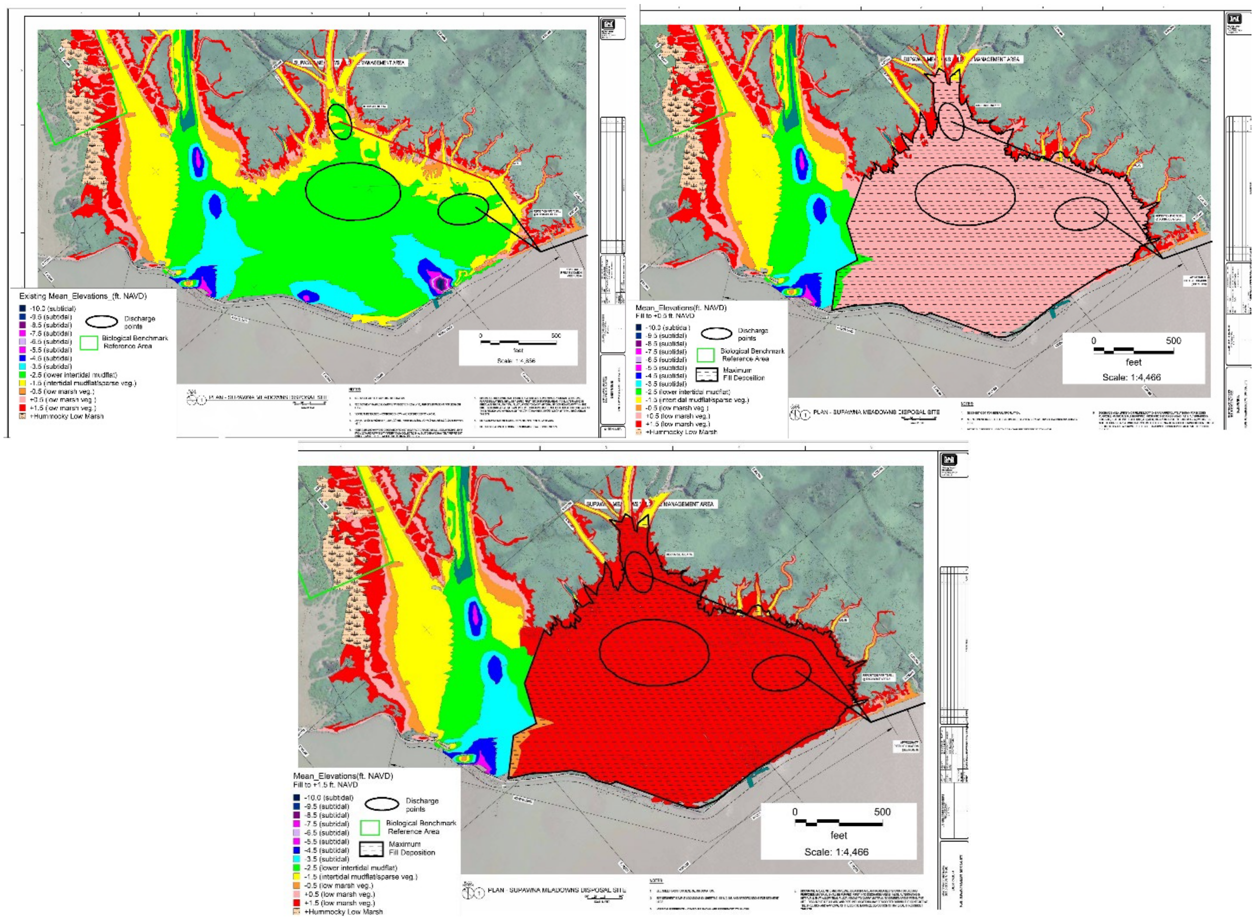


Figure 34. Goose Pond BUDM Affected Fill Area Scenarios for Existing, Fill to +0.5 ft. NAVD and Fill to +1.5 ft. NAVD.

of +1.5 feet NAVD, which would result in a mosaic of intertidal mudflat and low marsh habitats.

4.2.1.3 SAV

No submerged aquatic vegetation is known to occur in any of the affected areas. Therefore, any of the dredging, disposal, and BUDM activities are expected to have any impacts to SAV habitats. Additionally, the presence of SAV habitat would be considered HAPC for summer flounder. There is no HAPC in the affected areas.

4.3 Effects by Species: MID-ATLANTIC SPECIES

The following section provides an analysis of the direct, secondary, and cumulative impacts of the of the dredging, CDF disposal and BUDM placement options on federally managed species, and prey species consumed by managed species that occur in the project vicinity.

4.3.1 Atlantic Butterfish (Peprilus triacanthus) (L,J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-145 dated September 1999 (NOAA, 1999e). Delaware Bay provides EFH for larvae, juvenile and adult Atlantic butterfish. Juvenile and adult butterfish are pelagic fishes that form loose schools, often near the surface. Butterfish feed mainly on planktonic organisms. Butterfish eggs and larvae are pelagic and occur from the outer continental shelf to the seawater zone of estuaries in the Middle Atlantic Bight. In Delaware Bay, eggs are considered rare in the seawater zone and larvae are common. Eggs and larvae are present in May, June and July. Juvenile butterfish are common in both the mixing water and seawater zones. Spawning adults are rare and adults are rare in the mixing water zone and common in the seawater zone. Juveniles are present from July to December; adults are present May to October. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. While juveniles are more likely to be present during dredging and BUDM activities, the potential impact is considered small because of their pelagic nature. Atlantic butterfish feed on planktonic organisms, which will not be significantly affected by dredging activity.

4.3.2 Black sea bass (*Centropristis striata*) (J)

The following information was taken from NOAA Technical Memorandum NMFS-NE-200 dated February 2007 (NOAA, 2007a). Delaware Bay provides EFH for juvenile and adult black sea bass. Primary spawning habitats for black sea bass appear to be located in the nearshore continental shelf. Larvae have not been reported in Delaware Bay. Juveniles and adults can be found in Delaware Bay during the spring, summer and fall. In the winter they occur mostly offshore on the shelf. Black sea bass are generally associated with structurally complex habitats. They use a variety of man-made habitats including artificial reefs, shipwrecks, bridge abutments, piers, pilings, groins, submerged pipes and culverts, navigation aids, anchorages, rip rap barriers, fish and lobster traps, and rough bottom along the sides of navigation channels. Juvenile and adult black sea bass feed on benthic and epibenthic crustaceans, fish and squid. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Juvenile and sea bass could be present during this time period. However, there are no significant bottom structures that would be attractive for this species. Some individuals may be entrained into the dredge. This is more likely for young-of-year juveniles, as older juveniles and adults would be expected to move out of the way. The stone breakwater along the Goose Pond area is mostly intertidal, but could be attractive to black seabass during flood tides. However, BUDM activities at these locations would result in only minor conversions of rocky habitat to intertidal mudflat/marsh. BUDM placement within the nearshore of Oakwood Beach would affect a flat soft bottom area not likely to be suitable habitat for black seabass. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process.

4.3.3 Bluefish (*Pomatomus saltatrix*) (J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-198 dated July 2006 (NOAA, 2006). Delaware Bay provides EFH for juvenile and adult bluefish. Bluefish eggs and larvae are pelagic and are considered rare in Delaware Bay. Juveniles are considered abundant in Delaware Bay; they move to estuarine habitats in the Middle Atlantic Bight in late May to mid-June. Adults are less concentrated along the Mid-Atlantic coast, occurring mostly along Long Island, offshore south of Cape Cod, and on Georges Bank. Juveniles occur in many habitats, but do not use the marsh surface. Adult bluefish occur in the open ocean, large embayments, and most estuarine systems within their range. Studies suggest that juvenile and adult bluefish feed on whatever taxa are locally abundant, including fish, crustaceans and polychaetes. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Juvenile and adult bluefish would be present during this time period. Some individuals may be entrained into the dredge. This is more likely for young-of-year juveniles, as older juveniles and adults would be expected to move out of the way. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process. BUDM activities would result primarily in conversions of subtidal lower intertidal mudflat into a mosaic of intertidal mudflat and brackish marsh. BUDM placement in the Oakwood Beach nearshore would result in temporary and localized turbidity and minor bathymetric changes and availability of prey, but would not have any long-term adverse effects on bluefish EFH. Overall, no more than minimal impact on bluefish is anticipated as a result of the project.

4.3.4 Long finned inshore squid (*Loligo pealei*) (E)

The following information was taken from NOAA Technical Memorandum NMFS-NE-193 dated August 2005 (NOAA, 2005b). Delaware Bay provides EFH for adult long finned squid. Adult longfin squid inhabit the continental shelf and upper continental slope to depths of 400 meters. In summer and fall they inhabit inshore waters as shallow as 6 meters. They are found on mud or sand/mud substrate. They travel in schools and feed on planktonic organisms, crustaceans and small fish. In the Hudson-Raritan estuary, adults have mostly been collected at depths of 15-18 meters (50-60 feet) at salinities of 20-33 ppt. Eggs are demersal and may be present once water temperatures reach 10°C in warm months in polyhaline waters. Eggs are commonly found attached to rocks and small boulders on sandy/muddy bottom and on aquatic vegetation. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. The affected areas are in oligohaline areas and are not likely to have any concentration of eggs. Therefore, no impact on their habitat or food source is anticipated from maintenance dredging, CDF disposal or BUDM activities.

4.3.5 Scup (*Stenotomus chrysops*) (J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-149 dated September 1999 (NOAA, 1999f). Delaware Bay provides EFH for juvenile and adult scup. The life history of scup is typical of most demersal fishes, with pelagic eggs and larvae, and a gradual transition to a demersal adult stage. Spawning occurs from May to August, and larvae begin to become demersal in early July. During the summer and early fall juveniles and adults are common in most large estuaries in open and structured habitats where they feed on a variety of benthic invertebrates. Both juveniles and adults prefer salinities greater than 15 ppt. As a temperate species, scup is at the northern limits of its range in the northeastern United States and migrates south in the winter to warmer waters south of New Jersey. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Eggs and larvae are found in the water column during this time of year in the lower parts of Delaware Bay. Dredging activity is not likely to have a significant impact on life stages within the water column. Larvae, juvenile and adult scup can be found near the bottom in a variety of habitats during the summer, but any concentrations of scup in the area would be dependent on salinity as the affected areas are predominantly oligohaline. Some individuals may be entrained into the dredge. This is more likely for larvae and juveniles as adults would be expected to move out of the way. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process. Overall, no more than minimal impact on scup is anticipated as a result of the project. Other than temporary effects of increased turbidity and loss of benthic prey items, CDF disposal activities and BUDM activities are not expected to have significant adverse effects on EFH for juvenile and adult scup.

4.3.6 Summer flounder (*Paralicthys dentatus*) (J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-151 dated September 1999 (NOAA, 1999g). Delaware Bay provides EFH for juvenile and adult summer flounder. Summer flounder spawn during fall and winter in open ocean areas of the continental shelf. Spawning occurs while the fish are moving offshore to their wintering grounds. Adult summer flounder normally inhabit shallow coastal and estuarine waters during the warmer months of the year and remain offshore during the colder months. Juveniles are distributed inshore and in estuaries during spring, summer and fall. Some juveniles move offshore during the colder months, but many remain inshore. Juvenile and adult summer flounder are reported as preferring sandy habitats. Summer flounder are opportunistic feeders. Smaller flounder focus on crustaceans and polychaetes while fish become more important in the diets of larger juveniles. Adult summer flounder feed on fish and crustaceans. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Juvenile and adult summer flounder would be present during this time period. Some individuals may be entrained into the dredge. This is more likely for young-of-year juveniles, as older juveniles and adults would be expected to move out of the way. Turbidity generated from dredging and CDF disposal and placement at BUDM sites would be elevated, and would temporarily affect the water column. Effects of increased turbidity could adversely affect respiration and sight feeding during the dredging/discharge activities. There would be some loss of shallow water habitat at the Goose Pond BUDM site, but the re-establishment of tidal guts on the new marsh platform will provide habitat. Benthic prey items would be removed from the channel dredging areas and would be buried at both BUDM locations. However, benthic recolonization through either horizontal and/or even vertical migration following dredging and placement activities is generally a rapid process.

4.4 Effects by Species: NEW ENGLAND SPECIES

4.4.1 Atlantic sea herring (*Clupea harengus*) (J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-192 dated July 2005 (NOAA, 2005a). Delaware Bay provides EFH for juvenile and adult Atlantic herring. They are pelagic and form large schools, feeding on planktonic organisms. Spawning occurs in the spring, summer and fall from Labrador to Nantucket shoals. In Delaware Bay, juveniles are considered common in both the seawater and mixing water zones. Juveniles are common in April and May, rare from June to October, and not present November to March. Adult Atlantic herring are considered common in the seawater zone and rare in the mixing water zone. Adults are common in November to January and rare the remainder of the year. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Impacts from dredging and disposal/BUDM placement activities on juvenile and adult Atlantic herring are pelagic and would be minimal because they are rare in the mixing zone of the Delaware Bay during this portion of the year. Atlantic herring feed on planktonic organisms, which will not be affected by the dredging, CDF disposal and BUDM activities.

4.4.2 Windowpane Flounder (*Scopthalmus aquosus*) (J,A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-137 dated September 1999 (NOAA, 1999c). Delaware Bay provides EFH for eggs, larvae, juvenile and adult windowpane flounder. In Delaware Bay, juveniles and adults are considered abundant in the mixing water and seawater zones. Windowpane is a year-round resident off southern New Jersey and occurs primarily on sand substrates. Juvenile and adult windowpane feed on small crustaceans and various fish larvae. Eggs and larvae are pelagic and should not be impacted by dredging activities. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Juvenile and adult windowpane flounder would be present during this time period. Because of their demersal habits, some individuals may be entrained into the dredge. This is more likely for smaller juveniles, as older juveniles and adults would be expected to move out of the way. Turbidity generated from dredging and CDF disposal and placement at BUDM sites would be elevated and would temporarily affect the water column. Effects of increased turbidity could adversely affect respiration and sight feeding during the dredging/discharge activities. There would be some loss of shallow water habitat at the Goose Pond BUDM site, but the re-establishment of tidal guts on the new marsh platform will provide habitat. Benthic prey items would be removed from the channel dredging areas and would be buried at both BUDM locations. However, benthic recolonization through either horizontal and/or even vertical migration following dredging and placement activities is generally a rapid process.

4.4.3 Red hake (*Urophycis chuss*) (A)

The following information was taken from NOAA Technical Memorandum NMFS-NE-133 dated September 1999 (NOAA, 1999b). Delaware Bay provides EFH for eggs, larvae, juvenile and adult red hake. Red hake eggs are buoyant and are found in surface waters. Larval red hake have been collected in the upper water column of the Middle Atlantic Bight from May to December. Juvenile red hake are initially pelagic but become demersal generally between the months of September and December. Adult red hake are demersal but can be found in the water column. They are common on soft sediments and much less common on gravel and open sandy bottom in depths > 5 meters. Juvenile and adult red hake commonly prey on small benthic and pelagic crustaceans, but also consume a variety of demersal and pelagic fish and squid. In Long Island Sound, they were most common in salinities that ranged from 20 to 33 ppt. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. While adult red hake may be found at the bottom mostly of mud with some sands, salinity could be a factor for their presence as they prefer more polyhaline waters than the affected areas. While some individuals could be entrained into the dredge, the level of impact is considered small. Demersal juvenile and adult red hake feed on demersal organisms. These would be removed from the channel in areas that require dredging. Because of the shallow nature of the BUDM locations, adult red hake are not likely to be present. Channel dredging would result in temporary losses of benthic prey items, but this effect would be temporary as benthic recolonization is expected to occur after dredging.

4.4.4 Little skate (*Raja erinacea)* (J,A)

EFH is designated within the project area for little skate juveniles and adults. They are broadly distributed from Nova Scotia to Cape Hatteras. Juveniles and adults mostly prefer sand or gravelly bottoms but some mud also. Little skate occur in Delaware Bay when temperatures are less than 15 °C (Late October through May) and prefer the deeper waters of the center of the lower Delaware Bay but can be found in salinities as low as 15 ppt. Little Skates are not likely to be found in the shallow BUDM locations. Few are caught during the summer months as most move to deeper waters. The most important prey items to little skate are decapod crustaceans, amphipods and polychaetes. Periodic maintenance dredging in the Salem River Federal Navigation Channel and either CDF disposal or BUDM activities are scheduled to occur from July 1 through March 1. Some individuals may be entrained into the dredge. This is more likely for young-of-year juveniles, as older juveniles and adults would be expected to move out of the way. Although dredging may affect feeding success, this will be a temporary occurrence in a relatively small area. Turbidity may impact sight feeding, but the present population will undoubtedly flee to neighboring waters where feeding will be less problematic. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process. No more than minimal impact to feeding success should occur to little skate.

4.4.5 Winter skate (*Raja ocellata*) (J,A)

EFH is designated within the project area grid for winter skate juveniles and adults. They are broadly distributed from Newfoundland to Cape Hatteras. Juveniles mostly prefer sand, gravel bottoms and some mud substrate. Winter skate generally feed on polychaetes, amphipods, decapods, isopods, bivalves, squid, crab and fishes. Polychaetes and amphipods are the predominant prey. Trawls between 1966 to 1999 found that the greatest numbers of juveniles and adults were in the winter and spring and were most abundant in the center of lower Delaware Bay, near the mouth. Therefore, are not expected to be in any significant concentrations in the affected areas. Although dredging activities may affect feeding success, this will be a temporary occurrence in a relatively small area. Additionally, the wide range of prey increases the potential for feeding success. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process. No more than minimal impact to feeding success should occur to winter skate.

4.4.6 Clearnose skate (*Raja eglanteria*) (J,A)

EFH is designated within the project area for clearnose skate juveniles and adults. They are broadly distributed along the eastern United States from Nova Scotia to Northeastern Florida. Juveniles and adults are most abundant in the summer months and less abundant in the cooler months of fall, winter and spring. Clearnose skate prefer soft bottom habitats but can also be found in rocky or gravelly bottoms in salinities >20 ppt (the affected areas are generally 0.5 to 15 ppt). According to the 1966-1999 Delaware Division of Fish and Wildlife bottom trawl surveys, juveniles and adults mostly occur in depths of 8-14 meters during the fall. The diet of the clearnose skate consists of polychaetes, amphipods, mysid shrimp, crab, squid, bivalves and small fish. Although dredging may affect feeding success, this will be a temporary occurrence in a relatively small area. Turbidity may impact sight feeding, but the present population will undoubtedly flee to neighboring waters where feeding will be less problematic. Benthic invertebrates would be removed from the channel in areas that require dredging. Benthic recolonization following dredging is generally a rapid process. Although this EFH may encompass part of the project area, the clearnose skate is broadly distributed along the eastern United States and the habitat will rapidly recover. No more than minimal impact on all life stages of the clearnose skate EFH is anticipated as a result of the proposed project.

4.5 Cumulative Effects

Salem River Federal Navigation Channel Dredging and Disposal at Killcohook CDF:

The Salem River Federal Navigation was first constructed in 1907 and has been modified several times in its channel dimensions. The most current dimensions were authorized in 1995 and constructed in 1996. This modification included a compensatory wetland mitigation project for unavoidable adverse impacts to wetlands and aquatic resources, which was completed in 1997. Since 1996, maintenance dredging has occurred six times with dredged material disposal occurring in the Federally owned Killcohook CDF. This CDF is also used for maintenance dredging of the Delaware River Main Navigation Channel (Philadelphia to the Sea). Periodic input of the Salem River navigation channel sediments, although, a much smaller amount than the Delaware River Main Channel sediments, into the Killcohook CDF would decrease (cumulatively) the existing capacity of the CDF. However, current capacity estimates of the Killcohook CDF do not indicate any issues within the near future. Continued maintenance dredging of the Salem River navigation channel and disposal operations at the Killcohook CDF would have temporary and localized adverse impacts on water quality (turbidity), fisheries/EFH, and wildlife, but would not result in an expansion or increase the magnitude of these impacts. Therefore, the cumulative effects of continued maintenance dredging and disposal at the Killcohook CDF would be minimal.

Delaware River Main Channel Deepening: A number of related activities have occurred or are in the planning stages within the Delaware Estuary. One of the biggest changes recently was the completion of the Delaware River Main Channel Deepening (DRMCD) project from Philadelphia to the Sea, which is now in the Operations and Maintenance (O&M) phase.

Construction of the DRMCD involved the deepening of the previous Federal channel depth of 40 feet to the new 45-foot depth. Most of the completed dredging within the DRMCD reaches was accomplished by the pumping of the dredged material into upland confined disposal facilities (CDFs). The deepening also involved the blasting of bedrock in the Marcus Hook Range, where this material was mechanically dredged from the channel. The lower portion of Reach E (Brandywine Range) utilized sand dredged from within this area that was beneficially used as beachfill for the eroding beach at Broadkill Beach on the Delaware side of the lower Delaware Bay.

Goose Pond BUDM Placement: BUDM placement at Goose Pond would help preserve the capacity of the Killcohook CDF by utilizing the dredged sediment from the Salem River navigation channel as a resource for beneficial use placement for ecosystem restoration purposes. Since the Goose Pond BUDM action is part of a larger plan to restore brackish tidal marsh wetlands at Supawna Meadows including the integration of BUDM with the restoration/modification of the Goose Pond/Mill Creek breakwater. The following is adopted from USFWS (2017): With the exception of two Service projects located at other refuges, the geographic area for the assessment of cumulative impacts from the Proposed Action at the refuge was primarily identified as the Pennsville/Penns Grove tributaries watershed. This watershed includes the municipalities of Oldmans Township, Carney's Point Township, Penns Grove Borough, and Pennsville Township. All of these municipalities are located in Salem County. However, Pennsville Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Project area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the creation of ditches for agricultural purposes (salt mash hay farming) and mosquito control. Additionally, other land use changes to the watershed have increased impervious surface area resulting in an increase in stormwater quantity and a subsequent decrease in stormwater quality. The Proposed Action is intended to provide long-term improvement to the environment through the restoration of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the refuge.

Overall, the Proposed Action will serve to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired hydrologic function. The positive consequences of the preferred alternative include sustainment and/or improvement of the salt marshes' ability to provide water quality services, increased vegetative vigor which will create the conditions for marsh accretion to occur, minor economic benefits through personnel increasing spending near the Project location, and the restoration of healthy salt marsh habitat. These changes would lead to higher quality habitat for waterfowl, migratory birds, threatened and endangered species, and other wildlife as well as create a net positive impact for recreational hunters and nature observers. In addition, The Service would be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

A review of the Pennsville Master Plan (RRA 2002) revealed that there are no known present or future projects that are anticipated to impact or be impacted by the Proposed Action. One of the goals listed in the Pennsville Township's Master Plan is "to protect sensitive environmental resources from destruction or degradation, including…rivers, wetlands, stream corridors, potable water supplies, and aquifers." The Proposed Action would be in line with this goal.

A review of the *Salem County Growth Management Element of the Comprehensive County Master Plan* (SCPB 2016) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Master Plan presents a number of improvements, past and planned, within an area designated as the "Smart Growth Zone" located within the northwestern portion of the county, none are anticipated to adversely affect or be affected by the Proposed Action. One of the goals listed in the Growth Management Element of the Comprehensive County Master Plan is to "preserve and protect the County's valued resources including air and water quality, agricultural lands, historic areas, natural features such as floodplains, wetlands, woodlands, wildlife habitat areas, greenways, and scenic views." The Proposed Action would be in line with this goal.

The Supawna Meadows Project (modification/restoration of the Goose Pond/Mill Creek Breakwater) is one of two phases of the Service's Design/Build Marsh Restoration at the Cape May National Wildlife Refuge Complex (Resiliency Project #37) – the other project being the Reeds Beach Design/Build Marsh Restoration Project. Similar to the Supawna Meadows Project, the Reeds Beach Project consists of the restoration and enhancement of portions of an existing stone breakwater in order to facilitate a more natural hydrologic regime, enhance marsh resilience, and improve rates of accretion. These two projects are anticipated to work in concert with each other to improve marsh resiliency in two different areas of the Delaware Bay coastline.

Similarly, a number of Service projects currently underway at the Edwin B. Forsythe Refuge Complex along the Atlantic coastline are also designed to increase marsh resiliency in response to sea level rise and other anthropogenic effects. These projects, the Marsh Enhancement Design/Build Project, the Pole Removal Project component of the Marsh Enhancement Design/Build Project, and the Headquarters Impoundment Design/Build Project, are all intended to increase marsh resiliency, counter anthropogenic effects, and provide ecological uplift to the refuge. All of the above Service projects will have a combined positive impact upon each other.

In summary, there would not be any substantial cumulative adverse environmental impacts on EFH from the Marsh Restoration Project at the Supawna Meadows NWR when considered together with other past, present, and reasonably foreseeable future projects in the area.

<u>Oakwood Beach Nearshore and Beach Placement:</u> For placement at Oakwood Beach, cumulative impacts of the project were assessed in USACE (1999) and USACE (2014) as part of the existing Federal CSRM project. The utilization of sandy material from the Salem River navigation project would be considered a beneficial use of dredged material that would benefit the beachfill template existing CSRM project either by functioning as a sediment "feeder" source within the nearshore littoral zone or through direct placement on the beach. Although, the quantities of sand from the Salem River navigation channel are generally low for CSRM re-nourishments, they would help reduce the amount of material required for periodic nourishment of Oakwood Beach (about 33,000 cubic yards every 8 years). Since sand placement in the nearshore and on the beach are periodic, impacts to water quality, benthic resources, fisheries/EFH and wildlife, are temporary and localized. Therefore, the cumulative adverse impacts of

the action of using Oakwood Beach as a BUDM placement location are not considered significant.

5.0 MONITORING AND ADAPTIVE MANAGEMENT

The goal of adaptive management of the BUDM placement of dredged material within the Goose Pond area of Supawna Meadows National Wildlife Refuge is to assist in preserving, protecting and restoring the brackish marsh habitat by raising the substrate elevation to levels suitable for re-establishment of marsh vegetation and intertidal mudflats where they previously existed.

In order to determine performance of the BUDM for future placements and effectiveness in enhancing valuable resilient wetland habitat, the placement site will be monitored before, during, and after placement operations. Monitoring will provide information essential to assessing ways in which adaptive management can be applied to future placements both here and other estuarine saltmarsh with comparable hydrodynamic and morphological conditions.

Monitoring efforts and adaptive management are adopted as part of ongoing research being conducted in partnership with USACE’s ERDC conjunction with the maintenance dredging and BUDM placement plan for the Salem River federal navigation channel. The monitoring plan and adaptive management opportunities have been developed through lessons learned from SMIIL projects and other beneficial use projects by the Philadelphia District in New Jersey and Delaware as well as across USACE nationally.

During construction, dredged material will be placed in the intertidal mudflat areas along the eastern portion of Goose Pond between existing low marsh areas and the stone breakwater along the Delaware River shoreline. The placement of this predominantly fine-grained sediment will need time to consolidate and build elevation over several dredging cycles and will be monitored with each successive placement. This intertidal mudflat/marsh edge protection plan will provide a natural infrastructure solution to restore substrate elevations necessary to provide protection to the vulnerable brackish marshes within the Supawna Meadows NWR and adjacent natural habitat.

The initial placement will be monitored to observe sediment properties and will inform the second placement operation scheduled to occur approximately 1 to 2 years later and any subsequent placement cycles thereafter (if required). Building with mixed sediments will create protective natural and nature-based features adjacent to the existing marsh in a varied landscape approach that will include mudflats and intertidal shallows and may also lead to the re-establishment of brackish marsh vegetation in the area. This dredging and BUDM placement project for the Salem River and Goose Pond area is based on RSM and EWN principles and practices and employs a science-based approach for creating and optimizing natural infrastructure in the Delaware Bay region experiencing devastating erosion. Keeping sediment in this eroding system is critical to the future of habitats and overall resilience of this important system. The proposed

BUDM placement is considered to be low risk and high yield for creating, protecting, and restoring varied habitats to build a more resilient system. Monitoring before, during, and after placement operations will document the outcome of the BUDM for the Salem River/Goose Pond area. Monitoring studies at other beneficial use placement locations in SMIIL and other areas within New Jersey as well as nationally are evidence that dredged sediments are a valuable resource for creating natural infrastructure and natural and nature-based features.

A significant component of the monitoring at the Goose Pond is the partnership with USFWS and DU. As part of the National Fish and Wildlife Federation (NFWF) grant, the following core metrics have and will be monitored by USFWS/DU beginning August 2021-23:

- Tidal marsh plant community monitoring (e.g., species composition, percent cover, areal coverage);
- Water quality;
- Marsh surface elevation change trend; and
- Marsh accretion and erosion.

Table 7. provides a summary of monitoring commitments for the Goose Pond BUDM, which includes monitoring tasks accomplished by project partners for related efforts at Supawna Meadows but separate from the dredging and placement operations.

Table 7. Goose Pond BUDM Monitoring Tasks by Phase

Monitoring Task	**POC** (references)	**Pre**	**During**	**Post**
Evaluation of local hydrodynamics (waves & currents) and sediment mobility.	USFWS (via Woods Hole Group)[1] USACE NAP	X		
Evaluation of sediments from borrow area and placement.	USACE ERDC	X		
Topographic and Bathymetric Surveys	USFWS (via Woods Hole Group, pre)[1] NAP (pre & post)	X		X
Turbidity monitoring via roving surveys with meter and fixed meter prior to and during initial construction	NAP & ERDC[2,3]	X	X	
High Resolution photography and video footage	NAP & ERDC		X	X
Post placement sediment follow-up consolidation work including	ERDC			X

Table 7. Goose Pond BUDM Monitoring Tasks by Phase

Monitoring Task	**POC** $^{(references)}$	**Pre**	**During**	**Post**
modeling. Collect samples as needed.				
Nekton abundance, species richness	USFWS	X	X	X
Tidal marsh plant community monitoring (e.g., species composition, percent cover, areal coverage*)*	USFWS	X	X	X
Water Quality (temperature, pH, salinity, DO, specific conductance alkalinity, ammonia, nitrate, nitrite, & phosphorus).	USFWS	X	X	X
Marsh surface elevation change	USFWS	X	X	X
Marsh accretion and erosion	USFWS	X	X	X

6.0 SUMMARY OF FINDINGS

Within the project area, there is a diversity of species with EFH designations. The listed species utilize a broad array of habitats and includes pelagic and benthic species as well as those that inhabit multiple types of habitats across their life stages. Impacts from construction within the Goose Pond area would result in the permanent conversion of approximately 4 acres of subtidal soft bottom into intertidal mudflat and vegetated brackish marsh. There would also be cumulative conversions of intertidal mudflat (approximately 27 acres) into intertidal brackish marsh. However, the net result is likely a mosaic of these habitats, which would not be a loss in EFH. Impacts of maintenance dredging would have temporary impacts on EFH, but would not permanently change the habitat as substrate, bathymetry, physiochemical factors, and biota would be similar to baseline conditions. Dredging would temporarily produce elevated turbidity in the water column and at the CDF and BUDM locations but would subside upon cessation of these activities.

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NOAA. 1999f. Essential Fish Habitat Source Document: Scup, *Stenotomus chrysops*, Life History and Habitat Characteristics, NOAA Technical Memorandum NMFS-NE-149, Northeast Fisheries Science Center, Woods Hole, MA.

NOAA. 1999g. Essential Fish Habitat Source Document: Summer Flounder, *Paralichthys dentatus*, Life History and Habitat Characteristics, NOAA Technical Memorandum NMFS-NE-151, Northeast Fisheries Science Center, Woods Hole, MA.

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NOAA. 2007a. Essential Fish Habitat Source Document: Black Sea Bass, *Centropristis striata*, Life History and Habitat Characteristics, NOAA Technical Memorandum NMFS-NE-200, Northeast Fisheries Science Center, Woods Hole, MA.

SCPB (Salem County Planning Board). 2016. Salem County “The Gateway to New Jersey” Growth Management Element of the Comprehensive County Master Plan. Adopted January 19, 2016.

APPENDIX D

GARFO ESA Section 7: NLAA Program Verification Form

and

IPaC: Explore Location Resources

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Salem River Maintenance Dredging and Goose Pond BUDM

Area of Interest (AOI) Information

Area : 7,917.63 acres

Sep 15 2022 13:30:26 Eastern Daylight Time

Maintenance dredging of Salem River Navigation Channel within Delaware River and Beneficial Use of Dredged Material Disposal at Goose Pond - Supawna Meadows National Wildlife Refuge - open-water and intertidal placement.

Summary

Name	Count	Area(acres)	Length(mi)
Atlantic Sturgeon	5	25,028.90	N/A
Shortnose Sturgeon	5	25,028.90	N/A
Atlantic Salmon	0	0	N/A
Sea Turtles	4	9,030.45	N/A
Atlantic Large Whales	0	0	N/A
In or Near Critical Habitat	1	4,537.34	N/A

Atlantic Sturgeon

#	Feature ID	Species	Lifestage	Behavior	Zone	From	Until	From (2)	Until (2)	Area(acres)
1	ANS_DEL_PYL_MAF	Atlantic sturgeon	Post Yolk-sac Larvae	Migrating & Foraging	Delaware River	04/01	09/30	N/A	N/A	5,005.78
2	ANS_DEL_SUB_MAF	Atlantic sturgeon	Subadult	Migrating & Foraging	Delaware River	03/15	11/30	N/A	N/A	5,005.78
3	ANS_DEL_YOY_MAF	Atlantic sturgeon	Young of year	Migrating & Foraging	Delaware River	01/01	12/31	N/A	N/A	5,005.78
4	ANS_DEL_ADU_MAF	Atlantic sturgeon	Adult	Migrating & Foraging	Delaware River	03/15	11/30	N/A	N/A	5,005.78
5	ANS_DEL_JUV_MAF	Atlantic sturgeon	Juvenile	Migrating & Foraging	Delaware River	01/01	12/31	N/A	N/A	5,005.78

Shortnose Sturgeon

#	Feature ID	Species	Life Stage	Behavior	Zone	From	Until	From (2)	Until (2)	Area(acres)
1	SNS_DEL_YOY_MAF	Shortnose sturgeon	Young of year	Migrating & Foraging	Delaware River	01/01	12/31	N/A	N/A	5,005.78
2	SNS_DEL_PYL_MAF	Shortnose sturgeon	Post Yolk-sac Larvae	Migrating & Foraging	Delaware River	03/15	07/31	N/A	N/A	5,005.78
3	SNS_DEL_JUV_WIN	Shortnose sturgeon	Juvenile	Overwintering	Delaware River	11/01	03/31	N/A	N/A	5,005.78
4	SNS_DEL_JUV_MAF	Shortnose sturgeon	Juvenile	Migrating & Foraging	Delaware River	01/01	12/31	N/A	N/A	5,005.78
5	SNS_DEL_ADU_MAF	Shortnose sturgeon	Adult	Migrating & Foraging	Delaware River	01/01	12/31	N/A	N/A	5,005.78

Sea Turtles

#	Feature ID	Species	Life Stage	Behavior	Zone	From	Until	From (2)	Until (2)	Area(acres)
1	GRN_STS_AJV_MAF	Green sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia	5/1	11/30	*No Data*	*No Data*	2,257.61
2	KMP_STS_AJV_MAF	Kemp's ridley sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia	5/1	11/30	*No Data*	*No Data*	2,257.61
3	LTR_STS_AJV_MAF	Leatherback sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia	5/1	11/30	*No Data*	*No Data*	2,257.61
4	LOG_STS_AJV_MAF	Loggerhead sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia	5/1	11/30	*No Data*	*No Data*	2,257.61

In or Near Critical Habitat

#	Species	In or Near Critical Habitat	Area(acres)
1	Atlantic Sturgeon	New York Bight Unit 4: Delaware River	4,537.34

NOAA FISHERIES
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Greater Atlantic Region

US Army Corps of Engineers

GARFO ESA Section 7: NLAA Program Verification Form

(Please submit a signed version of this form, together with any project plans, maps, supporting analyses, etc., to nmfs.gar.esa.section7@noaa.gov with "**USACE NLAA Program: [Application Number]**" in the subject line)

Section 1: General Project Details

Application Number:	
Reinitiation:	No
Applicant(s):	U.S. Army Corps of Engineers, Philadelphia District
Permit Type:	Civil Works/Federal Navigation
Anticipated project start date (e.g., 10/1/2020)	7/1/2023
Anticipated project end date (e.g., 12/31/2022 – if there is no permit expiration date, write "N/A")	3/1/2024

Project Type/Category (check all that apply to entire action):

☐	Aquaculture (shellfish) and artificial reef creation	☐	Mitigation (fish/wildlife enhancement or restoration)
☑	Dredging and disposal/beach nourishment	☐	Bank stabilization
☐	Piers, ramps, floats, and other structures	☑	If other, describe project type category: Ecosystem Restoration

Town/City:	Salem	Zip:	08079
State:	New Jersey	Water body:	Delaware River

Project/Action Description **and** Purpose
(*include relevant permit conditions that are not captured elsewhere on form*):

The Salem River Federal Navigation Project was adopted in 1925 (HD 68-110), and provides for an entrance channel 16 feet deep and 150 to 250 feet wide in the Delaware River across Salem Cove to the mouth thence 16 feet deep (MLLW) and 100 feet wide to the fixed highway bridge (Route 49) in Salem. The channel transitions to 9 feet deep (MLLW) and 100 feet wide upstream of Route 49 and terminates at Route 45 (Market Street) (Figure 1). The navigation channel also provides for a cutoff between the mouth and the City of Salem. The project length is approximately 5 miles. Within the last 25 years, disposal of dredged material has occurred at the Killcohook Confined Disposal Facility (CDF). In 2021, approximately 13,000 cubic yards of sand dredged from the Salem River Channel were disposed of along the subtidal shoreline of Oakwood Beach.

For this action, maintenance dredging is required from the Salem River Navigation Channel entrance within the Delaware River to the mouth of the Salem River for a distance of approximately 12,000 feet. This action involves the removal of shoals

Type of Bottom Habitat Modified:	Permanent/Temporary:	Area (acres):
Silt/Mud/Clay (saline)	Temporary	29.30
Silt/Mud/Clay (saline)	Permanent	42.00
Select Type of Bottom Habitat	Select Permanent or Temporary	

Project Latitude (e.g., 42.625884)	39.553060
Project Longitude (e.g., -70.646114)	-75.529100
Mean Low Water (MLW)(m)	0.00
Mean High Water (MHW)(m)	1.63

Width (m) of water body in action area:	Stressor Category (stressor that extends furthest distance into water body – e.g., turbidity plume; sound pressure wave):	Max extent (m) of stressor into the water body:
3,000.00	turbidity plume	305.00

Section 2: ESA-listed species and/or critical habitat in the action area:

☑	Atlantic sturgeon (all DPSs)	☑	Kemp's ridley sea turtle
☑	Atlantic sturgeon critical habitat Indicate which DPS : NYB	☑	Loggerhead sea turtle (NW Atlantic DPS)
☑	Shortnose sturgeon	☑	Leatherback sea turtle
☐	Atlantic salmon (GOM DPS)	☐	North Atlantic right whale
☐	Atlantic salmon critical habitat (GOM DPS)	☐	North Atlantic right whale critical habitat
☑	Green sea turtle (N. Atlantic DPS)	☐	Fin whale

* Please consult GARFO PRD's ESA Section 7 Mapper for ESA-listed species and critical habitat information for your action area at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater.

Section 3: NLAA Determination (check all applicable fields):
If the Project Design Criteria (PDC) is met, select Yes. If the PDC is not applicable (N/A) for your project (e.g., the stressor category is not included for your project activity, or for PDC 2, your project does not occur within the range of the GOM DPS of Atlantic salmon), select N/A. If the PDC is applicable, but is not met, leave both boxes blank and provide a justification for that PDC in Section 4.

a) GENERAL PDC			
Yes	N/A	PDC #	PDC Description
☑	☐	1.	No portion of the proposed action will individually or cumulatively have an adverse effect on ESA-listed species or designated critical habitat.
☐	☑	2.	No portion of the proposed action will occur in the tidally influenced portion of rivers/streams where Atlantic salmon presence is possible from April 10–November 7. **Note**: If the project will occur within the geographic range of the GOM DPS Atlantic salmon but their presence is not expected following the best available commercial scientific data, the work window does not need to be applied (include reference in project description).
☑	☐	3.	No portion of the proposed action that may affect shortnose or Atlantic sturgeon will occur in areas identified as spawning grounds as follows: i. Gulf of Maine: April 1–Aug. 31 ii. Southern New England/New York Bight: Mar. 15–Aug. 31 iii. Chesapeake Bay: March 15–July 1 and Sept. 15–Nov. 1 **Note**: If river specific information exists that provides better or more refined time of year information, those dates may be substituted with NMFS approval (include reference in project description).
☑	☐	4.	No portion of the proposed action that may affect shortnose or Atlantic sturgeon will occur in areas identified as overwintering grounds, where dense aggregations are known to occur, as follows: i. Gulf of Maine: Oct. 15–April 30 ii. Southern New England/ New York Bight: Nov. 1–Mar. 15 iii. Chesapeake Bay: Nov. 1–Mar. 15 **Note**: If river specific information exists that provides better or more refined time of year information, those dates may be substituted with NMFS approval (include reference in project description).
☐	☑	5.	Within designated Atlantic salmon critical habitat, no portion of the proposed action will affect spawning and rearing areas (PBFs 1-7).
☑	☐	6.	Within designated Atlantic sturgeon critical habitat, no work will affect hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand) (PBF 1).

Yes	N/A	PDC #	PDC Description
☑	☐	7.	Work will result in no or only temporary/short-term changes in water temperature, water flow, salinity, or dissolved oxygen levels.
☑	☐	8.	If ESA-listed species are (a) likely to pass through the action area at the time of year when project activities occur; and/or (b) the project will create an obstruction to passage when in-water work is completed, then a zone of passage (~50% of water body) with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., physical or biological stressors such as turbidity and sound pressure must not create barrier to passage).
☐	☑	9.	Any work in designated North Atlantic right whale critical habitat must have no effect on the physical and biological features (PBFs).
☑	☐	10.	The project will not adversely impact any submerged aquatic vegetation (SAV).
☑	☐	11.	No blasting or use of explosives will occur.

b) The following stressors are applicable to the action (check all that apply – use Stressor Category Table for guidance):	
☐	Sound Pressure
☑	Impingement/Entrapment/Capture
☑	Turbidity/Water Quality
☐	Entanglement (Aquaculture)
☑	Habitat Modification
☑	Vessel Traffic

	Stressor Category					
Activity Category	Sound Pressure	Impingement/ Entrapment/ Capture	Turbidity/ Water Quality	Entanglement	Habitat Mod.	Vessel Traffic
Aquaculture (shellfish) and artificial reef creation	N	N	Y	Y	Y	Y
Dredging and disposal/beach nourishment	N	Y	Y	N	Y	Y

	Stressor Category					
Activity Category	Sound Pressure	Impingement/ Entrapment/ Capture	Turbidity/ Water Quality	Entanglement	Habitat Mod.	Vessel Traffic
Piers, ramps, floats, and other structures	Y	N	Y	N	Y	Y
Transportation and development (e.g., culvert construction, bridge repair)	Y	N	Y	N	Y	Y
Mitigation (fish/wildlife enhancement or restoration)	N	N	Y	N	Y	Y
Bank stabilization and dam maintenance	Y	N	Y	N	Y	Y

c) SOUND PRESSURE PDC

Information for Pile Driving:
If your project includes non-timber piles*, please attach your calculation to this verification form showing that the noise is below the injury thresholds of ESA-listed species in the action area. The GARFO Acoustic Tool is available as one source, should you not have other information:

https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultation-technical-guidance-greater-atlantic

*Sound pressure effects from timber and steel sheet piles were analyzed in the NLAA programmatic consultation, so no additional acoustic information is necessary.

	Pile material	Pile diameter/width (inches)	Number of piles	Installation method
a)	Select pile material			Select installation method
b)	Select pile material			Select installation method
c)	Select pile material			Select installation method
d)	Select pile material			Select installation method

Yes	N/A	PDC #	PDC Description
☐	☑	12.	If pile driving is occurring during a time of year when ESA-listed species may be present, and the anticipated noise is above the behavioral noise threshold, a "soft start" is required to allow animals an opportunity to leave the project vicinity before sound pressure levels increase. *In addition to using a soft start at the beginning of the work day for pile driving, one must also be used at any time following cessation of pile driving for a period of 30 minutes or longer.* For impact pile driving: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving. For vibratory pile installation: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
☐	☑	13.	Any new pile supported structure must involve the installation of ≤ 50 piles (below MHW).
☐	☑	14.	All underwater noise (pressure) is below (<) the physiological/injury noise threshold for ESA-species in the action area.

d) IMPINGEMENT/ENTRAINMENT/CAPTURE PDC

Information for Dredging/Disposal:			
Type of dredge:	Hydraulic/Cutterhead		
Maintenance dredging?:	Yes	If "Yes", how many acres?	36.00
If maintenance, when was the last dredge cycle?	2022		
New dredging:	No	If "Yes", how many acres?	
Estimated number of dredging events covered by permit:	10		
ESA-species exclusion measures required (e.g., cofferdam, turbidity curtain):	No		
If no exclusion measures required, explain why:	Not operationally feasible		
Information for Intake Structures:			
Mesh screen size (mm) for temporary intake:			

Yes	N/A	PDC #	PDC Description
☑	☐	15.	Only mechanical, cutterhead, and low volume hopper (e.g., CURRITUCK, ~300 cubic yard maximum bin capacity) dredges may be used.
☑	☐	16.	No new dredging in Atlantic sturgeon or Atlantic salmon critical habitat (maintenance dredging still must meet all other PDCs). New dredging outside Atlantic sturgeon or salmon critical habitat is limited to one time dredge events (e.g., burying a utility line) and minor (≤ 2 acres) expansions of areas already subject to maintenance dredging (e.g., marina/harbor expansion).
☐	☑	17.	Work behind cofferdams, turbidity curtains, or other methods to block access of animals to dredge footprint is required when operationally feasible or beneficial and ESA-listed species are likely to be present (if presence is limited to rare, transient individuals, exclusion methods are not necessary).
☐	☑	18.	Temporary intakes related to construction must be equipped with appropriate sized mesh screening (as determined by GARFO section 7 biologist and/or according to Chapter 11 of the NOAA Fisheries Anadromous Salmonid Passage Facility Design) and must not have greater than 0.5 fps intake velocities, to prevent impingement or entrainment of any ESA-listed species life stage.
☐	☑	19.	No new permanent intake structures related to cooling water, or any other inflow at facilities (e.g. water treatment plants, power plants, etc.).

e) TURBIDITY/WATER QUALITY PDC

Information for Turbidity Producing Activity (excluding disposal):

ESA-species turbidity control measures required (e.g., turbidity curtain):	No
If no turbidity control measures required, explain why:	Not operationally feasible

Information for Dredged Material Disposal:

Disposal site:	Nearshore placement/nourishment
Estimated number of trips to disposal site:	3
Relevant disposal site permit/special conditions required (NAE: for offshore disposal, include Group A, B, C, or relevant Long Island Sound consultation):	CWA Section 401 Water Quality Certification, Acceptable Use Determination and Federal CZM consistency with the Delaware and New Jersey Coastal Management Program. USFWS Special Use Permit for National Wildlife Refuges

Yes	N/A	PDC #	PDC Description
☐	☑	20.	Work behind cofferdams, turbidity curtains, or other methods to control turbidity is required when operationally feasible or beneficial and ESA-listed species are likely to be present (if presence is limited to rare, transient individuals, turbidity control methods are not necessary).
☐	☑	21.	In-water offshore disposal may only occur at designated disposal sites that have been the subject of ESA section 7 consultation with NMFS, where a valid consultation is in place and appropriate permit/special conditions are included.

Yes	N/A	PDC #	PDC Description
☑	☐	22.	Any temporary discharges must meet state water quality standards (e.g., no discharges of substances in concentrations that may cause acute or chronic adverse reactions, as defined by EPA water quality standards criteria).
☐	☑	23.	Only repair, upgrades, relocations and improvements of existing discharge pipes or replacement in-kind are allowed; no new construction of untreated discharges.

f) ENTANGLEMENT PDC

Information for Aquaculture Projects:

Approximate distance from shore (MHW)(m):	
Grow season begins (approximate):	
Grow season ends (approximate):	
Total number of vertical lines:	
Total number of horizontal lines:	
Is any gear seasonally removed from the water? If yes, which parts and when?	

	Aquaculture Gear	Acreage (total permit footprint)	Type of Shellfish Cultivated
a)	Select aquaculture gear		Select type of shellfish cultivated
b)	Select aquaculture gear		Select type of shellfish cultivated
c)	Select aquaculture gear		Select type of shellfish cultivated

Yes	N/A	PDC #	PDC Description
☐	☑	24.	Shell on bottom <50 acres with maximum of 4 corner marker buoys;
☐	☑	25.	Cage on bottom with no loose floating lines <5 acres and minimal vertical lines (1 per string of cages, 4 corner marker buoys);
☐	☑	26.	Floating cages in <3 acres in waters and shallower than -10 feet MLLW with no loose lines and minimal vertical lines (1 per string of cages, 4 corner marker buoys);
☐	☑	27.	Floating upweller docks in >10 feet MLLW.
☐	☑	28.	Any in-water lines, ropes, or chains must be made of materials and installed in a manner to minimize or avoid the risk of entanglement by using thick, heavy, and taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.

g) HABITAT MODIFICATION PDC

Yes	N/A	PDC #	PDC Description
☑	☐	29.	No conversion of habitat type (soft bottom to hard, or vice versa) for aquaculture or reef creation.

	h) VESSEL TRAFFIC PDC

Information for Vessel Traffic:

	Temporary Project Vessel Type	Number of Vessels
a)	Tug	1
b)	Crew support vessel	1
c)	Dredge vessel	1
	Type of Non-Commercial or Aquaculture Vessels Added *– only include if there is a net increase directly/indirectly resulting from project*)	Number of Vessels (*if sum > 2, PDC 33 is not met and justification required in Section 4*)
a)	Select type of non-commercial or aquaculture vessels	
b)	Select type of non-commercial or aquaculture vessels	
	Type of Commercial Vessels Added (*only include if there is a net increase directly/indirectly resulting from project*)	Number of Vessels (*if > 0, PDC 33 is not met and justification required in Section 4*)
a)		
b)		

If no temporary/permanent vessel traffic, briefly explain (e.g., all land-based work, no net increase in vessel traffic)	Temporary increase in vessel traffic during dredging/disposal operations. Permanent vessel traffic is expected to remain similar to existing conditions.

Yes	N/A	PDC #	PDC Description
☑	☐	30.	Maintain project vessels operating within the action area to speed limits below 10 knots and dredge vessel speeds of 4 knots maximum, while dredging.
☐	☑	31.	Maintain a 1,500-foot buffer between project vessels and ESA-listed whales and a 150-foot buffer between project vessels and sea turtles unless the vessel is navigating to an in-water disposal site/activity. If the vessel is navigating to an in-water disposal site/activity, refer to and include the conditions contained in the appropriate GARFO-USACE/EPA consultation for the disposal site.
☑	☐	32.	The number of project vessels must be limited to the greatest extent possible, as appropriate to size and scale of project.
☐	☑	33.	The permanent net increase in vessels resulting from a project (e.g., dock/float/pier/boating facility) must not exceed two non-commercial vessels. A project must not result in the permanent net increase of any commercial vessels (e.g., a ferry terminal).

Section 4: Justification for Review under the NLAA Program

If the action is not in compliance with all of the General PDC and appropriate stressor PDC, but you can provide justification and/or special conditions to demonstrate why the project still meets the NLAA determination and is consistent with the aggregate effects considered in the programmatic consultation, you may still certify your project through the NLAA program using this verification form. Please identify which PDC your project does not meet (e.g., PDC 9, PDC 15, PDC 22, etc.) and provide your rationale and justification for why the project is still eligible for the verification form.

To demonstrate that the project is still NLAA, you must explain why the effects on ESA-listed species or critical habitat are **insignificant** (i.e., too small to be meaningfully measured or detected) or **discountable** (i.e., extremely unlikely to occur). **Please use this language in your justification.**

PDC#	Justification
1	The use of a cutterhead-suction dredge will minimize the potential for takes of Atlantic sturgeon, shortnose sturgeon, green sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle and loggerhead sea turtle. Disposal operations/beneficial use of dredged material will occur behind a stone breakwater in the Goose Pond area and will be semi-confined to minimize turbidity from reaching Delaware River waters. This work may result in the conversion of approximately 4 acres of shallow subtidal mudflat to intertidal mudflat and brackish marsh. Dredging work would occur within an area designated in critical habitat for Atlantic sturgeon and would remove 1-3 feet of shoaling within approximately 12,000 linear feet of channel (approximately 30 acres of channel bottom). No significant habitat modifications would occur as dredging would be confined to the authorized channel dimensions.
3	Dredging and proposed disposal activities would occur between July 1 and March 1 using a cutterhead hydraulic cutter-suction dredge. The affected areas including dredging and disposal site are not likely to be areas of spawning activity for either Atlantic or shortnose sturgeon due to oligohaline (0.5 to 5.0 ppt) salinities and soft bottom substrates (silts and sands). Spawning habitats for both species occur in freshwater (0 to 0.5 ppt) and in hard bottom (gravels, pebble, cobble) habitats.
4	Dense aggregations of overwintering Atlantic sturgeon occur for adults and subadults in the lower Delaware estuary and offshore areas. The Salem River and approach channel in the Delaware River area may contain adult and subadult Atlantic sturgeon throughout the year, but is not known to contain dense aggregations during the winter months.

20	BUDM disposal would occur behind an existing stone breakwater that would facilitate suspended sediments to drop out within the mudflat area in Goose Pond, and is intended to build elevation into an intertidal low marsh.

Section 5: USACE Verification of Determination

☐	In accordance with the NLAA Program, USACE has determined that the action complies with all applicable PDC and is not likely to adversely affect listed species.
☑	In accordance with the NLAA Program, the USACE has determined that the action is not likely to adversely affect listed species per the justification and/or special conditions provided in Section 4.

USACE Signature:	Date:

Section 6: GARFO Concurrence

☐	In accordance with the NLAA Program, GARFO PRD concurs with USACE's determination that the action complies with all applicable PDC and is not likely to adversely affect listed species or critical habitat.
☐	In accordance with the NLAA Program, GARFO PRD concurs with USACE's determination that the action is not likely to adversely affect listed species or critical habitat per the justification and/or special conditions provided in Section 4.
☐	GARFO PRD does not concur with USACE's determination that the action complies with the applicable PDC (with or without justification), and recommends an individual Section 7 consultation to be completed independent from the NLAA Program.

GARFO Signature:	Date:

IPaC

U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Delaware and New Jersey

Local offices

New Jersey Ecological Services Field Office

☎ (609) 646-9310

4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205

Chesapeake Bay Ecological Services Field Office

☎ (410) 573-4599
📠 (410) 266-9127

177 Admiral Cochrane Drive
Annapolis, MD 21401-7307

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Red Knot *Calidris canutus rufa* Wherever found This species only needs to be considered if the following condition applies: • This activity area is upstream of red knot habitat. Consultation is needed ONLY for proposed new or changed petroleum product storage or transport, and for spill response planning. No other activity types are expected to affect red knots in this area. There is **proposed** critical habitat for this species. https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS

Bog Turtle Glyptemys muhlenbergii	Threatened

This species only needs to be considered if the following condition applies:

- Activity is in a supporting watershed for known/suspected bog turtle habitat. Consultation recommended only for activities involving significant changes to surface/ground water, including stormwater. See details on FWS NJFO website.

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6962

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Sensitive Joint-vetch Aeschynomene virginica Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/855	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher Haematopus palliatus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31

Bald Eagle Haliaeetus leucocephalus
Breeds Oct 15 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Scoter Melanitta nigra
Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Skimmer Rynchops niger
Breeds May 20 to Sep 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5234

Black-billed Cuckoo Coccyzus erythropthalmus
Breeds May 15 to Oct 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Blue-winged Warbler Vermivora pinus
Breeds May 1 to Jun 30

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink Dolichonyx oryzivorus
Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Brown Pelican Pelecanus occidentalis
Breeds Jan 15 to Sep 30

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Canada Warbler Cardellina canadensis
Breeds May 20 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Chimney Swift Chaetura pelagica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Common Loon gavia immer This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Gull-billed Tern Gelochelidon nilotica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Hudsonian Godwit Limosa haemastica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Kentucky Warbler Oporornis formosus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail Rallus elegans This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-tailed Duck Clangula hyemalis This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere

Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere

Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Surf Scoter Melanitta perspicillata This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted

Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (🟨)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

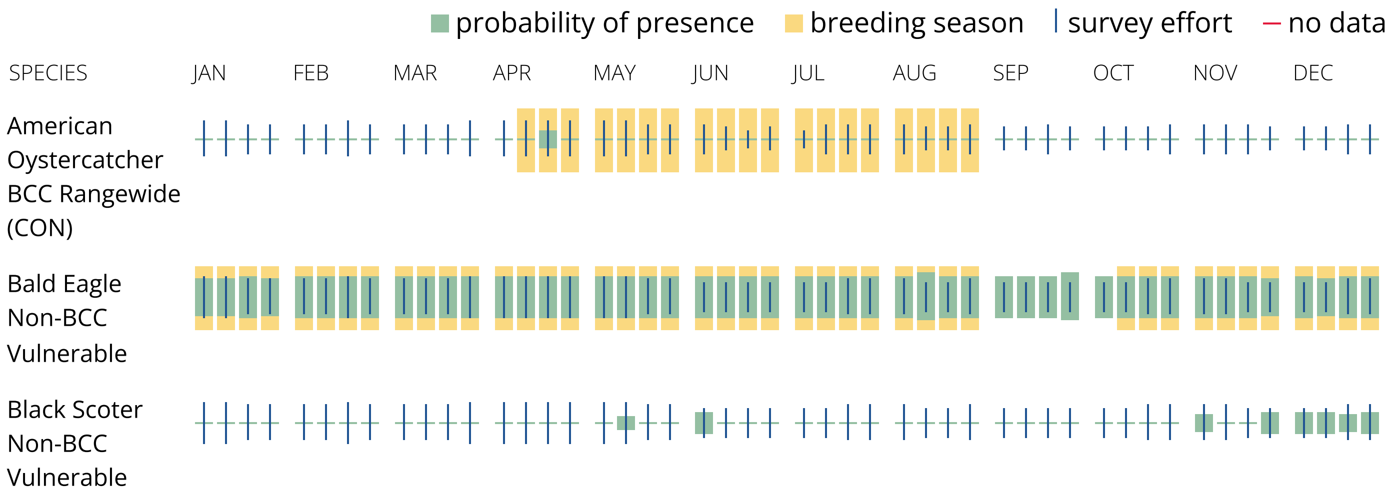
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

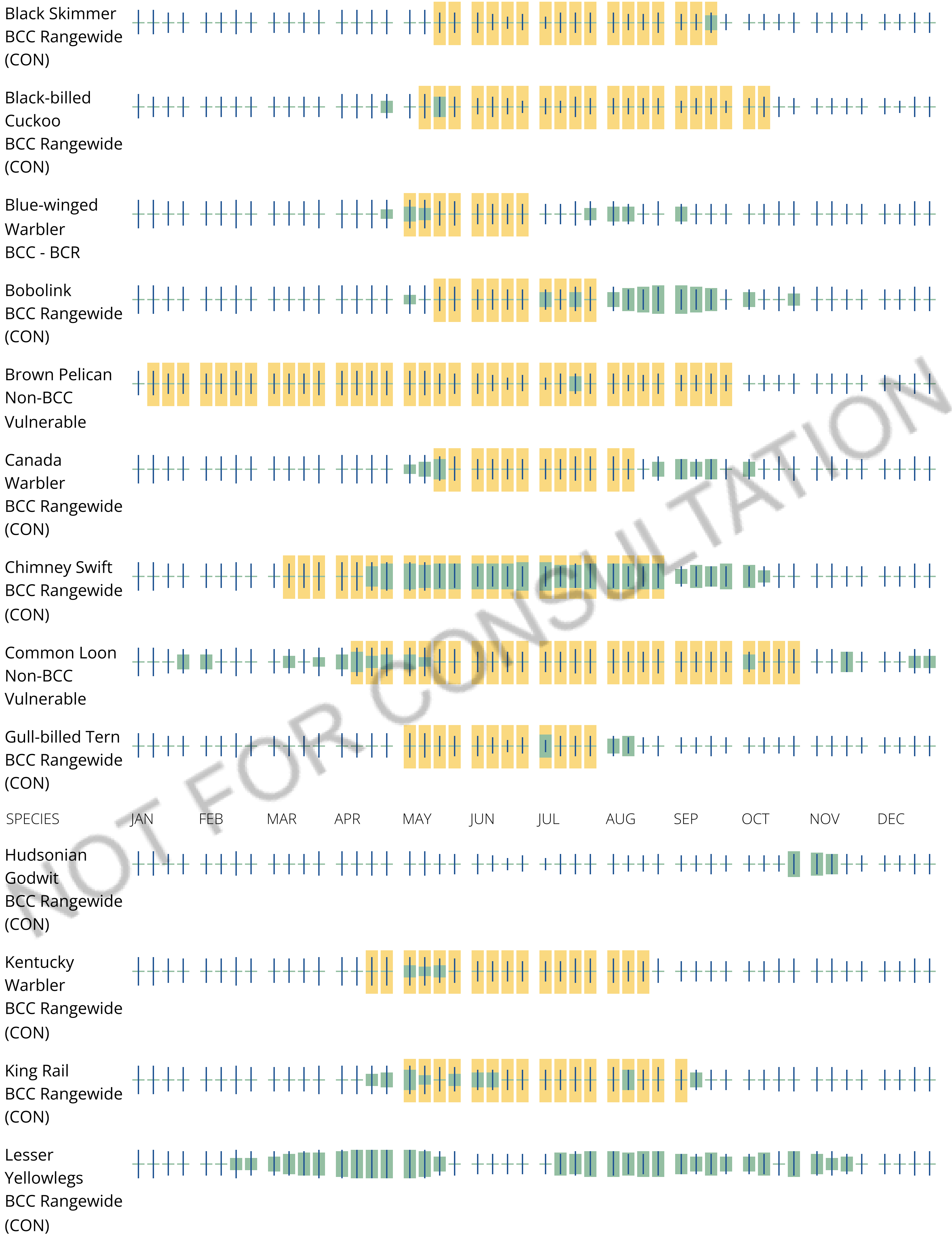
No Data (–)

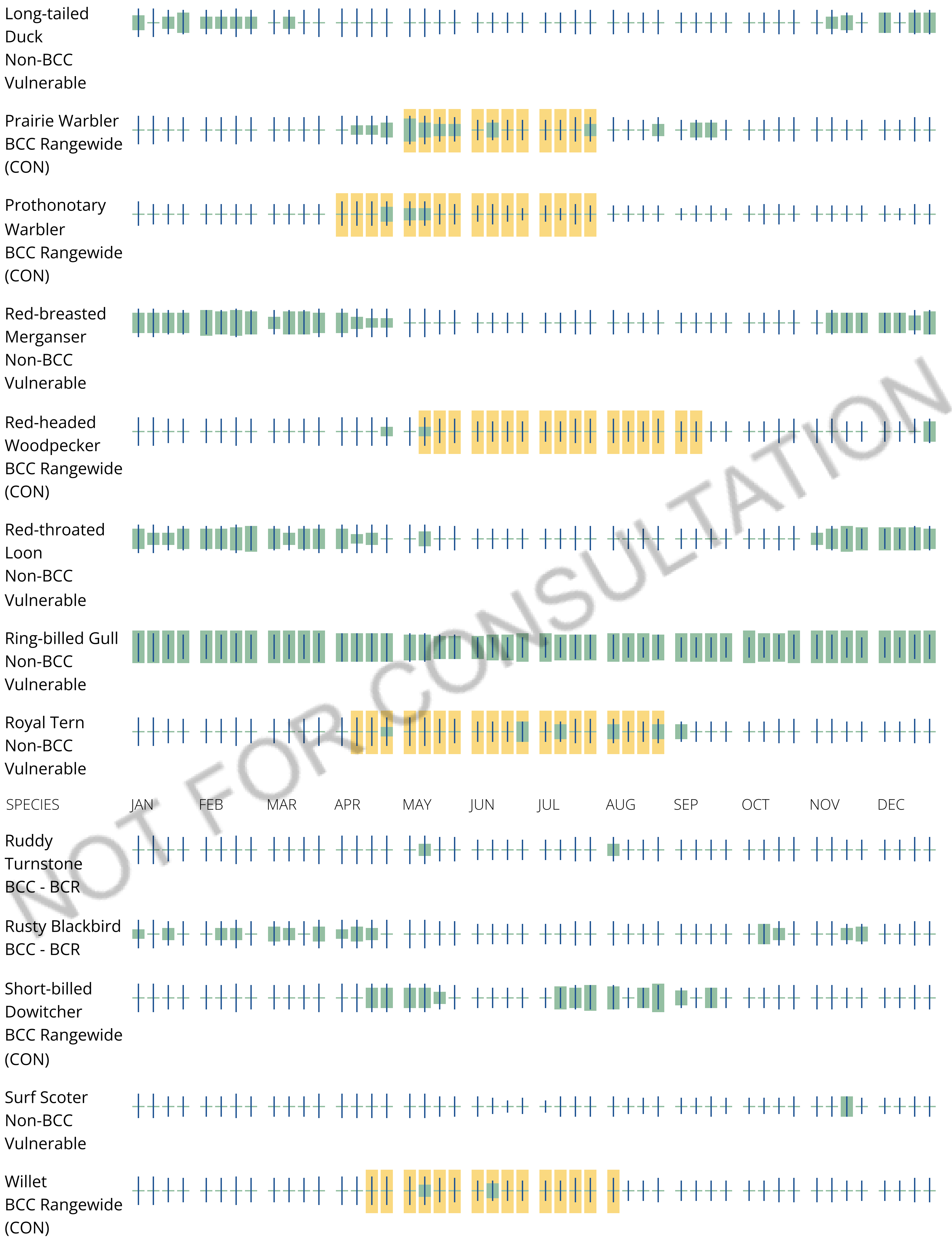
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

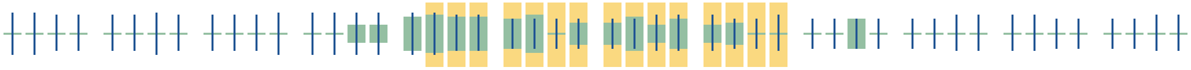
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.




Black Skimmer
BCC Rangewide
(CON)
Black-billed Cuckoo
BCC Rangewide
(CON)
Blue-winged Warbler
BCC - BCR
Bobolink
BCC Rangewide
(CON)
Brown Pelican
Non-BCC
Vulnerable
Canada Warbler
BCC Rangewide
(CON)
Chimney Swift
BCC Rangewide
(CON)
Common Loon
Non-BCC
Vulnerable
Gull-billed Tern
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Hudsonian Godwit
BCC Rangewide
(CON)
Kentucky Warbler
BCC Rangewide
(CON)
King Rail
BCC Rangewide
(CON)
Lesser Yellowlegs
BCC Rangewide
(CON)


Long-tailed Duck
Non-BCC Vulnerable
Prairie Warbler
BCC Rangewide (CON)
Prothonotary Warbler
BCC Rangewide (CON)
Red-breasted Merganser
Non-BCC Vulnerable
Red-headed Woodpecker
BCC Rangewide (CON)
Red-throated Loon
Non-BCC Vulnerable
Ring-billed Gull
Non-BCC Vulnerable
Royal Tern
Non-BCC Vulnerable
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Ruddy Turnstone
BCC - BCR
Rusty Blackbird
BCC - BCR
Short-billed Dowitcher
BCC Rangewide (CON)
Surf Scoter
Non-BCC Vulnerable
Willet
BCC Rangewide (CON)

Wood Thrush
BCC Rangewide
(CON)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES
SUPAWNA MEADOWS NATIONAL WILDLIFE REFUGE	3,445.95 acres

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX E

Federal Coastal Zone Consistency Review

New Jersey

and
Delaware

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New Jersey

Federal Consistency Review

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)							
PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)							
LOCATION: Salem County, NJ							
	ACTIVITY				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
SUBCHAPTER 1. GENERAL PROVISIONS							
7:7-1.1 Purpose							
7:7-1.2 Scope							
7:7-1.3 Review, revision, and expiration							
7:7-1.4 Standards for evaluating permit applications							
7:7-1.5 Definitions							
7:7-1.6 Forms, checklists, information; Department address and website							
7:7-1.7 Liberal construction							
7:7-1.8 Severability							
SUBCHAPTER 2. APPLICABILITY AND ACTIVITIES FOR WHICH A PERMIT IS REQUIRED							
7:7-2.1 When a permit is required	NA	NA	NA	NA	The proposed action as a federal project is not subject to a CAFRA permit, but the action will be conducted in a manner consistent with CAFRA requirements.		
7:7-2.2 CAFRA	NA	NA	NA	NA			
7:7-2.3 Coastal wetlands	NA	NA	NA	NA			
7:7-2.4 Waterfront development	NA	NA	NA	NA			
7:7-2.5 Obtaining an applicability determination	NA	NA	NA	NA			
SUBCHAPTER 3. GENERAL PROVISIONS FOR PERMITS-BY-RULE, GENERAL PERMITS-BY CERTIFICATION, GENERAL PERMITS							
7:7-3.1 Purpose and scope	NA	NA	NA	NA			
7:7-3.2 Standards for issuance, by rulemaking, of permits-by-rule, general permits-by-certification, and general permits	NA	NA	NA	NA			
7:7-3.3 Use of a permit-by-rule, or an authorization pursuant to a general permit-by-certification or a general permit to conduct regulated activities	NA	NA	NA	NA			
7:7-3.4 Use of more than one permit on a single site	NA	NA	NA	NA			
7:7-3.5 Duration of an authorization under a general permit-by-certification	NA	NA	NA	NA			
7:7-3.6 Duration of an authorization under a general permit for which an application was declared complete for review prior to July 6, 2015	NA	NA	NA	NA			
7:7-3.7 Duration of an authorization under a general permit for which an application is deemed complete for review on or after July 6, 2015	NA	NA	NA	NA			
7:7-3.8 Conditions applicable to a permit-by-rule, or to an authorization pursuant to a general permit by certification or a general permit	NA	NA	NA	NA			
SUBCHAPTER 4. PERMITS-BY-RULE							
7:7-4.1 Permit-by-rule 1 - expansion of a single-family home or duplex	NA	NA	NA	NA			
7:7-4.2 Permit-by-rule 2 - development of a single-family home or duplex and/or accessory development on a bulkheaded lagoon lot	NA	NA	NA	NA			
7:7-4.3 Permit-by-rule 3 - placement of public safety or beach/dune ordinance signs on beaches or dunes and placement of signs on beaches or dunes at public parks	NA	NA	NA	NA			
7:7-4.4 Permit-by-rule 4 - construction of nonresidential docks, piers, boat ramps, and decks located landward of mean high water line	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021) PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM) LOCATION: Salem County, NJ	ACTIVITY				DISCUSSION	Is action consistent with applicable policy?	Reference for further information
POLICY	Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)*	Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)*	BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)	BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)			
7:7-4.5 Permit-by-rule 5 - construction of portion of a recreational dock or pier located landward of mean high water line	NA	NA	NA	NA			
7:7-4.6 Permit-by-rule 6 - reconstruction of a residential or commercial development within the same footprint	NA	NA	NA	NA			
7:7-4.7 Permit-by-rule 7 – expansion or relocation (with or without expansion) landward or parallel to the mean high water line of the footprint of a residential or commercial development	NA	NA	NA	NA			
7:7-4.8 Permit-by-rule 8 - construction of a utility line attached to a bridge or culvert	NA	NA	NA	NA			
7:7-4.9 Permit-by-rule 9 - previous filling of tidelands associated with an existing single family home or duplex	NA	NA	NA	NA			
7:7-4.10 Permit-by-rule 10 - construction of portion of boat ramp located landward of the mean high water line at a residential development	NA	NA	NA	NA			
7:7-4.11 Permit-by-rule 11 - construction and/or installation of a boat wash wastewater system at a marina, boatyard, or boat sales facility	NA	NA	NA	NA			
7:7-4.12 Permit-by-rule 12 - construction of one to three wind turbines less than 200 feet in height having a cumulative rotor swept area no greater than 2,000 square feet	NA	NA	NA	NA			
7:7-4.13 Permit-by-rule 13 - installation of solar panels on a maintained lawn or landscaped area at a single-family home or duplex lot	NA	NA	NA	NA			
7:7-4.14 Permit-by-rule 14 – reconfiguration of any legally existing dock, wharf, or pier at a legally existing marina	NA	NA	NA	NA			
7:7-4.15 Permit-by-rule 15 - placement of sand fencing to create or sustain a dune	NA	NA	NA	NA			
7:7-4.16 Permit–by-rule 16 - placement of land-based upwellers and raceways for aquaculture activities	NA	NA	NA	NA			
7:7-4.17 Permit-by-rule 17 - placement of predator screens and oyster spat attraction devices within a shellfish lease area	NA	NA	NA	NA			
7:7-4.18 Permit-by-rule 18 - placement of shellfish cages within a shellfish lease area	NA	NA	NA	NA			
7:7-4.19 Permit-by-rule 19 - construction and/or installation of a pumpout facility and/or pumpout support facilities	NA	NA	NA	NA			
7:7-4.20 Permit-by-rule 20 – implementation of a sediment sampling plan for sampling in a water area as part of a dredging or dredged material management activity or as part of a remedial investigation of a contaminated site	X	X	X	X	All activities may require sediment sampling for pre-dredge and post-dredge monitoring purposes conducted in a manner consistent with Permit by Rule 20. Pre-dredge sediment testing was conducted in accordance with N.J.A.C. 7:7-12.6 and Appendix G.	YES	EA Sections 5.17 and 5.16 and Tetra Tech (2020)
7:7-4.21 Permit-by-rule 21 – application of herbicide within coastal wetlands to control invasive plant species	NA	NA	NA	NA			
7:7-4.22 Permit-by-rule 22 - construction of a swimming pool, spa, or hot tub and associated decking on a bulkheaded lot without wetlands	NA	NA	NA	NA			
7:7-4.23 Permit-by-rule 23 – installation of an at-grade dune walkover at a residential, commercial, or public development other than a single-family home or duplex	NA	NA	NA	NA			
SUBCHAPTER 5. GENERAL PERMITS-BY-CERTIFICATION							
7:7-5.1 General permit-by-certification 10 – reconstruction of a legally existing functioning bulkhead in-place or upland of a legally existing functioning bulkhead	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

	ACTIVITY				DISCUSSION	Is action consistent with applicable policy?	Reference for further information
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-5.2 General permit-by-certification 15 – construction of piers, docks, including jet ski ramps, pilings, and boatlifts in man-made lagoons	NA	NA	NA	NA			
7:7-5.3 General permit-by-certification 1A – installation of an elevated timber dune walkover at a residential, commercial, or public development other than a single-family home or duplex	NA	NA	NA	NA			
SUBCHAPTER 6. GENERAL PERMITS							
7:7-6.1 General permit 1 - amusement pier expansion	NA	NA	NA	NA			
7:7-6.2 General permit 2 – activities on a beach and dune	NA	NA	NA	NA			
7:7-6.3 General permit 3 - voluntary reconstruction of certain residential or commercial development	NA	NA	NA	NA			
7:7-6.4 General permit 4 - development of one or two single-family homes or duplexes				NA			
7:7-6.5 General permit 5 - expansion, or reconstruction (with or without expansion), of a single-family home or duplex	NA	NA	NA	NA			
7:7-6.6 General permit 6 - construction of a bulkhead and placement of associated fill on a man-made lagoon	NA	NA	NA	NA			
7:7-6.7 General permit 7 - construction of a revetment at a single-family home or duplex lot	NA	NA	NA	NA			
7:7-6.8 General permit 8 - construction of gabions at a single family/duplex lot	NA	NA	NA	NA			
7:7-6.9 General permit 9 - construction of support facilities at legally existing and operating marinas	NA	NA	NA	NA			
7:7-6.10 General permit 10 –reconstruction of a legally existing functioning bulkhead	NA	NA	NA	NA			
7:7-6.11 General permit 11 – investigation, cleanup, removal, or remediation of hazardous substances	NA	NA	NA	NA			
7:7-6.12 General permit 12 – landfall of utilities	NA	NA	NA	NA			
7:7-6.13 General permit 13 – construction of recreational facilities at public parks	NA	NA	NA	NA			
7:7-6.14 General permit 14 – bulkhead construction and placement of associated fill at a single-family home or duplex lot	NA	NA	NA	NA			
7:7-6.15 General permit 15 – construction of piers, docks, including jet ski ramps, pilings, and boatlifts in man-made lagoons	NA	NA	NA	NA			
7:7-6.16 General permit 16 - minor maintenance dredging in man-made lagoons	NA	NA	NA	NA			
7:7-6.17 General permit 17 – stabilization of eroded shorelines	NA	NA	NA	X	The Placement of material in the nearshore of Oakwood Beach would provide a sand source for the eroded beach.	YES	
7:7-6.18 General permit 18 – avian nesting structures	NA	NA	NA	NA			
7:7-6.19 General permit 19 – modification of existing electrical substations	NA	NA	NA	NA			
7:7-6.20 General permit 20 –legalization of the filling of tidelands	X	NA	X	NA	The Salem River Federal Navigation Channel approach is in DE and the entrance at the mouth is in NJ. Killcohook CDF is not within Tidelands boundaries. Oakwood Beach nearshore is within Delaware waters. The proposed actions are not subject to GP-20 but would be conducted consistently with GP-20.	YES	
7:7-6.21 General permit 21 –construction of telecommunication towers	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

	ACTIVITY				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-6.22 General permit 22 –construction of certain structures related to the tourism industry at hotels and motels, commercial developments, and multi-family residential developments over 75 units	NA	NA	NA	NA			
7:7-6.23 General permit 23 –geotechnical survey borings	X	X	X	X	Exploratory geotechnical borings would be required for soil/sediment monitoring. The proposed action is not subject to a GP-23 but is consistent with GP-23 requirements.	YES	
7:7-6.24 General permit 24 - habitat creation, restoration, enhancement, and living shoreline activities	NA	NA	X	NA	BUDM at Goose Pond is being conducted for the purpose of creating a mosaic of intertidal mudflat and brackish marshes in accordance with SMNWR goals and would be conducted consistently with GP-24. BUDM at Oakwood Beach is being conducted for the purpose of providing a sand source for the littoral zone of Oakwood Beach.	YES	EA Sections 1.0 to 4.0
7:7-6.25 General permit 25 – construction of one to three wind turbines less than 200 feet in height and having a cumulative rotor swept area no greater than 4,000 square feet	NA	NA	NA	NA			
7:7-6.26 General permit 26 – construction of wind turbines less than 250 feet in height and having a cumulative rotor swept area no greater than 20,000 square feet	NA	NA	NA	NA			
7:7-6.27 General permit 27 –dredging of sand from a man-made lagoon deposited as a result of a storm event for which the Governor declared a State of Emergency	NA	NA	NA	NA			
7:7-6.28 General permit 28 – dredging of material from a waterway at a residential or commercial which the Governor declared a State of Emergency development deposited as a result of the failure of a bulkhead as a consequence of a storm event for	NA	NA	NA	NA			
7:7-6.29 General permit 29 –dredging and management of material from a marina deposited as a result of a storm event for which the Governor declared a State of Emergency	NA	NA	NA	NA			
7:7-6.30 General permit 30 – commercial shellfish aquaculture activities	NA	NA	NA	NA			
7:7-6.31 General permit 31 – placement of shell within shellfish lease areas	NA	NA	NA	NA			
7:7-6.32 General permit 32 – application of herbicide within coastal wetlands to control invasive plant species	NA	NA	NA	NA			
SUBCHAPTER 7. LONG BRANCH REDEVELOPMENT ZONE PERMIT							
7:7-7.1 Applicability; permit conditions	NA	NA	NA	NA			
7:7-7.2 Notification to the Department regarding developments requiring planning board approval	NA	NA	NA	NA			
7:7-7.3 Notification to the Department regarding developments not requiring planning board approval	NA	NA	NA	NA			
7:7-7.4 Publication of notice of Department's decision that Long Branch Redevelopment Zone Permit is or is not applicable to development	NA	NA	NA	NA			
7:7-7.5 Requests for adjudicatory hearings	NA	NA	NA	NA			
SUBCHAPTER 8. INDIVIDUAL PERMITS							
7:7-8.1 Requirement to obtain an individual permit	NA	NA	NA	NA			
7:7-8.2 Duration of an individual permit	NA	NA	NA	NA			
7:7-8.3 Conditions applicable to an individual permit	NA	NA	NA	NA			
SUBCHAPTER 9. SPECIAL AREAS							
7:7-9.1 Purpose and scope							

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

	ACTIVITY				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-9.2 Shellfish habitat	NA	NA	NA	NA			
7:7-9.3 Surf clam areas	NA	NA	NA	NA			
7:7-9.4 Prime fishing areas	NA	NA	NA	NA			
7:7-9.5 Finfish migratory pathways	X	X	X	X	All activities affect the Delaware River Finfish Migratory pathway. Through dredging and generation of turbidity into the water column. This can be avoided by implementing a seasonal work restriction from March 1 and June 30.	YES	EA Sections 5.2.4 and 6.2.3
7:7-9.6 Submerged vegetation habitat	NA	NA	NA	NA	No known SAV habitat exists in affected areas		
7:7-9.7 Navigation channels	X	NA	NA	NA	The Salem River Federal Navigation Channel is an existing project approved for maintenance dredging to maintain the authorized dimensions. The dredging will be conducted in accordance with N.J.A.C. 7:7-12.6 and Appendix G.	YES	EA Section 1.1
7:7-9.8 Canals	NA	NA	NA	NA			
7:7-9.9 Inlets	NA	NA	NA	NA			
7:7-9.10 Marina moorings	NA	NA	NA	NA			
7:7-9.11 Ports		NA	NA	NA			
7:7-9.12 Submerged infrastructure routes	NA	NA	NA	NA			
7:7-9.13 Shipwreck and artificial reef habitats	NA	NA	NA	NA			
7:7-9.14 Wet borrow pits	NA	NA	NA	NA			
7:7-9.15 Intertidal and subtidal shallows	NA	NA	X	X	The proposed BUDM actions would directly and/or indirectly affect intertidal and subtidal shallows. BUDM at Goose Pond would enhance the marsh complex by providing needed sediment to build elevation in an area experiencing erosion and subsidence and is vulnerable to SLR. BUDM nearshore placement for Oakwood Beach would provide a sand source to feed the littoral zone of Oakwood Beach benefitting the CSRM properties of the beach.	YES	EA Section 5.2.1 and 6.2.1
7:7-9.16 Dunes	NA	NA	NA	NA			
7:7-9.17 Overwash areas	NA	NA	NA	NA			
7:7-9.18 Coastal high hazard areas	NA	NA	NA	NA			
7:7-9.19 Erosion hazard areas	NA	NA	NA	NA			
7:7-9.20 Barrier island corridor	NA	NA	NA	NA			
7:7-9.21 Bay islands	NA	NA	NA	NA			
7:7-9.22 Beaches	NA	NA	NA	X	BUDM nearshore placement for Oakwood Beach would provide a sand source to feed the littoral zone of Oakwood Beach benefitting the CSRM properties of the beach.	YES	EA Sections 1.3.1 and 4.3
7:7-9.23 Filled water's edge	NA	NA	NA	NA			
7:7-9.24 Existing lagoon edges	NA	NA	NA	NA			
7:7-9.25 Flood hazard areas	NA	NA	NA	NA			
7:7-9.26 Riparian zones	NA	NA	NA	NA			
7:7-9.27 Wetlands	NA	NA	X	NA	BUDM at Goose Pond would have direct beneficial effects on wetlands defined in 7:7-9.27(a)1-4. Compensatory mitigation is not required since this activity would increase the quantity and quality of intertidal marshes and mudflats.	YES	EA Section 5.2.1 and 6.2.1

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

POLICY	**ACTIVITY**				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
	Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)*	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-9.28 Wetlands buffers	NA	NA	NA	NA	Work at Goose Pond area affects intertidal wetlands, but buffer areas would be unaffected		
7:7-9.29 Coastal bluffs	NA	NA	NA	NA			
7:7-9.30 Intermittent stream corridors	NA	NA	NA	NA			
7:7-9.31 Farmland conservation areas	NA	NA	NA	NA			
7:7-9.32 Steep slopes	NA	NA	NA	NA			
7:7-9.33 Dry borrow pits	NA	NA	NA	NA			
7:7-9.34 Historic and archaeological resources	NA*	NA*	X	NA*	BUDM at Goose Pond would require approval from the NJ SHPO in accordance with Section 106 of the NHPA. *The other activities have received prior approvals from NJ and DE SHPO's.	Pending SHPO review and approval	EA Section 5.3.5 and 6.3.4
7:7-9.35 Specimen trees	NA	NA	NA	NA			
7:7-9.36 Endangered or threatened wildlife or plant species habitats	X	X	X	X	The affected areas are within the range of several Federally and State listed species. A discussion of Federal/State T&E species is provided in the EA and Appendix D of the EA.	Pending Federal and State Reviews	EA Section 5.2.6 and 6.2.6
7:7-9.37 Critical wildlife habitat	X	NA	NA	X	The Salem River approach channel and the BUDM nearshore placement location occur within the Delaware River and is considered critical habitat for the Atlantic sturgeon. The dredging and placement activities will be consulted with NOAA Fisheries in advance of the action.	Pending consultation/review with NOAA Fisheries and NJDEP	EA Section 5.2.6 and 6.2.6
7:7-9.38 Public open space	NA	NA	X	X	The Goose Pond area is part of the Supawna Meadows National Wildlife Refuge. A special use permit (SUP) from the refuge would be obtained prior to BUDM activities. The Oakwood Beach area is a public beach. Access to the beach would be continued during BUDM in the nearshore.	YES, and pending SUP from USFWS	
7:7-9.39 Special hazard areas	NA	NA	NA	NA			
7:7-9.40 Excluded Federal lands							
7:7-9.41 Special urban areas	NA	NA	NA	NA			
7:7-9.42 Pinelands National Reserve and Pinelands Protection Area	NA	NA	NA	NA			
7:7-9.43 Meadowlands District	NA	NA	NA	NA			
7:7-9.44 Wild and scenic river corridors	NA	NA	NA	NA			
7:7-9.45 Geodetic control reference marks	NA	NA	NA	NA			
7:7-9.46 Hudson River waterfront area	NA	NA	NA	NA			
7:7-9.47 Atlantic City	NA	NA	NA	NA			
7:7-9.48 Lands and waters subject to public trust rights	X	NA	X	X	The public would be temporarily prohibited from entering work areas such as dredging locations, pipelines, and discharge points at BUDM locations until work is completed. The Killcohook CDF is not open for public access.	YES	
7:7-9.49 Dredged material management areas	NA	X	NA	NA	The Killcohook CDF is an active federal dredged material management area. The continued utilization of this area for Salem River dredged material disposal operations will not change the established land use of this area.	YES	
SUBCHAPTER 10. STANDARDS FOR BEACH AND DUNE ACTIVITIES							
7:7-10.1 Purpose and scope	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

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LOCATION: Salem County, NJ

POLICY	**ACTIVITY**				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
	Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)*	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-10.2 Standards applicable to routine beach maintenance	NA	NA	NA	NA			
7:7-10.3 Standards applicable to emergency post-storm beach restoration	NA	NA	NA	NA			
7:7-10.4 Standards applicable to dune creation and maintenance	NA	NA	NA	NA			
7:7-10.5 Standards applicable to the construction of boardwalks	NA	NA	NA	NA			
SUBCHAPTER 11. STANDARDS FOR CONDUCTING AND REPORTING THE RESULTS OF AN ENDANGERED OR THREATENED WILDLIFE OR PLANT SPECIES HABITAT IMPACT ASSESSMENT AND/OR ENDANGERED OR THREATENED WILDLIFE SPECIES HABITAT EVALUATION							
7:7-11.1 Purpose and scope							
7:7-11.2 Standards for conducting endangered or threatened wildlife or plant species habitat impact assessment	X	NA	X	X	The affected area is within the range of several Federally and State listed threatened and endangered species. Reviews and consultations are in progress with USFWS, NOAA Fisheries, and NJDEP and compliance with applicable laws and regulations will be met prior to undertaking the work. Preliminary conclusions are that the actions may affect but are not likely to adversely affect threatened and endangered species.	Pending consultation/review with USFWS, NOAA Fisheries and NJDEP	
7:7-11.3 Standards for conducting endangered or threatened wildlife species habitat evaluation	X	NA	X	X			
7:7-11.4 Standards for reporting the results of impact assessments and habitat evaluations	X	NA	X	X			
SUBCHAPTER 12. GENERAL WATER AREAS							
7:7-12.1 Purpose and scope	X	X	X	X			
7:7-12.2 Shellfish aquaculture	NA	NA	NA	NA			
7:7-12.3 Boat ramps	NA	NA	NA	NA			
7:7-12.4 Docks and piers for cargo and commercial fisheries	NA	NA	NA	NA			
7:7-12.5 Recreational docks and piers	NA	NA	NA	NA			
7:7-12.6 Maintenance dredging	X	X	X	X	The Salem River Federal Navigation Channel is an existing project approved for maintenance dredging to maintain the authorized dimensions. The dredging will be conducted in accordance with N.J.A.C. 7:7-12.6 and Appendix G. Sediment analyses (Tetra Tech 2020) are presented in the EA, and do not indicate significant contamination and water quality standards are expected to be met for all disposal options.	Pending Review for Section 401 Water Quality Certification	EA Section 1.1, 5.1.7 and 6.1.6
7:7-12.7 New dredging	NA	NA	NA	NA			
7:7-12.8 Environmental dredging	NA	NA	NA	NA			
7:7-12.9 Dredged material disposal	X	X	X	X	Dredging of the Salem River FNC requires 3 disposal options: existing CDF, intertidal placement of fine-grained sediment at Goose Pond to restore brackish marsh habitat, and subtidal placement of sand only within the nearshore of the Oakwood Beach CSRM project. The material has been tested and evaluated and considered suitable for BUDM in the EA.	Pending Review for Section 401 Water Quality Certification	EA Section 1.1, 5.1.7 and 6.1.6
7:7-12.10 Solid waste or sludge dumping	NA	NA	NA	NA			
7:7-12.11 Filling	NA	NA	X	X	Filling would occur in shallow subtidal and intertidal elevations at Goose Pond for the purpose to build a marsh platform to restore eroding/subsiding brackish marsh habitat. Filling sandy material into the shallow subtidal nearshore of Oakwood Beach would provide a sand source in the littoral zone for Oakwood Beach.	YES	EA Section 6.2.1
7:7-12.12 Mooring	NA	NA	NA	NA			
7:7-12.13 Sand and gravel mining	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021) **PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)** **LOCATION: Salem County, NJ**							
	ACTIVITY				**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-12.14 Bridges	NA	NA	NA	NA			
7:7-12.15 Submerged pipelines	NA	NA	NA	NA			
7:7-12.16 Overhead transmission lines	NA	NA	NA	NA			
7:7-12.17 Dams and impoundments	NA	NA	NA	NA			
7:7-12.18 Outfalls and intakes	NA	NA	NA	NA			
7:7-12.19 Realignment of water areas	NA	NA	NA	NA			
7:7-12.20 Vertical wake or wave attenuation structures	NA	NA	NA	NA			
7:7-12.21 Submerged cables	NA	NA	NA	NA			
7:7-12.22 Artificial reefs	NA	NA	NA	NA			
7:7-12.23 Living shorelines	NA	NA	X	NA	BUDM would create a brackish marsh platform in an area experiencing losses due to erosion, subsidence and sea level rise and would function as a living shoreline preventing further losses of marsh habitat.	YES	
7:7-12.24 Miscellaneous uses	NA	NA	NA	NA			
SUBCHAPTER 13. REQUIREMENTS FOR IMPERVIOUS COVER AND VEGETATIVE COVER FOR GENERAL LAND AREAS AND CERTAIN SPECIAL AREAS							
7:7-13.1 Purpose and scope	NA	NA	NA	NA			
7:7-13.2 Definitions	NA	NA	NA	NA			
7:7-13.3 Impervious cover requirements that apply to sites in the upland waterfront development and CAFRA areas	NA	NA	NA	NA			
7:7-13.4 Vegetative cover requirements that apply to sites in the upland waterfront development and CAFRA areas	NA	NA	NA	NA			
7:7-13.5 Determining if a site is forested or unforested	NA	NA	NA	NA			
7:7-13.6 Upland waterfront development area regions and growth ratings	NA	NA	NA	NA			
7:7-13.7 Determining the environmental sensitivity of a site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.8 Determining the development potential of a site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.9 Determining the development potential for a residential or minor commercial development site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.10 Determining the development potential for a major commercial or industrial development site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.11 Determining the development potential for a campground development site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.12 Determining the development intensity of a site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.13 Impervious cover limits for a site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.14 Vegetative cover percentages for a site in the upland waterfront development area	NA	NA	NA	NA			
7:7-13.15 Coastal Planning Areas in the CAFRA area	NA	NA	NA	NA			
7:7-13.16 Boundaries for Coastal Planning Areas, CAFRA centers, CAFRA cores, and CAFRA nodes; non-mainland coastal centers	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

	ACTIVITY						
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**	**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
7:7-13.17 Impervious cover limits for a site in the CAFRA area	NA	NA	NA	NA			
7:7-13.18 Vegetative cover percentages for a site in the CAFRA area	NA	NA	NA	NA			
7:7-13.19 Mainland coastal centers	NA	NA	NA	NA			
SUBCHAPTER 14. GENERAL LOCATION RULES							
7:7-14.1 Rule on location of linear development	NA	NA	NA	NA			
7:7-14.2 Basic location rule	NA	NA	NA	NA			
7:7-14.3 Secondary impacts	NA	NA	NA	NA			
SUBCHAPTER 15. USE RULES							
7:7-15.1 Purpose and scope	NA	NA	NA	NA			
7:7-15.2 Housing	NA	NA	NA	NA			
7:7-15.3 Resort/recreational	NA	NA	NA	NA			
7:7-15.4 Energy facility	NA	NA	NA	NA			
7:7-15.5 Transportation	NA	NA	NA	NA			
7:7-15.6 Public facility	NA	NA	NA	NA			
7:7-15.7 Industry	NA	NA	NA	NA			
7:7-15.8 Mining	NA	NA	NA	NA			
7:7-15.9 Port	NA	NA	NA	NA			
7:7-15.10 Commercial facility	NA	NA	NA	NA			
7:7-15.11 Coastal engineering	NA	NA	NA	X	The placement of sandy material in the nearshore of Oakwood Beach would benefit the CSRM project by providing a supplementals source of sediment into the Oakwood Beach littoral system that may help with reducing periodic nourishment quantities.	YES	
7:7-15.12 Dredged material placement on land	NA	X	NA	NA	The disposal of Salem River Federal Navigation Channel maintenance dredging sediments into the Killcohook CDF is an existing authorized practice and will be conducted in accordance with N.J.A.C. 7:7-12.6 and Appendix G. Sediment analyses (Tetra Tech 2020) are presented in the EA, and do not indicate significant contamination and water quality standards are expected to be met for all disposal options.	YES	
7:7-15.13 National defense facilities	NA	NA	NA	NA			
7:7-15.14 High-rise structures	NA	NA	NA	NA			
SUBCHAPTER 16. RESOURCE RULES							
7:7-16.1 Purpose and Scope							
7:7-16.2 Marine fish and fisheries	X	X	X	X	Marine fish and fisheries would be affected by dredging, dredged material placement (BUDM) and discharges from a CDF which would temporarily elevate turbidity in affected waters. To minimize these effects, a migratory fish window would be implemented between March 1 and June 30th.	YES	EA Section 5.2.4 and 6.2.3
7:7-16.3 Water quality	X	X	X	X	All aspects of dredging, BUDM, and CDF discharges would temporarily generate turbidity. The sediments have been tested in accordance with the NJ Sediment Testing manual and do not indicate significant contamination that would violate NJ Water Quality Standards.	Pending Review for Section 401 Water Quality Certification	EA Section 5.1.7 and 6.1.6
7:7-16.4 Surface water use	X	X	X	X			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)

PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)

LOCATION: Salem County, NJ

	ACTIVITY						
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**	**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
7:7-16.5 Groundwater use	NA	NA	NA	NA			
7:7-16.6 Stormwater management	NA	NA	NA	NA			
7:7-16.7 Vegetation	NA	NA	NA	NA			
7:7-16.8 Air quality	X	X	X	X	All dredging and disposal/BUDM activities will result in temporary and localized increases in emissions associated with diesel powered equipment. Based on the size of the operation and duration, air emissions are expected to be below the de minimus threshold for a marginal ozone nonattainment area. Therefore, a General Conformity determination is not required based on the expected de minimus level emissions along with the proposed action meeting the exemption for maintenance dredging under 40 CFR § 93.153 (c)(2)(ix).	YES	EA Section 5.1.6 and 6.1.5
7:7-16.9 Public access	X	NA	X	X	Public access will be temporarily prohibited in all active work areas for safety reasons. Once activities are completed, the public can access the open water areas within the Salem River navigation channel and nearshore of Oakwood Beach. Public access to the Goose Pond BUDM area would be restricted at the discretion of the refuge manager. Public access is prohibited within the Killcohook CDF at all times.	YES	EA Section 6.3.3
7:7-16.10 Scenic resources and design	X	X	X	X	All construction activities will have temporary adverse impacts on scenic resources due to equipment operation, earth disturbance and turbidity in water. No long-term adverse effects on scenic resources are expected. BUDM at Goose Pond would have a long-term beneficial effect upon establishment of marsh vegetation.	YES	EA Section 5.3.6 and 6.3.5
7:7-16.11 Buffers and compatibility of uses	NA	NA	NA	NA			
7:7-16.12 Traffic	NA	NA	NA	NA			
7:7-16.13 Subsurface sewage disposal systems	NA	NA	NA	NA			
7:7-16.14 Solid and hazardous waste	NA	NA	NA	NA			
SUBCHAPTER 17. MITIGATION							
7:7-17.1 Definitions	NA	NA	NA	NA			
7:7-17.2 General mitigation requirements	NA	NA	NA	NA	Maintenance dredging and disposal at the Killcohook CDF is an existing practice and doesn't require mitigation. The BUDM placement at Goose Pond will result in increases in brackish marsh habitat and an ecological uplift of the area by providing a mosaic of intertidal habitats, which will not require mitigation. The BUDM placement of sand in the nearshore of Oakwood Beach is compatible with existing aquatic habitats and would not require mitigation.		
7:7-17.3 Timing of mitigation	NA	NA	NA	NA			
7:7-17.4 Amount of mitigation required	NA	NA	NA	NA			
7:7-17.5 Property suitable for mitigation	NA	NA	NA	NA			
7:7-17.6 Conceptual review of a mitigation area	NA	NA	NA	NA			
7:7-17.7 Basic requirements for mitigation proposals	NA	NA	NA	NA			
7:7-17.8 Department review and approval of a mitigation proposal	NA	NA	NA	NA			
7:7-17.9 Requirements for shellfish habitat mitigation	NA	NA	NA	NA			
7:7-17.10 Requirements for submerged vegetation habitat mitigation	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)					DISCUSSION	Is action consistent with applicable policy?	Reference for further information
PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)							
LOCATION: Salem County, NJ							
	ACTIVITY						
POLICY	Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)*	Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)*	BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)	BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)			
7:7-17.11 Requirements for intertidal and subtidal shallows and tidal water mitigation	NA	NA	NA	NA			
7:7-17.12 Requirements for riparian zone mitigation	NA	NA	NA	NA			
7:7-17.13 Requirements for wetlands mitigation	NA	NA	NA	NA			
7:7-17.14 Wetlands mitigation hierarchy	NA	NA	NA	NA			
7:7-17.15 Requirements for credit purchase from an approved mitigation bank	NA	NA	NA	NA			
7:7-17.16 Requirements for in-lieu fee payment	NA	NA	NA	NA			
7:7-17.17 Financial assurance for mitigation projects; general provisions	NA	NA	NA	NA			
7:7-17.18 Financial assurance; fully funded trust fund requirements	NA	NA	NA	NA			
7:7-17.19 Financial assurance; line of credit requirements	NA	NA	NA	NA			
7:7-17.20 Financial assurance; letter of credit requirements	NA	NA	NA	NA			
7:7-17.21 Financial assurance; surety bond requirements	NA	NA	NA	NA			
7:7-17.22 Mitigation banks	NA	NA	NA	NA			
7:7-17.23 Application for a mitigation bank	NA	NA	NA	NA			
SUBCHAPTER 18. CONSERVATION RESTRICTIONS							
7:7-18.1 Conservation restriction form and recording requirements	NA	NA	NA	NA			
7:7-18.2 Additional requirements applicable to a conservation restriction for mitigation areas	NA	NA	NA	NA			
7:7-18.3 Reservation of rights	NA	NA	NA	NA			
SUBCHAPTER 19. RELAXATION OF PROCEDURES; RECONSIDERATION OF APPLICATION OF RULES							
7:7-19.1 Relaxation of procedures in this chapter	NA	NA	NA	NA			
7:7-19.2 Reconsideration of the application of a rule(s) in this chapter	NA	NA	NA	NA			
SUBCHAPTER 20. PROVISIONAL PERMITS							
7:7-20.1 Provisional permits	NA	NA	NA	NA			
SUBCHAPTER 21. EMERGENCY AUTHORIZATIONS							
7:7-21.1 Standard for issuance of an emergency authorization	NA	NA	NA	NA			
7:7-21.2 Procedure to request an emergency authorization	NA	NA	NA	NA			
7:7-21.3 Issuance of emergency authorization; conditions	NA	NA	NA	NA			
SUBCHAPTER 22. PRE-APPLICATION CONFERENCES							
7:7-22.1 Purpose and scope	NA	NA	NA	NA			
7:7-22.2 Request for a pre-application conference; scheduling; information required	NA	NA	NA	NA			
SUBCHAPTER 23. APPLICATION REQUIREMENTS							
7:7-23.1 Purpose and scope	NA	NA	NA	NA			
7:7-23.2 General application requirements	NA	NA	NA	NA			
7:7-23.3 Additional application requirements for an authorization under a general permit-by certification	NA	NA	NA	NA			
7:7-23.4 Additional application requirements for an authorization under a general permit or for an individual permit	NA	NA	NA	NA			
7:7-23.5 Compliance statement requirement for an application for authorization under a general permit	NA	NA	NA	NA			
7:7-23.6 Additional requirements specific to an application for an individual permit	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)					**DISCUSSION**	**Is action consistent with applicable policy?**	**Reference for further information**
PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)							
LOCATION: Salem County, NJ							
	ACTIVITY						
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
SUBCHAPTER 24. REQUIREMENTS FOR AN APPLICANT TO PROVIDE PUBLIC NOTICE OF AN APPLICATION							
7:7-24.1 Purpose and scope	NA	NA	NA	NA			
7:7-24.2 Timing of public notice of an application	NA	NA	NA	NA			
7:7-24.3 Contents and recipients of public notice of an application	NA	NA	NA	NA			
7:7-24.4 Additional requirements for public notice of an application for a CAFRA individual permit	NA	NA	NA	NA			
7:7-24.5 Content and format of newspaper notice	NA	NA	NA	NA			
7:7-24.6 Documenting public notice of an application; documenting public notice of public comment period or public hearing on CAFRA individual permit application	NA	NA	NA	NA			
SUBCHAPTER 25. APPLICATION FEES							
7:7-25.1 Application fees	NA	NA	NA	NA			
7:7-25.2 Adjustment of application fees	NA	NA	NA	NA			
SUBCHAPTER 26. APPLICATION REVIEW							
7:7-26.1 General application review provisions	NA	NA	NA	NA			
7:7-26.2 Applications for all coastal general permit authorizations and applications for waterfront development and coastal wetlands individual permits – completeness review	NA	NA	NA	NA			
7:7-26.3 CAFRA individual permit application – initial completeness review	NA	NA	NA	NA			
7:7-26.5 CAFRA individual permit application – public hearing	NA	NA	NA	NA			
7:7-26.6 Department decision on an application that is complete for review	NA	NA	NA	NA			
7:7-26.7 Cancellation of an application	NA	NA	NA	NA			
7:7-26.8 Withdrawal of an application	NA	NA	NA	NA			
7:7-26.9 Re-submittal of an application after denial, cancellation, or withdrawal	NA	NA	NA	NA			
7:7-26.10 Fee refund or credit when an application is returned, withdrawn, or cancelled	NA	NA	NA	NA			
SUBCHAPTER 27. PERMIT CONDITIONS; MODIFICATION, TRANSFER, SUSPENSION, AND TERMINATION OF AUTHORIZATIONS AND PERMITS							
7:7-27.1 Purpose and scope	NA	NA	NA	NA			
7:7-27.2 Conditions that apply to all coastal permits	NA	NA	NA	NA			
7:7-27.3 Extension of an authorization under a general permit or of a waterfront development individual permit for activities waterward of the mean high water line	NA	NA	NA	NA			
7:7-27.4 Transfer of an emergency authorization, an authorization under a general permit or an individual permit	NA	NA	NA	NA			
7:7-27.5 Modification of an authorization under a general permit or an individual permit	NA	NA	NA	NA			
7:7-27.6 Application for a modification	NA	NA	NA	NA			
7:7-27.7 Suspension of an authorization under a general permit, an individual permit, or an emergency authorization	NA	NA	NA	NA			
7:7-27.8 Termination of an authorization under a general permit, an individual permit, or an emergency authorization	NA	NA	NA	NA			
SUBCHAPTER 28. REQUESTS FOR ADJUDICATORY HEARINGS							
7:7-28.1 Procedure to request an adjudicatory hearing; decision on the request	NA	NA	NA	NA			
7:7-28.2 Procedure to request dispute resolution	NA	NA	NA	NA			

NEW JERSEY FEDERAL CONSISTENCY REVIEW OF N.J.A.C. 7:7 COASTAL ZONE RULES (Amended Oct. 5, 2021)					DISCUSSION	Is action consistent with applicable policy?	Reference for further information
PROJECT NAME: Salem River Federal Navigation Channel Maintenance Dredging and Beneficial Use of Dredged Material (BUDM)							
LOCATION: Salem County, NJ							
	ACTIVITY						
POLICY	**Maintenance Dredging of 16 ft MLLW Salem River Federal Navigation Channel (DE & NJ)***	**Dredged Material Disposal at Existing Killcohook Confined Disposal Facility (DE & NJ)***	**BUDM Intertidal Marsh Restoration at Goose Pond SMNWR (NJ)**	**BUDM Subtidal Nearshore of Oakwood Beach, NJ (DE)**			
7:7-28.3 Effect of request for hearing on operation of permit or authorization	NA	NA	NA	NA			
7:7-28.4 Notice of certain settlement discussions on a coastal permit decision; notice of settlement agreement	NA	NA	NA	NA			
SUBCHAPTER 29. ENFORCEMENT							
7:7-29.1 General provisions	NA	NA	NA	NA			
7:7-29.2 Issuance of an administrative order	NA	NA	NA	NA			
7:7-29.3 Assessment, settlement, and payment of a civil administrative penalty	NA	NA	NA	NA			
7:7-29.4 Procedures to request and conduct an adjudicatory hearing to contest an administrative order and/or a notice of civil administrative penalty assessment	NA	NA	NA	NA			
7:7-29.5 Civil administrative penalties for failure to obtain a permit prior to conducting regulated activities	NA	NA	NA	NA			
7:7-29.6 Civil administrative penalties for violations other than failure to obtain a permit prior to conducting regulated activities	NA	NA	NA	NA			
7:7-29.7 Civil penalties	NA	NA	NA	NA			
7:7-29.8 Civil actions	NA	NA	NA	NA			
7:7-29.9 Criminal action	NA	NA	NA	NA			
7:7-29.10 Grace period applicability; procedures	NA	NA	NA	NA			
NA-Activity is not applicable to coastal policy							
X-Feature has applicability and/or an effect on coastal resource policy							

Delaware

Federal Consistency Review

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Delaware Department of Natural Resources and
Environmental Control
Delaware Coastal Management Program

Initial Review: ________
Updated On: ________
Complete: ________
Official Use Only

Coastal Zone Management Act
Federal Consistency Form

This document provides the Delaware Coastal Management Program (DCMP) with a Federal Consistency Determination or Certification for activities regulated under the Coastal Zone Management Act of 1972, as amended, and NOAA's Federal Consistency Regulations, 15 C.F.R. Part 930. Federal agencies and other applicants for federal consistency are not required to use this form; it is provided to applicants to facilitate the submission of a Consistency Determination or Consistency Certification. In addition, federal agencies and applicants are only required to provide the information required by NOAA's Federal Consistency Regulations.

Project/Activity Name:	Salem River Federal Navigation Channel Maintenance and Beneficial Use of Dredged Material

I. Federal Agency or Non-Federal Applicant Contact Information:

Contact Name/Title: Steven D. Allen

Federal Agency Contractor Name (if applicable): ________

Federal Agency: U.S. Army Corps of Engineers, Philadelphia District
(either the federal agency proposing an action or the federal agency issuing a federal license/permit or financial assistance to a non-federal applicant)

Mailing Address: Macquarie Building 100 South Independence Mall West (Interim) Philadelphia, PA 19106-3400

City: Philadelphia State: PA Zip Code: 19106-3400

E-mail: Steven.D.Allen@usace.army.mil Telephone #: 215-656-6559

II. Federal Consistency Category:

● Federal Activity or Development Project (15 C.F.R. Part 930, Subpart C)

○ Outer Continental Shelf Activity (15 C.F.R. Part 930, Subpart E)

○ Federal Financial Assistance (15 C.F.R. Part 930, Subpart F)

○ Federal License or Permit Activity (15 C.F.R. Part 930, Subpart D)

○ Federal License or Permit Activity which occurs wholly in another state (interstate consistency activities identified in DCMP's Policy document)

III. Detailed Project Description (attach additional sheets if necessary):

To maintain the authorized Salem River Federal Navigation Channel (FNC), by dredging and removal of shoals to a depth of 16 ft MLLW (+1 ft over-depth) within the channel. Approximately, 200,000 cubic yards of fine-grained sediment material would be placed in the Goose Pond area of the Supawna Meadows National Wildlife Refuge (NWR) in Salem County, NJ. The Goose Pond area abuts Delaware waters, and the receiving waters would be the Delaware River in New Castle County, Delaware. The purpose of the placement at the Goose Pond location in Supawna Meadows (NWR) is for the Beneficial Use of Dredged Material (BUDM) to restore brackish tidal marsh wetlands, which require influxes of sediments to counter the effects of sea level rise and subsidence. This activity is described in the 2023 Draft EA. Additional related actions are the continued placement of sand in the nearshore of Oakwood Beach as BUDM (FC 2022.0011) from maintenance of the Salem River FNC and the continued use of the Killchook Confined Disposal Facility (Fedcon issued 4/12/1991) to provide flexibility in dredged material disposal and management options.

IV. General Analysis of Coastal Effects (attach additional sheets if necessary):

The maintenance dredging of the approach channel for the Salem River Federal Navigation Project (previously authorized) and associated floating pipeline distribution route occurs in the Delaware River adjacent to Salem Cove and Oakwood Beach within State of Delaware territorial waters. The BUDM placement of approximately 200,000 cubic yards of fine-grained sediments would occur at the Goose Pond area of Supawna Meadows NWR in shallow subtidal and intertidal waters located in Salem County, NJ however, drainage from the area is in the Delaware River receiving waters located in New Castle County, Delaware. This is a new action. Therefore, both activities would have coastal effects in Delaware (A federal consistency review will also be initiated with the State of New Jersey).

V. Detailed Analysis of Consistency with DCMP Enforceable Policies (attach additional sheets if necessary):

Policy 5.1: Wetlands Management

The BUDM activity at Goose Pond in Supawna Meadows would occur in wetlands in New Jersey, and would increase wetland acreage and productivity within the affected area (approximately 42 acres). No effects are anticipated in Delaware's jurisdiction.

Policy 5.2: Beach Management

No effect.

Policy 5.3: Coastal Waters Management (includes wells, water supply, and stormwater management. Attach additional sheets if necessary)

The discharge of BUDM fine-grained sediments into the Goose Pond area of Supawna Meadows NWR in New Jersey will generate turbidity in the receiving waters of the tidally-connected Delaware River in Delaware. This effect is expected to be temporary and localized. This portion of the Delaware Estuary is within the turbidity maximum zone. The pre-dredge sediments in the Salem River FNC were tested and evaluated for contaminants and do not indicate that their discharge would exceed Delaware's surface water quality standards. More information is provided in the Draft EA.

Policy 5.4: Subaqueous Land and Coastal Strip Management

The maintenance dredging of the Salem River FNC would occur within Subaqueous Lands in Delaware waters. Section 401 Water Quality Certification will be requested from DNREC upon review of the submitted application materials.

Policy 5.5: Public Lands Management

No effect.

Policy 5.6: Natural Lands Management

No effect.

Policy 5.7: Flood Hazard Areas Management

No effect.

Policy 5.8: Port of Wilmington

No effect.

Policy 5.9: Woodlands and Agricultural Lands Management

No effect.

Policy 5.10: Historic and Cultural Areas Management

The maintenance dredging of the Salem River FNC was evaluated in accordance with Section 106 of the National Historic Preservation Act, and the Delaware State Historic Preservation Office concurred with a "no effect" determination on historic and cultural resources (DESHPO letter dated 1/12/1989). The Goose Pond area of Supawna Meadows NWR would be under the jurisdiction of the New Jersey SHPO and the BUDM activity would require a "no effect" determination from the NJSHPO.

Policy 5.11: Living Resources

The maintenance dredging of the Salem River FNC would periodically remove the benthic community within the shoaled areas of the channel. This effect is temporary as the benthic community is expected to recover between dredging intervals. The dredging and BUDM discharges would affect finfish either through entrainment into the dredge or through turbidity generated from the dredging/BUDM placements. To avoid or minimize effects to migratory fish, a seasonal restriction would be in place from March 1 to June 30th during peak migration period. The affected areas within the Delaware River in Delaware are inhabited by several federal and state listed threatened and endangered species including the Atlantic sturgeon, shortnose sturgeon, loggerhead sea turtle, Kemp's Ridley sea turtle, hawksbill turtle, and green sea turtle. Informal consultation is being conducted with the NOAA Fisheries. The EA preliminary conclusion is that the activities may affect, but are not likely to adversely affect these species.

Policy 5.12 Mineral Resources Management

No effect.

Policy 5.13: State Owned Coastal Recreation and Conservation

No effect.

Policy 5.14: Public Trust Doctrine

The public would be temporarily prohibited from entering work areas such as dredging locations, pipelines, and discharge points at BUDM locations until work is completed. The Killcohook CDF is not open for public access.

Policy 5.15: Energy Facilities

No effect.

Policy 5.16: Public Investment

No effect.

Policy 5.17: Recreation and Tourism

No effect.

Policy 5.18: National Defense and Aerospace Facilities

No effect.

Policy 5.19: Transportation Facilities

No effect.

Policy 5.20: Air Quality Management

All dredging and disposal/BUDM activities will result in temporary and localized increases in emissions associated with diesel powered equipment. Based on the size of the operation and duration, air emissions are expected to be below the de minimus threshold for a marginal ozone nonattainment area. Therefore, a General Conformity determination is not required based on the expected de minimus level emissions along with the proposed action meeting the exemption for maintenance dredging under 40 CFR § 93.153 (c)(2)(ix).

Policy 5.21: Water Supply Management

No effect.

Policy 5.22: Waste Disposal Management

No effect.

Policy 5.23: Development

No effect.

Policy 5.24: Pollution Prevention

The proposed actions will be conducted in a manner that complies with pollution prevention policies in accordance with waste management and spill prevention and abatement practices.

Policy 5.25: Coastal Management Coordination

The proposed action will be reviewed concurrently under the National Environmental Policy Act as a draft Environmental Assessment made available for public and agency review. Section 401 Water Quality Certification review will be requested from DNREC and a Federal Consistency Determination and Section 401 Water Quality Certification will be requested from the New Jersey Department of Environmental Protection for activities within NJ jurisdiction. The EA and other documents such as Essential Fish Habitat Evaluation and Endangered Species reviews will be provided to NOAA Fisheries and the U.S. Fish and Wildlife Service.

VI. JPP and RAS Review (Check all that apply)**:**

Has the project been reviewed in a monthly Joint Permit Processing and/or Regulatory Advisory Service meeting?

☐ JPP ☐ RAS ☒ None

*If yes, provide the date of the meeting(s): ____________________

VII. Statement of Certification/Determination and Signature (Check one and sign below):

☒ **FEDERAL AGENCY CONSISTENCY DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity is consistent to the maximum extent practicable with the enforceable policies of the Delaware Coastal Management Program.

OR

☐ **FEDERAL AGENCY NEGATIVE DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity will not have any reasonably foreseeable effects on Delaware's coastal uses or resources (Negative Determination) and is therefore consistent with the enforceable policies of the Delaware Coastal Management Program.

OR

☐ **NON-FEDERAL APPLICANT'S CONSISTENCY CERTIFICATION.** Based upon the information, data, and analysis included herein, the non-federal applicant for a federal license or permit, or state or local government agency applying for federal funding, listed in (I) above, finds that this proposed activity complies with the enforceable policies of the Delaware Coastal Management Program and will be conducted in a manner consistent with such program.

Signature:			
Printed Name:	Peter R. Blum, Chief Planning Division	Date:	2/6/2023

Pursuant to 15 C.F.R. Part 930, the Delaware Coastal Management Program must provide its concurrence with or objection to this consistency determination or consistency certification in accordance with the deadlines listed below. Concurrence will be presumed if the state's response is not received within the allowable timeframe.

Federal Consistency Review Deadlines:

Federal Activity or Development Project (15 C.F.R. Part 930, Subpart C)	60 days with option to extend an additional 15 days or stay review (15 C.F.R. § 930.41)
Federal License or Permit (15 C.F.R. Part 930, Subpart D)	Six months, with a status letter at three months. The six month review period can be stayed by mutual agreement. (15 C.F.R. § 930.63)
Outer Continental Shelf Activity (15 C.F.R. Part 930, Subpart E)	Six months, with a status letter at three months. If three month status letter not issued, then concurrence presumed. The six month review period can be stayed by mutual agreement. (15 C.F.R. § 930.78)
Federal Financial Assistance to State or Local Governments (15 C.F.R. Part 930, Subpart F)	State Clearinghouse schedule

OFFICIAL USE ONLY:

Reviewed By:	Fed Con ID:	Date Received:
Public notice dates: to	Comments Received: ☐ NO ☐ YES *[attach comments]*	
Decision type: *(objections or conditions attach details)*	_ Decision Date:	

APPENDIX F

Draft
Finding of No Significant Impact (FONSI)

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Draft

FINDING OF NO SIGNIFICANT IMPACT
SALEM RIVER FEDERAL NAVIGATION CHANNEL AND BENEFICIAL USE OF DREDGED MATERIAL
SALEM COUNTY, NEW JERSEY
AND
NEW CASTLE COUNTY, DELAWARE

The U.S. Army Corps of Engineers, Philadelphia District (USACE) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The draft Environmental Assessment (EA), dated 13 February 2023 and titled *Salem River Federal Navigation Channel and Beneficial Use of Dredged Material – Salem County, New Jersey and New Castle County, Delaware* evaluates existing environmental, cultural, and socio-economic conditions and the effects of the project on existing resources at the proposed project site in the Salem River, Delaware River, Supawna Meadows National Wildlife Refuge (Goose Pond area), Oakwood Beach and Killcohook Confined Disposal Facility (CDF). The EA also evaluates the effects on existing resources of not dredging the federal channel (No Action Alternative) and the current maintenance dredging and placement practices (Current Practice).

The USACE is proposing to conduct maintenance dredging of the Salem River Federal Navigation Channel (FNC) in the vicinity of Salem Cove in New Castle County, DE and to beneficially place the material within the Goose Pond area of the U.S. Fish and Wildlife Service (USFWS) – Supawna Meadows National Wildlife Refuge (Salem County, NJ), which is a subtidal mudflat and intertidal brackish marsh along the Delaware River. The Service reports significant losses of intertidal marsh habitats due to subsidence and conversions to open water, which are important for trust wildlife species. The USFWS proposes to restore the marsh habitats by building elevation to intertidal elevations to establish a mosaic of intertidal mudflat and low marsh habitat. Another objective is to beneficially place sandy dredged material into the subtidal nearshore shoreline of Oakwood Beach (New Castle County, DE) to provide a littoral zone - sand source to the existing USACE-Coastal Storm Risk Management Project. Additionally, the existing authorized Killcohook CDF would be retained as needed for dredged material disposal.

Approximately 200,000 cubic yards of silts, fine sands, and clays would initially be hydraulically dredged to remove shoals within the Salem River Federal Navigation Channel over a period of approximately 16 weeks in the July thru February timeframe and placed within the Goose Pond area of Supawna Meadows National Wildlife Refuge with a target elevation at +1.5 ft. NAVD to establish desirable low marsh habitat. To achieve the final elevation, multiple placements of sediment would be required. The fill material would be dredged from the Salem River FNC and brought to the Goose Pond area via a floating pipeline. The dredged material would be piped through a "Y" distributor directly into the Goose Pond area for infilling to the surrounding marsh elevation. Monitoring to ensure sediment accretion and elevation objectives are being met would be conducted during and after placement activities. The placement within the Oakwood Beach nearshore would be accomplished with a small split-hull hopper dredge that allows the vessel to enter into shallow water to place sandy material from portions of the Salem FNC containing sand shoals. Placement would occur within a 90-acre area fronting Oakwood Beach in depths ranging from -4 to -8 ft MLLW. The plan also includes the continued use of the Killcohook CDF, which would receive Salem River FNC dredged material via hydraulic pipeline dredge approximately 3.5 miles from the CDF. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	☒	☐	☐
Air quality	☒	☐	☐
Aquatic resources/wetlands	☒	☐	☐
Invasive species	☒	☐	☐
Fish and wildlife habitat	☒	☐	☐
Threatened/Endangered species/critical habitat	☒	☐	☐
Historic properties	☐	☐	☒
Other cultural resources	☐	☐	☒
Floodplains	☐	☐	☒
Hazardous, toxic & radioactive waste	☐	☐	☒
Hydrology	☒	☐	☐
Land use	☐	☐	☒
Navigation	☒	☐	☐
Noise levels	☒	☐	☐
Public infrastructure	☒	☐	☐
Socio-economics	☒	☐	☐
Environmental justice	☐	☐	☒
Soils	☒	☐	☐
Tribal trust resources	☐	☐	☒

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Water quality	☒	☐	☐
Climate change	☐	☐	☒

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs), as applicable, will be implemented to minimize impacts.[1] In consultation with the NOAA Fisheries, pursuant to the Magnuson Stevens Fishery Conservation and Management Act (MSA) for the protection of Essential Fish Habitat (EFH) and federally-managed fish species, USACE will adhere to NOAA Fisheries recommended seasonal restricted period for dredging and placement activities. USACE will continue to coordinate with NMFS to apply adaptive management to the monitoring program for each future placement operation. Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, a determination that the project may affect, but is not likely to adversely affect listed species or critical habitat was submitted to NOAA Fisheries Greater Atlantic Regional Field Office for review. A determination that the action is not likely to adversely affect the sensitive joint vetch plant was submitted to the U.S. Fish and Wildlife Service for review. All terms and conditions of the Section 7 consultation with NOAA Fisheries and USFWS shall be implemented in order to minimize take or jeopardizing endangered species.

Public review of the draft EA was initiated 15 February and completed on 17 March 2023. All comments submitted during the public review period are addressed in the Final EA and included in the Correspondence Appendix. Comments from state and federal agency review did not result in any changes to the final EA. All state and federally-mandated approvals have been received.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, USACE determined that no historic properties will be adversely affected by the recommended plan. The determination was submitted to the New Jersey and Delaware State Historic Preservation Offices for review and concurrence.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with Section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is included in the Final EA.

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[1] 40 CFR 1505.2(C) all practicable means to avoid and minimize environmental harm are adopted.

Water Quality Certification pursuant to Section 401 of the Clean Water Act will be obtained from the Delaware Department of Natural Resources and Environmental Control and New Jersey Department of Environmental Protection. All conditions of the Water Quality Certification shall be implemented in order to minimize adverse impacts to water quality.

A determination of consistency with the Delaware and New Jersey Coastal Zone Management Program pursuant to the Coastal Zone Management Act of 1972 will be obtained from both states. All conditions of the consistency determination shall be implemented in order to minimize adverse impacts to the coastal zone.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date

Ramon Brigantti P.E.
Lieutenant Colonel, Corps of Engineers
District Commander