# Edwin B. Forsythe National Wildlife Refuge: Marsh Enhancement Design/Build Project

## Environmental Assessment

**U. S. Fish and Wildlife Service**

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# LIST OF ACRONYMS

| | |
|---|---|
| µS/cm | Micro-Siemens per centimeter |
| ACOE-ERDC | Army Corps of Engineers-Engineering, Research, and Development Center |
| Amec | Amec Foster Wheeler, Environment & Infrastructure, Inc. |
| APE | Area of Potential Effect |
| AT&T | American Telephone & Telegraph |
| BB-LEH | Barnegat Bay-Little Egg Harbor |
| BCM | Bureau of Coastal Management |
| BGEPA | Bald and Golden Eagle Protection Act |
| BIDEH | Biological Integrity, Diversity, and Environmental Health |
| BTEs | Biological Target Elevations |
| °C | Degrees Celsius |
| CAFRA | Coastal Area Facility Review Act |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CY | Cubic yards |
| DFW | Division of Fish and Wildlife |
| DLUR | Division of Land Use Regulation |
| DO | Dissolved Oxygen |
| EA | Environmental Assessment |
| EFH | Essential Fish Habitat |
| EFHA | Essential Fish Habitat Area |
| E&S | Soil Erosion and Sediment |
| ESA | Endangered Species Act |
| °F | Degrees Fahrenheit |
| FONSI | Findings of No Significant Impact |
| HAPC | Habitat Areas of Particular Concern |
| HSM | High Salt Marsh |
| IPaC | Information, Planning, and Conservation |
| LiDAR | Light Detection and Ranging |
| LSM | Low Salt Marsh |
| MBTA | Migratory Bird Treaty Act |
| mg/L | Milligrams per liter |
| MHW | Mean High Water |
| MLW | Mean Low Water |
| mm/yr | Millimeters per year |
| msl | Mean Sea Level |
| MUTCD | Manual on Uniform Traffic Control Devices |
| NAAQS | National Ambient Air Quality Standards |
| NAVD 88 | North American Vertical Datum 1988 |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NJAAQS | New Jersey Ambient Air Quality Standards |
| N.J.A.C. | New Jersey Administrative Code |
| NJDEP | New Jersey Department of Environmental Protection |
| NJDOT | New Jersey Department of Transportation |
| NJFO | New Jersey Field Office |

| | |
|---|---|
| NJICW | New Jersey Intracoastal Waterway, |
| N.J.S.A. | New Jersey Statutes Annotated |
| NJSM | New Jersey State Museum |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NWI | National Wetlands Inventory |
| OCMC | Ocean County Mosquito Commission |
| OCSCD | Ocean County Soil Conservation District |
| ODST | Office of Dredging Sediment and Technology |
| OMWM | Open Marsh Water Management |
| PCBs | Polychlorinated biphenyls |
| ppt | Parts per thousand |
| SAV | Submerged Aquatic Vegetation |
| Service | United State Fish and Wildlife Service |
| SHPO | State Historic Preservation Office |
| SILs | Significant Impact Levels |
| SLAMM | Sea-Level Affecting Marshes Model |
| SMI | Salt Marsh Integrity |
| SVOCs | Semi-volatile Organic Compounds |
| SWQS | Surface Water Quality Standards |
| TSS | Total Suspended Solids |
| USACE | United States Army Corps of Engineers |
| U.S.C. | United States Code |
| USDOI | United States Department of the Interior |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| USNVCS | National Vegetation Classification Standard |
| WCS | Water Control Structure |
| WMA | Watershed Management Area |
| WOTUS | Waters of the United States |

# Chapter 1 - Introduction

Global climate change and accompanying sea level rise is threatening our nation's coastal environments. The Earth's surface temperatures have risen by 1.3 degrees Fahrenheit ($^{o}$F) over the last 100 years, with a rate of warming over the last 50 years almost double that of the rate of warming over the last 100 years (USEPA 2010). This global climate change produces a number of far-reaching environmental effects, of which sea level rise is one of the most pronounced (Climate Institute 2010). The relationship between global climate change and sea level rise is closely linked (Poore *et al*. 2000) with the rate of sea level rise largely attributed to global warming (UCS 2013). Three major factors link global climate change to sea level rise. These are (1) the thermal expansion of the world's oceans as water temperatures increase, (2) the increased melting rate of the world's glaciers and ice caps, and (3) the loss of ice mass from Greenland and Antarctica (Climate Institute 2010, Cooper *et al.* 2005, Poore *et al.* 2000, UCS 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 21$^{st}$ Century (Climate Institute 2010, UCS 2013). The global average of sea level rise is approximately 8 inches since the Industrial Revolution, but other areas of the world, particularly the East and Gulf Coasts 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). Executive Order No. 13653 (2013) states that global climate change induced sea level rise is a significant threat to the nation's natural infrastructure, and for their associated species and habitats.

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). The amplification of these natural coastline dynamics can cause unwanted environmental conditions such as permanent inundation, beach erosion, episodic flooding that reaches farther inland, and saline intrusion into low-lying coastal areas (Cooper *et al.* 2005, NJDEP 2011a). These types of adverse 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).

Meeting the challenge of sea level rise will require increasing the resiliency of the coastline (UCS 2013). Executive Order No. 13653 requires deliberate preparation and close cooperation between the public and private sectors to improve climate preparedness and resilience. Likewise, the United States Department of the Interior (USDOI) Secretarial Order No. 3289 (2009) states that as the USDOI is the primary land, water, and wildlife manager for the nation, they have an obligation to address the impacts of climate change and sea level rise by developing adaptation and mitigation strategies. "Resiliency" is a recurring theme in technical and governmental discussions for preparing the nation's coastlines in response to sea level rise. Mentioned directly in Executive Order No. 13653 and The White House Office of the Press Secretary "Fact Sheet for New Jersey and the Northeast" (The White House 2014), increasing coastline resiliency is reported as an

effective strategy for dealing with the adverse effects of sea level rise (Climate Central 2014, UNEP n.d.).

Sea level rise and the effects of historical human-induced impacts to New Jersey's coastline have resulted in a degraded condition that is forecasted to worsen over time if not actively managed. Predictive tools such as the National Oceanic and Atmospheric Administration's (NOAA) Sea Level Rise Affecting Marsh Model (SLAMM) and assessment tools such as the United States Fish and Wildlife Service's (Service) Salt Marsh Integrity (SMI)[1] monitoring system, indicate the continued degradation and loss of important salt marsh along the New Jersey coast. Such degradation and loss runs counter to the mission of the National Wildlife Refuge (NWR) System, the purpose of the refuge, and the goals of the refuge Comprehensive Conservation Plan (CCP) (USFWS 2004).

This Environmental Assessment (EA) examines a Proposed Action (Project) to increase the resiliency[2] of salt marshes within the Service's Edwin B. Forsythe National Wildlife Refuge (refuge) in response to sea level rise and other human-induced impacts. The Service is the lead Federal agency in charge of the Proposed Action. More than 82 percent of the refuge is wetlands, of which 78 percent of these wetlands is salt marsh (USFWS 2009). In 1986, the refuge was placed on the Ramsar List of Wetlands of International Importance, a list that recognizes wetlands of significant value for the country, surrounding countries, and for all of humanity. The refuge is also part of the Jacques Cousteau National Estuarine Research Reserve. The refuge intersects with the Manahawkin Bay Natural Heritage Priority Macrosite, designated by the NJDEP as some of the State's most significant habitats (NJA 2015).

Since 2008, the refuge has been developing and collecting SMI data, which has involved extensive amounts of time traversing refuge marshes on foot and by boat. This time spent in the marsh has provided an opportunity for refuge and regional Service biologists to identify both qualitatively healthy and degraded marshes within the region. Biologists examined the condition of marshes, including the ditch density, tidal flushing, and vegetation. As sites were qualitatively compared to the refuge and region, the suite of sites in need of restoration identified first through best professional judgment was further refined through discussions with expert partners as well as more intensive quantitative monitoring through a contract with Amec Foster Wheeler.

The refuge salt marshes provide critical habitat for a wide variety of commercially and recreationally important wildlife, acts as a buffer against storm surges and coastal flooding, and serves to improve water quality. However, these are suffering from subsidence (i.e. marsh drowning), as evidenced by a marked increase in the number of pools and salt pannes[3], an increase in the acreage of these pools and salt pannes, and the prevalence of low vigor vegetation. The marshes are also suffering from altered and impeded hydrology from the presence of old dikes and berms that no longer serve their intended purpose, and in one case, an undersized culvert which is

[1] Since 2008, the refuge has been developing and collecting data for SMI, which has involved extensive amounts of time traversing refuge marshes on foot and by boat. The data allows refuge and regional Service biologists to identify both quantitatively and qualitatively, healthy and degraded marshes within the region.
[2] Salt marsh resiliency is defined here as the ability of a salt marsh to return to a sustainable state after impacts from sea level rise, large storm events, and other ecosystem stressors (USFWS 2015a).
[3] Pannes are shallow depressions in the marsh that typically contain high salinity.

restricting tidal flow. These conditions of marsh subsidence and altered hydrology have an additive effect upon each other and collectively lower the ecological integrity of the salt marsh. The environmental consequences of these conditions are discussed in Chapter 2. Photographs depicting such areas of mash subsidence and altered hydrology are presented in **Appendix A**.

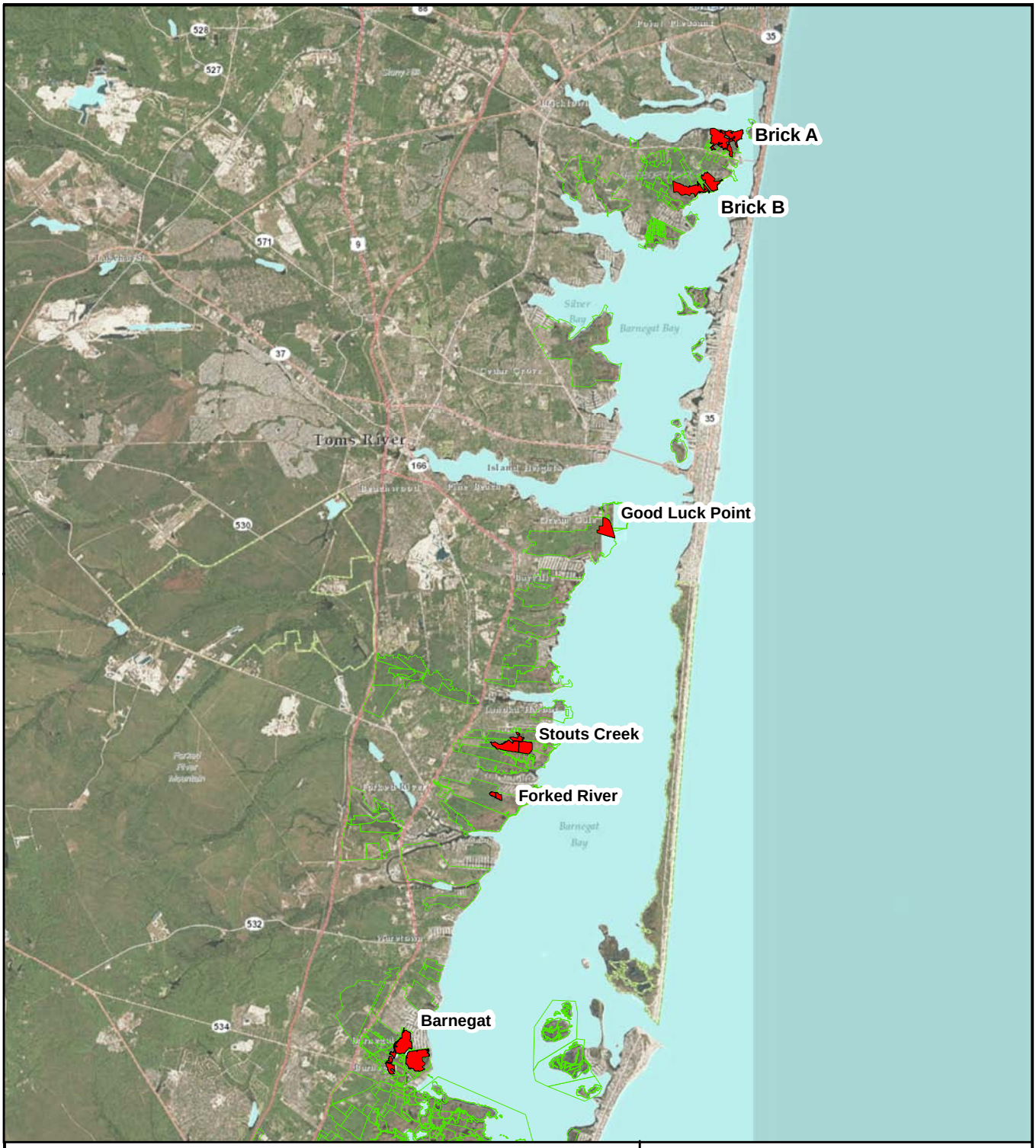
The Project thus proposes to increase salt marsh resiliency by (1) counteracting the negative effects of subsidence-based marsh loss by increasing the elevation of the salt marsh and (2) counteracting the negative effects of altered hydrology by a recreating a marsh topography that is more effective for proper hydrologic function. The Project will accomplish these goals by opening areas of restricted tidal flow and increasing the elevation of some areas of the refuge. This increased resiliency will be a by-product of improvement of approximately 500 acres of estuarine-salt marsh habitat among the following five Project locations within the refuge. Increasing the resiliency and enhancing the refuge wetlands is clearly a step towards ensuring the ecological role of these Project areas within the larger ecosystem (**Figure 1-1**):

- Brick A
- Brick B
- Good Luck Point
- Stouts Creek
- Forked River
- Barnegat

These areas proposed for enhancement are deficient in sediment deposition, tidal flow, or altered by anthropogenic actions. This Project will be conducted as the second phase of the Service's Marsh Enhancement and Telephone Array Removal Project and will take place at the above separate areas within the refuge. An Assessment has been developed for sediment enrichment[4] at Brick A, Brick B, and Good Luck Point, the replacing or addition of a culvert at Good Luck Point, and the decommissioning (i.e. breaching of dikes) of three non-functioning impoundments at Stouts Creek, Forked River, and Barnegat.

This document presents a detailed discussion of the purpose and need for the Proposed Action in Chapter 2, with an overview of the Project components and goals. Chapter 3 describes the existing conditions at each of the five Project areas, including topics such as their physical and environmental settings, ecology, and socioeconomic factors. Chapter 4 presents greater detail of the specific scope of work components for each Project area and discusses alternatives that were considered, including a scenario for not implementing the Project (i.e. a No Action Alternative). Chapter 5 presents an assessment of the consequences for each alternative, including the No Action Alternative. The EA concludes with literature references in Chapter 6, and list of report preparers in Chapter 7.

[4] Sediment enrichment involves depositing a layer of sediment to increase the elevation of the marsh. Generally, sediment less than 6 inches thick results in revegetation by sprouting of the seed bank, while sediment deposits greater than 6 inches smother and kill the vegetation requiring revegetation with new plant material (Ford *et al.* 1999).



**Legend**

- Project Area Boundary
- Refuge Boundary

N
W E
S

0 2 4
Miles

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

amec foster wheeler

Figure 1.1

Project Overview
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
|---|---|---|

# Chapter 2 - Purpose and Need

## 2.1 Statement of the Problem

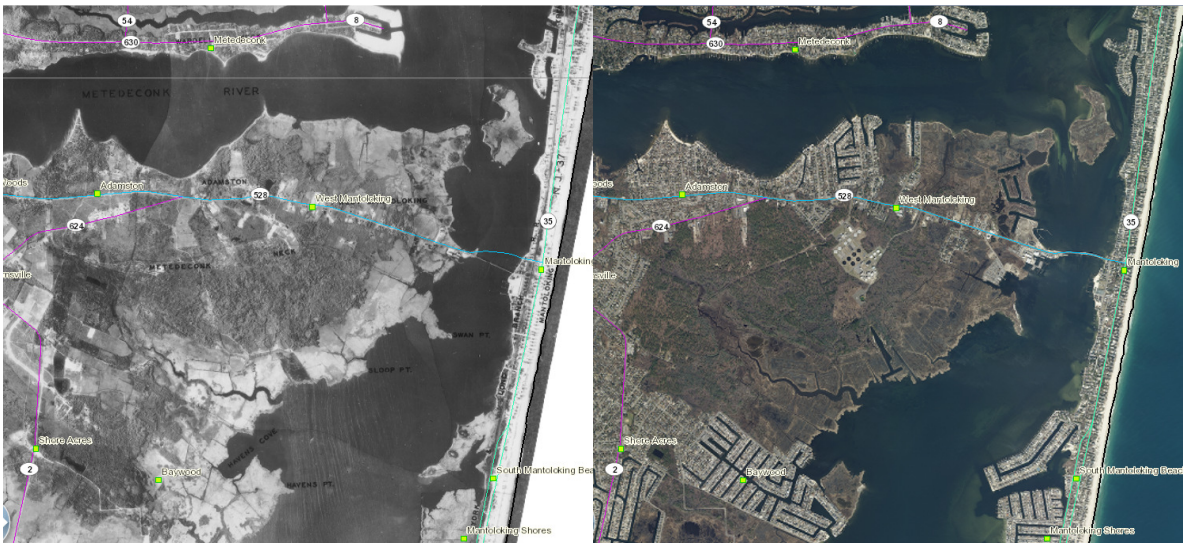
The importance of wetlands are well understood for providing fish and wildlife habitat, natural water quality improvement, flood storage, shoreline erosion protection, opportunities for recreation and aesthetic appreciation, and for the production of natural products (USEPA 2016). Wetlands are generally 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 2015a). The elevation of a salt marsh determines the rate, frequency, and duration of tidal inundation that the marsh surface experiences, which determines what plant species can survive there, which in turn determines the resulting vegetation community.

Salt marshes are typically divided into two vegetation zones based on elevation: low marsh and high marsh. The low marsh community is flooded twice daily (semidiurnal) by high tides and is dominated almost exclusively by smooth cordgrass (*Spartina alterniflora*). The high marsh community is irregularly flooded and usually dominated by saltmeadow cordgrass (*Spartina patens*) and seashore saltgrass (*Distichlis spicata*). As elevation increases, shrub species such as groundsel tree (*Baccharis halimifolia*) and saltmarsh elder (*Iva frutescens*) become prevalent, although in disturbed land areas, the invasive species common reed (*Phragmites australis*) also occurs, sometimes in dense, monotypic stands. The salt marsh pannes are usually vegetated with glassworts (*Salicornia* spp.) that can tolerate the relatively saltier conditions of this habitat.

Because salt marshes only exist within this narrow range of elevation, they are highly susceptible to the effects of sea level rise. 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, New Jersey's salt marshes cannot keep pace with the rate of sea level rise. 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).

A review of historical aerial imagery for the five Project areas suggest that vertical accretion and sea level rise have been relatively synchronous; however, a few instances suggest that these Project areas are indeed starting to become wetter. The following pages present side-by-side visual comparisons of the five Project areas from past years to the present.

A side-by-side comparison of the region containing the Brick A and Brick B Project areas reveal little change in the coastline shape and wetted area between 1930 (left) and 2012 (right):

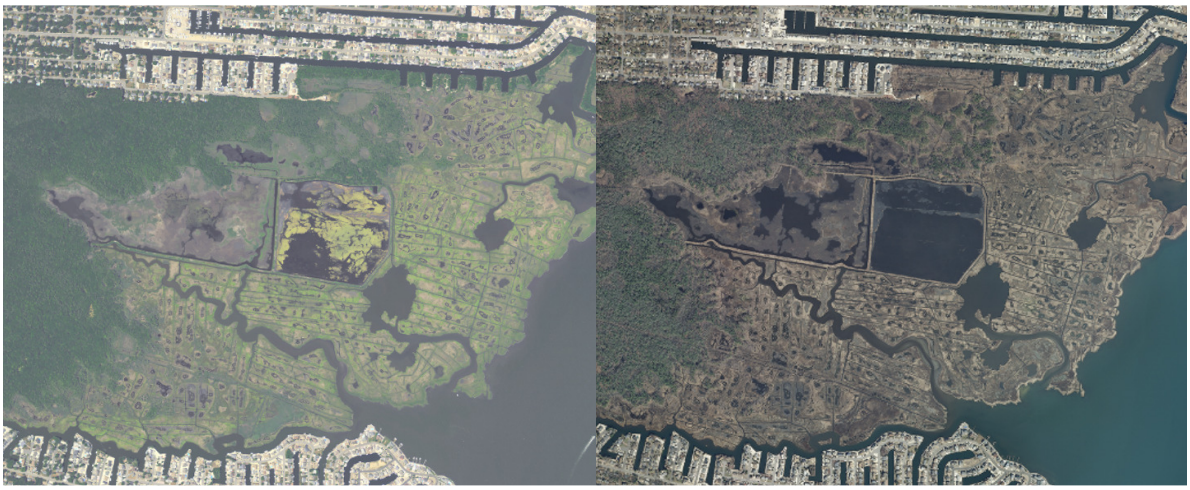



Source: NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm)

A side-by-side comparison of the region containing the Good Luck Point Project area reveal little change in the coastline shape but an increase in wetted area between 1930 (left) and 2012 (right):

Source: NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm)

A side by side comparison of the region containing the Stouts Creek Project area reveals an increase in the amount of wetted area between 2010 (left) and 2012 (right):



Source: NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm)

A side-by-side comparison of the region containing the Forked River Project area reveals an increase in the amount of wetted area between 2010 (left) and 2012 (right):

Source: NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm)

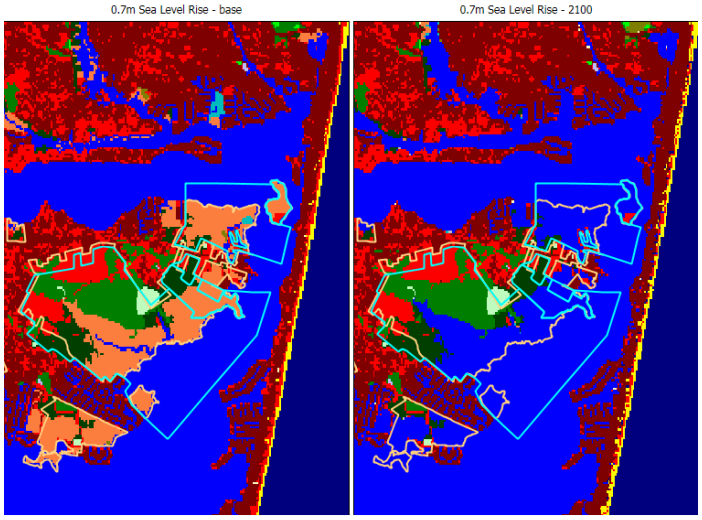
A side-by-side comparison of the region containing the Barnegat Project area reveals an increase in the wetted area between 2010 (left) and 2012 (right):

Source: NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm)

Cooper et al. (2005) reports the findings of Gormitz (1995) and Hartig et al. (2001) that wetland accretion along the mid-Atlantic coast has stagnated, but with large regional variation, implying that some areas are outpacing sea level rise whereas other areas are experiencing wetland loss. Although these data are variable, the average accretion rate for New Jersey is estimated to be 2 mm per year, less than the 3.5 mm per year of average sea level rise. This suggests that New Jersey's coast will be unable to keep pace with sea level rise and risks permanent inundation.

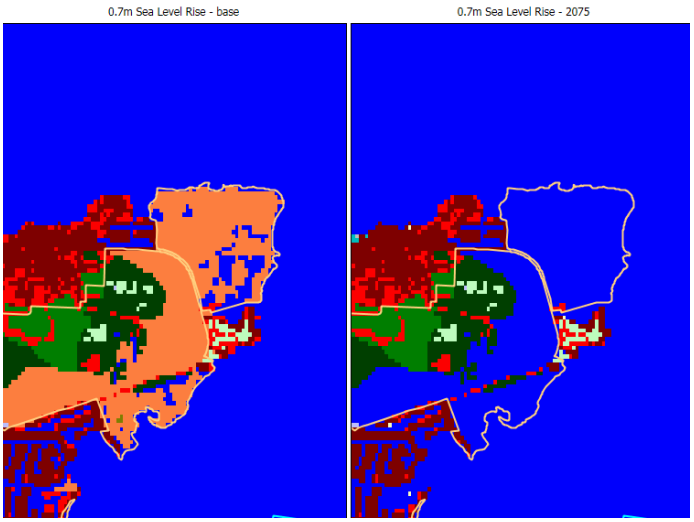
This prediction is well represented visually when using the SLAMM assessment tool mentioned in Chapter 1 (http://www.slammview.org/). The SLAMM tool not only examines sea level rise, but also takes into account other factors such as biological impacts, sediment and organic matter accumulation on the marshes, and erosion from tides and storms, resulting in a more realistic model. The user of this tool can select between a simple quick viewer mode and a more detailed input mode to depict a number of outputs. The following pages present side-by-side visual comparisons of the five Project areas from the present to the future, indicating a marked change in the shoreline and extent of coastline inundation.

A side-by-side comparison of the region containing the Brick Project areas predicts that a 0.7-meter (2.3-foot) rise in sea level will result in the inundation of the present coastline (left) by the Year 2025 (right), where the dark blue color depicts open water:



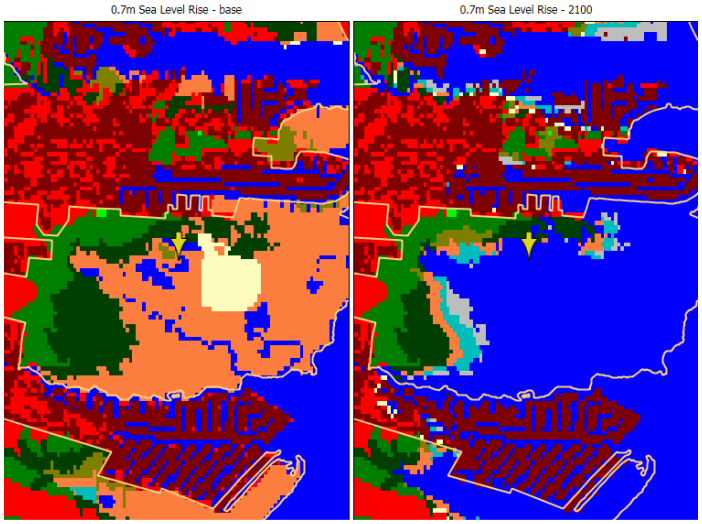

Source: Sea Level Rise Affecting Marshes Model (SLAMM; (http://www.slammview.org/)

A side-by-side comparison of the region containing the Good Luck Point Project area predicts that a 0.7-meter (2.3-foot) rise in sea level will result in the inundation of the present coastline (left) by the Year 2075 (right):



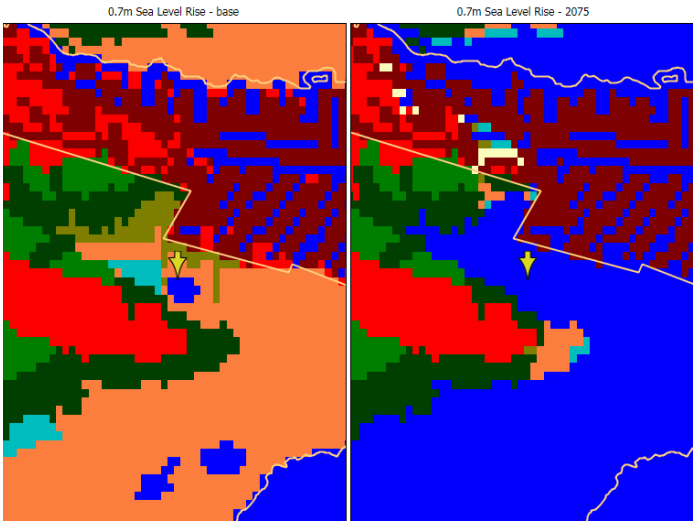

Source: Sea Level Rise Affecting Marshes Model (SLAMM; (http://www.slammview.org/)

A side-by-side comparison of the region containing the Stouts Creek Project area predicts that a 0.7-meter (2.3-foot) rise in sea level will result in the inundation of the present coastline (left) by the Year 2025 (right):



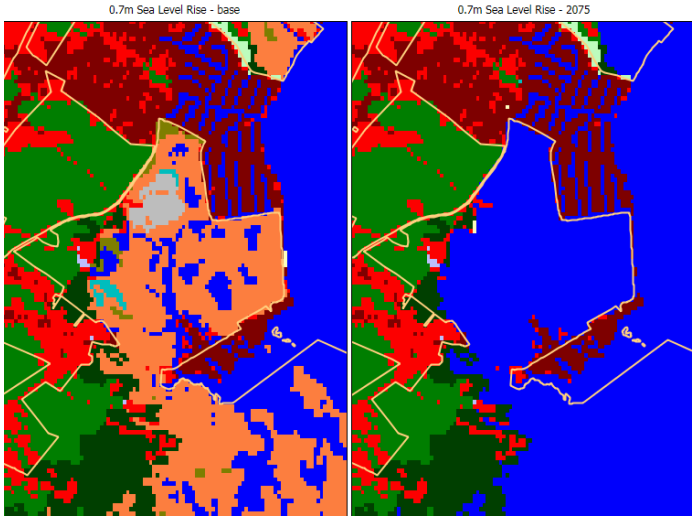

Source: Sea Level Rise Affecting Marshes Model (SLAMM; (http://www.slammview.org/)

A side-by-side comparison of the region containing the Forked River Project area predicts that a 0.7-meter (2.3-foot) rise in sea level will result in the inundation of the present coastline (left) by the Year 2075 (right):




Source: Sea Level Rise Affecting Marshes Model (SLAMM; (http://www.slammview.org/)

A side-by-side comparison of the region containing the Barnegat Project area predicts that a 0.7-meter (2.3-foot) rise in sea level will result in the inundation of the present coastline (left) by the Year 2075 (right):




Source: Sea Level Rise Affecting Marshes Model (SLAMM; (http://www.slammview.org/)

A July 2014 Rutgers University's Center for Remote Sensing and Spatial Analysis (CRSSA) study, "Modeling the Fate of New Jersey's Salt Marshes under Future Sea Level Rise", reports that if sea levels rise between 1 to 2 feet by the Year 2050, approximately 5% of the tidal marshes in New Jersey could be replaced by open water and unconsolidated shoreline (NJDEP 2015a). The report also states that a mere one foot of sea level rise (less than the 2.3 feet depicted in the above SLAMM images) could result in a loss of more than 9,300 acres of salt marsh.

## 2.2 Wetland Degradation and Loss of Marsh Function

The goal of this Project is to increase the resiliency of degraded wetlands, or wetlands that are predicted to degrade over time as a result of sea level rise coupled with historic anthropogenic disturbances. However, when discussing the concept of wetland degradation, it is useful to first gain an understanding of wetland function, since wetland degradation is linked to a loss of wetland function. Wetland functions are often described as natural processes stemming from physical, chemical, and biological interactions within the wetland, independent of public interest or societal value. These interactions include surface water storage, subsurface water storage, particle retention, maintenance of plant and animal communities, nutrient cycling, and groundwater recharge (ASWM n.d., NRCS 2005). Thus, the loss of these functions results in a degraded wetland since the wetland no longer provides these ecosystem services. Similarly, the New Jersey Department of Environmental Protection (NJDEP) defines a degraded wetland in terms of a loss of wetland function, that is, "…a wetland in which there is impaired surface water flow or groundwater hydrology, or excessive drainage; a wetland which has been partially filled or excavated, contaminated with hazardous substances, or which has an ecological value substantially less than that of undisturbed wetlands in the region." (N.J.A.C. 7:7A-1.4).

It is evident from the comparisons between the historical changes of these Project areas against the rapid changes predicted by the sea level rise model, that the New Jersey coastline is under threat of permanent changes with a resulting substantial loss of salt marsh and subsequent wetland function. The Richard Stockton College of New Jersey, Coastal Research Center and Monmouth University (CRC UCI 2014) report that the Barnegat Bay Partnership's 2011 "State of the Bay" identified significant areas of coastal wetlands as degraded since 1995. Notwithstanding, the incremental increase in the rate, frequency, and duration of inundation with each passing year has impacts upon the productivity and ecology of these marshes. Alterations of the hydrologic condition due to sea level rise can have impacts on the biology, structure, and condition of these coastal marshes. Coastal marsh topographies are shaped by the relative distribution of hydrologic regimes and any small change in these regimes, on the scale of millimeters, can lead to important shifts in ecological processes (Haaf et al. 2015).

While tidal marsh plants are able to tolerate some waterlogging, excessive saturation can cause soil oxygen deficiency, which impacts plant growth and functions such as stomatal opening, photosynthesis, water and mineral uptake, and hormonal balance (Tiner 1999). In addition to the direct effects that the hydroperiod has on plants, there are secondary effects that can impact plant productivity, such as changes to marsh soil chemistry (e.g. redox potential and nutrient delivery). As inundation patterns become altered with sea level rise, species distributions and morphological changes are expected (Haaf et al. 2015).

The Service is concerned that this vegetation die-back and reduction in rates of salt marsh accretion from prolonged inundation may 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. 2015). In some areas of the refuge, the increase in sea levels and prolonged duration of inundation have already physically overtaxed plants and resulted in a decrease of plant density (die-back) (Bertness and Silliman 2008). Lathrop (2010) reported Barnegat Bay has lost more than one quarter of its tidal salt marshes over the past century due to filling and development.

These changes also affect the productivity of the coastline as vegetated marshes transition to either pannes or pools. Increases in the inundation patterns in Northeastern marshes leads to declines in primary productivity, lower organic matter accumulation, and other environmental stresses (Ekberg 2014). While pannes and pools do offer a different form of wildlife habitat than the vegetated low marsh, in the mid-Atlantic coast[5], these areas are generally lower in species richness and in primary productivity (Rudstam and Swackhammer 1982). Pannes are usually higher in salinity than the surrounding marsh, contain hypoxic soil, are hence are less vegetated (Gedan and Bertness 2009, NHDFL n.d., Perry and Atkinson 2009). Likewise, pools are usually of considerable depth that preclude vegetation from becoming established.

Irrespective of the reduction or absence of large vascular plants such as smooth cordgrass, the reduction or absence of benthic algae in pannes and pools are a major factor in the decreased

[5] It is important to distinguish regional variation in the species richness of pannes in the mid-Atlantic versus New England. Pannes in New England marshes tend to have a higher species richness than in the low marsh due to the increased number of *Salicornia* species that are present in more northern environments of the U.S. (NHDFL n.d.).

primary productivity seen in these habitats. Christensen (1993) reports that the benthic algal community is considered to be the most important source of primary production in salt marshes. In a well-cited study, Gallagher and Daiber (1974) reported benthic algae primary production rates in a Delaware marsh to be the lowest on unvegetated creek banks, followed by pannes. Similarly, Weinstein and Kreeger (2002) report Pinckney and Zingmark's (1993) findings that unvegetated shallows (such as pannes and shallow pools) exhibit some of the lowest primary productivity rates.

Additional stressors on the marsh that contribute to their loss of function include thousands of miles of grid ditches that were dug in the early 20th century for mosquito control. These grid ditches were created to reduce the mosquito population by draining standing water where mosquitos bred (USFWS 2015a). Ditches were normally dug at 50- to 100-meter intervals throughout Atlantic coastal marshes, connecting perpendicularly to tidal channels (Clarke et al. 1984). The impacts of ditching on salt marshes included a decrease in the time tidal waters took to recede off the salt marsh platform, a decrease in the temporal scale of standing water in the marsh platform during ebb tides, vegetation changes, and associated impacts on fish and bird habitat.

Once the detrimental effects of ditching were recognized, the practice of Open Marsh Water Management (OMWM), considered a more ecologically appropriate mosquito control method, was introduced in the late 1960s (Hruby et al. 1985). The OMWM technique incorporates biological control by linking mosquito-breeding depressions to small ponds where fish that feed on mosquito larvae can reside (e.g., mummichog (*Fundulus heteroclitus*), other killifish species (*Fundulus* spp,), and sheepshead minnow (*Cyprinodon variegatus*)). As beneficial as OMWM has been, the impacts of historic grid ditching nevertheless continue to exert its long-term negative effects on the marsh.

## 2.3 Effects on the Service's and Refuge's Mission

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. Galbraith et al. (2002) reports that even a modest estimate of sea level rise could impair the ability of the Delaware Bay region to support the current number of migratory birds. Under a more realistic, but dire scenario, the Delaware Bay is predicted to lose at least 60% of its shorebird feeding habitats by the Year 2100. These habitat losses are not only restricted to marshes. As saline intrusion occurs, and as the salt marsh attempts to shift more landward, there is also the potential loss of maritime forest and coastal dune forest which is critical habitat for many wildlife species, such as the state-threatened black-crowned night-heron (*Nycticorax nycticorax*). Also at risk are fragile foredune habitats for a number of plant and animals species, such as the federally-listed seabeach amaranth (*Amaranthus pumilis*) (Cooper et al. 2005).

The refuge conducts management actions to maintain and restore, where possible, the biological integrity, diversity, and environmental health (BIDEH) of its properties in accordance with the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The purpose of the proposed action is to sustain native saltmarsh plants (i.e. *Spartina alterniflora*) and wildlife, federal trust resources, and species of conservation concern (e.g. saltmarsh sparrow, *Ammodramus*

*caudacutus*) in areas where human impacts have reduced resilience of natural systems to disturbance and anticipated climate change.

The reduction or loss of wetland function (i.e. wetland degradation) and subsequent habitat loss run counter to the mission and goals of the Service and the refuge. The mission of the NWR System is as follows:

- "…to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).

More specifically, the Forsythe refuge was established for the following purposes (USFWS 2013):

- For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. §715-715r), as amended, "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds…" (16 U.S.C. §715d).
- For "…the development, advancement, management, conservation, and protection of fish and wildlife resources…" (16 U.S.C. §742f(a)(4), Fish and Wildlife Act of 1956).
- For "…the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations (regarding migratory birds)…" (16 U.S.C. §3901(b), 100 Stat. 3583 Emergency Wetlands Resources Act of 1986).
- To "…secure for the American people of present and future generations the benefits of an enduring resource of wilderness." (78 Stat. 890:16 U.S.C. 1211 (note), 1131-1136, Wilderness Act of 1964).

The CCP describes the future status of the Forsythe refuge, in part, as follows (USFWS 2004):

- "Edwin B. Forsythe Refuge will continue to contain some of the most important migratory bird habitat in the National Wildlife Refuge System."
- "…will provide a true wilderness experience on pristine barrier islands and salt marshes…"
- "…provide stop-over and wintering habitats of sufficient size and quality to assist in maintaining migratory birds on the Atlantic Flyway."
- "…will preserve important plant and animal populations, ecological communities, and the integrity of the landscape by protecting lands from development, restoring fire to the upland habitats, and <u>restoring wetlands</u>." (emphasis added)

All of the above conditions are vulnerable to the adverse impacts of sea level rise. Thus there is a strong need for implementing the Proposed Action to increase resiliency in order to uphold the Service's and refuge's missions, purposes, and goals. As this Project is an action proposed by the Service, a Federal agency, the National Environmental Policy Act [42 United States Code (U.S.C.) 4321 et seq.; NEPA] and the Council on Environmental Quality's (CEQ) NEPA regulations [40 Code of Federal Regulations (CFR), Parts 1500 to 1508] require that the potential environmental impacts of this Proposed Action be considered before a final decision to carry through with the Proposed Action is made. In compliance with these regulations, this EA has been developed which

examines the need for the Proposed Action, the potential environmental impacts of the Proposed Action and the No Action Alternative, and identifies the unavoidable adverse environmental impacts identified as a result of the Proposed Action, if it were to be implemented.

The Service is committed to working closely with federal and state resources, prior to and during project construction to continue monitoring and collection of additional data, provide relevant supplemental information as needed, and to apply adaptive management and best management practices as appropriate. The United States Army Corps of Engineers (USACE) and the National Marine Fisheries Service (NMFS) are serving as cooperating agencies in the preparation and review of the NEPA documentation for this project.

## 2.4 Project Scope

The five Project areas were selected for their long history of anthropogenic alterations, their advanced state of degradation, and their vulnerability to sea level rise and other stressors. This Project will be conducted as the second phase of the Service's Marsh Enhancement and Telephone Pole Array Removal Project[6], in order to help the Service achieve the following long term goals for the refuge:

- Manage salt marshes to be resilient to increases in sea level.
- Manage salt marshes to be resilient to large storm events.
- Restore ecological function and habitat value of the salt marshes (hydrologic connectivity, species abundance/diversity, fish nursery, etc.) and those portions of the salt marsh negatively impacted by grid-ditching and salt hay farming.

To address these goals, the Service plans to implement the following restoration techniques at one or more of five Project areas within the refuge:

- Increase the marsh surface elevation to reduce vegetation die-back resulting from prolonged inundation, and improve rates of salt marsh accretion;
- Alter hydrologic conditions to promote optimal tidal flow; and
- Address the negative impacts of anthropogenic structures (e.g., roads, berms, defunct WCSs, dikes, undersized culverts) or actions (e.g., grid-ditching, salt hay farming, and erosion).

A previous iteration of this Draft EA presented 30% Design Plans as Appendix B which depicted the Proposed Actions in each project area. Due to modifications in the technical approach since this previous EA, coupled with no further development of design by Amec Foster Wheeler as requested by the Service, the graphical depictions of the Proposed Actions now appear as figures embedded into the main text body of the EA.

[6] Additional marsh enhancement work at the Good Luck Point Project Area and another area within the refuge (removal of poles, antennas, and other ancillary structures) was addressed in a previous EA that was drafted based on the details for that phase of the Marsh Enhancement and Telephone Pole Array Removal Project. That EA was available for public comment from January 8, 2016 to February 12, 2016.

NEPA requirements help ensure that environmental information is made available to the public during the decision-making process and prior to implementing an action. The premise of NEPA is that the quality of decisions will be enhanced if proponents provide information to the public and involve the public in the planning process. The Service has conducted public outreach for this Project through website updates, press releases, and public meetings. The Service has been, and will continue to be, coordinating efforts with other Federal and New Jersey State agencies throughout this Project. State and Federal application reviews will also include public comment periods and meetings. The Federal and State laws most relevant to this Project are as follows:

- Federal level:
    - The Federal Water Pollution Control Act (Clean Water Act; 33 U.S.C. 1251 *et seq.*).
    - The Rivers and Harbors Act of 1899 (33 U.S.C. 407).
    - The Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531-1544).
    - National Historic Preservation Act of 1966 (NHPA; 16 U.S.C. 470).
        - In the event archeological relics or sites are discovered during Project operations, actions will be taken to be consistent and compliant with the following additional Federal laws:
            - The Antiquities Act of 1906 (16 U.S.C. 433).
            - The Archeological Resources Protection Act of 1979 (16 U.S.C. 470aa-47011).
            - The Archeological and Historic Preservation Act of 1960 (16 U.S.C. 469-469C).
            - The Historic Sites, Buildings and Antiquities Act of 1935 (Historic Sites Act) (16 U.S.C. 461-462, 464-467).
    - The National Wildlife System Improvement Act of 1997 (Public Law 105-57).
    - The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703–712).
    - The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c).
    - NEPA (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) and the CEQ's NEPA regulations 40 CFR, Parts 1500-1508).
        - Tribal consultation in accordance with both Section 106 NHPA and Section 40 CFR 1501.2(d)(2) of the CEQ's NEPA regulations.

- State level:
    - Waterfront Development Act (New Jersey Statutes Annotated (N.J.S.A.) 12:5-3).
    - Wetlands Act of 1970 (N.J.S.A. 13:9A).
    - Tidelands Act (N.J.S.A. 12:3).
    - Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19).
    - Surface Water Quality Standards (SWQS) (New Jersey Administrative Code (N.J.A.C.) 7:9B).
    - The New Jersey Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 *et seq.*) and its implementing rules (N.J.A.C. 7:13).

A number of agencies have been and will be involved in the review of the Federal Consistency of this Project. These agencies are as follows:

- Federal level:
  - USACE.

- State level:
  - New Jersey Department of Environmental Protection (NJDEP), Division of Land Use Regulation (DLUR).
  - NJDEP, Bureau of Coastal Management (BCM).
  - NJDEP, Office of Dredging Sediment and Technology (ODST).
  - NJDEP, State Historic Preservation Office (SHPO).
  - NJDEP, Division of Fish and Wildlife (DFW).

- County level:
  - Ocean County Soil Conservation District (OCSCD).

# Chapter 3 - Affected Environments and their Existing Conditions

## 3.1 Introduction

This section describes the existing environmental resources in each of the Project areas, including physical resources (topography, geology, etc.), biological resources (vegetation, wildlife, etc.), and other categories such as cultural resources, socioeconomic and environmental justice, and transportation. As stated previously, these areas within the refuge were selected for their long history of anthropogenic alterations, their advanced state of degradation, their vulnerability to sea level rise and other stressors, and their anticipated positive responses to increased resiliency.

## 3.2 Brick Township Project Area

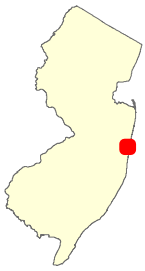
The Brick Township Project Area is located in Brick Township, Ocean County and is divided into two distinct regions: Brick Project Area A and Brick Project Area B. Brick Project Area A is the more northeasterly section and comprises 42 acres over multiple lots within Blocks 68 and 68.02. It is located north of Mantoloking Road (**Figure 3.1**) and is generally situated between the Metedeconk River to the north, Barnegat Bay to the east, and residential/commercial land to the south and west. Brick Project Area A is predominantly low salt marsh, interspersed with mudflats. Several man-made ditches run through the site. Prior to refuge acquisition, the property was a planned, canal access, residential community. Three large canals were excavated into the salt marsh to this end. Material from this construction was piled alongside the canals, thereby filling additional marsh. Fill was also added during this period to provide elevated roadways to access interior portions of the site, hydrologically separating portions of marsh.

Brick Project Area B covers multiple lots within Blocks 109 and 195 and is located south of Mantoloking Road (**Figure 3.1**). It comprises 62 acres and is generally situated between Reedy Creek to the west, Barnegat Bay to the south, and forested wetlands to the north and east. Brick Project Area B is predominantly stressed low salt marsh interspersed with mudflats. The site has been extensively ditched for mosquito management purposes.

The Brick Township Project Area is located in the Coastal Plain physiographic section of the state, within the Barnegat Bay Watershed Management Area (WMA 13) (**Figure 3.2**).

### 3.2.1 Topography

The topography of Brick Project Area A and Brick Project Area B is relatively flat and is situated between 0 and 5 feet above mean sea level (**Figure 3.3**). Net local surface water drainage from the marsh in Brick Project Area A drains into the adjacent Metedeconk River and Barnegat Bay. Net local surface water drainage from the marsh in Brick Project Area B drains into the adjacent Barnegat Bay and Reedy Creek.



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, 2015

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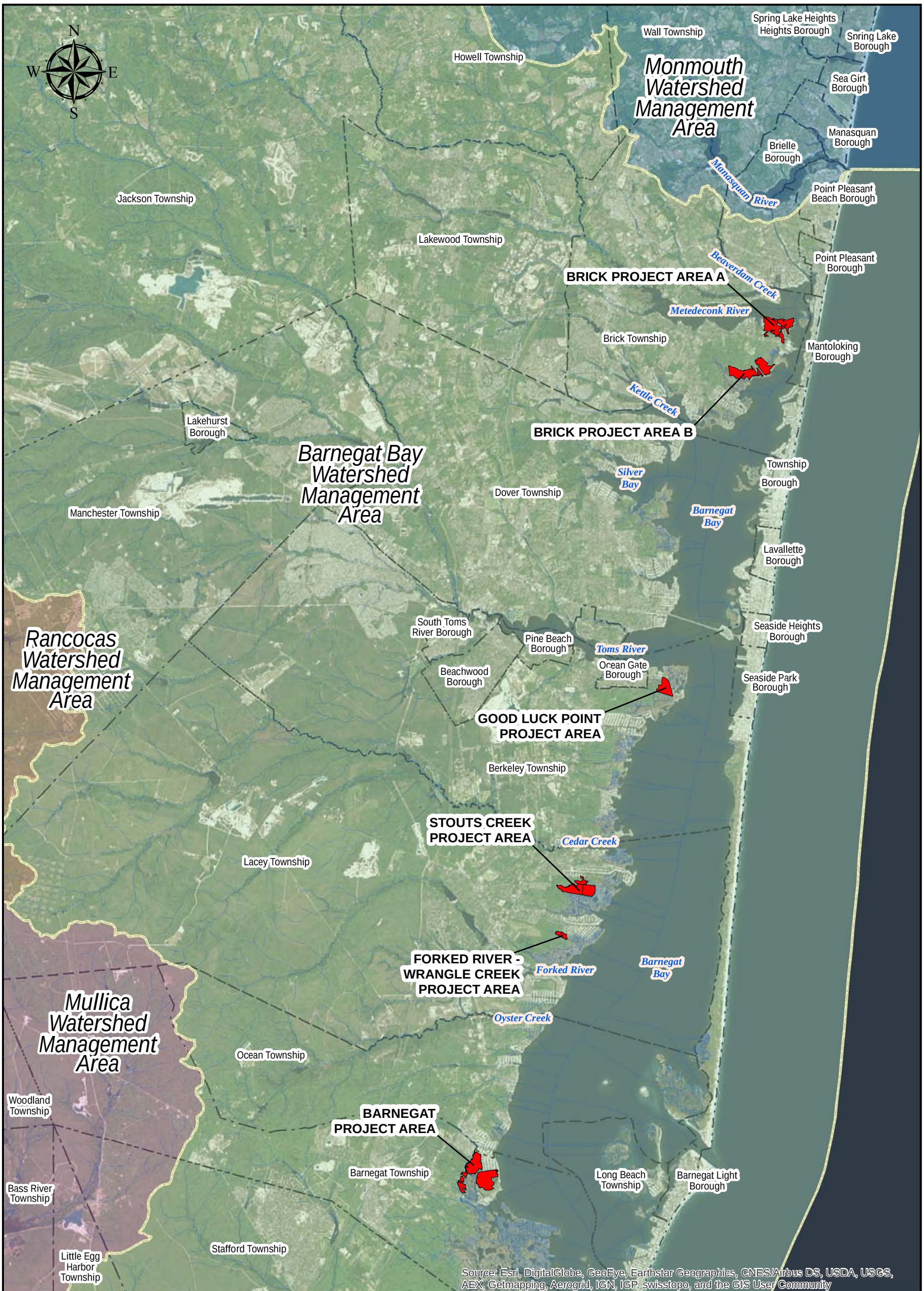
Figure 3.1

Street Map
Brick Township Project Area
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|




Legend

- Project Area
- Municipality
- NJ Streams 2002

Watershed Management Area

- Barnegat Bay
- Monmouth
- Mullica
- Rancocas

0 10,000 20,000 Feet

Data Source: NJDEP Watershed Management Areas in New Jersey (Version 200901); New Jersey Department of Environmental Protection (NJDEP), Division of Watershed Management (DWM), 2009; National Hydrography Dataset (NHD) Streams 2002, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, 2015

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Figure 3.2

Watershed Management Area Map
Marsh Enhancement Design/Build Project
Ocean County, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
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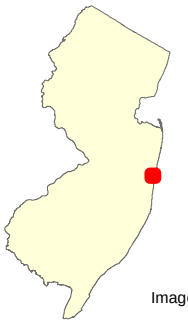

LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Copyright:© 2013 National Geographic Society, i-cubed, 2015

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Figure 3.3

USGS Topographic Map
Brick Township Project Area
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

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|---|---|---|

### 3.2.2 Geology and Soils

The Brick Township Project Area is located within the outer Coastal Plain Physiographic section of New Jersey (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 (NJDEP 1999).

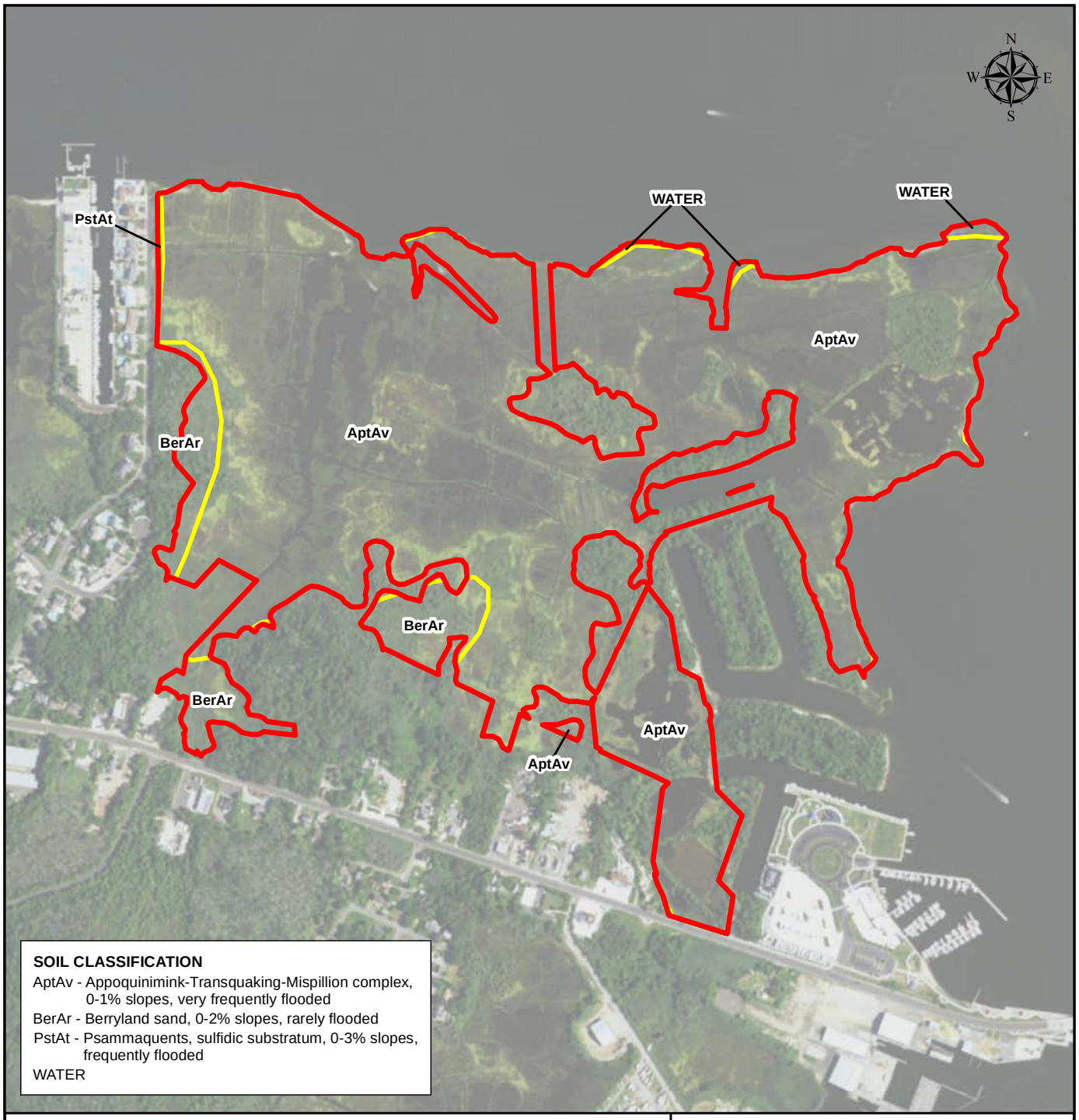
The bedrock geology of both Brick Project Area A and Brick Project Area B is made up of the Lower Member of the Kirkwood Formation (NJDEP 2014). The Lower Member is described as lower Miocene/Aquitanian Era aged unit that is primarily a massive to finely laminated, dark-gray clay with the lower part changing to a fossiliferous clayey silt (USGS 2015a).

The surficial geology of Brick Project Area A is listed as Salt Marsh and Estuarine Deposits over the eastern half and Cape May Formation, Unit 2 over the western half. The Salt Marsh and Estuarine Deposits 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. Cape May Formation, Unit 2 soils are described as lighter in color, ranging from very pale brown, yellow, reddish yellow, white, olive yellow or gray, and composed of sand, pebble gravel, minor silt, clay, peat, and cobble gravel. These soils were deposited during the late Pleistocene Era as marine terraces, and can be as thick as 200 feet in some areas (NJDEP 2014).

The majority of Brick Project Area A is mapped to occur on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes (**Figure 3.4**). This complex is described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). A small portion of the Project area is mapped as containing Berryland Sand, rarely flooded soils with 0 to 2 percent slopes. This soil is described as very poorly drained sands associated with flats, depressions and drainage ways. The parent material is described as sandy fluviomarine deposits (Maser 2012). Another sliver of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes.

The surficial geology of Brick Project Area B is listed primarily as Salt-Marsh and Estuarine Deposits with only a small portion listed as Cape May Formation, Unit 2 (NJDEP 2014).

Brick Project Area B is mapped to occur almost entirely on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0 to 1 percent slopes, with a very small portion mapped as containing Berryland Sand, rarely flooded soils with 0 to 2 percent slopes (**Figure 3.5**).



LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

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Figure 3.4

Soil Survey Map
Brick Project Area A
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
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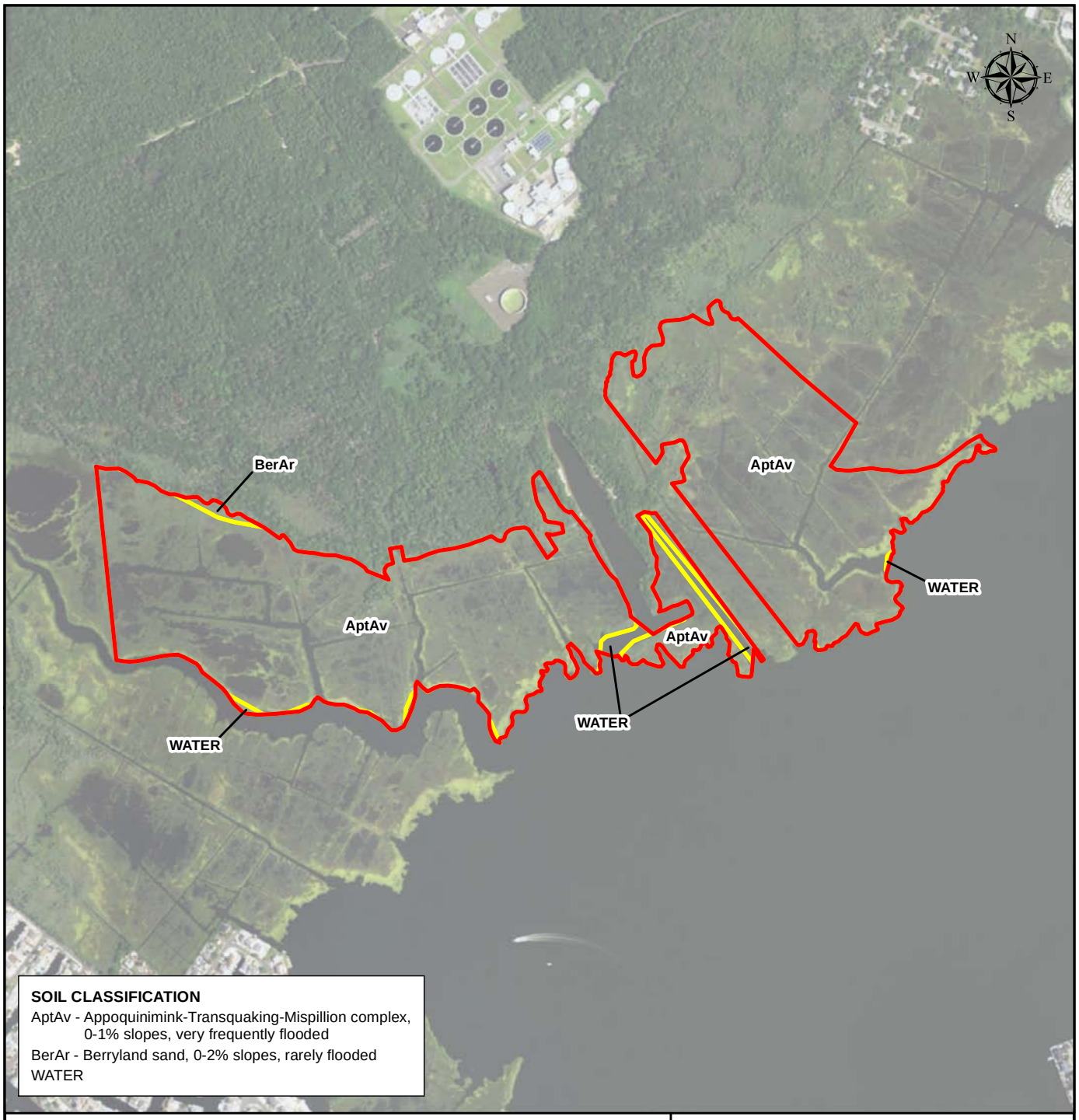

LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

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Figure 3.5

Soil Survey Map
Brick Project Area B
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

### 3.2.3 Air Quality

The United States Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015b). New Jersey is located in the Ozone Transport Region, an area that covers 13 northeastern ozone nonattainment states from Maine to Virginia (Trinity Consultants 2014). The Brick Township Project Area is located within Ocean County which is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2015b).

Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation, including stippling and chlorosis (the yellowing of leaf tissue due to a lack of chlorophyll) (Davis 1995).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or substantially contribute to a violation of the NAAQS or the New Jersey Ambient Air Quality Standards (NJAAQS). Toward that end, the USEPA and NJDEP have established Significant Impact Levels (SILs), which are a lesser fraction of the NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

### 3.2.4 Water Quality

According to the NJDEP (2008), “The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by the USEPA at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations.”

All waters within the Brick Township Project Area are classified as a SE1(C1) waters according to New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for category one (C1) saline estuarine (SE) waters with shellfish harvesting as a designated use. According to the NJDEP (2011b), “Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the anti-degradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on

exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)."

The portion of the Metedeconk River, adjacent to Brick Project Area A to the north, is classified as FW2-NT/SE1 according to the New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for freshwater not set aside for trout maintenance as well as for saline estuarine waters with shellfish harvesting as a designated use. Barnegat Bay, adjacent to Brick Project Area A to the east, is also classified as SE1(C1) waters.

Reedy Creek, adjacent to Brick Project Area B to the west, is classified as FW2-NT/SE1 waters and Barnegat Bay, adjacent to Brick Project Area B to the east, is classified as SE1(C1) waters.

Water quality monitoring station data from the USEPA STORET and water quality exchange website (USEPA 2016b) were evaluated from stations near the Project site in order to determine basic water quality characteristics of the surrounding area. One station (Station STA 99), located inside of the forked channel, approximately 475 feet south and 200 feet west of BRA 6 in Brick Project Area A, was sampled in the spring, summer, and fall of 2012. Results from that station revealed the following:

- Temperature ranged from 16.8 degrees Celsius (ºC) in the fall to 27.6 ºC in the spring.
- Salinity ranged from 22.37 parts per thousand (ppt) in the spring to 28.81 ppt in the summer.
- Dissolved oxygen (DO) ranged from 0.06 milligrams per liter (mg/L) in the summer to 8.06 mg/L in the fall.
- pH ranged from 6.66 in the spring to 8.08 in the fall.
- Total suspended solids (TSS) and conductivity were not analyzed.

One station (Station RC3w), located along the northern bank of Reedy Creek, adjacent to Brick Project Area B, was sampled in the spring, summer, and fall of 2012. Results from that station revealed the following:

- Temperature ranged from 14.9 ºC in the fall to 25.56 ºC in the summer.
- Salinity ranged from 17.07 ppt in the spring to 18.8 ppt in the fall.
- DO ranged from 2.23 mg/L in the summer to 12 mg/L in the fall.
- pH ranged from 6.81 in the summer to 7.77 in the fall.
- TSS ranged from 7.6 mg/L in the fall to 61.6 mg/L in the spring.
- Conductivity ranged from 20,138 micro-Siemens per centimeter (µS/cm) in the spring to 31,200 µS/cm in the fall.

### 3.2.5 Wetlands and Streams

The Clean Water Act (40 CFR 230.3) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under

normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Using that definition, wetlands are defined based on certain characteristics of vegetation, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic, or adapted to living in saturated areas. Soils are considered hydric (permanently or seasonally saturated by water) if they meet the criteria defined by the National Technical Committee for Hydric Soils (USDA 2015a). Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season (FIC 1989).

The most common method of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States*, wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine, and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands (Cowardin et al. 1979).

Defining areas that meet the regulatory definition of a wetland (33 CFR 328.3(b)) is important in determining the jurisdiction of those areas by the Federal government (USACE), and in some areas of the United States, state, county, and/or local governments. Jurisdiction over wetlands subsequently determines their regulation and the types of activities that are permittable. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into wetlands, meaning that a permit is required before dredged or fill material is discharged into these areas.

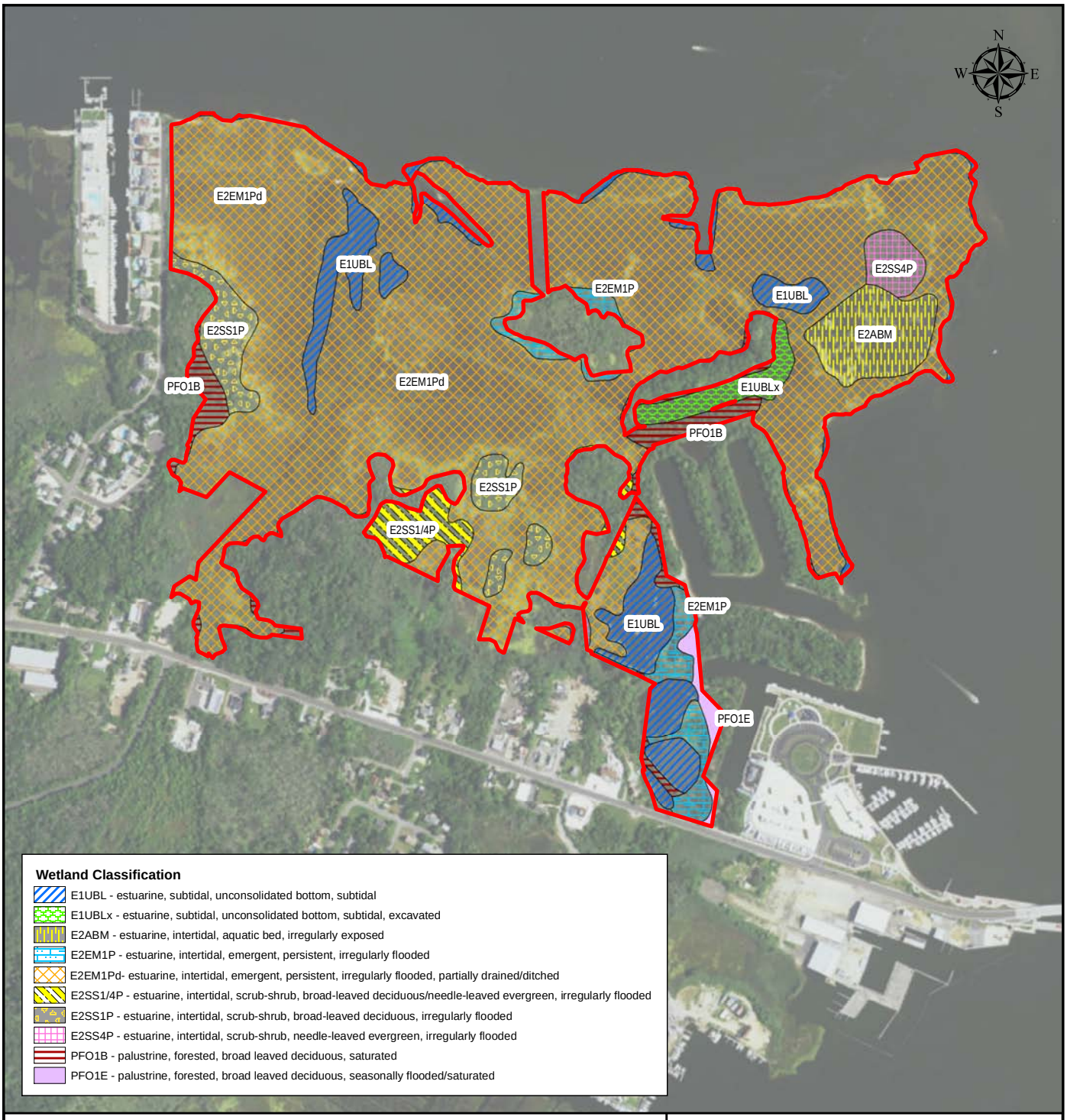
The premise of wetland regulation is that no dredged or fill material may be discharged if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded by the action. The USACE reviews permit applications for activities proposed within WOTUS. As the Project occurs on jurisdictional wetlands, it is subject to regulation by the USACE and the NJDEP.

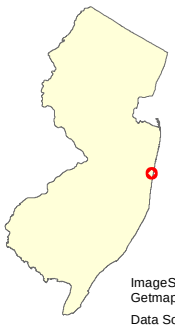
The Service's National Wetlands Inventory (NWI) indicates that the water bodies surrounding Brick Project Area A to the north and east (including Metedeconk Creek and Barnegat Bay) and Brick Project Area B to the south and west (including Barnegat Bay and Reedy creek) are classified as follows (USFWS 2015b):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).

The NWI indicates that the wetlands within the Brick Project Area A boundaries are classified as follows (**Figure 3.6**):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).
- Estuarine, subtidal, unconsolidated bottom, subtidal, excavated habitat (E1UBLx).
- Estuarine, intertidal, emergent, persistent, irregularly flooded habitat (E2EM1P).



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

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Figure 3.6

National Wetlands Inventory Map
Brick Project Area A
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

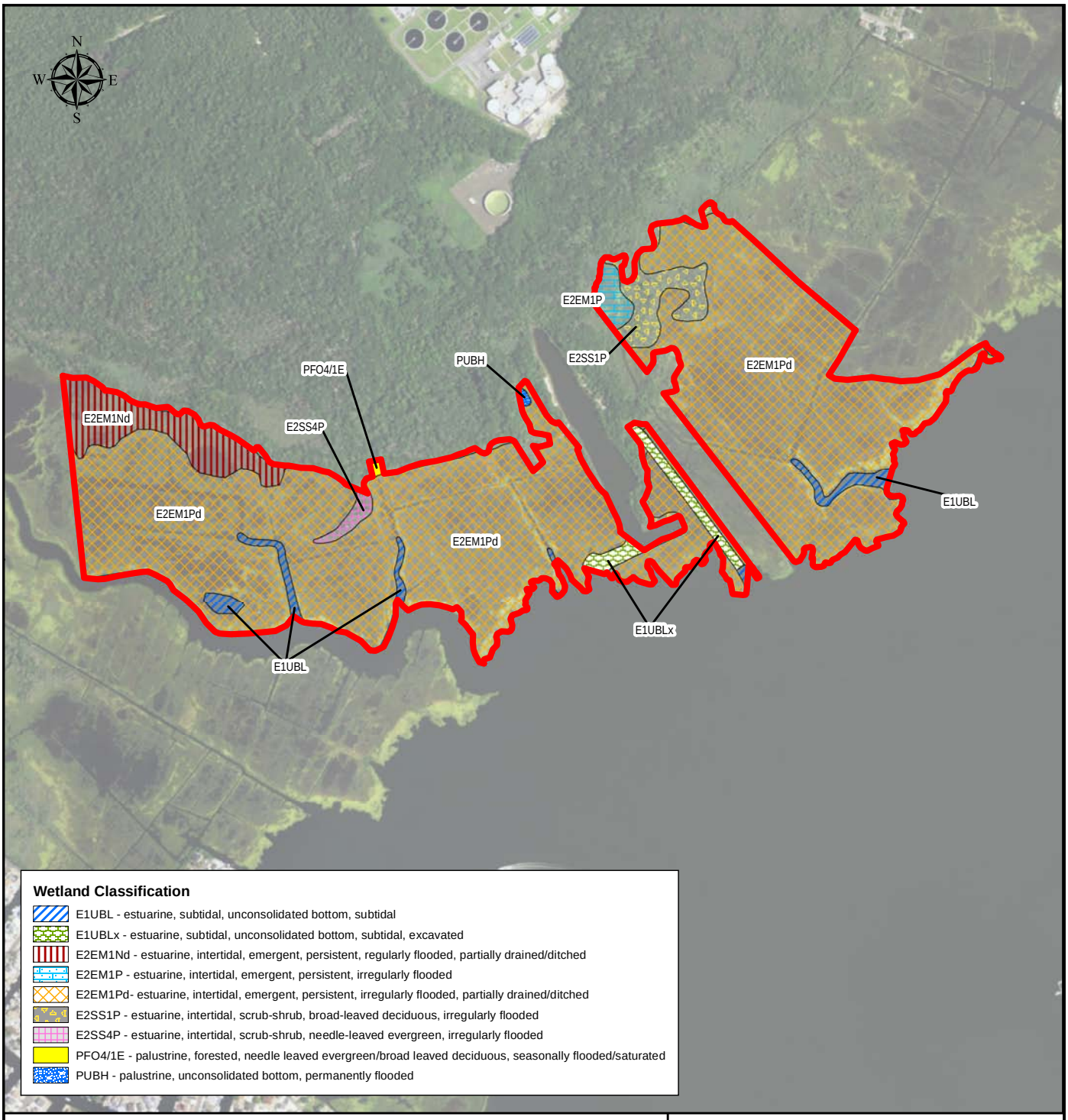
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched habitat (E2EM1Pd).
- Estuarine, intertidal, scrub-shrub, broad-leaved deciduous, irregularly flooded habitat (E2SS1P).
- Estuarine, intertidal, scrub-shrub, needle-leaved evergreen, irregularly flooded habitat (E2SS4P).
- Estuarine, intertidal, scrub-shrub, broad-leaved deciduous/needle-leaved evergreen, irregularly flooded habitat (E2SS1/4P).
- Estuarine, intertidal, aquatic bed, irregularly exposed habitat (E2ABM).
- Palustrine, forested, broad-leaved deciduous, saturated habitat (PFO1B).
- Palustrine, forested, broad-leaved deciduous, seasonally flooded/saturated habitat (PFO1E).

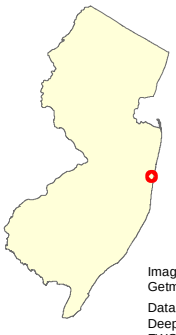
The NWI indicates that the wetlands within the Brick Project Area B boundaries are classified as follows (**Figure 3.7**):

- Estuarine, subtidal, unconsolidated bottom subtidal habitat (E1UBL).
- Estuarine, subtidal, unconsolidated bottom, subtidal, excavated habitat (E1UBLx).
- Estuarine, intertidal, emergent, persistent, irregularly flooded habitat (E2EM1P).
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched habitat (E2EM1Pd).
- Estuarine, intertidal, scrub-shrub, broad-leaved deciduous, irregularly flooded habitat (E2SS1P).
- Estuarine, intertidal, scrub-shrub, needle-leaved evergreen, irregularly flooded habitat (E2SS4P).
- Estuarine, intertidal, emergent, persistent, regularly flooded, partially drained/ditched habitat (E2EM1Nd).
- Palustrine, unconsolidated bottom, permanently flooded habitat (PUBH).
- Palustrine, forested, needle-leaved evergreen/broad-leaved deciduous, seasonally flooded/saturated habitat (PFO4/1E).

The NJDEP indicates that Brick Project Area A is mapped as containing the following wetland habitats (**Figure 3.8**):

- Tidal rivers, inland bays, and other tidal waters.
- Saline marsh (low marsh).
- Saline marsh (high marsh).
- Mixed scrub/shrub wetlands (deciduous dominant).
- Deciduous wooded wetlands.
- Deciduous scrub/shrub wetlands.



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

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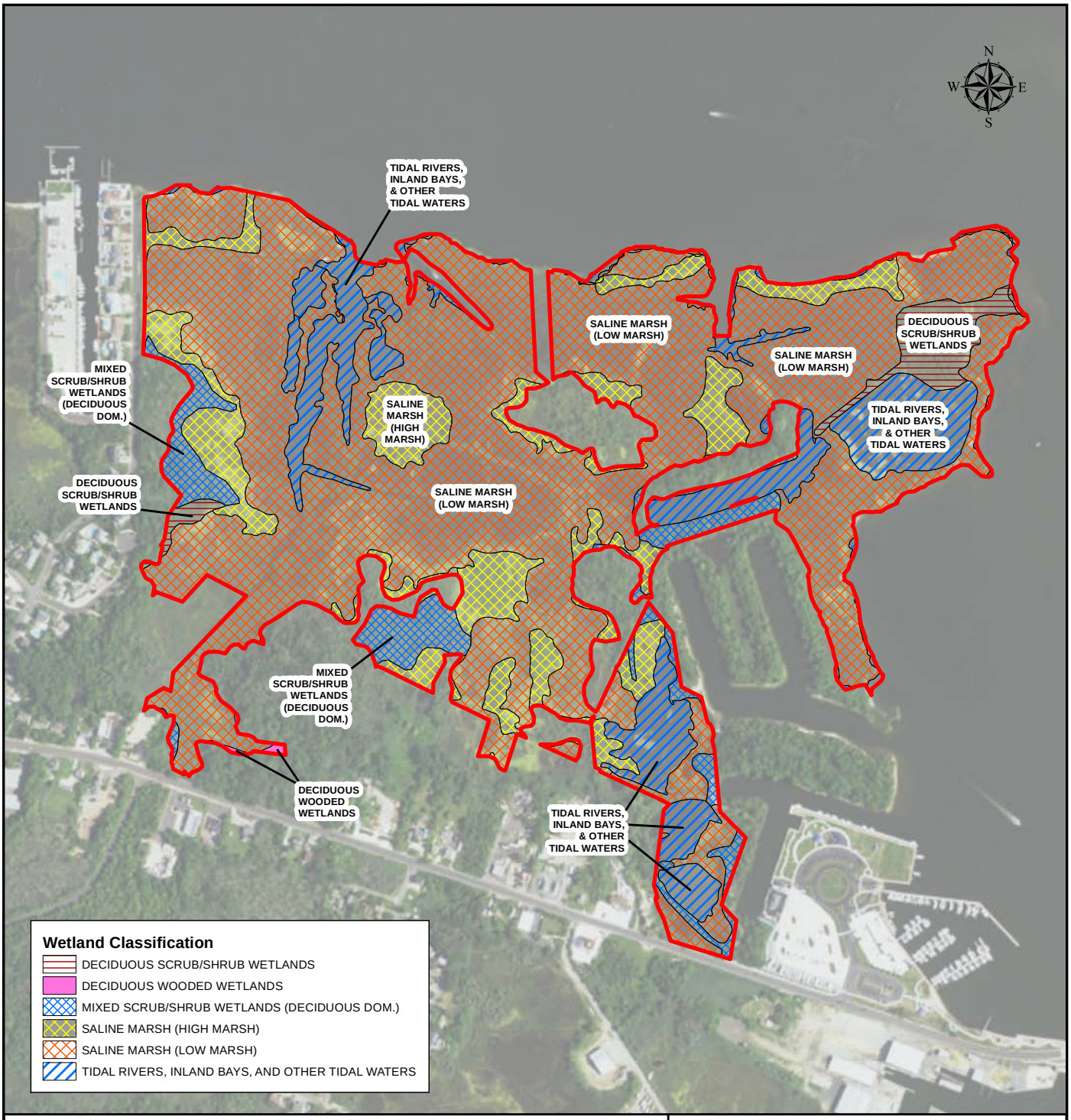
Figure 3.7

National Wetlands Inventory Map
Brick Project Area B
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015.

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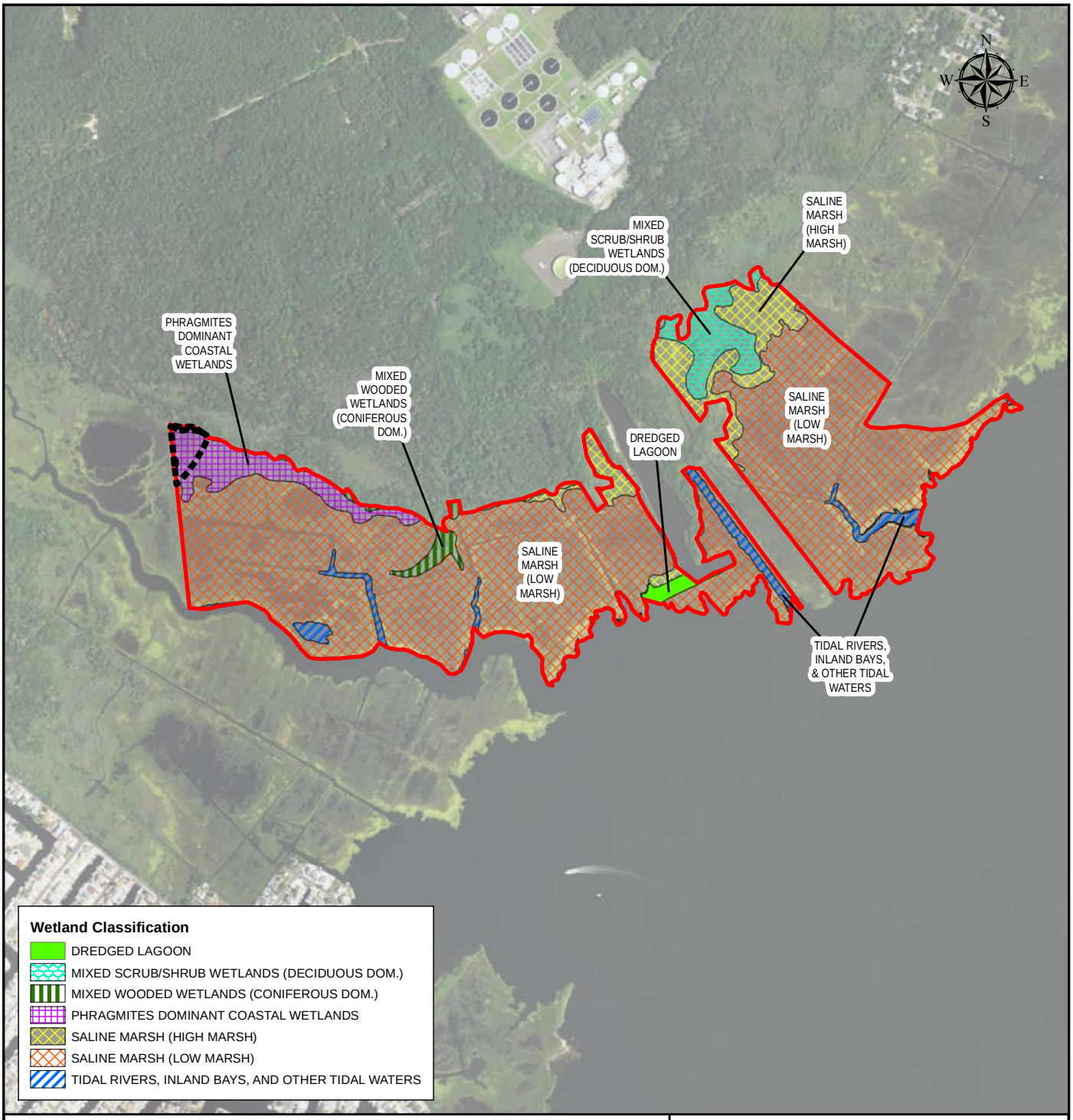
Figure 3.8

NJDEP Wetlands Map
Brick Project Area A
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

Project area

Potential vernal habitat area

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015. NJDEP Species Based Habitat, Vernal Habitat (ver. 3.1); New Jersey Department of Environmental Protection (NJDEP); Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP), 2012

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Figure 3.9

NJDEP Wetlands Map
Brick Project Area B
Marsh Enhancement Design/Build Project
Brick Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

The NJDEP indicates that Brick Project Area B is mapped as containing the following wetland habitats (**Figure 3.9**):

- Tidal rivers, inland bays, and other tidal waters.
- Saline marsh (low marsh).
- Saline marsh (high marsh).
- Mixed scrub/shrub wetlands (deciduous dominant).
- Mixed wooded wetlands (coniferous dominant).
- Common reed dominant coastal wetlands.
- Dredged lagoon.

### 3.2.6 Vegetation

A desktop assessment of the Project area was performed using aerial photographs (true color and color infrared) and light detection and ranging (LiDAR) imagery to provide a general perspective of salt marsh structure on a landscape scale. These resources were used to map general habitat types (high marsh, low marsh, upland, etc.). General habitat types were based upon the United States National Vegetation Classification Standard (USNVCS) (FGDC 2008) and methods used by NatureServe in their (2009) Vegetation Classification Report. Vegetative communities within the salt marsh group were further classified as either healthy or stressed.

Substantial areas of waterlogging (documented as open water and mudflats) and die-back areas were identified throughout the Brick Township Project Area due to increased water levels and decreased marsh elevation levels. The results of the ecological evaluation revealed that Brick Project Area A also has large areas of healthy low salt marsh and mudflats, with a smaller amount of upland woody vegetation (**Table 3.1**). A representative map showing the various habitat types within Brick Project Area A is presented as Figure 2-8 in **Appendix B**. **Appendix C** presents the habitat elevation data table (Table A-41) for which biological target elevations (BTEs) at Brick Project Area A were chosen for sediment enrichment.

**Table 3.1**
**Vegetation Summary for Brick Project Area A**

| Habitat Type | Acres | Approximate Percentage of Project Area | Vegetative Description |
|---|---|---|---|
| Open water | 4.91 | 3.8 | Areas covered in standing water – no vegetation present. |
| Beach | 0.11 | 0.085 | Areas covered in sand – no vegetation present. |
| North Atlantic coast estuarine intertidal mudflats/salt pannes | 33.69 | 26 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain |

| Table 3.1<br>Vegetation Summary for Brick Project Area A | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| | | | very high salinity in the waters within (interstitial) the sediment |
| Stressed North Atlantic low salt marsh | 4.30 | 3.3 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| North Atlantic low salt marsh | 57.58 | 44 | Low, regularly flooded salt marsh that is dominated by smooth cordgrass in the Northern Atlantic Coastal Plain. |
| Stressed North Atlantic high salt marsh | 1.48 | 1.1 | Less vigorous, partially or marginally functioning high salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning high salt marsh vegetation. |
| North Atlantic high salt marsh | 3.61 | 2.8 | Higher, irregularly flooded salt marsh that is dominated by smooth cordgrass and saltmeadow cordgrass in the Northern Atlantic Coastal Plain. |
| Reed tidal marsh | 6.55 | 5.0 | Areas of a salt marsh that have been invaded by common reed. |
| Scrub-shrub vegetative communities | 4.67 | 3.6 | Areas dominated by woody vegetation that is generally less than 6 meters tall. |
| Upland woody vegetative communities | 13.10 | 10 | Areas dominated by woody vegetation that is generally greater than 6 meters tall. |

The ecological evaluation also revealed that Brick Project Area B is predominantly composed of stressed low salt marsh, with near equal acreage of healthy low salt marsh, mudflat, and high salt marsh. Stressed high salt marsh was also identified within Brick Project Area B (**Table 3.2**). A representative map showing the various habitat types within Brick Project Area B is presented as Figure 2-9 in **Appendix B**. **Appendix C** presents the habitat elevation data table (Table A-41) for which BTEs at Brick Project Area B were chosen for sediment enrichment.

| Table 3.2<br>Vegetation Summary for Brick Project Area B | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| Open water | 11.68 | 8.2 | Areas covered in standing water – no vegetation present. |
| North Atlantic coast estuarine intertidal mudflats/salt pannes | 25.14 | 18 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain very high salinity in the waters within (interstitial) the sediment |
| Stressed North Atlantic low salt marsh | 40.10 | 28 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| North Atlantic low salt marsh | 26.44 | 18 | Low, regularly flooded salt marsh that is dominated by smooth cordgrass in the Northern Atlantic Coastal Plain. |
| Combination of North Atlantic low and high salt marsh | 0.13 | 0.091 | Areas characterized by both low salt marsh and high salt marsh vegetation. |
| Stressed North Atlantic high salt marsh | 0.63 | 0.44 | Less vigorous, partially or marginally functioning high salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning high salt marsh vegetation. |
| North Atlantic high salt marsh | 22.76 | 16 | Higher, irregularly flooded salt marsh that is dominated by smooth cordgrass and saltmeadow cordgrass in the Northern Atlantic Coastal Plain. |
| Reed tidal marsh | 7.01 | 4.9 | Areas of a salt marsh that have been invaded by common reed. |
| Scrub-shrub vegetative communities | 1.26 | 0.88 | Areas dominated by woody vegetation that is generally less than 6 meters tall. |
| Upland woody | 7.85 | 5.5 | Areas dominated by woody vegetation |

| Table 3.2<br>Vegetation Summary for Brick Project Area B | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| vegetative communities | | | that is generally greater than 6 meters tall. |

The variation of elevation between healthy low salt marsh and the stressed low salt marsh/die-back areas was an average of 0.08 feet within these Project areas. Mudflats, which were likely previously low salt marsh areas with severe die-back, are approximately 0.5 feet below the healthy low salt marsh average elevation.

### 3.2.7 Marine Resources

**Sediment of Placement Sites and Borrow Areas:** Sediments in the Barnegat Bay-Little Egg Harbor (BB-LEH) estuary have been documented to range from medium sands to coarse silts, with fine-to- medium sands tending to occur along the eastern boundary of BB-LEH and very fine sand and coarse silt tending to occur on the western side. However, there was considerable heterogeneity in the distribution of particle sizes. In several cases, sediments at two closely spaced stations were at opposite ends of the particle size spectrum. At the station closest to the Brick Township Project Area, median sediment size was classified as medium sands (Taghon et al. 2014).

The surface soils within the Brick Township Project Area sediment placement sites are mapped as Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes. This hydric soil complex is made up of soils from three soil series. The Appoqunimink series consists of very deep, very poorly drained soils that are formed by silty sediments overlying organic material. These soils are continuously saturated and are located on salt-water tidal marshes and estuaries. The mean annual soil temperature is 57 °F. Transquaking series soils consist of very deep, very poorly drained soils formed in thick organic deposits overlying loamy mineral sediments. This series has a very dark brown peat surface layer 9 inches thick formed on brackish estuarine marshes along tidally influenced rivers and creeks. The subsurface layers are composed of very dark gray mucky peat and muck from 22 to 65 inches and very dark gray silty clay to 80 inches. Mispillion series soils consist of very deep, very poorly drained soils formed in organic deposits overlying loamy mineral fluvial and marine soil materials that have low strength. They are located on salt water tidal marshes and estuaries with a very dark brown mucky peat surface layer 10 inches thick followed by very dark grayish brown mucky peat 14 inches thick. The subsurface layers are black and very dark brown muck to 40 inches and black mucky silt loam followed by dark gray silty clay loam and silt from 40 to 80 inches (T&M 2005). The Appoquinimink-Transquaking-Mispillion complex soils have a parent material consisting of loamy fluviomarine deposits over herbaceous organic material with a typical profile of (USDA 2016):

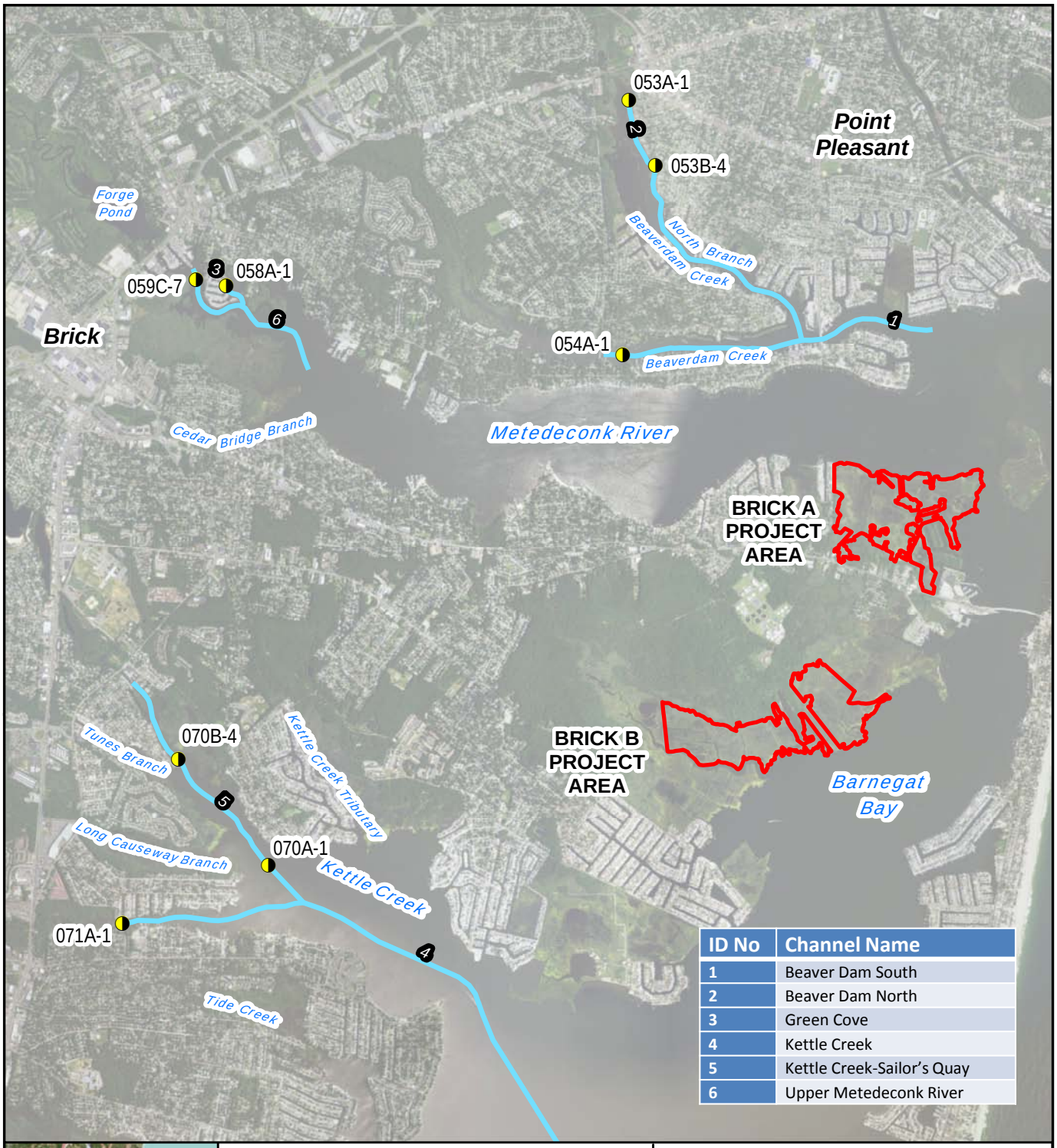
- 0 to 12 inches: mucky silt loam
- 12 to 30 inches: silt loam
- 30 to 80 inches: mucky peat

In 2009, a geotechnical survey was conducted at Trader's Cove Park and Marina, located approximately 1,000 feet south of the Brick Project Area A sediment enrichment placement site BRA-6. The results of this study indicated that subsurface conditions consisted of coarse to fine sands with a trace amount of silt and a trace amount of medium and fine gravel at the surface. Organic silt with fibers (peat) mixed with sands were evident between 3 and 4 feet in depth at samples close to the water. In addition, thin layers of silt and clay and clayey silt were found at isolated depths. The underlying sands were in a medium to very dense state below 9 feet, with low to high proportions of medium fine gravel and trace silt. Based on previous test results at that location, strata are estimated to be in a normal to over consolidated state with increasing depth (Gentech 2009).

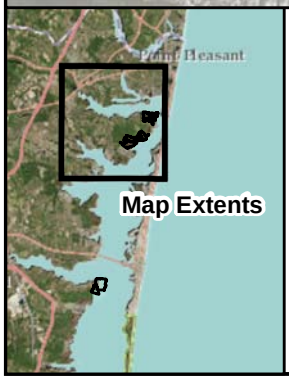
Seven New Jersey Department of Transportation (NJDOT) channels are currently being proposed as possible source areas of sediment for the Brick (and Good Luck Point) project areas (**Figures 3-10a** and **3-10b**). Sediment sampling for chemical constituents and geotechnical assessment was also conducted in accordance with the NJDEP Field Sampling Procedures Manual (NJDEP 2005) and the Dredging Technical Manual (Management of Regulation of Dredging Activities and Dredged Materials in New Jersey's Tidal Waters) (NJDEP 1997). Ten locations were sampled in January and February 2016 using a submersible vibracore to a depth of -6 feet mean low water (MLW) at nine of the locations (the Upper Metedeconk River core was advanced to a depth of -7 feet MLW) (Matrix 2016).

The sediments were analyzed for heavy metals, semi-volatile organic compounds (SVOCs), legacy organochlorine pesticides, polychlorinated biphenyls (PCBs), chlorinated dioxins and furans, and grain size. The chemical analytical results are typically compared to NJDEP soil remediation standards set forth at N.J.A.C. 7:26D. These soil remediation standards establish minimum standards for the remediation of contaminated soil as represented by the residential direct contact and nonresidential direct contact soil remediation standards. However, these soil remediation standards are human-health based and may not be fully protective of biota with different exposure conditions and contaminant sensitivities. Therefore, the Service Environmental Contaminants staff reviewed and interpreted the results after comparison to effects-based and mechanistic-based sediment quality criteria from peer-reviewed scientific literature in order to elucidate the potential for sediment toxicity to sensitive organisms. Where appropriate, contaminant exposure was modeled into higher trophic organisms such as birds or mink, and compared to literature-based benchmarks (in preparation by the Service) which are more stringent than soil remediation standards.

**Table 3-3** presents a summary of the sediment assessment findings. The sediments were found to consist of fine to medium grain sands mixed with finer grained silts and clays that would provide geotechnically-suitable materials for the sediment enrichment cells. The Green Cove channel (058A1) and the northern section of Beaver Dam North (053A1-3) were rejected due to unacceptable levels of mercury, arsenic, copper, lead, zine, and PCBs, and an elevated probability of toxicity based on their comparison to effects-based criteria.




| ID No | Channel Name |
|---|---|
| 1 | Beaver Dam South |
| 2 | Beaver Dam North |
| 3 | Green Cove |
| 4 | Kettle Creek |
| 5 | Kettle Creek-Sailor's Quay |
| 6 | Upper Metedeconk River |




**LEGEND**

- SEDIMENT ENRICHMENT CELLS
- PROPOSED DREDGE CHANNELS
- SEDIMENT SAMPLE LOCATION

N W E S

0 2,000 4,000 Feet

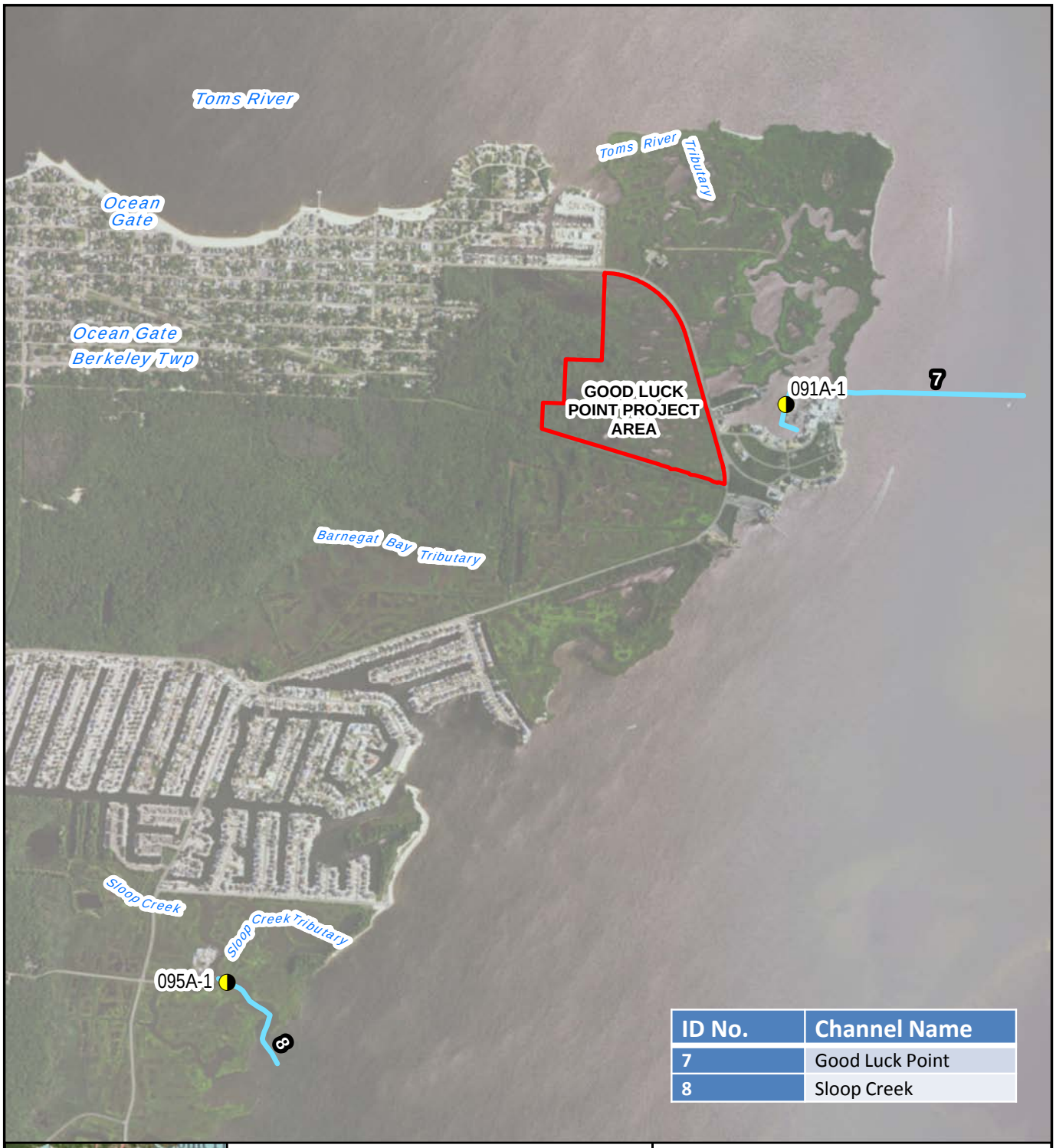
Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016

amec foster wheeler

Figure 3.10a

Sediment Source and Sample Locations for the Brick Project Areas
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: PP | Project No.: 3617157355.81.01 | August 2016 |
|---|---|---|




| ID No. | Channel Name |
|---|---|
| 7 | Good Luck Point |
| 8 | Sloop Creek |

**LEGEND**

- SEDIMENT ENRICHMENT CELLS
- PROPOSED DREDGE CHANNELS
- SEDIMENT SAMPLE LOCATION

N W E S

0 1,000 2,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016

amec foster wheeler

Figure 3.10b

Sediment Source and Sample Locations for the Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: PP | Project No.: 3617157355.81.01 | August 2016 |
|---|---|---|

| Table 3.3<br>Analysis Summary for Source Channel Sediment | | | | |
|---|---|---|---|---|
| **Sample ID** | **Channel Name** | **% Sand** | **% Silt & Clay** | **Acceptable/ Rejected** |
| 058A-1 | Green Cove | 78.2 | 21.8 | **Rejected** |
| 059C7 | Upper Metedeconk River | 79.9 | 12.8 | Acceptable |
| 053A1-3 | Beaver Dam Creek North | 62.4 | 37.7 | **Rejected** |
| 053B4-7 | Beaver Dam Creek North | 13 | 87 | Acceptable |
| 054A1-3 | Beaver Dam Creek South | 52.2 | 47.8 | Acceptable |
| 070A1-3 | Kettle Creek – Sailor's Quay | 57.1 | 42.9 | Acceptable |
| 070B4-6 | Kettle Creek – Sailor's Quay | 76.8 | 23.2 | Acceptable |
| 071A1-3 | Kettle Creek | 65.6 | 34.4 | Acceptable |
| 091A1-2 | Good Luck Point | 62.4 | 37.6 | Acceptable |
| 0951A-1 | Sloop Creek | --- | --- | **Rejected** |

A marsh surface sediment sampling plan for the Brick A, Brick B, and Good Luck Point project areas will be developed.

**Planktonic and Benthic Organisms:** The Barnegat Bay Estuary has experienced episodic recurrences of brown tides and other microalgal blooms, loss of submerged aquatic vegetation, and decline of hard clam stock and harvest. A two-year survey of the phytoplankton community in the BB-LEH estuary was conducted between 2011 and 2013. The study aimed to characterize species composition and spatial and temporal trends in the phytoplankton community. The results indicated that the number of phytoplankton taxa recorded from each year was similar and that the most common species belonged to five major groups: diatoms (Bacillariophyceae), dinoflatellates (Dinophyceae), cryptophytes (Cryptophyceae), chlorophytes (Chlorophyceae), and chrysophytes (Chrysophyceae). Diatoms made up approximately 50% of the total number of taxa. Although there were differences detected between the two years with regards to species occurrence and dominance among seasons and sites, species richness and diversity were comparable. Multivariate analysis of all samples showed significant relationships between phytoplankton species composition and the environmental variables, including salinity and temperature (Ren 2015).

As is common in estuarine environments, the benthic community in Barnegat Bay is dominated by relatively few species. In recent studies of the BB-LEH estuary, six taxa accounted for over 50% of all individuals collected. Of those six most-abundant taxa, five were annelids and one was a crustacean. The most abundant species, *Mediomastus ambiseta*, was present at 95 out of 100

stations and accounted for 31% of all individuals. That species was moderately abundant near the Brick Township Project Area, as was *Streblospio benedicti* and the amphipod *Ampelisca abdita* (11 to 100 individuals recorded at the closest monitoring station). Comparatively high numbers of Oligochaetes (*Oligochaete* spp.) (11 to 77 individuals recorded) and *Glycinde multidens* (11 to 91 individuals recorded) were present near the Project area. *Notomastus* sp. was not recorded in the monitoring station near the Project area. Salinity was determined to have a strong effect on the distribution and abundance of most taxa. Based on four multimetric or multivariate indices of habitat quality evaluated, the monitoring station closest to the Brick Township Project Area was classified as good, high, and/or meets restoration goals (Taghon et al. 2014).

**Submerged Aquatic Vegetation (SAV):** Seagrass, or submerged aquatic vegetation (SAV), habitat provides important ecosystem services, including essential habitat for shellfish and finfish. Although the BB-LEH estuary contains approximately 75% of New Jersey's known seagrass habitat (Lathrop et al. 1999), recent remote sensing and in situ surveys have indicated that seagrass habitat has contracted from historical levels due to human induced stressors, such as: (1) direct impacts due to physical alteration of benthic habitat through channel dredging, inlet modification, boat scarring, and dock building, and (2) indirect impacts caused by nutrient enrichment and eutrophication (Lathrop and Haag 2011; Burkholder et al. 2007; Lathrop et al. 2006; Kennish et al. 2008). Comparison of the 1970's and 1980's SAV survey maps with those from the 1990's shows a decrease of nearly 33% in SAV area (Lathrop et al. 1999).

In a study conducted between 2003 and 2009, the majority of the seagrass habitat in the northern portion of the BB-LEH estuary was dominated by widgeongrass (*Rupia maritima*) with small pockets of common eelgrass (*Zostera marina*). A total of 567 hectares of seagrass were mapped within the northern portion of the BB-LEH estuary in 2009, representing an increase of 188 hectares from 2003 (Lathrop and Haag 2011). The Point Pleasant New Jersey Submerged Aquatic Vegetation Distribution Map of 1979 (NJDEP 2016) revealed historic areas of SAV surrounding Brick Project Area A and a small area adjacent to Brick Project Area B. However, those areas are no longer evident in recent (2003/2009) mapping (Lathrop and Haag 2011).

**Fish and Shellfish**: The refuge lands are bordered by, and are hydrologically connected to, estuarine habitats made up of salt marshes, streams, ponds, bays, and rivers (USFWS 2013). Specifically, the Brick Township Project Area is located within the northern portion of the Barnegat Bay estuary system, home to a rich variety of fish, shellfish, and crabs. These species are of substantial importance to the sport and commercial fisheries and are a food base for many birds and mammals (USFWS 2004; USFWS 2013).

The Barnegat Bay estuary is estimated to be used by approximately 110 fish species. The ten most commonly reported species are bay anchovy (*Anchoa mitchilli*), Atlantic silverside (*Menidia menidia*), fourspine stickleback (*Apeltes quadracus*), spot (*Leiostomus xanthurus*), winter flounder (*Pseudopleuronectes americanus*), inland silverside (*Menidia beryllina*), northern pipefish (*Syngnathus fuscus*), mummichog, bluefish (*Pomatomus saltatrix*), and oyster toadfish (*Opsanus tau*) (TPL 2008). The salt marshes contain abundant mummichog and sheepshead minnow, which are frequently found in shallow water environments such as marsh ponds and small intertidal creeks. Important recreational and commercial species, including summer flounder (*Paralichthys*

*dentatus*), striped bass (*Morone saxatilis*), white perch (*Morone americana*), and northern weakfish (*Cynoscion regalis*) use the estuarine habitats as important nursery areas (USFWS 2013).

Barnegat Bay also contains a variety of shellfish and crabs. Species such as bay scallop (*Argopecten irradians*), eastern oyster (*Crassostrea virginica*), northern quahog (*Mercenaria mercenaria*), dwarf surfclam (*Mulinia lateralis*), softshell clam (*Mya arenaria*), blue mussel (*Mytilus edulis*), blue crab (*Callinectes sapidus*), and horseshoe crab (*Limulus polyphemus*) have been documented as being present in the waters of the bay (USFWS 2004).

**Essential Fish Habitat (EFH):** The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth procedures to identify, conserve, and enhance EFH for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the NOAA NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a). A comprehensive EFH Assessment is provided as **Appendix D.**

### 3.2.8 Terrestrial Wildlife

**Birds**: The primary focus of the refuge establishment has been to protect tidal wetland and shallow bay habitat for migratory water birds. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest. Some of these species, such as the American black duck (*Anas rubripes*), clapper rail (*Rallus crepitans*), and willet (*Tringa semipalmata*) breed at the refuge. The refuge is known for holding the largest concentrations of American black duck and Atlantic brant (*Branta bernicla*) on the Atlantic coast. Bald eagle (*Haliaeetus leucocephalus*) often forage over the open water areas, and osprey (*Pandion haliaetus*) and peregrine falcon (*Falco peregrinus*) nest on man-made platforms. Large numbers of songbirds also use the upland habitats on the refuge to breed, rest, and feed (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose (*Chen caerulescens*), Canada goose (*Branta canadensis*), Atlantic brant, mallard (*Anas platyrhynchos*), American black duck, northern shoveler (*Anas clypeata*), bufflehead (*Bucephala albeola*), double-crested cormorant (*Phalacrocorax auritus*), great egret (*Ardea alba*), glossy ibis (*Plegadis falcinellus*), clapper rail, greater yellowlegs (*Tringa melanoleuca*), semipalmated sandpiper (*Calidris pusilla*), least sandpiper (*Calidris minutilla*), short-billed dowitcher (*Limnodromus griseus*), laughing gull (*Leucophaeus atricilla*), ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), Forster's

tern (*Sterna forsteri*), and black skimmer (*Rynchops niger*) (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove (*Zenaida macroura*), red-bellied woodpecker (*Melanerpes carolinus*), blue jay (*Cyanocitta cristata*), fish crow (*Corvus ossifragus*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thryothorus ludovicianus*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), northern mockingbird (*Mimus polyglottos*), common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), northern cardinal (*Cardinalis cardinalis*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), and American goldfinch (*Carduelis tristis*). All of these species have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

**Mammals**: There are over 30 species of mammals that occur on the refuge, characteristic of assemblages within Mid-Atlantic coastal communities. The following mammals are associated with wetlands, such as those found at the Brick Township Project Area: mink (*Mustela vison*), river otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), meadow vole (*Microtus pennsylvanicus*), southern bog lemming (*Synaptomys cooperi*), and least shrew (*Cryptotis parva*) (USFWS 2004).

**Reptiles and Amphibians**: The 19 species of reptiles and amphibians that have been documented on the refuge fall into two major assemblages; Pine Barrens environment and coastal estuarine environment. The Brick Township Project Area hosts the coastal estuarine community type assemblage, which includes coastal marshes, estuaries, coves, tidal flats, and inner edges of barrier beaches. These habitats are used by important species such as the northern diamondback terrapin (*Malaclemys t. terrapin*) (USFWS 2004; USFWS 2013).

Salamanders, including the red-backed salamander (*Plethodon cinereus*), slimy salamander (*Plethodon glutinosus*), and marbled salamander (*Ambystoma opacum*) are also found in freshwater wetland habitats throughout the refuge (USFWS 2013).

Others reptiles that have been observed throughout the refuge include (NJA 2015; USFWS 2013):

- Five-lined skink (*Plestiodon fasciatus*)
- Black racer (*Coluber constrictor constrictor*)
- Black rat snake (*Pantherophis obsoletus*)
- Northern water snake (*Nerodia sipedon sipedon*)
- Eastern hognose snake (*Heterodon platirhinos*)
- Rough green snake (*Opheodrys aestivus*)

- Eastern ribbon snake (*Thamnophis sauritus sauritus*)
- Common snapping turtle (*Chelydra serpentina*)
- Eastern painted turtle (*Chrysemys picta picta*)
- Eastern mud turtle (*Kinosternon subrubrum subrubrum*)
- Redbelly turtle (*Pseudemys rubriventris*)

In addition, visitors to the various refuge properties have documented the following amphibians (NJA 2015):

- Green frog (*Rana clamitans melanota*)
- New Jersey chorus frog (*Pseudacris feriarum kalmi*)
- Northern cricket frog (*Acris crepitans crepitans*)
- Gray treefrog (*Hyela sp.*)
- Southern leopard frog (*Lithobates sphenocephalus sphenocephalus*)
- Northern red salamander (*Pseudotriton ruber ruber*)
- Four-toed salamander (*Hemidactylium scutatum*)

### 3.2.9 Threatened and Endangered Species

The unique habitats of the Barnegat Bay estuary (including barrier islands, salt marsh, tidal marshes, shallow water, and swamps) attract threatened and endangered species (TPL 2008). The Service completed an intra-service biological evaluation for the Brick Township Project Area pursuant to the ESA section 7 (**Appendix E**). As of the date of this EA, an official response is pending, but the initial results indicated the presence of the following federally listed threatened and endangered species on or near the Brick Township Project Area:

**Table 3.5**

**Intra-Service Section 7 Biological Evaluation Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Brick Township Project Area**

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| Knieskern's beaked-rush | *Rhynchospora knieskernii* | Threatened |
| Seabeach amaranth | *Amaranthus pumilus* | Threatened |
| Swamp pink | *Helonias bullata* | Threatened |
| Northern long-eared bat | *Myotis septentrionalis* | Threatened |

There were no critical habitats documented within the Brick Township Project Area. The Service's Information, Planning, and Conservation system (IPaC) was also consulted to determine which migratory bird species, protected under the MBTA and the BGEPA, could potentially move through the Brick Township Project Area. The results indicated the presence of the following 25 species:

| Table 3.6<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Brick Township Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| American oystercatcher | *Haematopus palliatus* |
| American bittern | *Botaurus lentiginosus* |
| Bald eagle | *Haliaeetus leucocephalus* |
| Black skimmer | *Rynchops niger* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Blue-winged warbler | *Vermivora pinus* |
| Fox sparrow | *Passerella liaca* |
| Great shearwater | *Puffinus gravis* |
| Gull-billed tern | *Gelochelidon nilotica* |
| Hudsonian godwit | *Limosa haemastica* |
| Least bittern | *Ixobrychus exilis* |
| Least tern | *Sterna antillarum* |
| Peregrine falcon | *Falco peregrinus* |
| Pied-billed grebe | *Podilymbus podiceps* |
| Prairie warbler | *Dendroica discolor* |
| Purple sandpiper | *Calidris maritima* |
| Red knot | *Calidris canutus rufa* |
| Rusty blackbird | *Euphagus carolinus* |
| Saltmarsh sparrow | *Ammodramus caudacutus* |
| Seaside sparrow | *Ammodramus maritimus* |
| Short-eared owl | *Asio flammeus* |
| Snowy egret | *Egretta thula* |
| Upland sandpiper | *Bartramia longicauda* |
| Wood thrush | *Hylocichla mustelina* |
| Worm-eating warbler | *Helmitheros vermivorum* |

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Brick Township Project Area:

| Table 3.7<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Brick Township Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Common tern | *Sterna hirundo* | Not listed | Special concern |
| Great blue heron | *Ardea herodias* | Not listed | Special concern |
| Least tern | *Sternula antillarum* | Not listed | Endangered |

| Table 3.7<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Brick Township Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Tricolored heron | *Egretta tricolor* | Not listed | Special concern |
| Little blue heron | *Egretta caerula* | Not listed | Special concern |
| Glossy ibis | *Plegadis falcinellus* | Not listed | Special concern |
| Northern harrier | *Circus cyaneus* | Not listed | Endangered |
| Osprey | *Pandion haliaetus* | Not listed | Threatened |
| Caspian tern | *Hydroprogne caspia* | Not listed | Special concern |
| Snowy egret | *Egretta thula* | Not listed | Special concern |
| Bald eagle | *Haliaeetus leucocephalus* | Not listed | Threatened |
| Black-crowned night-heron | *Nycticorax nycticorax* | Not listed | Threatened |

Since the NJDEP GeoWeb is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The October 9, 2015 findings of the Natural Heritage Program are presented in **Appendix E**.

These results indicated the following additional animal species that has the potential to occur on or near the Brick Township Project Area:

| Table 3.8<br>NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Brick Township Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| New Jersey Pine Barrens tiger beetle | *Cicindela patruela consentanea* | Not listed | Not listed - tracked by the Endangered and Nongame Species Program |

The results also indicated that the Brick Project Area B contains potential vernal pool habitat (**Figure 3.9**).

### 3.2.10 Cultural Resources

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. Views of the public should be solicited and considered throughout the process, and native Indian tribes must be consulted about undertakings on or affecting their lands under Executive Order 13175. If the agency's undertaking could affect

historic properties, the next steps are to review background information, consult with the SHPO and any Indian tribe that may attach religious or cultural importance to them, seek information from knowledgeable parties, and conduct additional studies as necessary. If it is determined that the activity that has no potential to affect historic properties, the agency has no further Section 106 obligations (ACHP, 2013).

To achieve compliance with the NHPA (Section 106), reviews of cultural resource files were performed at the offices of the NJDEP SHPO and the New Jersey State Museum (NJSM). The objective of the file reviews was to assess the potential for the Proposed Action to impact historic properties (listed or eligible for listing on the National Register of Historic Places) within the Brick Township Project Area. Historic properties include archaeological sites, as well as historic structures and districts. In addition, the Service has requested comment from the NJDEP SHPO and has been addressing Tribal consultation requirements. At this time, the Delaware Tribe of Indians is a consulting party. However, the Delaware Nation of Oklahoma did not wish to take part.

The Area of Potential Effect (APE) for the Brick Township Project includes the areas in which the sediment will be placed (BRA-1 through BRA-8 - Brick Project Area A; BRB-2 through BRB-7 – Brick Project Area B), equaling approximately 141 acres. File searches indicated that there are no previously inventoried historic properties within the APE. A previous cultural resource study conducted within a portion of the Brick Project Area B supported that conclusion as they found no evidence of prehistoric cultural remains, and the remnants of historical dwellings that were documented were of little archaeological interest (Hicks 1976). However, there is a historic district (Mantoloking Marine Historic District) listed as eligible for registration located approximately 1,600 feet south of Brick Project Area A (BRA-6). Within that historic district lie two surviving type “A” cat boats (“Lotus” and “Ghost”) as well as the Beaton Boat Yard and the Winter Yacht Basin. These boats and boat yards have also been deemed eligible by the NJDEP for listing in the National Register of Historic Places. In addition, there is one recorded Woodland period campsite archaeological site located in an area approximately 0.25 miles west of Brick Project Area B (BRB-2). **Appendix F** presents copies of documents associated with the historic district.

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE is low. Therefore, further Section 106 research was not conducted by Amec for the Brick Township Project Area. However, follow-up consultation with the NJDEP SHPO was performed by the Service and a July 27, 2016 letter of finding of No Historic Properties Adversely Effected was issued indicating no further Section 106 consultation being required.

### 3.2.11 Socioeconomic Resources and Environmental Justice

Ocean County began as a rural, agricultural and fishing center. In the latter part of the 1800s and through the 1900s, the resort industry of the New Jersey Shore began to develop, and commercial activities associated with seasonal resorts became the county's economic backbone. With year-round population increases, Ocean County's economic base has become increasingly diverse and a variety of new industries now supplement the traditional tourist-related businesses. The health care industry is now the top employer in the county and is the fastest growing employment sector.

Ocean County is projected to continue leading employment growth in the State through the next decade (OCDP 2014).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

### 3.2.12 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation.

Public use of the Brick Township Project Area is not encouraged, as the Service does not maintain recreational trails or visitor facilities. However, incidental use of this area by birders and the walking public may occur throughout the year. Fishing and recreational boating may also occur within the State-owned navigable channels throughout the Project area.

### 3.2.13 Transportation

The regional and State roads that convey traffic directly into and from Brick Township are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- New Jersey State Highway 70 also runs in a general northeast to southwest direction, extending approximately 60 miles from an interchange with Route 38 in Pennsauken Township, Camden County to an intersection with State Routes 34 and 35 in Wall Township, Monmouth County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Brick Township Project Area (between exits 80 and 74, southwest of the Project area) was estimated to be between 53,354 and 57,938 cars per day for 2015 during the fall season (October). These values represent approximately 96 percent of the maximum daily load on this stretch of roadway that occurs during summer months (T&M 2000).

Traffic volumes on a stretch of State Highway 70, just northwest of the Proposed Action in Brick Township, indicate that roadway's average annual daily traffic volume at 28,385 cars per day in August of 2012 (NJDOT 2015).

### 3.2.14 Noise

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.

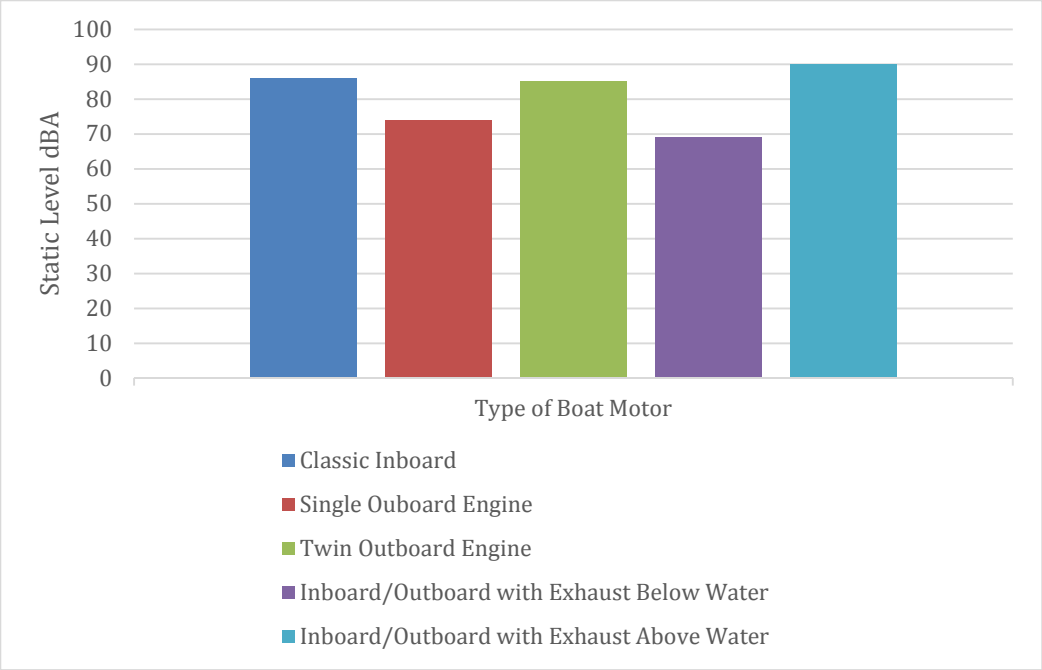
Duration – The duration of a sound affects its potential impact. Generally, long-term sounds are considered more harmful than short bursts of sound. "Masking" occurs when the pressure of a sound masks a sound of interest, by being equal to or greater in sound.

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. These noises are associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). A few examples of point sources of noise expected from activities at the Brick Township Project Area are the outboard motors associated with the boats carrying the work crew, the inboard motor associated with the sediment delivery vessel, and the pump required to spread the sediment.

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.

Static level noise measured from boats with various types of motors are presented below. These tests were conducted with the engine on idle and the microphone located four feet above the water and two feet behind the transom of the boat. As depicted, typical inboard motors run around 86 dBA in an idled state and typical single outboard motors run approximately 74 dBA (NUI, 1995). Stationary equipment, such as pumps or air compressors, generally run continuously at relatively constant power and speeds. Noise levels at 50 feet from stationary equipment can range from 68 to 88 dBA, with pumps typically on the quieter end (WSDOT 2013).




## 3.3 Good Luck Point Project Area

The second Project area for this phase (also known as the Good Luck Point Project Area) is located within Berkeley Township, Ocean County and is identified by the Township as Block 1206, Lots 1 and 1.01. It is located along Bayview Avenue (County Route 617) (**Figure 3.11**). The Good Luck Point Project Area occupies approximately 19 acres and is generally situated between Bayview Avenue to the north and east, East Atlantic Avenue to the south, and forested wetlands to the west. This Project area is also located within the Coastal Plain physiographic section of the state and the Barnegat Bay Watershed Management Area (WMA 13) (**Figure 3.2**).

The Good Luck Point Project Area was a former receiver facility and antenna field for Station WOO Ocean Gate Radio. Construction of the former American Telephone & Telegraph (AT&T) facility at the Good Luck Point Project Area made Toms River a central player in a radio and ship-to-shore telephone system that eventually linked Bell System telephones with the principal ocean liners plying the Atlantic Ocean. The former AT&T facility was subsequently closed in 1999 due to the development of undersea cables to Europe and the invention of satellite communication (AWR 2010).

The marshes on the interior of Bayview Avenue at Good Luck Point are waterlogged and disappearing. Bayview Avenue restricts the tidal flow into these interior marshes and part of this project's scope includes evaluating and improving this hydrological connectivity via replacement or addition of these culverts. The area has been grid ditched and high marsh remains only along the edge of the ditches. The vegetation on the interior of each grid has died back and now mudflats remain. The edges of these grids are slightly higher in elevation than the interior, since the soil excavated from the ditches was likely deposited just along the ditch edges. Raising the elevation

LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, 2015

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Figure 3.11

Street Map
Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Berkeley Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

of the interior areas of these grids and restoring the hydrological connectivity to the ditches will be important for the long term re-establishment of marsh grasses.

### 3.3.1 Topography

The topography of the Good Luck Point Project Area is relatively flat and is situated between 0 and 5 feet above mean sea level (**Figure 3.12**). Net local surface water drainage from the marsh ultimately drains into the nearby Toms River to the north or Barnegat Bay to the east.

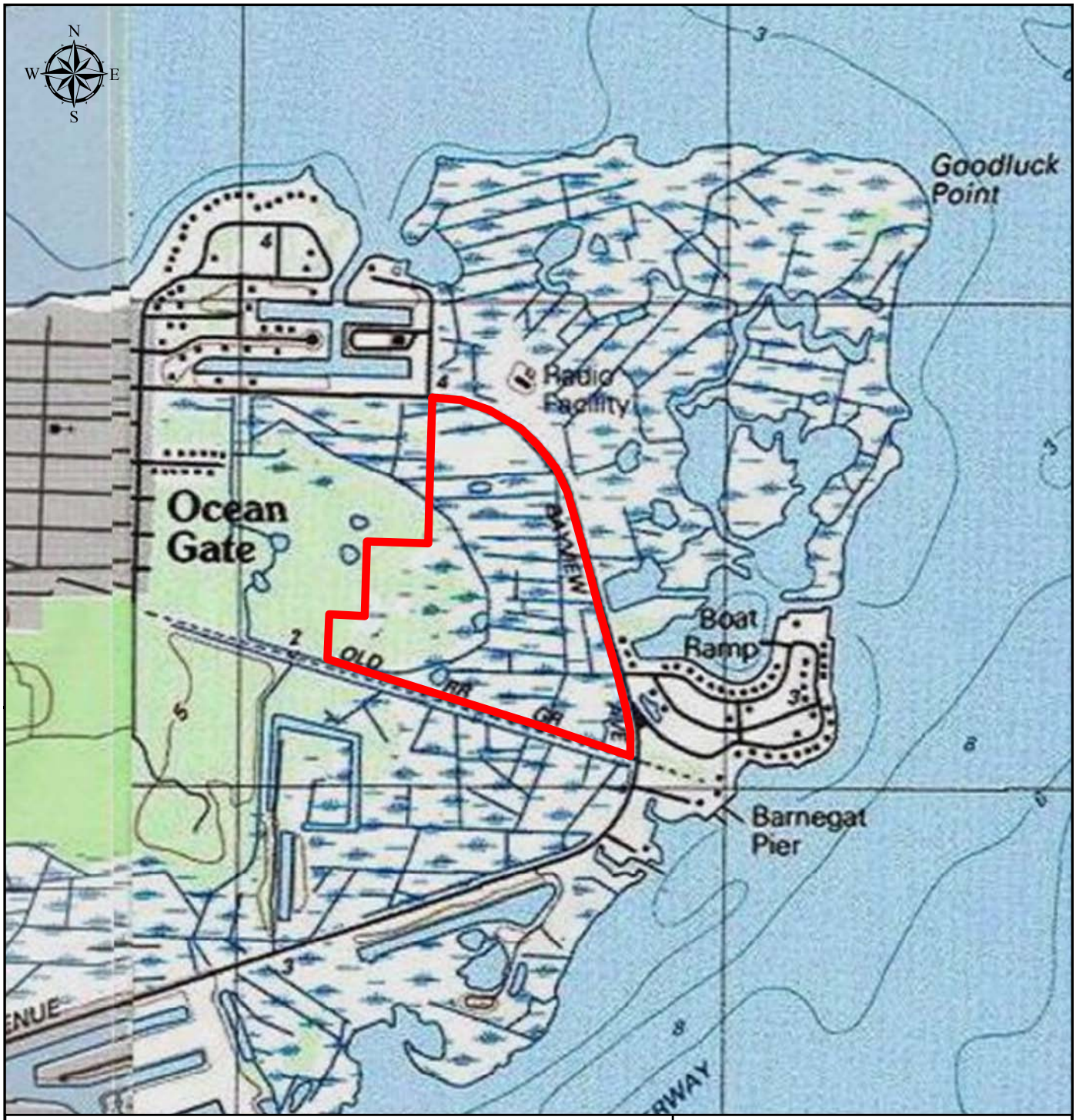
### 3.3.2 Geology and Soils

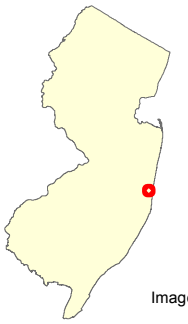
This Project area is similar to the Brick Township Project Area in that it is located within the outer Coastal Plain Physiographic section of New Jersey. The unconsolidated deposits of this province range in age from the Cretaceous to the Miocene (135 to 5.3 million years old) and gently dip to the southeast, 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 (NJDEP 1999).

The bedrock geology on this site is made up of the Wildwood Member of the Kirkwood Formation (NJDEP 2014). The Wildwood Member is described as late early and early middle Miocene Era aged clay rock with secondary silt, massive to finely bedded, dark-gray to olive-gray, locally interbedded with thin beds of light-colored sand and containing small shell fragments, primarily at the base (USGS 2015b).

The surficial geology over the majority of the Good Luck Point Project Area is listed as Cape May Formation, Unit 2 with a small portion in the southeast corner of the Project area listed as Salt Marsh and Estuarine Deposits. Cape May Formation, Unit 2 soils are described as light in color, ranging from very pale brown, yellow, reddish yellow, white, olive yellow or gray, and composed of sand, pebble gravel, minor silt, clay, peat, and cobble gravel. These soils were deposited during the late Pleistocene Era as marine terraces, and can be as thick as 200 feet in some areas. The Salt Marsh and Estuarine Deposits 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 (NJDEP 2014).

This Project area is similar to the Brick Project Area A and occurs primarily on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0 to 1 percent slopes with a smaller portion mapped as containing Berryland Sand, rarely flooded soils with 0 to 2 percent slopes (**Figure 3.13**). Appoquinimink-Transquaking-Mispillion complex soils are described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). Other smaller portions of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes and Mullica sandy loam with 0 to 2 percent slopes.



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Copyright:© 2013 National Geographic Society, i-cubed, 2015

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Figure 3.12

USGS Topographic Map
Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Berkeley Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
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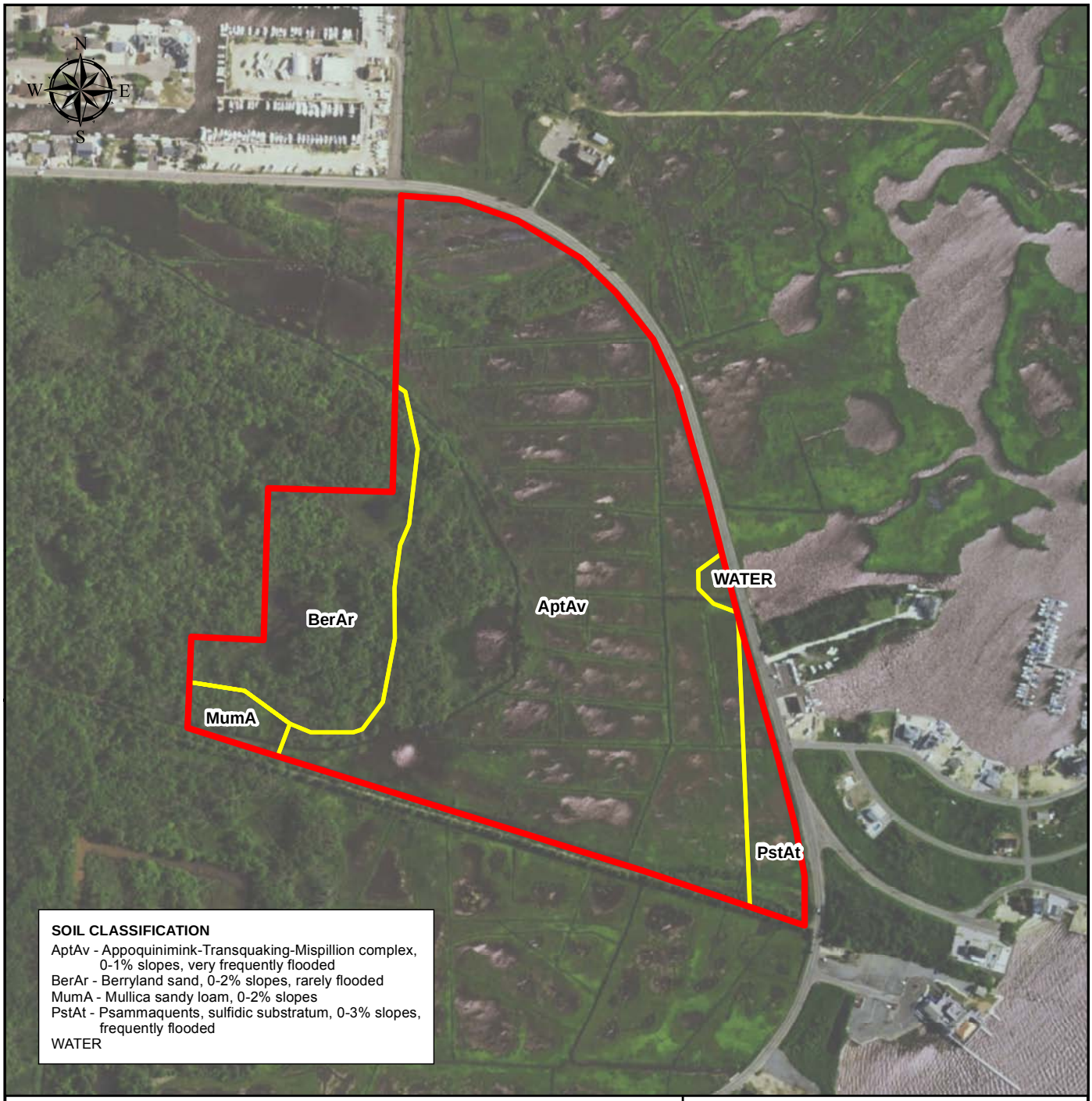

LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

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Figure 3.13

Soil Survey Map
Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Berkeley Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

### 3.3.3 Air Quality

The USEPA has set NAAQS for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015b). New Jersey is located in the Ozone Transport Region, an area that covers 13 northeastern ozone nonattainment states from Maine to Virginia (Trinity Consultants 2014). The Good Luck Point Project Area is located within Ocean County which is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2015b).

Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation, including stippling and chlorosis (the yellowing of leaf tissue due to a lack of chlorophyll) (Davis 1995).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or significantly contribute to a violation of the NAAQS or the NJAAQS. Toward that end, the USEPA and NJDEP have established SILs, which are a lesser fraction of the NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

### 3.3.4 Water Quality

According to the NJDEP (2008), “The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by the USEPA at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations.”

All waters within the Good Luck Point Project Area are classified as a SE1(C1) waters according to the New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for category one (C1) saline estuarine (SE) waters with shellfish harvesting as a designated use. According to the NJDEP (2011b), “Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the anti-degradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s) to protect their aesthetic value

(color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)."

Water quality monitoring station data from the USEPA STORET and water quality exchange website (USEPA 2016b) was evaluated from stations near the Project site in order to determine basic water quality characteristics of the surrounding area. One station (Station BB12-11-1), located along the southern shore at the junction of Toms River and Barnegat Bay, approximately 0.5 miles northeast of the Project area, was sampled in June of 2012. Results from that station revealed the following:

- Temperature measured 21.81 ºC.
- Salinity measured 13.68 ppt.
- DO measured 9.38 mg/L.
- pH measured 8.07.
- TSS measured 9.8 mg/L.
- Conductivity measured 22,655 µS/cm.

### 3.3.5 Wetlands and Streams

The Clean Water Act (40 CFR 230.3) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Using that definition, wetlands are defined based on certain characteristics of vegetation, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic, or adapted to living in saturated areas. Soils are considered hydric (permanently or seasonally saturated by water) if they meet the criteria defined by the National Technical Committee for Hydric Soils (USDA 2015a). Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season (FIC 1989).

The most common method of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States*, wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine, and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands (Cowardin et al. 1979).

Defining areas that meet the regulatory definition of a wetland (33 CFR 328.3(b)) is important in determining the jurisdiction of those areas by the Federal government (USACE), and in some areas of the United States, state, county, and/or local governments. Jurisdiction over wetlands subsequently determines their regulation and the types of activities that are permittable. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into wetlands, meaning that a permit is required before dredged or fill material is

discharged into these areas.

The premise of wetland regulation is that no dredged or fill material may be discharged if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded by the action. The USACE reviews permit applications for activities proposed within WOTUS. As the Project occurs on jurisdictional wetlands, it is subject to regulation by the USACE and the NJDEP.

The Service's NWI indicates that the wetlands within the Good Luck Point Project boundaries are classified as follows (**Figure 3.14**):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).
- Estuarine, intertidal, emergent, persistent, regularly flooded, partially drained/ditched habitat (E2EM1Nd).
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched habitat (E2EM1Pd).
- Palustrine, scrub-shrub, needle-leaved evergreen, seasonally flooded habitat (PSS4C).
- Palustrine, emergent, persistent, seasonally flooded habitat (PEM1C).

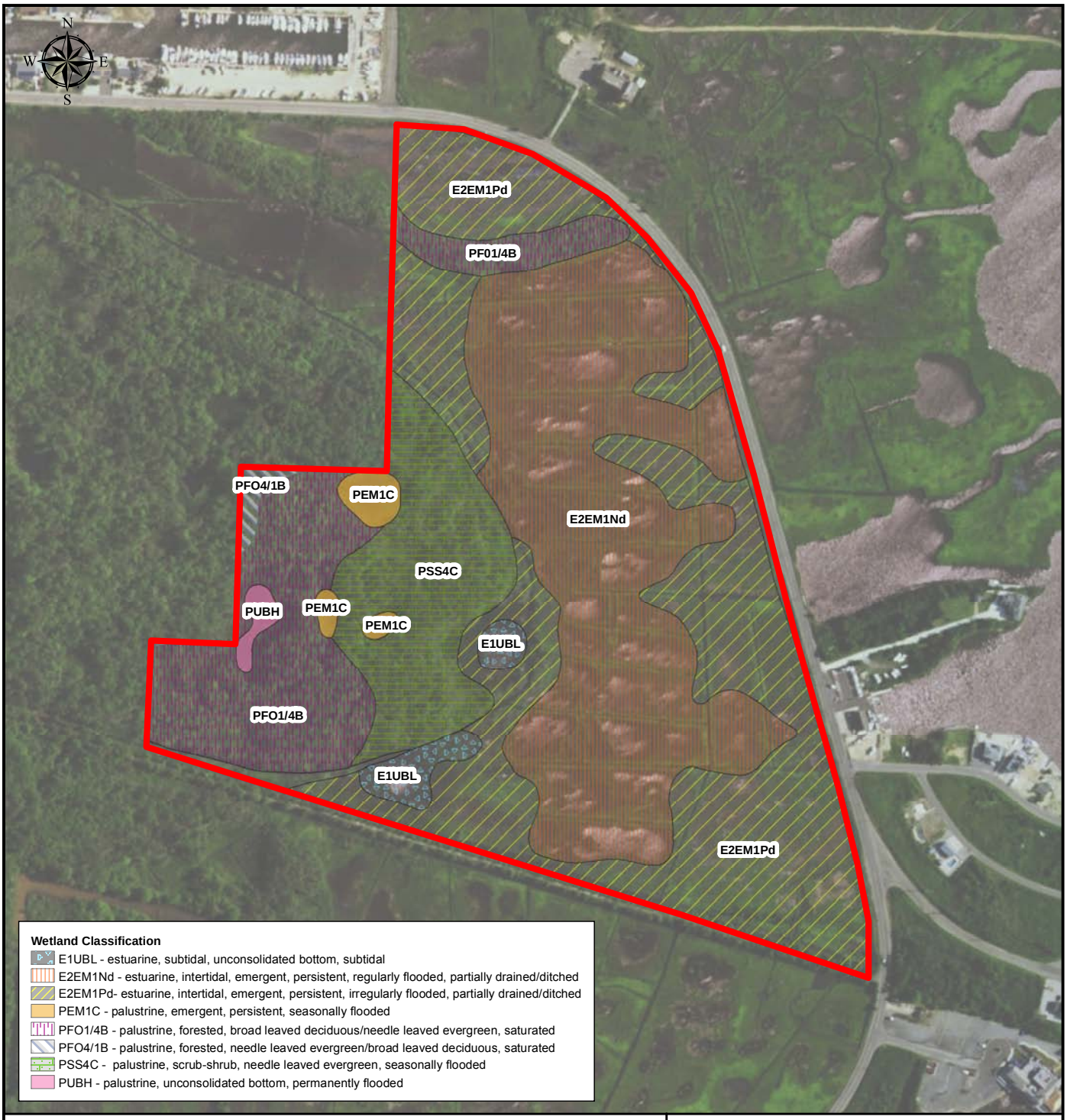
- Palustrine, forested, broad-leaved deciduous/needle-leaved evergreen, saturated habitat (PFO1/4B).
- Palustrine, forested, needle-leaved evergreen/broad-leaved deciduous, saturated habitat (PFO4/1B).
- Palustrine, unconsolidated bottom, permanently flooded habitat (PUBH).

The NJDEP indicates that the wetlands within the Good Luck Point Project boundaries are classified as follows (**Figure 3.15**):

- Saline marsh (low marsh).
- Saline marsh (high marsh).
- Natural lakes.
- Mixed scrub-shrub wetlands (coniferous dominant).
- Mixed wooded wetlands (coniferous dominant).
- Mixed wooded wetlands (deciduous dominant).
- Deciduous scrub-shrub wetlands.

### 3.3.6 Vegetation

A vegetation community characterization was performed by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec) for the Good Luck Point Project Area on September 16, 2015. The following resources were consulted as part of this characterization: *Classification of Wetlands and Deepwater Habitats of the United States* (USFWS 1979); *Classification of Vegetation Communities of New Jersey: Second Iteration* (Breden et al., 2001), and *Plant Communities of New Jersey* (Collins and Anderson, 1994).



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

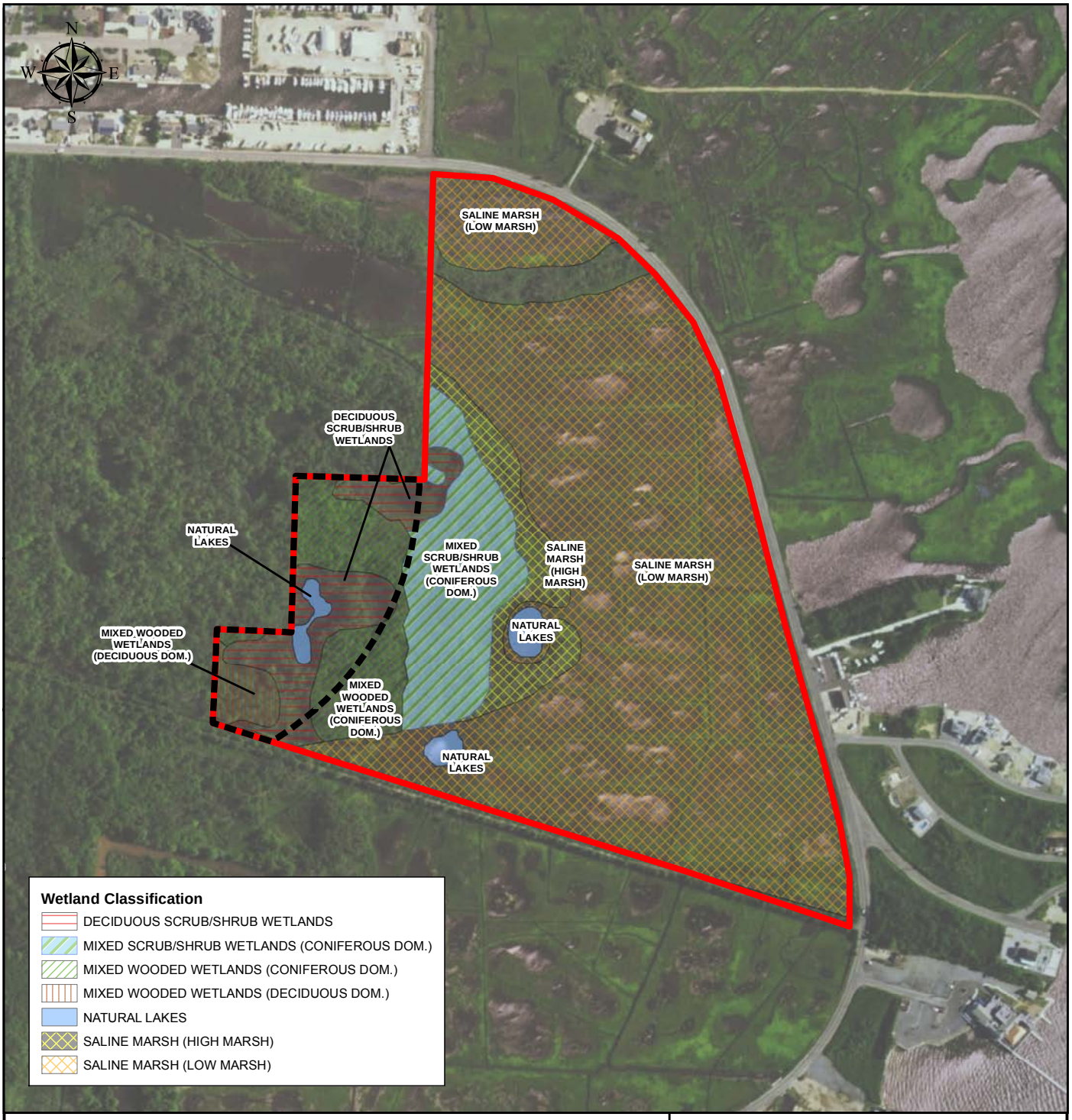
Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

amec foster wheeler

Figure 3.14

National Wetlands Inventory Map
Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Berkeley Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

Project area

Potential vernal habitat area

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015. NJDEP Species Based Habitat, Vernal Habitat (ver. 3.1); New Jersey Department of Environmental Protection (NJDEP); Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP), 2012

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Figure 3.15

NJDEP Wetlands Map
Good Luck Point Project Area
Marsh Enhancement Design/Build Project
Berkeley Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | March 2016 |
|---|---|---|

At the Good Luck Point Project Area, salt marsh composes the majority of the Project area, bisected by tidal ditches or interspersed with open water, either as pools or as tidal creeks. The eastern portion of the salt marsh contains a greater proportion of saltmeadow cordgrass, with some areas entirely dominated by this species. Portions of the salt marsh closer to the center of the Project area exhibit a greater proportion of smooth cordgrass. There is a moderate amount of micro-topographic variation at the Good Luck Point Project Area, and subsequently, there are small pockets of bigleaf marsh-elder (*Iva frutescens*) and common reed interspersed through the salt marsh. A maritime evergreen woodland is located in the westernmost portion of the Project area. The portion of the Project area is dominated by eastern red cedar (*Juniperus virginiana*) with swamp rose-mallow (*Hibiscus moscheutos*) along the woods edge. This community is connected to a large contiguous forest that extends westward towards U.S. Route 9.

When comparing the observed vegetation community at the Good Luck Point Project Area to the *Classification of Vegetation Communities of New Jersey* (Breden et al., 2001), the smooth cordgrass-dominated marsh is classified as a Saltmarsh Cordgrass Tidal Herbaceous Alliance, and the saltmeadow cordgrass-dominated community is classified as a Saltmeadow Cordgrass – (Saltgrass) Tidal Herbaceous Alliance. The maritime woodland community is similar to that described as an Eastern Red Cedar/Northern Bayberry Woodland.

An additional desktop assessment for this Project area, using aerial photographs and LiDAR imagery, revealed substantial areas of waterlogging and die-back areas in lower elevations throughout the Good Luck Point Project Area. The results of the ecological evaluation revealed that approximately 22 acres of the total 59 habitat classified acres within the Project boundary is classified as mudflat while approximately 4 acres is classified as either stressed low salt marsh or stressed high salt marsh. Stressed low salt marsh was observed at the southern and eastern portions of the site mixed with large areas of mudflat. Stressed high salt marsh was observed in the northern end of the site. Approximately 8 acres of the project site is classified as healthy high salt marsh. This change in composition from marsh to open water is evident when examining the aerial photographs presented in Chapter 1 for this Project area, particularly noticeable in the area west of Bayville Avenue.

**Table 3.9** presents the proportions of vegetative habitat types (high marsh, low marsh, upland, etc.) based upon the USNVCS (FGDC 2008) and methods used by NatureServe in their (2009) Vegetation Classification Report. A representative map showing these various habitat types within the Good Luck Point Project Area is presented as Figure 2-21 in **Appendix B**. **Appendix C** presents the habitat elevation data table (Table A-42) for which BTEs at the Good Luck Point Project Area were chosen for sediment enrichment.

**Table 3.9**

**Vegetation Summary for the Good Luck Point Project Area**

| Habitat Type | Acres | Approximate Percentage of Project Area | Vegetative Description |
|---|---|---|---|
| Open water | 2.35 | 3.9 | Areas covered in standing water – no |

| Table 3.9<br>Vegetation Summary for the Good Luck Point Project Area | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| | | | vegetation present. |
| North Atlantic coast estuarine intertidal mudflats/salt pannes | 22.39 | 37 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain very high salinity in the waters within (interstitial) the sediment |
| Stressed North Atlantic low salt marsh | 2.24 | 3.7 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| North Atlantic low salt marsh | 7.32 | 12 | Low, regularly flooded salt marsh that is dominated by smooth cordgrass in the Northern Atlantic Coastal Plain. |
| Combination of North Atlantic low and high salt marsh | 0.24 | 0.39 | Areas characterized by both low salt marsh and high salt marsh vegetation. |
| Stressed North Atlantic high salt marsh | 1.58 | 2.6 | Less vigorous, partially or marginally functioning high salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning high salt marsh vegetation. |
| North Atlantic high salt marsh | 8.46 | 14 | Higher, irregularly flooded salt marsh that is dominated by smooth cordgrass and saltmeadow cordgrass in the Northern Atlantic Coastal Plain. |
| Reed tidal marsh | 0.16 | 0.26 | Areas of a salt marsh that have been invaded by common reed. |
| Scrub-shrub vegetative | 0.05 | 0.082 | Areas dominated by woody vegetation that is |

| Table 3.9<br>Vegetation Summary for the Good Luck Point Project Area | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| communities | | | generally less than 6 meters tall. |
| Upland woody vegetative communities | 16.21 | 27 | Areas dominated by woody vegetation that is generally greater than 6 meters tall. |

### 3.3.7 Marine Resources

**Placement Sites and Borrow Areas:** Sediments in the BB-LEH estuary have been documented to range from medium sands to coarse silts, with fine-to- medium sands tending to occur along the eastern boundary of BB-LEH and very fine sand and coarse silt tending to occur on the western side. However, there was considerable heterogeneity in the distribution of particle sizes. In several cases, sediments at two closely spaced stations were at opposite ends of the particle size spectrum. At the stations closest to the Good Luck Point Project Area, median sediment size was classified as coarse silt to the northwest and as medium sand to the southeast (Taghon et al. 2014).

The surface soils within the Good Luck Point Project Area sediment placement site are mapped almost entirely of Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes. This hydric soil complex is made up of soils from three soil series. The Appoqunimink series consists of very deep, very poorly drained soils that are formed by silty sediments overlying organic material. These soils are continuously saturated and are located on salt-water tidal marshes and estuaries. The mean annual soil temperature is 57 °F. Transquaking series soils consist of very deep, very poorly drained soils formed in thick organic deposits overlying loamy mineral sediments. This series has a very dark brown peat surface layer 9 inches thick formed on brackish estuarine marshes along tidally influenced rivers and creeks. The subsurface layers are composed of very dark gray mucky peat and muck from 22 to 65 inches and very dark gray silty clay to 80 inches. Mispillion series soils consist of very deep, very poorly drained soils formed in organic deposits overlying loamy mineral fluvial and marine soil materials that have low strength. They are located on salt water tidal marshes and estuaries with a very dark brown mucky peat surface layer 10 inches thick followed by very dark grayish brown mucky peat 14 inches thick. The subsurface layers are black and very dark brown muck to 40 inches and black mucky silt loam followed by dark gray silty clay loam and silt from 40 to 80 inches (T&M 2005). The Appoquinimink-Transquaking-Mispillion complex soils have a parent material consisting of loamy fluviomarine deposits over herbaceous organic material with a typical profile of (USDA 2016):

- 0 to 12 inches: mucky silt loam
- 12 to 30 inches: silt loam

- 30 to 80 inches: mucky peat

A very small section in the southeast corner of the sediment placement site is composed of Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3% slopes. This hydric soil's parent material is sandy lateral spread deposits over organic material with a typical profile of (USDA 2016):

- 0 to 12 inches: coarse sand
- 12 to 36 inches: gravelly sand
- 36 to 43 inches: mucky peat
- 43 to 80 inches: mucky peat

Seven New Jersey Department of Transportation (NJDOT) channels are currently being proposed as possible source areas of sediment for the Good Luck Point (and Brick A and Brick B) project area (**Figure 3-10**). Sediment sampling for chemical constituents and geotechnical assessment was also conducted in accordance with the NJDEP Field Sampling Procedures Manual (NJDEP 2005) and the Dredging Technical Manual (Management of Regulation of Dredging Activities and Dredged Materials in New Jersey's Tidal Waters) (NJDEP 1997). Ten locations were sampled in January and February 2016 using a submersible vibracore to a depth of -6 feet mean low water (MLW) at nine of the locations (the Upper Metedeconk River core was advanced to a depth of -7 feet MLW) (Matrix 2016).

The sediments were analyzed for heavy metals, semi-volatile organic compounds (SVOCs), legacy organochlorine pesticides, polychlorinated biphenyls (PCBs), chlorinated dioxins and furans, and grain size. The chemical analytical results are typically compared to NJDEP soil remediation standards set forth at N.J.A.C. 7:26D. These soil remediation standards establish minimum standards for the remediation of contaminated soil as represented by the residential direct contact and nonresidential direct contact soil remediation standards. However, these soil remediation standards are human-health based and may not be fully protective of biota with different exposure conditions and contaminant sensitivities. Therefore, the Service Environmental Contaminants staff reviewed and interpreted the results after comparison to effects-based and mechanistic-based sediment quality criteria from peer-reviewed scientific literature in order to elucidate the potential for sediment toxicity to sensitive organisms. Where appropriate, contaminant exposure was modeled into higher trophic organisms such as birds or mink, and compared to literature-based benchmarks (in preparation by the Service) which are more stringent than soil remediation standards.

**Table 3-10** presents a summary of the sediment assessment findings. The sediments were found to consist of fine to medium grain sands mixed with finer grained silts and clays that would provide geotechnically-suitable materials for the sediment enrichment cells. The Green Cove channel (058A1) and the northern section of Beaver Dam North (053A1-3) were rejected due to unacceptable levels of mercury, arsenic, copper, lead, zine, and PCBs, and an elevated probability of toxicity based on their comparison to effects-based criteria.

| Table 3.10<br>Analysis Summary for Source Channel Sediment | | | | |
|---|---|---|---|---|
| **Sample ID** | **Channel Name** | **% Sand** | **% Silt & Clay** | **Acceptable/ Rejected** |
| 058A-1 | Green Cove | 78.2 | 21.8 | **Rejected** |
| 059C7 | Upper Metedeconk River | 79.9 | 12.8 | Acceptable |
| 053A1-3 | Beaver Dam Creek North | 62.4 | 37.7 | **Rejected** |
| 053B4-7 | Beaver Dam Creek North | 13 | 87 | Acceptable |
| 054A1-3 | Beaver Dam Creek South | 52.2 | 47.8 | Acceptable |
| 070A1-3 | Kettle Creek – Sailor's Quay | 57.1 | 42.9 | Acceptable |
| 070B4-6 | Kettle Creek – Sailor's Quay | 76.8 | 23.2 | Acceptable |
| 071A1-3 | Kettle Creek | 65.6 | 34.4 | Acceptable |
| 091A1-2 | Good Luck Point | 62.4 | 37.6 | Acceptable |
| 0951A-1 | Sloop Creek | Pending | Pending | Pending |

**Planktonic and Benthic Organisms:** The Barnegat Bay Estuary has experienced episodic recurrences of brown tides and other microalgal blooms, loss of submerged aquatic vegetation, and decline of hard clam stock and harvest. A two-year survey of the phytoplankton community in the BB-LEH estuary was conducted between 2011 and 2013. The study aimed to characterize species composition and spatial and temporal trends in the phytoplankton community. The results indicated that the number of phytoplankton taxa recorded from each year was similar and that the most common species belonged to five major groups (see section 3.2.7). Diatoms made up approximately 50% of the total number of taxa. Although there were differences detected between the two years with regards to species occurrence and dominance among seasons and sites, species richness and diversity were comparable. Multivariate analysis of all samples showed significant relationships between phytoplankton species composition and the environmental variables, including salinity and temperature (Ren 2015).

As is common in estuarine environments, the benthic community in Barnegat Bay is dominated by relatively few species. In recent studies of the BB-LEH estuary, six taxa accounted for over 50% of all individuals collected. Of those six most-abundant taxa, five were annelids and one was a crustacean. The most abundant species, *Mediomastus ambiseta*, was present at 95 out of 100 stations and accounted for 31% of all individuals. That species was moderately abundant near the Good Luck Point Project Area as was *Streblospio benedicti* (11 to 100 individuals recorded at the closest monitoring stations). The amphipod *Ampelisca abdita* was recorded less frequently (2 to 10 individuals). Oligochaetes (*Oligochaete* spp.) and the *Notomastus* sp. were not recorded in the monitoring stations near the Project area. Comparitively moderate (2 to 10 individuals) to high (11 to 91 individuals) numbers of *Glycinde multidens* were present near the Project area. Salinity was

determined to have a strong effect on the distribution and abundance of most taxa. Based on four multimetric or multivariate indices of habitat quality evaluated, one of the monitoring stations close to the Good Luck Point Project Area was classified as good, high, and/or meets restoration goals. The other station close to the Project area did not have a consensus due to lower species diversity and only a moderate Benthic Quality Index (Taghon et al. 2014).

**SAV:** Seagrass habitat provides important ecosystem services, including essential habitat for shellfish and finfish. Although the BB-LEH estuary contains approximately 75% of New Jersey's known seagrass habitat (Lathrop et al. 1999), recent remote sensing and in situ surveys have indicated that seagrass habitat has contracted from historical levels due to human induced stressors, such as: (1) direct impacts due to physical alteration of benthic habitat through channel dredging, inlet modification, boat scarring, and dock building, and (2) indirect impacts caused by nutrient enrichment and eutrophication (Lathrop and Haag 2011; Burkholder et al. 2007; Lathrop et al. 2006; Kennish et al. 2008). Comparison of the 1970's and 1980's SAV survey maps with those from the 1990's shows a decrease of nearly 33% in SAV area (Lathrop et al. 1999).

In a study conducted between 2003 and 2009, the seagrass habitat in the central portion of the BB-LEH estuary represented a transition zone from common eelgrass-dominated habitat to widgeongrass-dominated habitat in the north. A total of 1,662 hectares of seagrass were mapped within the central portion of the BB-LEH estuary in 2009, representing an increase of 256 hectares from 2003 (Lathrop and Haag 2011). The Seaside Park New Jersey Submerged Aquatic Vegetation Distribution Map of 1979 (NJDEP 2016) revealed historic areas of common eelgrass SAV surrounding the Good Luck Point Project Area. However, those areas are no longer evident in recent (2003/2009) mapping (Lathrop and Haag 2011).

**Fish and Shellfish:** The refuge lands are bordered by, and are hydrologically connected to, estuarine habitats made up of salt marshes, streams, ponds, bays, and rivers (USFWS 2013). Specifically, the Good Luck Point Project Area is located within the central portion of the Barnegat Bay estuary system. In general, the refuge is home to a rich variety of fish, shellfish, and crabs. These species are of substantial importance to the sport and commercial fisheries and are a food base for many birds and mammals (USFWS 2004; USFWS 2013).

The salt marshes contain abundant mummichog and sheepshead minnow, which are frequently found in shallow water environments such as marsh ponds and small intertidal creeks. Important recreational and commercial species, including summer flounder, striped bass, white perch, and northern weakfish use the estuarine habitats as important nursery areas (USFWS 2013).

The Barnegat Bay estuary is estimated to be used by approximately 110 fish species. The ten most commonly reported species are bay anchovy, Atlantic silverside, fourspine stickleback, spot, winter flounder, inland silverside, northern pipefish, mummichog, bluefish, and oyster toadfish (TPL 2008). It also contains a variety of shellfish and crabs. Species such as bay scallop, eastern oyster, northern quahog, dwarf surfclam, softshell clam, blue mussel, blue crab, and horseshoe crab have been documented as being present in the waters of the bay (USFWS 2004).

**EFH:** The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth

procedures to identify, conserve, and enhance EFH for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the NOAA NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a). A comprehensive EFH Assessment for this Project area is provided as **Appendix D.**

### 3.3.8 Terrestrial Wildlife

**Birds**: The primary focus of the refuge establishment has been to protect tidal wetland and shallow bay habitat for migratory water birds. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose, Canada goose, Atlantic brant, mallard, American black duck, northern shoveler, bufflehead, double-crested cormorant, great egret, glossy ibis, clapper rail, greater yellowlegs, semipalmated sandpiper, least sandpiper, short-billed dowitcher, laughing gull, ring-billed gull, herring gull, great black-backed gull, Forster's tern, and black skimmer (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove, red-bellied woodpecker, blue jay, fish crow, tree swallow, barn swallow, Carolina chickadee, tufted titmouse, Carolina wren, American robin, gray catbird, northern mockingbird, common yellowthroat, song sparrow, northern cardinal, red-winged blackbird, common grackle, and American goldfinch. All of these species have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Good Luck Point provides a forested island for resting and feeding along the Atlantic flyway and is considered an important bird migration and wintering spot for many neotropical birds (TPL 2005; TPL 2015). Herons, peregrine falcons, American bitterns *(Botaurus lentiginosus*), bald eagles and osprey often frequent the area due to the abundant food in the bay and tidal saltmarsh (TPL 2003; TPL 2005).

**Mammals**: The Good Luck Point Project Area includes both forested wetlands as well as tidal salt marsh habitat. Therefore, according to the Service's Comprehensive Conservation Plan for the refuge (2004), in addition to the typical mammals found in wetland areas described for the Brick Township Project Area (see section 3.2.8), forested species may also reside here. Forested species found throughout the refuge include red fox (*Vulpes vulpes*), grey fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela erminea*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginiana*), white-tailed deer (*Odocoileus virginianus*), grey squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), redbacked vole (*Clethrionomys gapperi*), pine vole (*Microtus pinetorum*), masked shrew (*Sorex cinereus*), short-tailed shrew (*Blarina brevicauda*), eastern mole (*Scalopus aquaticus*), and a variety of bat species.

**Reptiles and Amphibians**: The Good Luck Point Project Area also falls into the coastal estuarine community type assemblage, which includes coastal marshes, estuaries, coves, tidal flats, and/or inner edges of barrier beaches. Therefore, the Good Luck Point Project Area may include habitat for the northern diamondback terrapin (USFWS 2004).

The forested wetlands of the Good Luck Point Project Area may be used by the wetland amphibian and reptilian species documented throughout the refuge including (NJA 2015; USFWS 2013):

- Five-lined skink
- Black racer
- Black rat snake
- Northern water snake
- Eastern hognose snake
- Rough green snake
- Eastern ribbon snake
- Common snapping turtle
- Eastern painted turtle
- Eastern mud turtle
- Redbelly turtle
- Green frog
- New Jersey chorus frog
- Northern cricket frog
- Gray treefrog
- Southern leopard frog
- Northern red salamander
- Four-toed salamander

The Project area may also potentially be used by upland herpetofauna. In general, the upland amphibians documented within the refuge include the commonly observed Fowler's toad (*Anaxyrus fowlerii*) or the less frequently observed eastern spadefoot toad (*Scaphiopus holbrookii*) or wood frog (*Lithobates sylvatica*). Upland reptilian species that are found throughout the refuge

include the northern fence lizard (*Sceloporus undulatus*), northern pine snake (*Pituophis melanoleucus*), and eastern box turtle (*Terrapene carolina*) (USFWS 2013).

### 3.3.9 Threatened and Endangered Species

The unique habitats of the Barnegat Bay estuary (including barrier islands, salt marsh, tidal marshes, shallow water, and swamps) attract threatened and endangered species (TPL 2008). The Service completed an intra-service biological evaluation for the Good Luck Point Project Area pursuant to the ESA section 7 (**Appendix E**). As of the date of this EA, an official response is pending, but the initial results indicated the presence of the following federally listed threatened and endangered species on or near the Good Luck Point Project Area:

**Table 3.11**

**Intra-Service Section 7 Biological Evaluation Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Good Luck Point Project Area**

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| Red knot | *Calidris canutus rufa* | Threatened |
| Knieskern's beaked-rush | *Rhynchospora knieskernii* | Threatened |
| Seabeach amaranth | *Amaranthus pumilus* | Threatened |
| Swamp pink | *Helonias bullata* | Threatened |
| Northern long-eared bat | *Myotis septentrionalis* | Threatened |

There were no critical habitats documented within the Good Luck Point Project Area. The Service's IPaC system was also consulted to determine which migratory bird species, protected under the MBTA and the BGEPA, could potentially move through the Good Luck Point Project Area. The results indicated the presence of the following 25 species:

**Table 3.12**

**Service's IPaC Findings for Potential Migratory Bird Species On or Near the Good Luck Point Project Area**

| Common Name | Scientific Name |
|---|---|
| American oystercatcher | *Haematopus palliatus* |
| American bittern | *Botaurus lentiginosus* |
| Black skimmer | *Rynchops niger* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Blue-winged warbler | *Vermivora pinus* |
| Fox sparrow | *Passerella liaca* |
| Great shearwater | *Puffinus gravis* |
| Gull-billed tern | *Gelochelidon nilotica* |
| Horned grebe | *Podiceps auritus* |
| Hudsonian godwit | *Limosa haemastica* |

| Table 3.12<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Good Luck Point Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| Least bittern | *Ixobrychus exilis* |
| Least tern | *Sterna antillarum* |
| Peregrine falcon | *Falco peregrinus* |
| Pied-billed grebe | *Podilymbus podiceps* |
| Prairie warbler | *Dendroica discolor* |
| Purple sandpiper | *Calidris maritima* |
| Red knot | *Calidris canutus rufa* |
| Rusty blackbird | *Euphagus carolinus* |
| Saltmarsh sparrow | *Ammodramus caudacutus* |
| Seaside sparrow | *Ammodramus maritimus* |
| Short-eared owl | *Asio flammeus* |
| Snowy egret | *Egretta thula* |
| Upland sandpiper | *Bartramia longicauda* |
| Wood thrush | *Hylocichla mustelina* |
| Worm-eating warbler | *Helmitheros vermivorum* |

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Good Luck Point Project Area:

| Table 3.13<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Good Luck Point Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Common tern | *Sterna hirundo* | Not listed | Special concern |
| Tricolored heron | *Egretta tricolor* | Not listed | Special concern |
| Little blue heron | *Egretta caerula* | Not listed | Special concern |
| Glossy ibis | *Plegadis falcinellus* | Not listed | Special concern |
| Least tern | *Sterna antillarum* | Not listed | Endangered |
| Peregrine falcon | *Falco peregrinus* | Not listed | Endangered |
| Osprey | *Pandion haliaetus* | Not listed | Threatened |
| Caspian tern | *Hydroprogne caspia* | Not listed | Special concern |
| Snowy egret | *Egretta thula* | Not listed | Special concern |
| Black-crowned night-heron | *Nycticorax nycticorax* | Not listed | Threatened |

Since the NJDEP GeoWeb is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The

September 11, 2015 findings of the Natural Heritage Program are presented in **Appendix E**. These results indicated the following additional plant and animal species that have the potential to occur on or near the Good Luck Point Project Area:

**Table 3.14**

**NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Good Luck Point Project Area**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| Brown thrasher | *Toxostoma rufum* | Not listed | Special concern |
| Mudbank crown grass | *Paspalum dissectum* | Not listed | S2 – Imperiled in New Jersey |

The results also indicated that the Good Luck Point Project Area contains potential vernal pool habitat (**Figure 3.15**).

There are a total of three osprey nests (Service ID numbers GLPws001, GLPws002, and GLPws003jpl) located within the Good Luck Point Project Area. These nests are located on the top of abandoned poles previous used for radio and/or telephone communication systems.

### 3.3.10 Cultural Resources

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. Views of the public should be solicited and considered throughout the process, and native Indian tribes must be consulted about undertakings on or affecting their lands under Executive Order 13175. If the agency's undertaking could affect historic properties, the next steps are to review background information, consult with the SHPO and any Indian tribe that may attach religious or cultural importance to them, seek information from knowledgeable parties, and conduct additional studies as necessary. If it is determined that the activity that has no potential to affect historic properties, the agency has no further Section 106 obligations (ACHP, 2013).

To achieve compliance with the NHPA (Section 106), reviews of cultural resource files were performed at the offices of the NJDEP SHPO and the NJSM to assess the potential for the Proposed Action to impact historic properties (listed or eligible for listing on the National Register of Historic Places) within the Good Luck Point Project Area. Historic properties include archaeological sites, as well as historic structures and districts. In addition, the Service has requested comment from the NJDEP SHPO and has been addressing Tribal consultation requirements. At this time, the Delaware Tribe of Indians is a consulting party. However, the Delaware Nation of Oklahoma did not wish to take part.

The APE for the Good Luck Point Project includes the area in which the sediment will be placed and the area around the proposed culvert, equaling approximately 19 acres. The search indicated that the Project area contains a historic property (the AT&T Transmitter Building and Antenna

Field) that was previously determined eligible for listing on the National Register of Historic Places. The file searches indicated there are no other previously inventoried historic properties (or archaeological sites) within the APE at Good Luck Point.

Construction of the former AT&T facility at the Good Luck Point Project Area made Toms River a central player in a radio and ship-to-shore telephone system that eventually linked Bell System telephones with the principal ocean liners plying the Atlantic Ocean. The former AT&T facility was subsequently closed in 1999 due to the development of undersea cables to Europe and the invention of satellite communication (AWR 2010). In 2007, the SHPO determined that the AT&T Transmitter Building and Antenna Field is eligible for listing in the National Register because of its "association with the early implementation and expansion of ship-to-shore telephony" and because it is a "representative, substantially intact example of an early shortwave transmitter building with its associated antenna field." There will be no effect on the historical portions of this property (transmitter building and poles/antennae) from the action that is proposed in the present Environmental Assessment. **Appendix F** presents selected relevant information from the SHPO files concerning the historical background of the Good Luck Point APE.

Because a historic property is located within the Project area, a Phase 1A Cultural Resources Assessment Report (**Appendix G**) was developed to assess the archaeological sensitivity of the Good Luck Point APE. The results concluded that the closest known archaeological sites are recorded northwest of the APE, to the north of Toms River. The assessment found that any intact upland areas within the APE may have moderate to high sensitivity for unrecorded archaeological sites. However, the Project does not involve the process of soil/sediment removal, with the exception of the small culvert construction area. Therefore, the potential for impacts to previously undiscovered historical artifacts is low.

Further Section 106 research was not conducted by Amec for the Good Luck Point Project Area; however, follow-up consultation with the NJDEP SHPO was performed by the Service and a July 27, 2016 letter of finding of No Historic Properties Adversely Effected was issued indicating no further Section 106 consultation being required.

### 3.3.11 Socioeconomic Resources and Environmental Justice

The socioeconomic structure of the Good Luck Point Project Area is similar to that of the Brick Township Project Area, as they are both located within the coastal portion of Ocean County. Ocean County began as a rural, agricultural and fishing center. In the latter part of the 1800s and through the 1900s, the resort industry of the New Jersey Shore began to develop, and commercial activities associated with seasonal resorts became the county's economic backbone. With year-round population increases, Ocean County's economic base has become increasingly diverse and a variety of new industries now supplement the traditional tourist-related businesses. The health care industry is now the top employer in the county and is the fastest growing employment sector. Ocean County is projected to continue leading employment growth in the State through the next decade (OCDP 2014).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including

horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

### 3.3.12 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation. The forested wetlands and uplands neighboring the Good Luck Point Project Area are owned by the Ocean County Natural Lands Trust and are used for hiking, boating and birding by tourists during the peak summer tourism months. It is an important bird migration and wintering spot along the Atlantic flyway, which includes woodlands with hiking trails, tidal marsh habitat, and scenic views across the Barnegat Bay (TPL 2015).

Public use of the Good Luck Point Project Area is not encouraged, as the Service does not maintain recreational trails or visitor facilities. However, incidental use of this area by birders and the walking public may occur throughout the year.

### 3.3.13 Transportation

The regional and State roads that convey traffic directly into and from Good Luck Point are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- U.S. Route 9 also runs in a general northeast to southwest direction, extending from an interchange with Route 1 in Woodbridge Township, Middlesex County down to its endpoint in Lower Township, Cape May County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Good Luck Point Project Area (between exits 80 and 74, west/southwest of the Project area) was estimated to be between 53,354 and 57,938 cars per day for 2015 during the fall season (October). These values represent approximately 96 percent of the maximum daily load on this stretch of roadway, which occurs during summer months (T&M 2000).

Traffic volumes on a stretch of U.S. Route 9, just west of the Proposed Action at Good Luck Point, indicate that roadway's average annual daily traffic volume at 31,858 cars per day in December of 2012 (NJDOT 2015).

### 3.3.14 Noise

Noise can be characterized by the following four factors: frequency, intensity, duration, and distance. Each of these factors is described in section 3.2.14.

The two most common types of noise are point source and line source. This Proposed Action would generate point source noise. These noises are associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). A few examples of point sources of noise expected from activities at the Good Luck Point Project Area are the inboard motors associated with the sediment delivery vessel, the pump required to spread the sediment, and the dump truck, small wheeled excavator, and jackhammer required for the new culvert installation.

OSHA regulations state that workers must not be exposed to noise levels above 85 dBA as a 8-hour noise exposure level or to 140 dBC as a peak sound level. The New Jersey law allows a maximum of 90 db for watercraft motors measured at idle.

Static level noise measurements from boats with various types of motors were conducted with the engine on idle and the microphone located four feet above the water and two feet behind the transom of the boat. Typical single outboard motor noise ran approximately 74 dBA in an idled state (NUI, 1995). Stationary equipment, such as pumps or air compressors, generally run continuously at relatively constant power and speeds. Noise levels at 50 feet from stationary equipment can range from 68 to 88 dBA, with pumps typically on the quieter end. According to the Washington State Department of Transportation (WSDOT) (2013), dump trucks measure a maximum of 76 dBA, excavators measure a maximum of 81 dBA, and jackhammers measure a maximum of 89 dbA (WSDOT 2013).

## 3.4 Stouts Creek Project Area

The third Project area (also known as the Stouts Creek Project Area) is located within Lacey Township and covers multiple lots within Blocks 520 and 630. It is located east of U.S. Route 9, south of Cedar Drive (**Figure 3.16**).

The Stouts Creek Project Area is composed of a large man made impoundment that is split into two distinct cells, with a small, more natural, ponded area along the northern portion of the Project site. It is approximately 127 acres in size and is generally situated between salt marsh associated with Stouts Creek and Wire Pond/Wire Creek to the south and east, respectively, and forested wetlands to the north and west. This site is also located within the Coastal Plain physiographic section of the state and the Barnegat Bay Watershed Management Area (WMA 13) (**Figure 3.2**).

### 3.4.1 Topography

The topography of the Stouts Creek Project Area is relatively flat and is situated between 0 and 5 feet above mean sea level (**Figure 3.17**). Net local surface water drainage from the marsh ultimately drains into the adjacent Wire Pond/Wire Creek complex to the east or Stouts Creek to the south.

### 3.4.2 Geology and Soils

This Project area is similar to the other Project areas in that it is located within the outer Coastal Plain Physiographic section of New Jersey. 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 (NJDEP 1999).

The bedrock geology is classified as the Wildwood Member of the Kirkwood Formation, described as late early and early middle Miocene Era aged clay rock with secondary silt, massive to finely bedded, dark-gray to olive-gray, locally interbedded with thin beds of light-colored sand and containing small shell fragments, primarily at the base (USGS 2015b).

The surficial geology of this Project area is listed as 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 (NJDEP 2014).

Soils for the eastern portion of the Stouts Creek Project Area are listed as Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes (**Figure 3.18**). Appoquinimink-Transquaking-Mispillion complex soils are described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). The northern and western portions of the Stouts Creek Project Area are mapped as primarily containing open water and Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes, with some small pockets of Berryland Sand, rarely flooded soils with 0 to 2 percent slopes.

### 3.4.3 Air Quality

The USEPA has set NAAQS for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015b). New Jersey is located in the Ozone Transport Region, an area that covers 13 northeastern ozone nonattainment states from Maine to Virginia (Trinity Consultants 2014). The Stouts Creek Project Area is located within Ocean County which is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2015b).

Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation, including stippling and chlorosis (the yellowing of leaf tissue due to a lack of chlorophyll) (Davis 1995).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or significantly contribute to a violation of the NAAQS or the NJAAQS. Toward that end, the USEPA and NJDEP have established SILs, which are a lesser fraction of the NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

### 3.4.4 Water Quality

According to the NJDEP (2008), "The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by the USEPA at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations."

All waters within the Stouts Creek Project Area are classified as SE1(C1) waters according to New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for category one (C1) saline estuarine (SE) waters with shellfish harvesting as a designated use. According to the NJDEP (2011b), "Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the anti-degradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)."

LEGEND

PROJECT AREA

0 1,000 2,000 Feet

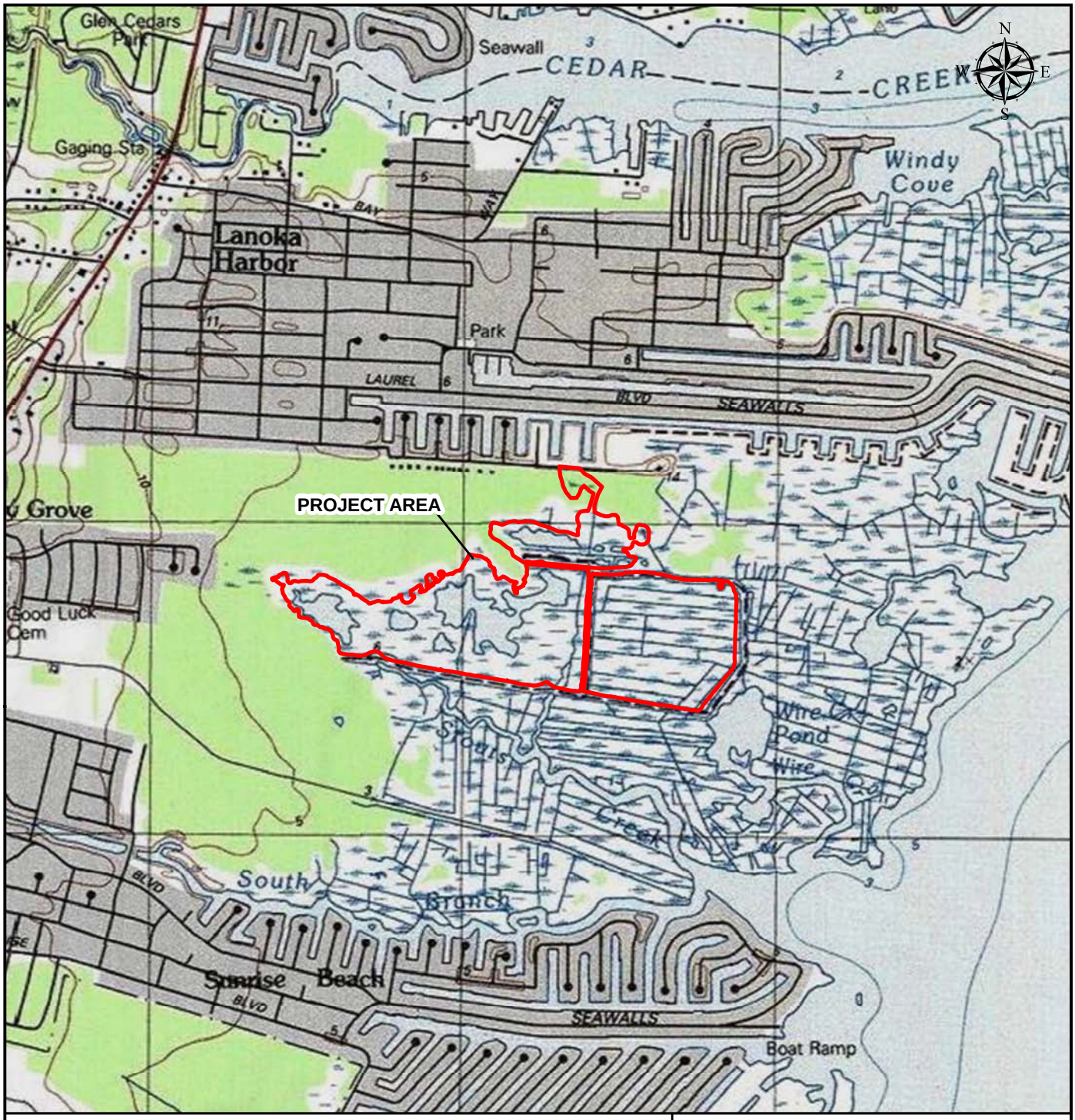
Image Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, 2015

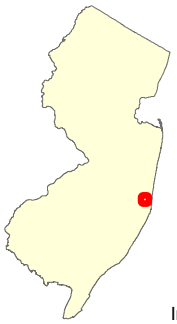
amec foster wheeler

Figure 3.16

Street Map
Stouts Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Copyright:© 2013 National Geographic Society, i-cubed, 2015

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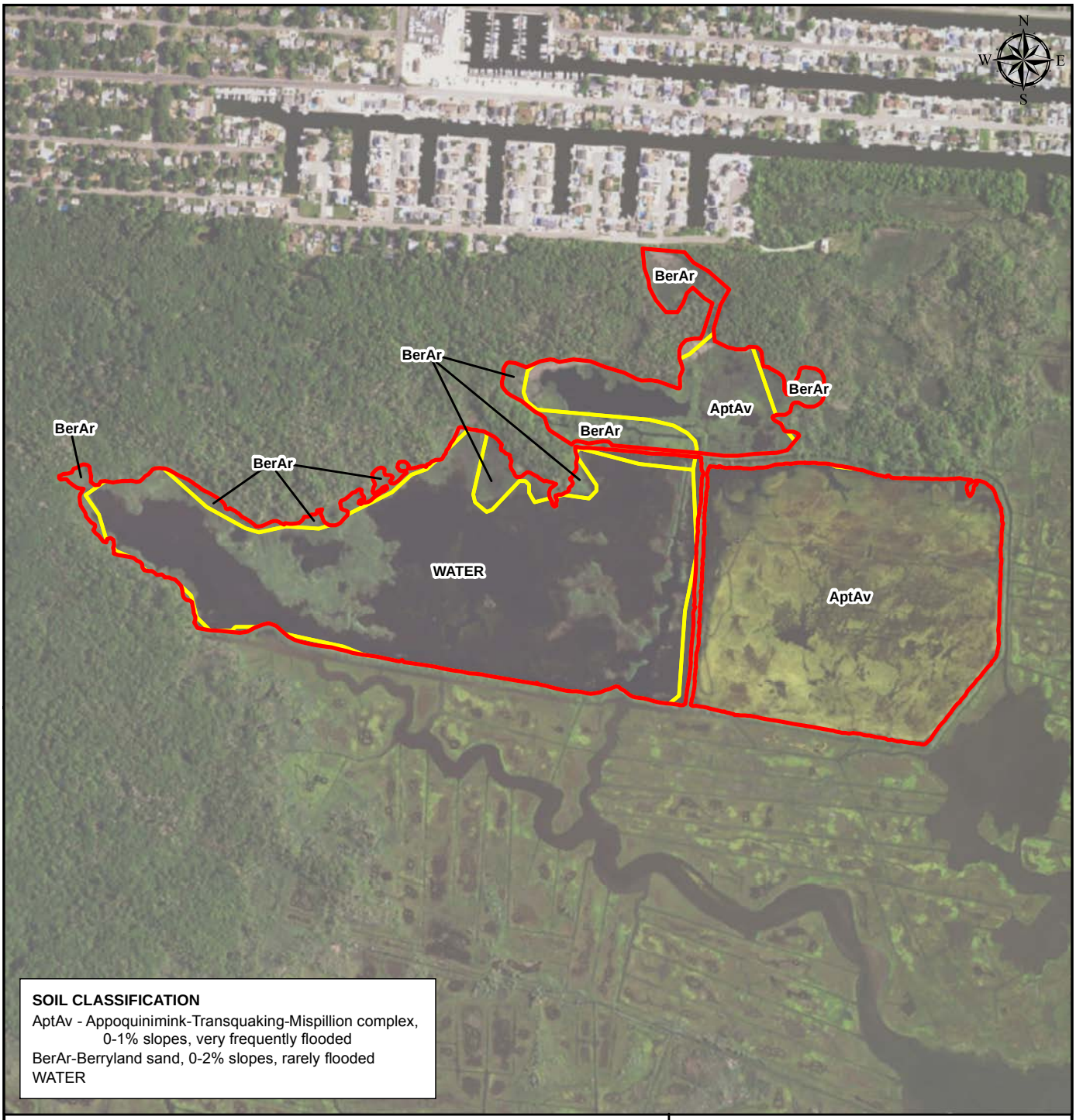
Figure 3.17

USGS Topographic Map
Stouts Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

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Figure 3.18

Soil Survey Map
Stouts Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

Water quality monitoring station data from the USEPA STORET and water quality exchange website (USEPA 2016b) was evaluated from stations near the Project site in order to determine basic water quality characteristics of the surrounding area. Two stations (Station BB12-14-1 and Station BB12-14-2), located at the mouth of Stouts Creek approximately 0.3 miles south/southeast of the Project area, were sampled in June of 2012. Results from those stations revealed the following:

- Temperature ranged from 22.03 to 24.38 ºC.
- Salinity measured between 25.45 and 25.47 ppt.
- DO ranged from 5.85 to 6.92 mg/L.
- pH ranged from 7.04 to 7.62.
- TSS ranged from 9.2 to 17.6 mg/L.
- Conductivity ranged from 30,009 to 39,824 µS/cm.

### 3.4.5 Wetlands and Streams

The Clean Water Act (40 CFR 230.3) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Using that definition, wetlands are defined based on certain characteristics of vegetation, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic, or adapted to living in saturated areas. Soils are considered hydric (permanently or seasonally saturated by water) if they meet the criteria defined by the National Technical Committee for Hydric Soils (USDA 2015a). Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season (FIC 1989).

The most common method of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States*, wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine, and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands (Cowardin et al. 1979).

Defining areas that meet the regulatory definition of a wetland (33 CFR 328.3(b)) is important in determining the jurisdiction of those areas by the Federal government (USACE), and in some areas of the United States, state, county, and/or local governments. Jurisdiction over wetlands subsequently determines their regulation and the types of activities that are permittable. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into wetlands, meaning that a permit is required before dredged or fill material is discharged into these areas.

The premise of wetland regulation is that no dredged or fill material may be discharged if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded by the action. The USACE reviews permit applications for activities proposed within WOTUS. As the Project occurs on jurisdictional wetlands, it is subject to regulation by the USACE and the NJDEP.

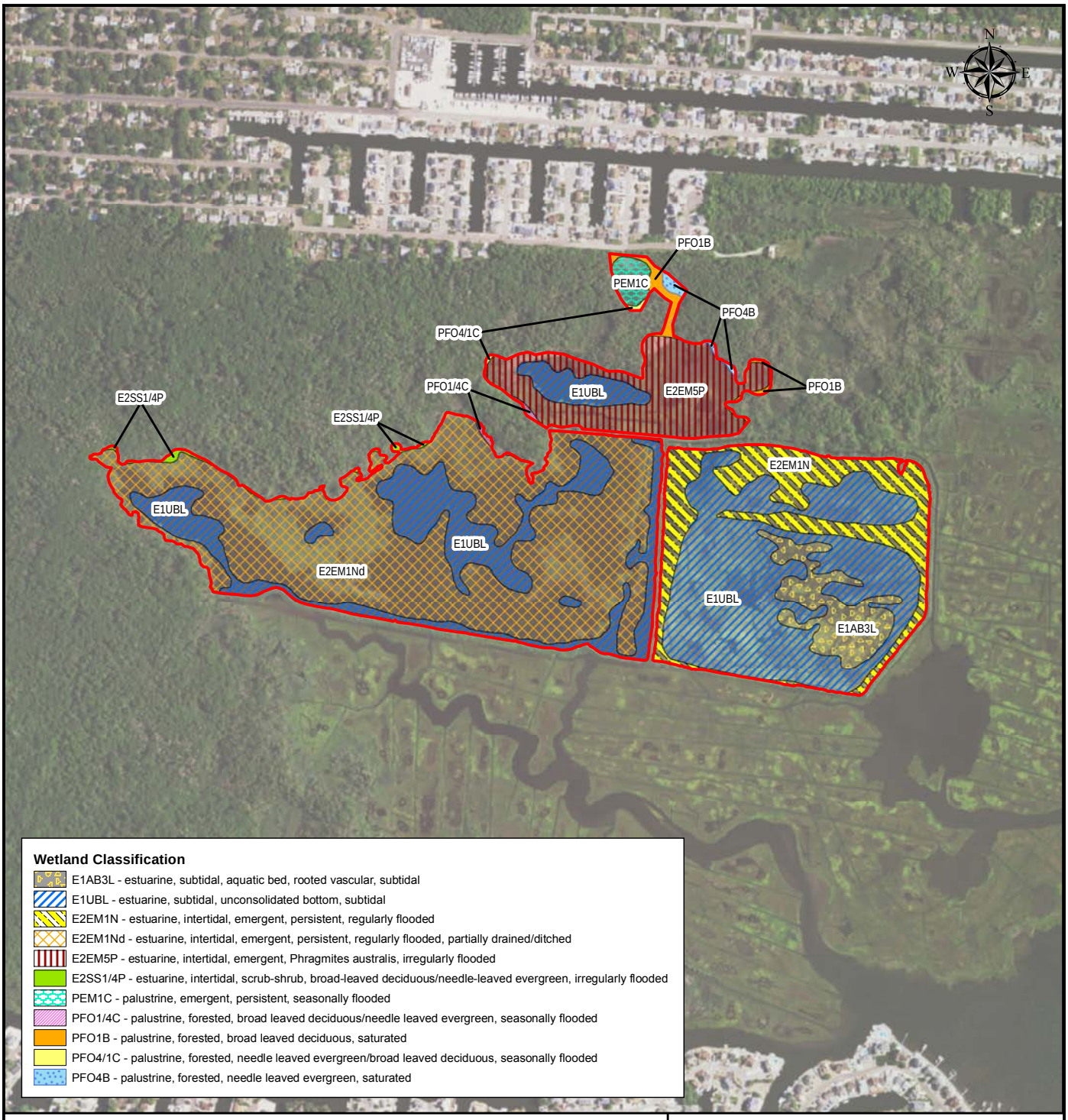
The Service's NWI indicates that the wetlands within the Stouts Creek Project Area boundaries are classified as follows (**Figure 3.19**):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).
- Estuarine, subtidal, aquatic bed, rooted vascular, subtidal habitat (E1AB3L).
- Estuarine, intertidal, emergent, persistent, regularly flooded, partially drained/ditched habitat (E2EM1Nd).

- Estuarine, intertidal, emergent, persistent, regularly flooded habitat (E2EM1N).
- Estuarine, intertidal, scrub-shrub, broad-leaved deciduous/needle-leaved evergreen, irregularly flooded habitat (E2SS1/4P).
- Estuarine, intertidal, emergent, *Phragmites australis*, irregularly flooded habitat (E2EM5P).
- Palustrine, emergent, persistent, seasonally flooded habitat (PEM1C).
- Palustrine, forested, broad-leaved deciduous, saturated habitat (PFO1B).
- Palustrine, forested, broad-leaved deciduous/needle-leaved evergreen, seasonally flooded habitat (PFO1/4C).
- Palustrine, forested, needle-leaved evergreen, saturated habitat (PFO4B).
- Palustrine, forested, needle-leaved evergreen/broad-leaved deciduous, seasonally flooded habitat (PFO4/1C).

The NJDEP indicates that the wetlands within the Stouts Creek Project boundaries are classified as follows (**Figure 3.20**):

- Saline marsh (low marsh).
- Saline marsh (high marsh).
- Tidal rivers, inland bays, and other tidal waters.
- *Phragmites* dominant coastal wetlands.
- *Phragmites* dominant interior wetlands.
- Coniferous wooded wetlands.
- Deciduous scrub-shrub wetlands.



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

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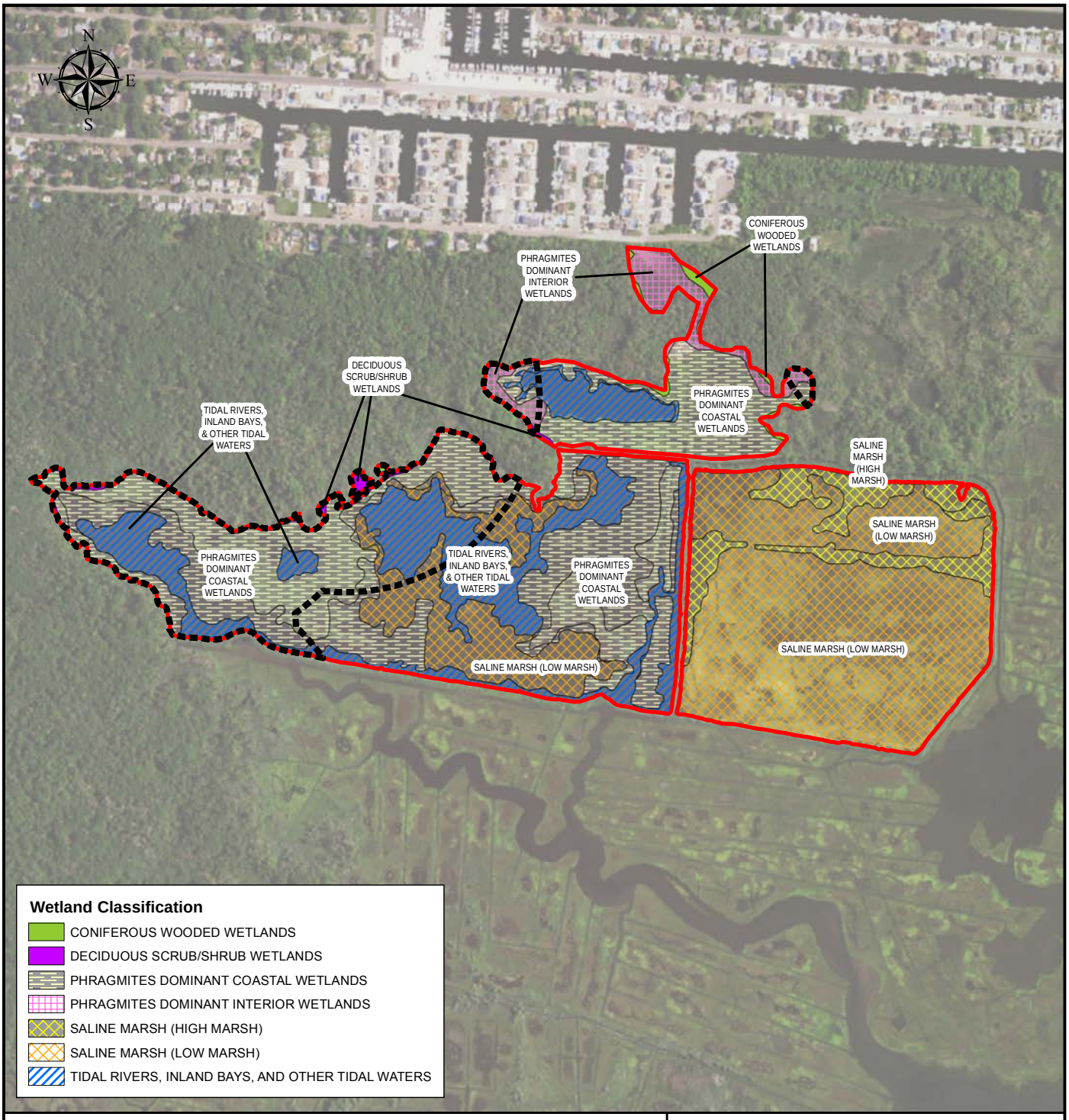
Figure 3.19

National Wetlands Inventory Map
Stouts Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

Project area

Potential vernal habitat area

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015. NJDEP Species Based Habitat, Vernal Habitat (ver. 3.1); New Jersey Department of Environmental Protection (NJDEP); Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP), 2012

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Figure 3.20

NJDEP Wetlands Map
Stouts Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | March 2016 |
|---|---|---|

### 3.4.6 Vegetation

A desktop assessment the Project area was performed using aerial photographs (true color and color infrared) and LiDAR imagery to provide a general perspective of salt marsh structure on a landscape scale. These resources were used to map general habitat types (high marsh, low marsh, upland, etc.). General habitat types were based upon the USNVCS (FGDC 2008) and methods used by NatureServe in their (2009) Vegetation Classification Report. Vegetative communities within the salt marsh group were further classified as either healthy or stressed.

The easternmost impoundment at Stouts Creek consists of a large mudflat characterized by submerged aquatic vegetation and floating algae that contains a shallow amount of water (approximately 0 to 0.5 feet) over an unconsolidated muck substrate. The western impoundment consists of a similar substrate but with less standing water (approximately 0 to 0.25 feet). The western impoundment also contains higher elevations throughout the center of the impoundment that are dominated by monotypic stands of common reed. The remaining portions of the Project area include the actual dike berms around the impoundment that are dominated by common reed and shrubs, and a small natural pond-like feature dominated by common reed on the north side of the Project area. Unlike the natural high and low salt marsh areas observed outside the Project area boundary at Stouts Creek, the habitat within the Project area is dominated by open water and mudflats which have been created by flooding the area. The dominant vegetation found throughout the Project area consists of invasive species and the overall health of this impoundment area is generally poor (**Table 3.15**). A representative map showing the various habitat types within the Good Luck Point Project Area is presented as Figure 2-24 in **Appendix B.**

**Table 3.15**
**Vegetation Summary for the Stouts Creek Project Area**

| Habitat Type | Acres | Approximate Percentage of Project Area | Vegetative Description |
|---|---|---|---|
| North Atlantic coast estuarine intertidal mudflats/salt pannes | 96.98 | 76 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain very high salinity in the waters within (interstitial) the sediment |
| Stressed North Atlantic low salt marsh | 0.14 | 0.11 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| Reed tidal marsh | 27.76 | 22 | Areas of a salt marsh that have been invaded |

| Table 3.15<br>Vegetation Summary for the Stouts Creek Project Area | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| | | | by common reed. |
| Scrub-shrub vegetative communities | 0.31 | 0.24 | Areas dominated by woody vegetation that is generally less than 6 meters tall. |
| Upland woody vegetative communities | 1.81 | 1.4 | Areas dominated by woody vegetation that is generally greater than 6 meters tall. |

### 3.4.7 Marine Resources

**Planktonic and Benthic Organisms:** The Barnegat Bay Estuary has experienced episodic recurrences of brown tides and other microalgal blooms, loss of submerged aquatic vegetation, and decline of hard clam stock and harvest. A two-year survey of the phytoplankton community in the BB-LEH estuary was conducted between 2011 and 2013. The study aimed to characterize species composition and spatial and temporal trends in the phytoplankton community. The results indicated that the number of phytoplankton taxa recorded from each year was similar and that the most common species belonged to five major groups (see section 3.2.7). Diatoms made up approximately 50% of the total number of taxa. Although there were differences detected between the two years with regards to species occurrence and dominance among seasons and sites, species richness and diversity were comparable. Multivariate analysis of all samples showed significant relationships between phytoplankton species composition and the environmental variables, including salinity and temperature (Ren 2015).

As is common in estuarine environments, the benthic community in Barnegat Bay is dominated by relatively few species. In recent studies of the BB-LEH estuary, six taxa accounted for over 50% of all individuals collected. Of those six most-abundant taxa, five were annelids and one was a crustacean. The most abundant species, *Mediomastus ambiseta*, was present at 95 out of 100 stations and accounted for 31% of all individuals. That species was very abundant near the Stouts Creek Project Area (101 to 686 individuals recorded at the closest monitoring station). A moderate abundance (11 to 100 individuals) of the amphipod *Ampelisca abdita* and the annelid worm *Notomastus* sp. were recorded. *Streblospio benedicti* was recorded less frequently (2 to 10 individuals). Oligochaetes (*Oligochaete* spp.) were not recorded in the monitoring station nearest the Project area. Comparitively high (11 to 91 individuals) numbers of *Glycinde multidens* were present near the Project area. Salinity was determined to have a strong effect on the distribution and abundance of most taxa. Based on four multimetric or multivariate indices of habitat quality

evaluated, the monitoring station closest to the Stouts Creek Project Area was classified as good, high, and/or meets restoration goals (Taghon et al. 2014).

**SAV:** Seagrass habitat provides important ecosystem services, including essential habitat for shellfish and finfish. Although the BB-LEH estuary contains approximately 75% of New Jersey's known seagrass habitat (Lathrop et al. 1999), recent remote sensing and in situ surveys have indicated that seagrass habitat has contracted from historical levels due to human induced stressors, such as: (1) direct impacts due to physical alteration of benthic habitat through channel dredging, inlet modification, boat scarring, and dock building, and (2) indirect impacts caused by nutrient enrichment and eutrophication (Lathrop and Haag 2011; Burkholder et al. 2007; Lathrop et al. 2006; Kennish et al. 2008). Comparison of the 1970's and 1980's SAV survey maps with those from the 1990's shows a decrease of nearly 33% in SAV area (Lathrop et al. 1999).

In a study conducted between 2003 and 2009, the seagrass habitat in the central portion of the BB-LEH estuary represented a transition zone from common eelgrass-dominated habitat to widgeongrass-dominated habitat in the north. A total of 1,662 hectares of seagrass were mapped within the central portion of the BB-LEH estuary in 2009, representing an increase of 256 hectares from 2003 (Lathrop and Haag 2011). The Forked River New Jersey Submerged Aquatic Vegetation Distribution Map of 1979 (NJDEP 2016) revealed historic areas of common eelgrass SAV along the entire bay coastline, just east of the Stouts Creek Project Area. However, current mapping shows the area of SAV east of the Project area as substantially smaller than in 1979. The small area of SAV, currently mapped along the bay from evaluations conducted in 2009, was not present at all when mapped in 2003 (Lathrop and Haag 2011).

**Fish and Shellfish:** The refuge lands are bordered by, and are hydrologically connected to, estuarine habitats made up of salt marshes, streams, ponds, bays, and rivers (USFWS 2013). Specifically, the Stouts Creek Project Area is located within the central portion of the Barnegat Bay estuary system. In general, the refuge is home to a rich variety of fish, shellfish, and crabs. These species are of substantial importance to the sport and commercial fisheries and are a food base for many birds and mammals (USFWS 2004; USFWS 2013).
Figure 3.20 – NJDEP Wetlands Map (Stouts Creek Project Area)

The salt marshes contain abundant mummichog and sheepshead minnow, which are frequently found in shallow water environments such as marsh ponds and small intertidal creeks. Important recreational and commercial species, including summer flounder, striped bass, white perch, and northern weakfish use the estuarine habitats as important nursery areas (USFWS 2013).

The Barnegat Bay estuary is estimated to be used by approximately 110 fish species. The ten most commonly reported species are bay anchovy, Atlantic silverside, fourspine stickleback, spot, winter flounder, inland silverside, northern pipefish, mummichog, bluefish, and oyster toadfish (TPL 2008). It also contains a variety of shellfish and crabs. Species such as bay scallop, eastern oyster, northern quahog, dwarf surfclam, softshell clam, blue mussel, blue crab, and horseshoe crab have been documented as being present in the waters of the bay (USFWS 2004).

**EFH:** The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth

procedures to identify, conserve, and enhance EFH for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the NOAA NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a). A comprehensive EFH Assessment for this Project area is provided as **Appendix D.**

### 3.4.8 Terrestrial Wildlife

**Birds**: The primary focus of the refuge establishment has been to protect tidal wetland and shallow bay habitat for migratory water birds. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose, Canada goose, Atlantic brant, mallard, American black duck, northern shoveler, bufflehead, double-crested cormorant, great egret, glossy ibis, clapper rail, greater yellowlegs, semipalmated sandpiper, least sandpiper, short-billed dowitcher, laughing gull, ring-billed gull, herring gull, great black-backed gull, Forster's tern, and black skimmer (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove, red-bellied woodpecker, blue jay, fish crow, tree swallow, barn swallow, Carolina chickadee, tufted titmouse, Carolina wren, American robin, gray catbird, northern mockingbird, common yellowthroat, song sparrow, northern cardinal, red-winged blackbird, common grackle, and American goldfinch. All of these species have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Stouts Creek's open water and wetland habitats are ideal for the thousands of migrating ducks, geese, shorebirds, and wading birds that stop at the refuge each spring and fall to feed and rest.

**Mammals**: The Stouts Creek Project Area includes both adjacent forested wetlands as well as salt marsh habitat. Therefore, the typical mammals found in salt marsh habitat areas, such as mink, river otter, muskrat, meadow vole, southern bog lemming, and least shrew may reside here, as well

as those found in upland forested area, including red fox, grey fox, coyote, raccoon, long-tailed weasel, short-tailed weasel, striped skunk, opossum, white-tailed deer, grey squirrel, red squirrel, chipmunk, white-footed mouse, redbacked vole, pine vole, masked shrew, short-tailed shrew, eastern mole, and a variety of bat species (USFWS 2004).

**Reptiles and Amphibians**: The Stouts Creek Project Area also falls into the coastal estuarine community type assemblage, which includes coastal marshes, estuaries, coves, tidal flats, and/or inner edges of barrier beaches. Therefore, the Stouts Creek Project Area may include habitat for the northern diamondback terrapin (USFWS 2004).

Stouts Creek may also contain many of the other wetland amphibian and reptilian species documented throughout the refuge including (NJA 2015; USFWS 2013):

- Five-lined skink
- Black racer
- Black rat snake
- Northern water snake
- Eastern hognose snake
- Rough green snake
- Eastern ribbon snake
- Common snapping turtle
- Eastern painted turtle
- Eastern mud turtle
- Redbelly turtle
- Green frog
- New Jersey chorus frog
- Northern cricket frog
- Gray treefrog
- Southern leopard frog
- Northern red salamander
- Four-toed salamander

The forested wetlands adjacent to the north and west of the site may be utilized by the same upland herpetofauna assemblage potentially found at the Good Luck Point Project Area, such as Fowler's toad, spadefoot toad, wood frog, northern fence lizard, northern pine snake, and eastern box turtle (USFWS 2013).

### 3.4.9 Threatened and Endangered Species

The unique habitats of the Barnegat Bay estuary (including barrier islands, salt marsh, tidal marshes, shallow water, and swamps) attract threatened and endangered species (TPL 2008). The Service completed an intra-service biological evaluation for the Stouts Creek Project Area pursuant to the ESA section 7 (**Appendix E**). As of the date of this EA, an official response is pending, but the initial results indicated the presence of the following federally listed threatened and endangered species on or near the Stouts Creek Project Area:

| Table 3.16<br>Intra-Service Section 7 Biological Evaluation Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Stouts Creek Project Area | | |
|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** |
| Red knot | *Calidris canutus rufa* | Threatened |
| Knieskern's beaked-rush | *Rhynchospora knieskernii* | Threatened |
| Swamp pink | *Helonias bullata* | Threatened |
| Northern long-eared bat | *Myotis septentrionalis* | Threatened |

There were no critical habitats documented within the Stouts Creek Project Area. The Service's IPaC system was also consulted to determine which migratory bird species, protected under the MBTA and the BGEPA, could potentially move through the Stouts Creek Project Area. The results indicated the presence of the following 25 species:

| Table 3.17<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Stouts Creek Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| American oystercatcher | *Haematopus palliatus* |
| American bittern | *Botaurus lentiginosus* |
| Bald eagle | *Haliaeetus leucocephalus* |
| Black skimmer | *Rynchops niger* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Blue-winged warbler | *Vermivora pinus* |
| Fox sparrow | *Passerella liaca* |
| Gull-billed tern | *Gelochelidon nilotica* |
| Hudsonian godwit | *Limosa haemastica* |
| Least bittern | *Ixobrychus exilis* |
| Least tern | *Sterna antillarum* |
| Lesser yellowlegs | *Tringa flavipes* |
| Peregrine falcon | *Falco peregrinus* |
| Pied-billed grebe | *Podilymbus podiceps* |
| Prairie warbler | *Dendroica discolor* |
| Prothonotary warbler | *Protonotaria citrea* |
| Purple sandpiper | *Calidris maritima* |
| Red knot | *Calidris canutus rufa* |
| Rusty blackbird | *Euphagus carolinus* |
| Seaside sparrow | *Ammodramus maritimus* |
| Short-eared owl | *Asio flammeus* |
| Snowy egret | *Egretta thula* |

| Table 3.17<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Stouts Creek Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| Upland sandpiper | *Bartramia longicauda* |
| Wood thrush | *Hylocichla mustelina* |
| Worm-eating warbler | *Helmitheros vermivorum* |

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Stouts Creek Project Area:

| Table 3.18<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Stouts Creek Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Common tern | *Sterna hirundo* | Not listed | Special concern |
| Tricolored heron | *Egretta tricolor* | Not listed | Special concern |
| Little blue heron | *Egretta caerula* | Not listed | Special concern |
| Glossy ibis | *Plegadis falcinellus* | Not listed | Special concern |
| Bald eagle | *Haliaeetus leucocephalus* | Not listed | Endangered |
| Black skimmer | *Rynchops niger* | Not listed | Endangered |
| Barred owl | *Strix varia* | Not listed | Threatened |
| Osprey | *Pandion haliaetus* | Not listed | Threatened |
| Black-crowned night-heron | *Nycticorax nycticorax* | Not listed | Threatened |
| Atlantic loggerhead sea turtle | *Caretta caretta* | Threatened | Endangered |
| Kemp's or Atlantic Ridley sea turtle | *Lepidochelys kempii* | Endangered | Endangered |
| Atlantic green sea turtle | *Chelonia mydas* | Threatened | Threatened |

Since the NJDEP GeoWeb is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The October 9, 2015 findings of the Natural Heritage Program are presented in **Appendix E**. These results indicated the following additional plant species that has the potential to occur on or near the Stouts Creek Project Area:

| Table 3.19<br>NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Stouts Creek Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Southern twayblade | *Listera australis* | Not listed | S3 – Rare in New Jersey |

The results also indicated that the Stouts Creek Project Area contains potential vernal pool habitat (**Figure 3.20**).

### 3.4.10 Cultural Resources

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. Views of the public should be solicited and considered throughout the process, and native Indian tribes must be consulted about undertakings on or affecting their lands under Executive Order 13175. If the agency's undertaking could affect historic properties, the next steps are to review background information, consult with the SHPO and any Indian tribe that may attach religious or cultural importance to them, seek information from knowledgeable parties, and conduct additional studies as necessary. If it is determined that the activity that has no potential to affect historic properties, the agency has no further Section 106 obligations (ACHP, 2013).

To achieve compliance with the NHPA (Section 106), reviews of cultural resource files were performed at the offices of the NJDEP SHPO and the NJSM. The objective of the file reviews was to assess the potential for the Proposed Action to impact historic properties (listed or eligible for listing on the National Register of Historic Places) within the Stouts Creek Project Area. Historic properties include archaeological sites, as well as historic structures and districts. In addition, the Service has requested comment from the NJDEP SHPO and has been addressing Tribal consultation requirements. At this time, the Delaware Tribe of Indians is a consulting party. However, the Delaware Nation of Oklahoma did not wish to take part.

The APE for the Stouts Creek Project includes the eastern and western impoundment areas in which portions of the dikes will be removed. These impoundments equal approximately 127 acres. File searches indicated that there are no previously inventoried historic properties within the APE. A previous cultural resource study conducted within Lacey Township supported that conclusion as they found no historical properties within the Stouts Creek Project Area. The closest historical properties (aboriginal stations) were documented more than ½ mile to the northeast of the APE (Mounier and Kalb 1976).

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE is low. Therefore, further Section 106 research was not conducted by Amec for the Stouts Creek Project Area. However, follow-up consultation with the NJDEP SHPO was performed by the

Service and a July 27, 2016 letter of finding of No Historic Properties Adversely Effected was issued indicating no further Section 106 consultation being required.

### 3.4.11 Socioeconomic Resources and Environmental Justice

The socioeconomic structure of the Stouts Creek Project Area is similar to that of the Brick Township Project Area, as they are both located within the coastal portion of Ocean County. Ocean County began as a rural, agricultural and fishing center. In the latter part of the 1800s and through the 1900s, the resort industry of the New Jersey Shore began to develop, and commercial activities associated with seasonal resorts became the county's economic backbone. With year-round population increases, Ocean County's economic base has become increasingly diverse and a variety of new industries now supplement the traditional tourist-related businesses. The health care industry is now the top employer in the county and is the fastest growing employment sector. Ocean County is projected to continue leading employment growth in the State through the next decade (OCDP 2014).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

### 3.4.12 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation.

Public use of the Brick Township Project Area is not encouraged, as the Service does not maintain recreational trails or visitor facilities. However, incidental use of this area by birders and the walking public may occur throughout the year.

### 3.4.13 Transportation

The regional and State roads that convey traffic directly into and from the Stouts Creek Project Area are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- U.S. Route 9 also runs in a general northeast to southwest direction, extending from an interchange with Route 1 in Woodbridge Township, Middlesex County down to its endpoint in Lower Township, Cape May County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Stouts Creek Project Area (between exits 80 and 74, west/northwest of the site) was estimated to be between 53,354 and 57,938 cars per day for 2015 during the fall season (October). These values represent approximately 96 percent of the maximum daily load on this stretch of roadway, which occurs during summer months (T&M 2000).

Traffic volumes on a stretch of U.S. Route 9, just northwest of the Stouts Creek Project Area, indicate that roadway's average annual daily traffic volume at 18,199 cars per day in January of 2011 (NJDOT 2015).

### 3.4.14 Noise

Noise can be characterized by the following four factors: frequency, intensity, duration, and distance. Each of these factors is described in section 3.2.14.

The two most common types of noise are point source and line source. This Proposed Action would generate point source noise. These noises are associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). A few examples of point sources of noise expected from activities at the Stouts Creek Project Area are from the track-mounted/wheeled excavators and dump trucks required for dike excavation.

OSHA regulations state that workers must not be exposed to noise levels above 85 dBA as a 8-hour noise exposure level or to 140 dBC as a peak sound level. According to the WSDOT (2013), dump trucks measure a maximum of 76 dBA while excavators measure a maximum of 81 dBA.

## 3.5 Forked River-Wrangle Creek Project Area

The other Lacey Township site, also known as the Forked River-Wrangle Creek Project Area, covers a small portion of Block 315, Lot 38.02 and is located south of Sunrise Boulevard (**Figure 3.21**). This Project area is composed of a large man-made impoundment that is also split into two distinct cells. It is 17.5 acres in size and is generally situated between coastal marsh to the east, forested wetlands to the west, a mix of forested wetlands and uplands to the south, and residential land use to the north. This site is also located within the Coastal Plain physiographic section of the state and the Barnegat Bay Watershed Management Area (WMA 13) (**Figure 3.2**).

### 3.5.1 Topography

The topography of the Forked River-Wrangle Creek Project Area is relatively flat and is situated between 0 and 5 feet above mean sea level (**Figure 3.22**). Net local surface water drainage from the marsh ultimately drains into the adjacent Wrangle Creek to the southeast.

### 3.5.2 Geology and Soils

This Project area is similar to the other Project areas in that it is located within the outer Coastal Plain Physiographic section of New Jersey. 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 (NJDEP 1999).

The bedrock geology is classified as the Wildwood Member of the Kirkwood Formation, described as late early and early middle Miocene Era aged clay rock with secondary silt, massive to finely bedded, dark-gray to olive-gray, locally interbedded with thin beds of light-colored sand and containing small shell fragments, primarily at the base (USGS 2015b).

The surficial geology over the northeastern portion of the Forked River-Wrangle Creek Project Area is listed as 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. Cape May Formation, Unit 2 soils are mapped over the southwestern half of the site. Cape May Formation, Unit 2 soils are described as lighter in color, ranging from very pale brown, yellow, reddish yellow, white, olive yellow or gray, and composed of sand, pebble gravel, minor silt, clay, peat, and cobble gravel. These soils were deposited during the late Pleistocene Era as marine terraces, and can be as thick as 200 feet in some areas (NJDEP 2014).

The soil survey map reveals that the Forked River-Wrangle Creek Project Area contains mostly water surrounded by Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes (**Figure 3.23**). These soils are described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012).

### 3.5.3 Air Quality

The USEPA has set NAAQS for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015b). New Jersey is located in the Ozone Transport Region, an area that covers 13 northeastern ozone nonattainment states from Maine to Virginia (Trinity Consultants 2014). The Forked River-Wrangle Creek Project Area is located within Ocean County which is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2015b).

Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation, including stippling and chlorosis (the yellowing of leaf tissue due to a lack of chlorophyll) (Davis 1995).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or significantly contribute to a violation of the NAAQS or the NJAAQS. Toward that end, the USEPA and NJDEP have established SILs, which are a lesser fraction of the

NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

### 3.5.4 Water Quality

According to the NJDEP (2008), "The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by the USEPA at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations."

All waters within the Forked River-Wrangle Creek Project Area are classified as SE1(C1) waters according to New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for category one (C1) saline estuarine (SE) waters with shellfish harvesting as a designated use. According to the NJDEP (2011b), "Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the anti-degradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)."

Water quality monitoring station data from the USEPA STORET and water quality exchange website (USEPA 2016b) was evaluated from stations near the Project site in order to determine basic water quality characteristics of the surrounding area. Two stations (Station BB12-15-1 and Station BB12-15-2), located along the northern junction of Forked River and Barnegat Bay, approximately 0.7 miles south/southeast of the Project area, were sampled in June of 2012. Results from those stations revealed the following:

- Temperature ranged from to 21.57 to 22.09 ºC.
- Salinity measured between 28.41 and 28.61 ppt.
- DO ranged from 7.14 to 7.46 mg/L.
- pH ranged from 7.7 to 7.85.
- TSS ranged from 4.6 to 11.1 mg/L.
- Conductivity ranged from 44,090 to 44,248 µS/cm.

### 3.5.5 Wetlands and Streams

The Clean Water Act (40 CFR 230.3) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under

normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Using that definition, wetlands are defined based on certain characteristics of vegetation, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic, or adapted to living in saturated areas. Soils are considered hydric (permanently or seasonally saturated by water) if they meet the criteria defined by the National Technical Committee for Hydric Soils (USDA 2015a). Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season (FIC 1989).

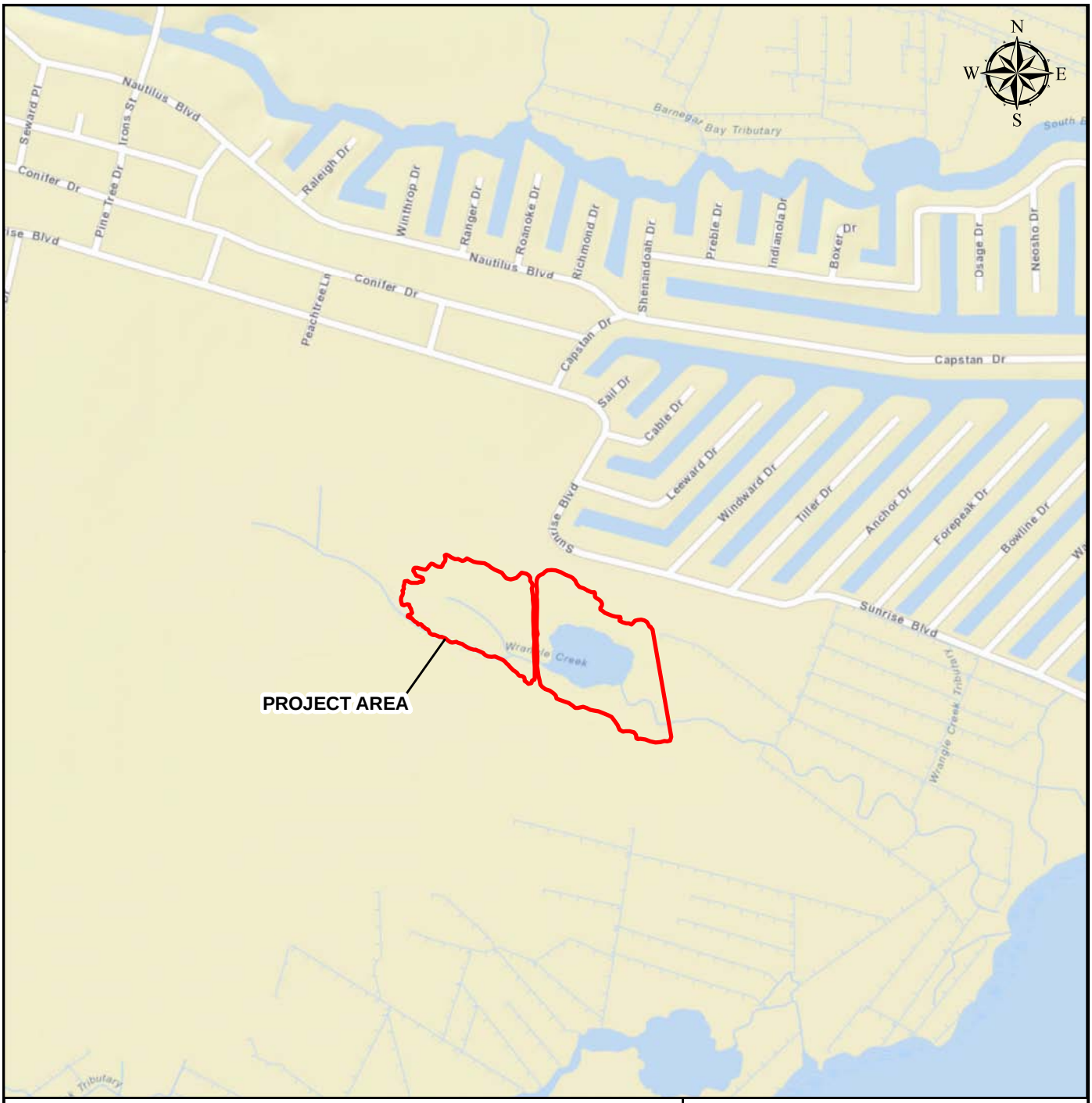
The most common method of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States*, wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine, and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands (Cowardin et al. 1979).

Defining areas that meet the regulatory definition of a wetland (33 CFR 328.3(b)) is important in determining the jurisdiction of those areas by the Federal government (USACE), and in some areas of the United States, state, county, and/or local governments. Jurisdiction over wetlands subsequently determines their regulation and the types of activities that are permittable. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into wetlands, meaning that a permit is required before dredged or fill material is discharged into these areas.

The premise of wetland regulation is that no dredged or fill material may be discharged if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded by the action. The USACE reviews permit applications for activities proposed within WOTUS. As the Project occurs on jurisdictional wetlands, it is subject to regulation by the USACE and the NJDEP.

The Service's NWI indicates that the wetlands within the Forked River-Wrangle Creek Project Area boundaries are classified as follows (**Figure 3.24**):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched habitat (E2EM1Pd).
- Estuarine, intertidal, scrub-shrub, broad-leaved deciduous, irregularly flooded habitat (E2SS1P).
- Palustrine, forested, broad leaved deciduous, saturated habitat (PFO1B).
- Palustrine, forested, broad leaved deciduous, seasonally flooded habitat (PFO1C).



LEGEND

PROJECT AREA

0 500 1,000 Feet

Image Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, 2015

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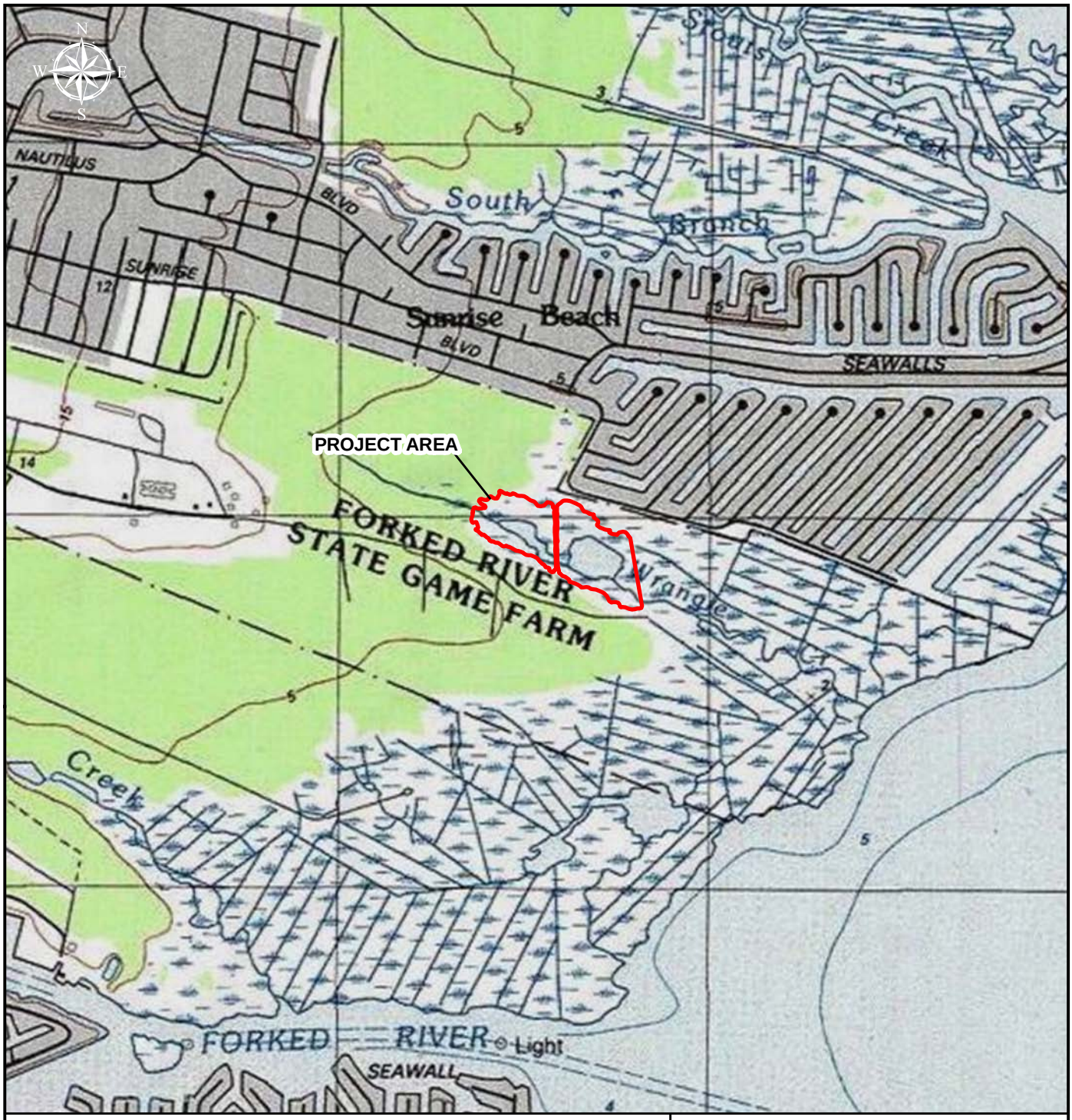
Figure 3.21

Street Map
Forked River–Wrangle Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Copyright:© 2013 National Geographic Society, i-cubed, 2015

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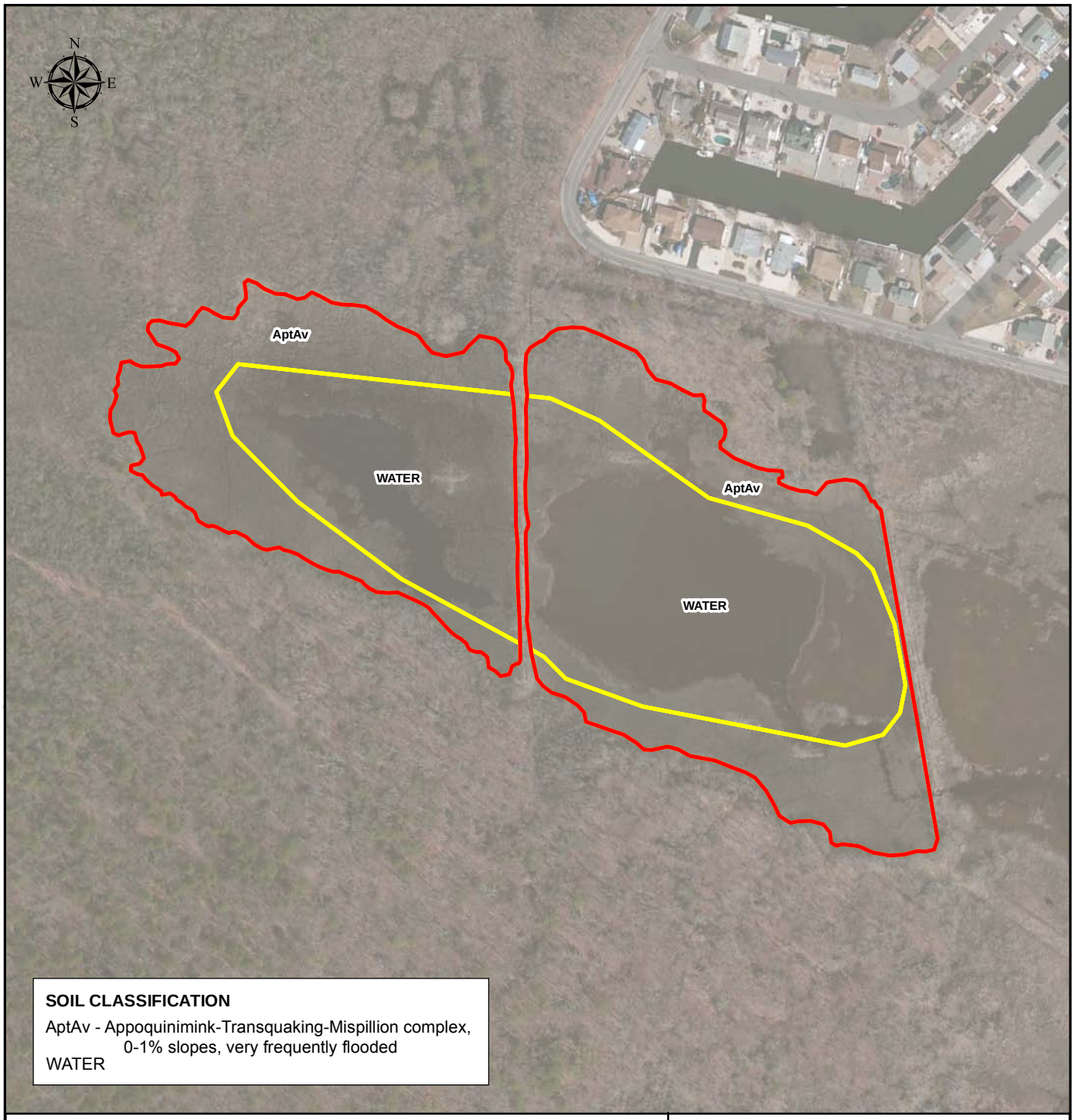
Figure 3.22

USGS Topographic Map
Forked River–Wrangle Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 200 400 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

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Figure 3.23

Soil Survey Map
Forked River–Wrangle Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

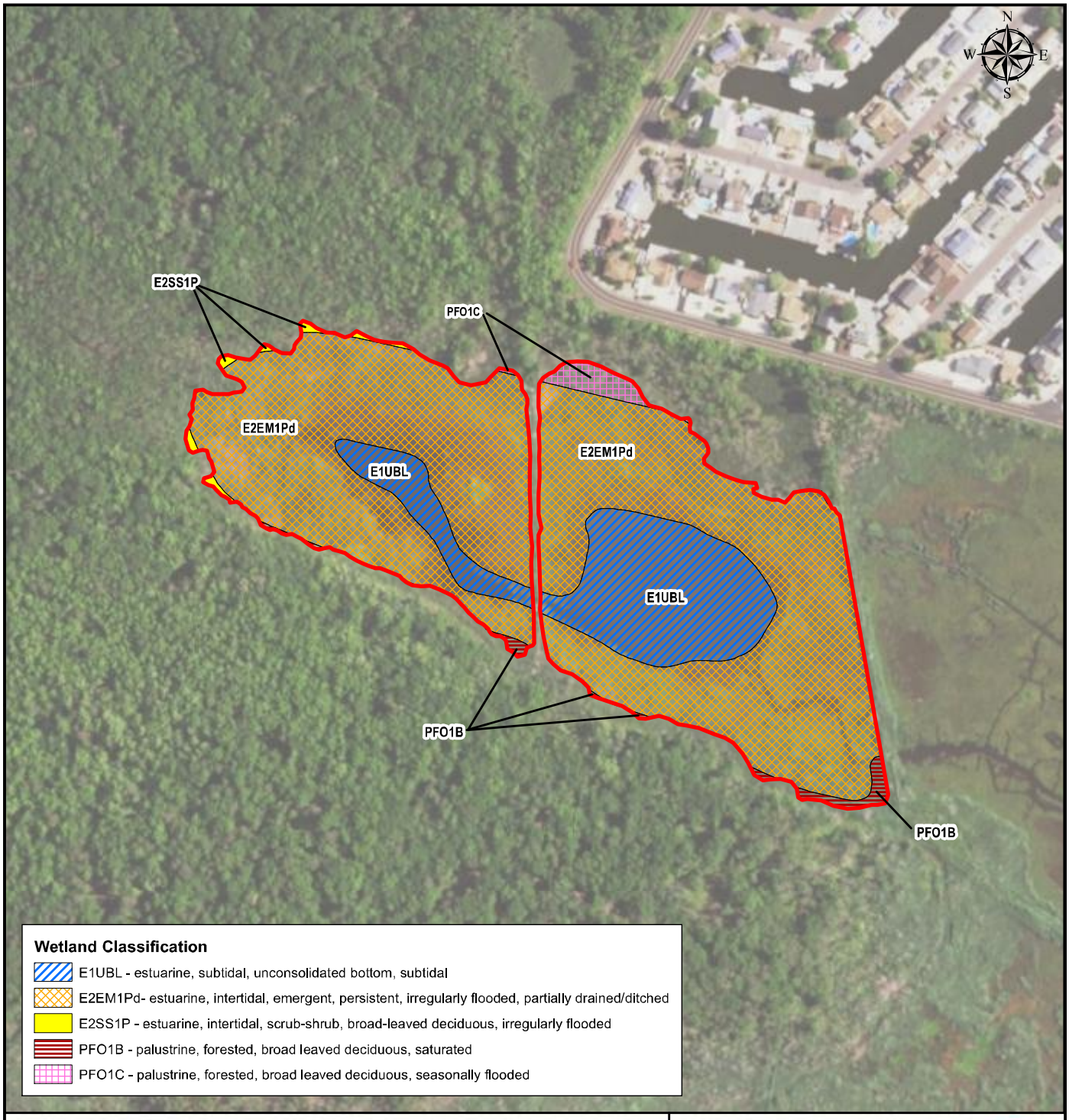
The NJDEP indicates that the wetlands within the Forked River-Wrangle Creek Project boundaries are classified as follows (**Figure 3.25**):

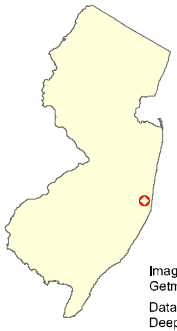
- Saline marsh (high marsh).
- Tidal rivers, inland bays, and other tidal waters.
- *Phragmites* dominant coastal wetlands.
- Deciduous wooded wetlands.
- Deciduous scrub-shrub wetlands.

### 3.5.6 Vegetation

A desktop assessment of the Project area was performed using aerial photographs (true color and color infrared) and LiDAR imagery to provide a general perspective of salt marsh structure on a landscape scale. These resources were used to map general habitat types (high marsh, low marsh, upland, etc.). General habitat types were based upon the USNVCS (FGDC 2008) and methods used by NatureServe in their (2009) Vegetation Classification Report. Vegetative communities within the salt marsh group were further classified as either healthy or stressed.

The Forked River-Wrangle Creek Project Area is dominated by highly stressed marsh areas that have been turned into open water impoundments and mudflats, with stressed salt marsh habitat along the fringes of the impoundments. The higher elevations and dikes are dominated by common reed. The easternmost impoundment consists of a large un-vegetated area within the center of the impoundment that contains an average of 0 to 0.5 feet of water over an unconsolidated muck substrate. The remaining portion of this eastern impoundment is dominated by the typical low salt marsh species of smooth cordgrass with occasional spike grass. The western impoundment consists of a similar substrate but with less standing water and the surrounding salt marsh vegetation was not identified as the typical low salt marsh habitat. Instead, a more diverse coverage of plant species was identified including common threesquare (*Schoenoplectus pungens*), dwarf spikerush (*Eleocharis parvula*), and fern flatsedge (*Cyperus filicinus*). This unique habitat type was also mapped as stressed as field crews observed less than 50 percent vegetative cover throughout this habitat with small pockets of mudflats throughout (**Table 3.20**). A representative map showing the various habitat types within the Forked River-Wrangle Creek Project Area is presented as Figure 2-30 in **Appendix B**.



LEGEND

PROJECT AREA

0 200 400 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

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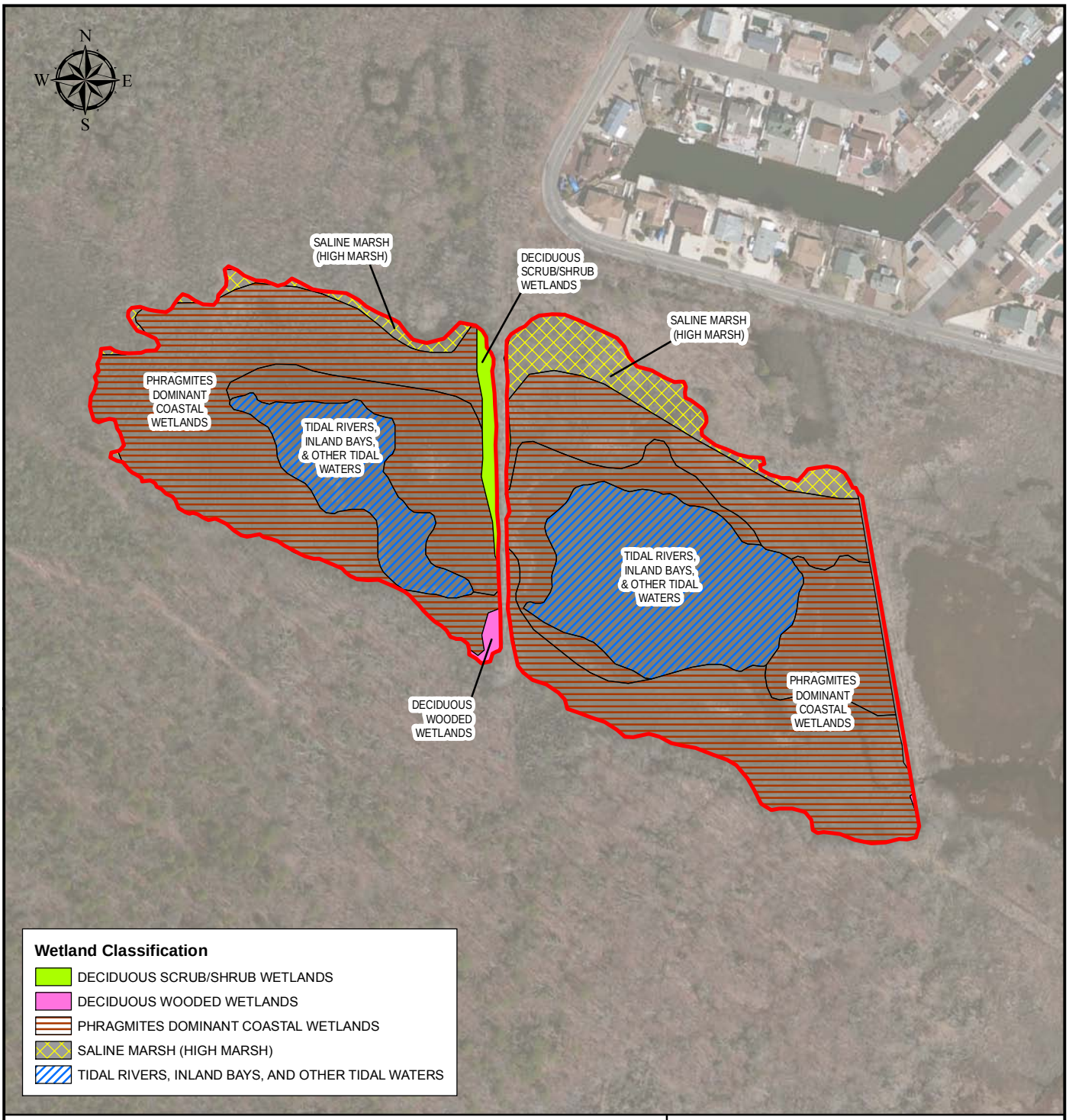
Figure 3.24

National Wetlands Inventory Map
Forked River–Wrangle Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 200 400 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015.

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Figure 3.25

NJDEP Wetlands Map
Forked River–Wrangle Creek Project Area
Marsh Enhancement Design/Build Project
Lacey Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

| Table 3.20<br>Vegetation Summary for the Forked River-Wrangle Creek Project Area | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| North Atlantic coast estuarine intertidal mudflats/salt pannes – standing water present | 3.89 | 22 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain very high salinity in the waters within (interstitial) the sediment – standing water present. |
| Stressed North Atlantic low salt marsh | 1.76 | 10 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| North Atlantic low salt marsh | 1.83 | 10 | Low, regularly flooded salt marsh that is dominated by smooth cordgrass in the Northern Atlantic Coastal Plain. |
| Stressed coastal salt pond marsh | 3.32 | 19 | Less vigorous, partially or marginally functioning, regularly flooded salt marsh that is dominated by a diverse coverage of plant species including common three-square, dwarf spikerush, and fern flatsedge. |
| Reed tidal marsh | 5.65 | 32 | Areas of a salt marsh that have been invaded by common reed. |
| Scrub-shrub vegetative communities | 0.26 | 1.5 | Areas dominated by woody vegetation that is generally less than 6 meters tall. |
| Upland woody vegetative communities | 0.85 | 4.8 | Areas dominated by woody vegetation that is generally greater than 6 meters tall. |

### 3.5.7 Marine Resources

**Planktonic and Benthic Organisms:** The Barnegat Bay Estuary has experienced episodic recurrences of brown tides and other microalgal blooms, loss of submerged aquatic vegetation, and decline of hard clam stock and harvest. A two-year survey of the phytoplankton community in the BB-LEH estuary was conducted between 2011 and 2013. The study aimed to characterize species composition and spatial and temporal trends in the phytoplankton community. The results indicated that the number of phytoplankton taxa recorded from each year was similar and that the most common species belonged to five major groups (see section 3.2.7). Diatoms made up approximately 50% of the total number of taxa. Although there were differences detected between the two years with regards to species occurrence and dominance among seasons and sites, species richness and diversity were comparable. Multivariate analysis of all samples showed significant relationships between phytoplankton species composition and the environmental variables, including salinity and temperature (Ren 2015).

As is common in estuarine environments, the benthic community in Barnegat Bay is dominated by relatively few species. In recent studies of the BB-LEH estuary, six taxa accounted for over 50% of all individuals collected. Of those six most-abundant taxa, five were annelids and one was a crustacean. The most abundant species, *Mediomastus ambiseta*, was present at 95 out of 100 stations and accounted for 31% of all individuals. That species was very abundant near the Forked River-Wrangle Creek Project Area (101 to 686 individuals recorded at the closest monitoring station). A moderate abundance (11 to 100 individuals) of *Streblospio benedicti* and the annelid worm *Notomastus* sp. were recorded. The amphipod *Ampelisca abdita* was recorded less frequently (2 to 10 individuals). Comparitively moderate numbers of Oligochaetes (2 to 10 individuals) (*Oligochaete* spp.) and comparatively high numbers of *Glycinde multidens* (11 to 91 individuals) were present near the Project area. Salinity was determined to have a strong effect on the distribution and abundance of most taxa. Based on four multimetric or multivariate indices of habitat quality evaluated, the monitoring station closest to the Forked River-Wrangle Creek Project Area was classified as good, high, and/or meets restoration goals (Taghon et al. 2014).

**SAV:** Seagrass habitat provides important ecosystem services, including essential habitat for shellfish and finfish. Although the BB-LEH estuary contains approximately 75% of New Jersey's known seagrass habitat (Lathrop et al. 1999), recent remote sensing and in situ surveys have indicated that seagrass habitat has contracted from historical levels due to human induced stressors, such as: (1) direct impacts due to physical alteration of benthic habitat through channel dredging, inlet modification, boat scarring, and dock building, and (2) indirect impacts caused by nutrient enrichment and eutrophication (Lathrop and Haag 2011; Burkholder et al. 2007; Lathrop et al. 2006; Kennish et al. 2008). Comparison of the 1970's and 1980's SAV survey maps with those from the 1990's shows a decrease of nearly 33% in SAV area (Lathrop et al. 1999).

In a study conducted between 2003 and 2009, the seagrass habitat in the central portion of the BB-LEH estuary represented a transition zone from common eelgrass-dominated habitat to widgeongrass-dominated habitat in the north. A total of 1,662 hectares of seagrass were mapped within the central portion of the BB-LEH estuary in 2009, representing an increase of 256 hectares from 2003 (Lathrop and Haag 2011). The Forked River New Jersey Submerged Aquatic Vegetation Distribution Map of 1979 (NJDEP 2016) revealed historic areas of common eelgrass

SAV along the entire bay coastline, just east of the Forked River-Wrangle Creek Project Area. Current mapping shows SAV along the bay, just east of the Forked River-Wrangle Creek Project Area, that was not present at all when mapped in 2003 but was evident in 2009 (Lathrop and Haag 2011).

**Fish and Shellfish:** The refuge lands are bordered by, and are hydrologically connected to, estuarine habitats made up of salt marshes, streams, ponds, bays, and rivers (USFWS 2013). Specifically, the Forked River-Wrangle Creek Project Area is located within the central portion of the Barnegat Bay estuary system. In general, the refuge is home to a rich variety of fish, shellfish, and crabs. These species are of substantial importance to the sport and commercial fisheries and are a food base for many birds and mammals (USFWS 2004; USFWS 2013).

The salt marshes contain abundant mummichog and sheepshead minnow, which are frequently found in shallow water environments such as marsh ponds and small intertidal creeks. Important recreational and commercial species, including summer flounder, striped bass, white perch, and northern weakfish use the estuarine habitats as important nursery areas (USFWS 2013).

The Barnegat Bay estuary is estimated to be used by approximately 110 fish species. The ten most commonly reported species are bay anchovy, Atlantic silverside, fourspine stickleback, spot, winter flounder, inland silverside, northern pipefish, mummichog, bluefish, and oyster toadfish (TPL 2008). It also contains a variety of shellfish and crabs. Species such as bay scallop, eastern oyster, northern quahog, dwarf surfclam, softshell clam, blue mussel, blue crab, and horseshoe crab have been documented as being present in the waters of the bay (USFWS 2004).

**EFH:** The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth procedures to identify, conserve, and enhance EFH for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the NOAA NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a). A comprehensive EFH Assessment for this Project area is provided as **Appendix D.**

### 3.5.8 Terrestrial Wildlife

**Birds**: The primary focus of the refuge establishment has been to protect tidal wetland and shallow bay habitat for migratory water birds. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose, Canada goose, Atlantic brant, mallard, American black duck, northern shoveler, bufflehead, double-crested cormorant, great egret, glossy ibis, clapper rail, greater yellowlegs, semipalmated sandpiper, least sandpiper, short-billed dowitcher, laughing gull, ring-billed gull, herring gull, great black-backed gull, Forster's tern, and black skimmer (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove, red-bellied woodpecker, blue jay, fish crow, tree swallow, barn swallow, Carolina chickadee, tufted titmouse, Carolina wren, American robin, gray catbird, northern mockingbird, common yellowthroat, song sparrow, northern cardinal, red-winged blackbird, common grackle, and American goldfinch. All of these species have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

The Forked River-Wrangle Creek Project Area contains open water and salt marsh habitat ideal for the thousands of migrating ducks, geese, shorebirds, and wading birds that stop at the refuge each spring and fall to feed and rest.

**Mammals**: The Forked River-Wrangle Creek Project Area includes both adjacent forested wetlands as well as salt marsh habitat. Therefore, the typical mammals found in salt marsh habitat areas, such as mink, river otter, muskrat, meadow vole, southern bog lemming, and least shrew may reside here, as well as those found in upland forested area, including red fox, grey fox, coyote, raccoon, long-tailed weasel, short-tailed weasel, striped skunk, opossum, white-tailed deer, grey squirrel, red squirrel, chipmunk, white-footed mouse, redbacked vole, pine vole, masked shrew, short-tailed shrew, eastern mole, and a variety of bat species (USFWS 2004).

**Reptiles and Amphibians**: The Forked River-Wrangle Creek Project Area also falls into the coastal estuarine community type assemblage, which includes coastal marshes, estuaries, coves, tidal flats, and/or inner edges of barrier beaches. Therefore, the Forked River-Wrangle Creek Project Area may include habitat for the northern diamondback terrapin (USFWS 2004).

Forked River-Wrangle Creek may also contain many of the other wetland amphibian and reptilian species documented throughout the refuge including (NJA 2015; USFWS 2013):

- Five-lined skink
- Black racer
- Black rat snake
- Northern water snake
- Eastern hognose snake
- Rough green snake

- Eastern ribbon snake
- Common snapping turtle
- Eastern painted turtle
- Eastern mud turtle
- Redbelly turtle
- Green frog
- New Jersey chorus frog
- Northern cricket frog
- Gray treefrog
- Southern leopard frog
- Northern red salamander
- Four-toed salamander

The forested wetlands adjacent to the south and west of the site may be utilized by the same upland herpetofauna assemblage potentially found at the Good Luck Point Project Area, such as Fowler's toad, spadefoot toad, wood frog, northern fence lizard, northern pine snake, and eastern box turtle (USFWS 2013).

### 3.5.9 Threatened and Endangered Species

The unique habitats of the Barnegat Bay estuary (including barrier islands, salt marsh, tidal marshes, shallow water, and swamps) attract threatened and endangered species (TPL 2008). The Service completed an intra-service biological evaluation for the Forked River-Wrangle Creek Project Area pursuant to the ESA section 7 (**Appendix E**). As of the date of this EA, an official response is pending, but the initial results indicated the presence of the following federally listed threatened and endangered species on or near the Forked River-Wrangle Creek Project Area:

**Table 3.21**

**Intra-Service Section 7 Biological Evaluation Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Forked River-Wrangle Creek Project Area**

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| Red knot | *Calidris canutus rufa* | Threatened |
| Knieskern's beaked-rush | *Rhynchospora knieskernii* | Threatened |
| Swamp pink | *Helonias bullata* | Threatened |
| Northern long-eared bat | *Myotis septentrionalis* | Threatened |

There were no critical habitats documented within the Forked River-Wrangle Creek Project Area. The Service's IPaC system was also consulted to determine which migratory bird species, protected under the MBTA and the BGEPA, could potentially move through the Forked River-Wrangle Creek Project Area. The results indicated the presence of the following 25 species:

| Table 3.22<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Forked River-Wrangle Creek Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| American oystercatcher | *Haematopus palliatus* |
| American bittern | *Botaurus lentiginosus* |
| Bald eagle | *Haliaeetus leucocephalus* |
| Black skimmer | *Rynchops niger* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Blue-winged warbler | *Vermivora pinus* |
| Fox sparrow | *Passerella liaca* |
| Gull-billed tern | *Gelochelidon nilotica* |
| Hudsonian godwit | *Limosa haemastica* |
| Least bittern | *Ixobrychus exilis* |
| Least tern | *Sterna antillarum* |
| Lesser yellowlegs | *Tringa flavipes* |
| Peregrine falcon | *Falco peregrinus* |
| Pied-billed grebe | *Podilymbus podiceps* |
| Prairie warbler | *Dendroica discolor* |
| Prothonotary warbler | *Protonotaria citrea* |
| Purple sandpiper | *Calidris maritima* |
| Red knot | *Calidris canutus rufa* |
| Rusty blackbird | *Euphagus carolinus* |
| Seaside sparrow | *Ammodramus maritimus* |
| Short-eared owl | *Asio flammeus* |
| Snowy egret | *Egretta thula* |
| Upland sandpiper | *Bartramia longicauda* |
| Wood thrush | *Hylocichla mustelina* |
| Worm-eating warbler | *Helmitheros vermivorum* |

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Forked River-Wrangle Creek Project Area:

| Table 3.23<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Forked River-Wrangle Creek Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Common tern | *Sterna hirundo* | Not listed | Special concern |
| Tricolored heron | *Egretta tricolor* | Not listed | Special concern |
| Little blue heron | *Egretta caerula* | Not listed | Special concern |
| Snowy egret | *Egretta thula* | Not listed | Special concern |

| Table 3.23<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Forked River-Wrangle Creek Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Glossy ibis | *Plegadis falcinellus* | Not listed | Special concern |
| Bald eagle | *Haliaeetus leucocephalus* | Not listed | Endangered |
| Black skimmer | *Rynchops niger* | Not listed | Endangered |
| Barred owl | *Strix varia* | Not listed | Threatened |
| Osprey | *Pandion haliaetus* | Not listed | Threatened |
| Black-crowned night-heron | *Nycticorax nycticorax* | Not listed | Threatened |
| Northern harrier | *Circus cyaneus* | Not listed | Endangered |
| Cooper's hawk | *Accipiter cooperii* | Not listed | Special concern |

Since the NJDEP GeoWeb is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The October 9, 2015 findings of the Natural Heritage Program are presented in **Appendix E**. These results indicated the following additional plant species that have the potential to occur on or near the Forked River-Wrangle Creek Project Area:

| Table 3.24<br>NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Forked River-Wrangle Creek Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Smooth orange milkweed | *Asclepias lanceolata* | Not listed | S2 - Imperiled in New Jersey |
| Southern twayblade | *Listera australis* | Not listed | S3 – Rare in New Jersey |

The results also indicated that the Forked River-Wrangle Creek Project Area contains the Forked River Woods Natural Heritage Priority Site (**Appendix E**). This area is described as a wet deciduous woods that includes habitat for one state imperiled plant species.

### 3.5.10 Cultural Resources

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties that are included in the National Register of Historic Places or

that meet the criteria for the National Register. Views of the public should be solicited and considered throughout the process, and native Indian tribes must be consulted about undertakings on or affecting their lands under Executive Order 13175. If the agency's undertaking could affect historic properties, the next steps are to review background information, consult with the SHPO and any Indian tribe that may attach religious or cultural importance to them, seek information from knowledgeable parties, and conduct additional studies as necessary. If it is determined that the activity that has no potential to affect historic properties, the agency has no further Section 106 obligations (ACHP, 2013).

To achieve compliance with the NHPA (Section 106), reviews of cultural resource files were performed at the offices of the NJDEP SHPO and the NJSM. The objective of the file reviews was to assess the potential for the Proposed Action to impact historic properties (listed or eligible for listing on the National Register of Historic Places) within the Forked River-Wrangle Creek Project Area. Historic properties include archaeological sites, as well as historic structures and districts. In addition, the Service has requested comment from the NJDEP SHPO and has been addressing Tribal consultation requirements. At this time, the Delaware Tribe of Indians is a consulting party. However, the Delaware Nation of Oklahoma did not wish to take part.

The APE for the Forked River-Wrangle Creek Project includes the eastern and western impoundment areas in which portions of the dikes will be removed. These impoundments equal approximately 17.5 acres. File searches indicated that there are no previously inventoried historic properties within the APE. A previous cultural resource study conducted within Lacey Township supported that conclusion as they found no cultural resources of National Register quality exist within the Forked River-Wrangle Creek Project Area (Mounier and Kalb 1976).

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE is low. Therefore, further Section 106 research was not conducted by Amec for the Forked River-Wrangle CreekProject Area. However, follow-up consultation with the NJDEP SHPO was performed by the Service and a July 27, 2016 letter of finding of No Historic Properties Adversely Effected was issued indicating no further Section 106 consultation being required.

### 3.5.11 Socioeconomic Resources and Environmental Justice

The socioeconomic structure of the Forked River-Wrangle Creek Project Area is similar to that of the Brick Township Project Area, as they are both located within the coastal portion of Ocean County. Ocean County began as a rural, agricultural and fishing center. In the latter part of the 1800s and through the 1900s, the resort industry of the New Jersey Shore began to develop, and commercial activities associated with seasonal resorts became the county's economic backbone. With year-round population increases, Ocean County's economic base has become increasingly diverse and a variety of new industries now supplement the traditional tourist-related businesses. The health care industry is now the top employer in the county and is the fastest growing employment sector. Ocean County is projected to continue leading employment growth in the State through the next decade (OCDP 2014).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

### 3.5.12 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation.

Public use of the Forked River-Wrangle Creek Project Area is not encouraged, as the Service does not maintain recreational trails or visitor facilities. However, incidental use of this area by birders and the walking public may occur throughout the year.

### 3.5.13 Transportation

The regional and State roads that convey traffic directly into and from the Forked River-Wrangle Creek Project Area are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- U.S. Route 9 also runs in a general northeast to southwest direction, extending from an interchange with Route 1 in Woodbridge Township, Middlesex County down to its endpoint in Lower Township, Cape May County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Forked River-Wrangle Creek Project Area (between exits 74 and 69, west of the site) was estimated to be between 41,382 and 44,946 cars per day for 2015 during the fall season (October). These values represent approximately 97% of the maximum daily load on this stretch of roadway, which occurs during summer months (T&M 2000).

Traffic volumes on a stretch of U.S. Route 9, just southwest of the Forked River-Wrangle Creek Project Area, indicate that roadway's average annual daily traffic volume at 18,198 cars per day in January of 2011 (NJDOT 2015).

### 3.5.14 Noise

Noise can be characterized by the following four factors: frequency, intensity, duration, and distance. Each of these factors is described in section 3.2.14.

The two most common types of noise are point source and line source. This Proposed Action would generate point source noise. These noises are associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). A few examples of point sources of noise expected from activities at the Forked River-Wrangle Creek Project Area are from the track-mounted/wheeled excavators and dump trucks required for dike excavation.

OSHA regulations state that workers must not be exposed to noise levels above 85 dBA as a 8-hour noise exposure level or to 140 dBC as a peak sound level. According to the WSDOT (2013), dump trucks measure a maximum of 76 dBA while excavators measure a maximum of 81 dBA.

## 3.6 Barnegat Project Area

The fifth Project area for this phase (also known as the Barnegat Project Area) is located within Barnegat Township, Ocean County and covers multiple lots within Blocks 208 and 239 and is located between East Bay Avenue to the south, Bay Shore Drive to the north and east, and Ridgeway Street to the west (**Figure 3.26**). The Barnegat Project Area is composed of five separate man made impoundments, or pools, that occupy approximately 238 acres. These pools are generally situated between Barnegat Bay to the east, forested wetlands to the west, and residential land use to the north and south. This site is also located within the Coastal Plain physiographic section of the state and the Barnegat Bay Watershed Management Area (WMA 13) (**Figure 3.2**).

The impoundments are shallow and consist of soft, mucky, largely unvegetated bottoms. The easternmost impoundment is the largest, is largely unvegetated, and typically contains 0 to 6 inches of water. A series of four impoundments are along the west side of this Project area; the northernmost of these is the largest, and the remaining three are relatively small. These four impoundments are also largely unvegetated and typically contain 0 to 6 inches of water. All five impoundments are connected to the tides by multiple culverts, risers, and dike breaches at various locations.

### 3.6.1 Topography

The topography of the Barnegat Project Area is relatively flat and is situated between 0 and 5 feet above mean sea level (**Figure 3.27**). Net local surface water drainage from the marsh ultimately drains into the adjacent Double Creek or Barnegat Bay.

### 3.6.2 Geology and Soils

This Project area is similar to the other Project areas in that it is located within the outer Coastal Plain Physiographic section of New Jersey. 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 (NJDEP 1999).

The bedrock geology on this site is made up of Cohansey Formation (NJDEP 2014), which is described as a middle Miocene/Serravallian Era aged unit that is primarily composed of unconsolidated, fine- to coarse-grained sand. The sand is gray-brown to dark gray in color, but turns yellow to white upon weathering. It is locally gravelly and interbedded with discrete beds of clay or silty clay (USGS 2015c).

The surficial geology over the majority of the Barnegat Project Area is listed as Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes (**Figure 3.28**). These soils are described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). Smaller portions of the Project area contain Berryland Sand, rarely flooded soils with 0 to 2 percent slopes and Atsion Sand, or tide flooded Atsion Sand, with 0 to 2 percent slopes. Atsion Sands are described as poorly drained sandy, siliceous, mesic Aeric Alaquods that form sandy marine sediments in coastal flats and depressions (USDA 2015b). Another sliver of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes.

### 3.6.3 Air Quality

The USEPA has set NAAQS for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015b). New Jersey is located in the Ozone Transport Region, an area that covers 13 northeastern ozone nonattainment states from Maine to Virginia (Trinity Consultants 2014). The Barnegat Project Area is located within Ocean County which is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards (NJDEP 2015b).

Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation, including stippling and chlorosis (the yellowing of leaf tissue due to a lack of chlorophyll) (Davis 1995).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or significantly contribute to a violation of the NAAQS or the NJAAQS. Toward that end, the USEPA and NJDEP have established SILs, which are a lesser fraction of the NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

### 3.6.4 Water Quality

According to the NJDEP (2008), "The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by

the USEPA at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations."

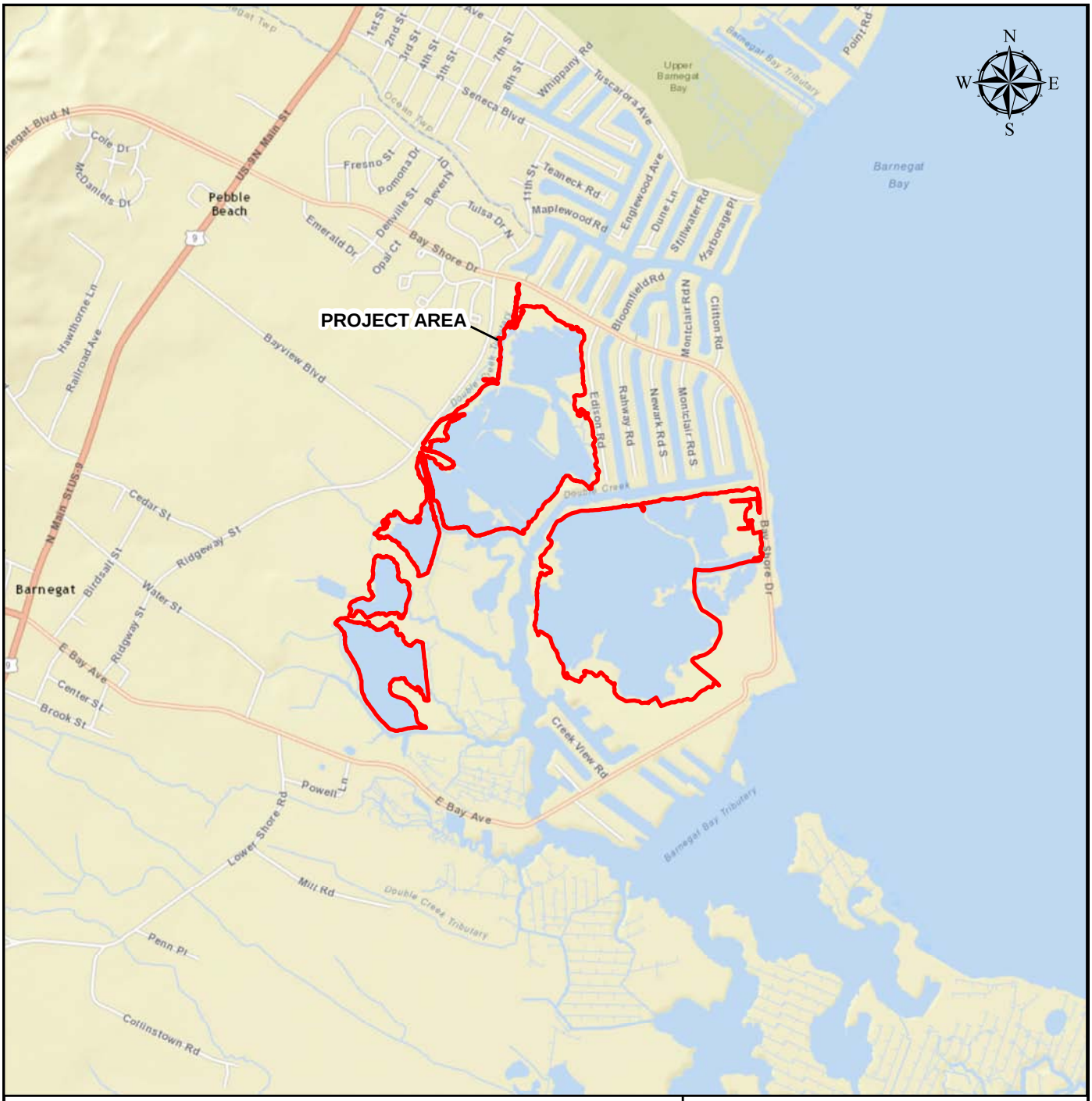
All waters within the Barnegat Project Area are classified as SE1(C1) waters according to New Jersey Surface Water Quality Standards (NJDEP 2011b). This classification is for category one (C1) saline estuarine (SE) waters with shellfish harvesting as a designated use. According to the NJDEP (2011b), "Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the anti-degradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)."

Water quality monitoring station data from the USEPA STORET and water quality exchange website (USEPA 2016b) was evaluated from stations near the Project site in order to determine basic water quality characteristics of the surrounding area. One station (Station BB12-18-2), located in Barnegat Bay approximately 0.6 miles southeast of the Project area, was sampled in June of 2012. Results from that station revealed the following:

- Temperature measured 21.76 ºC.
- Salinity measured 27.82 ppt.
- DO measured 7.25 mg/L.
- pH measured 7.85.
- TSS measured 4.0 mg/L.
- Conductivity measured 43,155 µS/cm.

### 3.6.5 Wetlands and Streams

The Clean Water Act (40 CFR 230.3) defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, 2015

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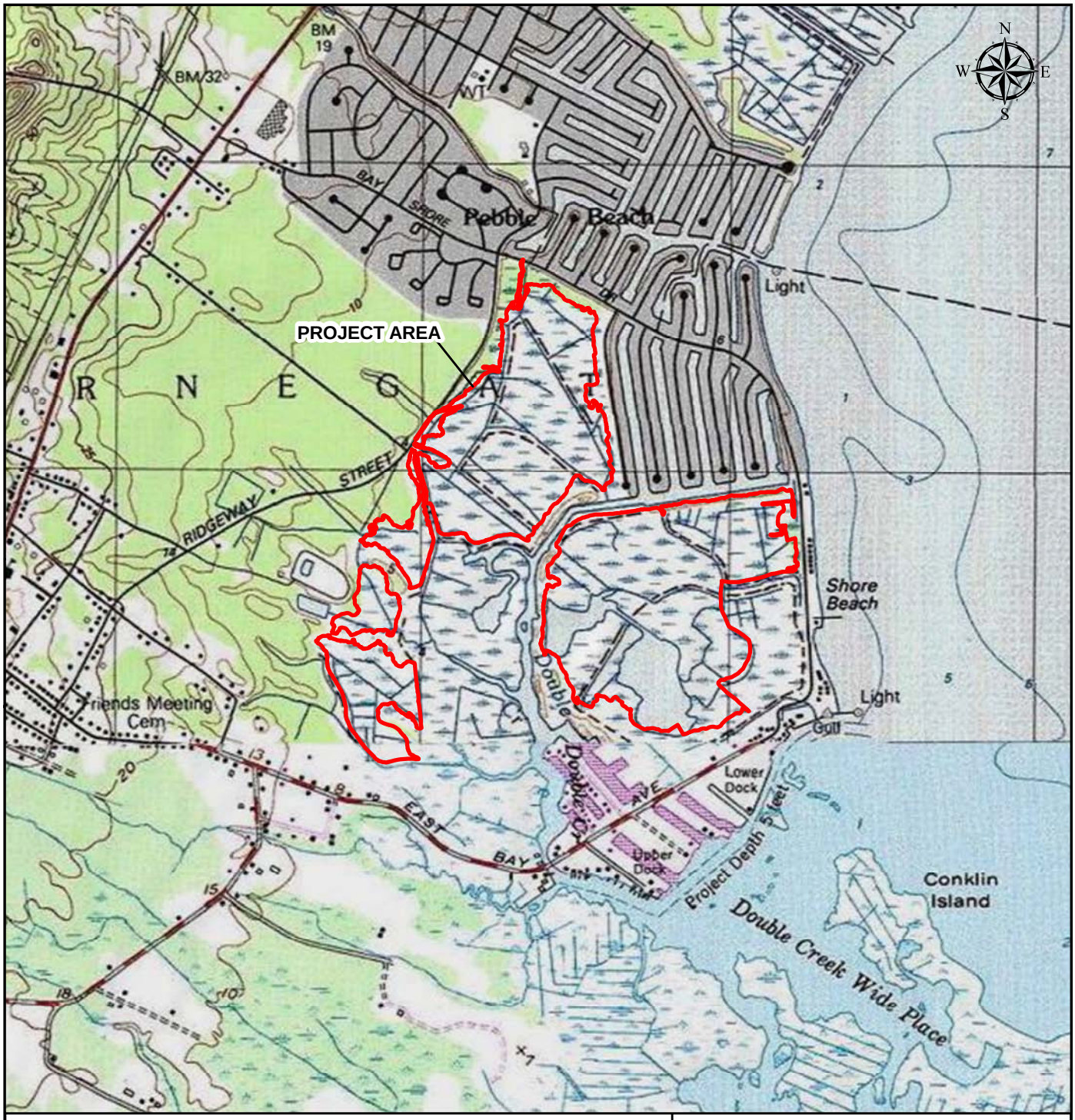
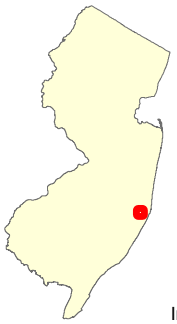
Figure 3.26

Street Map
Barnegat Project Area
Marsh Enhancement Design/Build Project
Barnegat Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Copyright:© 2013 National Geographic Society, i-cubed, 2015

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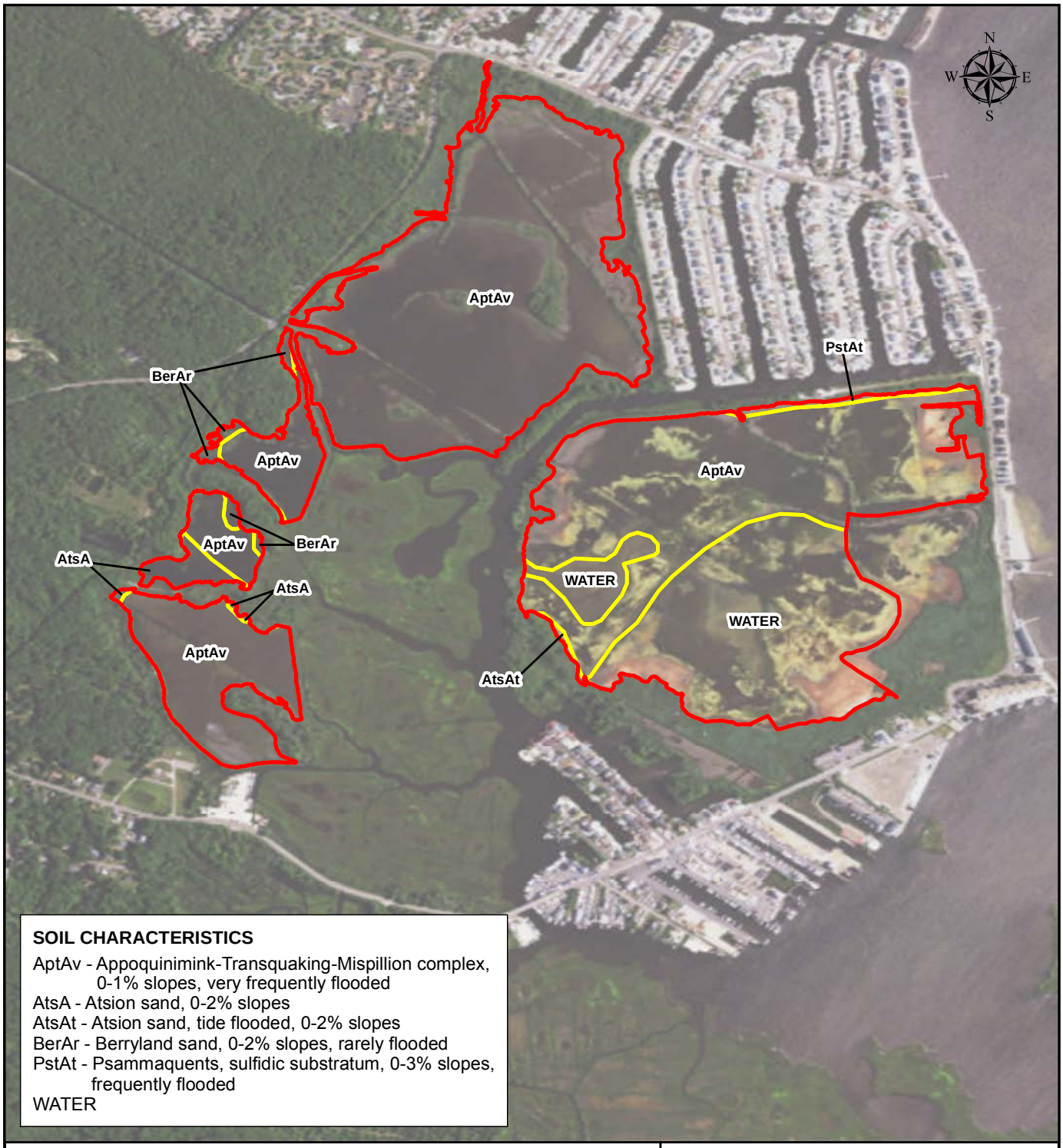
Figure 3.27

USGS Topographic Map
Barnegat Project Area
Marsh Enhancement Design/Build Project
Barnegat Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|




**SOIL CHARACTERISTICS**

AptAv - Appoquinimink-Transquaking-Mispillion complex, 0-1% slopes, very frequently flooded
AtsA - Atsion sand, 0-2% slopes
AtsAt - Atsion sand, tide flooded, 0-2% slopes
BerAr - Berryland sand, 0-2% slopes, rarely flooded
PstAt - Psammaquents, sulfidic substratum, 0-3% slopes, frequently flooded
WATER

LEGEND

PROJECT AREA

0 1,000 2,000 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Soil Survey Geographic (SSURGO) database; Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [10/01/2015]

amec foster wheeler

Figure 3.28

Soil Survey Map
Barnegat Project Area
Marsh Enhancement Design/Build Project
Barnegat Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

Using that definition, wetlands are defined based on certain characteristics of vegetation, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic, or adapted to living in saturated areas. Soils are considered hydric (permanently or seasonally saturated by water) if they meet the criteria defined by the National Technical Committee for Hydric Soils (USDA 2015a). Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season (FIC 1989).

The most common method of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States*, wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine, and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands (Cowardin et al. 1979).

Defining areas that meet the regulatory definition of a wetland (33 CFR 328.3(b)) is important in determining the jurisdiction of those areas by the Federal government (USACE), and in some areas of the United States, state, county, and/or local governments. Jurisdiction over wetlands subsequently determines their regulation and the types of activities that are permittable. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into wetlands, meaning that a permit is required before dredged or fill material is discharged into these areas.

The premise of wetland regulation is that no dredged or fill material may be discharged if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded by the action. The USACE reviews permit applications for activities proposed within WOTUS. As the Project occurs on jurisdictional wetlands, it is subject to regulation by the USACE and the NJDEP.

The Service's NWI indicates that the wetlands within the Barnegat Project Area boundaries are classified as follows (**Figure 3.29**):

- Estuarine, subtidal, unconsolidated bottom, subtidal habitat (E1UBL).
- Estuarine, subtidal, aquatic bed, rooted vascular, subtidal habitat (E1AB3L).
- Estuarine, intertidal, aquatic bed, irregularly exposed habitat (E2ABM).
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched habitat (E2EM1Pd).
- Estuarine, intertidal, emergent, persistent, regularly flooded habitat (E2EM1N).
- Estuarine, intertidal, unconsolidated shore, regularly flooded habitat (E2USN).
- Palustrine, forested, broad-leaved deciduous, saturated habitat (PFO1B).
- Palustrine, forested, needle-leaved evergreen, saturated habitat (PFO4B).

The NJDEP indicates that the wetlands within the Barnegat Project boundaries are classified as follows (**Figure 3.30**):

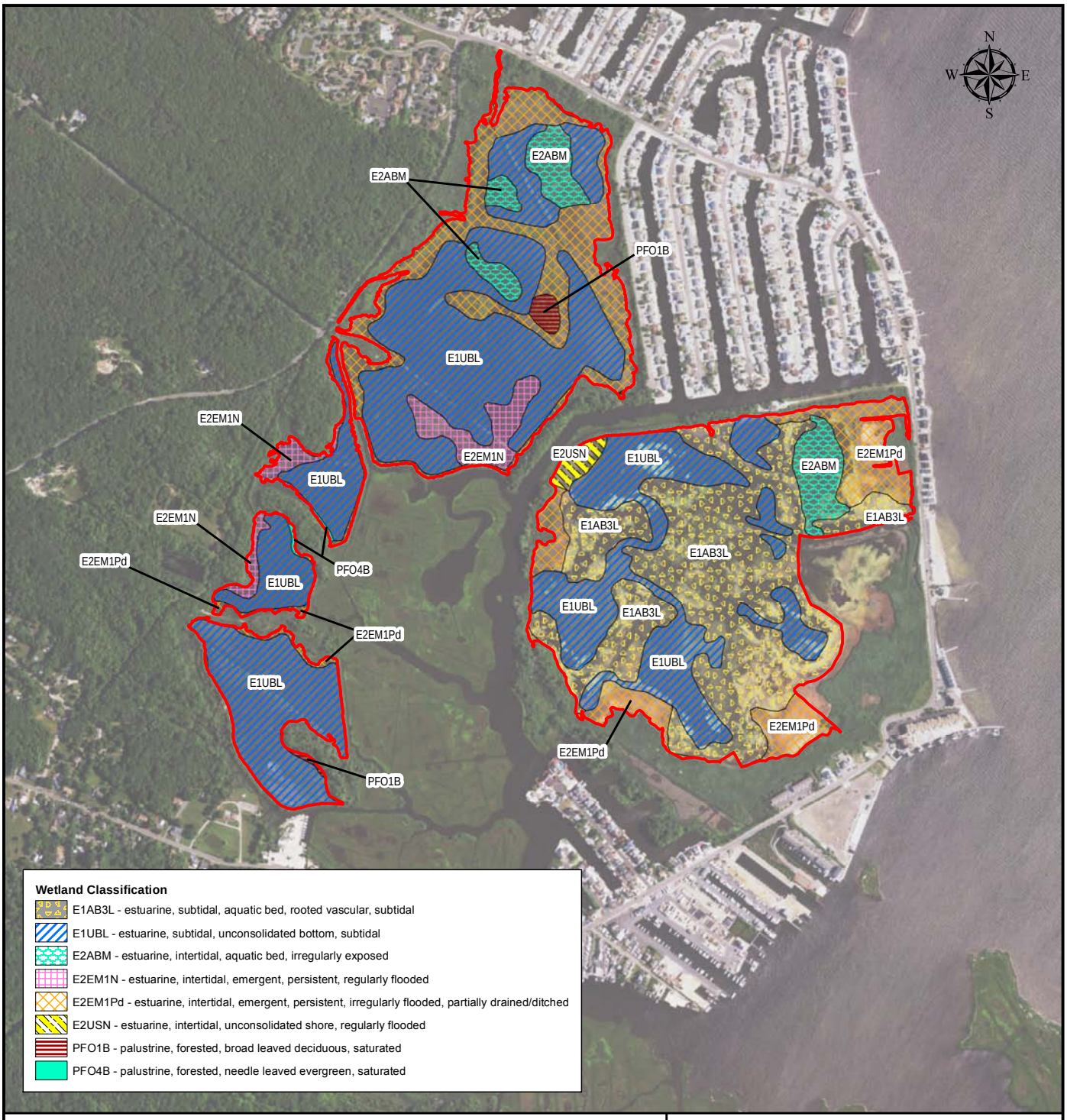
- Saline marsh (high marsh).
- Saline marsh (low marsh).
- Tidal rivers, inland bays, and other tidal waters.
- *Phragmites* dominant coastal wetlands.
- Disturbed tidal wetlands.

### 3.6.6 Vegetation

A desktop assessment of the Project area was performed using aerial photographs (true color and color infrared) and LiDAR imagery to provide a general perspective of salt marsh structure on a landscape scale. These resources were used to map general habitat types (high marsh, low marsh, upland, etc.). General habitat types were based upon the USNVCS (FGDC 2008) and methods used by NatureServe in their (2009) Vegetation Classification Report. Vegetative communities within the salt marsh group were further classified as either healthy or stressed.

This Project area is composed of five separate man-made impoundments. The easternmost impoundment is the largest and consists of an un-vegetated area that contains an average of 0 to 0.5 feet of water over an unconsolidated muck substrate. The remaining area inside the impoundment consists of dense common reed stands and areas where common reed appears to be severely stressed due to persistent flooding and only remnants of the rhizomes and dead vegetation remain. The four impoundments along the west side of the Project area also consist mainly of large, un-vegetated mudflats with an average of 0 to 0.5 feet of water. However, unlike the larger impoundment to the east, these impoundments contain low lying vegetated areas of scrub-shrub wetland and low salt marsh along the edge of the dikes. The remaining portions of the Project area include the actual dike berms around the impoundments that are dominated by tidal reed marsh and shrub areas. There was no SAV or freshwater wetland habitats observed within the impoundments.

In general the Barnegat Project Area is dominated by highly stressed marsh areas that have been turned into open water impoundments and mudflats, with higher elevations dominated by common reed. Some remnants of low and high salt marsh were observed along the toe of the impoundment berms as a very narrow (1 to 3 foot wide) bench-like feature. However, these areas are very sparse and typically the common reed dominates the berms to the edge. Long, narrow strips of islands, with sparse scrub-shrub vegetation, are also located throughout the western impoundments. These appear to be remnants of larger, vegetated islands and berms that have been flooded and highly impacted by salt water levels (**Table 3.25**). A representative map showing the various habitat types within the Barnegat Project Area is presented as Figure 2-33 in **Appendix B**.



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

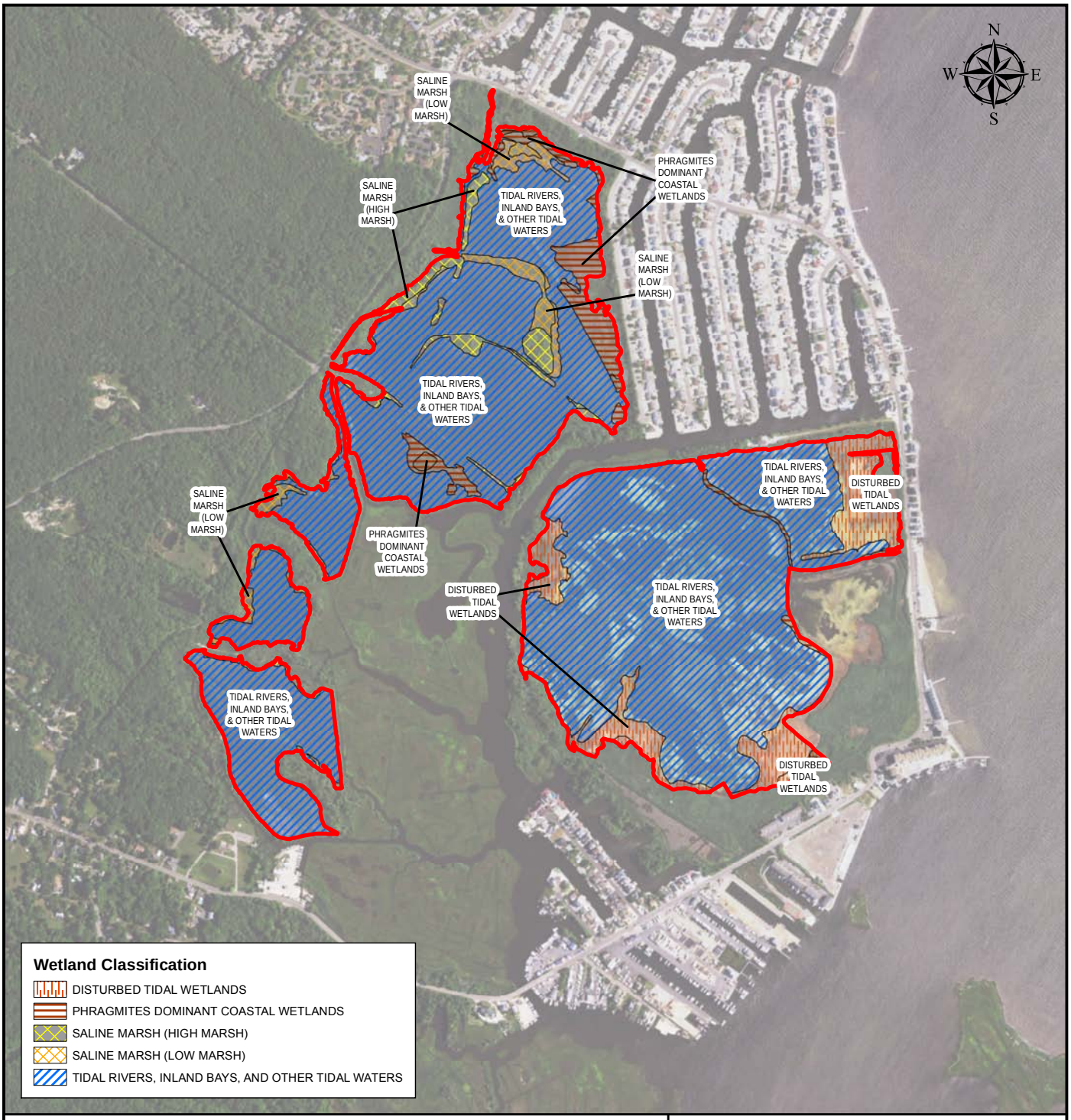
Data Source: U.S. Fish and Wildlife Service; National Wetlands Inventory - Wetlands Classification of Wetlands and Deepwater Habitats of the United States; U.S. Department of the Interior, Fish and Wildlife Service; Washington, DC. FWS/OBS-79/31; http://www.fws.gov/wetlands/

amec foster wheeler

Figure 3.29

National Wetlands Inventory Map
Barnegat Project Area
Marsh Enhancement Design/Build Project
Barnegat Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|



LEGEND

PROJECT AREA

0 500 1,000 Feet

ImageSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2015

Data Source: Data Source: Land Use/Land Cover 2012 Update, Edition 20150217 Subbasin 02040301 - Mullica-Toms (Land_lu_2012_hu02040301), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Pub. Date: 02/17/2015.

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Figure 3.30

NJDEP Wetlands Map
Barnegat Project Area
Marsh Enhancement Design/Build Project
Barnegat Township, New Jersey

| Rev. By: CB | Project No.: 3617157355.81.01 | January 2016 |
|---|---|---|

| Table 3.25<br>Vegetation Summary for the Barnegat Project Area | | | |
|---|---|---|---|
| **Habitat Type** | **Acres** | **Approximate Percentage of Project Area** | **Vegetative Description** |
| North Atlantic coast estuarine intertidal mudflats/salt pannes | 188.74 | 80 | Large, flat expanses of mud, composed of fine silts and clays, found at low-lying areas of the marsh/Shallow depressions located on the marsh platform that contain very high salinity in the waters within (interstitial) the sediment – standing water present. |
| Stressed coastal salt pond marsh | 1.56 | 0.66 | Low, regularly flooded salt marsh that is dominated by a diverse coverage of plant species including common three-square, dwarf spikerush, and fern flatsedge. |
| Stressed North Atlantic low salt marsh | 1.55 | 0.66 | Less vigorous, partially or marginally functioning low salt marsh vegetation that is generally less dense, shorter, and of a duller color than healthy, high functioning low salt marsh vegetation. |
| North Atlantic low salt marsh | 0.3 | 0.13 | Low, regularly flooded salt marsh that is dominated by smooth cordgrass in the Northern Atlantic Coastal Plain. |
| Stressed reed tidal marsh | 31.3 | 13 | Less vigorous, partially or marginally functioning, areas of a salt marsh that have been invaded by common reed. |
| Reed tidal marsh | 4.79 | 2.0 | Areas of a salt marsh that have been invaded by common reed. |
| Scrub-shrub vegetative communities | 8.36 | 3.5 | Areas dominated by woody vegetation that is generally less than 6 meters tall. |

### 3.6.7 Marine Resources

**Planktonic and Benthic Organisms:** The Barnegat Bay Estuary has experienced episodic recurrences of brown tides and other microalgal blooms, loss of submerged aquatic vegetation, and decline of hard clam stock and harvest. A two-year survey of the phytoplankton community in the BB-LEH estuary was conducted between 2011 and 2013. The study aimed to characterize species composition and spatial and temporal trends in the phytoplankton community. The results indicated that the number of phytoplankton taxa recorded from each year was similar and that the most common species belonged to five major groups (see section 3.2.7). Diatoms made up approximately 50% of the total number of taxa. Although there were differences detected between the two years with regards to species occurrence and dominance among seasons and sites, species richness and diversity were comparable. Multivariate analysis of all samples showed significant relationships between phytoplankton species composition and the environmental variables, including salinity and temperature (Ren 2015).

As is common in estuarine environments, the benthic community in Barnegat Bay is dominated by relatively few species. In recent studies of the BB-LEH estuary, six taxa accounted for over 50% of all individuals collected. Of those six most-abundant taxa, five were annelids and one was a crustacean. The most abundant species, *Mediomastus ambiseta*, was present at 95 out of 100 stations and accounted for 31% of all individuals. That species was very abundant near the Barnegat Project Area (101 to 686 individuals recorded at the closest monitoring station). A moderate abundance (11 to 100 individuals) of *Streblospio benedicti* and the annelid worm *Notomastus* sp. were recorded. The amphipod *Ampelisca abdita* was recorded less frequently (2 to 10 individuals). Comparitively high numbers of Oligochaetes (11 to 77 individuals) (*Oligochaete* spp.) and comparatively moderate numbers of *Glycinde multidens* (2 to 10 individuals) were present near the Project area. Salinity was determined to have a strong effect on the distribution and abundance of most taxa. Based on four multimetric or multivariate indices of habitat quality evaluated, the monitoring station closest to the Barnegat Project Area was classified as good, high, and/or meets restoration goals (Taghon et al. 2014).

**SAV:** Seagrass habitat provides important ecosystem services, including essential habitat for shellfish and finfish. Although the BB-LEH estuary contains approximately 75% of New Jersey's known seagrass habitat (Lathrop et al. 1999), recent remote sensing and in situ surveys have indicated that seagrass habitat has contracted from historical levels due to human induced stressors, such as: (1) direct impacts due to physical alteration of benthic habitat through channel dredging, inlet modification, boat scarring, and dock building, and (2) indirect impacts caused by nutrient enrichment and eutrophication (Lathrop and Haag 2011; Burkholder et al. 2007; Lathrop et al. 2006; Kennish et al. 2008). Comparison of the 1970's and 1980's SAV survey maps with those from the 1990's shows a decrease of nearly 33% in SAV area (Lathrop et al. 1999).

In a study conducted between 2003 and 2009, a total of 721 hectares of seagrass were mapped within the southern portion of the BB-LEH estuary in 2009, representing an increase of 231 hectares from 2003 (Lathrop and Haag 2011). The Ship Bottom Submerged Aquatic Vegetation Distribution Map of 1979 (NJDEP 2016) revealed historic areas of common eelgrass SAV along the entire bay coastline, just east of the Barnegat Project Area and at the mouth of Double Creek. Current mapping shows SAV in those same areas (Lathrop and Haag 2011).

**Fish and Shellfish:** The refuge lands are bordered by, and are hydrologically connected to, estuarine habitats made up of salt marshes, streams, ponds, bays, and rivers (USFWS 2013). Specifically, the Barnegat Project Area is located within the southern portion of the Barnegat Bay estuary system. In general, the refuge is home to a rich variety of fish, shellfish, and crabs. These species are of substantial importance to the sport and commercial fisheries and are a food base for many birds and mammals (USFWS 2004; USFWS 2013).

The salt marshes contain abundant mummichog and sheepshead minnow, which are frequently found in shallow water environments such as marsh ponds and small intertidal creeks. Important recreational and commercial species, including summer flounder, striped bass, white perch, and northern weakfish use the estuarine habitats as important nursery areas (USFWS 2013).

The Barnegat Bay estuary is estimated to be used by approximately 110 fish species. The ten most commonly reported species are bay anchovy, Atlantic silverside, fourspine stickleback, spot, winter flounder, inland silverside, northern pipefish, mummichog, bluefish, and oyster toadfish (TPL 2008). It also contains a variety of shellfish and crabs. Species such as bay scallop, eastern oyster, northern quahog, dwarf surfclam, softshell clam, blue mussel, blue crab, and horseshoe crab have been documented as being present in the waters of the bay (USFWS 2004).

**EFH:** The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth procedures to identify, conserve, and enhance EFH for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the NOAA NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a). A comprehensive EFH Assessment for this Project area is provided as **Appendix D.**

### 3.6.8 Terrestrial Wildlife

**Birds**: The primary focus of the refuge establishment has been to protect tidal wetland and shallow bay habitat for migratory water birds. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose, Canada goose, Atlantic brant, mallard, American black duck, northern shoveler, bufflehead, double-crested cormorant, great egret, glossy ibis, clapper rail, greater yellowlegs, semipalmated sandpiper, least sandpiper, short-billed dowitcher, laughing gull, ring-billed gull,

herring gull, great black-backed gull, Forster's tern, and black skimmer (USFWS 2012; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove, red-bellied woodpecker, blue jay, fish crow, tree swallow, barn swallow, Carolina chickadee, tufted titmouse, Carolina wren, American robin, gray catbird, northern mockingbird, common yellowthroat, song sparrow, northern cardinal, red-winged blackbird, common grackle, and American goldfinch. All of these species have been documented to breed at the refuge (USFWS 2012; USFWS 2014a; USFWS 2014b).

The Barnegat Project Area contains open water and salt marsh habitat ideal for the thousands of migrating ducks, geese, shorebirds, and wading birds that stop at the refuge each spring and fall to feed and rest.

**Mammals**: The Barnegat Project Area is primarily composed of salt marsh habitat. Therefore, the typical mammals found in salt marsh habitat areas, such as mink, river otter, muskrat, meadow vole, southern bog lemming, and least shrew may reside here (USFWS 2004).

**Reptiles and Amphibians**: The Barnegat Project Area also falls into the coastal estuarine community type assemblage, which includes coastal marshes, estuaries, coves, tidal flats, and/or inner edges of barrier beaches. Therefore, the Barnegat Project Area may include habitat for the northern diamondback terrapin (USFWS 2004).

Barnegat may also contain many of the other wetland amphibian and reptilian species documented throughout the refuge including (NJA 2015; USFWS 2013):

- Five-lined skink
- Black racer
- Black rat snake
- Northern water snake
- Eastern hognose snake
- Rough green snake
- Eastern ribbon snake
- Common snapping turtle
- Eastern painted turtle
- Eastern mud turtle
- Redbelly turtle
- Green frog
- New Jersey chorus frog

- Northern cricket frog
- Gray treefrog
- Southern leopard frog
- Northern red salamander
- Four-toed salamander

### 3.6.9 Threatened and Endangered Species

The unique habitats of the Barnegat Bay estuary (including barrier islands, salt marsh, tidal marshes, shallow water, and swamps) attract threatened and endangered species (TPL 2008). The Service completed an intra-service biological evaluation for the Barnegat Project Area pursuant to the ESA section 7 (**Appendix E**). As of the date of this EA, an official response is pending, but the initial results indicated the presence of the following federally listed threatened and endangered species on or near the Barnegat Project Area:

**Table 3.26**

**Intra-Service Section 7 Biological Evaluation Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Barnegat Project Area**

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| Red knot | *Calidris canutus rufa* | Threatened |
| Knieskern's beaked-rush | *Rhynchospora knieskernii* | Threatened |
| Swamp pink | *Helonias bullata* | Threatened |
| Northern long-eared bat | *Myotis septentrionalis* | Threatened |

There were no critical habitats documented within the Barnegat Project Area. The Service's IPaC system was also consulted to determine which migratory bird species, protected under the MBTA and the BGEPA, could potentially move through the Barnegat Project Area. The results indicated the presence of the following 26 species:

**Table 3.27**

**Service's IPaC Findings for Potential Migratory Bird Species On or Near the Barnegat Project Area**

| Common Name | Scientific Name |
|---|---|
| American oystercatcher | *Haematopus palliatus* |
| American bittern | *Botaurus lentiginosus* |
| Bald eagle | *Haliaeetus leucocephalus* |
| Black skimmer | *Rynchops niger* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Blue-winged warbler | *Vermivora pinus* |
| Fox sparrow | *Passerella liaca* |
| Gull-billed tern | *Gelochelidon nilotica* |

| Table 3.27<br>Service's IPaC Findings for Potential Migratory Bird Species On or Near the Barnegat Project Area | |
|---|---|
| **Common Name** | **Scientific Name** |
| Horned grebe | *Podiceps auritus* |
| Hudsonian godwit | *Limosa haemastica* |
| Least bittern | *Ixobrychus exilis* |
| Least tern | *Sterna antillarum* |
| Lesser yellowlegs | *Tringa flavipes* |
| Peregrine falcon | *Falco peregrinus* |
| Pied-billed grebe | *Podilymbus podiceps* |
| Prairie warbler | *Dendroica discolor* |
| Prothonotary warbler | *Protonotaria citrea* |
| Purple sandpiper | *Calidris maritima* |
| Red knot | *Calidris canutus rufa* |
| Rusty blackbird | *Euphagus carolinus* |
| Seaside sparrow | *Ammodramus maritimus* |
| Short-eared owl | *Asio flammeus* |
| Snowy egret | *Egretta thula* |
| Upland sandpiper | *Bartramia longicauda* |
| Wood thrush | *Hylocichla mustelina* |
| Worm-eating warbler | *Helmitheros vermivorum* |

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Barnegat Project Area:

| Table 3.28<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Barnegat Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Common tern | *Sterna hirundo* | Not listed | Special concern |
| Tricolored heron | *Egretta tricolor* | Not listed | Special concern |
| Little blue heron | *Egretta caerula* | Not listed | Special concern |
| Glossy ibis | *Plegadis falcinellus* | Not listed | Special concern |
| Snowy egret | *Egretta thula* | Not listed | Special concern |
| Black skimmer | *Rynchops niger* | Not listed | Endangered |
| Osprey | *Pandion haliaetus* | Not listed | Threatened |
| Black-crowned night-heron | *Nycticorax nycticorax* | Not listed | Threatened |

| Table 3.28<br>NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Barnegat Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| Roseate tern | *Sterna dougallii dougallii* | Endangered | Endangered |
| Atlantic loggerhead sea turtle | *Caretta caretta* | Threatened | Endangered |
| Kemp's or Atlantic Ridley sea turtle | *Lepidochelys kempii* | Endangered | Endangered |
| Atlantic green sea turtle | *Chelonia mydas* | Threatened | Threatened |

Since the NJDEP GeoWeb is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The October 9, 2015 findings of the Natural Heritage Program are presented in **Appendix E**. These results indicated the following additional plant and animal species that have the potential to occur on or near the Barnegat Project Area:

| Table 3.29<br>NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Barnegat Project Area | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Federal Status** | **State Status** |
| New Jersey rush | *Juncus caesariensis* | Not listed | S2 - Imperiled in New Jersey |
| Pine Barren gentian | *Gentiana autumnalis* | Not listed | S3 – Rare in New Jersey |
| Curly grass fern | *Schizaea pusilla* | Not listed | S3 – Rare in New Jersey |
| Cope's gray treefrog | *Hyla chrysoscelis* | Not listed | Endangered |
| Brown thrasher | *Toxostoma rufum* | Not listed | Special concern |
| Barred owl | *Strix varia* | Not listed | Threatened |
| Veery | *Catharus fuscescens* | Not listed | Special concern |

### 3.6.10 Cultural Resources

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. Views of the public should be solicited and considered throughout the process, and native Indian tribes must be consulted about undertakings on or affecting their lands under Executive Order 13175. If the agency's undertaking could affect historic properties, the next steps are to review background information, consult with the SHPO and any Indian tribe that may attach religious or cultural importance to them, seek information from knowledgeable parties, and conduct additional studies as necessary. If it is determined that the activity that has no potential to affect historic properties, the agency has no further Section 106 obligations (ACHP, 2013).

To achieve compliance with the NHPA (Section 106), reviews of cultural resource files were performed at the offices of the NJDEP SHPO and the NJSM. The objective of the file reviews was to assess the potential for the Proposed Action to impact historic properties (listed or eligible for listing on the National Register of Historic Places) within the Barnegat Project Area. Historic properties include archaeological sites, as well as historic structures and districts. In addition, the Service has requested comment from the NJDEP SHPO and has been addressing Tribal consultation requirements. At this time, the Delaware Tribe of Indians is a consulting party. However, the Delaware Nation of Oklahoma did not wish to take part.

The APE for the Barnegat Project includes the five pool areas in which portions of the dikes will be removed, equaling approximately 238 acres. File searches indicated that there are no previously inventoried historic properties within the APE. A previous cultural resource study conducted along East Bay Avenue supported that conclusion. Only recent or late 19$^{th}$ century material was recovered in testing near Pool 5 and Pool 3, although nothing documented worthy of National Register status. However, the study did indicate the presence of one recorded archaeological site located approximately 450 feet west of Pool 3. Testing just south of that area, however, did not reveal prehistoric artifacts (Wilson 1977).

The previously conducted archaeological investigation concluded that it is possible but not probable that prehistorical archeological resources remain in the area below the water table in the area around the Barnegat Project Area (Wilson 1977). Based on that assessment and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE is low. Therefore, further Section 106 research was not conducted by Amec for the Barnegat Project Area. However, follow-up consultation with the NJDEP SHPO was performed by the Service and a July 27, 2016 letter of finding of No Historic Properties Adversely Effected was issued indicating no further Section 106 consultation being required.

### 3.6.11 Socioeconomic Resources and Environmental Justice

The socioeconomic structure of the Barnegat Project Area is similar to that of the Brick Township Project Area, as they are both located within the coastal portion of Ocean County. Ocean County began as a rural, agricultural and fishing center. In the latter part of the 1800s and through the 1900s, the resort industry of the New Jersey Shore began to develop, and commercial activities

associated with seasonal resorts became the county's economic backbone. With year-round population increases, Ocean County's economic base has become increasingly diverse and a variety of new industries now supplement the traditional tourist-related businesses. The health care industry is now the top employer in the county and is the fastest growing employment sector. Ocean County is projected to continue leading employment growth in the State through the next decade (OCDP 2014).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

### 3.6.12 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation.

Public use of the Barnegat Project Area is directed to a short boardwalk and overlook on the northern end, which is accessed via Bayshore Drive.

### 3.6.13 Transportation

The regional and State roads that convey traffic directly into and from the Barnegat Project Area are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- U.S. Route 9 also runs in a general northeast to southwest direction, extending from an interchange with Route 1 in Woodbridge Township, Middlesex County down to its endpoint in Lower Township, Cape May County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Barnegat Project Area (between exits 69 and 67, west/northwest of the site) was estimated to be between 43,085 and 46,790 cars per day for 2015 during the fall season (October). These values represent approximately 97 percent of the maximum daily load on this stretch of roadway, which occurs during summer months (T&M 2000).

Traffic volumes on a stretch of U.S. Route 9, just northwest of the Barnegat Project Area, indicate that roadway's average annual daily traffic volume at 17,890 cars per day in September of 2011 (NJDOT 2015).

### 3.6.14 Noise

Noise can be characterized by the following four factors: frequency, intensity, duration, and distance. Each of these factors is described in section 3.2.14.

The two most common types of noise are point source and line source. This Proposed Action would generate point source noise. These noises are associated with a source that remains in one place for extended periods of time, such as with most construction activities (WSDOT 2013). A few examples of point sources of noise expected from activities at the Barnegat Project Area are from the track-mounted/wheeled excavators and dump trucks required for dike excavation.

OSHA regulations state that workers must not be exposed to noise levels above 85 dBA as a 8-hour noise exposure level or to 140 dBC as a peak sound level. According to the WSDOT (2013), dump trucks measure a maximum of 76 dBA while excavators measure a maximum of 81 dBA.

# Chapter 4 - Alternatives Including the Proposed Action

Several alternatives were assessed during the development of this EA. The Proposed Action, which includes sediment enrichment, culvert replacement, and possible tidal flow restoration within the respective Project areas, is considered to be the most direct and effective way of meeting the Project objectives. The "Alternatives Considered but Eliminated" section details potential actions that were considered as part of data gathering efforts, but were removed from consideration due to disqualifying factors such as cost effectiveness and limited funding for this Project. The Proposed Action, the Alternatives Considered but Eliminated, and the No Action Alternative are discussed in the following sections.

## 4.1 Sediment Enrichment Site Selection

Use of dredged materials is sanctioned by the USACE as well as Congress. The USACE currently allows the use of dredged material for bathymetric re-contouring and the creation/restoration of intertidal marshes and mudflats (Barone et al. 2014). The Service is working closely with the New Jersey Department of Transportation (NJDOT) to use material that their contractors will dredge from state waterways to elevate refuge marsh habitats to meet habitat objectives described herein in a process known as sediment enrichment, beneficial use of dredged material, or thin layer deposition. Building marsh elevations with sediment from nearby dredging projects is a valuable tool for creating, restoring and maintaining coastal marshes and may help slow or reverse losses of salt marsh due to sea level rise (Woodhouse et al. 1972) and increase the resiliency of systems that have been degraded by centuries of anthropogenic impacts (such as grid-ditching and salt hay farming).

Determining the appropriate thickness of material to apply is a function of the habitat type, as coastal marshes are able to accommodate the placement of greater sediment thicknesses as opposed to freshwater wetlands. Calculating the appropriate thickness requires an understanding not only of the desired or target elevations but also the nature of materials to be pumped, the nature of the sediments in the areas receiving the pumped sediment, and the extent of dewatering and subsequent compression (Ray 2007). Generally, sediment placement in these types of projects is less than 0.5 feet thick so that plants and invertebrates can readily grow or migrate up through the material. Sediment deposits greater than 0.5 feet has the potential to smother and kill existing vegetation, requiring revegetation of the site with new plant material (Ford et al. 1999). However, Cahoon and Cowan (1987, 1988) reported that recolonization by typical salt marsh plant species was underway in coastal wetlands 14 months after high-pressure application of up to 1.2 feet of dredged sediment occurred. Within four years, the placement sites were no longer distinguishable or were very similar to reference areas, with the exception of some species variance (Ray 2007).

The refuge has designated specific locations in the Brick A, Brick B, and Good Luck Point project areas that may benefit from sediment enrichment. They worked with the contractor Amec Foster Wheeler and other experts in the field of engineering and marsh biology to develop target elevations at these project areas, which are composed of high and low salt marsh, as well as patches of maritime shrubs. These areas have been ditched for mosquito control, and other anthropogenic alterations have occurred. The marshes are increasingly waterlogged, likely due to the inability of

the marshes to keep pace with sea level rise. Elevation and vegetation data collected during the ecological assessment were used to determine the existing elevations of high salt marsh, low salt marsh, and common reed stands in the general vicinity of existing die-back areas. These data were used to evaluate whether or not die-back areas were lower in elevation relative to nearby healthy high and low salt marsh habitat. These marshes may benefit from sediment enrichment to increase/re-establish an elevation for optimum *Spartina* growth.

The Brick and Good Luck Point project areas are in close proximity to proposed NJDOT maintenance dredging sites; proximity is an important condition to make sediment enrichment projects feasible, cost effective, and the least impactful for the environment. The two project areas will be divided into separate cells, each of which will receive the dredged sediment and to varying thicknesses depending upon their baseline elevations. Watercourses within or adjacent to these cells will be protected from the dredged material with erosion controls such as filter block, coir fiber logs, or other materials. These protective measures will be placed at some distance from the edge of the watercourse in order to provide a buffer for additional protection. This distance may vary from 10 to 50 feet depending upon site-specific conditions. Dredging barges will pump sediment from the bottom of waterways through secure welded pipelines towards the Project areas. The pipeline will be floated over water except where it crosses over navigation channels, where it will be sunk in order to avoid interference with vessel and watercraft traffic. At landfall, it will be placed directly onto the marsh surface. The end of the pipeline where sediment is discharged will have a diffuser on it to spread out the pressure of the water and sediment mixture. The sediment placed on the marsh will be designed and constructed by the NJDOT subcontractor.

In practicality, there will be variation in the amount of material distributed within each cell due to local topographic features and, more importantly, due to variability in settling as material moves away from the discharge pipe of the pumping operation. Target elevations are typically met closer to the outflow pipe and are reduced as distance increases, or that in low areas, such as ponds or ditches, there will likely be even more settling. The benefit to the refuge is that a mosaic of habitat types, including high marsh, low marsh, mud flat, and open water will be achieved, which mimics natural conditions and will benefit a wide array of fish and wildlife species.

To determine the volume of sediment to place in each cell, refuge biologists developed biological target elevations (BTEs) based on site-specific vegetation, elevation, hydrologic, and orthoimagery data included in the Marsh Enhancement and Telephone Pole Array Removal Report. Evaluations from experts such as Dr. Candice D. Piercy, a Research Environmental Engineer with the USACE, Engineering, Research, and Development Center (ACOE-ERDC), as well as Dr. Susan C. Adamowicz, a Coastal Habitat Biologist with the Service's Northeast Region were also used. Each BTE is the site-specific elevation goal for within 2 to 3 years of sediment placement, taking into account the material settlement. The elevation of existing vegetation (smooth cordgrass, saltmeadow cordgrass, or common reed) in relation to msl, MLW, and mean high water (MHW) levels gathered from locally-installed water level monitors referenced to United States Geological Survey (USGS) tide gauges were used as part of this evaluation.

To create and enhance high marsh habitat, site-specific target elevations above mean sea level and close to MHW were chosen, which would be regularly inundated by full moon (spring) tides and other high water events (Barone et al. 2014). Those elevations are within the range at which healthy

high salt marsh is currently growing, but at the lowest end of the range at which the invasive species common reed is currently growing. For low salt marsh habitat, target elevations above MLW (USGS 2016) and within the range of currently healthy low marsh were selected. The elevation of high marsh and low marsh by site, as well as assignment by cell is given in **Table 4.1**, **Figures 4.1** to **4.3** depict the cells and their respective acreages for the Brick A, Brick B, and Good Luck Point project areas, **Figures 4.4** and **4.5** present example cross-sections for the Brick A and Good Luck Point project areas.

**Table 4.1**

**Summary of Biological Target Elevations (US Survey Feet) NAVD88 for High Salt Marsh (HSM) and Low Salt Marsh (LSM) Habitats for the Brick A, Brick B, and Good Luck Point Sediment Enrichment Project Areas**

| CELL | HSM | LSM | ACRES | COMMENTS |
|---|---|---|---|---|
| ***BRICK A*** | **0.66** | **0.33** | | |
| BRA-1 | | X | 7.65 | The cell is located close to a zone with common reed; LSM habitat is targeted to reduce the risk of invasive species cover. |
| BRA-2 | X | | 5.91 | |
| BRA-3 | X | | 6.91 | |
| BRA-4 | X | | 3.14 | |
| BRA-5 | | X | 6.27 | The cell is located on the bay edge of the marsh, and more likely was LSM historically. Additionally, as this cell contains what appears to be semi-natural pannes, LSM is targeted to preserve fisheries habitat. |
| BRA-6 | | X | 5.08 | This cell currently contains open water, mud flat and LSM. LSM is targeted based on site conditions and to preserve fisheries habitat. |
| BRA-7 | X | | 1.85 | |
| BRA-8 | X | | 4.85 | |
| ***BRICK B*** | **0.77** | **0.44** | | |
| BRB-2 | X | | 40.63 | |
| BRB-3 | X | | 23.80 | |
| BRB-4 | | X | 3.37 | This cell is very small and is surrounded by open water and creeks. LSM and mud flat are dominant in this cell. Healthy LSM elevation is targeted based on site conditions and to preserve fisheries habitat. |
| BRB-5 | X | | 19.9 | |
| BRB-6 | | X | 5.76 | This cell contains mostly stressed LSM bordered by a thin strip of HSM. Healthy LSM elevation is targeted based on site conditions. |

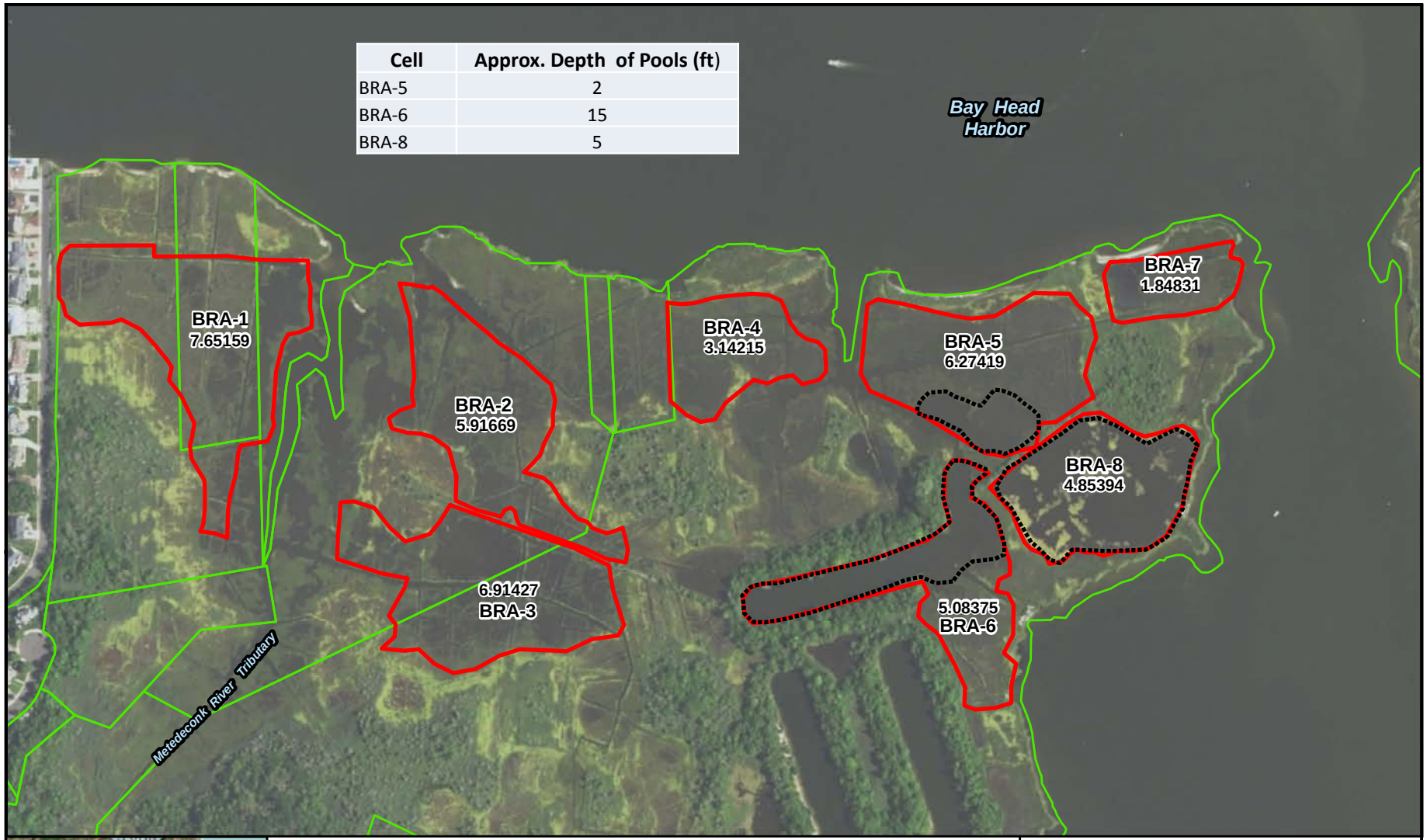
| Table 4.1<br>Summary of Biological Target Elevations (US Survey Feet) NAVD88 for High Salt Marsh (HSM) and Low Salt Marsh (LSM) Habitats for the Brick A, Brick B, and Good Luck Point Sediment Enrichment Project Areas | | | | |
|---|---|---|---|---|
| **CELL** | **HSM** | **LSM** | **ACRES** | **COMMENTS** |
| BRB-7 | | X | 5.99 | This cell contains mostly stressed LSM bordered by a thin strip of HSM. Healthy LSM elevation is targeted based on site conditions. |
| ***GLP*** | **0.62** | | | |
| | X | | 18.90 | Culvert replacement/enhancements under Bayview Avenue will improve tidal flushing to this site. This cell contains mostly stressed HSM and mud flat. Considering existing vegetation and planned hydrologic restoration, HSM is targeted. |

The estimated quantity of volume of fill needed for Brick A is approximately 125,986 cubic yards (CY), for Brick B is approximately 59,125 CY, and Good Luck Point is approximately 17,082 CY. Once the BTE have been achieved for a particular cell, no more sediment will be delivered. Additional dredged sediment will be disposed of in either New Jersey's Dredged Hole 18 or Dredged Hole 25 as per the existing restoration plan for these Dredged Holes.[7]

The revegetation of sediment enrichment areas by undesirable species, such as non-native and/or invasive species, is a genuine concern. Sediment enrichment areas may revegetate with undesirable species before native marsh vegetation pushes through the sediment layer, or can outcompete native marsh vegetation that has already pushed through. The monitoring of sediment enrichment areas following this procedure is an important tool to achieve the intended goal of marsh enhancement. Rather than provide a prescriptive approach to dealing with the potential for revegetation by undesirable species, the Service will adopt an adaptive management approach that provides flexibility in developing solutions where necessary. Different portions of the marsh will respond differently to sediment enrichment and such responses may change from year to year. By committing to an adaptive management approach, the techniques to manage the vegetation community can be tailored to the specific area during that particular season.

[7] Dredged holes, or subaqueous borrow pits, are submerged features within the bays and estuaries of Ocean, Atlantic, and Cape May Counties. These are former sediment borrow pits that were excavated in the early to mid-1900s as sources for construction of upland areas, roads and bridges, railroad beds, or beach replenishment (Howard et al. 2015).

| Cell | Approx. Depth of Pools (ft) |
|---|---|
| BRA-5 | 2 |
| BRA-6 | 15 |
| BRA-8 | 5 |



**Legend**

- Sediment Enrich. Cells/Acres
- Refuge Boundary
- Pools

N W E S

0 200 400 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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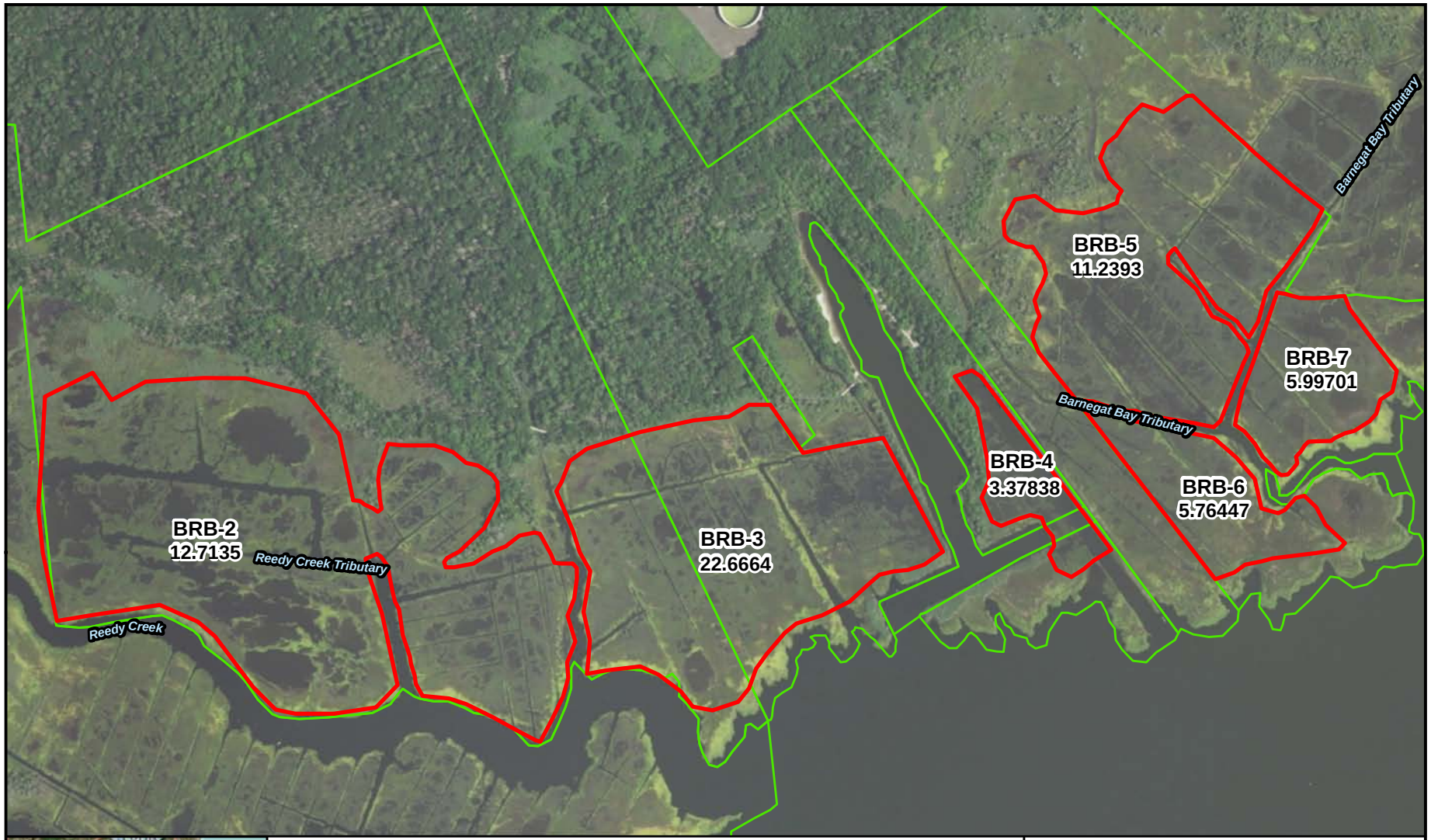
Figure 4.1

Brick A Proposed Sediment Enrichment Cells
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
|---|---|---|



**Legend**

Sediment Enrich. Cells/Acres

Refuge Boundary

N
W E
S

0 200 400 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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Figure 4.2

Brick B Proposed Sediment Enrichment Cells
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
|---|---|---|

**Legend**

- Sediment Enrich. Cells/Acres
- Refuge Boundary
- Approximate location of proposed culvert

N
W E
S

0 200 400 Feet

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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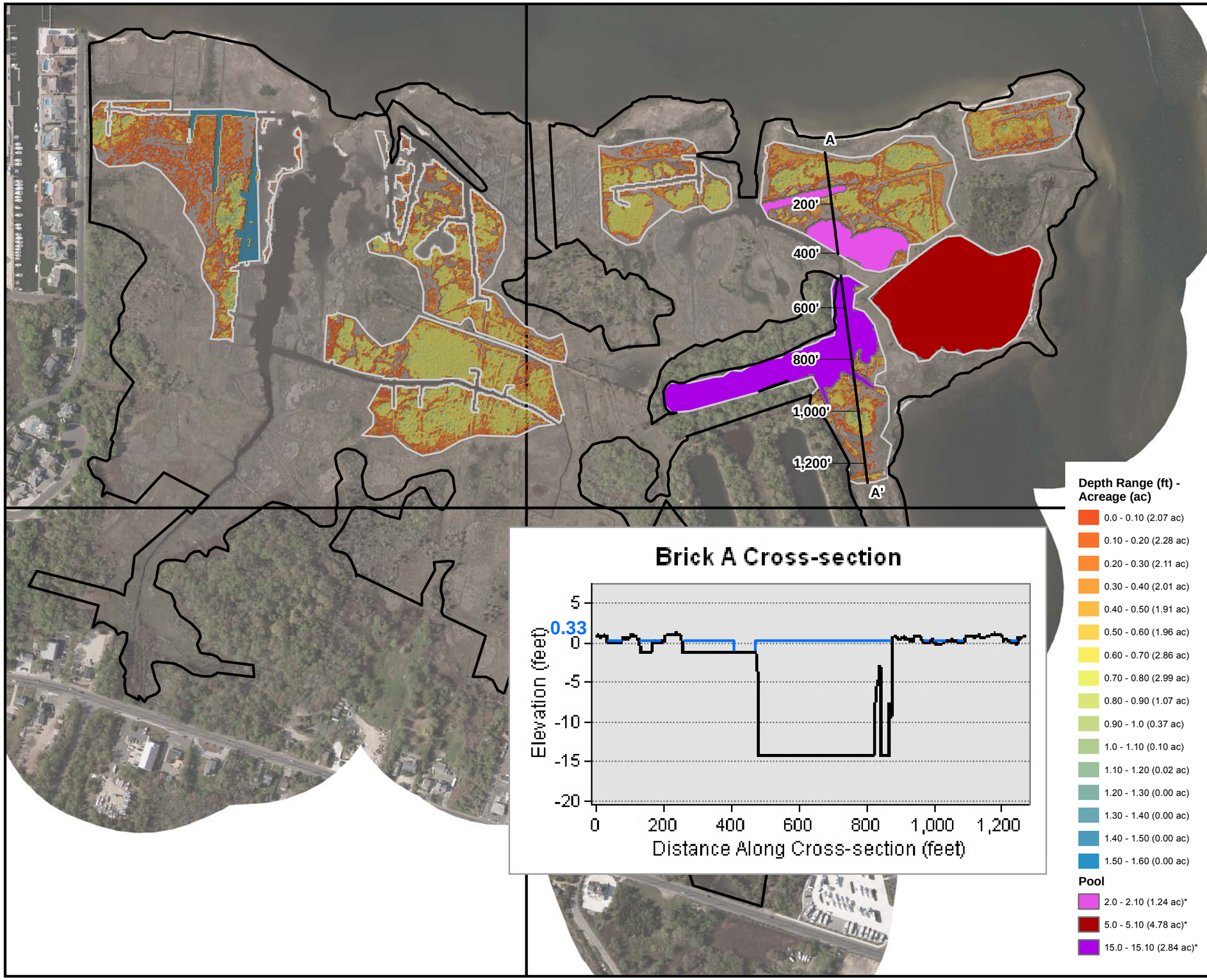
Figure 4.3

Good Luck Point Sediment Enrichment Cell
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
|---|---|---|



**Depth Range (ft) - Acreage (ac)**

- 0.0 - 0.10 (2.07 ac)
- 0.10 - 0.20 (2.28 ac)
- 0.20 - 0.30 (2.11 ac)
- 0.30 - 0.40 (2.01 ac)
- 0.40 - 0.50 (1.91 ac)
- 0.50 - 0.60 (1.96 ac)
- 0.60 - 0.70 (2.86 ac)
- 0.70 - 0.80 (2.99 ac)
- 0.80 - 0.90 (1.07 ac)
- 0.90 - 1.0 (0.37 ac)
- 1.0 - 1.10 (0.10 ac)
- 1.10 - 1.20 (0.02 ac)
- 1.20 - 1.30 (0.00 ac)
- 1.30 - 1.40 (0.00 ac)
- 1.40 - 1.50 (0.00 ac)
- 1.50 - 1.60 (0.00 ac)

**Pool**

- 2.0 - 2.10 (1.24 ac)*
- 5.0 - 5.10 (4.78 ac)*
- 15.0 - 15.10 (2.84 ac)*

N W E S

**Legend**

- Project Boundary
- NJDOT Area to Fill
- Existing Elevation of Marsh Surface
- Proposed Elevation of Sediment Enrichment - (Elevation of Existing Healthy LSM)

* Bathymetry data was not collected for these depths. Depths are estimated.

Depth of sediment enrichment to elevation 0.7' NAVD 88.
Volume of fill 125,986 CY.

LiDAR elevations within the boundaries of the vegetation community "High Salt Marsh" (HSM) have been decreased by 0.162' to correlate with field collected RTK spot elevations.

An assumed elevation of -0.73' has been applied to various channels and shallow bodies of water across the site as these locations were not covered by LiDAR. This elevation was derived from spot elevations collected in the field at the bottom of channel banks.

Horizontal Datum: NAD83 UTM 18N Foot US
Vertical Datum: NAVD88 Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015
NJDOT Area to Fill: Prepared by NJDOT 12/14/2015

Map Date: 8/9/2016

0 200 400 Feet

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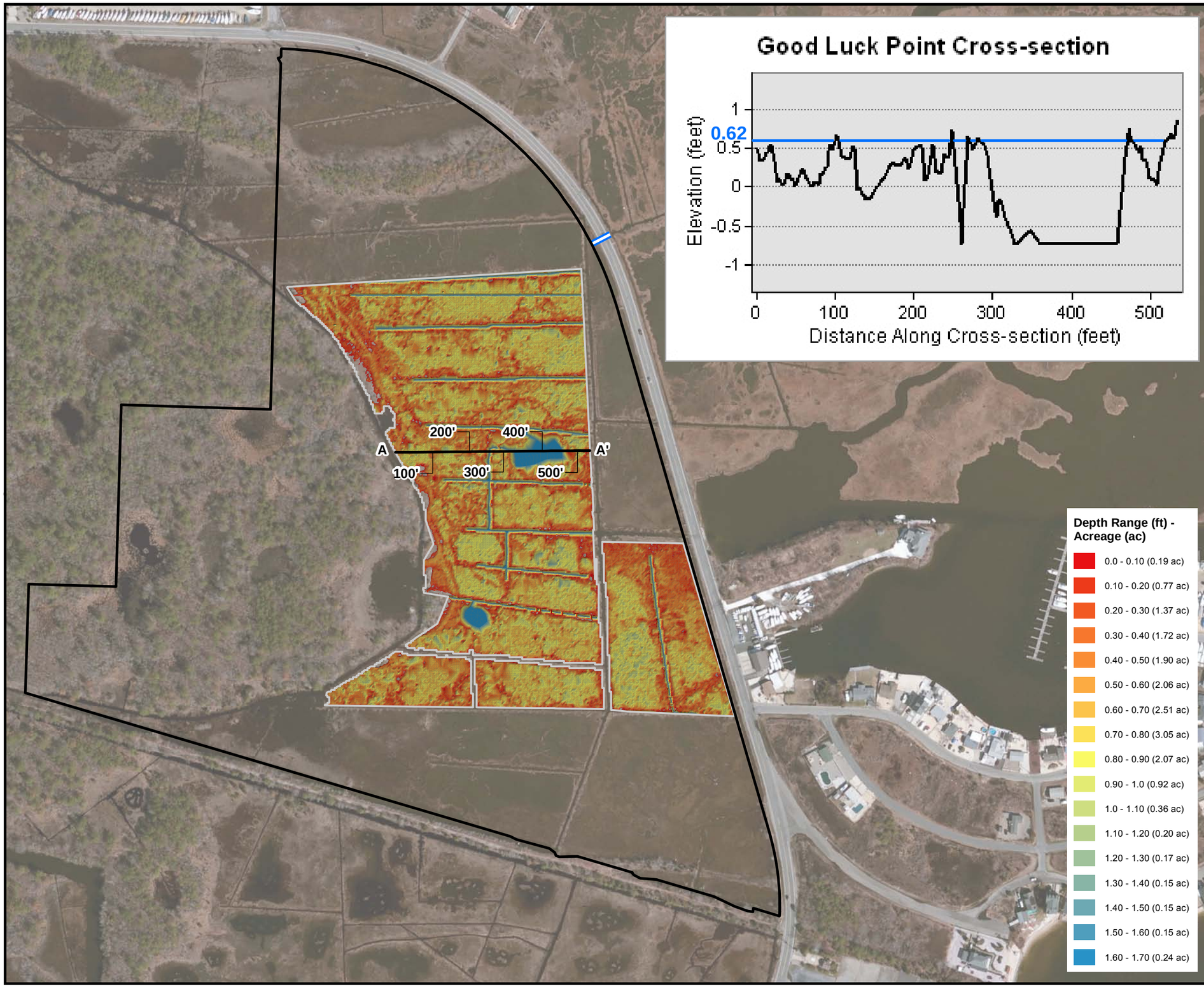
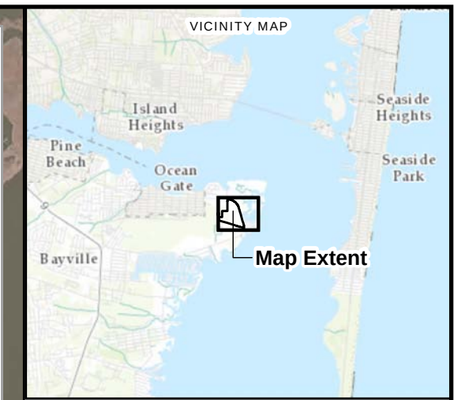
Figure 4.4

Sediment Deposition Cross-Section
for the Brick A Project Area
E.B Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

| Rev. By: PP | Project No.: 3617157355.81.01 | August 2016 |
|---|---|---|




**Legend**

- Project Boundary
- NJDOT Area to Fill
- Approximate Location of Proposed Culvert (Actual location to be determined during hydrologic assessment)
- Existing Elevation of Marsh Surface
- Proposed Elevation of Sediment Enrichment - (Elevation of Existing Healthy LSM)

Depth of sediment enrichment to elevation 0.85' NAVD 88.
Volume of fill 17,082 CY.

LiDAR elevations within the boundaries of the vegetation community "High Salt Marsh" (HSM) have been decreased by 0.162' to correlate with field collected RTK spot elevations.

An assumed elevation of -0.73' has been applied to various channels and shallow bodies of water across the site as these locations were not covered by LiDAR. This elevation was derived from spot elevations collected in the field at the bottom of channel banks.

Horizontal Datum: NAD83 UTM 18N Foot US
Vertical Datum: NAVD88 Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015
NJDOT Area to Fill: Prepared by NJDOT 12/14/2015

Map Date: 8/9/2016

0 200 400 Feet

amec foster wheeler

Figure 4.5

Sediment Deposition Cross-Section
for the Good Luck Point Project Area
E.B Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

| Rev. By: PP | Project No.: 3617157355.81.01 | August 2016 |
|---|---|---|

## 4.2 Culvert Addition/Enhancement

Undersized culverts restrict tidal flow and can alter the natural hydrology and water chemistry of inland and coastal areas. Altered hydrology from inefficient culverts around estuaries can affect water residence time, temperature, and salinity. In addition, increases in vertical stratification of the water column can occur, which inhibits the diffusion of oxygen into deeper water leading to reduced (hypoxic) or depleted (anoxic) dissolved oxygen concentrations (Kennedy et al. 2002). Reduced tidal flow can subsequently reduce sediment deposition on the marsh platform, ultimately decreasing accretion and resilience of the marsh to adapt to sea level rise.

This is the case at the Good Luck Point Project Area where undersized culverts beneath Bayview Avenue act as tidal restrictors. The addition or enhancement of the existing culvert will allow the waterlogged marsh west of Bayview Avenue to drain during tidal cycles and also provide the mechanism for sediment transport to enhance the rate of marsh development. Nutrient, sediment, and salinity exchange between the two marshes on either side of Bayview Avenue will be closer to what the conditions would be without the road in place. A larger culvert will also aid in fish movement between the marsh areas.

## 4.3 Impoundment Restoration

Based on an assessment of the condition and functionality of the refuge impoundments pre-Hurricane Sandy and post-Hurricane Sandy (Fredrickson 2014; Schnabel 2014), the refuge is proposing to breach the dikes at the Stouts Creek, Forked River, and Barnegat project areas. This action will re-establish tidal flow, providing the mechanism for sediment transport which will in turn enhance the rate of marsh development and allow for the movement of aquatic organisms.

Elevation surveys, LIDAR surveys, and the examination of tidal flow data and historical aerial photographs were performed by the refuge, Amec Foster Wheeler, and the Ocean County Mosquito Commission (OCMC) in order to determine the best method for breaching the dikes. The locations of all the proposed breaches are at weak spots, defined as areas that are already breached or partially breached, where non-functioning water control structures (WCSs) are present, or where creeks once historically flowed. The non-functioning WCSs will be removed and left open as a breach, whereas functioning WCSs will remain in place. An amphibious excavator or a low-ground pressure excavator will create these breaches which will measure approximately 3 to 4 feet wide and 3 feet deep. The excavated materials will be kept nearby in order to use for minor adjustments and corrections to the openings.

## 4.4 Alternative A – Proposed Action

### 4.4.1 Brick Township Project Area

The Brick Township Project Area is divided into two distinct regions: Project Area A and Project Area B. Project Area A is the more easterly section and comprises 42 acres. Area A has been divided into eight cells for sediment enrichment. The western area is identified as Project Area B and comprises 62 acres. Area B has been divided into six cells. Brick is generally characterized by

a mixture of North Atlantic low and high salt marsh and maritime shrubs. This site has been manipulated by mosquito control ditches and is increasingly waterlogged.

#### *4.4.1.1 Sediment Enrichment*

The Service believes this Project area would benefit from sediment enrichment to combat critical salt marsh vegetation die-back. For Brick Project Areas A and B, approximately 125,986 and 59,125 CY of material would be dredged from the New Jersey Intracoastal Waterway, (NJICW) respectively, however these values will most likely be reduced once the Service finalizes the designs. The material would be placed in degraded marsh areas, and containment barriers (type not yet determined) will be used to hold the material in specific locations on the marsh. Target elevations for Brick Project Area A are 0.66 feet above MLW and 0.33 feet above MLW in an effort to convert open water or mudflat areas to high salt marsh and low salt marsh habitat, respectively. Target elevations for Brick Project Area B are 0.77 feet above MLW and 0.44 feet above MLW in an effort to convert open water or mudflat areas to high salt marsh and low salt marsh habitat, respectively.

As discussed earlier, the nature of the sediment in the area receiving the enrichment plays a role in the rate and degree of settling and compaction, as does the nature of the sediment brought in. The Brick A and Brick B Project Areas are predominantly underlain by Appoquinimink-Transquaking-Mispillon complex soils. This complex is composed of 40% Appoquinimink, 30% Transquaking, 25% Mispillion, and 5% Hammonton soils. The USDA Official Soil Series Description for these soils indicate the Appoquinimink soils (40% of the complex) are very deep, very poorly drained, sediments that are high in silt that overlie organic materials (i.e. a mucky silt). Permeability is slow in the mineral layer and moderately rapid to rapid in the organic layer. The mineral layer can range from 16 to 40 inches, with an underlying organic layer greater than 16 inches.

The Transquaking soils (30% of the complex) are very deep, very poorly drained, organic deposits (i.e. peat) underlain by mineral layers. Permeability is rapid in the organic layer, and slow in the underlying mineral layer. The thickness of the organic layer ranges from 52 to 80 inches. The Mispillion soils (25% of the complex) are very deep, very poorly drained, mucky peat soils underlain by mineral sediments. Permeability is moderately rapid to rapid in the organic layer, and slow in the underlying mineral layer. The thickness of the organic layer ranges from 16 to 51 inches. The Hammonton soils (5% of the complex) are very deep, moderately well drained soils of Coastal Plain uplands consisting of loamy sand.

Because these waterlogged/die-back areas appear to be formed as a result of increased water levels and decreased marsh elevation levels, they have the potential to be restored to natural vegetated salt marsh habitat using sediment enrichment.

### 4.4.2 Good Luck Point Project Area

The Good Luck Point Project Area is generally characterized by a mixture of North Atlantic low and high salt marsh and maritime shrubs. This Project area has been thoroughly altered by the construction of mosquito control ditches and the presence of abandoned wooden poles and metal

antenna towers. Two existing culverts currently restrict tidal flow between the west and east sides of Bayview Avenue. The Service believes this area would benefit from a combination of sediment enrichment and hydrologic restoration, through construction of an additional culvert, to combat critical salt marsh vegetation die-back.

#### *4.4.2.1 Pole Removal*

Pole removal at the site was addressed in a separate Environmental Assessment (Amec 2016) and will not be further addressed here.

#### *4.4.2.2 Culvert Replacement*

The designs for the culvert enhancement/addition have not been developed yet, but the refuge is working with its contractor Amec Foster Wheeler and the Ocean County Planning and Engineering Department of develop the designs. The refuge is anticipating the equipment that will be used during culvert enhancement will include an excavator, crane, and/or skid steer.

#### *4.4.2.3 Sediment Enrichment*

Elevation and vegetation data collected during the ecological assessment were used to determine the existing elevations of high salt marsh, low salt marsh, and common reed stands in the general vicinity of existing die-back areas. These data were used to evaluate whether or not die-back areas were lower in elevation relative to nearby healthy high and low salt marsh habitat.

Elevation data collected on the east side of Bayview Avenue revealed the average elevation of healthy high salt marsh on that side of the road was 0.85 feet above mean sea level, which is 0.36 feet higher than the average elevation of the same vegetative community on the west side of the roadway. The variation of elevation between healthy high salt marsh and stressed high salt marsh/die-back areas west of Bayview Avenue was an average of 0.19 feet (**Appendix C**). Mudflat areas, which were likely previously low salt marsh areas with severe die-back, are approximately 0.5 feet below the healthy low salt marsh average elevation.

As discussed earlier, the nature of the sediment in the area receiving the enrichment plays a role in the rate and degree of settling and compaction, as does the nature of the sediment brought in. The Good Luck Point Project Area is predominantly underlain by Appoquinimink-Transquaking-Mispillon complex soils. This complex is composed of 40% Appoquinimink, 30% Transquaking, 25% Mispillion, and 5% Hammonton soils. The USDA Official Soil Series Description for these soils indicate the Appoquinimink soils (40% of the complex) are very deep, very poorly drained, sediments that are high in silt that overlie organic materials (i.e. a mucky silt). Permeability is slow in the mineral layer and moderately rapid to rapid in the organic layer. The mineral layer can range from 16 to 40 inches, with an underlying organic layer greater than 16 inches.

The Transquaking soils (30% of the complex) are very deep, very poorly drained, organic deposits (i.e. peat) underlain by mineral layers. Permeability is rapid in the organic layer, and slow in the underlying mineral layer. The thickness of the organic layer ranges from 52 to 80 inches. The

Mispillion soils (25% of the complex) are very deep, very poorly drained, mucky peat soils underlain by mineral sediments. Permeability is moderately rapid to rapid in the organic layer, and slow in the underlying mineral layer. The thickness of the organic layer ranges from 16 to 51 inches. The Hammonton soils (5% of the complex) are very deep, moderately well drained soils of Coastal Plain uplands consisting of loamy sand.

Because these waterlogged/die-back areas appear to be formed partially as a result of decreased marsh elevation levels, they have the potential to be restored to natural vegetated salt marsh habitat using sediment enrichment.

For Good Luck Point, approximately 17,082 CY of material would be dredged from the NJICW. The material would be placed in degraded marsh areas and containment barriers (type not yet determined) will be used to hold the material in specific locations on the marsh. The target elevation for the Good Luck Point Project Area B is 0.62 feet above MLW in an effort to convert open water or mudflat areas to high salt marsh habitat.

### 4.4.3 Tidal Flow Restoration

Tidal flow will be restored to former salt marshes that were previously impounded. The berms in coastal impoundments located at Stouts Creek, Forked River, and Barnegat will be breached in multiple locations as a first step in restoring these coastal impoundments to salt marsh. Below are some generalities of all three projects and then specifics for each project area.

The Ocean County Mosquito Commission (Commission) will be performing the construction of the berm breaches at the three Project Areas. The Commission used various historical maps to look at the areas before impoundments were in place. The Commission conducted field surveys and aerial survey of the impoundments to see if any weak points or non-functioning water control structures (WCS) were present. Using this information, they identified the best locations to place breaches within the impoundment walls. All of the proposed breaches are in weak spots (breached or semi-breached), have non-functioning WCS present, or are located where a past creek was situated. The Commission will leave the functioning WCS's in place at Barnegat and Stouts Creek and the non-functioning WCS's will be removed and replaced with a breach.

All breaches will be 3-4ft wide and 3ft deep. The material that is excavated will be kept nearby so that at any point the breach can be filled back in. The Commission will use an amphibious excavator or a low-ground pressure excavator during construction.

The Commission does not see any of the proposed work increasing the risk of flooding to anyone's personal property under normal circumstances. During an extreme weather event (nor'easter or hurricane) the work would be inconsequential to the flooding since it is at salt marsh level which is several feet below roads and personal property.

#### *4.4.3.1 Stouts Creek Project Area*

Unlike the natural high and low salt marsh observed outside the Project area boundary at Stouts Creek, the area within the Project boundary is dominated by open water and mudflats which have

been created by flooding the area. The increased water levels have flooded the majority of the previously existing vegetation, resulting in the current vegetation being dominated by invasive species. The overall ecosystem health of this impoundment is generally poor.

Elevation data collected by field crews at Stouts Creek show the average interior elevations of the impoundments are higher than the average bottom of bank elevations for interior marsh ditches within the larger marsh complex. As it is assumed that the interior marsh ditches undergo full tidal flushing at their current bottom of channel elevations, it can be concluded that, if reconnected to the larger marsh system, these impoundments would experience additional tidal flushing as well (water would drain out at low tide). The difference of elevation between the bottom elevation of the impoundments and the small areas of high and low salt marsh is over 0.5 feet. On average, the bottom elevation of the impoundments is below mean sea level.

The following activities are proposed:

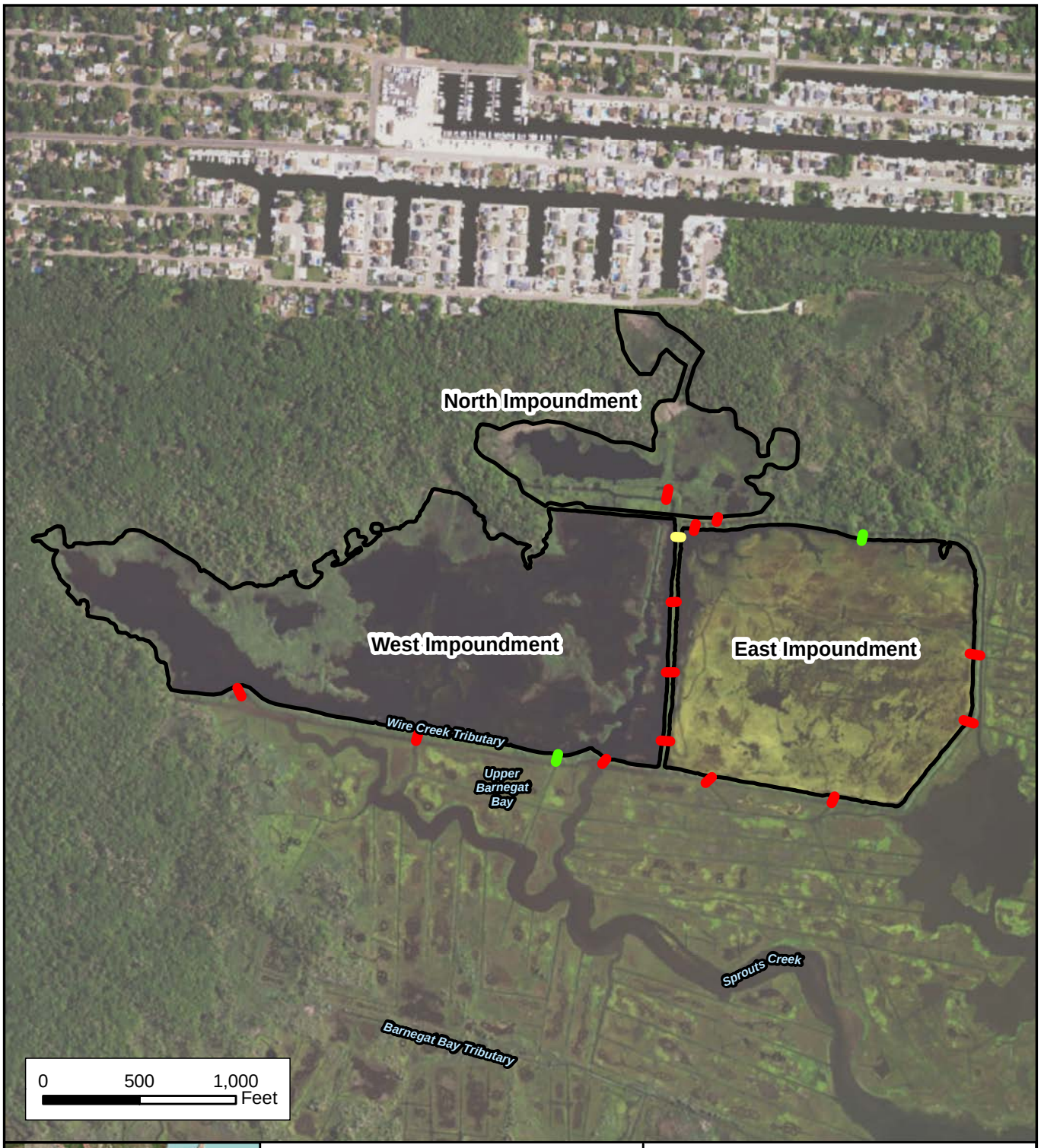
A total of 14 breaches will be put in place between the three impoundments (**Figure 4.6**), one of them being at the location of a non-functioning water control structure, which will be removed. Along the edge of the salt marsh and wood line is an area that the Commission has to treat regularly for mosquito production. Breaching the impoundment and allowing the water to enter and exit efficiently will reduce or eliminate the mosquito production in this area. The increased tidal flow will allow mosquito-eating fish into the area as well as helping the area to re-vegetate with *Spartina spp*. During rain events, the breaches will also help to alleviate the flooding within the wood line which in turn will decrease the number of breeding mosquitoes.

### 4.4.4 Forked River-Wrangle Creek Project Area

The Forked River-Wrangle Creek Project Area encompasses approximately 17.5 acres and is composed of two impoundments along Wrangle Creek. Prior to the construction of the impoundments, this area was tidally influenced salt marsh. The Service's goal is to restore tidal flow to these impoundments by breaching the existing dikes. This alternative is discussed in the EA although implementation of this activity is contingent upon future funding.

#### *4.4.4.1 Tidal Flow Restoration*

At the Forked River-Wrangle Creek Project Area there are two defunct WCSs. The first WCS (WCS #2) is found on the southern end of the dike separating the west and east impoundments. The second WCS (WCS #1) is located along the southern end of the eastern dike of the eastern impoundment (**Figure 4.7**). WCS #1 theoretically controls flow from the eastern impoundment to Wrangle Creek, a waterway which continues out to Barnegat Bay. In their present condition, these two WCSs are an impediment to tidal flushing, while in the past, these structures may have been a means of maintaining certain volumes and salinity contents of the two impoundments.



**Legend**

- Project Boundary
- Proposed Breaches
- Functional Water Control Structure
  - no
  - yes

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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Figure 4.6

Stouts Creek Proposed Dike Breaches
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

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|---|---|---|

**Legend**

- Project Boundary
- Proposed Breaches

N
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Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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Figure 4.7

Forked River Proposed Dike Breaches
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
|---|---|---|

In general the Forked River-Wrangle Creek Project Area is dominated by highly stressed marsh areas that have been turned into open water impoundments and mudflat with stressed salt marsh habitat along the fringes of the impoundments and the higher elevations and dikes dominated by common reed. The variation of elevation between the bottom elevation of the impoundments, also referred to as mudflats, and the low salt marsh habitat is 0.07 feet.

Since the average interior elevation of the two impoundments at this Project area is similar to, if not slightly higher, than the average elevation of healthy low and high salt marsh outside of the impoundments, dike breaching has the potential to restore full tidal flushing and healthy salt marsh vegetation if high tide inundates this area. The breaches would also allow for greater fish and other organism movement throughout the marsh system.

The following activities are proposed:

The existing cement water control structure (WCS) will be cleaned of sediment and debris but otherwise left untouched. A total of two (2) breaches will be put into place, one on each impoundment wall. The breach will be constructed just north of the existing WCS on both impoundments (Figure 5-7). The breaches will have an excavated channel 3-4ft wide and 3 foot deep. In addition, the berm wall will be removed to the marsh surface elevation for 8-10ft on either side of the excavated breach channel, which will allow the excavator access to the area and allow water flow over the salt marsh during high tides. These breaches will help to alleviate mosquito production in the impoundments as well as in the wood line because the water from rain events and tidal events can exit efficiently.

### 4.4.5 Barnegat Project Area

The Barnegat Project Area encompasses approximately 226 acres and is composed of five separate large man-made impoundments north of East Bay Avenue. These impoundments appear to be connected to a tidal channel that tidally influences the conditions of each impoundment. Prior to the construction of the impoundments, this area was tidally influenced salt marsh. The Service's goal is to restore tidal flow to these impoundments by breaching the existing dikes. This alternative is discussed in the EA although implementation of this activity is contingent upon future funding.

#### *4.4.5.1 Tidal Flow Restoration*

Five impoundments exist at the Barnegat site. However, these impoundments are connected to the tidal system via multiple culverts, risers and existing dike breaches in various locations. Based upon field collected elevation data, the average interior elevation is lower than the average bottom of bank elevation for interior marsh ditches within the larger marsh complex.

Restoration activities often re-introduce a sediment source which helps increase the elevation of the marsh surface, which in turn may also promote healthy plant growth leading to increased accretion rates. The ability of the re-introduction of tidal flushing and a brackish water source to promote elevation increases within the marsh surface are based on 1) the availability of suspended solids within the water column; 2) the ability for a high velocity wave environment to occur leading

to scour and increased erosion; and 3) the extent to which the tidal restriction prevents sediment delivery to the system (Williams et al. 2002).

Based on the factors above (i.e. unknown potential subsidence and accretion rates), the ability to actively manage the gradual reintroduction of saltwater into the impounded system is preferable (Smit et al. 2009, Portnoy and Giblin 1997) as compared to attempting to predict the rate and amount of subsidence likely to occur. The breaching portions of the existing dikes would facilitate tidal flow and hydraulically connect former freshwater impoundment areas with the surrounding estuarine systems. The breach would also allow for greater fish and other organism movement throughout the marsh system. The Barnegat Project Area has existing dike berms that have created a freshwater or reduced brackish water habitat with excess water levels that have the potential to be restored to natural salt marsh habitat.

A total of 13 breaches will be put in place within the five impoundments (**Figure 4.8**), two of them being where non-functioning water control structures will be removed. Increasing the tidal exchange in this area will help to decrease the number of mosquitoes, introduce mosquito-eating fish into the area and help create a habitat that is suitable for the re-vegetation of salt marsh grasses.

## 4.5 Alternative B- Alternatives Considered But Eliminated

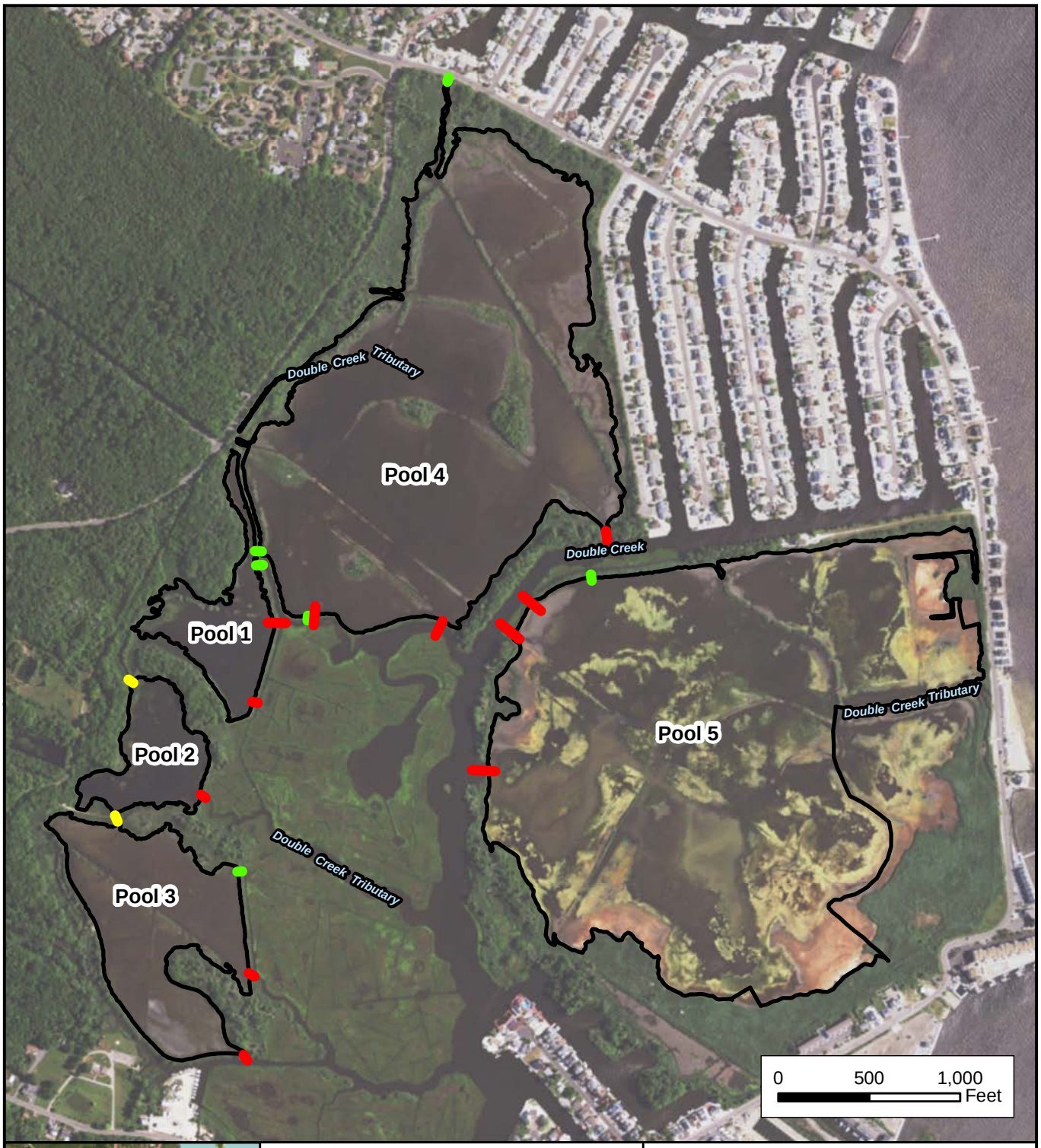
### 4.5.1 Brick Township Project Area

#### *4.5.1.1 Runnels*

Runnel excavation is a restoration technique used to alleviate waterlogged areas of a marsh that can allow for the recolonization of marsh vegetation, which in turn helps promote the accretion of the marsh surface. These drainage features also serve to provide a route for juvenile fish and crustaceans to access the marsh during incoming tides, and larger channels are used as migratory pathways and foraging areas by many species of predatory fish (Drummond 2013). This alternative was eliminated from further consideration as it would not aid in increasing elevation as effectively as providing additional elevation capital on the marsh via sediment enrichment.

#### *4.5.1.2 Use of Construction Equipment to Spread Sediment*

Earlier approaches to the sediment enrichment process included the use of construction equipment on the marsh to help spread the deposited sediment evenly around the receiving cells. Further discussions among the project proponents have determined that such an approach could be damaging to the marsh surface, thus construction equipment will not be used for this purpose and instead, altering the piping layout and position will be used to help spread the sediment evenly where needed.



**Legend**

- Project Boundary
- Proposed Breaches
- Functional Water Control Structure
  - no
  - yes

N
W E
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Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributorsand the GIS User Community, 2016

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Figure 4.8

Barnegat Proposed Dike Breaches
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

| Rev. By: PP | Project No.: 361757355.81.01 | August 2016 |
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### 4.5.2 Good Luck Point Project Area

#### *4.5.2.1 Runnels*

Runnel excavation is a restoration technique used to alleviate waterlogged areas of a marsh that can allow for the recolonization of marsh vegetation. These drainage features also serve to provide a route for juvenile fish and crustaceans to access the marsh during incoming tides, and larger channels are used as migratory pathways and foraging areas by many species of predatory fish (Drummond 2013). This alternative was eliminated from further consideration as it would not aid in increasing elevation as effectively as providing additional elevation capital on the marsh via sediment enrichment.

#### *4.5.2.2 Use of Construction Equipment to Spread Sediment*

Earlier approaches to the sediment enrichment process included the use of construction equipment on the marsh to help spread the deposited sediment evenly around the receiving cells. Further discussions among the project proponents have determined that such an approach could be damaging to the marsh surface, thus construction equipment will not be used for this purpose and instead, altering the piping layout and position will be used to help spread the sediment evenly where needed.

### 4.5.3 Barnegat Project Area

#### *4.5.3.1 Sediment Enrichment*

Since the average interior elevation is lower than the average bottom of bank elevation for interior marsh ditches within the larger marsh complex, sediment enrichment in the Barnegat Project Area might be necessary in the future to raise the top of sediment within the impoundment to an elevation that would support healthy salt marsh vegetation and avoid perpetual inundation/creation of salt water ponds. Sediment enrichment at Barnegat Project Area was considered for this EA, but was eliminated due to cost effectiveness and limited funding for this Project.

## 4.6 Alternative C – No Action

A No Action Alternative is also explored as part of the EA process, in which the effect of not implementing the Proposed Action is assessed. This section of the report discusses the implications of not implementing the sediment enrichment, culvert replacement, or dike breaching activities at the Project areas.

The condition of the currently degraded wetlands that have either lost or a diminished ecosystem function will worsen over time, and wetlands that are not yet degraded will begin to lose their ecosystem function. The net result will be an overall loss of wetlands - wetlands that are on the Ramsar List of Wetlands of International Importance, wetlands that are part of the Jacques Cousteau National Estuarine Research Preserve, and wetlands that are part of the Manahawkin

Bay Natural Heritage Priority Macrosite. This process of a loss of wetland function and loss of wetland area will occur through an increase in the rate, duration, and frequency of inundation as sea levels cover the low salt marsh and encroach upon the high salt marsh, as depicted in the SLAMM graphics in Chapter 2 and also as predicted by the Rutgers University CRSSA study (NJDEP 2014), coupled with the impaired hydrology of the wetlands from the unbreached dikes and undersized culverts.

The increasing sea levels will perpetuate the vegetation die-back that the salt marshes are currently experiencing, causing a shift in the vegetation community composition (Haaf et al. 2015), decreasing the acreage of low salt marsh while increasing the number and acreage of pannes and pools. This condition would result in the lowering of the primary productivity of the salt marsh (Ekberg 2014, Weinstein and Kreeger 2002), a community that is typically the leading primary producer in an ecosystem. This vegetation die-back results in the inability of the salt marsh to handle tidal flooding, thereby amplifying the effects of not only coastal storms but regular tidal cycles. The loss of vegetation and the increase in inundation create a negative feedback loop in which sediment accretion ceases and erosion increases, resulting in further inundation that reaches farther inland with subsequent saline intrusion into freshwater systems.

This encroachment of inundation into inland areas is problematic for the Project areas as they are confined by either residential development or forested communities that are of themselves important elements of the coastal ecosystem. The Brick A Project Area is largely confined by Mantoloking Road to the south and residential development to the west. Increased inundation in this Project area would encroach upon Mantoloking Road and the private residences, causing a public safety hazard and potential private property damage. The Brick B Project Area is confined to the inland by wooded communities. Increased inundation in this Project area would encroach upon these wooded communities and threaten their condition through flooding and saline waters.

Similarly, the Good Luck Point Project Area is confined to the west by wooded communities that would also be under the threat of inundation and the negative effects of saline intrusion. The undersized culvert beneath Bayview Avenue serves to amplify the additional confining aspects of Bayview Avenue which bisects the Project area. The No Action Alternative would leave the undersized culvert in place, and the effects of the tidal restriction caused by this culvert would worsen. The result of this condition would be that tidal waters would back up on the east side (waterward side) of the road exacerbating the flooding of the salt marsh to the east.

The Stouts Creek Project Area is confined by woods with residential development behind them. Similarly, the Barnegat Project Area is confined by a combination of woods and residential development. The Forked River Project Area is confined on all sides by woods. The effects of the No Action Alternative would again be that inundation would encroach upon these wooded communities and residential areas, threatening the integrity of these vegetation communities and private properties. The threat to the wooded areas has potentially far-reaching consequences as this community provides important habitat to a variety of wildlife, including numerous migratory birds and the state-threatened black-crowned night-heron. The wooded communities around all of these project areas that are freshwater forested wetland also provide potential habitat for the federally listed swamp pink. Even slight changes in the hydrology or salinity of these forested

wetlands would interfere with the narrow range of environmental conditions required by this species.

Thus, the overall consequence of the No Action Alternative is that the mission and conservation goals of the Service, the refuge, and the CCP would not be met under the rapidly changing environmental conditions of sea level rise, and the coastline resiliency goals of Executive Order 13653 and USDOI Secretarial Order 3289 would not be addressed. The mission and goals would not be met as a result of a loss of wetland function, a physical loss of the wetlands themselves, the inland migration of tidal flooding and saline waters which will negatively impact the surrounding ecosystem and public community, and the detrimental effect of direct and indirect impacts to wildlife.

# Chapter 5 - Environmental Consequences and Cumulative Impacts

## 5.1 Brick Township Project Area

### 5.1.1 Topography

The Proposed Action involves sediment enrichment which includes offsite dredging and depositing a layer of the collected sediment in selected areas to increase the elevation of the marsh to target elevations. There will be intentional, unavoidable impacts to the local topography from the Preferred Alternative at the dredge location site and within the Brick Township Project Area. However, the changes in topography at the Project Area are necessary to combat die-back of native flora due to increased water levels and prolonged inundation, and conserve extremely sensitive and highly important salt marsh habitat. The deposition of sediment on the marsh surface is also expected to initiate a positive feedback loop in which the conditions that lead to increased vegetative vigor will in turn, create the conditions for marsh accretion to occur. That is, the re-establishment of the low salt marsh will trap sediment and provide the senescent vegetation to further build up the marsh surface elevation.

The No Action Alternative would result in the a negative impact to the local topography as there would be no active correction to the inundation of the marsh as sea levels continue to rise. Without sediment enrichment, the existing pannes and pools will continue to deepen and expand, and new pannes and pools will form, covering more area of the already diminishing salt marsh. The end result would be a net decrease in elevation of the Project area.

### 5.1.2 Geology and Soils

The Proposed Action involves the addition of sediment from an underwater dredge location to a salt marsh underlain by the USDA soil mapping unit Appoquinimink-Transquaking-Mispillion complex. This action will result in a change in the substrate of the salt marsh, in terms of texture (i.e. grain size), organic matter content, etc. The preferred alternative will affect the uppermost layer of the soil profile of the marsh, and will not extend downward into the upper subsoil. The dredging locations will be affected to somewhat deeper levels relative to the salt marsh, but this is a normal consequence of channel dredging that is unavoidable. These changes are not considered to be adverse impacts to the local geology and soils.

The No Action Alternative would not result in any impacts to the local geology and soils.

### 5.1.3 Air Quality

The Proposed Action at the Brick Township Project Area is not expected to have a substantial impact to air quality. Some temporary impacts are expected as the Proposed Action would involve the use of emission-producing vehicles and machinery. However, those emissions are expected to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and off-road vehicles and machinery would be up-to-date in their

registration and emission inspections (for those that require emissions testing), and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

### 5.1.4 Water Quality

Healthy salt marshes are well documented to provide the important ecosystem service of improving water quality of their surrounding estuaries by removing nutrients, sediments, organic matter, and contaminants from surface water runoff and tidal influx (Koch and Gobler 2009, Nelson and Zavaleta 2012). The removal of nutrients, nitrogen in particular, occurs primarily through three major environmental processes: (1) plant uptake in tissue, (2) denitrification by microbial communities, and (3) burial in marsh sediments (Nelson and Zavaleta 2012, Velinsky et al. 2013). The major source of the eutrophication problems observed in the Barnegat Bay is attributable to nitrogen loading into the salt marsh from agricultural runoff, stormwater discharges, and restricted tidal flushing (Velinksy et al. 2013). The eutrophication of Barnegat Bay will increase over time if the surrounding salt marshes are allowed to continue to degrade from sea level rise.

Healthy salt marsh, as defined by plant cover, and the ability of a well vegetated marsh to improve water quality is also well documented and studied (NERRSSC 2015). Likewise, the contrary condition, a poorly vegetated salt marsh does not perform as well in nutrient and pollutant removal since the marsh lacks the plant biomass to assimilate these materials (Koch and Gobler 2009). Thus accelerated sea level rise have indirect adverse impacts to water quality by directly impacting the ability of a salt marsh to sustain a healthy vegetation community (NERRSSC 2015). This condition is further worsened by the decomposition of salt marsh vegetation that is killed by rising water levels, adding another nutrient and pollutant source into the surrounding estuaries (Nelson and Zavaleta 2012).

The Proposed Action is intended to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired hydrologic function. The environmental consequence of the preferred alternative is a sustainment and improvement of the salt marshes' ability to provide water quality services in areas of currently healthy and degraded marsh, respectively. Nevertheless, there will be some unavoidable but temporary and minor adverse impacts resulting from the implementation of the preferred alternative, both at the dredging sites where the sediment will be sourced, and at the Project Area where the sediment will be placed.

Dredging of the sediment will result in adverse impacts to water quality at the removal site. These impacts affect not only the removal location itself, but may also affect the surrounding areas through turbid plumes, the resuspension and sedimentation of materials, the potential release of sediment constituents, and bathymetric changes. Dredging is proposed to occur in any or all of the following locations:

- Beaver Dam Creek North
- Beaver Dam Creek South
- Bay Head Channel
- Winter Yacht Basin
- Kettle Creek – Sailor's Quarry
- Kettle Creek
- Good Luck Point
- Sloop Creek

Dredging effects on water quality are temporary and localized; however, and these dredging sites will return to stable conditions as sedimentation and tidal circulation occurs over time. Sedimentation rates are difficult to predict and vary widely among different aquatic systems. While major factors such as grain size and water action play an obvious role, other factors such as the physiochemical interactions between saline and fresh water, the clay and organic matter content in the water column, temperature, and pH all play a role in determining the rate at which the clarity of the water will return (ERDC 2005).

The placement of sediment to raise the marsh surface elevation will also result in some short-term turbidity. However, this increase in turbidity will be temporary and localized to the specific work area within the receiving cell. There is a positive trade-off between the short-term and localized turbidity impacts to water quality which will be largely contained within the salt marsh, versus the long-term benefits to water quality by maintaining and enhancing the refuge marshes.

There will be a number of site controls that are implemented in order to minimize the sedimentation into the open water features (e.g., ditches, creeks, pannes, and pools) in a sediment enrichment cell. As described in Chapter 4, erosion control measures such as filter blocks, coir fiber logs, or other materials will be installed at some distance from the edge of the open water feature. The installation of these controls at a distance from the water features also serves as a buffer as opposed to their installation right at the feature's edge.

The No Action Alternative would not result in direct impacts to water quality at the Brick Township Project Area or the dredging sites as no activities that suspend sediment would occur. However, there will be indirect impacts to water quality at the Project Area as the salt marshes would continue to be subject to the adverse effects of sea level rise. The sea level rise would continue to reduce the extent and vigor of salt marsh vegetation thereby reducing the ability of the marsh to intercept nutrient and pollutant runoff.

### 5.1.5 Wetlands and Streams

The Proposed Action will result in direct, unavoidable adverse impacts to wetlands as a result of the sediment enrichment process. Mechanized equipment and personnel will be traversing the marsh, and dredged sediment will be placed directly onto the marsh surface. The majority of this direct impact will be to the existing wetland vegetation through trampling and smothering; however, this disturbance will be limited to the receiving cells which are either currently degraded or are predicted to degrade in the future. With regards to streams, as described in Chapter 3, measures will be taken to minimize the impacts of the sediment delivery pipeline upon the marsh.

In addition, the use of filter blocks, coir logs, or other erosion and sedimentation controls will minimize or eliminate adverse impacts to the marsh creeks and ditches.

The No Action Alternative would not have a direct adverse impact to wetlands and streams; however, an indirect impact would be expected as the wetlands continue to degrade as a result of prolonged inundation, leading to vegetation die-back, and a continued decrease in ecosystem function.

### 5.1.6 Vegetation

Similar to the impacts to wetlands described above, the Proposed Action would have unavoidable, but temporary impacts to vegetation as a result of mechanized equipment and personnel that will be traversing the marsh, and dredged sediment that will be placed directly onto the marsh surface. The majority of this direct impact will be from trampling and smothering; however, this disturbance will be limited to the receiving cells which contain either stressed vegetation or unvegetated areas. As also described in section 5.1.7 (Marine Resources), stem elongation and vegetation regrowth can occur through newly-placed sediment provided that the rhizome layer is largely intact and that the depth and weight of the overlying sediment does not preclude plant growth.

The No Action Alternative would not result in any immediate, direct physical impact to vegetation as no sediment will be deposited, and no equipment or personnel would be traversing through the marsh. However, this alternative would perpetuate the environmental conditions that result in vegetation die-back through increased inundation, thereby resulting in a long-term, indirect adverse impact to vegetation.

### 5.1.7 Marine Resources

The Proposed Action will have unavoidable impacts upon marine resources both at the dredging site and at the Project Area. The Project Area may also experience some unavoidable impacts to EFH. Potential impacts at the dredging site include both those in the water column and the subsequent sedimentation effects. Berry et al. (2003) report the oft-cited findings of Wilber and Clarke (2001) in that the increased turbidity resulting from suspended sediments create altered light regimes which then impacts primary productivity, changes in plant and animal species distributions, behavior, feeding, reproduction, and survival. Direct impacts of suspended sediment also occur through gill effects of marine fish and invertebrates (Berry et al. 2003, Newcombe and Jensen 1996). Newcombe and Jensen (1996) report that increased suspended sediment results in increased mortality of fish fry and larvae, avoidance behavior in juvenile and adult fish. Suspended sediments under laboratory conditions have also been demonstrated to cause gill damage, starvation, and slowed maturation in fish (Reynolds et al. 1989 in Newcombe and Jensen 1996).

Sedimentation effects to marine resources and EFH following sediment suspension from dredging include direct impacts, indirect impacts, or a combination of both. Direct impacts include smothering, toxicity, physical abrasion, and reduced light intensity. It is important to note that toxicity is not limited to environmental contaminants but includes exposure to anaerobic sediments which alters chemical processes in the water column, sediment layers, and within marine

organisms. Indirect impacts from sedimentation include changes in habitat conditions which can result in changes to the quality of the habitat to both the marine resource and its food/prey item. Sediment suspension and sedimentation will also occur during sediment placement in the cells. As with dredging, sediment suspension is a shorter-term condition relative to sedimentation, but the direct and indirect impacts to marine resources and EFH are similar.

Submerged aquatic vegetation can be directly removed by dredging or indirectly covered from sedimentation or directly smothered from sediment placement activities (ERDC 2005). The increased turbidity resulting from dredging and sediment placement can temporarily alter light availability and decrease water quality which has been linked to SAV impacts (Durako 1994, Orth and Moore 1983, Robblee et al. 1991, and Zieman and Zieman 1989 in ERDC 2005). However, if the rate of SAV stem elongation is greater than the smothering effects of sedimentation, and damage to the rhizome layer does not occur, then re-growth through the sediment is possible (Duarte et al. 1997 in ERDC 2005). Furthermore, the altered light availability and reduction in water quality are only temporary conditions.

Invertebrates such as crustaceans, molluscs, and gastropods would experience similar direct and indirect impacts from dredging and sediment placement. Most crustaceans are highly mobile however, and can move away from and avoid areas where disturbances are occurring. Many crustaceans are also highly adapted to turbid conditions at different portions of their life cycles. Nevertheless, their avoidance of turbid conditions under normal environmental circumstances suggests their preference to avoid suspended sediment and burial by sediment (Herrnkind et al. 1988, Pottle and Elner 1982 in ERDC 2005). The movement away from turbid conditions or sediment placement activities has the potential to result in the crowding of individuals and increases in mobile search time for new areas to inhabit, which in turn increases predation risk (ERDC 2005). In contrast, non-mobile or relatively slower moving molluscs and gastropods are susceptible to direct removal, smothering, and other sedimentation effects similar to that which may be experienced by SAV. Sedimentation in thin layers may not directly affect certain invertebrates, although other indirect effects may occur through behavioral changes, including reproductive behaviors (ERDC 2005).

All of these direct and indirect impacts are an unavoidable consequence of the preferred alternative. Many of the indirect impacts of sediment suspension and sedimentation both at the dredging site and in the Project Area are temporary and somewhat localized, and the motility of certain marine resources can ameliorate these adverse impacts. Nevertheless, these impacts are considered to be less damaging in the long-term than the alternative discussed below.

The No Action Alternative would not result in the above direct or indirect impacts to marine resources or EFH. However, the long-term consequences to these resources from the No Action Alternative also needs to be assessed. Continuing sea level rise and the loss of the salt marsh to open water may initially appear to benefit resources such as SAV, invertebrates, and fish; however, the existence of these marine resources rely on the ability of the salt marsh ecosystem to function as a primary producer and nursery ground for numerous marine organisms that provide the food base for other marine resources. The No Action Alternative would result in the expansion of open water and the reduction of salt marsh at an accelerated rate, thereby eliminating this ecosystem function.

### 5.1.8 Terrestrial Wildlife

The Proposed Action will not have substantial long-term adverse impacts to terrestrial wildlife. This is because of the timing of the work in relation to wildlife use of the refuge, the temporary nature of the disturbance, the mobility of terrestrial wildlife, and the resulting long-term benefits to terrestrial wildlife from the ecological uplift that is the goal of the Proposed Action. The work will be done largely outside of the migratory bird nesting season. As discussed in Chapter 2, the management of migratory bird habitat is one of the primary purposes of the Service, and the management of terrestrial wildlife is an integral component of the Service's mission, the refuge purpose, and the CCP's goals. Thus, the potential for adverse impacts to terrestrial wildlife will be minimized by avoiding the most sensitive time periods during the year. This protection applies not only to migratory birds, but to mammals, herpetofauna, invertebrates, as well as fish (as discussed in the "Marine Resources" section).

The proposed work is expected to take 15 days to complete. This is a relatively short time period in relation to the long-term benefits to terrestrial wildlife by saving this salt marsh from permanent loss through inundation or altered hydroperiod. Although the changes to the salt marsh from the sediment deposition will be apparent for several years afterwards, each year will bring the wildlife habitat closer to pre-disturbance conditions, and for the degraded areas, to healthier wildlife habitat than pre-disturbance conditions. The combined preservation, conservation, and ecological uplift of habitat will benefit all forms of wildlife, including some special cases such as that of the saltmarsh sparrow (*Ammodramus maritimus*), an indicator of healthy salt marshes (Rising 2005), whose mid-Atlantic subspecies (*maritimus*) utilizes both high and low marshes.

Terrestrial wildlife also have the ability to avoid or move out of the project area if they find it unsuitable once work activities commence. This change in behavior is in itself an adverse impact in that the organism would use its time and energy to move out of the area - time and energy that would normally be used for feeding, resting, loafing, or mating. The movement of terrestrial wildlife to a new area also exposes those organisms to greater predatory risk and accident. However, the end result in this alteration of behavior is that the organisms would relocate to a more suitable and less stressful area. This is turn benefits the organisms in the long-term provided that they are not harmed along the way. Some terrestrial wildlife are also expected not to move, but to remain in the project area if these individuals do not find the work activities to be disruptive to their normal functioning. While some organisms may be mildly disrupted by work activities, it may not reach the level at which relocation occurs.

The No Action Alternative would not result in any short term impacts to terrestrial wildlife since no work activities would occur that could cause wildlife to move out of the work area or alter their behavior, and there would be no changes to the marsh surface from sediment enrichment. However, there would be a long-term adverse impact to terrestrial wildlife from this alternative. This alternative would not attempt to correct the current degradation and continued degradation of the salt marsh from sea level rise, and thus would allow for the loss of important wildlife habitat. Such losses would run counter to the mission, purpose, and goals of the Service, the refuge, and CCP. The Service would not be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

### 5.1.9 Threatened and Endangered Species

**Appendix E** presents a signed Intra-Service Section 7 Biological Evaluation regarding the red knot, Knieskern's beaked-rush, seabeach amaranth, swamp pink, and northern long-eared bat for all of the project areas. The Biological Evaluation reports that red knot may occur near the Good Luck Point Project Area, Knieskern's beaked-rush and swamp pink is not known to exist or occur, respectively, in the project areas, seabeach amaranth may occur in the Good Luck Point Project Area east of Bayview Avenue along sections of sandy beach, and summer habitat for northern long-eared bat may occur in the forested areas near but not within the project areas.

Knieskern's beaked-rush (threatened), an endemic perennial sedge, grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance; it is highly intolerant of competition (USFWS 2014c, USFWS 1997, USFWS 1993). Seabeach amaranth (threatened) occurs on barrier island beaches, where its primary habitat consists of overwash flats and upper strands of non-eroding beaches. It usually grows on a nearly pure sand substrate and is intolerant of competition. It does not occur on well-vegetated sites (USFWS 2015c, USFWS 2014d). Swamp pink (threatened), an evergreen wetland forb, grows in shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014e).

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. However, the Project area does not provide habitat for this species which uses mines and caves in the winter to hibernate and uses upland forests to forage and roost throughout the rest of the year. Because this project will occur on salt marsh, the Project would not have the possibility of impacting federally listed threatened and endangered species.

Based on this information, coupled with the Intra-Service Section 7 Biological Evaluation, the Proposed Action will not have substantial long-term environmental impacts to federally listed plant and animal species.

The additional State-listed threatened and endangered species or species of special concern that have the potential to be on or near the Project area (e.g., 12 bird species) would be expected to avoid the Project area due to the presence of the work crew. This indirect impact would be temporary, as the Project is expected to take approximately 15 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 bird species, as well as other wildlife of concern that live on or near the Brick Township Project Area.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the marsh. However, leaving the marsh in its current condition would lead to further reduction of salt marsh, a habitat type that is critical for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species.

### 5.1.10 Cultural Resources

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE was determined to be low and no further archaeological investigations were conducted. Although a Woodland period campsite is recorded 0.25 miles west of the Brick Project Area B boundary, Project activities are not scheduled in that area and the sediment enrichment activities do not involve the movement of upland soil. Therefore, the Proposed Action has no potential to affect historic properties that may still remain in that area. In addition, the Project will not incur any visual impacts on the nearby historic district, or the historic properties within the district, as there are no structures being added to the viewshed.

It has been concluded that the Proposed Action at the Brick Township Project Area would not have impacts on historic properties that are eligible for listing in the National Register of Historic Places or on known areas where historic or prehistoric archaeological artifacts have been recorded previously, as no below-ground work would be performed in the Project area. However, if any historic or prehistoric artifacts are discovered during the completion of this Project, work would be stopped immediately and the refuge management would be contacted to determine how to proceed. The Service, in consultation with the SHPO, will determine the appropriate management actions and additional Tribal consultation that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources, as no work would be performed in the Project area.

### 5.1.11 Socioeconomic Resources and Environmental Justice

The Proposed Action is not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the county's leading employment industries, including resorts and commercial outfits related to tourism, health care, or commercial fishing. It does not include long-term construction of any facility that would increase the number of permanent jobs in Brick Township or Ocean County, nor would it have any effect on State or local tax revenue. Only minor, temporary, economic benefits may occur locally through Project area personnel increasing spending at nearby gas stations, hotels, restaurants, hardware stores, other retail shops, etc.

The No Action Alternative would not have any impacts on county or local socioeconomic resources, as no workforce would be required in the Project area.

### 5.1.12 Recreation

While the refuge as a whole receives over 250,000 visitors each year, the Brick Township Project Area is not used regularly by visitors for recreational activities other than waterfowl hunting. However, other contiguous portions of the refuge in Brick Township are used by walkers and nature observers along established trails; however, these areas are not within the vicinity of the Project Area. In addition to waterfowl hunters, recreational boaters use the open waters around the refuge particular during the warmer months. The Proposed Action will have adverse, but

temporary impacts to hunters as the preferred alternative will likely result in waterfowl avoiding the Project Area because of the human activity since the work may be performed during hunting season (November and December).

The New Jersey waterfowl hunting season is finalized after public comment, but in general, for the coastal zone it extends from early November for youth hunters until mid-February for adult hunters. Additionally, some areas in the state are open during the entire month of September for the "Canada goose September season". The impacts to waterfowl hunters may also continue for a few years after the completion of the Project as the marsh habitat will be altered from the deposition of sediment. The Proposed Action will not have an adverse impact to recreational boaters since the sediment delivery pipeline will be submerged within any navigation channels.

The Proposed Action will have a net positive impact to recreation over the long term through improving the resiliency and health of the salt marsh, which will provide for higher quality habitat for waterfowl, migratory birds, and other wildlife. This positive impact will benefit both waterfowl hunters and nature observers.

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 salt marsh degradation and loss, which would have an adverse impact over the long-term upon waterfowl and other coastal wildlife.

### 5.1.13 Transportation

The Project does not involve the building, removal, or repair of any major transportation infrastructure. Personnel and vehicles would be required to travel along local roads leading to the refuge, such as Mantoloking Road and Tilton Road. The use of these local roads by Project crew would also be only very minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling 28,385 cars per day, would not be substantial. In addition, the Proposed Action in the Brick Township Project Area is anticipated to only require approximately 15 working days to complete.

The No Action Alternative would not have any impacts on infrastructure, as no workforce would be required to travel to and from the Project area.

### 5.1.14 Noise

The Project 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. Although the noise generated from the boat used during the Project is expected to be at or close to 8-hour threshold levels set for humans, the noise will be typical of area activities and the Project crew will wear any necessary hearing protection. The Project is also expected to require only 15 working days 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 Project area and public use of the the

Brick Township Project Area is not encouraged. Therefore, Project-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

### 5.1.15 Cumulative Impacts

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the project 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 project may be felt.
2. Assessment of the impacts that are expected in that area from the project.
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.

The geographic area for the assessment of cumulative impacts from the Proposed Action at the Brick Township Project Area was primarily identified as the Kettle Creek/Barnegat Bay North watershed, and to a lesser degree the Metedeconk River watershed. These watersheds include the municipalities of Brick Township, Lakewood Township, Toms River Township, Point Pleasant Borough, Point Pleasant Beach Borough, Bay Head Borough, Mantoloking Borough, Lavallette Borough, and Seaside Heights Borough. All of these municipalities are located in Ocean County. However, Brick Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Brick Township Project Area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the creation of mosquito control ditches. 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 enhancement of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the Project area.

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 in the Project area, 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 2007 *Township of Brick, NJ Master Plan* (Township of Brick 2007) 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 Brick Township's Master Plan is "to enhance, preserve or restore unique natural areas or land types." The Proposed Action would be in line with this goal.

A review of the *Ocean County Planning Board Comprehensive Master Plan* (OCPB 2011) 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, to the Garden State Parkway, U.S. Route 9, and other major roadways and transportation infrastructure, none are anticipated to adversely affect or be affected by the Proposed Action.

In summary, there would not be any substantial cumulative adverse environmental impacts from the Marsh Enhancement Project at the Brick Township Project Area when considered together with other past, present, and reasonably foreseeable future projects in the area. A Draft Finding of No Significant Impact (FONSI) has been included as **Appendix H** to this EA.

## 5.2 Good Luck Point Project Area

### 5.2.1 Topography

The Proposed Action involves sediment enrichment which includes offsite dredging and depositing a layer of the collected sediment in selected areas to increase the elevation of the marsh to target elevations. There will be intentional, unavoidable impacts to the local topography from the Preferred Alternative at the dredge location site and within the Good Luck Point Project Area. However, the changes in topography at the Project Area are necessary to combat die-back of native flora due to increased water levels and prolonged inundation, and conserve extremely sensitive and highly important salt marsh habitat. The deposition of sediment on the marsh surface is also expected to initiate a positive feedback loop in which the conditions that lead to increased vegetative vigor will in turn, create the conditions for marsh accretion to occur. That is, the re-establishment of the low salt marsh will trap sediment and provide the senescent vegetation to further build up the marsh surface elevation. The installation of a new culvert beneath Bayview Avenue will not have any impacts to local topography.

The No Action Alternative would result in the a negative impact to the local topography as there would be no active correction to the inundation of the marsh as sea levels continue to rise. Without sediment enrichment, the existing pannes and pools will continue to deepen and expand, and new pannes and pools will form, covering more area of the already diminishing salt marsh. The end result would be a net decrease in elevation of the Project area.

### 5.2.2 Geology and Soils

The Proposed Action involves the addition of sediment from an underwater dredge location to a salt marsh underlain by the USDA soil mapping unit Appoquinimink-Transquaking-Mispillion complex. This action will result in a change in the substrate of the salt marsh, in terms of texture

(i.e. grain size), organic matter content, etc. The preferred alternative will affect the uppermost layer of the soil profile of the marsh, and will not extend downward into the upper subsoil. The dredging locations will be affected to somewhat deeper levels relative to the salt marsh, but this is a normal consequence of channel dredging that is unavoidable. These changes are not considered to be adverse impacts to the local geology and soils.

The No Action Alternative would not result in any impacts to the local geology and soils.

### 5.2.3 Air Quality

The Proposed Action at the Good Luck Point Project Area is not expected to have a substantial impact to air quality. Some temporary impacts are expected as the Proposed Action will involve the use of emission-producing vehicles and machinery. However, those emissions are expected to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and off-road vehicles and machinery would be up-to-date in their registration and emission inspections (for those that require emissions testing), and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

### 5.2.4 Water Quality

Healthy salt marshes are well documented to provide the important ecosystem service of improving water quality of their surrounding estuaries by removing nutrients, sediments, organic matter, and contaminants from surface water runoff and tidal influx (Koch and Gobler 2009, Nelson and Zavaleta 2012). The removal of nutrients, nitrogen in particular, occurs primarily through three major environmental processes: (1) plant uptake in tissue, (2) denitrification by microbial communities, and (3) burial in marsh sediments (Nelson and Zavaleta 2012, Velinsky et al. 2013). The major source of the eutrophication problems observed in the Barnegat Bay is attributable to nitrogen loading into the salt marsh from agricultural runoff, stormwater discharges, and restricted tidal flushing (Velinksy et al. 2013). The eutrophication of Barnegat Bay will increase over time if the surrounding salt marshes are allowed to continue to degrade from sea level rise.

Healthy salt marsh, as defined by plant cover, and the ability of a well vegetated marsh to improve water quality is also well documented and studied (NERRSSC 2015). Likewise, the contrary condition, a poorly vegetated salt marsh does not perform as well in nutrient and pollutant removal since the marsh lacks the plant biomass to assimilate these materials (Koch and Gobler 2009). Thus accelerated sea level rise have indirect adverse impacts to water quality by directly impacting the ability of a salt marsh to sustain a healthy vegetation community (NERRSSC 2015). This condition is further worsened by the decomposition of salt marsh vegetation that is killed by rising water levels, adding another nutrient and pollutant source into the surrounding estuaries (Nelson and Zavaleta 2012).

The Proposed Action is intended to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired hydrologic function. The environmental consequence of the preferred alternative is a sustainment and improvement of the salt marshes' ability to provide water quality services in areas of currently healthy and degraded marsh, respectively. Nevertheless, there will be some unavoidable but temporary and minor adverse impacts resulting from the implementation of the preferred alternative, both at the dredging sites where the sediment will be sourced, and at the Project Area where the sediment will be placed.

Dredging of the sediment will result in adverse impacts to water quality at the removal site. These impacts affect not only the removal location itself, but may also affect the surrounding areas through turbid plumes, the resuspension and sedimentation of materials, the potential release of sediment constituents, and bathymetric changes. Dredging is proposed to occur in any or all of the following locations:

- Beaver Dam Creek North
- Beaver Dam Creek South
- Bay Head Channel
- Winter Yacht Basin
- Kettle Creek – Sailor's Quarry
- Kettle Creek
- Good Luck Point
- Sloop Creek

Dredging effects on water quality are temporary and localized; however, and these dredging sites will return to stable conditions as sedimentation and tidal circulation occurs over time. Sedimentation rates are difficult to predict and vary widely among different aquatic systems. While major factors such as grain size and water action play an obvious role, other factors such as the physiochemical interactions between saline and fresh water, the clay and organic matter content in the water column, temperature, and pH all play a role in determining the rate at which the clarity of the water will return (ERDC 2005).

The placement of sediment to raise the marsh surface elevation will also result in some short-term turbidity. However, this increase in turbidity will be temporary and localized to the specific work area within the receiving cell. There is a substantial positive trade-off between the short-term and localized turbidity impacts to water quality which will be largely contained within the salt marsh, versus the long-term benefits to water quality by maintaining and enhancing the refuge marshes.

There will be a number of site controls that are implemented in order to minimize the sedimentation into the open water features (e.g., ditches, creeks, pannes, and pools) in a sediment enrichment cell. As described in Chapter 4, erosion control measures such as filter blocks, coir fiber logs, or other materials will be installed at some distance from the edge of the open water feature. The installation of these controls at a distance from the water features also serves as a buffer as opposed to their installation right at the feature's edge.

The No Action Alternative would not result in direct impacts to water quality at the Brick Township Project Area or the dredging sites as no activities that suspend sediment would occur. However, there will be indirect impacts to water quality at the Project Area as the salt marshes would continue to be subject to the adverse effects of sea level rise. The sea level rise would continue to reduce the extent and vigor of salt marsh vegetation thereby reducing the ability of the marsh to intercept nutrient and pollutant runoff.

### 5.2.5 Wetlands and Streams

The Proposed Action will result in direct, unavoidable adverse impacts to wetlands as a result of the sediment enrichment process. Mechanized equipment and personnel will be traversing the marsh, and dredged sediment will be placed directly onto the marsh surface. The majority of this direct impact will be to the existing wetland vegetation through trampling and smothering; however, this disturbance will be limited to the receiving cells which are either currently degraded or are predicted to degrade in the future. With regards to streams, as described in Chapter 3, measures will be taken to minimize the impacts of the sediment delivery pipeline upon the marsh. In addition, the use of filter blocks, coir logs, or other erosion and sedimentation controls will minimize or eliminate adverse impacts to the marsh creeks and ditches.

The No Action Alternative would not have a direct adverse impact to wetlands and streams; however, an indirect impact would be expected as the wetlands continue to degrade as a result of prolonged inundation, leading to vegetation die-back, and a continued decrease in ecosystem function.

### 5.2.6 Vegetation

Similar to the impacts to wetlands described above, the Proposed Action would have unavoidable, but temporary impacts to vegetation as a result of mechanized equipment and personnel that will be traversing the marsh, and dredged sediment that will be placed directly onto the marsh surface. The majority of this direct impact will be from trampling and smothering; however, this disturbance will be limited to the receiving cells which contain either stressed vegetation or unvegetated areas. As also described in Section 5.1.7 (Marine Resources), stem elongation and vegetation regrowth can occur through newly-placed sediment provided that the rhizome layer is largely intact and that the depth and weight of the overlying sediment does not preclude plant growth.

The No Action Alternative would not result in any immediate, direct physical impact to vegetation as no sediment will be deposited, and no equipment or personnel would be traversing through the marsh. However, this alternative would perpetuate the environmental conditions that result in vegetation die-back through increased inundation, thereby resulting in a long-term, indirect adverse impact to vegetation.

### 5.2.7 Marine Resources

The Proposed Action will have unavoidable impacts upon marine resources both at the dredging site and at the Project Area. The Project Area may also experience some unavoidable impacts to

EFH. Potential impacts at the dredging site include both those in the water column and the subsequent sedimentation effects. Berry et al. (2003) report the oft-cited findings of Wilber and Clarke (2001) in that the increased turbidity resulting from suspended sediments create altered light regimes which then impacts primary productivity, changes in plant and animal species distributions, behavior, feeding, reproduction, and survival. Direct impacts of suspended sediment also occur through gill effects of marine fish and invertebrates (Berry et al. 2003, Newcombe and Jensen 1996). Newcombe and Jensen (1996) report that increased suspended sediment results in increased mortality of fish fry and larvae, avoidance behavior in juvenile and adult fish. Suspended sediments under laboratory conditions have also been demonstrated to cause gill damage, starvation, and slowed maturation in fish (Reynolds et al. 1989 in Newcombe and Jensen 1996).

Sedimentation effects to marine resources and EFH following sediment suspension from dredging include direct impacts, indirect impacts, or a combination of both. Direct impacts include smothering, toxicity, physical abrasion, and reduced light intensity. It is important to note that toxicity is not limited to environmental contaminants but includes exposure to anaerobic sediments which alters chemical processes in the water column, sediment layers, and within marine organisms. Indirect impacts from sedimentation include changes in habitat conditions which can result in changes to the quality of the habitat to both the marine resource and its food/prey item. Sediment suspension and sedimentation will also occur during sediment placement in the cells. As with dredging, sediment suspension is a shorter-term condition relative to sedimentation, but the direct and indirect impacts to marine resources are similar.

Submerged aquatic vegetation can be directly removed by dredging or indirectly covered from sedimentation or directly smothered from sediment placement activities (ERDC 2005). The increased turbidity resulting from dredging and sediment placement can temporarily alter light availability and decrease water quality which has been linked to SAV impacts (Durako 1994, Orth and Moore 1983, Robblee et al. 1991, and Zieman and Zieman 1989 in ERDC 2005). However, if the rate of SAV stem elongation is greater than the smothering effects of sedimentation, and damage to the rhizome layer does not occur, then re-growth through the sediment is possible (Duarte et al. 1997 in ERDC 2005). Furthermore, the altered light availability and reduction in water quality are only temporary conditions.

Invertebrates such as crustaceans, molluscs, and gastropods would experience similar direct and indirect impacts from dredging and sediment placement. Most crustaceans are highly mobile however, and can move away from and avoid areas where disturbances are occurring. Many crustaceans are also highly adapted to turbid conditions at different portions of their life cycles. Nevertheless, their avoidance of turbid conditions under normal environmental circumstances suggests their preference to avoid suspended sediment and burial by sediment (Herrnkind et al. 1988, Pottle and Elner 1982 in ERDC 2005). The movement away from turbid conditions or sediment placement activities has the potential to result in the crowding of individuals and increases in mobile search time for new areas to inhabit, which in turn increases predation risk (ERDC 2005). In contrast, non-mobile or relatively slower moving molluscs and gastropods are susceptible to direct removal, smothering, and other sedimentation effects similar to that which may be experienced by SAV. Sedimentation in thin layers may not directly affect certain invertebrates, although other indirect effects may occur through behavioral changes, including reproductive behaviors (ERDC 2005).

All of these direct and indirect impacts are an unavoidable consequence of the preferred alternative. Many of the indirect impacts of sediment suspension and sedimentation both at the dredging site and in the Project Area are temporary and somewhat localized, and the motility of certain marine resources can ameliorate these adverse impacts. Nevertheless, these impacts are considered to be less damaging in the long-term than the alternative discussed below.

The No Action Alternative would not result in the above direct or indirect impacts to marine resources or EFH. However, the long-term consequences to marine resources from the No Action Alternative also needs to be assessed. Continuing sea level rise and the loss of the salt marsh to open water may initially appear to benefit resources such as SAV, invertebrates, and fish; however, the existence of these marine resources rely on the ability of the salt marsh ecosystem to function as a primary producer and nursery ground for numerous marine organisms that provide the food base for other marine resources. The No Action Alternative would result in the expansion of open water and the reduction of salt marsh at an accelerated rate, thereby eliminating this ecosystem function.

### 5.2.8 Terrestrial Wildlife

The Proposed Action will not have substantial long-term adverse impacts to terrestrial wildlife. This is because of the timing of the work in relation to wildlife use of the refuge, the temporary nature of the disturbance, the mobility of terrestrial wildlife, and the resulting long-term benefits to terrestrial wildlife from the ecological uplift that is the goal of the Proposed Action. The work will be done largely outside of the migratory bird nesting season. As discussed in Chapter 2, the management of migratory bird habitat is one of the primary purposes of the Service, and the management of terrestrial wildlife is an integral component of the Service's mission, the refuge purpose, and the CCP's goals. Thus, the potential for adverse impacts to terrestrial wildlife will be minimized by avoiding the most sensitive time periods during the year. This protection applies not only to migratory birds, but to mammals, herpetofauna, invertebrates, as well as fish (as discussed in the "Marine Resources" section).

The proposed work is expected to take a maximum of 35 days to complete (20 working days for culvert installation and 15 working days for sediment enrichment). This is a relatively short time period in relation to the long-term benefits to terrestrial wildlife by saving this salt marsh from permanent loss through inundation or altered hydroperiod. Although the changes to the salt marsh from the sediment deposition will be apparent for several years afterwards, each year will bring the wildlife habitat closer to pre-disturbance conditions, and for the degraded areas, to healthier wildlife habitat than pre-disturbance conditions. The installation of the properly-sized culvert will also play a major role in maintaining a hydroperiod that supports the salt marsh. The combined preservation, conservation, and ecological uplift of habitat will benefit all forms of wildlife, including some special cases such as that of the saltmarsh sparrow (*Ammodramus maritimus*), an indicator of healthy salt marshes (Rising 2005), whose mid-Atlantic subspecies (*maritimus*) utilizes both high and low marshes.

Terrestrial wildlife also have the ability to avoid or move out of the project area if they find it unsuitable once work activities commence. This change in behavior is in itself an adverse impact

in that the organism would use its time and energy to move out of the area - time and energy that would normally be used for feeding, resting, loafing, or mating. The movement of terrestrial wildlife to a new area also exposes those organisms to greater predatory risk and accident. However, the end result in this alteration of behavior is that the organisms would relocate to a more suitable and less stressful area. This is turn benefits the organisms in the long-term provided that they are not harmed along the way. Some terrestrial wildlife are also expected not to move, but to remain in the project area if these individuals do not find the work activities to be disruptive to their normal functioning. While some organisms may be mildly disrupted by work activities, it may not reach the level at which relocation occurs.

The No Action Alternative would not result in any short term impacts to terrestrial wildlife since no work activities would occur that could cause wildlife to move out of the work area or alter their behavior, and there would be no changes to the marsh surface from sediment enrichment, nor the marsh hydrology from the installation of a properly-sized culvert. However, there would be a long-term adverse impact to terrestrial wildlife from this alternative. This alternative would not attempt to correct the current degradation and continued degradation of the salt marsh from sea level rise, and thus would allow for the loss of important wildlife habitat. Such losses would run counter to the mission, purpose, and goals of the Service, the refuge, and CCP. The Service would not be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

### 5.2.9 Threatened and Endangered Species

**Appendix E** presents a signed Intra-Service Section 7 Biological Evaluation regarding the red knot, Knieskern's beaked-rush, seabeach amaranth, swamp pink, and northern long-eared bat. The Biological Evaluation reports that red knot may occur near the Good Luck Point Project Area, Knieskern's beaked-rush and swamp pink is not known to exist or occur, respectively, in the project areas, seabeach amaranth may occur in the Good Luck Point Project Area east of Bayview Avenue along sections of sandy beach, and summer habitat for northern long-eared bat may occur in the forested areas near but not within the project areas.

With regards to the red knot, email correspondence also included in **Appendix E** indicates that the refuge has found no evidence of use of the Good Luck Point Project Area by this species during surveys 3 times per year from May to July in 2013, 2015, and 2016. The refuge also indicates their request for the Service's New Jersey Field Office (NJFO) to examine eBird, International Shorebird Survey, and bandedbird.com for records of red knots in the project areas. The nearest records found were from Barnegat Inlet, which is over 11 miles from the nearest project area.

Knieskern's beaked-rush (threatened), an endemic perennial sedge, grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance; it is highly intolerant of competition (USFWS 2014c, USFWS 1997, USFWS 1993). Seabeach amaranth (threatened) occurs on barrier island beaches, where its primary habitat consists of overwash flats and upper strands of non-eroding beaches. It usually grows on a nearly pure sand substrate and is intolerant of competition. It does not occur on well-vegetated sites (USFWS 2015c, USFWS 2014d). Swamp pink (threatened), an evergreen

wetland forb, grows in shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014e).

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. Because this project will occur on salt marsh, the Project would not have the possibility of impacting federally listed threatened and endangered species.

Based on this information, coupled with the Intra-Service Section 7 Biological Evaluation, the Proposed Action will not have substantial long-term environmental impacts to federally listed plant and animal species.

The additional State-listed threatened and endangered animal species or species of special concern that have the potential to be on or near the Project area (e.g., 11 bird species), would be expected to avoid the Project area due to the presence of the work crew. This indirect impact would be temporary, as the culvert installation portion of the Project is expected to take 20 working days to complete and the sediment enrichment activities are expected to take 15 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 bird species, as well as other threatened and endangered wildlife that live on or near the Good Luck Point Project Area. The remaining plant species (mudbank crown grass), listed as State imperiled, is typically found along streambanks, lake shores, dried-up woodland pools, or vernal ponds (NatureServe 2015a) and is not expected to found within the Project boundaries.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the marsh. However, leaving the marsh in its current condition would lead to further reduction of salt marsh, a habitat type that is critical for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species.

### 5.2.10 Cultural Resources

Because a listed historic property is located within the Good Luck Point Project Area, a Phase 1A Cultural Resources Assessment Report (**Appendix G**) was developed to assess the archaeological sensitivity of the Good Luck Point APE. The results concluded that any intact upland areas within the APE may have moderate to high sensitivity for unrecorded archaeological sites. However, the Project does not involve the process of soil/sediment removal, with the exception of the small culvert construction area. Therefore, the potential for impacts to previously undiscovered historical artifacts is low.

It has been concluded that the Proposed Action at the Good Luck Point Project Area would have no impacts on the former AT&T radio transmission building or associated structures that have been determined to be eligible for listing in the National Register of Historic Places or on known areas where historic or prehistoric archaeological artifacts have been recorded previously. The only ground disturbance proposed is for the installation of the new culvert, but this activity will occur in an area already disturbed by the creation of Bayview Avenue. Consequently, there is no potential for effect on listed archaeological resources. However, if any historic or prehistoric

artifacts are discovered during the completion of this Project, work would be stopped immediately and the refuge management would be contacted to determine how to proceed. The Service, in consultation with the SHPO, will determine the appropriate management actions and additional Tribal consultation that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources, as no work would be performed in the Project area.

### 5.2.11 Socioeconomic Resources and Environmental Justice

The Proposed Action is not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the county's leading employment industries, including resorts and commercial outfits related to tourism, health care, or commercial fishing. It does not include long-term construction of any facility that would increase the number of permanent jobs in Berkeley Township or Ocean County, nor would it have any effect on State or local tax revenue. Only minor, temporary, economic benefits may occur locally through Project area personnel increasing spending at nearby gas stations, hotels, restaurants, hardware stores, other retail shops, etc.

The No Action Alternative would not have any impacts on county or local socioeconomic resources, as no workforce would be required in the Project area.

### 5.2.12 Recreation

While the refuge as a whole receives over 250,000 visitors each year, the Good Luck Point Project Area is not used regularly by visitors for recreational activities, as it is closed to the public. Therefore, there would be no adverse impacts to recreation. In addition, Project activities would not cause any impacts on hunters (deer and waterfowl) hunting in the adjacent uplands or tidal estuary. The long-term benefits would include restoration of migratory bird routes to a more natural condition, which will indirectly improve recreation opportunities to other parts of the refuge.

The No Action Alternative would not have any impacts on recreation, as no work would be performed in the Project area.

### 5.2.13 Transportation

The Project does not involve the building, removal, or repair of any major transportation infrastructure. Personnel and vehicles would be required to travel along local roads leading to the refuge, such as Bayview Avenue. The use of these local roads by Project crew would also be only very minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling 31,858 cars per day, would not be substantial. Furthermore, the Good Luck Point Project activities are anticipated to require, in total, approximately 35 working days to complete.

The Proposed Action at the Good Luck Point Project Area does require the replacement of a small culvert beneath Bayview Avenue. Although this portion of the Project is anticipated to only take 20 working days to complete, it will have a temporary impact upon local traffic on Bayview Avenue as it will require a lane closure for approximately six working days. The construction of the new culvert will likely be done one side at a time, resulting in one lane being closed for three days, followed by the other being closed for three days. However, this is a temporary disruption in normal traffic flow for a somewhat routine construction activity. There will be no adverse impacts to public safety as the construction contractor will coordinate the activity with the Berkeley Township Police Department, and will comply with standards and guidelines for ensuring traffic safety during construction, such as the Manual on Uniform Traffic Control Devices (MUTCD), the NJDOT Standard Specifications for Road and Bridge Construction, or other guidance as directed by Berkeley Township.

As Bayview Avenue is a township road, the Berkeley Township Police Department will, at their discretion, determine whether police presence is necessary for the proposed activity. If police presence is required, the Proposed Action will have a slight positive impact to the local economy from the increased regular and overtime wages associated with staffing the activity.

The No Action Alternative would not have any impacts on infrastructure, as no workforce would be required to travel to and from the Project area. In addition, there would be no temporary impacts to local traffic patterns along Bayview Avenue should the Proposed Action not be conducted in the Good Luck Point Project Area.

### 5.2.14 Noise

The Project area includes typical ambient noise from a park environment located near the water, such as boat or vehicular traffic and local pedestrian or trespasser activity. Although the noise generated from the boat, dump trucks, excavators, and jackhammers used during the Project are expected to be above or close to 8-hour threshold levels set for humans, the Project 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 Project is also expected to require only 35 working days 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 Project area and public use of the Good Luck Point Project Area is not encouraged. Therefore, Project-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

### 5.2.15 Cumulative Impacts

The geographic area for the assessment of cumulative impacts from the Proposed Action at the Good Luck Point Project Area was largely identified as the Barnegat Bay Central and tributaries watershed. This watershed includes the municipalities of Berkeley Township, Ocean Gate Borough, Lacey Township, Toms River Township, Seaside Park Borough, Seaside Heights Borough, and Ocean Township. All of these municipalities are located in Ocean County. However, Berkeley Township was the only municipality included in the geographic area of this cumulative

impacts assessment as the Good Luck Point Project Area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the construction of poles and antennas associated with the former AT&T receiver station at the Good Luck Point Project Area. 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 enhancement of coastal marsh habitat. The Proposed Action would not induce development, land use change, or other external pressure to the Project area.

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 in the Project area, 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 *Berkeley Township Comprehensive Master Plan* (SDI 1997) and the *2008 Master Plan Reexamination Report* (CMX 2008) revealed that there are no known present or future projects that are anticipated to impact or be impacted by the Proposed Action. A review of the *Ocean County Planning Board Comprehensive Master Plan* (OCPB 2011) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Ocean County Master Plan presents a number of improvements, past and planned, to the Garden State Parkway, U.S. Route 9, and other major roadways and transportation infrastructure, none are anticipated to adversely affect or be affected by the Proposed Action.

The Service's Marsh Enhancement and Telephone Pole Array Removal Project (Contract # P11PC00121) includes an additional pole removal phase for the Good Luck Point Project Area in addition to the sediment enrichment phase of the marsh restoration. These pole removal activities include the safe removal of the aboveground portions of abandoned wooden poles, metal antenna towers and associated guy wires, metal anchors, and concrete footings in an effort to protect migratory birds from flyway hazards and the native flora and fauna of the marsh from the detrimental effects of the decaying poles. The pole removal activities, in combination with the marsh restoration phase, would bolster the enhancement of the local environment and would further serve to perpetuate the Service's mission for conservation and protection of fish and wildlife resources.

In summary, there would not be any substantial cumulative adverse environmental impact from the Marsh Restoration Project at the Good Luck Point Project Area when considered together with other past, present, and reasonably foreseeable future projects in the area. A Draft FONSI has been included as **Appendix H** to this EA.

## 5.3 Stouts Creek Project Area

### 5.3.1 Topography

The Proposed Action involves the removal of defunct WCSs and the breaching of dikes. There will be very small and unavoidable impacts to the local topography from the Preferred Alternative at the WCS removal and breach sites; however, the direct changes in topography at the Project Area will occur in man-made features in the landscape. Indirect long-term changes in the topography will occur over many years as the Project Area equalizes to the restored tidal hydrology. These changes in topography are necessary to combat die-back of the native flora due to the currently altered tidal hydrology. The restoration of proper tidal hydrology will create the conditions for which normal sediment exchange between the marsh and the bay will occur.

The No Action Alternative would result in the a negative impact to the local topography as there would be no active correction to the improper tidal hydrology, which will perpetuate the existing degraded condition of the marsh.

### 5.3.2 Geology and Soils

The Proposed Action does not involve negative impacts to soil composition, nor will any of the Project activities extend down to surficial geological layers. The limited amount of soil disturbance will occur in man-made features that were likely created using native soils borrowed from within the vicinity of the WCSs and the dikes. Therefore, the Proposed Action will not have adverse impacts to the local or regional geology and soils.

The No Action Alternative would not result in impacts to the local or regional geology and soils as the WCSs would remain in place and no dike breaching would occur.

### 5.3.3 Air Quality

The Proposed Action at the Stouts Creek Project Area is not expected to have a substantial impact to air quality. Some temporary impacts are expected, as the Proposed Action will involve the use of emission-producing vehicles and machinery. However, those emissions are predicted to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and off-road vehicles and machinery will be up-to-date in their registration and inspections, and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

### 5.3.4 Water Quality

Healthy salt marshes are well documented to provide the important ecosystem service of improving water quality of their surrounding estuaries by removing nutrients, sediments, organic

matter, and contaminants from surface water runoff and tidal influx (Koch and Gobler 2009, Nelson and Zavaleta 2012). The removal of nutrients, nitrogen in particular, occurs primarily through three major environmental processes: (1) plant uptake in tissue, (2) denitrification by microbial communities, and (3) burial in marsh sediments (Nelson and Zavaleta 2012, Velinsky et al. 2013). The major source of the eutrophication problems observed in the Barnegat Bay is attributable to nitrogen loading into the salt marsh from agricultural runoff, stormwater discharges, and restricted tidal flushing (Velinksy et al. 2013). The eutrophication of Barnegat Bay will increase over time if the surrounding salt marshes are allowed to continue to degrade from sea level rise.

Healthy salt marsh, as defined by plant cover, and the ability of a well vegetated marsh to improve water quality is also well documented and studied (NERRSSC 2015). Likewise, the contrary condition, a poorly vegetated salt marsh does not perform as well in nutrient and pollutant removal since the marsh lacks the plant biomass to assimilate these materials (Koch and Gobler 2009). Thus accelerated sea level rise have indirect adverse impacts to water quality by directly impacting the ability of a salt marsh to sustain a healthy vegetation community (NERRSSC 2015). This condition is further worsened by the decomposition of salt marsh vegetation that is killed by rising water levels, adding another nutrient and pollutant source into the surrounding estuaries (Nelson and Zavaleta 2012).

The Proposed Action is intended to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired tidal hydrology. The environmental consequence of the preferred alternative is a sustainment and improvement of the salt marshes' ability to provide water quality services in areas of currently healthy and degraded marsh, respectively. Nevertheless, there will be some unavoidable but temporary and minor adverse impacts resulting from the implementation of the preferred alternative.

The disturbances caused by the removal of the WCSs and dike breachings are temporary and localized. These work areas will return to stable conditions as sedimentation and tidal circulation occurs over time. The restoration of tidal hydrology will also result in an increase in the salinity of the interior of the project area, as tidal waters will flow more freely landward. Sedimentation rates are difficult to predict and vary widely among different aquatic systems. While major factors such as grain size and water action play an obvious role, other factors such as the physiochemical interactions between saline and fresh water, the clay and organic matter content in the water column, temperature, and pH all play a role in determining the rate at which the clarity of the water will return (ERDC 2005).

The No Action Alternative would not result in direct impacts to water quality at the Stouts Creek Project Area as no activities that suspend sediment would occur. However, there will be indirect impacts to water quality at the Project Area as the salt marshes would continue to be subject to the adverse effects of sea level rise and altered tidal hydrology. These conditions would continue to reduce the extent and vigor of salt marsh vegetation thereby reducing the ability of the marsh to intercept nutrient and pollutant runoff.

### 5.3.5 Wetlands and Streams

The Proposed Action will result in direct, unavoidable adverse impacts to wetlands as a result of the WCS removal and dike breaching activities. Mechanized equipment and personnel will use upland access points to reach the work areas to the extent practicable, but some intrusion into the wetlands will be necessary. The majority of the direct impact will be to existing wetland vegetation through trampling and removal; however, this disturbance will be limited to the work areas which are relatively small in area compared to the surrounding wetlands. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger wetland system. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community. No streams are associated with the preferred alternative at this project area.

The No Action Alternative would not have a direct adverse impact to wetlands; however, an indirect impact would be expected as the wetlands continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.3.6 Vegetation

Similar to the impacts to wetlands described above, the Proposed Action would have unavoidable, but temporary impacts to vegetation as a result of mechanized equipment and personnel that will perform the WCS removal and dike breachings. The majority of this direct impact will be from trampling and removal; however, this disturbance will be limited to small work areas. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger vegetation community. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community.

The No Action Alternative would not have a direct adverse impact to vegetation; however, an indirect impact would be expected as the plant community will continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.3.7 Marine Resources

The Proposed Action will have unavoidable, but temporary and minor impacts to marine resources and EFH. This potential impact is increased turbidity at the work locations and the subsequent, but relatively minor sedimentation effects. Sediment suspension will occur but is expected to be limited to the immediate work area and not to be a long-term condition since a combination of settling and tidal flushing will attenuate the turbidity. Mobile marine resources, such as gastropods, crustaceans, and fish can move away from and avoid areas where disturbances are occurring. Many crustaceans and immobile invertebrates such as molluscs are also highly adapted to turbid conditions.

The No Action Alternative would not result in the above impacts to marine resources or EFH; however, there would be long-term consequences to marine resources from this alternative. The

improper tidal hydrology would continue to degrade the function of this salt marsh, and in turn, the marsh would not be able to support a healthy ecosystem that marine resources require.

### 5.3.8 Terrestrial Wildlife

The Proposed Action will not have substantial long-term adverse impacts to terrestrial wildlife. This is because of the timing of the work in relation to wildlife use of the refuge, the temporary nature of the disturbance, the mobility of terrestrial wildlife, and the resulting long-term benefits to terrestrial wildlife from the ecological uplift that is the goal of the Proposed Action. The work will be done largely outside of the migratory bird nesting season. As discussed in Chapter 2, the management of migratory bird habitat is one of the primary purposes of the Service, and the management of terrestrial wildlife is an integral component of the Service's mission, the refuge purpose, and the CCP's goals. Thus, the potential for adverse impacts to terrestrial wildlife will be minimized by avoiding the most sensitive time periods during the year. This protection applies not only to migratory birds, but to mammals, herpetofauna, invertebrates, as well as fish (as discussed in the "Marine Resources" section).

The proposed work is expected to take seven days to complete. This is a relatively short time period in relation to the long-term benefits to terrestrial wildlife by saving this salt marsh from permanent loss through inundation and improper tidal hydrology. The removal of the WCSs and the breaching of the dikes will play a major role in maintaining a hydroperiod that supports the salt marsh. The combined preservation, conservation, and ecological uplift of habitat will benefit all forms of wildlife, including some special cases such as that of the saltmarsh sparrow (*Ammodramus maritimus*), an indicator of healthy salt marshes (Rising 2005), whose mid-Atlantic subspecies (*maritimus*) utilizes both high and low marshes.

Terrestrial wildlife also have the ability to avoid or move out of the project area if they find it unsuitable once work activities commence. This change in behavior is in itself an adverse impact in that the organism would use its time and energy to move out of the area - time and energy that would normally be used for feeding, resting, loafing, or mating. The movement of terrestrial wildlife to a new area also exposes those organisms to greater predatory risk and accident. However, the end result in this alteration of behavior is that the organisms would relocate to a more suitable and less stressful area. This is turn benefits the organisms in the long-term provided that they are not harmed along the way. Some terrestrial wildlife are also expected not to move, but to remain in the project area if these individuals do not find the work activities to be disruptive to their normal functioning. While some organisms may be mildly disrupted by work activities, it may not reach the level at which relocation occurs.

The No Action Alternative would not result in any short term impacts to terrestrial wildlife since no work activities would occur that could cause wildlife to move out of the work area or alter their behavior. However, there would be a long-term adverse impact to terrestrial wildlife from this alternative. This alternative would not attempt to correct the current degradation and continued degradation of the salt marsh from sea level rise and improper tidal hydrology, and thus would allow for the loss of important wildlife habitat. Such losses would run counter to the mission, purpose, and goals of the Service, the refuge, and CCP. The Service would not be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

### 5.3.9 Threatened and Endangered Species

**Appendix E** presents a signed Intra-Service Section 7 Biological Evaluation regarding the red knot, Knieskern's beaked-rush, seabeach amaranth, swamp pink, and northern long-eared bat. The Biological Evaluation reports that red knot may occur near the Good Luck Point Project Area, Knieskern's beaked-rush and swamp pink is not known to exist or occur, respectively, in the project areas, seabeach amaranth may occur in the Good Luck Point Project Area east of Bayview Avenue along sections of sandy beach, and summer habitat for northern long-eared bat may occur in the forested areas near but not within the project areas.

With regards to the red knot, email correspondence also included in **Appendix E** indicates that the refuge has found no evidence of use of the Good Luck Point Project Area by this species during surveys 3 times per year from May to July in 2013, 2015, and 2016. The refuge also indicates their request for the Service's New Jersey Field Office (NJFO) to examine eBird, International Shorebird Survey, and bandedbird.com for records of red knots in the project areas. The nearest records found were from Barnegat Inlet, which is over 11 miles from the nearest project area.

Knieskern's beaked-rush (threatened), an endemic perennial sedge, grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance; it is highly intolerant of competition (USFWS 2014c, USFWS 1997, USFWS 1993). Swamp pink (threatened), an evergreen wetland forb, grows in shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014e).

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. Because this project will occur on salt marsh, the Project would not have the possibility of impacting federally listed threatened and endangered species.

Based on this information, coupled with the Intra-Service Section 7 Biological Evaluation, the Proposed Action will not have substantial long-term environmental impacts to federally listed plant and animal species.

The additional State-listed threatened and endangered animal species or species of special concern that have the potential to be on or near the Project area (e.g., 9 bird species), would be expected to avoid the Project area due to the presence of the work crew. This indirect impact would be temporary, as the Project is only expected to take seven 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 bird species, as well as other threatened and endangered wildlife living on or near the Stouts Creek Project Area.

The three State-listed turtle species documented as having the potential to be on or near the Project area [Atlantic loggerhead sea turtle (endangered), Kemp's Ridley sea turtle (endangered), and Atlantic green sea turtle (threatened)] may be found in the bay east of the Project area, but are not expected to migrate into the brackish inlets within the Project boundaries. The remaining plant species (southern twayblade), listed as rare in the State of New Jersey, is typically found in open

or sparsely wooded poor fens (i.e., a transitional bog consisting of dense low growth of small sedges and other plants) on the side and base of hummocks (Hoy 2003). Therefore, it is not expected to found within the Project boundaries.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the marsh. However, leaving the marsh in its current condition would lead to further reduction of salt marsh, a habitat type that is critical for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species.

### 5.3.10 Cultural Resources

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE was determined to be low and no further archaeological investigations were conducted.

It has been concluded that the Proposed Action at the Stouts Creek Project Area would not have impacts on historic properties that are eligible for listing in the National Register of Historic Places or on known areas where historic or prehistoric archaeological artifacts have been recorded previously, as no below-ground work would be performed on native soils, only removal of current fill material would occur. However, if any historic or prehistoric artifacts are discovered during the completion of this Project, work would be stopped immediately and the refuge management would be contacted to determine how to proceed. The Service, in consultation with the SHPO, will determine the appropriate management actions and additional Tribal consultation that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources, as no work would be performed in the Project area.

### 5.3.11 Socioeconomic Resources and Environmental Justice

The Proposed Action is not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the county's leading employment industries, including resorts and commercial outfits related to tourism, health care, or commercial fishing. It does not include long-term construction of any facility that would increase the number of permanent jobs in Lacey Township or Ocean County, nor would it have any effect on State or local tax revenue. Only minor, temporary, economic benefits may occur locally through Project area personnel increasing spending at nearby restaurants, hardware supply stores, etc.

The No Action Alternative would not have any impacts on county or local socioeconomic resources, as no workforce would be required in the Project area.

### 5.3.12 Recreation

While the refuge as a whole receives over 250,000 visitors each year, the Stouts Creek Project Area is not used regularly by visitors for recreational activities, as it is closed to the public. Therefore, there would be no short-term impacts to recreation. In addition, Project activities would

not cause any impacts on hunters (deer and waterfowl) hunting in the adjacent uplands or tidal estuary. The long-term benefits would include restoration of migratory bird routes to a more natural condition, which may indirectly improve recreation opportunities to other parts of the refuge.

The No Action Alternative would not have any impacts on recreation, as no work would be performed in the Project area.

### 5.3.13 Transportation

The Project does not involve the building, removal, or repair of any major transportation infrastructure. In addition, the Project's scale is small, with minimal personnel required to complete the tasks. Personnel and vehicles would be required to travel along local roads leading to the refuge, such as Cedar Drive. The use of these local roads by Project crew would also be only very minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling 18,199 cars per day, would not be substantial. Furthermore, the Stouts Creek Project Area is anticipated to only require seven working days to complete.

The No Action Alternative would not have any impacts on infrastructure, as no workforce would be required to travel to and from the Project area.

### 5.3.14 Noise

The Project area includes typical ambient noise from a park environment located near the water, such as boat or vehicular traffic and local pedestrian or trespasser activity. Although the noise generated from the track-mounted/wheeled excavators and dump trucks required for dike excavation during the Project is expected to be close to 8-hour threshold levels set for humans, the noise will be typical of any small construction project. In addition, the Project is expected to require only seven working days to complete and the Project crew will wear any necessary hearing protection. 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 Project area and public use of the Stouts Creek Project Area is not encouraged. Therefore, Project-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

### 5.3.15 Cumulative Impacts

The geographic area for the assessment of cumulative impacts from the Proposed Action at the Stouts Creek Project Area was largely identified as the Barnegat Bay Central and Tributaries watershed. This watershed includes the municipalities of Berkeley Township, Ocean Gate Borough, Lacey Township, Toms River Township, Seaside Park Borough, Seaside Heights Borough, and Ocean Township. All of these municipalities are located in Ocean County. However, Lacey Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Stouts Creek Project Area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the construction of the impoundment dikes and the three WCSs currently located within the Project area. Additionally, due to habitat loss from development, the watershed has 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 enhancement of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the Project area.

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 in the Project area, 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 readily available Lacey Township *Master Plan Reexamination Report* (Gravatt 2012) revealed that there are no known present or future projects that are anticipated to impact or be impacted by the Proposed Action. A review of the *Ocean County Planning Board Comprehensive Master Plan* (OCPB 2011) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Lacey Township and Ocean County Master Plans presented a number of improvements, past and planned, to the Garden State Parkway, U.S. Route 9, and other major roadways and transportation infrastructure, none are anticipated to adversely affect or be affected by the Proposed Action.

In summary, there would not be any substantial cumulative adverse environmental impact from the Marsh Restoration Project at the Stouts Creek Project Area when considered together with other past, present, and reasonably foreseeable future projects in the area. A Draft FONSI has been included as **Appendix H** to this EA.

## 5.4 Forked River-Wrangle Creek Project Area

### 5.4.1 Topography

The Proposed Action involves the removal of defunct WCSs and the breaching of dikes. There will be very small and unavoidable impacts to the local topography from the Preferred Alternative at the WCS removal and breach sites; however, the direct changes in topography at the Project Area will occur in man-made features in the landscape. Indirect long-term changes in the topography will occur over many years as the Project Area equalizes to the restored tidal hydrology. These changes in topography are necessary to combat die-back of the native flora due to the currently altered tidal hydrology. The restoration of proper tidal hydrology will create the conditions for which normal sediment exchange between the marsh and the bay will occur.

The No Action Alternative would result in the a negative impact to the local topography as there would be no active correction to the improper tidal hydrology, which will perpetuate the existing degraded condition of the marsh.

### 5.4.2 Geology and Soils

The Proposed Action does not involve negative impacts to soil composition, nor will any of the Project activities extend down to surficial geological layers. The limited amount of soil disturbance will occur in man-made features that were likely created using native soils borrowed from within the vicinity of the WCSs and the dikes. Therefore, the Proposed Action will not have adverse impacts to the local or regional geology and soils.

The No Action Alternative would not result in impacts to the local or regional geology and soils as no dike breaching would occur.

### 5.4.3 Air Quality

The Proposed Action at the Forked River-Wrangle Creek Project Area is not expected to have a substantial environmental impact to air quality. Some temporary impacts are expected, as the Proposed Action will involve the use of emission-producing vehicles and machinery. However, those emissions are predicted to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and off-road vehicles and machinery will be up-to-date in their registration and inspections, and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

### 5.4.4 Water Quality

Healthy salt marshes are well documented to provide the important ecosystem service of improving water quality of their surrounding estuaries by removing nutrients, sediments, organic matter, and contaminants from surface water runoff and tidal influx (Koch and Gobler 2009, Nelson and Zavaleta 2012). The removal of nutrients, nitrogen in particular, occurs primarily through three major environmental processes: (1) plant uptake in tissue, (2) denitrification by microbial communities, and (3) burial in marsh sediments (Nelson and Zavaleta 2012, Velinsky et al. 2013). The major source of the eutrophication problems observed in the Barnegat Bay is attributable to nitrogen loading into the salt marsh from agricultural runoff, stormwater discharges, and restricted tidal flushing (Velinksy et al. 2013). The eutrophication of Barnegat Bay will increase over time if the surrounding salt marshes are allowed to continue to degrade from sea level rise.

Healthy salt marsh, as defined by plant cover, and the ability of a well vegetated marsh to improve water quality is also well documented and studied (NERRSSC 2015). Likewise, the contrary condition, a poorly vegetated salt marsh does not perform as well in nutrient and pollutant removal

since the marsh lacks the plant biomass to assimilate these materials (Koch and Gobler 2009). Thus accelerated sea level rise have indirect adverse impacts to water quality by directly impacting the ability of a salt marsh to sustain a healthy vegetation community (NERRSSC 2015). This condition is further worsened by the decomposition of salt marsh vegetation that is killed by rising water levels, adding another nutrient and pollutant source into the surrounding estuaries (Nelson and Zavaleta 2012).

The Proposed Action is intended to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired tidal hydrology. The environmental consequence of the preferred alternative is a sustainment and improvement of the salt marshes' ability to provide water quality services in areas of currently healthy and degraded marsh, respectively. Nevertheless, there will be some unavoidable but temporary and minor adverse impacts resulting from the implementation of the preferred alternative.

The disturbances caused by the removal of the WCSs and dike breachings are temporary and localized. These work areas will return to stable conditions as sedimentation and tidal circulation occurs over time. The restoration of tidal hydrology will also result in an increase in the salinity of the interior of the project area, as tidal waters will flow more freely landward. Sedimentation rates are difficult to predict and vary widely among different aquatic systems. While major factors such as grain size and water action play an obvious role, other factors such as the physiochemical interactions between saline and fresh water, the clay and organic matter content in the water column, temperature, and pH all play a role in determining the rate at which the clarity of the water will return (ERDC 2005).

The No Action Alternative would not result in direct impacts to water quality at the Forked River Project Area as no activities that suspend sediment would occur. However, there will be indirect impacts to water quality at the Project Area as the salt marshes would continue to be subject to the adverse effects of sea level rise and altered tidal hydrology. These conditions would continue to reduce the extent and vigor of salt marsh vegetation thereby reducing the ability of the marsh to intercept nutrient and pollutant runoff.

### 5.4.5 Wetlands and Streams

The Proposed Action will result in direct, unavoidable adverse impacts to wetlands as a result of the WCS removal and dike breaching activities. Mechanized equipment and personnel will use upland access points to reach the work areas to the extent practicable, but some intrusion into the wetlands will be necessary. The majority of the direct impact will be to existing wetland vegetation through trampling and removal; however, this disturbance will be limited to the work areas which are relatively small in area compared to the surrounding wetlands. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger wetland system. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community. No streams are associated with the preferred alternative at this project area.

The No Action Alternative would not have a direct adverse impact to wetlands; however, an indirect impact would be expected as the wetlands continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.4.6 Vegetation

Similar to the impacts to wetlands described above, the Proposed Action would have unavoidable, but temporary impacts to vegetation as a result of mechanized equipment and personnel that will perform the WCS removal and dike breachings. The majority of this direct impact will be from trampling and removal; however, this disturbance will be limited to small work areas. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger vegetation community. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community.

The No Action Alternative would not have a direct adverse impact to vegetation; however, an indirect impact would be expected as the plant community will continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.4.7 Marine Resources

The Proposed Action will have unavoidable, but temporary and minor impacts to marine resources and EFH. This potential impact is increased turbidity at the work locations and the subsequent, but relatively minor sedimentation effects. Sediment suspension will occur but is expected to be limited to the immediate work area and not to be a long-term condition since a combination of settling and tidal flushing will attenuate the turbidity. Motile marine resources, such as gastropods, crustaceans, and fish can move away from and avoid areas where disturbances are occurring. Many crustaceans and immobile invertebrates such as molluscs are also highly adapted to turbid conditions.

The No Action Alternative would not result in the above impacts to marine resources or EFH; however, there would be long-term consequences to marine resources from this alternative. The imopropery tidal hydrology would continue to degrade the function of this salt marsh, and in turn, the marsh would not be able to support a healthy ecosystem that marine resources require.

### 5.4.8 Terrestrial Wildlife

The Proposed Action will not have substantial long-term adverse impacts to terrestrial wildlife. This is because of the timing of the work in relation to wildlife use of the refuge, the temporary nature of the disturbance, the mobility of terrestrial wildlife, and the resulting long-term benefits to terrestrial wildlife from the ecological uplift that is the goal of the Proposed Action. The work will be done largely outside of the migratory bird nesting season. As discussed in Chapter 2, the management of migratory bird habitat is one of the primary purposes of the Service, and the management of terrestrial wildlife is an integral component of the Service's mission, the refuge purpose, and the CCP's goals. Thus, the potential for adverse impacts to terrestrial wildlife will be minimized by avoiding the most sensitive time periods during the year. This protection applies not

only to migratory birds, but to mammals, herpetofauna, invertebrates, as well as fish (as discussed in the "Marine Resources" section).

The proposed work is expected to take one day to complete. This is a relatively short time period in relation to the long-term benefits to terrestrial wildlife by saving this salt marsh from permanent loss through inundation and improper tidal hydrology. The removal of the WCSs and the breaching of the dikes will play a major role in maintaining a hydroperiod that supports the salt marsh. The combined preservation, conservation, and ecological uplift of habitat will benefit all forms of wildlife, including some special cases such as that of the saltmarsh sparrow (*Ammodramus maritimus*), an indicator of healthy salt marshes (Rising 2005), whose mid-Atlantic subspecies (*maritimus*) utilizes both high and low marshes.

Terrestrial wildlife also have the ability to avoid or move out of the project area if they find it unsuitable once work activities commence. This change in behavior is in itself an adverse impact in that the organism would use its time and energy to move out of the area - time and energy that would normally be used for feeding, resting, loafing, or mating. The movement of terrestrial wildlife to a new area also exposes those organisms to greater predatory risk and accident. However, the end result in this alteration of behavior is that the organisms would relocate to a more suitable and less stressful area. This is turn benefits the organisms in the long-term provided that they are not harmed along the way. Some terrestrial wildlife are also expected not to move, but to remain in the project area if these individuals do not find the work activities to be disruptive to their normal functioning. While some organisms may be mildly disrupted by work activities, it may not reach the level at which relocation occurs.

The No Action Alternative would not result in any short term impacts to terrestrial wildlife since no work activities would occur that could cause wildlife to move out of the work area or alter their behavior. However, there would be a long-term adverse impact to terrestrial wildlife from this alternative. This alternative would not attempt to correct the current degradation and continued degradation of the salt marsh from sea level rise and improper tidal hydrology, and thus would allow for the loss of important wildlife habitat. Such losses would run counter to the mission, purpose, and goals of the Service, the refuge, and CCP. The Service would not be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

### 5.4.9 Threatened and Endangered Species

**Appendix E** presents a signed Intra-Service Section 7 Biological Evaluation regarding the red knot, Knieskern's beaked-rush, seabeach amaranth, swamp pink, and northern long-eared bat. The Biological Evaluation reports that red knot may occur near the Good Luck Point Project Area, Knieskern's beaked-rush and swamp pink is not known to exist or occur, respectively, in the project areas, seabeach amaranth may occur in the Good Luck Point Project Area east of Bayview Avenue along sections of sandy beach, and summer habitat for northern long-eared bat may occur in the forested areas near but not within the project areas.

With regards to the red knot, email correspondence also included in **Appendix E** indicates that the refuge has found no evidence of use of the Good Luck Point Project Area by this species during surveys 3 times per year from May to July in 2013, 2015, and 2016. The refuge also indicates their

request for the Service's New Jersey Field Office (NJFO) to examine eBird, International Shorebird Survey, and bandedbird.com for records of red knots in the project areas. The nearest records found were from Barnegat Inlet, which is over 11 miles from the nearest project area.

Knieskern's beaked-rush (threatened), an endemic perennial sedge, grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance; it is highly intolerant of competition (USFWS 2014c, USFWS 1997, USFWS 1993). Swamp pink (threatened), an evergreen wetland forb, grows in shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014e).

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. Because this project will occur on salt marsh, the Project would not have the possibility of impacting federally listed threatened and endangered species.

Based on this information, coupled with the Intra-Service Section 7 Biological Evaluation, the Proposed Action will not have substantial long-term environmental impacts to federally listed plant and animal species.

The Project area does not provide habitat for the southern twayblade (rare), one of the State-listed plant species of concern reported to have the potential to occur on or near the Project area. However, the smooth orange milkweed (imperiled) is found in fresh to brackish marshes or wet pinelands (UTA 2016). It has also been documented within the Forked River Woods Natural Heritage Priority Site (**Appendix E)** in which the Project area is contained. Therefore, every effort will be made to ensure individual plants of this species will not be compromised during excavation efforts.

The additional State-listed threatened and endangered animal species or species of special concern that have the potential to be on or near the Project area (e.g., 12 bird species), would be expected to avoid the Project area due to the presence of the work crew. This indirect impact would be temporary, as the Project is only expected to take one working day 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 bird species, as well as other threatened and endangered wildlife that live on or near the Forked River-Wrangle Creek Project Area.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the marsh. However, leaving the marsh in its current condition would lead to further reduction of salt marsh, a habitat type that is critical for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species.

### 5.4.10 Cultural Resources

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE was determined to be low and no further archaeological investigations were conducted.

It has been concluded that the Proposed Action at the Forked River-Wrangle Creek Project Area would not have impacts on historic properties that are eligible for listing in the National Register of Historic Places or on known areas where historic or prehistoric archaeological artifacts have been recorded previously, as no below-ground work would be performed on native soils, only removal of current fill material would occur. However, if any historic or prehistoric artifacts are discovered during the completion of this Project, work would be stopped immediately and the refuge management would be contacted to determine how to proceed. The Service, in consultation with the SHPO, will determine the appropriate management actions and additional Tribal consultation that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources, as no work would be performed in the Project area.

### 5.4.11 Socioeconomic Resources and Environmental Justice

The Proposed Action is not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the county's leading employment industries, including resorts and commercial outfits related to tourism, health care, or commercial fishing. It does not include long-term construction of any facility that would increase the number of permanent jobs in Lacey Township or Ocean County, nor would it have any effect on State or local tax revenue. Only minor, temporary, economic benefits may occur locally through Project area personnel increasing spending at nearby gas stations, hotels, restaurants, hardware stores, other retail shops, etc.

The No Action Alternative would not have any impacts on county or local socioeconomic resources, as no workforce would be required in the Project area.

### 5.4.12 Recreation

While the refuge as a whole receives over 250,000 visitors each year, the Forked River-Wrangle Creek Project Area is only open for deer hunting. It is within Deer Management Zone #58 (Forked River) which allows for permit bow, permit muzzleloader, and permit shotgun hunting during the fall and winter. There are no impacts to the use of the project area by hunters since the work is proposed outside of this hunting season. There will be indirect positive impacts to the recreational use of the refuge, as the long-term goal of the Proposed Action is to enhance the salt marsh ecosystem, which in turn benefits the entire plant and animal communities, benefiting the users of the refuge.

The No Action Alternative would not have any impacts on recreation, as no work would be performed in the Project area.

### 5.4.13 Transportation

The Project does not involve the building, removal, or repair of any major transportation infrastructure. In addition, the Project's scale is small, with minimal personnel required to complete the tasks. Personnel and vehicles would be required to travel along local roads leading to the refuge, such as Sunrise Boulevard. The use of these local roads by the Project crew would also be only very minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling 18,198 cars per day, would not be substantial. Furthermore, the Forked River-Wrangle Creek Project Area is anticipated to only require one working day to complete.

The No Action Alternative would not have any impacts on infrastructure, as no workforce would be required to travel to and from the Project area.

### 5.4.14 Noise

The Project area includes typical ambient noise from a park environment located near the water, such as boat or vehicular traffic and local pedestrian or trespasser activity. Although the noise generated from the track-mounted/wheeled excavators and dump trucks required for dike excavation during the Project is expected to be close to 8-hour threshold levels set for humans, the noise will be typical of any small construction project. In addition, the Project is expected to require only one working day to complete and the Project crew will wear any necessary hearing protection. 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 Project area and public use of the Forked River-Wrangle Creek Project Area is not encouraged. Therefore, Project-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

### 5.4.15 Cumulative Impacts

The geographic area for the assessment of cumulative impacts from the Proposed Action at the Forked River-Wrangle Creek Project Area was largely identified as the Barnegat Bay Central and Tributaries watershed. This watershed includes the municipalities of Berkeley Township, Ocean Gate Borough, Lacey Township, Toms River Township, Seaside Park Borough, Seaside Heights Borough, and Ocean Township. All of these municipalities are located in Ocean County. However, Lacey Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Stouts Creek Project Area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the construction of the impoundment dikes and the two WCSs currently located within the Project area. Additionally, due to habitat loss from development, the watershed has 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 enhancement of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the Project area.

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 in the Project area, 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 Lacey Township *Master Plan Reexamination Report* (Gravatt 2012) revealed that there are no known present or future projects that are anticipated to impact or be impacted by the Proposed Action. A review of the *Ocean County Planning Board Comprehensive Master Plan* (OCPB 2011) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Lacey Township and Ocean County Master Plans presented a number of improvements, past and planned, to the Garden State Parkway, U.S. Route 9, and other major roadways and transportation infrastructure, none are anticipated to adversely affect or be affected by the Proposed Action.

In summary, there would not be any substantial cumulative adverse environmental impact from the Marsh Restoration Project at the Forked River-Wrangle Creek Project Area when considered together with other past, present, and reasonably foreseeable future projects in the area. Also, no long-term adverse impacts are anticipated to result from implementation of the Proposed Action. Furthermore, as the refuge land is managed by full-time staff, any unforeseeable impacts would be mitigated with best management practices. A Draft FONSI has been included as **Appendix H** to this EA.

## 5.5 Barnegat Site

### 5.5.1 Topography

The Proposed Action involves the removal of defunct WCSs and the breaching of dikes. There will be very small and unavoidable impacts to the local topography from the Preferred Alternative at the WCS removal and breach sites; however, the direct changes in topography at the Project Area will occur in man-made features in the landscape. Indirect long-term changes in the topography will occur over many years as the Project Area equalizes to the restored tidal hydrology. These changes in topography are necessary to combat die-back of the native flora due to the currently altered tidal hydrology. The restoration of proper tidal hydrology will create the conditions for which normal sediment exchange between the marsh and the bay will occur.

The No Action Alternative would result in the a negative impact to the local topography as there would be no active correction to the improper tidal hydrology, which will perpetuate the existing degraded condition of the marsh.

### 5.5.2 Geology and Soils

The Proposed Action does not involve negative impacts to soil composition, nor will any of the Project activities extend down to surficial geological layers. The limited amount of soil disturbance will occur in man-made features that were likely created using native soils borrowed from within the vicinity of the WCSs and the dikes. Therefore, the Proposed Action will not have adverse impacts to the local or regional geology and soils.

The No Action Alternative would not result in impacts to the local or regional geology and soils as no dike breaching would occur.

### 5.5.3 Air Quality

The Proposed Action at the Barnegat Project Area is not expected to have a substantial environmental impact to air quality. Some temporary impacts are expected, as the Proposed Action will involve the use of emission-producing vehicles and machinery. However, those emissions are predicted to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and off-road vehicles and machinery will be up-to-date in their registration and inspections, and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

### 5.5.4 Water Quality

Healthy salt marshes are well documented to provide the important ecosystem service of improving water quality of their surrounding estuaries by removing nutrients, sediments, organic matter, and contaminants from surface water runoff and tidal influx (Koch and Gobler 2009, Nelson and Zavaleta 2012). The removal of nutrients, nitrogen in particular, occurs primarily through three major environmental processes: (1) plant uptake in tissue, (2) denitrification by microbial communities, and (3) burial in marsh sediments (Nelson and Zavaleta 2012, Velinsky et al. 2013). The major source of the eutrophication problems observed in the Barnegat Bay is attributable to nitrogen loading into the salt marsh from agricultural runoff, stormwater discharges, and restricted tidal flushing (Velinksy et al. 2013). The eutrophication of Barnegat Bay will increase over time if the surrounding salt marshes are allowed to continue to degrade from sea level rise.

Healthy salt marsh, as defined by plant cover, and the ability of a well vegetated marsh to improve water quality is also well documented and studied (NERRSSC 2015). Likewise, the contrary condition, a poorly vegetated salt marsh does not perform as well in nutrient and pollutant removal since the marsh lacks the plant biomass to assimilate these materials (Koch and Gobler 2009). Thus accelerated sea level rise have indirect adverse impacts to water quality by directly impacting the ability of a salt marsh to sustain a healthy vegetation community (NERRSSC 2015). This condition is further worsened by the decomposition of salt marsh vegetation that is killed by rising water levels, adding another nutrient and pollutant source into the surrounding estuaries (Nelson and Zavaleta 2012).

The Proposed Action is intended to preserve and enhance the salt marsh vegetation community by counteracting the deleterious effects of sea level rise and impaired tidal hydrology. The environmental consequence of the preferred alternative is a sustainment and improvement of the salt marshes' ability to provide water quality services in areas of currently healthy and degraded marsh, respectively. Nevertheless, there will be some unavoidable but temporary and minor adverse impacts resulting from the implementation of the preferred alternative.

The disturbances caused by the removal of the WCSs and dike breachings are temporary and localized. These work areas will return to stable conditions as sedimentation and tidal circulation occurs over time. The restoration of tidal hydrology will also result in an increase in the salinity of the interior of the project area, as tidal waters will flow more freely landward. Sedimentation rates are difficult to predict and vary widely among different aquatic systems. While major factors such as grain size and water action play an obvious role, other factors such as the physiochemical interactions between saline and fresh water, the clay and organic matter content in the water column, temperature, and pH all play a role in determining the rate at which the clarity of the water will return (ERDC 2005).

The No Action Alternative would not result in direct impacts to water quality at the Barnegat Project Area as no activities that suspend sediment would occur. However, there will be indirect impacts to water quality at the Project Area as the salt marshes would continue to be subject to the adverse effects of sea level rise and altered tidal hydrology. These conditions would continue to reduce the extent and vigor of salt marsh vegetation thereby reducing the ability of the marsh to intercept nutrient and pollutant runoff.

### 5.5.5 Wetlands and Streams

The Proposed Action will result in direct, unavoidable adverse impacts to wetlands as a result of the WCS removal and dike breaching activities. Mechanized equipment and personnel will use upland access points to reach the work areas to the extent practicable, but some intrusion into the wetlands will be necessary. The majority of the direct impact will be to existing wetland vegetation through trampling and removal; however, this disturbance will be limited to the work areas which are relatively small in area compared to the surrounding wetlands. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger wetland system. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community. No streams are associated with the preferred alternative at this project area.

The No Action Alternative would not have a direct adverse impact to wetlands; however, an indirect impact would be expected as the wetlands continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.5.6 Vegetation

Similar to the impacts to wetlands described above, the Proposed Action would have unavoidable, but temporary impacts to vegetation as a result of mechanized equipment and personnel that will

perform the WCS removal and dike breachings. The majority of this direct impact will be from trampling and removal; however, this disturbance will be limited to small work areas. Additionally, these temporary and localized disturbances are for the long-term benefit of the larger vegetation community. These disturbed areas are expected to rebound through tidal flushing and revegetation from the surrounding plant community.

The No Action Alternative would not have a direct adverse impact to vegetation; however, an indirect impact would be expected as the plant community will continue to degrade as a result of improper tidal hydrology, leading to further vegetation die-back, and a continued decrease in ecosystem function.

### 5.5.7 Marine Resources

The Proposed Action will have unavoidable, but temporary and minor impacts to marine resources and EFH. This potential impact is increased turbidity at the work locations and the subsequent, but relatively minor sedimentation effects. Sediment suspension will occur but is expected to be limited to the immediate work area and not to be a long-term condition since a combination of settling and tidal flushing will attenuate the turbidity. Motile marine resources, such as gastropods, crustaceans, and fish can move away from and avoid areas where disturbances are occurring. Many crustaceans and immobile invertebrates such as molluscs are also highly adapted to turbid conditions.

The No Action Alternative would not result in the above impacts to marine resources or EFH; however, there would be long-term consequences to marine resources from this alternative. The improper tidal hydrology would continue to degrade the function of this salt marsh, and in turn, the marsh would not be able to support a healthy ecosystem that marine resources require.

### 5.5.8 Terrestrial Wildlife

The Proposed Action will not have substantial long-term adverse impacts to terrestrial wildlife. This is because of the timing of the work in relation to wildlife use of the refuge, the temporary nature of the disturbance, the mobility of terrestrial wildlife, and the resulting long-term benefits to terrestrial wildlife from the ecological uplift that is the goal of the Proposed Action. The work will be done largely outside of the migratory bird nesting season. As discussed in Chapter 2, the management of migratory bird habitat is one of the primary purposes of the Service, and the management of terrestrial wildlife is an integral component of the Service's mission, the refuge purpose, and the CCP's goals. Thus, the potential for adverse impacts to terrestrial wildlife will be minimized by avoiding the most sensitive time periods during the year. This protection applies not only to migratory birds, but to mammals, herpetofauna, invertebrates, as well as fish (as discussed in the "Marine Resources" section).

The proposed work is expected to take ten days to complete. This is a relatively short time period in relation to the long-term benefits to terrestrial wildlife by saving this salt marsh from permanent loss through inundation and improper tidal hydrology. The removal of the WCSs and the breaching of the dikes will play a major role in maintaining a hydroperiod that supports the salt marsh. The combined preservation, conservation, and ecological uplift of habitat will benefit all forms of

wildlife, including some special cases such as that of the saltmarsh sparrow (*Ammodramus maritimus*), an indicator of healthy salt marshes (Rising 2005), whose mid-Atlantic subspecies (*maritimus*) utilizes both high and low marshes.

Terrestrial wildlife also have the ability to avoid or move out of the project area if they find it unsuitable once work activities commence. This change in behavior is in itself an adverse impact in that the organism would use its time and energy to move out of the area - time and energy that would normally be used for feeding, resting, loafing, or mating. The movement of terrestrial wildlife to a new area also exposes those organisms to greater predatory risk and accident. However, the end result in this alteration of behavior is that the organisms would relocate to a more suitable and less stressful area. This is turn benefits the organisms in the long-term provided that they are not harmed along the way. Some terrestrial wildlife are also expected not to move, but to remain in the project area if these individuals do not find the work activities to be disruptive to their normal functioning. While some organisms may be mildly disrupted by work activities, it may not reach the level at which relocation occurs.

The No Action Alternative would not result in any short term impacts to terrestrial wildlife since no work activities would occur that could cause wildlife to move out of the work area or alter their behavior. However, there would be a long-term adverse impact to terrestrial wildlife from this alternative. This alternative would not attempt to correct the current degradation and continued degradation of the salt marsh from sea level rise and improper tidal hydrology, and thus would allow for the loss of important wildlife habitat. Such losses would run counter to the mission, purpose, and goals of the Service, the refuge, and CCP. The Service would not be able to fulfill its mission for the conservation and management of wildlife habitat, including migratory bird habitat.

### 5.5.9 Threatened and Endangered Species

**Appendix E** presents a signed Intra-Service Section 7 Biological Evaluation regarding the red knot, Knieskern's beaked-rush, seabeach amaranth, swamp pink, and northern long-eared bat. The Biological Evaluation reports that red knot may occur near the Good Luck Point Project Area, Knieskern's beaked-rush and swamp pink is not known to exist or occur, respectively, in the project areas, seabeach amaranth may occur in the Good Luck Point Project Area east of Bayview Avenue along sections of sandy beach, and summer habitat for northern long-eared bat may occur in the forested areas near but not within the project areas.

With regards to the red knot, email correspondence also included in **Appendix E** indicates that the refuge has found no evidence of use of the Good Luck Point Project Area by this species during surveys 3 times per year from May to July in 2013, 2015, and 2016. The refuge also indicates their request for the Service's New Jersey Field Office (NJFO) to examine eBird, International Shorebird Survey, and bandedbird.com for records of red knots in the project areas. The nearest records found were from Barnegat Inlet, which is over 11 miles from the nearest project area.

Knieskern's beaked-rush (threatened), an endemic perennial sedge, grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance; it is highly intolerant of competition (USFWS 2014c, USFWS 1997, USFWS 1993). Swamp pink (threatened), an evergreen wetland forb, grows in

shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014e).

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. Because this project will occur on salt marsh, the Project would not have the possibility of impacting federally listed threatened and endangered species.

Based on this information, coupled with the Intra-Service Section 7 Biological Evaluation, the Proposed Action will not have substantial long-term environmental impacts to federally listed plant and animal species.

The Project area does not provide habitat for the three State-listed plant species of concern reported to have the potential to occur on or near the Project area. New Jersey rush (imperiled) prefers to grow in sphagnous bogs and swamps (Schuyler 1990), Pine barren gentian (rare) usually grows in wet pine barrens habitat and coastal bogs (USBG 2016), and curly grass fern (rare) grows on hummocks, around edges, or on tree bases in bogs, such as *Sphagnum* bogs. It can also be found within open wooded habitats such as savannas, pine barrens, or low mossy open woods (NatureServe 2015b). None of these habitat types are included within the project area, therefore the Project will not adversely impact these State-listed threatened and endangered plant species.

The additional State-listed threatened and endangered animal species or species of special concern that have the potential to be on or near the Project area (e.g., 12 bird species), would be expected to avoid the Project area due to the presence of the work crew. This indirect impact would be temporary, as the Project is only expected to take ten working days to complete. In addition, the ecological uplift resulting from the restoration of healthy salt mash habitat within their home range would have an indirect, long-term, and beneficial impact to these bird species, as well as other threatened and endangered wildlife that live on or near the Barnegat Project Area. The three State-listed turtle species documented as having the potential to be on or near the Project area [Atlantic loggerhead sea turtle (endangered), Kemp's Ridley sea turtle (endangered), and Atlantic green sea turtle (threatened)] may be found in the bay east of the Project area, but are not expected to migrate into the brackish inlets within the Project boundaries.

The No Action Alternative would not have any direct impacts to threatened and endangered species, as no activities would occur in the marsh. However, leaving the marsh in its current condition would lead to further reduction of salt marsh, a habitat type that is critical for breeding, nesting, and foraging for Federal and State-listed threatened and endangered species.

### 5.5.10 Cultural Resources

Due to the results of the previously conducted archaeological investigation, and the lack of historical properties found within the APE, the potential for intact cultural deposits within the APE was determined to be low and no further archaeological investigations were conducted. Although shell mounds from an unknown period are documented near the Project boundary, the breaching of the dikes to restore tidal flow within the impoundments only involves the movement of soils

that were placed there in current times in order to create the impoundments. Therefore, the Proposed Action has no potential to affect historic properties that may still remain in that area.

It has been concluded that the Proposed Action at the Brick Township Project Area would not have impacts on historic properties that are eligible for listing in the National Register of Historic Places or on known areas where historic or prehistoric archaeological artifacts have been recorded previously, as no below-ground work would be performed on native soils, only removal of current fill material would occur. However, if any historic or prehistoric artifacts are discovered during the completion of this Project, work would be stopped immediately and the refuge management would be contacted to determine how to proceed. The Service, in consultation with the SHPO, will determine the appropriate management actions and additional Tribal consultation that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources, as no work would be performed in the Project area.

### 5.5.11 Socioeconomic Resources and Environmental Justice

The Proposed Action is not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the county's leading employment industries, including resorts and commercial outfits related to tourism, health care, or commercial fishing. It does not include long-term construction of any facility that would increase the number of permanent jobs in Barnegat Township or Ocean County, nor would it have any effect on State or local tax revenue. Only minor, temporary, economic benefits may occur locally through Project area personnel increasing spending at nearby restaurants, hardware supply stores, etc.

The No Action Alternative would not have any impacts on county or local socioeconomic resources, as no workforce would be required in the Project area.

### 5.5.12 Recreation

The Barnegat Project Area is frequented by visitors to the Barnegat Observation Platform and boardwalk accessible off of Bayshore Drive. This boardwalk and observation platform is visited by birders and other nature enthusiasts, providing a safe and convenient location to observe the surrounding wildlife and landscape. The Proposed Action will not have any adverse impacts to the recreational use of the refuge. There may be some temporary impacts from the public avoiding the refuge during construction as the project activities may cause some wildlife to move away from the area. Some visitation may also decrease in response to construction noise. However, visitation also has the potential to increase as the public becomes aware of, and curious about, the marsh enhancement activities. Furthermore, the long-term benefit of the preferred action is to enhance the marsh system, which in turn provides for better habitat for wildlife and subsequently, better opportunities for the viewing public in the future.

The No Action Alternative would not result in any potential disruption of the use of the observation platform and boardwalk, but there would be a long-term adverse impact if the salt marsh system is allowed to continue to degrade. Such degradation would eventually result in the diminished use

of the marsh by wildlife, and subsequently, a diminished use of the observation platform and boardwalk by nature enthusiasts.

### 5.5.13 Transportation

The Project does not involve the building, removal, or repair of any major transportation infrastructure. In addition, the Project's scale is small, with minimal personnel required to complete the tasks. Personnel and vehicles would be required to travel along local roads leading to the refuge, such as East Bay Avenue and Bay Shore Drive. The use of these local roads by Project crew would also be only very minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling 17,890 cars per day, would not be substantial. Furthermore, the Barnegat Project Area is anticipated to only require ten working days to complete.

The No Action Alternative would not have any impacts on infrastructure, as no workforce would be required to travel to and from the Project area.

### 5.5.14 Noise

The Project 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. Although the noise generated from the track-mounted/wheeled excavators and dump trucks required for dike excavation during the Project is expected to be close to 8-hour threshold levels set for humans, the noise will be typical of any small construction project. In addition, the Project is expected to require only ten working days to complete and the Project crew will wear any necessary hearing protection. 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 Project area and public use of the Forked River-Wrangle Creek Project Area is not encouraged. Therefore, Project-related noise would not jeopardize the health or welfare of the public or the wildlife in the area.

### 5.5.15 Cumulative Impacts

The geographic area for the assessment of cumulative impacts from the Proposed Action at the Barnegat Project Area was largely identified as the Waretown Creek/Barnegat Bay South watershed. This watershed includes the municipalities of Ocean Township, Barnegat Light Borough, Berkeley Township, Long Beach Township, Barnegat Township, Stafford Township, and Harvey Cedars Borough. All of these municipalities are located in Ocean County. However, Barnegat Township was the only municipality included in the geographic area of this cumulative impacts assessment as the Barnegat Project Area's drainage occurs only within this municipality.

Substantial changes were made to the aquatic environment by the construction of the impoundment dikes and the seven WCSs currently located within the Project area. Additionally, due to habitat loss from development, the watershed has 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 enhancement

of coastal marsh habitat. The Proposed Action will not induce development, land use change, or other external pressure to the Project area.

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 in the Project area, 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.

The 2011 Barnegat Township Master Plan was not readily available for review. However, a review of the *Ocean County Planning Board Comprehensive Master Plan* (OCPB 2011) did not reveal any potential conflicts between the Proposed Action and future planned activities for the county. While the Ocean County Master Plan presented a number of improvements, past and planned, to the Garden State Parkway, U.S. Route 9, and other major roadways and transportation infrastructure, none are anticipated to adversely affect or be affected by the Proposed Action.

In summary, there would not be any substantial cumulative adverse environmental impact from the Marsh Restoration Project at the Barnegat Project Area when considered together with other past, present, and reasonably foreseeable future projects in the area. A Draft FONSI has been included as **Appendix H** to this EA.

## Chapter 6 - References


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## Chapter 7 - List of Preparers

This Environmental Assessment was prepared by Virginia Rettig, Paul Castelli, Vinny Turner, Amy Drohan, Mason Sieges, Rebecca Reeves, Tim Binzen, and Marc Virgilio from the Service, Edwin B. Forsythe National Wildlife Refuge, Oceanville, New Jersey. Assistance was provided by Charles Harman, P.W.S.

# APPENDIX A

# PHOTOGRAPHS

# PHOTOLOG FOR THE BRICK TOWNSHIP PROJECT AREA

**Photo 1**

**Typical view of the marsh system in Brick A.**

**Photo 2**

**BRA-1 on left side of photo; BRA-2 on right side of photo.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Brick Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 3**

**BRA-1 on right side of photo; BRA-2 on left side of photo.**

**Photo 4**

**BRA-2, facing west.**

**Photo 5**

**Typical view of the marsh system in Brick B.**

**Photo 6**

**BRB-3 in foreground, BRB-2 in background, facing west.**

**Photo 7**

**BRB-2, facing north.**

**Photo 8**

**General view of BRB-3.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Brick Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 9**

**BRB-3, facing east, with BRB-4 in background.**

**Photo 10**

**General view of BRB-3.**

# PHOTOLOG FOR THE GOOD LUCK POINT PROJECT AREA

**Photo 1**

**Northern portion of the project area, facing northwest.**

**Photo 2**

**Northern portion of the project area, facing southwest.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Good Luck Point Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 3**

**Northern portion of the project area, facing south-southwest.**

**Photo 4**

**Northern portion of the project area, facing southeast.**

**Photo 5**

**Central portion of the project area, facing southwest.**

**Photo 6**

**South-central portion of the project area, facing south.**

**Photo 7**

**Central portion of the project area, facing northeast.**

**Photo 8**

**Central portion of the project area, facing north-northeast.**

# PHOTOLOG FOR THE STOUTS CREEK PROJECT AREA

**Photo 1**

**General view of the eastern pool, facing east. Breach E is in the background of the photo.**

**Photo 2**

**Additional general photo of the eastern pool, facing north.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Stouts Creek Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 3**

**Breach A, facing southwest.**

**Photo 4**

**Marsh area outside of Breach B.**

**Photo 5**

**Breach B area.**

**Photo 6**

**Breach C area.**

**Photo 7**

**Area around Breach C. Breach C is behind the camera.**

**Photo 8**

**Area around Breach D.**

**Photo 9**

**Breach E.**

**Photo 10**

**Alternate view of Breach E.**

**Photo 11**

**Northern pool, facing west.**

**Photo 12**

**View of dike between western and northern pools, facing west.**

# PHOTOLOG FOR THE FORKED RIVER-WRANGLE CREEK PROJECT AREA

**Photo 1**

**General view of project area, facing south.**

**Photo 2**

**General view of the western portion of the site, facing south.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Forked River – Wrangle Creek Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 3**

**Eastern edge of dike that bisects the project area, facing south.**

**Photo 4**

**Camera atop Breach A, facing west.**

**Photo 5**

**Culvert at Breach A.**

**Photo 6**

**Piezometer at Breach A.**

**Photo 7**

**At Breach B, facing east.**

**Photo 8**

**Alternate photo at Breach B, facing east.**

# PHOTOLOG FOR THE BARNEGAT PROJECT AREA

**Photo 1**

**Pool 1, facing northwest.**

**Photo 2**

**Pool 1, facing west.**

**PHOTOGRAPHIC LOG**

Edwin B. Forsythe National Wildlife Refuge
Barnegat Project Area
Ocean County, New Jersey

Amec Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

**Photo 3**

**General view of Pool 2.**

**Photo 4**

**General view of Pool 3.**

**Photo 5**

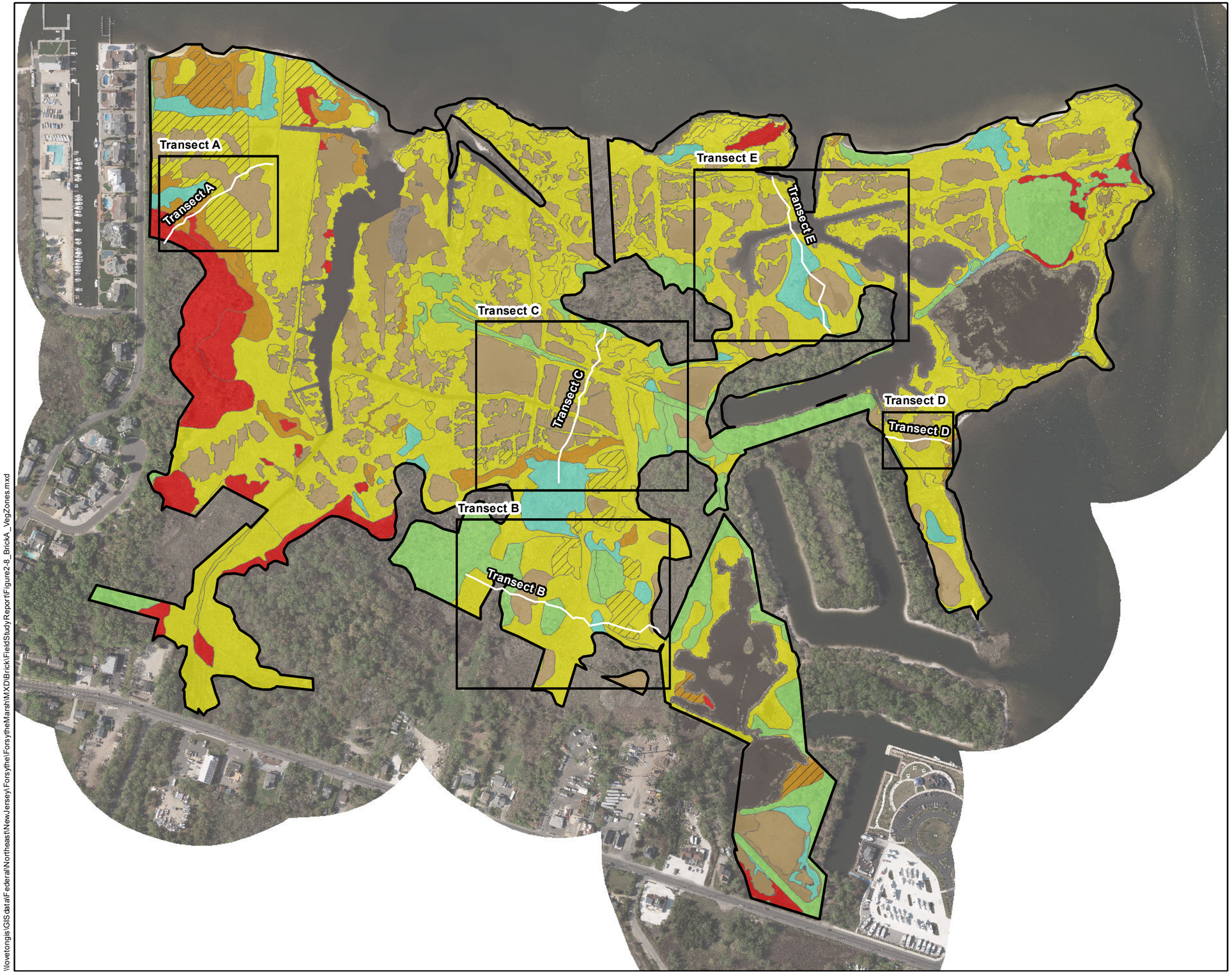
**Alternate general view of Pool 3.**

**Photo 6**

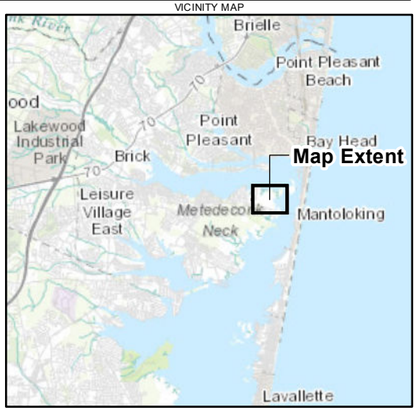
**General view of Pool 4.**

# APPENDIX B

# VEGETATION SURVEY MAPS




VICINITY MAP




**Legend**

Project Boundary

Transect

Vegetation Type

- BH - Beach
- HSM - North Atlantic High Salt Marsh
- STRESSED HSM - Stressed North Atlantic High Salt Marsh
- LSM - North Atlantic Low Salt Marsh
- STRESSED LSM - Stressed North Atlantic Low Salt Marsh
- MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne
- SCRB - Various Scrub-Shrub Vegetation Communities
- TPM - Reed Tidal Marsh
- UW - Various Dominantly Upland Woody Vegetation Communities

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/6/2016

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Feet

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-8**
**Brick Project Area A**
**Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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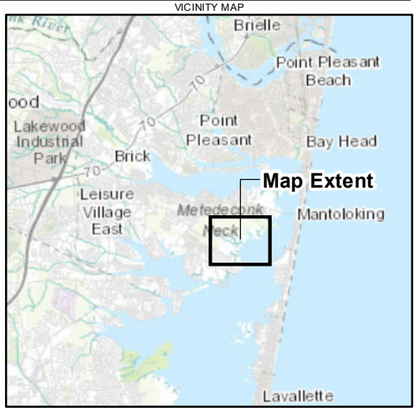


**Legend**

- Project Area B
- Control Area
- Transect

Vegetation Type

- HSM - North Atlantic High Salt Marsh
- STRESSED HSM - Stressed North Atlantic High Salt Marsh
- LSM - North Atlantic Low Salt Marsh
- STRESSED LSM - Stressed North Atlantic Low Salt Marsh
- LHSM - Combination of North Atlantic Low and High Salt Marsh
- MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne
- SCRB - Various Scrub-Shrub Vegetation Communities
- TPM - Reed Tidal Marsh
- UW - Various Dominantly Upland Woody Vegetation Communities

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/6/2016

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-9**
**Brick Project Area B and Control Area Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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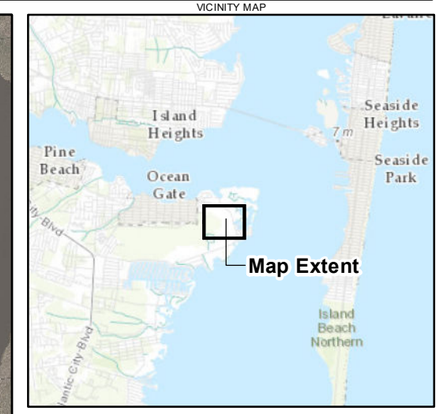


**Legend**

- Project Boundary
- Transect

Vegetation Type

- HSM - North Atlantic High Salt Marsh
- STRESSED HSM - Stressed North Atlantic High Salt Marsh
- LSM - North Atlantic Low Salt Marsh
- STRESSED LSM - Stressed North Atlantic Low Salt Marsh
- Combination of North Atlantic Low and High Salt Marsh
- MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne
- SCRB - Various Scrub-Shrub Vegetation Communities
- TPM - Reed Tidal Marsh
- UW - Various Dominantly Upland Woody Vegetation Communities

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/6/2016

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Feet

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-21**
**Good Luck Point**
**Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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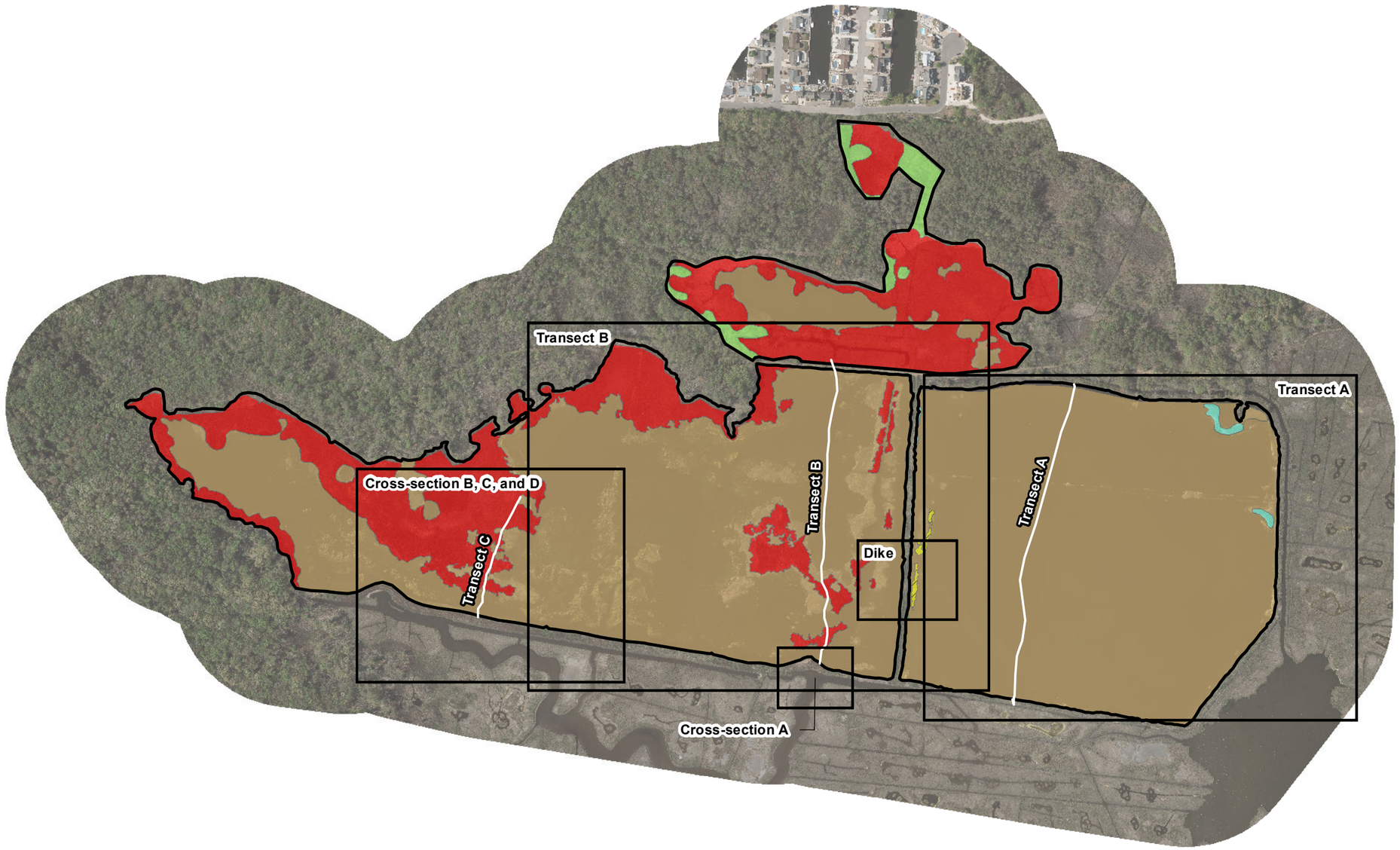
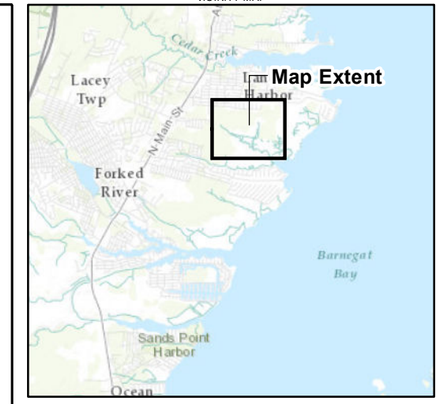



VICINITY MAP




**Legend**

Project Boundary

Transect

Vegetation Type

STRESSED LSM - Stressed North Atlantic Low Salt Marsh

MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne

SCRB - Various Scrub-Shrub Vegetation Communities

TPM - Reed Tidal Marsh

UW - Various Dominantly Upland Woody Vegetation Communities

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/6/2016

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Feet

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-24**
**Stouts Creek**
**Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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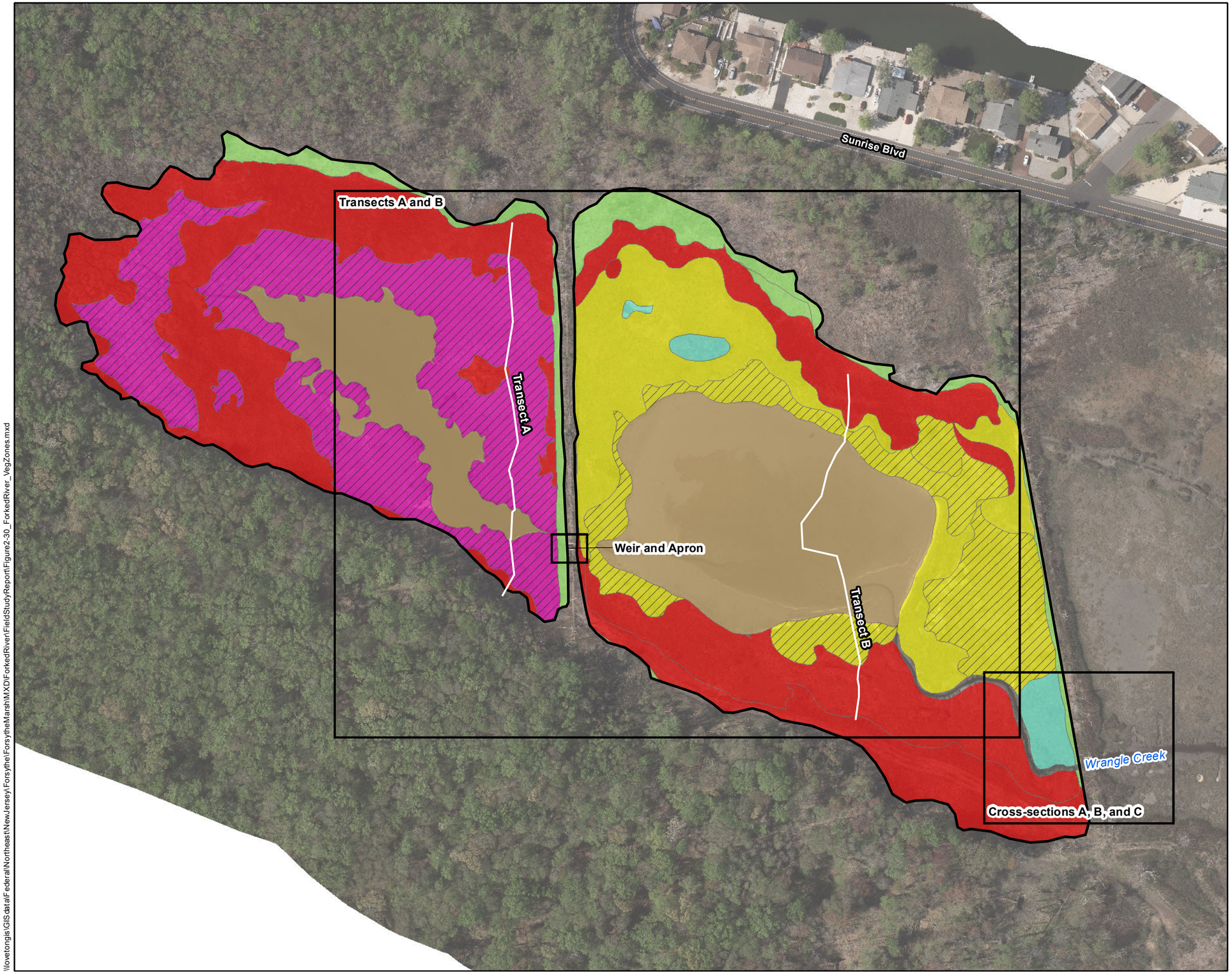


VICINITY MAP

**Legend**

Project Boundary

Transect

Vegetation Type

- LSM - North Atlantic Low Salt Marsh
- STRESSED LSM - Stressed North Atlantic Low Salt Marsh
- MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne
- SCRB - Various Scrub-Shrub Vegetation Communities
- TPM - Reed Tidal Marsh
- STRESSED SPM - Stressed Coastal Salt Pond Marsh
- UW - Various Dominantly Upland Woody Vegetation Communities

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/12/2016

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-30**
**Forked River/Wrangle Impoundment Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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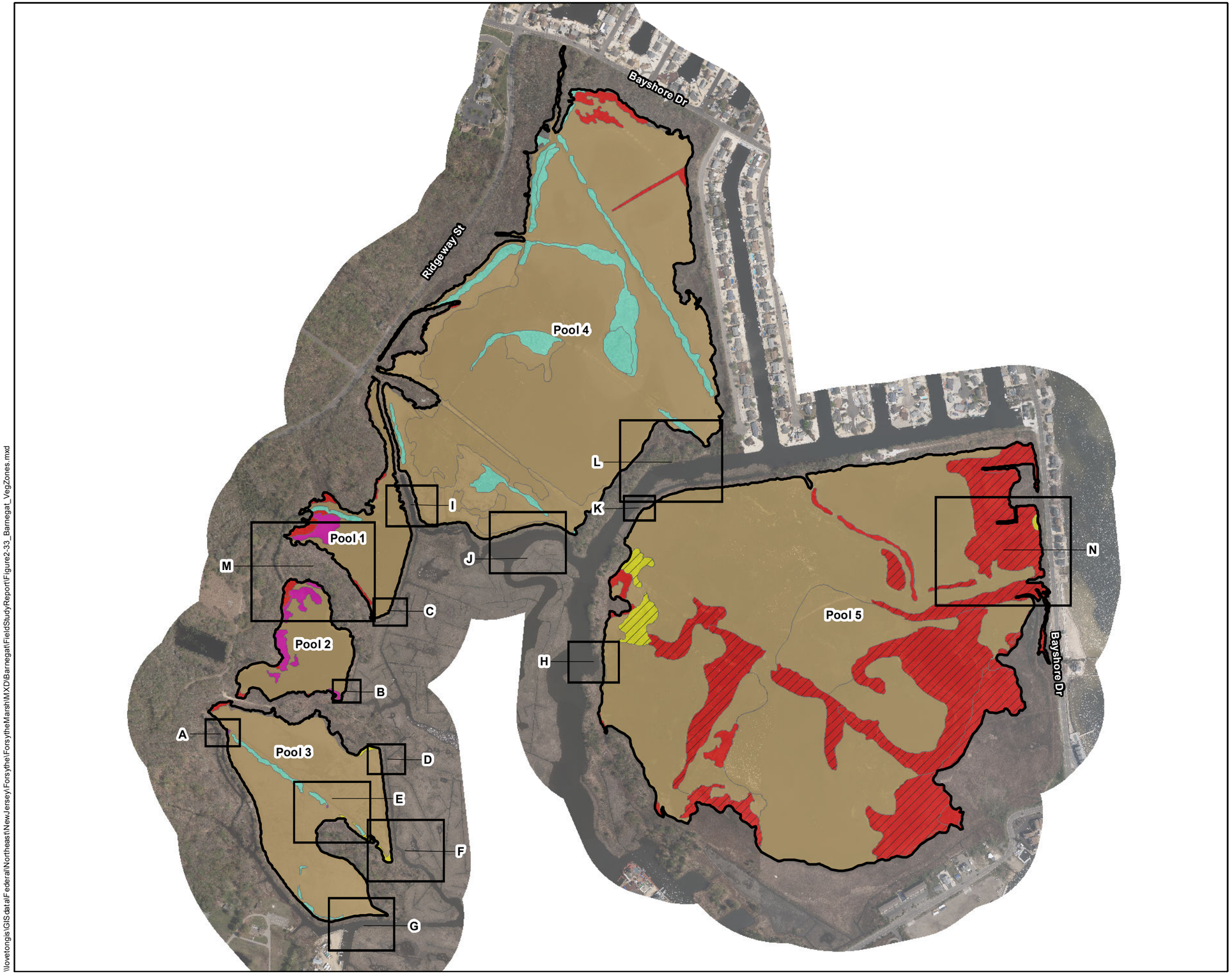


VICINITY MAP

## Legend

Project Boundary

Vegetation Type

- LSM - North Atlantic Low Salt Marsh
- STRESSED LSM - Stressed North Atlantic Low Salt Marsh
- Combination of North Atlantic Low and High Salt Marsh
- MUDF - North Atlantic Coast Estuarine Intertidal Mudflats/Salt Panne
- SCRB - Various Scrub-Shrub Vegetation Communities
- TPM - Reed Tidal Marsh
- STRESSED TPM - Stressed Reed Tidal Marsh
- SPM - Coastal Salt Pond Marsh

The description of Upland Woody was not assigned in the field, but a description of SCRB, TPM, or SCRB/TPM was given to these areas as a more descriptive term.

Horizontal Datum: NAD83 UTM 18N Foot US

Aerial: Quantum Spatial 2015
Boundary: USFWS 2015

Map Date: 1/6/2016

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Feet

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EA Engineering, Science, and Technology, Inc., PBC

**Figure 2-33**
**Barnegat**
**Vegetation Zones**
E.B. Forsythe Marsh
Resiliency Project #37C
Ocean County, New Jersey

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# APPENDIX C

# HABITAT ELEVATION DATA TABLES

## Table A41. Brick Summary Table

| Habitat Type | Area A – 130 Acres | | | | Brick 1 Transducer[1] | Area B – 143 Acres | | | | Brick 2 Transducer[1] | Control – 106 Acres | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min[1] | Max[1] | Average[1,2] | Acreage | | Min[1] | Max[1] | Average[1,2] | Acreage | | Min[1] | Max[1] | Average[1,2] | Acreage |
| MUDF | -0.94 | 0.59 | -0.17 | 33.69 | | -0.86 | 0.34 | -0.25 | 25.14 | | -0.55 | -0.01 | -0.28 | 10.45 |
| STRESSED LSM | -0.06 | 0.14 | 0.04 | 4.30 | MLW 0.110 | 0.00 | 0.49 | 0.20 | 40.10 | MLW 0.383 | -0.20 | 0.39 | 0.17 | 55.18 |
| LSM | -0.16 | 0.58 | 0.17 | 57.58 | | -0.27 | 0.62 | 0.23 | 26.44 | | 0.48 | 0.48 | ---[3] | 12.26 |
| LHSM | 0.29 | 0.75 | 0.52 | 0.00 | | 0.06 | 0.82 | 0.43 | 0.13 | | 0.47 | 0.47 | 0.47 | 0.00 |
| STRESSED HSM | ---[3] | ---[3] | ---[3] | 1.48 | MHW 0.600 | ---[3] | ---[3] | ---[3] | 0.63 | MHW 1.057 | ---[3] | ---[3] | ---[3] | 0.25 |
| HSM | 0.53 | 0.79 | 0.66 | 3.61 | | 0.63 | 0.92 | 0.77 | 22.76 | | 0.61 | 0.93 | 0.77 | 6.13 |
| TPM | 0.65 | 1.25 | 1.01 | 6.55 | | 0.34 | 0.51 | 0.48 | 7.01 | | ---[3] | ---[3] | ---[3] | 0.93 |
| SCRB | 0.48 | 2.53 | 1.47 | 4.67 | | ---[3] | ---[3] | ---[3] | 1.26 | | ---[3] | ---[3] | ---[3] | 1.41 |
| SCRB/TPM | 0.65 | 0.94 | ---[3] | ---[4] | | ---[3] | ---[3] | ---[3] | ---[4] | | ---[3] | ---[3] | ---[3] | ---[4] |
| UW | ---[3] | ---[3] | ---[3] | 13.10 | | ---[3] | ---[3] | ---[3] | 7.85 | | ---[3] | ---[3] | ---[3] | 13.30 |
| OPEN WATER | ---[3] | ---[3] | ---[3] | 4.91 | | ---[3] | ---[3] | ---[3] | 11.68 | | ---[3] | ---[3] | ---[3] | 6.09 |
| BH | ---[3] | ---[3] | ---[3] | 0.11 | | ---[3] | ---[3] | ---[3] | 0.00 | | ---[3] | ---[3] | ---[3] | 0.00 |

1. Elevations are in NAVD 88.
2. Excludes edge points – edge points are RTK field collected elevation points on the boundaries between two vegetation communities and may not accurately represent the average elevation of either vegetation community but were used for minimum and maximum edge points.
2. Not included in surveyed transects, spot elevations, or cross-sections.
3. In desktop analysis, habitat type was either identified as TPM or SCRB; therefore, no acreages are reported.

**Table A42. Good Luck Point Summary Table**

| Habitat Type | GLP 2 Transducer[1] | GLP Project Area – 61 Acres | | | | GLP 1 Transducer[1] |
|---|---|---|---|---|---|---|
| | | Min[1] | Max[1] | Average[1,2] | Acreage | |
| MUDF | | -0.90 | 0.20 | -0.27 | 22.39 | |
| STRESSED LSM | MLW 0.33 | 0.09 | 0.41 | 0.24 | 2.24 | MLW 0.06 |
| LSM | | 0.11 | 0.37 | 0.22 | 7.32 | |
| LHSM | | 0.23 | 0.50 | 0.35 | 0.24 | |
| STRESSED HSM | MHW 0.53 | 0.17 | 0.48 | 0.30 | 1.58 | MHW 0.78 |
| HSM | | 0.36 | 0.62 | 0.49 | 8.46 | |
| TPM | | 0.26 | 0.26 | 0.26 | 0.16 | |
| SCRB | | 0.44 | 2.39 | 1.58 | 0.05 | |
| SCRB/TPM | | 0.21 | 0.76 | 0.57 | ---[4] | |
| UW | | ---[3] | ---[3] | ---[3] | 16.21 | |
| OPEN WATER | | ---[3] | ---[3] | ---[3] | 2.35 | |
| BH | | ---[3] | ---[3] | ---[3] | 0.00 | |

1. Elevations are in NAVD 88.
2. Excludes edge points – edge points are RTK field collected elevation points on the boundaries between two vegetation communities and may not accurately represent the average elevation of either vegetation community but were used for minimum and maximum edge points.
2. Not included in surveyed transects, spot elevations, or cross-sections.
3. In desktop analysis, habitat type was either identified as TPM or SCRB; therefore, no acreages are reported.

# APPENDIX D

# ESSENTIAL FISH HABITAT ASSESSMENT

# Edwin B. Forsythe National Wildlife Refuge 37c Marsh Enhancement Project

# Essential Fish Habitat Assessment

**Prepared By**

**U.S. Fish and Wildlife Service**
**June 24, 2016**
**Project No: F15PD00834**
**Edwin B Forsythe NWR, 800 Great Creek Road, Oceanville, New Jersey 08231**

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# 1 Introduction

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth procedures to identify, conserve, and enhance Essential Fish Habitat (EFH) for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2015). The Magnuson-Stevens Act requires Federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015).

The Proposed Action is to open areas of restricted tidal flow and to increase the elevation of some areas of the refuge so that the habitat values are increased, the marshes are more resilient to sea level rise and coastal storms and to manage the habitats of the refuge in accordance with the Comprehensive Management Plan within the U.S. Fish & Wildlife Service (the Service) Edwin B. Forsythe National Wildlife Refuge (the refuge).

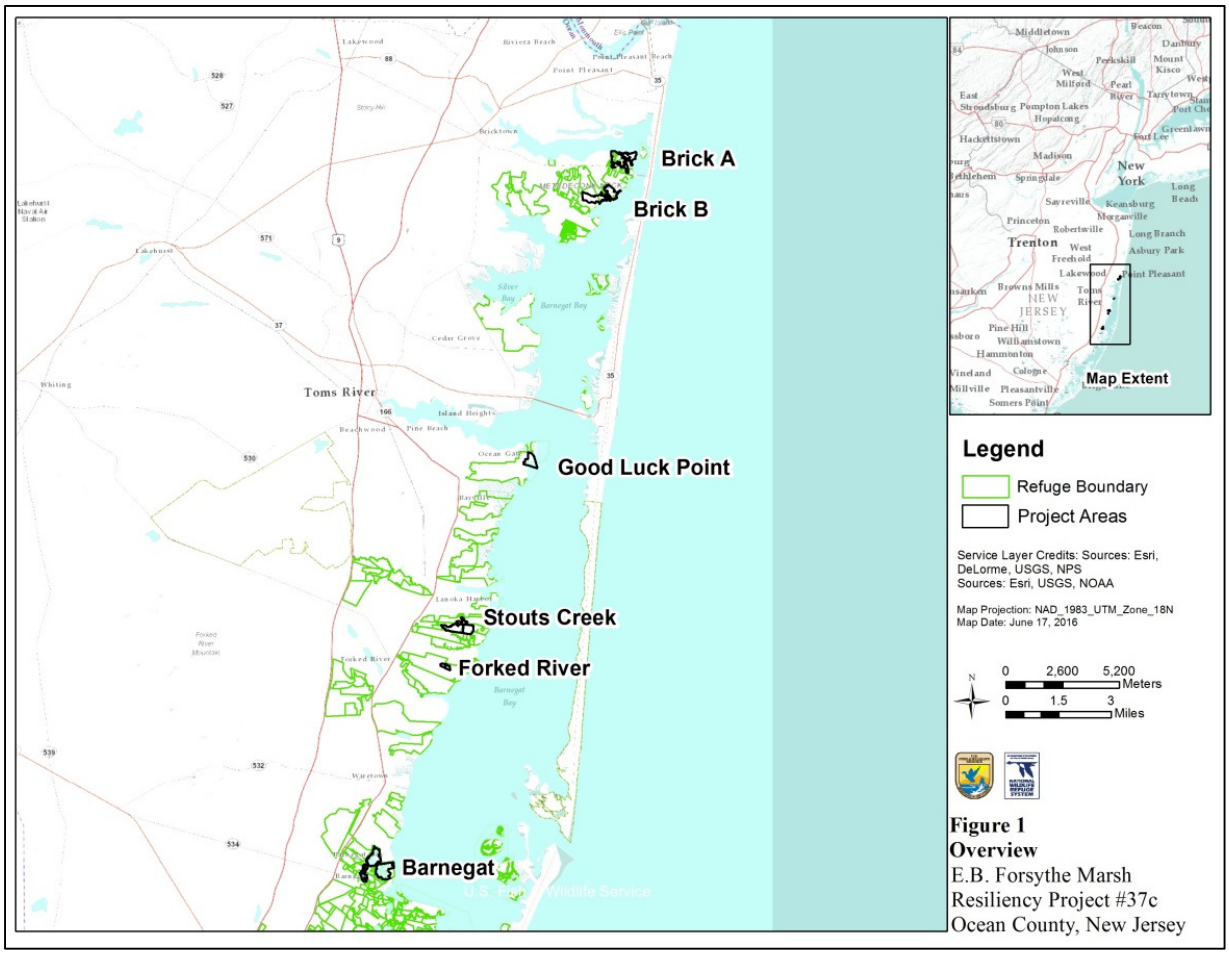
This EFH Assessment was prepared for the Marsh Enhancement and Telephone Pole Array Removal Design/Build Project within the refuge.

# 2 Proposed Action

The refuge is presenting and evaluating the impacts of site specific proposed actions for tidal marsh restoration, which is also guided by the Refuge's Comprehensive Conservation Plan (2013) and the Refuge's Habitat Management Plan (USFWS 2013). This Project will be conducted as the second phase of the Service's Marsh Enhancement and Telephone Pole Array Removal Project (Contract #P11PC00121). This phase of the Project would take place at five separate areas within the refuge.

An Assessment has been developed for sediment enrichment at three project areas (Brick A, Brick B, and Good Luck Point), the replacing or addition of a culvert at one project area (Good Luck Point), and the decommissioning (i.e, breaching of dikes) of three non-functioning impoundments at three project areas (Stouts Creek, Forked River, and Barnegat) (Figure 1).

**Figure 1.** Overview map of the six project areas proposed for enhancement.




## 3 Project Objectives

In general, the refuge conducts management actions to maintain and restore, where possible, the biological integrity, diversity, and environmental health (BIDEH) of its properties in accordance with the National Wildlife Refuge System Improvement Act of 1997 (Public law 105-57). The purpose of the proposed action is to sustain native salt marsh plants (i.e., *Spartina alterniflora*) and wildlife, federal trust resources, and species of conservation concern (i.e., salt marsh sparrow- *Ammodramus caudacutus*) in areas where human impacts have reduced resilience of natural systems to disturbance and anticipated climate change. The goal of this plan is to maintain and restore, where possible, the biological integrity, diversity, and environmental health of refuge habitats to sustain native salt marsh plants (i.e., *Spartina alterniflora*) and wildlife, federal trust resources, and species of conservation concern (i.e., salt marsh sparrow- *Ammodramus caudacutus*).

## 4 Description of the Project

This project will improve approximately 500 acres of estuarine-salt marsh habitat by enhancing and/or restoring currently degraded areas that have been negatively impacted by activities such as grid-ditching, salt hay farming, erosion, and sea level rise. The six (6) areas proposed for enhancement are deficient in sediment deposition, tidal flow, or altered by anthropogenic actions. Additionally, there are other tidal flow barriers (e.g. roads, berms, defunct water control structures, dikes, and under sized culverts) that degrade the marshes and shall be addressed. The overarching goal of this project is the enhancement of coastal marsh habitats by increasing marsh resiliency from impacts of sea level rise, large storm events and other ecosystem stressors.

Since 2008, the refuge has been developing and collecting data for a salt marsh integrity index (SMI), which has involved extensive amounts of time traversing refuge marshes on foot and by boat. This time spent in the marsh has provided an opportunity for refuge and regional USFWS biologists to identify both, quantitative and qualitatively, healthy and degraded marshes within the region. Biologists examined the condition of marshes, including ditch density, tidal flushing, and vegetation characteristics. As sites were quantitatively compared to the refuge and region, the suite of sites in need of restoration were identified first through best professional judgment. These areas were further refined through discussions with expert partners as well as more intensive quantitative monitoring through a contract with Amec Foster Wheeler.

The Refuge contracted Amec Foster Wheeler to conduct field investigations, including a desktop assessment of each project site using aerial photographs (true color and color infrared) and LiDAR imagery to provide a general perspective of salt marsh structure on a landscape scale. These resources were used to map general habitat types (high marsh, low marsh, upland, etc.) at each site and identify areas of interest (AOIs) for further review during the ecological assessment to determine restoration suitability. General habitat types were based upon the U.S. National Vegetation Classification (NVCS) and methods used by NatureServe in their 2009 Vegetation Classification Report (See Marsh EA for further details).

The Refuge also used its SMI monitoring data to bolster the summaries and statements in this Assessment, one of which was the nekton density and richness at specific locations within the marsh. Nekton are defined as the free-swimming fishes and crustaceans that are abundant in the marsh and are an integral link between primary producers, consumers and top predators. Throw traps (Rozas, L. P. and T. J. Minello 1997) were used for sampling wide (>1 meter) features such as large creeks and pools, whereas ditch nets (James-Pirri, M.J., C.T. Roman, J.L. Swanson 2010) were used for sampling narrow (<1 meter) creeks and ditches. Both of these traps are active and can be used to estimate nekton density. Nekton was sampled using one of two quantitative techniques depending on the site (Amec 2016).

The following sections describe how and where the refuge is proposing to conduct sediment enrichment and tidal flow restoration (i.e., culvert enhancement and impoundment restorations):

Sediment Enrichment (SE):

Sediment enrichment involves depositing a layer of sediment in selected areas to increase the elevation of the marsh. Generally, sediment less than 6 in. thick results in revegetation by sprouting of native seed stock, while sediment deposits greater than 6 in. smother and kill the

vegetation requiring revegetation with new plant material (Ford, M. A., D. R. Cahoon, and J. C. Lynch 1999).

Many fish communities, particularly those that utilize salt marshes for feeding and nursery areas, are expected to benefit from the restoration of tidal marshes, and will be monitored during and after the project. Changes in fish communities will be monitored through seasonal SMI surveys.

The refuge has designated specific locations in the Brick A and B, and Good Luck Point project areas that may benefit from sediment enrichment. These areas are comprised of a mixture of high and low salt marsh, as well as small patches of maritime shrubs. The areas have been ditched for mosquito control, and other anthropogenic alterations have occurred. The marsh is increasingly waterlogged, likely due to the inability of the marsh to keep pace with sea level rise. The salt marsh may benefit from sediment enrichment to increase/reestablish an elevation for optimum Spartina growth.

The refuge considered the elevation and condition of existing vegetation (*Spartina alterniflora*, *S. patens*, or *Phragmites australis*) in relation to mean sea level, mean low water, and mean high water levels gathered from locally placed water level monitors that were cross referenced with USGS tide gauges. These biological target elevations are expected to be achieved within 2-3 years of sediment placement based on previous sediment enrichment project results (Croft, A.L., A.L. Leonard, T.D. Alphin, L.B. cahoon, M.H. Posey 2006; Ford, M. A., D. R. Cahoon, and J. C. Lynch 1999). For high marsh, the Refuge chose site-specific target elevations above mean sea level and close to mean high water, which would be regularly inundated by full moon (spring) tides and other high water events (Barone 2014). The Refuge selected an elevation within the range at which healthy high salt marsh is currently growing, but at the lowest end of the range at which the invasive species *Phragmites australis* is currently growing. For low salt marsh, the Refuge selected a target elevation above mean low water (http//nj.usgs.gov/) and within the range of currently healthy low marsh. We also considered the logistics of achieving of each of these elevations.

At present, high marsh comprises a relatively small proportion of these sites and as sea level continues to rise, it is expected to decline further (FitzGerald DM, Fenster MS, Argow BA, Buynevich IV 2008). Restoring high marsh results in more marsh elevation than other salt marsh habitats, therefore it would be expected to persist as a marsh habitat type longer. The reality of targeting high marsh in a particular cell is that high marsh elevations are expected to be achieved with reasonable accuracy in the areas adjacent to pipe outlets for sediment discharge. However, as the distances from the discharge pipe increases, it is expected that the elevation of the sediment would be somewhat lower than the target elevations. In low areas, such as ponds or ditches, there will likely be more settling of material. We expect that areas assigned a high marsh biological target elevation would actually achieve a mosaic of habitat types, including low marsh, mud flat, and open water. This is a desirable result as we recognize the importance of these habitats for fish and wildlife. Because there is uncertainty regarding the amount of each of these habitats that would result from applying a high marsh biological target elevation, we have also developed low marsh biological target elevations to cells where it is the most appropriate vegetation type based on our analysis. Restoring a subset of our restoration cells to low marsh to ensure we maintain a diverse mix of natural habitats. We allocated high marsh and low marsh assignment by cell based on the landscape position, hydrological connections, and surrounding vegetation.

Refuge biologists developed biological target elevations for sediment enrichment sites to achieve high salt marsh (HSM) and low salt marsh (LSM) for 8 cells at Brick A, 6 cells at Brick B, and one cell at Good Luck Point (Figures 2a, 3a, and 4a). The biological target elevations are based on site-specific vegetation, elevation, hydrologic, and orthoimagery data included in the Marsh Enhancement Final Study Report (Amec 2016) as well as input from experts in the field. We worked with Dr. Candice D. Piercy, a Research Environmental Engineer with the U.S. Army Corps of Engineers, Engineering, Research, and Development Center (ACOE-ERDC), as well as Dr. Susan C. Adamowicz, a Coastal Habitat Biologist with the USFWS Region 5. The Refuge consulted with NJDOT, who will place the sediment, as well as with ACOE-ERDC. They concur that material placement in the field is generally possible to within one inch of the target elevation. Elevations for the actual placement of sediments will likely be greater to account for consolidation and settlement of sediments and underlying substrate after placement. The additional elevation required to meet the biological target elevations will be developed by consulting engineers. It is also likely that the number of cells to receive material at each project area will be reduced depending on the final construction elevation and the amount of dredge material available.

The sediment placed on the marsh will be designed and constructed by the NJDOT subcontractor. The project entails putting sediment from NJDOT channels via hydraulic pipeline. The estimated quantity of volume of fill, and the number of cells may be reduced depending on the sediment analyses of the dredge channels, needed for Brick A is approximately 125,986 CY, for Brick B is approximately 59, 125 CY, and Good Luck Point is approximately 17, 082 CY.

Brick A and Brick B are located in Brick Township, Ocean County. Brick A project area covers multiple lots within Blocks 68 and 68.02 and is located north of Mantoloking Road (Figure 2a). It comprises 42 acres and is generally situated between the Metedeconk River to the north, Barnegat Bay to the east, and residential/commercial land to the south and west. Brick B project area covers multiple lots within Blocks 109 and 195 and is located south of Mantoloking Road (Figure 3a). It comprises 62 acres and is generally situated between Reedy Creek to the west, Barnegat Bay to the south, and forested wetlands to the north and east.

**Figure 2 a.** Brick A project area proposed sediment enrichment cells.

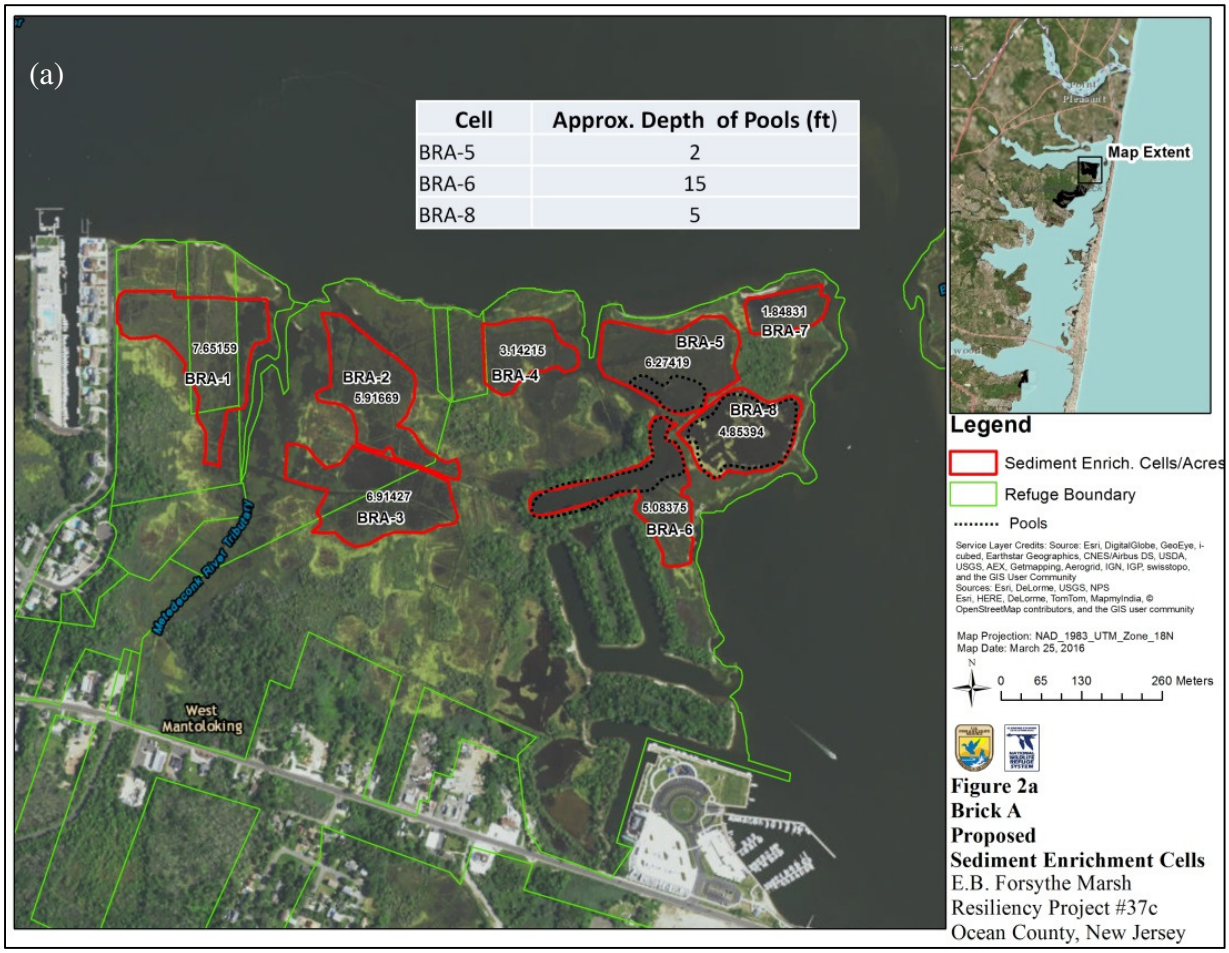


**Figure 2 b.** Brick A project area historical aerial image from the 1930's shows more vegetation and less ditching than is currently present. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930's.

**Figure 3 a.** Brick B project area proposed sediment enrichment cells

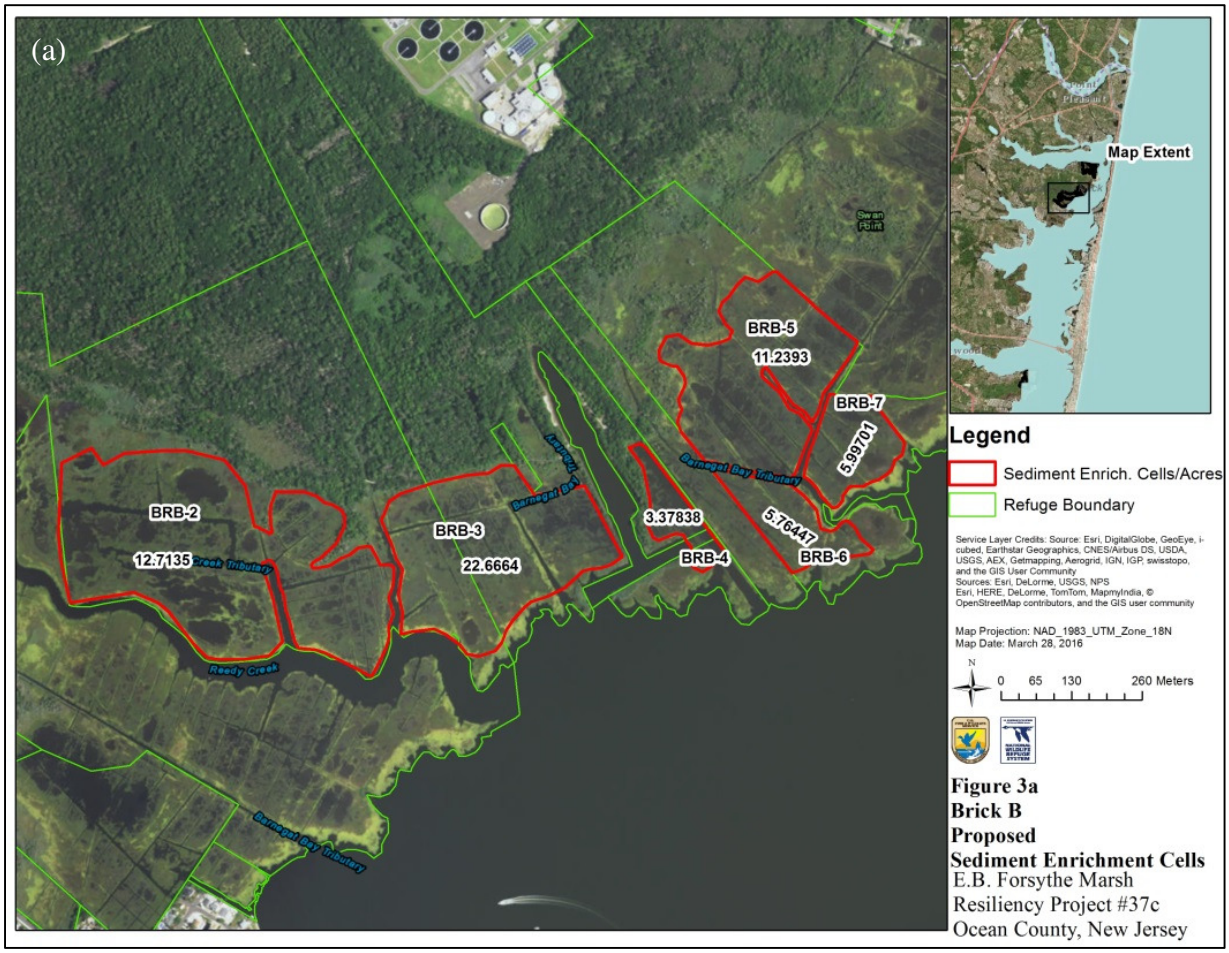
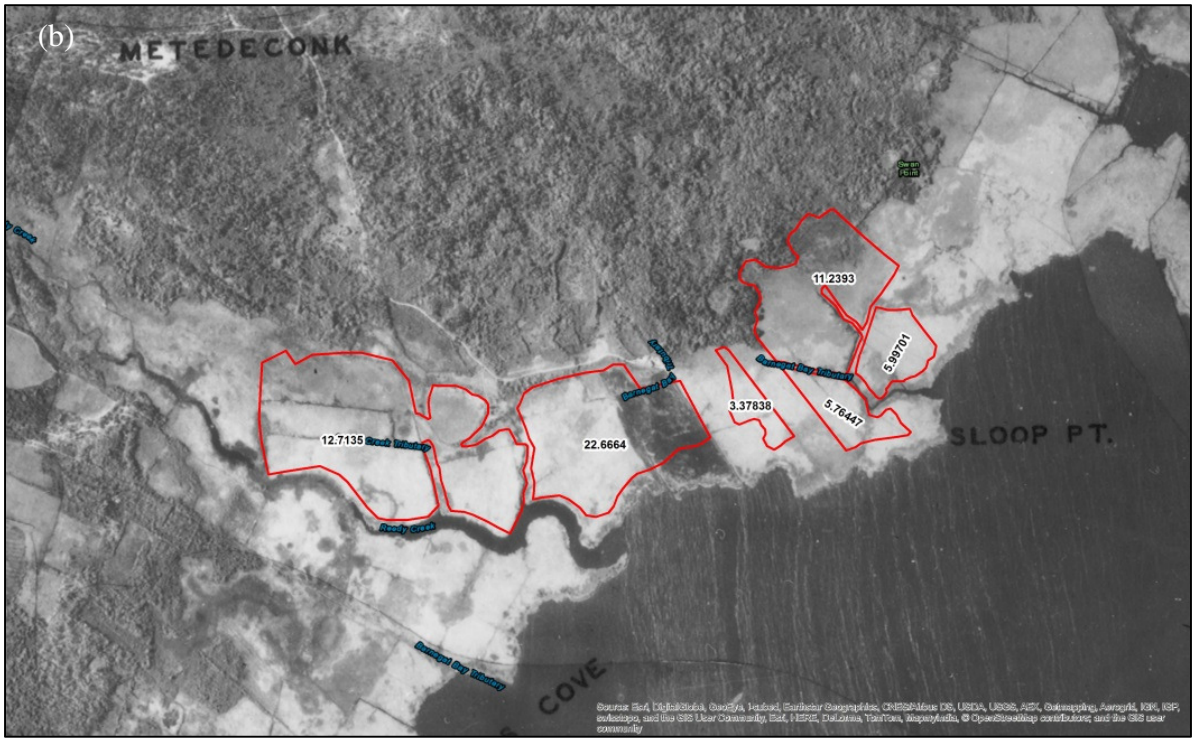


**Figure 3b.** Brick B project area historical image from the 1930's shows more vegetation and less ditching than currently present. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930.




The third project area for sediment enrichment (also known as the Good Luck Point project area) is located within Berkeley Township, Ocean County, NJ and is identified by the Township as Block 1206, Lots 1 and 1.01. It is located along Bayview Avenue (County Route 617) (**Figure 4a**). The Good Luck Point project area occupies approximately 61 acres and is generally situated between Bayview Avenue to the north and east, East Atlantic Avenue to the south, and forested wetlands to the west.

**Figure 4a.** Good Luck Point project area proposed sediment enrichment cell.

**Figure 4b.** Good Luck Point project area historical aerial image from the 1930's shows more vegetation and less ditching than is currently present. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930.

*Tidal Flow Restoration:*

Culvert Enhancement

The addition or enhancement of an existing culvert at the Good Luck Point project area will allow the waterlogged marsh west of Bayview Avenue to drain during tidal cycles and also provide the mechanism for sediment transport to enhance the rate of marsh development (Figure 4a). Undersized culverts restrict tidal flow and can alter the natural hydrology and water chemistry of inland areas. Reduced tidal flow can subsequently reduce sediment deposition on the marsh platform, decreasing accretion and resilience of the marsh to adapt to sea level rise. This is the case at the Good Luck Point Project Area where undersized culverts beneath Bayview Avenue act as tidal restrictors. Therefore, replacement of the undersized culverts, by constructing a new, appropriately sized culvert would improve tidal flow and better support resilient salt marsh habitat (Figure 4a). The designs for the culvert enhancement/addition have not been developed yet, but the refuge is going to work with its contractor Amec and the Ocean County Planning and Engineering Department to develop the designs. The refuge is anticipating the equipment that will be used during culvert enhancement will include an excavator, crane, and/or skid steer.

Impoundment Restoration

Hurricane Sandy resulted in the need for an assessment of the condition and functionality of the refuge impoundments and the potential for future management for each impoundment given their

current condition. Based on an assessment of impoundment reports prepared for the refuge by an engineer company pre-Hurricane Sandy and an impoundment report prepared for the refuge post-Hurricane Sandy (Fredrickson 2014; Schnabel 2014), the refuge is proposing to breach the dikes at Stouts Creek, Forked River, and Barnegat (Figures 5a, 6a, 7a). Breaching the impoundments will ensure the re-establishment of tidal flow and provide the mechanism for sediment transport which should enhance the rate of marsh development and allow the passage of federally managed EFH species.

The refuge, Amec FW, and the Ocean County Mosquito Commission (OCMC) performed elevation surveys, examined tidal flow data, and performed LiDAR surveys to determine the best method to breach the dikes. Additionally, various historical maps were used to look at the sites before there were impoundments (Figure 5b, 6b, 7b). All of the proposed breaches at the impoundments are in weak spots (breached or semi-breached), have non-functioning water control structures present, or are located where a past creek was situated. The refuge will leave the functioning water control structures in place, and the non-functioning water control structures will be removed and left open as a breach. All breaches will be 3-4ft wide and 3ft deep. The material that is excavated will be kept nearby so that at any point the breach can be filled back in. An amphibious excavator or a low-ground pressure excavator will be used for construction at all three project areas.

Stouts Creek Impoundment

The Stouts Creek project area is composed of a large man-made impoundment that is split into two distinct cells, with a small, more natural, ponded area along the northern portion of the Project site (Figure 5a). It is approximately 127 acres in size and is generally situated between salt marsh associated with Stouts Creek and Wire Pond/Wire Creek to the south and east, respectively and forested wetlands to the north and west. The Stouts Creek project area (Lacey Township) covers multiple lots within Blocks 520 and 630 and is located east of U.S. Route 9, south of Cedar Drive. The Forked River project area covers a small portion of Block 315, Lot 38.02 and is located south of Sunrise Boulevard. The Barnegat project area is located within Barnegat Township, Ocean County and covers multiple lots within Blocks 208 and 239 and is located between East Bay Avenue to the south, Bay Shore Drive to the north and east, and Ridgeway Street to the west.

Unlike the natural high and low salt marsh observed outside the Project area boundary at Stouts Creek, the area within the Project boundary is dominated by open water and mudflats which have been created by flooding the area. The increased water levels have flooded the majority of the previously existing vegetation, resulting in the current vegetation being dominated by invasive species. The overall ecosystem health of this impoundment is generally poor. Historically, the impoundments at Stouts Creek were covered in salt marsh grasses such *Spartina spp* (Figure 5b).

Elevation data collected by field crews at Stouts Creek show the average interior elevations of the impoundments are higher than the average bottom of bank elevations for interior marsh ditches within the larger marsh complex (see Marsh EA for further information). As it is assumed that the interior marsh ditches undergo full tidal flushing at their current bottom of channel elevations, it can be concluded that, if reconnected to the larger marsh system, these impoundments would experience additional tidal flushing as well (water would drain out at low tide). The difference of

elevation between the bottom elevation of the impoundments and the small areas of high and low salt marsh is over 0.5 feet. On average, the bottom elevation of the impoundments is below mean sea level. Using this information, the refuge and its partners identified the best locations to place breaches within the impoundment walls.
The following activities are proposed at Stouts Creek:

A total of 14 breaches that are 3 to 4 feet wide and 3 feet deep are proposed at Stouts Creek. There are two functioning water control structures (WCS) that will remain in place (Figure 5a). Removal or breaching of existing dikes will increase the tidal flow, increase salinity, and restore a more natural hydrologic regime within the Stouts Creek Project Area impoundment.

**Figure 5a.** Stouts Creek project area proposed dike breaching locations.

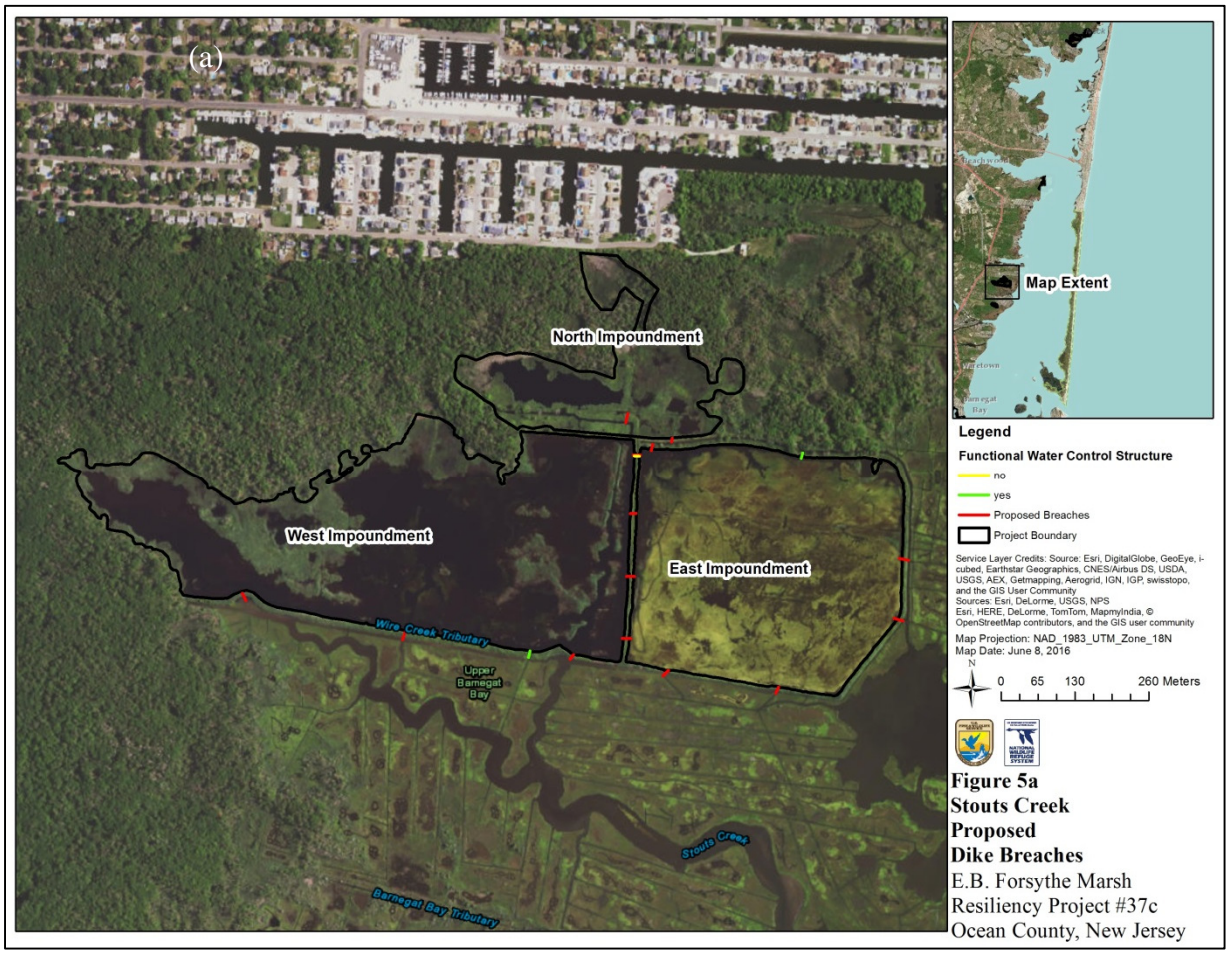
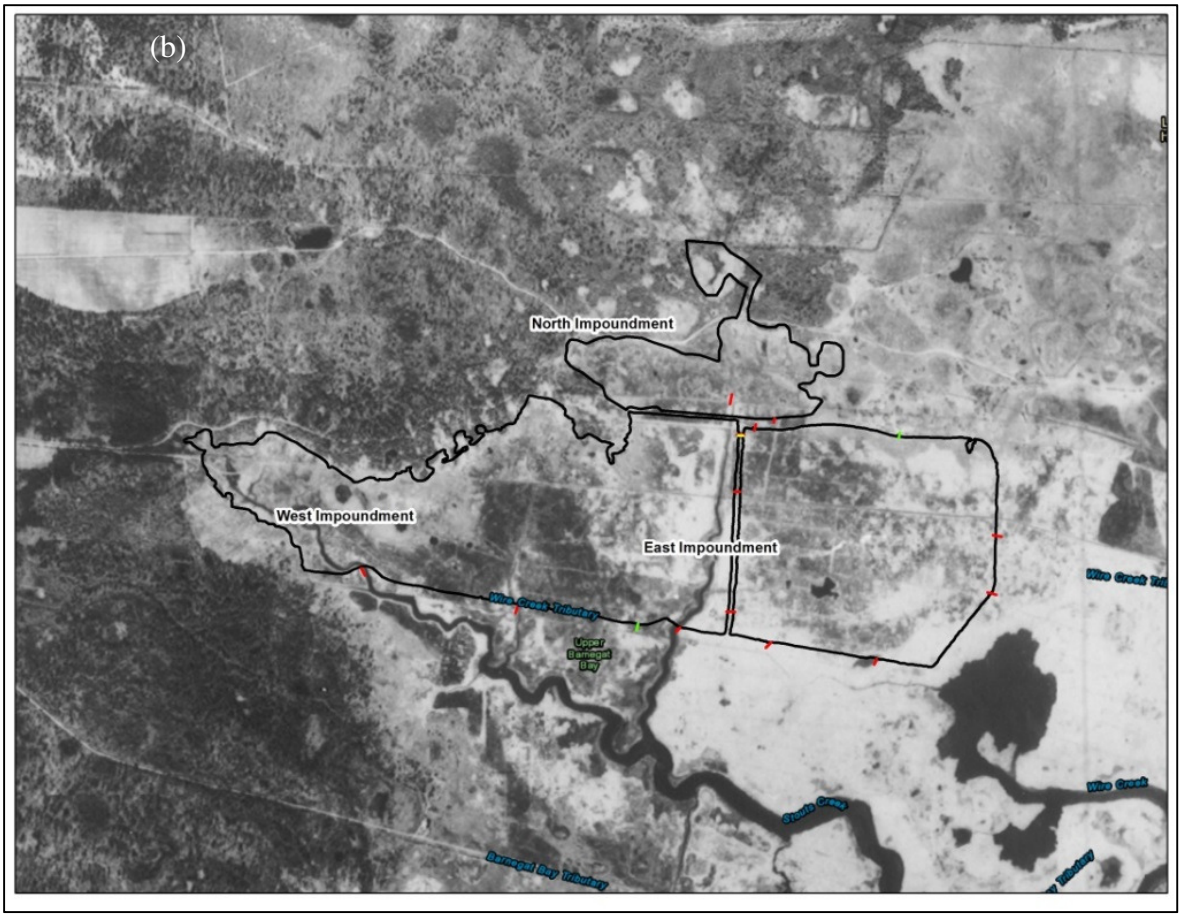


**Figure 5b.** Stouts Creek project area historical aerial image from the 1930's shows more vegetation and less ditching than is currently present. Red lines are proposed breaches and green lines are functioning WCS. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930.




Forked River Impoundment

The Forked River project area is composed of a large man made impoundment that is also split into two distinct cells that are fed by Wrangle Creek (Figure 6a). The impoundments are situated just south of Sunrise Boulevard in Lacey Township. It is approximately 17.5 acres in size and is generally situated between coastal marsh to the east, forested wetlands to the west, a mix of forested wetlands and uplands to the south, and residential land use to the North.

In general the Forked River project area is dominated by open water impoundments and mudflat with highly stressed salt marsh habitat along the fringes of the impoundments. The higher elevations and dikes dominated by common reed. The variation of elevation between the bottom elevation of the impoundments, also referred to as mudflats, and the low salt marsh habitat is 0.07 feet. Historically, the impoundments at Forked River were covered in salt marsh grasses such *Spartina spp* (Figure 6b).

Since the average interior elevation of the two impoundments at this Project area is similar to, if not slightly higher, than the average elevation of healthy low and high salt marsh outside of the impoundments, dike removal has the potential to restore full tidal flushing and healthy salt marsh vegetation if high tide inundates this area. However, if the mean high tide elevation is not greater than the average elevation of the interior of the Forked River project area impoundments, it is likely that the invasive species common reed (Phragmites) would establish itself due to optimal

elevation, dry conditions, and low salinity levels. The following activities are proposed at the Forked River project area:

Two breaches will be put into place, one on each impoundment wall. The breach will be constructed just north of the existing water control structures (WCS) on both impoundments. The existing cement WCS will be cleaned of sediment and debris but otherwise left untouched. The breaches will have a channel 3-4ft wide. In addition to the 3ft deep breach channel, the berm wall will be removed to the marsh surface elevation for 8-10ft on either side of the channel to the present salt marsh elevation, which will allow the excavator access to the area and allow water flow over the salt marsh during high tides.

**Figure 6a.** Forked River project area proposed dike breaching locations.

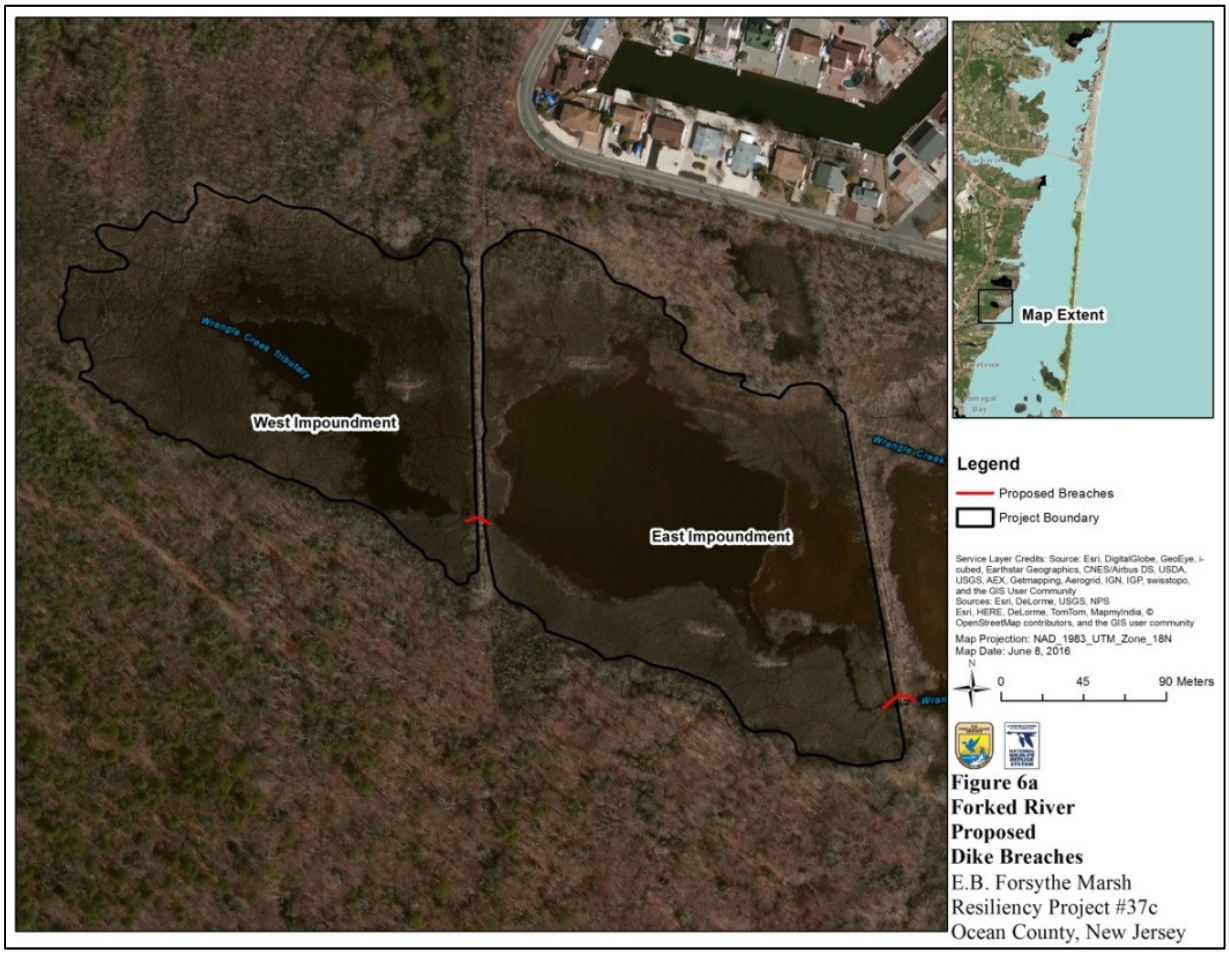
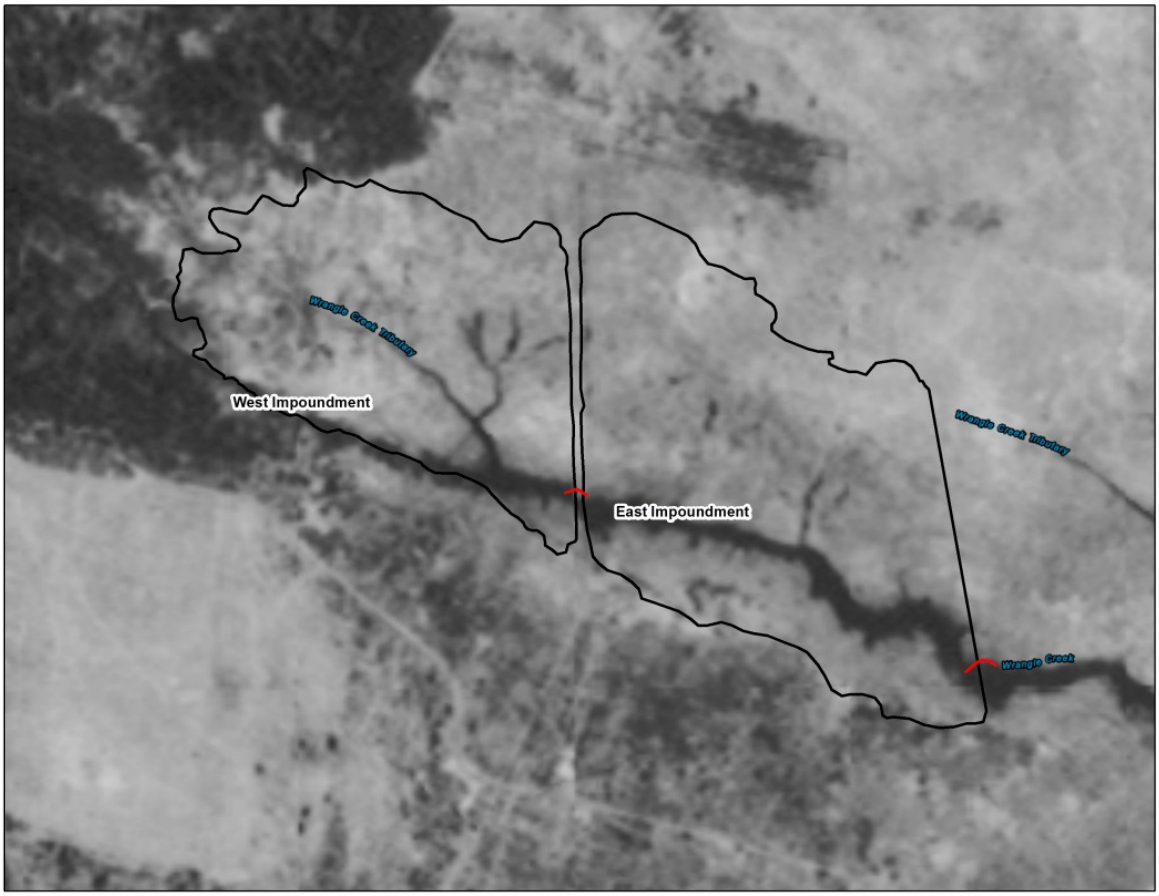


**Figure 6b.** Forked River project area area historical aerial image from the 1930's shows more vegetation and less ditching than is currently present. Red lines are proposed breaches. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930.




Barnegat Impoundment

The Barnegat project area is composed of five separate man made impoundments, or pools that occupy approximately 238 acres (Figure 7a). These pools are generally situated between Barnegat Bay to the east, forested wetlands to the west, and residential land use to the north and south. The Barnegat impoundments are connected to the tidal system via multiple culverts, risers and existing dike breaches in various locations. Based upon field collected elevation data, the average interior elevation is lower than the average bottom of bank elevation for interior marsh ditches within the larger marsh complex.

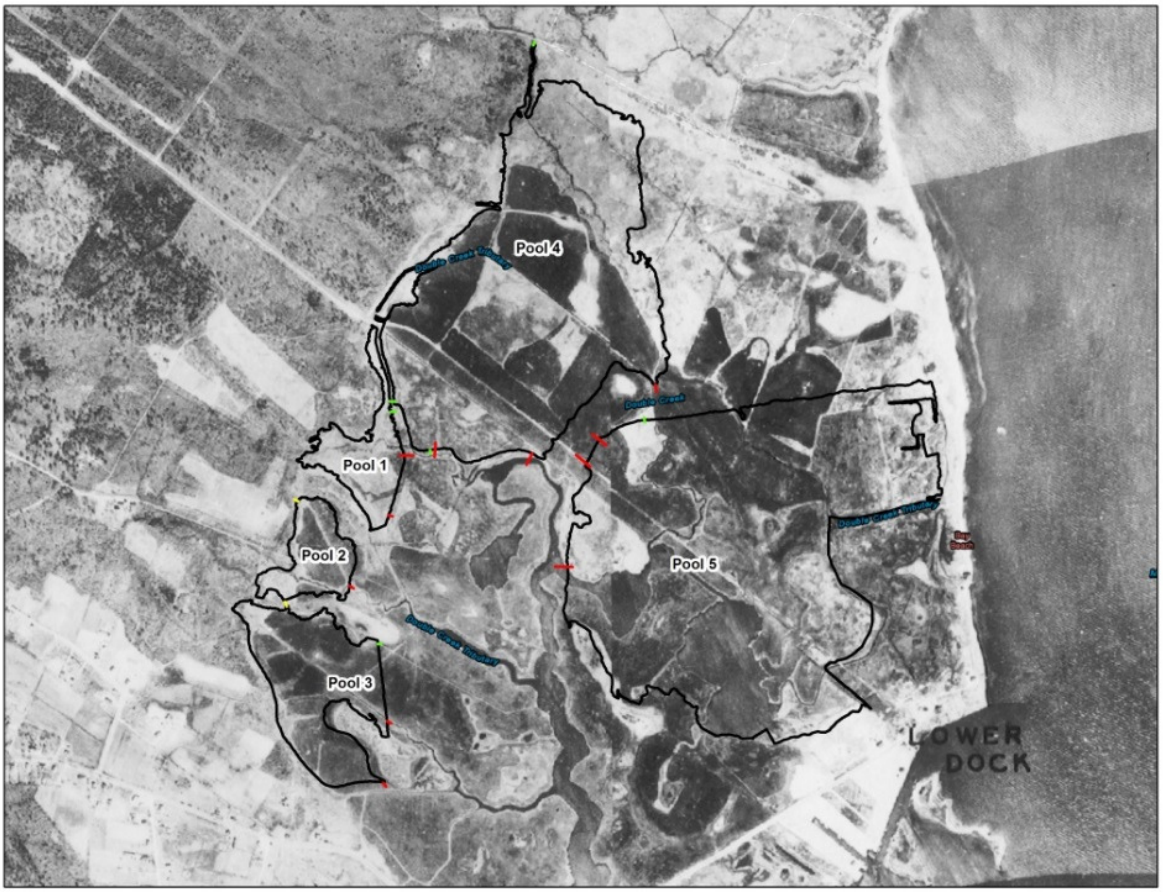
Restoration activities often re-introduce a sediment source which helps increase the elevation of the marsh surface, which in turn may also promote healthy plant growth leading to increased accretion rates. The ability of the re-introduction of tidal flushing and a brackish water source to promote elevation increases within the marsh surface are based on 1) the availability of suspended solids within the water column; 2) the ability for a high velocity wave environment to occur leading to scour and increased erosion; and 3) the extent to which the tidal restriction prevents sediment delivery to the system (Williams, P. B., M.K. Orr, and N.J. Garrity 2002). Historically, the impoundments at Barnegat were covered in salt marsh grasses such *Spartina spp* (Figure 7b).

The following activities are proposed at the Barnegat project area:

A total of 13 breaches will be constructed on the five impoundments, two of them being where non-functioning water control structures will be removed (Figure 7a). Increasing the tidal exchange in this area will help to introduce more fish and invertebrate species into the area and help create a habitat that is suitable for the re-vegetation of salt marsh grasses.

**Figure 7a.** Barnegat project area proposed dike breaching locations.

**Figure 7b.** Barnegat project area historical aerial image from the 1930's shows more vegetation and less ditching than is currently present. Red lines are proposed breaches. Source Data: NJDEP http://geodata.state.nj.us/imagerywms/BlackWhite1930




## 4.1 General Description of Dredged or Fill Material

There are seven NJDOT channels currently being proposed as possible source areas of sediment enrichment material for Brick A, Brick B, and Good Luck Point project areas (Figures 8, 9). Sediment sampling of those areas was performed in accordance with the New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual (NJDEP 2005a) and the Dredging Technical Manual (Management and Regulation of Dredging Activities and Dredged Materials in New Jersey's Tidal Waters) (NJDEP 1997; NJDEP 2005a). Ten locations were sampled using a submersible vibracore to a depth of -6 feet mean low water (ft mlw), which accounts for the project depth (-5 ft mlw) plus 1 foot for over-dredge. The Upper Metedeconk River core was advanced to a depth of -7 ft mlw, thereby accounting for a project depth of -6 ft mlw plus 1 foot for over-dredge. Individual cores collected were inspected, logged and photographed prior to homogenization and compositing. The samples were sent to Accutest Laboratories, Inc., in Dayton, New Jersey for geotechnical and chemical analyses.

Source area channel (Table 1) sediments consists of fine to medium grain sands intermixed with finer grained silts and clays, that would provide geotechnically suitable materials for the sediment enrichment cells in Brick A, Brick B, and Good Luck Point (Figures 2a, 3a, and 4a).

Source area channels sediments were analyzed for heavy metals, semi-volatile organic compounds (SVOC), legacy organochlorine pesticides, polychlorinated biphenyls (PCBs), and chlorinated dioxins and furans; the results were compared to soil remediation standards set forth at N.J.A.C. 7:26D (Matrix 2016). New Jersey soil remediation standards establish minimum standards for the remediation of contaminated soil as represented by the residential direct contact and nonresidential direct contact soil remediation standards. Those soil remediation standards are human-health based and may not be fully protective of biota with different exposure conditions and contaminant sensitivities. Therefore, USFWS Environmental Contaminants staff reviewed and interpreted the results after comparison to effects-based and mechanistic-based sediment quality criteria from peer-reviewed literature in order to elucidate the potential for sediment toxicity to sensitive organisms. Where appropriate, contaminant exposure was modeled into higher trophic organisms such as birds or mink and compared to literature-based benchmarks (USFWS in preparation). The ecologically based criteria used by the USFWS are more stringent than the soil remediation standards.

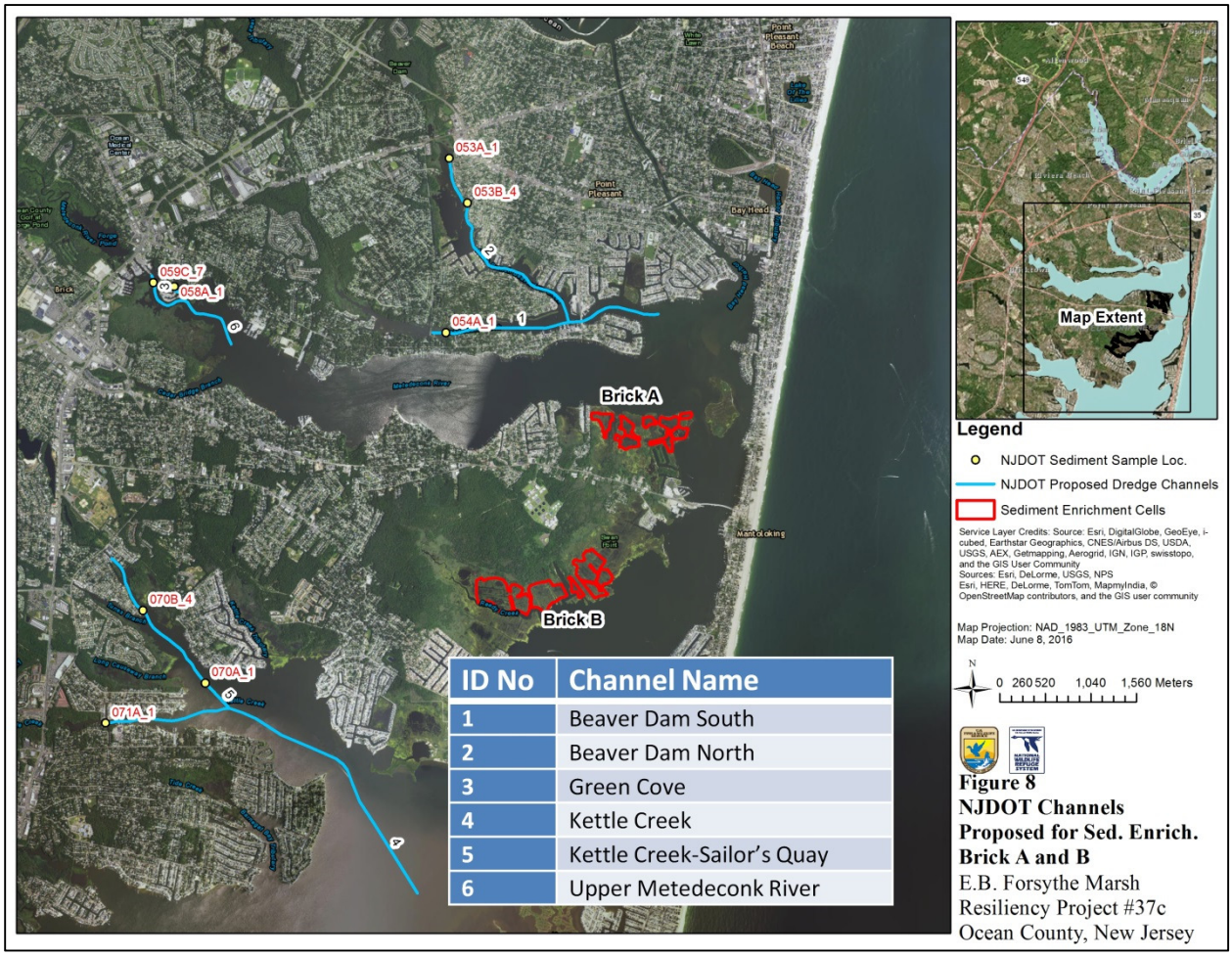
Collectively, the geotechnical data and chemical characterization of the sediments were used to evaluate the acceptability of sediments for beneficial use on the refuge (Table 1). Green Cove (058A1) channel and the northern section of Beaver Dam North (053A1-3) were rejected due to unacceptable levels of mercury; elevated levels of arsenic, copper, lead, zinc and PCBs; and, an elevated probability of toxicity based on effects-based criteria.

**Table 1**. Grain size analyses for specific NJDOT dredging channels

**Table 1**. Grain size analyses for specific NJDOT dredging channels and USFWS acceptance or rejection of the channel based on contamination (Source Data: Matrix 2016, NJDEP, 1997 &2005).

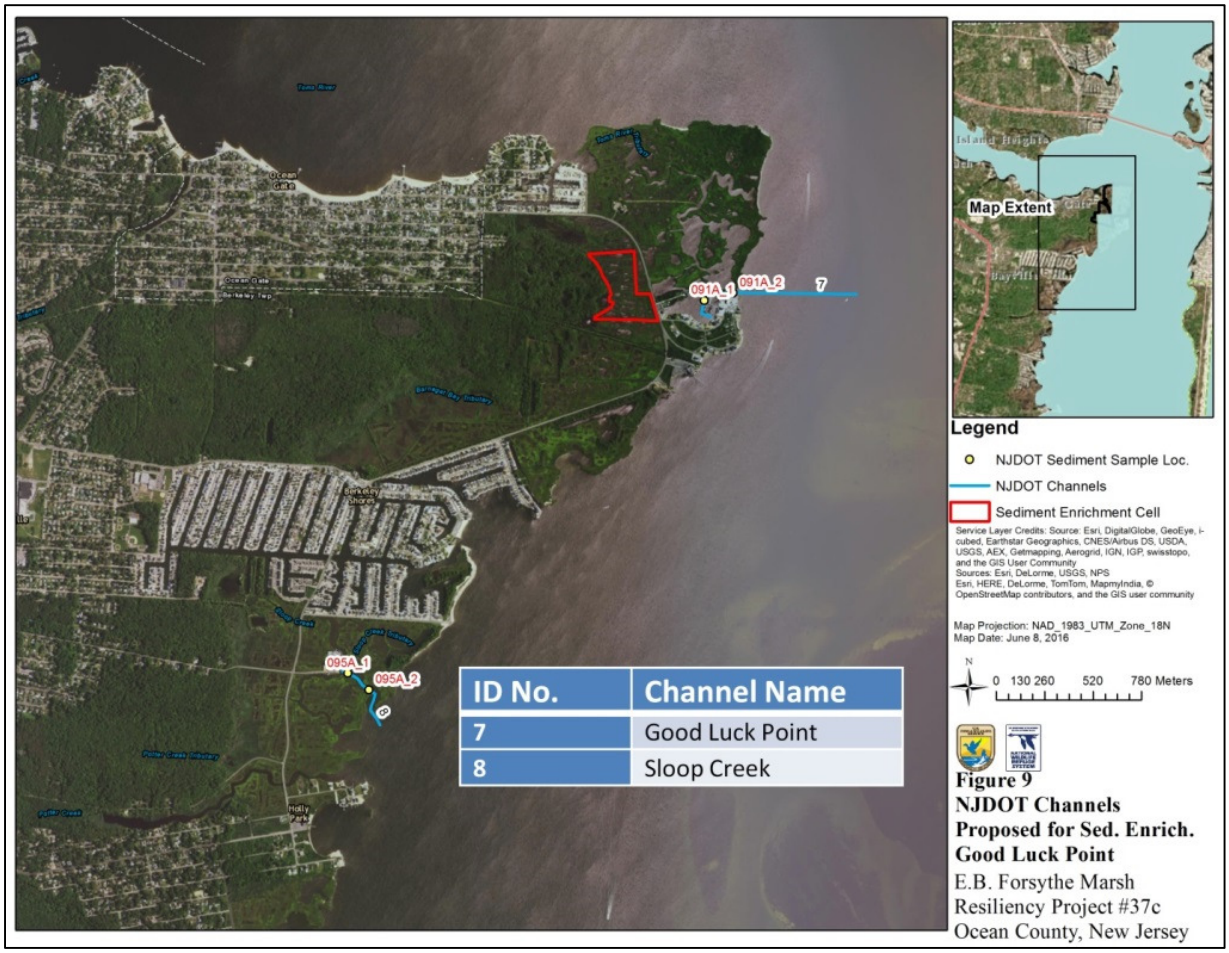
| **Sample ID** | **Channel Name** | **% Sand** | **% Silt, Clay** | **Acceptable/ Rejected** |
|---|---|---|---|---|
| ***Sediment Samples w/o Elutriate Data*** | | | | |
| 058A1 | Green Cove | 78.2 | 21.8 | **Rejected** |
| 059C7 | Upper Metedeconk River | 79.9 | 12.8 | Acceptable |
| ***Composited Sediments*** | | | | |
| 053A1-3 | Beaver Dam Creek North | 62.4 | 37.7 | **Rejected** |
| 053B4-7 | Beaver Dam Creek North | 13 | 87 | Acceptable |
| 054A1-3 | Beaver Dam Creek South | 52.2 | 47.8 | Acceptable |
| 070A1-3 | Kettle Creek-Sailor's Quay | 57.1 | 42.9 | Acceptable |
| 070B4-6 | Kettle Creek-Sailor's Quay | 76.8 | 23.2 | Acceptable |
| 071A1-3 | Kettle Creek | 65.6 | 34.4 | Acceptable |
| 091A1-2 | Good Luck Point | 62.4 | 37.6 | Acceptable |
| 0951A-1 | Sloop Creek | ---------- | --------- | Rejected |

**Figure 8.** Brick A and B project areas and NJDOT proposed channels for sediment enrichment.




| ID No | Channel Name |
|---|---|
| 1 | Beaver Dam South |
| 2 | Beaver Dam North |
| 3 | Green Cove |
| 4 | Kettle Creek |
| 5 | Kettle Creek-Sailor's Quay |
| 6 | Upper Metedeconk River |

**Figure 9.** Good Luck Point project area and NJDOT proposed channels for sediment enrichment.




## 4.2 Description of Proposed Sediment Enrichment Placement Site and Culvert Enhancement Site

Our three project areas for sediment enrichment have varying coverages of high salt marsh, low salt marsh, and mudflats, as well as different hydrological regimes. Brick A is predominantly low salt marsh, interspersed with mudflats and has been divided into eight proposed sediment enrichment cell placement locations (Figure 2a). Historical black and white aerial images from the 1930's showed this area appears to have been more vegetated, with narrower and far fewer tidal creeks (Figure 2b). Several man-made ditches run through the site. Prior to refuge acquisition, the property was a planned, canal access, residential community. Three canals were excavated into the salt marsh to this end. Material from construction was piled alongside the canals filling, additional marsh. Additional fill was also added during this period to provide elevated roadways to access interior portions of the site, hydrologically separating portions of marsh.

Brick B is predominantly stressed low salt marsh and as a result has numerous interspersed mudflats and has been divided into six proposed sediment enrichment cells (Figure 3a). The site has been extensively ditched for mosquito management purposes. Historical aerial images also showed these marshes were more vegetated and less fragmented (Figure 3b). The Brick B project area (Figure 3b).

The marshes on the interior of Bayview Avenue at Good Luck Point are waterlogged and disappearing (Figure 4a). Historical aerial images showed this area also to be more vegetated and less fragmented (Figure 4b). Bayview Avenue restricts the tidal flow into these interior marshes and part of this project's scope includes evaluating and improving this hydrological connectivity via replacement or addition of these culverts. The area has been grid ditched and high marsh remains only along the edge of the ditches. The vegetation on the interior of each grid has died back and now mudflats remain. The edges of these grids are slightly higher in elevation than the interior, since the soil excavated from the ditches was likely deposited just along the ditch edges. Raising the elevation of the interior areas of these grids and restoring the hydrological connectivity to the ditches will be important for the long term re-establishment of marsh grasses. This area has not been divided into multiple cells and will all be one cell.

### 4.2.1 Marsh Surface Sediment Characteristics

A Marsh surface sediment sampling plan will be developed for the Brick A, Brick B, and Good Luck Point project areas. At this time, the Marsh EA contains surrogate sediment characteristic data for its project areas.

Brick A is an intertidal site and the dredged channel locations are subtidal. The majority of Brick A is mapped to occur on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes. This complex is described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). A small percentage of the project area contains Berryland Sand, and rarely flooded soils with 0 to 2 percent slopes. This soil is described as very poorly drained sands associated with flats, depressions and drainage ways. The parent material is described as sandy fluviomarine deposits (Maser 2012). Another sliver of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes (NRCS 2016). See the Marsh EA for soil maps.

The following summary is from a Subsurface Exploration and Geotechnical Report in 2009 for Trader's Cove Park and Marina (Figure 2a), Lot 3.02, Block 68 in Brick Township, Ocean County, NJ (Gentech, Engineering Associates, P.C. Consulting Engineers 2009). The Report was developed for Trader's Cove Marina for the proposed construction of driveway and parking areas, two stormwater basin areas, boat storage areas, and a maintenance building and a restroom/storage building. Trader's Cove Marina is adjacent to the Brick A project area.
"The subsurface conditions at the test boring sites consisted of coarse to fine Sands with trace of Silt, trace of medium and fine gravel at the surface. There was organic Silt with fibers (peat) mixed with Sands in varying proportions generally between 3 to 4 feet in depth at Test Borings closer to the water and between 4 to 8 feet in depth at Test Boring further inland. The underlying Sand is very loose between 6 to 8 feet in depth at the borings closer to the water and slightly deeper to 10 feet at the borings inland, most likely due to the grade change. There were thin layers of Silt and Clay and clayey Silt present at isolated depths. The underlying Sands had low to high proportion of medium to very dense state below 9 feet in depth.

At the test pit locations the soil conditions varied. There was organic Silt/fibers mixed with Sand present at about a foot in depth at a test pit underlain by sand to 3.5 feet in depth. At another test pit the engineer did not observe organics but varying proportion of Sand, Silt and coarse fragments. At another test pit, the upper 12 inches was sand mixed with wood/lumber (fill) underlain by Sand to 20 inches.

Groundwater was between 16 to 21 inches in depth below existing surface grade test pits. At the boring locations groundwater was 2 feet in depth. Note, that the groundwater level in the bay at the time of drilling was about 1.5 feet below the top of the bulkhead and it rained the night before sampling."

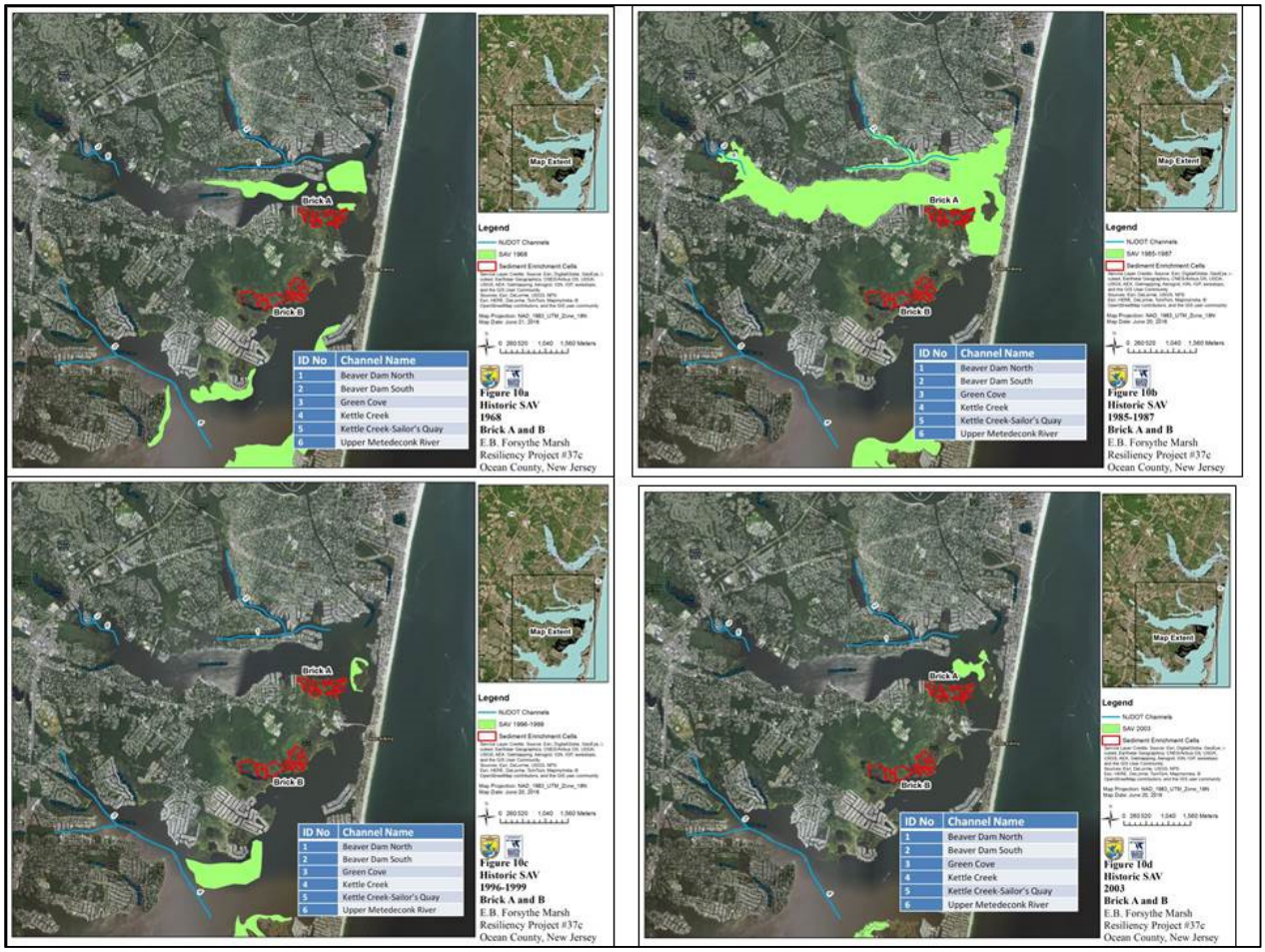
Brick B contains primarily Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0 to 1 percent slopes, with a very small percentage as Berryland Sand, rarely flooded soils with 0 to 2 percent slopes (NRCS 2016). See the Marsh EA soil maps.

Good Luck Point is similar to Brick Project Area A and occurs primarily on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0 to 1 percent slopes with a smaller portion mapped as containing Berryland Sand and rarely flooded soils with 0 to 2 percent slopes. Other smaller portions of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes and Mullica sandy loamwith 0 to 2 percent slopes (NRCS 2016). See the Marsh EA soil maps.

### 4.2.2 Submerged Aquatic Vegetation (SAV)

Historical maps of SAV (i.e., Ruppia maritima and Zostera marina) in Barnegat Bay from 1968 thru 1999 (Figure 10a-d) show SAV adjacent to Brick A sediment enrichment sites (Rutgers 2011). Historical SAV (1968) was also observed near potential sediment enrichment dredge locations in Brick A (Figure 10a-b, Beaver Dam South, and North) (Macomber, R.T. and D.A. Allen, 1979; Rutgers 2011; Lathrop, R.G., Styles, R.M., Seitzinger, S.P. 2001; Lathrop, R.G., P. Montesano and S. Haag 2004; Lathrop, R.G. and S. Haag 2011). Additionally, Montclair State University did restoration plantings of SAV from 2001 to 2004 on the northeast coast of Brick A (Bologna 2012). The results of this study concluded that SAV was able to re-establish itself in this area. Therefore, careful consideration and BMP's will be followed to avoid these SAV restoration areas when sediment enrichment pipes are placed in this project area.

**Figure 10a-d**. Historic Submerged aquatic vegetation near Brick A and Brick B project areas for years 1968, 1985-1987, 1996-1999, and 2003 (Source Data: Rutgers 2011).




SAV was also observed in Barnegat Bay from historical maps for years 1968 thru 2009 near the Good Luck Point project area (Figure 11a-c) and near potential sediment enrichment dredge locations for Good Luck Point (Figure 11a-c, Sloop Creek, and Good Luck Point Creek).

There is no known SAV currently near Brick A, B, and Good Luck Point potential dredging locations. It has not yet been decided where the dredging pipes will be positioned on the marsh or where the staging areas will be placed, but the presence of historic SAV will be considered in the design of the construction sites so that sediment enrichment pipes are not placed through any SAV beds. Also note, Rutgers 2011 historical SAV for 1979 was not considered in this summary because of discrepancies in how the data was originally digitized from hard copy maps to digital imagery. However, since historic SAV was found to be associated with the three sediment enrichment areas, all three sites will be treated as potential SAV areas and the refuge will use recommended Best Management Practices (BMP's) to ensure sediments do not encroach on SAV areas.

**Figure 11a-c**. Historic submerged aquatic vegetation near Good Luck Point project area for years 1968, 2003, and 2009 (Source Data: Rutgers 2011).

### 4.2.3 Wetlands

Brick A and B sites are dominated by a mix of low salt marsh and mudflat, with a large number of interior ditches throughout the marsh. The low salt marsh areas are dominated by smooth cordgrass with occasional seashore salt grass, while the high salt marsh areas are dominated by saltmeadow cordgrass. Brick A is predominantly composed of healthy low salt marsh, with large areas of mudflat and a moderate amount of upland woody vegetation acreage. Brick B is predominantly composed of stressed low salt marsh, with equal amounts of healthy low salt marsh, mudflat, and high salt marsh. Although mudflats are listed in Section 404 of the Clean Water Act 404 (b)(1), the Brick A and B project areas were historically vegetated with low and high salt marsh vegetation as well as forested habitats (see Figures 2a, 3a, 4a). The increase of mudflats at the Brick A and Brick B project areas is likely due to the inability of the marsh to keep pace with sea level rise. The salt marsh may benefit from sediment enrichment to increase/reestablish an elevation for optimum *Spartina* growth. The proposed plan will not only restore more than a 100 acres of salt marsh, but it will also protect nearby forested habitat from further degradation due to salt water intrusion from winds and storm surge.

The Good Luck Point project area is bisected by tidal ditches or interspersed with open water, either as pools or as tidal creeks. The eastern portion of the salt marsh contains a greater proportion of saltmeadow cordgrass, with some areas entirely dominated by this species. Portions of the salt marsh closer to the center of the site exhibit a greater proportion of smooth cordgrass. There is a moderate amount of micro-topographic variation at the Good Luck Point project area, and subsequently, there are small pockets of bigleaf marsh-elder (*Iva frutescens*) and common reed interspersed through the salt marsh. A maritime evergreen woodland forest is located in the westernmost portion of the site. The portion of the site is dominated by eastern red cedar (*Juniperus virginiana*) with swamp rose-mallow (*Hibiscus moscheutos*) along the woods edge. This community is connected to a large contiguous forest that extends westward towards U.S. Route 9. See Marsh EA for figures of these wetland types.

### 4.2.4 Shellfish

Brick A, B, and Good Luck Point project areas are habitat for many species of shellfish (Table 2). The (NJDEP) has mapped hard clam distribution maps for the upper Barnegat Bay in 2012 (NJDEP 2012) (Figure 12a). According to the NJDEP 2012 density map for hard clams in the upper Barnegat Bay, the Brick A, B and Good Luck Point project areas have low densities of hard clams nearby, however, an aquaculture lease site does exist east of the Brick A project area. Mitigation measures will be used to lessen turbidity concerns and during the design phase of the project, consideration will be given where pipes and staging areas will be constructed and established. Also, the refuge will use recommended BMP's to ensure sediments do not encroach on shellfish areas and open season harvesting zones (Figure 12aa).

Also, there is a historic oyster reef located off the eastern end of the Good Luck Point project area (Figure 12aa). In 2008 the Barnegat Bay Shellfish Restoration Program (BBSRP) planted a 1-acre plot of 8,000 bushels of clamshell and 110, 000 oyster seed at this location. In 2012, an additional 12,000 bushel of clam shells were placed over an adjacent 1-acre plot at the historical reef site. Post-monitoring study results showed spat were forming on the shells and other benthic organisms were inhabiting the reef again such as small fish (i.e., blennies, skilletfish, goby, toadfish, and eels) (ALS 2014).

**Table 2.** Summary of the common types of shellfish that could be found in the Barnegat Bay. This table is not all-inclusive (Source Data: (Barnegat Shellfish 2013).

| Phylum | Common Name | Scientific Name |
|---|---|---|
| Mollusca | | |
| | Hard calms | *Mercenaria mercenaria* |
| | Soft shell clams | *Mya arenaria* |
| | Razor clams | *Ensis directus* |
| | Stout Tagelus | *Tagelus plebeius* |
| | Little Surf Clams | *Mullinia lateralis* |
| | Oysters | *Crassostrea virginica* |
| | Atlantic ribbed mussels | *Geukensia demissa* |
| | Scallops | |
| | Knobbed whelks | *Busycon carica* |
| | Channeled whelks | *Busycotypus canaliculatus* |
| | Mud dog whelks | *Llyassoma obsoleta* |
| | northern moon snails | *Euspira heros* |
| | Atlantic moon snails | *Polinices duplicatus* |
| | Atlantic oyster drill | *Urosalpinx cinera* |
| | Atlantic slipper shells | *Crepidula fornicata* |
| Arthropoda | | |
| | Blue crabs | *Callinectes sapidus* |
| | Black-fingered mud crabs | *Panoeius herbstii* |
| | Green crabs | *Carcinus maenus* |
| | Lady crabs | *Ovalipes ocellatus* |
| | Common spider crabs | *Libinia emarginata* |
| | Marsh fiddler crabs | *Uca pugnax* |
| | Mole crabs and Sand crabs | Family: Albuneidae |
| | Atlantic sand crabs | *Emerita talpoida* |
| | Ghost crabs | *Ocypode quadrata* |
| | Hermit crabs | Superfamily: Paguroidea |
| | Long-armed hermit crabs | *Pagurus longicarpus* |
| | Grass shrimp | *Palaemonetes spp* |
| | Daggerblad grass shrimp | *Palaemonetes pugio* |
| | Sand shrimp | *Crangon septemspinosa* |

**Figure 12a**. NJDEP hard clam distributions for 2012 for the waters surrounding Brick A, Brick B, and Good Luck Point project areas. (Source Data: NJDEP 2012).

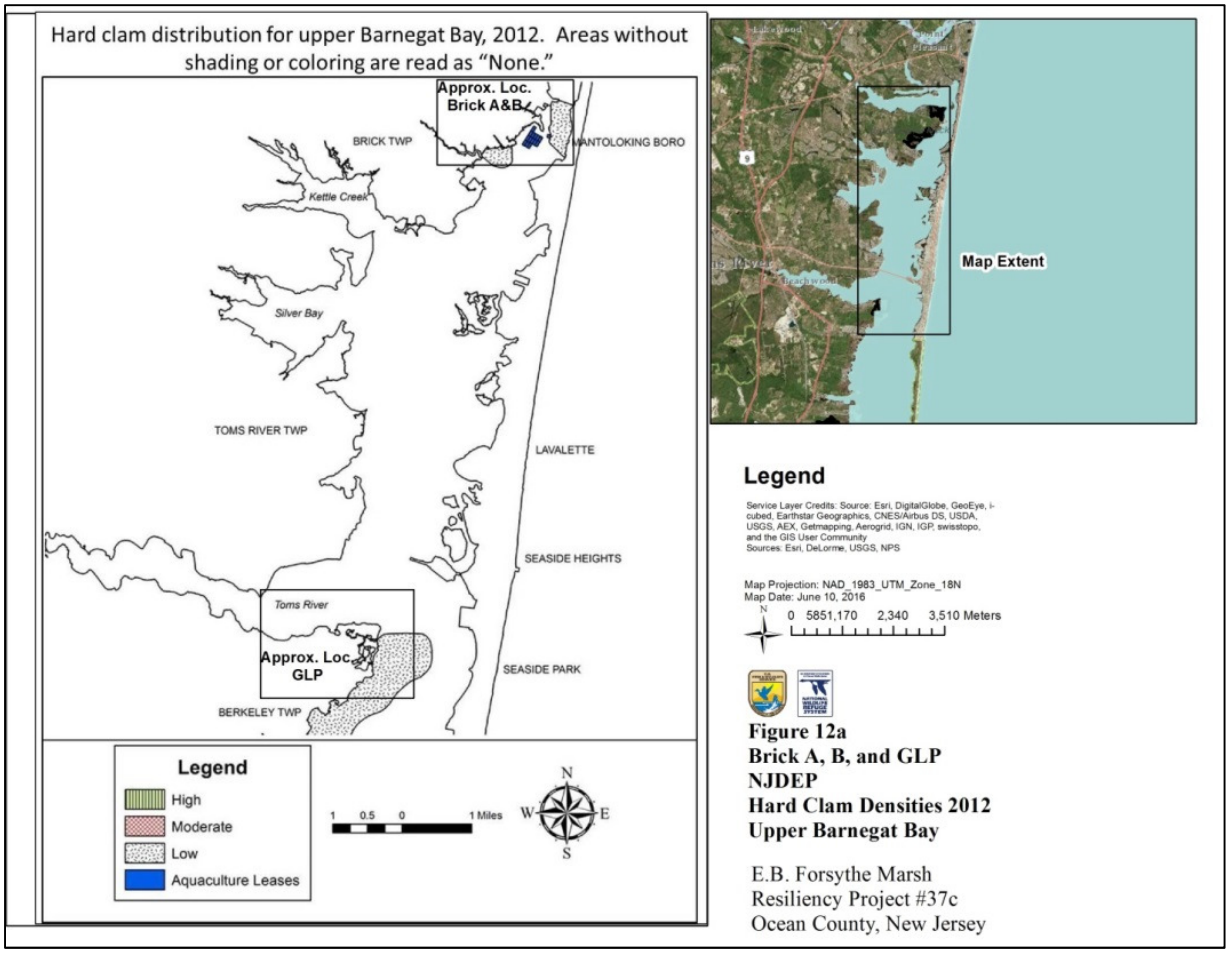
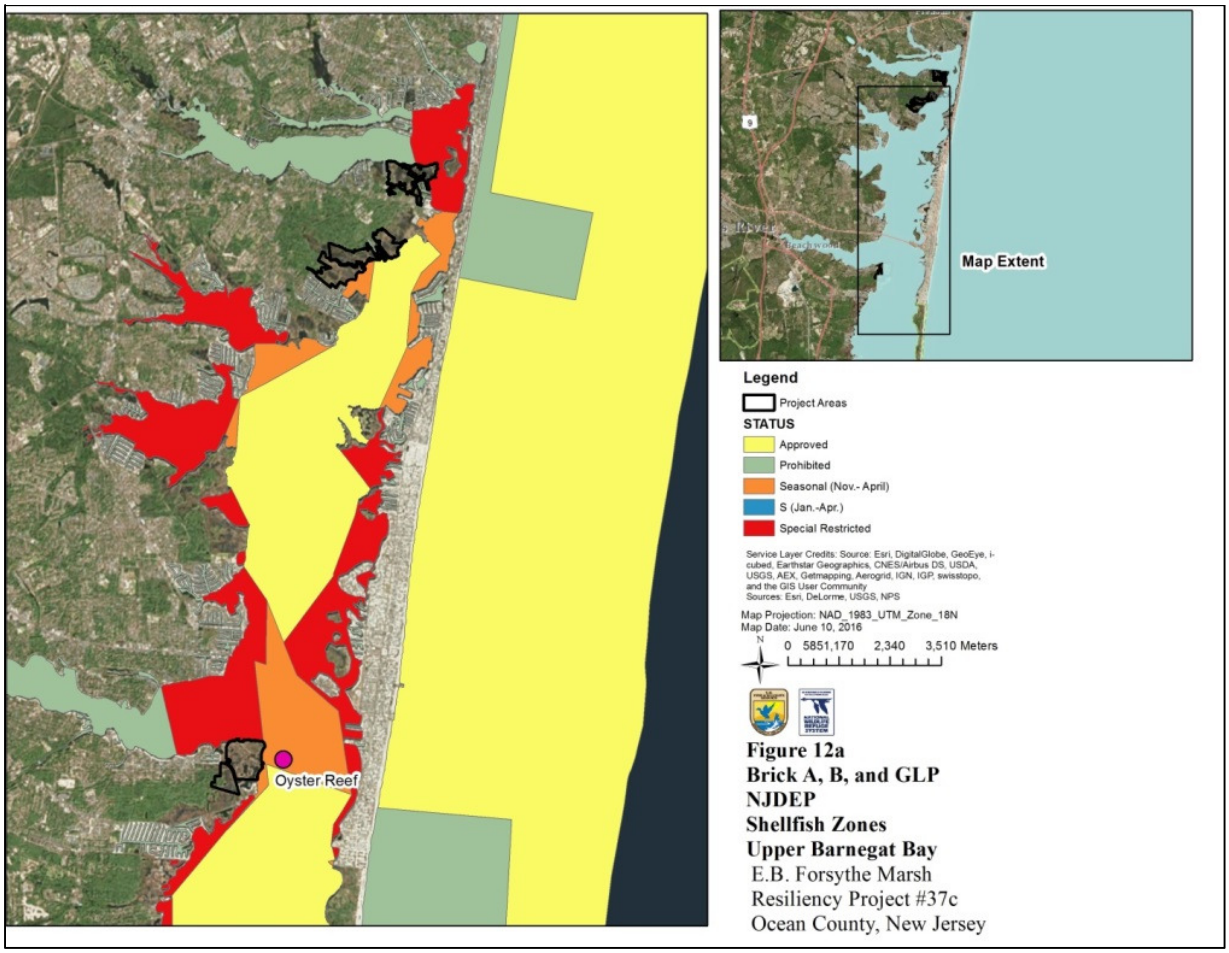


**Figure 12aa**. NJDEP shellfish classification for the waters surrounding Brick A, Brick B, and Good Luck Point project areas. (Source Data: (NJDEP 2014).




Sediment enrichment is scheduled to take place between September and late December for Brick A, Brick B, and Good Luck Point project areas. Shellfish in these project areas could be temporarily impacted by increased turbidity levels in the water if they are not mobile and capable of moving out of the way of construction. Mitigation measures such as turbidity curtains and containment barriers will be used at the construction sites which should minimize the amount of turbidity in the surrounding water bodies. Also, the Refuge will use recommended BMP's to ensure sediments do not encroach on shellfish areas. See Table 7 for additional details on NOAA trust resource impact assessments.

Culvert construction at Good Luck Point is scheduled to take place between September and late December. Mitigation measures such as turbidity curtains will be employed during this construction. It is anticipated that turbidity will be the most disturbing to non-mobile shellfish such as clams and oysters. The footprint of the culvert construction sites is still being determined but both culverts are located under Bayview Ave in Ocean Gate, NJ (Figure 4a).

### 4.2.5 Mudflats

There are mudflats present in the Brick A, Brick B, and Good Luck Point project areas. The objective for sediment enrichment at the Brick A and Brick B sites is to raise the elevation of the marsh in specific areas

to allow for the reintroduction of native marsh grasses such as S. alterniflora and S. patens which already inhabit the project areas but in low abundances. It's anticipated that raising the elevation in certain areas will reduce the area of mudflats, but in other areas it's anticipated that mudflats will remain the same. The proposed plan will not only restore more than a 100 acres of salt marsh, but it will also protect nearby forested habitat from further degradation due to salt water intrusion from winds and storm surge. See section 4.2.3 for additional information.

The Good Luck Point project area does not have as many mudflats as the Brick and Brick B project areas, but the same objective is intended at this site, which is to raise the elevation of the marsh to allow for native marsh plants to repopulate and protect adjacent forested habitat upland from further degradation due to salt water intrusion from winds and storm surge. The addition or enhancement of culverts at this site will also allow the swamped marsh in this area to flush with the tidal cycle more regularly. It's anticipated that the culvert replacement at this project area will reduce the number of mudflats, but in other areas, it's anticipated that mudflats will remain the same. See section 4.2.3 for additional information.

#### 4.2.6 Bottom Type

The bottom type at the Brick A, Brick B, and Good Luck Point project areas is comprised of soft sediments such as silt, sand, and mud. There is no rocky or cobble substrate (i.e., hard bottom habitat) at or adjacent to the project areas (Amec 2016). See section 4.2.1 for additional substrate information.

#### 4.2.7 Habitats of Particular Concern (HAPC)

SAV habitat in the Brick A, Brick B, and Good Luck point project areas has been designated as an HAPC for summer flounder (Paralichthys dentatus).The HAPC includes all native species of macroalgae, seagrasses, and freshwater tidal microphytes in any size bed as well as loose aggregations, within adult and juvenile EFH. See Table 6 for further information on impacts to EFH.

#### 4.2.8 Salinity

In general the average salinities for the Barnegat Bay and its associated tributaries and tidal creeks can average in range between 19 to 30 ppt, with even lower salinities found at the mouths of rivers and creeks and higher salinities found near the ocean inlets (USFWS 1996). Based on data collected by Amec Foster Wheeler in the summer of 2015 and SMI monitoring by the refuge, the average salinity during a lunar cycle in July for the Brick A project area was approximately between 16–20 ppt, Brick B was approximately between 10 and 20 ppt, and Good Luck Point was approximately between 15 to 20 ppt. Since the project areas already have estuarine salinity ranges, the sediment enrichment process is not expected to alter the salinity (Amec 2016, USFWS 2016).

#### 4.2.9 Depth

The topography of Brick Project Area A and Brick Project Area B is relatively flat and is situated between 0 and 5 feet above mean sea level. Net local surface water drainage from the marsh in the Brick A project area drains into the adjacent Metedeconk River and Barnegat Bay. Net local surface water drainage from the marsh in the Brick B project area drains into the adjacent Barnegat Bay and Reedy Creek. The Brick A project area cells (Figure 2a) have varied elevations (See Marsh EA Appendix for additional information). Three cells (BRA-5, BRA-6, and BRA-8) in the Brick Project Area A have open water pools (Figure 2a). The cell, BRA-5 is proposed to be

converted from open water to low salt marsh habitat. The cell is located on the bay edge of the marsh, and was historically mostly low salt marsh (Figure 2b).

Additionally, as this cell likely contains semi-natural pannes, LSM is targeted to preserve fisheries habitat. The cell, BRA-6 is also proposed to be converted to LSM. This cell currently contains open water, mud flat and LSM. LSM is targeted based on site conditions and to preserve fisheries habitat. Therefore, the depths at these open water pools will be reduced, but fisheries habitat will be maintained in these cells since they are not being filled in completely.

The Brick B project area does not have any deep open water pools that will be converted to LSM (Figure 3a). Sediment enrichment at this site is expected to raise the elevation and return the marsh to a more natural tidal marsh by promoting native plant species (i.e., S alterniflora and S. patens) to repopulate.

The Good Luck Point Project Area is relatively flat and is situated between 0 and 5 feet above mean sea level (Figure 4a). Net local surface water drainage from the marsh ultimately drains into the nearby Toms River to the north or Barnegat Bay to the east. There are no deep open water pools similar to the Brick project area that will be converted to LSM. Sediment enrichment is expected to raise the elevation of the marsh, and with the addition/enhancement of the culvert(s) at this site, the marsh should receive increased tidal flow to preserve fisheries habitat.

#### 4.2.10 Water Temperature

Brick A, Brick B, and Good Luck Point project areas have water temperatures comparable to the water temperatures of Barnegat Bay. Winter water temperatures for Barnegat Bay can be as low as 29.5°F in the winter to as high as 82°F in the summer with even lower temperatures found at the mouths of rivers and creeks in the winter and higher temperatures found near the ocean inlets in the summer (USFWS 1996). Sediment enrichment at all three project areas is not expected to alter water temperatures.

#### 4.2.11 Normal Frequency of Site Disturbance

The normal frequency of disturbance at all three project areas is minimal since all areas are restricted to the public. Therefore, there is very limited pedestrian traffic. Natural disturbances such as storm events do occur, but their impact (i.e., flooding of the wetlands) is temporary and usually not significant.

#### 4.2.12 Benthic Disturbance

The benthic community may be temporarily impacted during the SE and culvert enhancement construction phase at the project areas. The refuge has done SMI monitoring at the Brick A, B, and Good Luck Point project areas for nekton and fish counts and will continue monitor these sites after the sediment enrichment and culvert enhancement work is completed (Table 3).

**Table 3**. Nekton sampling at the Brick A, Brick, B, and Good Luck Point project areas for the SMI 2015 sampling season (USFWS 2016).

| Project Area | Nekton Counts | Mummichug (*Fundulus heteroclitus*) Counts |
|---|---|---|
| Brick A | 800 | 480 |
| Brick B | 450 | 100 |
| Good Luck Point | 600 | 100 |

Mobile benthic organisms should be able to move out of the way of construction equipment, but non-mobile benthic organisms such as clams, oysters, whelks, and many other benthic organisms may be temporarily impacted from the mechanical disturbance of the substrates on the marsh surface and from turbidity. However, previous studies have shown the recolonization of the benthic community after sediment enrichment is expected to be from a few months to a few years (Wigley, R.L. and Theroux, R.B. 1976; Maurer et al. 1981). Macrofaunal recovery is usually rapid after pumping operations cease. Recovery of the macrofaunal community may occur within one or two seasons because borrow material grain sizes are expected to be compatible with natural beach sediments. Results obtained from the intertidal and surf zone of Folly Beach, South Carolina, indicated that beach nourishment had a very brief effect on the infaunal abundance and number of species in the benthic communities (Lynch 1994). Recolonizing infauna was observed in substantial numbers one day after nourishment.

Highly mobile organisms, such as amphipods, can escape to the water column and can directly resettle after dredging operations are completed (Conner 1979). Mobile polychaetes are intermediate of amphipods and bivalves in their capacity to resettle directly after dredging. Bivalves are the least mobile organisms, although pelagic larvae of these species can result in high recruitment. Larval recruitment and horizontal migration from adjacent, unaffected areas initially recolonize the disturbed area (Van Dolah, Calder, and Knott 1984; Oliver et al. 1977). Some benthic studies have demonstrated only subtle changes in sediment characteristics with a slight shift in corresponding benthic community composition post-dredging (Scott 2012).

Additionally, BMP's and mitigation measures will be used such as turbidity curtains and containment barriers to contain the sediment placed on the marsh, but filter feeders such as clams, oysters, whelks, and plankton would be temporarily impacted.

The dredging operations at selected channels for Brick A, B, and Good Luck Point project areas as well as the culvert enhancement construction (Figures 8 and 9) may potentially impact benthic organisms. See Section 4 for more details on the type of equipment used to for the SE, dike breachings, and culvert enhancement work.

### 4.2.13 Will salt marsh habitat be impacted?

Salt marsh habitat at all three project areas will be temporarily impacted from sediment enrichment as discussed above in Section 4.2.13 however, the benefit to doing sediment enrichment is it should restore the marsh to a more natural habitat by encouraging native plants (i.e., S alterniflora and S. patens) to repopulate where salt water intrusion has waterlogged the marsh (see Figure 2 a and b). Additionally, sediment enrichment should create habitat for birds, wildlife, and juvenile fish (Reimold, R. J., M. A. Hardisky, and P. C. Adams 1978; Cahoon, D. R., and J. H. Cowan, Jr. 1987;

Cahoon, D. R., and J. H. Cowan, Jr. 1988). The refuge is doing this work for long-term benefits, but there will be short-term temporary impacts. Sediment enrichment done at the Assawoman Wildlife Area in 2012 has been monitored for wetland conditions to determine if ecological uplift was reached after placing different amounts of sediment (20 to 100 cm) on the marsh. Results have varied over the past three years and there has been decreased plant cover and increased soft sediments on the marsh surface, however, there was a lessening in severity of ditches, which may also be temporary. It is expected that decreases in vegetation are attributed to a temporary dip in habitat condition due to vegetation being knocked down and covered with sediment. It is expected that habitats will improve over the next 2-3 years as the sediment continues to settle and the vegetation cover and height recovers (Rogerson, A., A. Nichols, B. Wilson 2014).

#### 4.2.14 Will mudflat be impacted?

There are mudflats in all three project areas. The goal of sediment enrichment is to raise the elevation of the marsh so native plants repopulate the area. Therefore, some mudflats will disappear as native plants (i.e., *S. alterniflora* and *S. patens*) repopulate the project areas in the years following construction.

At Good Luck Point, the enhancement of the culvert(s) should allow the marsh to properly drain thereby allowing certain areas to re-establish as mudflats during periods of low tide. See Section 4.2.3 for additional information.

#### 4.2.15 Will turbidity increase?

Turbidity may increase temporarily at all three project areas during SE construction and at the culvert construction at Good Luck Point. The refuge will use the recommended BMP's to mitigate the effects of turbidity from the construction of sediment enrichment and culvert enhancement. See Benthic Disturbance section 4.2.12.

#### 4.2.16 Will contaminants be released into the marsh?

See Section 4.1 for information.

#### 4.2.17 Will tidal flow, currents, or wave patterns be altered?

Tidal flow at Brick A and B project areas will be altered after SE as the some of the cells are converted from open water to low salt marsh and some of the low salt marsh cells are converted to high marsh. See Marsh EA sediment enrichment section for more details. Tidal flow may be reduced in some areas at Brick A and Brick B project areas.

Tidal flow at Good Luck Point is anticipated to be increased as the culvert(s) in the project area are modified to allow for more tidal exchange and the drainage of marsh in between tidal cycles. The area has been grid ditched and high marsh remains only along the edge of the ditches. The vegetation on the interior of each grid has died back and now mudflats remain. The edges of these grids are slightly higher in elevation than the interior, since the soil excavated from the ditches was likely deposited just along the ditch edges. Raising the elevation of the interior areas of these grids and restoring the hydrological connectivity to the ditches will be important for the long term re-establishment of marsh grasses. Sediment enrichment in the project area may reduce the tidal exchange even after the culvert(s) are enhanced, but the goal for this area is to encourage more tidal flushing.

#### 4.2.18 Will water quality be altered?

Turbidity is the primary water quality parameter that will be altered during construction. There will be short-term elevations in suspended particulate concentrations during sediment enrichment construction and in the immediate vicinity of the dredging and discharge locations. The effects of water quality in the water column will be:

1. Light penetration – Short-term reduction at the dredging locations and runoff from the sediment enrichment locations.
2. Dissolved oxygen- It is anticipated the dissolved oxygen levels will decrease near the dredging locations and sediment enrichment locations on the marsh but the anticipated levels low levels of organics in the dredge material should not generate a high oxygen demand
3. Toxic metals and organics- The refuge has analyzed the dredge material, which is mostly fine to medium sand, for toxic metals and organics and has determined that the sediment is acceptable to place on its marshes. See Benthic Disturbance Section 4.2.12 for more details.

#### 4.2.19 Will ambient noise levels change?

During construction there will be short term and temporary ambient noise associated with equipment and staff presence. Once sediment enrichment is constructed at the three project areas and they are restored to a more natural hydrologic regime, it is expected that native marsh grasses such as Spartina alterniflora and Spartina patens will recolonize the area and may help absorb ambient noises from speed boats on the bay.

#### 4.2.20 Does the action have the potential to impact prey of federally managed fish with EFH designations?

Sediment enrichment at the three project areas does have the potential to affect the prey (i.e., shellfish, small fish, and plankton) of some managed fish with EFH designations. See Table 6 for impacts to EFH managed species.

#### 4.2.21 Description of Placement Method

The transport method of sediment will be hydraulic dredging, transport via high-density polyethylene (HDPE) pipe distributed via a network of outlets based on the targeted elevations at specific cells. The additional elevation required to meet the biological target elevations will be developed by consulting engineers. See section 4.0 for additional information.

## 4.3 Description of Tidal Flow Restoration Sites: Stouts Creek, Forked River, and Barnegat Impoundments

### 4.3.1 Project Area Overviews

The Stouts Creek project area encompasses approximately 127 acres (**Figure 5a**). The project site is comprised of a large, man-made impoundment that is split into two distinct cells (west and east)

with a small, more natural like ponded area along the northern portion (north) of the project site (Amec 2016). See Section 4.0 for additional information.

The Forked River project area is composed of a large man made impoundment that is also split into two distinct impoundments (**Figure 6a**). It is approximately 17.5 acres in size and is generally situated between coastal marsh to the east, forested wetlands to the west, a mix of forested wetlands and uplands to the south, and residential land use to the north (Amec 2016). See Section 4.0 for additional information.

The Barnegat project area is composed of five separate man-made impoundments, or pools, that occupy approximately 238 acres (**Figure 7a**). These pools are generally situated between Barnegat Bay to the east, forested wetlands to the west, and residential land use to the north and south (Amec 2016). See Section 4.0 for additional information.

### 4.3.2 Marsh Surface Sediment Characteristics

Soils for the eastern portion of the Stouts Creek Project Area are listed as Appoquinimink-Transquaking-Mispillion complex, very frequently flooded soils with 0 to 1 percent slopes. The northern and western portions of the Stouts Creek Project Area are primarily water and Appoquinimink-Transquaking-Mispillion complex, and very frequently flooded soils with 0 to 1 percent slopes, with some small pockets of Berryland Sand, rarely flooded soils with 0 to 2 percent slopes (NRCS 2016). The goal of breaching the dikes at the Stouts Creek impoundments is to introduce more tidal flow, increase salinity, and restore a more natural hydrologic regime within the impoundments, thus eventually allowing more resilient native coastal plant species to return to the impounded area. Similar marsh sediments to what is already present in the impoundments will be naturally introduced to the impoundments through increased tidal flow.

The sediment characteristics at Forked River primarily contain mostly water surrounded by Appoquinimink-Transquaking-Mispillion complex, and very frequently flooded soils with 0 to 1 percent slopes (NRCS 2016). The goal of breaching the dikes at the Forked River impoundments is to introduce more tidal flow, increase salinity, and restore a more natural hydrologic regime within the impoundments, thus eventually allowing more resilient native coastal plant species to return to the impounded area. Similar marsh sediments to what is already present in the impoundments will be naturally introduced to the impoundments through increased tidal flow.

The Barnegat project area sediment characteristics are primarily Appoquinimink-Transquaking-Mispillion complex, and very frequently flooded soils with 0 to 1 percent slopes. Smaller portions of the Project area contain Berryland Sand, rarely flooded soils with 0 to 2 percent slopes and Atsion Sand, or tide flooded Atsion Sand, with 0 to 2 percent slopes. Atsion Sands are described as poorly drained sandy, siliceous, mesic Aeric Alaquods that form sandy marine sediments in coastal flats and depressions. Another sliver of the Project boundaries occur over Psammaquents, sulfidic substratum, frequently flooded soils with 0 to 3 percent slopes (NRCS 2016). The goal of breaching the dikes at the Barnegat impoundments is to introduce more tidal flow, increase salinity, and restore a more natural hydrologic regime within the impoundments, thus eventually allowing more resilient native coastal plant species to return to the impounded area. Similar marsh

sediments to what is already present in the impoundments will be naturally introduced to the impoundments through increased tidal flow.

### 4.3.3 Submerged Aquatic Vegetation (SAV)

Unidentified SAV was found in the eastern Stouts Creek impoundment during Amec Foster Wheeler's field monitoring study in the summer of 2015 (Amec 2016). Historical maps (1968 to 2009) of SAV in Barnegat Bay did not reveal any SAV in or adjacent to the Stouts Creek impoundments (Macomber and Allen 1979, Rutgers 2011, Lathrop et. al. 2001, Lathrop et. al. 2004, Lathrop et. al. 2011). The SAV inside this impoundment will not likely come back once the impoundment is breached, but SAV inside this impoundment is not relevant for EFH since fish access was limited.

There was no SAV found to be present in or adjacent to the two Forked River impoundments during Amec Foster Wheeler's field monitoring study in the summer of 2015 (Amec 2016).

There was no SAV found to be present in or adjacent to the five Barnegat impoundments during Amec Foster Wheeler's field monitoring study in the summer of 2015 (Amec 2016). Also, historical maps (1968 to 2009) of SAV in Barnegat Bay did not reveal any SAV in or adjacent to the Stouts Creek impoundments (Macomber and Allen 1979, Rutgers 2011, Lathrop et. al. 2001, Lathrop et. al. 2004, Lathrop et al. 2011).

### 4.3.4 Wetlands

There are wetlands present at the Stouts Creek Impoundment. The easternmost impoundment at Stouts Creek consists of a large mudflat characterized by submerged aquatic vegetation and floating algae that contains a shallow amount of water (approximately 0 to 6 inches) over an unconsolidated muck substrate. The western impoundment consists of a similar substrate but with less standing water (approximately 0 to 3 inches). The western impoundment also contains higher elevations throughout the center of the impoundment that are dominated by monotypic stands of the invasive species common reed (*Phragmites australis*). The remaining portions of the Project area include the actual dike berms around the impoundment that are dominated by common reed and shrubs, and a small natural pond-like feature dominated by common reed on the north side of the Project area. Unlike the natural high and low salt marsh areas observed outside the Project area boundary at Stouts Creek, the habitat within the Project area is dominated by open water and mudflats which have been created by flooding the area. The dominant vegetation found throughout the Project area consists of invasive species and the overall health of this impoundment area is generally poor (USFWS 2016).

The Forked River project area is dominated by marsh areas that have been turned into open water impoundments and mudflats, with salt marsh habitat along the fringes of the impoundments. The higher elevations and dikes are dominated by common reed. The easternmost impoundment consists of a large un-vegetated area within the center of the impoundment that contains an average of 0 to 6 inches of water over an unconsolidated muck substrate. The remaining portion of this eastern impoundment is dominated by the typical low salt marsh species of smooth cordgrass with occasional spike grass. The western impoundment consists of a similar substrate but with less standing water and the surrounding salt marsh vegetation was not identified as the typical low salt

marsh habitat. Instead, a more diverse coverage of plant species was identified including common threesquare (*Schoenoplectus pungens*), dwarf spikerush (*Eleocharis parvula*), and fern flatsedge (*Cyperus filicinus*) (USFWS 2016).

The Barnegat project area is composed of five separate man-made impoundments. The easternmost impoundment is the largest and consists of an un-vegetated area that contains an average of 0 to 6 inches of water over an unconsolidated muck substrate. The remaining area inside the impoundment consists of dense common reed stands and areas where common reed appears to be severely stressed due to persistent flooding and only remnants of the rhizomes and dead vegetation remain. The four impoundments along the west side of the Project area also consist mainly of large, un-vegetated mudflats with an average of 0 to 6 inches of water. However, unlike the larger impoundment to the east, these impoundments contain low lying vegetated areas of scrub-shrub wetland and low salt marsh along the edge of the dikes. The remaining portions of the project area include the actual dike berms around the impoundments that are dominated by tidal reed marsh and shrub areas (Amec 2016).

In general the Barnegat project area is dominated by marsh areas that have been converted into open water impoundments and mudflats, with higher elevations dominated by common reed. Some remnants of low and high salt marsh were observed along the toe of the impoundment berms as a very narrow (1 to 3 foot wide) bench-like feature. However, these areas are very sparse and typically the common reed dominates the berms to the edge. Long, narrow strips of islands, with sparse scrub-shrub vegetation, are also located throughout the western impoundments. These appear to be remnants of larger, vegetated islands and berms that have been flooded and highly impacted by salt water levels (Amec 2016).

### 4.3.5 Shellfish

Stouts Creek, Forked River, and Barnegat –

Refer to Table 2 for the common shellfish found in the Stouts, Forked River, and Barnegat and Table 4 below for the refuge's nekton summary for the summer of 2015 monitoring. In addition to the refuge's SMI data, the NJDEP has mapped hard clam distributions near the Stouts Creek, Forked River, and Barnegat impoundments (Figure 12b and c).

**Figure 12b**. NJDEP hard clam distributions for the waters surrounding Stouts Creek and Forked River project areas. (Source Data: NJDEP 2012).

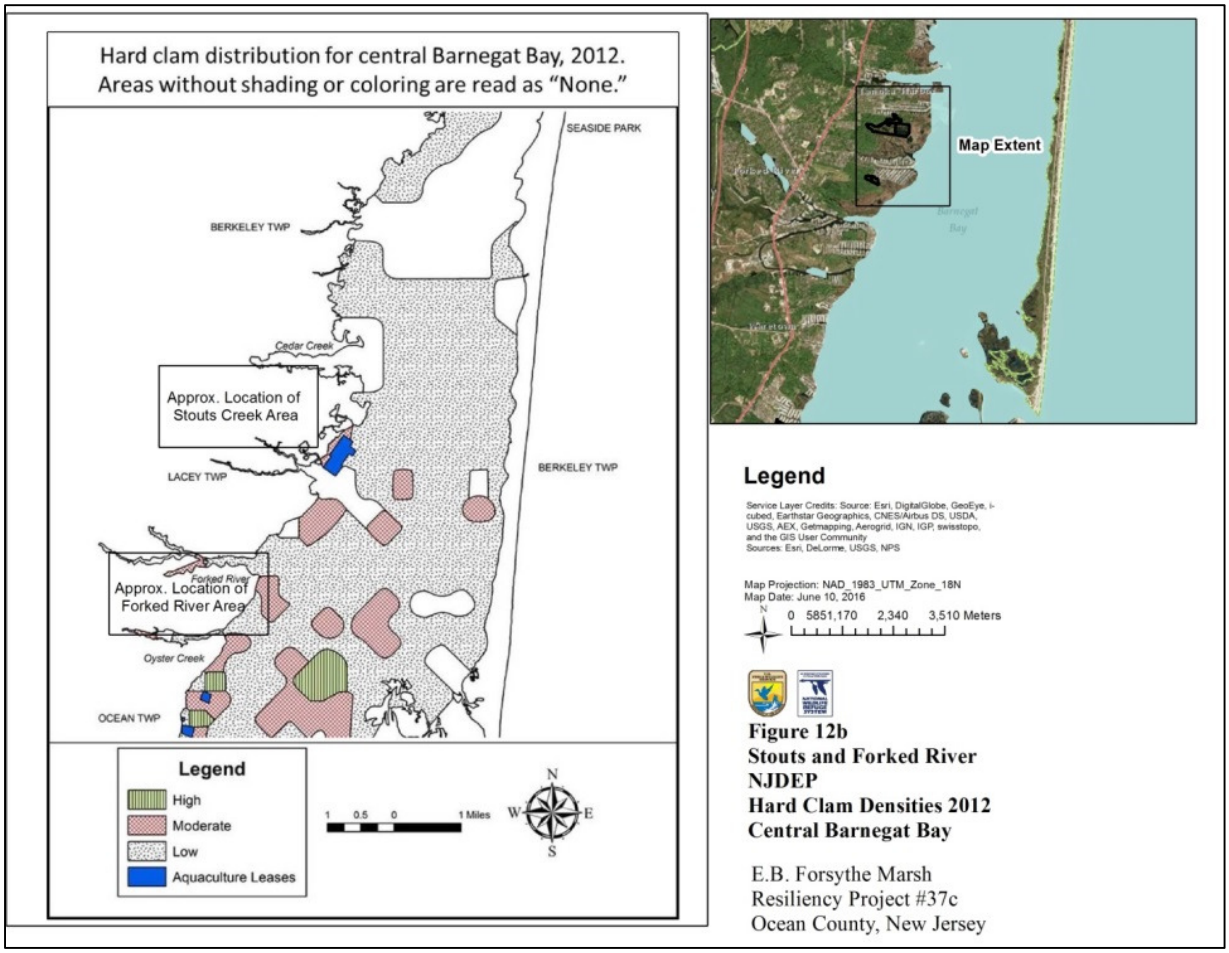
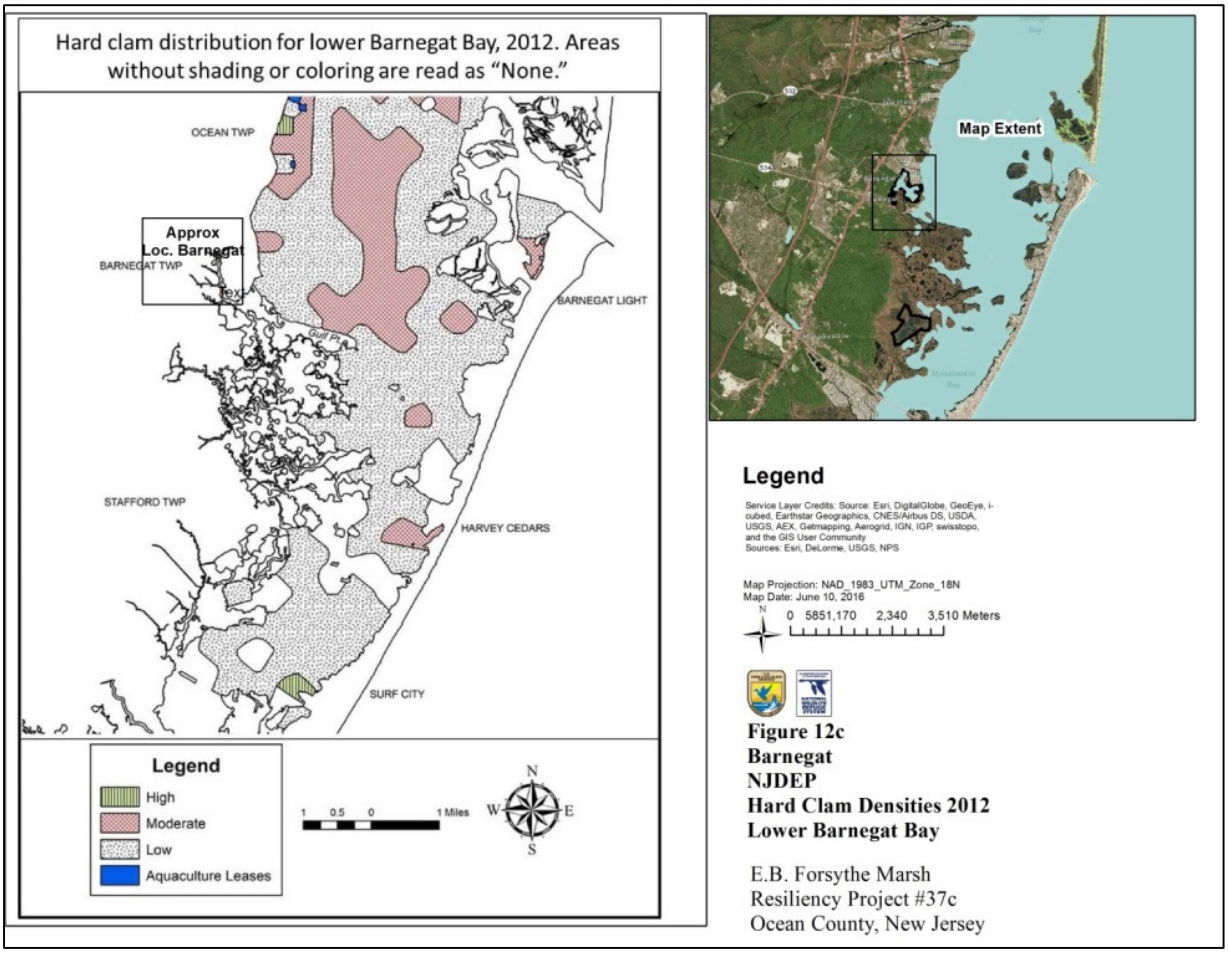


**Figure 12c**. NJDEP hard clam distributions for the waters near Barnegat Impoundments project areas. (Source Data: NJDEP 2012).




The removal of dikes in the Stouts Creek, Forked River, and Barnegat impoundments is scheduled to take place between September and late December. Dike removal should not have any effects to the water quality. There are no anticipated impacts to shellfish in the area from the breaching of the dikes.

### 4.3.6 Mudflats

There are mudflats present in the Stouts Creek, Forked River, and Barnegat project areas. See Section 4.3.4 for additional information.

### 4.3.7 Bottom Type

The bottom type is similar at all three project areas. It's a mixture of soft sediments such as silt, sand, and mud. There is no rocky or cobble substrate (i.e., hard bottom habitat) at or adjacent to the project sites (Amec 2016). See section 4.3.2 for additional information.

### 4.3.8 Habitats of Particular Concern (HAPC)

There is no HAPC designated in Stouts Creek, Forked River, or Barnegat impoundments.

### 4.3.9 Salinity

In general the average salinities for the Barnegat Bay and its associated tributaries and tidal creeks can average in range between 19 to 30 ppt, with even lower salinities found at the mouths of rivers and creeks and higher salinities found near the ocean inlets (USFWS 1996).

Based on data collected by Amec Foster Wheeler in the summer of 2015 for Stouts Creek, the average salinity for the eastern and western impoundments is 25 ppt, which suggests these impoundments are receiving some tidal flushing. Breaching some of the dikes at the impoundments will help ensure that the project site is restored to a more natural hydrologic regime. The average monthly salinity for the north impoundment was recorded to be 5 ppt, which suggests this impoundment does not receive enough tidal flushing and is inundated with some kind of a freshwater source (Amec 2016).

Based on data collected by Amec Foster Wheeler in the summer of 2015 for Forked River, the average salinity for the eastern and western impoundments is 5 ppt, which suggests these impoundments do not receive frequent tidal flushing (Amec 2016). Breaching some of the dikes at the western and eastern impoundments will help ensure that the project site is restored to a more natural hydrologic regime by increasing the salinity at the project site.

Based on data collected by Amec Foster Wheeler in the summer of 2015 for Barnegat impoundments, pools (Figure 7a) 1, 2, and 3 on average have low salinities between 5 and 15 ppt. Pools 4 and 5 have a salinity range primarily between 25 and 30 ppt (Amec 2016, USFWS 2016). Pools 4 and 5 experience more tidal flow than pools 1-3, therefore, the benthic habitat at these sites is not expected to change very much.

### 4.3.10 Depth

The average depth of the Stouts' Creek eastern impoundment ranges between 0-6 inches of water over an unconsolidated muck substrate. Meanwhile the western impoundment consists of a similar substrate but with less standing water (0-3 inches) (Amec 2016). After construction the water depths for the Stouts Creek impoundments will decrease during periods of low tide, but will increase during periods of high tide. Currently, the impoundments are not able to ebb and flow properly, but with the removal of some of the dikes, it is anticipated that the Stouts Creek project area will reflect a more natural tidal cycle similar to the surrounding, non-impounded marsh.

Forked River's eastern-most impoundment consists of a large un-vegetated area within the center of the impoundment that contains an average of 0-6 in. of water over an unconsolidated muck substrate. Meanwhile, the western impoundment consists of a similar substrate but with less standing water (Amec 2016). After construction the water depths for the Forked River impoundments will decrease during periods of low tide, but will increase during periods of high tide. Currently, the impoundments are not able to ebb and flow properly, but with the removal of some of the dikes, it is anticipated that the Forked River project area will reflect a more natural tidal cycle similar to the surrounding, non-impounded marsh.

Barnegat Impoundment's eastern-most impoundment (pool 5) is the largest area and consists of an unvegetated area that contains an average of 0-6 in. of water over an unconsolidated muck substrate. A series of four impoundments (pools 1, 2, 3, and 4) exist along the west side of the

project site with the northern impoundment as the largest and the remaining three areas significantly smaller in size. The four impoundment areas along the west side of the project site also consist mainly of large unvegetated mudflats with an average of 0-6 in. of water (Amec 2016). After construction the water depths for the Barnegat impoundments will decrease during periods of low tide, but will increase during periods of high tide. Currently, the impoundments are not able to ebb and flow properly, but with the removal of some of the dikes, the goal is that the Barnegat impoundment project area will reflect a more natural tidal cycle similar to the surrounding, non-impounded marsh.

### 4.3.11 Water Temperature

Winter water temperatures for Barnegat Bay can be as low as 29.5°F in the winter to as high as 82°F in the summer with even lower temperatures found at the mouths of rivers and creeks in the winter and higher temperatures found near the ocean inlets in the summer (USFWS 1996). The breaching of the dikes at the three project areas should ensure the project site water temperatures will be similar to the surrounding marsh water temperatures because the site will receive increased tidal flow.

### 4.3.12 Normal Frequency of Site Disturbance

There is very minimal site disturbance, both natural and man-made at the three project areas. The impoundments are located in a non-public area of the Refuge. Therefore, there is very limited pedestrian traffic. Natural disturbances such as storm events do occur, but their impact (i.e., flooding of the wetlands) is temporary and usually not significant.

### 4.3.13 Benthic Disturbance

The refuge has done SMI monitoring at the Stouts Creek, Forked River, and Barnegat project areas for nekton and fish counts and will continue monitor these sites after the sediment enrichment and culvert enhancement work is completed (Table 4).

**Table 4**. Nekton sampling at the Stouts, Forked River, and Barnegat project areas for the SMI 2015 sampling season (USFWS 2016).

| Project Area | Nekton Counts | Mummichug (*Fundulus heteroclitus*) Counts |
|---|---|---|
| Stouts Creek | 1,100 | 250 |
| Forked River | 400 | 250 |
| Barnegat | 700 | 250 |

The benthic community will be temporarily impacted by 14 dike breaches at the Stouts Creek impoundments, but the impacts should not have long-term effects on the benthic environment. The dike breaches will be 3-4 feet long and 3 feet deep (Figure 5). Mobile benthic organisms such as bottom dwelling fish, crustaceans, and snails will be able to relocate, but more sedentary organisms, such as clams and whelks will be more impacted, but it is unlikely they are present inside the impoundments. The disturbance from the construction is expected to take ten days. The most significant effect from the construction could be increases in turbidity from the disturbance

of the sediments at the breach locations. Protocols will be put in place such as the use of silt curtains to minimize the effects of turbidity. Mostly the filter feeders, such as clams and planktonic communities could be affected by this activity, which will be temporary. Once the construction is done, the Stouts Creek impoundments will receive more tidal exchange and water, which will result in more habitat for benthic communities such as shellfish, benthic fish, and planktonic organisms.

The benthic community will be temporarily impacted by two dike breaches at the Forked River impoundments, but the impacts should not have long-term effects on the benthic environment. Two dike removals will be the same size and dimensions as the Stouts Creek breaches (Figure 6a). Mobile benthic organisms such as bottom dwelling fish, crustaceans, and snails will be able to relocate, but more sedentary organisms, such as clams and whelks will be more impacted, but it is unlikely they are present inside the impoundments. The disturbance from the construction is expected to take ten days. The most significant effect from the construction could be increases in turbidity from the disturbance of the sediments at the breach locations. Protocols will be put in place such as the use of silt curtains to minimize the effects of turbidity. Mostly the filter feeders, such as clams and planktonic communities could be affected by this activity, which will be temporary. Once the construction is done, the Forked River impoundments will receive more tidal exchange and water, which will result in more habitat for benthic communities such as shellfish, benthic fish, and planktonic organisms.

The benthic community will be temporarily impacted by the breaching of dikes at the Barnegat impoundments, but the impacts should not have long-term effects on the benthic environment. There will be 13 breaches constructed (Figure 7a). The breaches will be the same dimensions as Stouts Creek and Forked River. Mobile benthic organisms such as bottom dwelling fish, crustaceans, and snails will be able to relocate, but more sedentary organisms, such as clams and whelks will be more impacted, but it is unlikely they are present inside the impoundments. The disturbance from the construction is expected to take ten days. The most significant effect from the construction could be increases in turbidity from the disturbance of the sediments at the breach locations. Protocols will be put in place such as the use of silt curtains to minimize the effects of turbidity. Mostly the filter feeders, such as clams and planktonic communities could be affected by this activity, which will be temporary. Once the construction is done, the Barnegat impoundments will receive more tidal exchange and water, which will result in more habitat for benthic communities such as shellfish, benthic fish, and planktonic organisms.

#### 4.3.14 Will salt marsh habitat be impacted?

Salt marsh habitat will be temporary impacted at all sites with the staging of equipment onto the dikes and the actual breaching of the dikes. An amphibious excavator or a low-ground pressure excavator will be used for construction at all three project areas. Construction equipment will temporarily impact the marsh surface, but we will likely see an increase in salt marsh habitat and an improvement in the existing habitat after the breaches are complete.

#### 4.3.15 Will mudflat be impacted?

Any construction equipment at the project areas will be located on the dikes and will not impact the mudflats. Once the dikes are breached more saltwater will enter the project areas during tidal

cycles, but with better flushing of the impoundments due to the opening of the dikes, the mudflat areas should reappear during periods of low tide.

#### 4.3.16 Will turbidity increase?

See Section 4.2.13.

#### 4.3.17 Will contaminants be released into the marsh?

The refuge does not anticipate any contaminants being released into the marsh during construction of the dike removals. The construction documents for this project will include quality assurance and quality control plans as well as a health and safety plan (HASP), which will have construction site control measures for the dike removal process and hazardous material spill plans from a possible construction vehicle leak.

#### 4.3.18 Will tidal flow, currents, or wave patterns be altered?

It is anticipated the breaching of the dikes will restore and improve tidal flow to the site to allow better tidal exchange.

#### 4.3.19 Will water quality be altered?

During construction, it is anticipated that temporary impacts to water quality from increases in turbidity may occur, but the effects will be temporary. Construction is scheduled for ten days, and during that time, turbidity curtains will be used to minimize the amount of turbidity allowed to encroach on the surrounding marsh areas or in non-construction areas of the impoundments. The organisms mostly affected from increases in turbidity will be filter feeders (i.e., clams, oysters, plankton, etc.). It is likely that after the breaches are constructed and tidal flow is allowed to return to the impoundments, the water quality will likely improve within the three project areas. Stouts Creek in particular is known for algal mats that cover an unconsolidated muck substrate, which is likely the result of low flow and increased organics from wildlife (i.e., waterfowl). Breaching the dikes at 14 locations at Stouts Creek will increase water flow and circulation and likely improve the water quality of the area.

**Figure 13**. Photo of algal mats and unidentified SAV at Stouts Creek. (Data Source: Amec 2016).

#### 4.3.20 Will ambient noise levels change?

During construction there will be short term and temporary ambient noise associated with equipment and staff presence. Once the dikes are removed in some locations and the project site is restored to a more natural hydrologic regime, it is expected that native marsh grasses such as *Spartina alterniflora* and *Spartina patens* will recolonize the area and may help absorb ambient noises from speed boats on the bay.

#### 4.3.21 Does the action have the potential to impact prey of federally managed fish with EFH designations?

The removal of dikes at the three project areas does have the potential to affect the prey (i.e., shellfish, small fish, and plankton) of some managed fish with EFH designations (See Table 6 for impacts to EFH managed species). There may be some temporary impacts during construction due to turbidity, but the restoration and improvement of tidal exchange following the breaching of the dikes will increase and improve habitat for prey species.

## 5 SCHEDULE

It is expected that this project will have similar timelines for sediment enrichment and tidal flow restoration. Sediment enrichment and tidal flow restoration are expected to take place between early September and late December.

## 6 EFFECTS OF PROPOSED ACTIONS ON EFH

### 6.1 Summary of Project Impacts

There are federally managed EFH species near the sediment enrichment and the tidal flow restoration areas (Table 5). The source data for Table 5 is the NOAA, National Marine Fisheries, Greater Atlantic Region website that lists the EFH species within 10' x 10' latitude-longitude grid boxes. The grid boxes were matched with the project areas, and an EFH species list was created. A thorough search of the scientific and technical literature was done for each of the EFH species listed that overlapped within the project areas. Only the EFH species with life stages that matched the benthic habitats, salinities and temperature ranges of the project areas are summarised in Table 5 and 6 and discussed in Section 6.2.

*Sediment Enrichment*

The dredging of sediment from the channels would have a temporary impact to the local benthic community at the dredging locations. The immediate impact would be entrainment in the dredge. Dredging removes benthic organisms in the sediments, prey species, and it impinges and entrains larvae. However, it is expected that there would be negligible impact to the regional benthic ecosystem from the sediment enrichment activities because 1) the benthic assemblages in the channels are not unique and are found throughout Barnegat Bay and 2) (Kennish 2001). The dredge will increase turbidity in the water, which could temporarily disturb the ability of mollusks and other filter feeders to filter plankton from the water; however this effect would be temporary. In the Brick A, Brick B, and Good Luck Point project areas it is anticipated that benthic organisms and plants could migrate up through the sediment enrichment placed on the marsh and has been observed in post monitoring at the Assawoman National Wildlife Refuge, Pepper Creek, sediment enrichment project )(Rogerson, A., A. Nichols, B. Wilson 2014).

Fish eggs and larvae are the life stages that are most likely to be affected by the dredging process. It is anticipated that turbidity will increase in the water column during dredging operations, which could temporarily lower dissolved oxygen levels directly affecting eggs on the bottom or slow-moving larvae more greatly than juveniles and adults. The construction will take place between September and late December when most spawning periods are over. See Table 6 for any impacts to EFH managed species.

*Tidal Flow Restoration:*

The culvert enhancement at Good Luck Point and the breaching of dikes at Stouts Creeks, Forked River, and Barnegat impoundments would have a temporary impact to the local benthic community. However, as is true for sediment enrichment impacts, it is expected that there would be negligible impact to the regional benthic ecosystem from the culvert enhancement and the dike breachings for the same reasons discussed in the sediment enrichment Section in 6.1.

**Table 5**. Summarized locations of EFH within the Brick (BRK), Good Luck Point (GLP), Stouts Creek (STS), Forked River (FR), and Barnegat (BGT) Project Areas. Life stage (E=Eggs, L=Larvae, J=Juvenile, A=Adult, N=Neonates) and EFH locations (10' x 10' latitude and longitude square grid) (NOAA 2016).

| Common Name | Scientific Name | BRK | GLP, FR, STS | BGT |
|---|---|---|---|---|
| Red Hake | *Urophycis chuss* | **L, J,** | **L, J** | **L, J** |
| Winter Flounder | *Pseudopleuronectes americanus* | **E, L, J, A** | **E, L, J, A** | **E, L, J, A** |
| Windowpane Flounder | *Scopthalmus aquosus* | **E, L, J, A** | **E, L, J, A** | **E, L, J, A** |
| Atlantic Sea Herring | *Clupea harengus* | **A** | **, A** | **, A** |
| Bluefish | *Pomatomus saltatrix* | **J, A** | **J, A** | **J, A** |
| Atlantic Butterfish | *Peprilus triacanthis* | ---------- | **J** | **J** |
| Summer Flounder | *Paralichthys dentatus* | **J, A** | **L, J, A** | **L, J, A** |
| Scup | *Stenotomus chrysops* | **J, A** | **J, A** | **J, A** |
| Black Sea Bass | *Centropristus striata* | ---------- | **J, A** | **J, A** |
| King Mackeral | *Scomberomorus cavalla* | **E, L, J, A** | **E, L, J, A** | **E, L, J, A** |
| Spanish Mackeral | *Scomberomorus maculatus* | **E, L, J, A** | **E, L, J, A** | **E, L, J, A** |
| Cobia | *Rachycentron canadum* | **E, L, J, A** | **E, L, J, A** | **E, L, J, A** |
| Dusky Shark | *Carcharinus obscurus* | **N** | **N** | **N** |
| Sandbar Shark | *Carcarhinus plumbeus* | **N, J, A** | **N, J, A** | **N, J** |
| Tiger Shark | *Galeocerdo cuvieri* | **N, J** | --------- | -------- |
| Clearnose Skate | *Raja eglanteria* | **J, A** | **J, A** | **J, A** |
| Little Skate | *Leucoraja erinacea* | **J, A** | **J, A** | **J, A** |
| Winter Skate | *Leucoraj ocellata* | **J, A** | **J, A** | **J, A** |

## 6.2 Description of Managed Species In Affected EFH Areas

### 6.2.1 Red Hake (*Urophycis chuss*)

Larvae are found in coastal waters between May and December. They prefer salinities greater than 0.5 ppt and temperatures less than 66° F. Once larvae hatch, they begin their descent to the bottom to settle and seek shelter among substrates (Steimle 1999). Juveniles are found throughout the year associated with bottom habitats comprised of shell fragments, including areas with an abundance of live scallops and prefer depths less than 330 feet to the low tide line, temperatures less than 60° F, and salinities between 31 and 33 ppt. Juveniles mainly prey upon crustaceans, amphipods, and polychaetes (Steimle, Frank W., Wallace W. Morse, and Donna Johnson 1999).

### 6.2.2 Winter Flounder (*Pseudopleuronectes americanus*)

Eggs are found in very shallow waters (less than 16 feet), at water temperatures of 50°F or less from January to May and salinities between 10 and 30 ppt. Eggs are associated with bottom substrates such as sand, muddy sand, mud, and gravel (Pereira et. al. 1999). Larvae are found in estuaries and associated with bottom habitats at depths 20 feet and bottom temperature ranges between 35°F and 60° F. Larvae are most likely to occur between March and July (Pereira et. al. 1999). Juveniles (age 1+) are found in estuaries associated with bottom habitats comprised of mud or fine grained sand and bottom temperatures less than 77° F between June and November. They prefer salinities between 10 and 30 ppt and depths between 3 and 164 feet. The major prey of juveniles is amphipods, copepods, polychaetes, and bivalve siphons (Pereira et. al. 1999). Adults are found in estuaries associated with bottom substrates comprised of mud, sand, and gravel, cobble, rocks, and boulders. Spawning adults are found primarily at depths less than 20 feet. Non-spawning adults are found at depths between 1 foot and 300 feet, salinities between 15 ppt and 33 ppt, and temperatures less than 77°F. Spawning adults prefer temperatures less than 60°F, and salinities between 5 and 36 ppt. All adults prey upon mainly amphipods, polychaetes, bivalves or siphons, capelin eggs, and crustaceans (Pereira, J.J, R.Goldberg, J.J. Ziskowsi, P.L. Berrien, W.W. Morse, and D.L. Johnson 1999).

### 6.2.3 Windowpane Flounder (*Scopthalmus aquosus*)

Eggs are found in surface waters in depths less than 230 feet. The seasonal occurrence for eggs in the Mid-Atlantic Bight (MAB) is between February and November, peaks May and October in MAB when temperatures are less than 70°F (Chang, S., P.L. Berrien, D.L. Jognson, and W.W. Morse 1999). Larvae prey on copepods and other zooplankton in surface waters. The seasonal occurrence for larvae in the Mid-Atlantic Bight is from February to November, and peaks from May to October. They prefer depths less than 230 feet and temperatures less than 70°F. Juveniles are associated with bottom habitats comprised of fine sandy sediments, temperatures less than 77°F, and salinities between 5 and 33 ppt. Juveniles prey on polychaetes and small crustaceans, such as mysids. Adults prefer mud, fine grained or sand substrates and salinities between 15 and

33 ppt at depths between 1 and 338 feet. They primarily prey on polychaetes and small crustaceans (i.e., mysids, decapod shrimp, various small fishes (i.e., hakes and tomcod) (Chang, S. 1999).

### 6.2.4 Atlantic Sea Herring (*Clupea harengus*)

Adults are found in nearshore waters at depths between 32-45 feet. mostly in the winter (December to February) when bottom temperatures are between 35°F and 43°F among hardbottom substrate (i.e., rocks and gravel beds) and salinities between 21 and 32 ppt. Their primary prey is zooplankton, arrow worms, pelagic amphipods and krill (Stevenson, D.K., and M.L. Scott 2005).

### 6.2.5 Bluefish (*Pomatomus saltatrix*)

Juveniles are found in estuaries and bays during the summer months (June to October) in shallow areas such as tidal creeks and near the shoreline. They prefer salinities between 23 and 36 ppt and temperatures between 66°F and 75°F. They primarily prey on Atlantic silversides, bay anchovy, clupeids, striped bass, sand shrimp, mysids, other fish, and invertebrates (Shepherd, G. R., and D. B. Packer 2006). Adults are generally found offshore but in the summer (June to August) and fall (September to November) they can be found nearshore at depths less than 250 feet when water temperatures are between 57°F and 60°F and salinities are greater than 30 ppt. Adults prey upon mostly other types of fish (Shepherd and Packer 2006).

### 6.2.6 Atlantic Butterfish (*Peprilus triacanthis*)

Juveniles are found nearshore on shallow sandy and muddy flats and in sheltered bays, estuaries, and the surf zone. Larger juveniles can be found in schools near the bottom during the day. Juveniles prefer temperatures between 40°F and 84°F and salinities between 3 and 37 ppt. Juveniles prey primarily on planktonic organisms such as squids, copepods, amphipods, decapods, coelenterates, polychaetes, small fishes and ctenophores (Cross, J. N., C.A. Zetlin, P.L. Berrien, D.L. Johnson, and C. McBride 1999).

### 6.2.7 Summer Flounder (*Paralichthys dentatus*)

Larvae are found inshore in tidal flats and marsh creeks on sandy substrate from September to February. During these months they prefer depths between 30 and 100 feet, low salinity zones (0 to 0.5 ppt, and temperatures between 48 and 55° F. They prey mostly upon zooplankton (Packer et. al. 1999). Juveniles are found inshore in estuaries throughout the year. They prefer marsh creeks, submerged aquatic vegetation, mud flats, and open bay areas throughout the year with higher densities found in spring (March to May). They prefer depths between 0 to 1.5 feet, salinities between 10 and 30 ppt, and temperatures greater than 50°F. They prey primarily on small crustaceans, polychaetes, and small fish (Packer, D. B., S.J. Griesbach, P.L Berrien, C.A. Zetlin, D.L. Johnson, and W.W. Morse 1999). Adults are found in shallow coastal estuarine waters (0 to 8 feet) when water temperatures are between 60°F and 66°F and their peak spawning season is between September and November. Their primary prey are sand lance, menhaden, and

mummichugs, squid, shrimp, and crabs (Packer et. al. 1999). Adults have a designated Habitat Areas of Particular Concern (HAPC) of all native species of macroalage, seagrasses, and freshwater tidal microphytes in any size bed as well as loose aggregations, within adult and juvenile EFH.

### 6.2.8 Scup (*Stenotomus chrysops*)

Juveniles are found in estuaries from March to August and prefer sand, mud, mussels, and eel grass beds. Their temperature range is primarily between 60°F and 70°F. They prefer depths between 0 and 124 feet and salinities greater than 15 ppt. They prey primarily on polychaetes, epibenthic amphipods, and other small crustaceans, mollusks, and fish eggs and larvae (Steimle 1999). Adults (smaller-sized) are found in larger bays and estuaries from November to April between depths of 6 and 600 feet and spawning adults are found nearshore at depths less than 100 feet between May and August when temperatures are greater than 44°F. They can be found on open sandy bottom or structured bottom such as mussel beds. They primarily prey upon benthic organisms such as small crustaceans, polychaetes, mollusks, small squid, vegetable detritus, insect larvae, and small fish (Steimle et. al. 1999).

### 6.2.9 Black Sea Bass (*Centropristus striata*)

The peak season for juveniles nearshore is between June and November when water temperatures are warmest (40°F to 64°F). Juveniles prefer structured bottom such as submerged pipes, culverts, rip-rap etc. They prefer salinities greater than 18 ppt and depths between 1 and 124 feet. Juveniles primarily feed upon crustaceans, such as small crabs, shrimp, and copepods (Drohan, A.F., J.P. Manderson, and D. B. Packer 2007). Adults prefer structured habitats (natural and man-made), sand and shell bottom. Adults prefer depths between 65 feet and 165 feet, salinities greater than 20 ppt, and temperatures greater than 42°F. Adults spawn in coastal bays, but not estuaries and prey upon benthic invertebrates, small squid, and fish copepods (Drohan and Manderson 2007).

### 6.2.10 King Mackeral (*Scomberomorus cavalla*)

Eggs are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Larvae are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Juveniles are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Adults are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward (NOAA 2016).

### 6.2.11 Spanish Mackeral (*Scomberomorus maculatus*)

Eggs are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Larvae are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Juveniles are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Adults are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward (NOAA 2016).

### 6.2.12 Cobia (*Rachycentron canadum*)

Eggs are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Larvae are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Juveniles are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward. Adults are found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier islands, oceanside waters from the surf zone to the shelf break, and also from the Gulf Stream shoreward (NOAA 2016).

### 6.2.13 Dusky Shark (*Carcharinus obscurus*)

Neonates/early juveniles can be found in shallow coastal waters, inlets and estuaries up to 80 feet from the eastern end of Long Island, New York, to Cape Lookout, North Carolina. Neonates prey primarily on small fish (i.e., sardines and anchovies) (Musick, J.A., Grubbs, R.D., Baum, J. & Cortés, E 2009). Dusky sharks usually avoid low salinity water such as estuaries but can be found inshore and offshore at deep depths. Neonates (newborns) are born in June and July when water temperatures are warmest and their diet consists of fish and squid. Dusky shark populations have been declining from 1961 to 2005 off New Jersey, possibly as a result from fishing pressure (NOAA 2011).

### 6.2.14 Sandbar Shark (*Carcarhinus plumbeus*)

Neonates are found in shallow coastal waters from Great Bay, NJ to Cape Canaveral, Florida, in the summer months (June to August) when temperatures are greater than 80°F and salinities are greater than 22 ppt. An HAPC has been identified for nursery grounds in shallow areas of Great Bay, NJ to lower and middle Delaware and further south. (NOAA 2016).

Juveniles are found in shallow coastal waters in summer months up to 80 foot depths. Adults are found inshore in shallow waters along NJ.

### 6.2.15 Tiger Shark (*Galeocerdo cuvieri*)

Neonates are found in shallow coastal areas up to 650 feet when water temperatures. Juveniles can be found inshore up to 330 feet (NOAA 2016).

### 6.2.16 Clearnose Skate (*Raja eglanteria*)

Juveniles are found inshore from spring to fall (March to November) with highest densities found in the fall. They prefer soft bottom such as sand and silt, but they are known to occur on rocky and gravelly bottom. They prefer depths between 1 and 86 feet in the spring and mostly between 36 and 68 feet in the fall. Juveniles prefer temperatures between 42°F to 68°F. They prey primarily on small crustaceans and small fish (Packer, D.B., C.A. Zetlin, and J.J. Vitaliano 2003a).

Adults are found inshore during spring, summer and fall (March to November). They prefer soft bottom similar to juveniles with similar temperature and diet preferences and depths mainly between 16 and 26 feet (Packer et. al. 2003).

### 6.2.17 Little Skate (*Leucoraja erinacea*)

Juveniles are found nearshore in estuaries during the fall, winter and spring months (September to February). Juveniles prefer sandy or gravelly substrate, but also inhabit mud bottoms. They prefer temperatures in the winter between 42°F and 53°F and salinities around 32 ppt but as low as 15 ppt.They primarily feed on crustaceans, polychates, isopods, bivalves, hydroids, and fishes (Packer et. al. 2003). Adults are found year-round in estuaries and prefer same bottom type and prey as juveniles (Packer, D.B., C.A. Zetlin, and J.J. Vitaliano 2003b).

### 6.2.18 Winter Skate (*Leucoraj ocellata*)

Juveniles are found in estuaries in winter, spring and fall, but are most abundant in the fall (September to November). They prefer depths between 100 and 370 feet and temperatures around 50°F. Juveniles prefer to bury themselves in sand and gravelly bottoms and primarily on feed on amphipods, small crustaceans, and polychaetes (Packer, D.B., C.A. Zetlin, and J.J. Vitaliano 2003b). Adults are found estuaries during the same seasons as juveniles and they have the same habitat and prey preferences as juveniles (Packer et. al. 2003).

**Table 6**. Effects of the proposed actions on the managed EFH species by project area and life stage present in the project areas. For all EFH species the refuge will use the recommended BMP's to ensure construction activities do not have any significant adverse effects on the habitat.

| **BRICK PROJECT AREA** | | | |
|---|---|---|---|
| **COMMON NAME** | **SCIENTIFIC NAME** | **SEASONAL OCCURRENCE** | **POTENTIAL ACTIVITIES EFFECT** |
| ***EGGS*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | January to May | It is anticipated that no impacts to eggs would occur at the Brick project area because construction will be occurring from September to December. |
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May and October in Middle Atlantic | It is anticipated that temporary impacts such as turbidity disturbance may occur to eggs in the water column near the Brick dredging locations. Any eggs and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to eggs would occur at the Brick project site because the eggs will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to eggs would occur at the Brick project site because the eggs will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to eggs would occur at the Brick project site because the eggs will be offshore during construction. |
| ***LARVAE*** | | | |
| Red Hake | *Urophycis chuss* | May to December | It is anticipated that temporary impacts may occur to larvae near the Brick dredging project area from turbidity within the water column. Also, any larvae and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Winter Flounder | *Pseudopleuronectes americanus* | March to July | It is anticipated that no impacts to larvae would occur at Brick project area because construction will be occurring when larvae are not present. |

| | | | |
|---|---|---|---|
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May to October in MAB | It is anticipated that temporary impacts may occur to larvae may occur at the Brick construction sites in the water column near the Brick dredging locations from turbidity within the water column. Also, any larvae and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | September to February | It is anticipated that temporary impacts may occur to larvae in the water column near the Brick dredging locations from turbidity within the water column. Also, any larvae and benthic within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to larvae would occur at the Brick project site because the eggs will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to larvae would occur at the Brick project site because the eggs will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to larvae would occur at the Brick project site because the eggs will be offshore during construction. |
| Dusky Shark (Neonate/early juveniles) | *Carcharinus obscurus* | | It is anticipated that no effects to neonates will occur to at Brick since construction will be from September to late December. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no effects to neonates will occur at the Brick project site because the neonates will likely not be present in the bay during construction from September to late December. |
| Tiger Shark | *Galeocerdo cuvieri* | | It is anticipated that no effects to neonates will occur at the Brick project site because the neonates will likely not be present in the bay during construction from September to late December. |
| ***JUVENILES*** | | | |
| Red Hake | *Urophycis chuss* | Year-round | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant |

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|---|---|---|---|
| | | | adverse effect because the dredging operations would be complete within a couple of weeks. |
| Winter Flounder (age 1+) | *Pseudopleuronectes americanus* | June to November | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Bluefish | *Pomatomus saltatrix* | North Atlantic estuaries from June-October, Mid-Atlantic estuaries from May-October | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Atlantic Butterfish | *Peprilus triacanthis* | Winter: shelf; spring to fall: estuaries | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | | It is anticipated that temporary disruptions to juveniles and their benthic food prey may occur within the dredging locations at Brick construction sites since juveniles are known to occur year-round in estuaries. Impacts to juveniles and their benthic food prey may occur from entrainment in the dredge or turbidity in the |

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|---|---|---|---|
| | | | water column. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Scup | *Stenotomus chrysops* | Spring (March to May) and summer (June to August) in bays and estuaries | It is anticipated that no disruptions to juveniles will occur to juveniles at the Brick construction sites because construction will be occurring between early September and Late December when Scup are not likely to be present. |
| Black Sea Bass | *Centropristus striata* | Found in coastal areas (April to December, peak June to November) between Virginia and Massachusetts, but winter offshore from New Jersey and south; estuaries in summer and spring. | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to juveniles would occur at the Brick project site because the juveniles will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to juveniles would occur at the Brick project site because the juveniles will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to juveniles would occur at the Brick project site because the juveniles will be offshore during construction. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no impacts would occur at the Brick project construction sites. |
| Tiger Shark | *Galeocerdo cuvieri* | | It is anticipated that no impacts would occur at the Brick project construction sites |
| Clearnose Skate | *Raja eglanteria* | March to November | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |

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| Little Skate | *Leucoraja erinacea* | September to February | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts may occur to juveniles in the water column near the Brick dredging locations from turbidity within the water column. Also, any juveniles and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| ***ADULTS*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | February to June (spawning adults) | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Atlantic Herring | *Clupea harengus* | December to February | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |

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| Bluefish | *Pomatomus saltatrix* | April to October (Mid-Atlantic estuaries) | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | September to November (spawning season)<br><br>Inhabit shallow coastal and estuarine waters during warmer months and move offshore on outer continental shelf at depths of 150 m in colder months. | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Scup | *Stenotomus chrysops* | November to April (wintering)<br><br>May to August (inshore spawning adults less than 100 feet) | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to adults would occur at the Brick project sites because the adults will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to adults would occur at the Brick project sites because the adults will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to adults would occur at the Brick project sites because the adults will be offshore during construction. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no impacts would occur at the Brick project construction sites. |
| Clearnose Skate | *Raja eglanteria* | June to November | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity |

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| | | | within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Little Skate | *Leucoraja erinacea* | Year-Round | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts may occur to adults in the water column near the Brick dredging locations from turbidity within the water column. Also, any adults and benthic prey within the dredging channels could become entrained in the dredging. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
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| **GOOD LUCK POINT, STOUTS CREEK, AND FORKED RIVER PROJECT AREAS** | | | |
| **COMMON NAME** | **SCIENTIFIC NAME** | **SEASONAL OCCURRENCE** | **DESCRIPTION OF EFH HABITAT NEAR PROJECT AREA / POTENTIAL ACTIVITIES EFFECT** |
| ***EGGS*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | January to May | It is anticipated that no impacts to eggs would occur at the Good Luck Point, Stouts Creek, or Forked River project sites because construction will be occurring from August to December. |
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May and October in Middle Atlantic | It is anticipated that temporary impacts may occur to eggs near the Good Luck Point dredging locations sites from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks.<br>It is anticipated that no impacts to eggs would occur at Stouts Creek, or Forked River project sites because the construction will be in the estuaries and eggs will be further offshore. |

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| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to eggs would occur at the Good Luck Point, Stouts Creek, or Forked River project sites because the eggs will be offshore during construction. |
| Spanish Mackeral | *Scomberomous maculatus* | | It is anticipated that no impacts to eggs would occur at the Good Luck Point, Stouts Creek, or Forked River project sites because the eggs will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to eggs would occur at the Good Luck Point, Stouts Creek, or Forked River project sites because the eggs will be offshore during construction. |
| ***LARVAE*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | March to July | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River project sites because construction because will be occurring when larvae are not present. |
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May to October in MAB | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River construction sites because construction will be occurring at depths where larvae are not present. |
| Summer Flounder | *Paralichthys dentatus* | September to February | It is anticipated that temporary impacts to larvae benthic prey would occur at the dredging locations for Good Luck Point site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. Temporary impacts to larvae from turbidity in the water column from the dike breaches may occur at Stouts Creek, and Forked River because construction is expected to take place during the seasonal occurrence of larvae. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River construction sites because the larvae will be offshore during construction. |
| Spanish Mackeral | *Scomberomous maculatus* | | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River construction sites because the larvae will be offshore during construction. |

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| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River construction sites because the larvae will be offshore during construction. |
| Dusky Shark | *Carcharinus obscurus* | | It is anticipated that no effects to neonates would occur at the Good Luck Point dredging location from entrainment since construction will be from September to late December when water temperatures are decreasing. It is anticipated that no impacts would occur at the Stouts Creek, and Forked River construction sites to neonates from dike breachings because the depth is too shallow and the salinities too low in the impoundments. |
| Sandbar Shark | *Carcharinus obscurus* | | It is anticipated that no effects to neonates would occur at the Good Luck Point dredging location from entrainment since construction will be from September to late December when water temperatures are decreasing. It is anticipated that no impacts would occur at the Stouts Creek, and Forked River construction sites to neonates from dike breachings because the depth is too shallow and the salinities too low in the impoundments. |
| ***JUVENILES*** | | | |
| Red Hake | *Urophycis chuss* | Year-round | Temporary disruptions of benthic food prey and juveniles from entrainment in the dredge may occur within dredging locations or disturbance from the turbidity from the culvert enhancement at the Good Luck Point project site. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that no impacts to juveniles would occur at the Stouts Creek and Forked River construction sites because they are lower salinity areas than juveniles prefer. |
| Winter Flounder (age 1+) | *Pseudopleuronectes americanus* | June to November | Temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. Temporary impacts to juveniles from turbidity due to dike breaching may impact |

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| | | | juveniles at Stouts Creek and Forked River because construction will be taking place during the seasonal occurrence of juveniles. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | Temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. Temporary impacts to juveniles from turbidity in the water column due to dike breachings may impact juveniles at Stouts Creek and Forked River construction sites because construction will be taking place during the seasonal occurrence of juveniles. |
| Atlantic Sea Herring | *Clupea harengus* | | It is anticipated that temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement . These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. No impacts are expected to juveniles at Stouts Creek or Forked River construction sites because juveniles are found at deeper depths than construction will take place. |
| Bluefish | *Pomatomus saltatrix* | North Atlantic estuaries from June-October, Mid-Atlantic estuaries from May-October | It is anticipated that no impacts to juveniles would occur at the Good Luck Point construction sites because construction is taking place after the seasonal occurrence for juveniles. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Atlantic Butterfish | *Peprilus triacanthis* | (winter – shelf)<br>(spring to fall – estuaries) | It is anticipated temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not |

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| | | | considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | Year-Round | It is anticipated temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks.. |
| Scup | *Stenotomus chrysops* | Spring (March to May) and summer (June to August) in bays and estuaries | It is anticipated that no disruptions to juveniles will occur at Good Luck Point construction sites because construction will be taking place in November and December. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Black Sea Bass | *Centropristus striata* | Found in coastal areas (April to December, peak June to November) between Virginia and Massachusetts, but winter offshore from New Jersey | It is anticipated temporary impacts to juveniles may occur at the Good Luck Point dredging locations from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is |

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| | | and south; estuaries in summer and spring. | anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to juveniles would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the juveniles will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to juveniles would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the juveniles will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to juveniles would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the juveniles will be offshore during construction. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no impacts to juveniles would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites. |
| Clearnose Skate | *Raja eglanteria* | March to November | It is anticipated that temporary impacts to juveniles would occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Little Skate | *Leucoraja erinacea* | September to February | It is anticipated that temporary impacts to juveniles would occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging |

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| | | | operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts to juveniles would occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement . These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| ***ADULTS*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | February to June (spawning adults) | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement . These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be |

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| | | | complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Atlantic Sea Herring | *Clupea harengus* | December to February | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Bluefish | *Pomatomus saltatrix* | April to October (Mid-Atlantic estuaries) | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | September and November (spawning season)<br><br>Inhabit shallow coastal and estuarine waters during warmer months and move offshore on outer | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement . These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts |

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| | | continental shelf at depths of 150 m in colder months. | Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Scup | *Stenotomus chrysops* | November to April (wintering)<br><br>May to August (inshore spawning adults less than 100 feet) | It is anticipated that temporary impacts to inshore spawning adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Black Sea Bass | *Centropristus striata* | Inshore, estuaries from May to October | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to adults would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the adults will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to adults would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the adults will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to adults would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites because the adults will be offshore during construction. |

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| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no impacts to adults would occur at the Good Luck Point, Stouts Creek, or Forked River construction sites |
| Clearnose Skate | *Raja eglanteria* | June to November | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Little Skate | *Leucoraja erinacea* | Year-Round | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts to adults may occur at the Good Luck Point project site from entrainment in the dredge or disturbance from the turbidity from the culvert enhancement. These impacts are short-term and are not considered a significant adverse effect because the dredging operations would be complete within a couple of weeks. It is anticipated that temporary disruptions of benthic food prey and juveniles from turbidity in the water column due to dike breachings at Stouts Creek and Forked River may occur, but these impacts are short-term and are not considered a significant adverse effect because the dike breachings would be complete within a couple of weeks. |
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| BARNEGAT PROJECT AREA | | | |
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| **COMMON NAME** | **SCIENTIFIC NAME** | **SEASONAL OCCURRENCE** | **DESCRIPTION OF EFH HABITAT NEAR PROJECT AREA / POTENTIAL ACTIVITIES EFFECT** |
| ***EGGS*** | | | |
| Winter Flounder | *Pseudopleuronectes americanus* | January to May | It is anticipated that no impacts to eggs would occur at the Barnegat construction sites because construction will be occurring from August to December. |
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May and October in Middle Atlantic | It is anticipated that temporary impacts to eggs may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts are short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to eggs would occur at the Barnegat construction sites because the eggs will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to eggs would occur at the Barnegat construction sites because the eggs will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to eggs would occur at the Barnegat construction sites because the eggs will be offshore during construction. |
| ***LARVAE*** | | | |
| Red Hake | *Urophycis chuss* | May to December | It is anticipated that no impacts to larvae would occur at Barnegat because construction is expected after the larval season. |
| Winter Flounder | *Pseudopleuronectes americanus* | March to July | It is anticipated that no impacts to larvae would occur at Barnegat project area because construction will be occurring when larvae are not present. |
| Windowpane Flounder | *Scopthalmus aquosus* | February to November, peaks May to October in MAB | It is anticipated that temporary impacts to larvae and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | September to February | It is anticipated that temporary impacts to larvae and their benthic prey may occur from turbidity in the water column due to dike |

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| | | | breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to larvae would occur at the Barnegat construction sites because the larvae will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to larvae would occur at the Barnegat construction sites because the larvae will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to larvae would occur at the Good Luck Point, Stouts Creek, and Forked River construction sites because the larvae will be offshore during construction. |
| Dusky Shark | *Carcharinus obscurus* | | It is anticipated that no effects to neonates would occur to neonates at the Good Luck Point, Stouts Creek, Forked River, and Barnegat construction sites, since construction will be from September to late December. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no effects to neonates would occur at the Good Luck Point, Stouts Creek, Forked River, and Barnegat construction sites, since construction will be from September to late December. |
| ***JUVENILES*** | | | |
| Red Hake | *Urophycis chuss* | Year-round | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Winter Flounder | *Pseudopleuronectes americanus* | June to November | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike |

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| | | | breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Atlantic Sea Herring | *Clupea harengus* | | It is anticipated that no impacts to juveniles will occur at the Barnegat construction sites because juveniles are found at deeper depths than construction will take place. |
| Bluefish | *Pomatomus saltatrix* | North Atlantic estuaries from June-October, Mid-Atlantic estuaries from May-October | It is anticipated that no impacts to juveniles will occur at the Barnegat construction sites because juveniles will be in deeper water. |
| Atlantic Butterfish | *Peprilus triacanthis* | (winter – shelf)<br>(spring to fall – estuaries) | It is anticipated temporary impacts to juveniles may occur at Barnegat construction sites because construction will be taking place during the seasonal occurrence of juveniles. |
| Summer Flounder | *Paralichthys dentatus* | Year-Round | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Scup | *Stenotomus chrysops* | Spring (March to May) and summer (June to August) in bays and estuaries | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Black Sea Bass | *Centropristus striata* | Found in coastal areas (April to December, peak June to November) between Virginia and Massachusetts, but winter offshore from New Jersey and south; estuaries in summer and spring. | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |

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| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to juveniles would occur at the Barnegat construction sites because the juveniles will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to juveniles would occur at the Barnegat construction sites because the juveniles will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to juveniles would occur at the Barnegat construction sites because the juveniles will be offshore during construction. |
| Sandbar Shark | *Carcarhinus plumbeus* | | It is anticipated that no impacts to juveniles would occur at the Barnegat construction sites . |
| Clearnose Skate | *Raja eglanteria* | March to November | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Little Skate | *Leucoraja erinacea* | September to February | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts to juveniles and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| ***ADULTS*** | | | |
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| Winter Flounder | *Pseudopleuronectes americanus* | February to June (spawning adults) | It is anticipated that temporary impacts to adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant |

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| | | | adverse effect because the breaching operations would be complete within a couple of weeks. |
| Windowpane Flounder | *Scopthalmus aquosus* | | It is anticipated that temporary impacts to adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Atlantic Sea Herring | *Clupea harengus* | December to February | It is anticipated no impacts are expected to adults at the Barnegat construction sites. |
| Bluefish | *Pomatomus saltatrix* | April to October (Mid-Atlantic estuaries) | It is anticipated that temporary impacts to adults and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Summer Flounder | *Paralichthys dentatus* | September to November (spawning season)<br><br>Inhabit shallow coastal and estuarine waters during warmer months and move offshore on outer continental shelf at depths of 150 m in colder months. | It is anticipated that temporary impacts to spawning adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Scup | *Stenotomus chrysops* | November to April (wintering)<br><br>May to August (inshore spawning adults less than 100 feet) | It is anticipated that temporary impacts to adults and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Black Sea Bass | *Centropristus striata* | Inshore, estuaries from May to October | It is anticipated that temporary impacts to adults and their prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant |

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| | | | adverse effect because the breaching operations would be complete within a couple of weeks. |
| King Mackeral | *Scomberomorus cavalla* | | It is anticipated that no impacts to adults would occur at the Barnegat construction sites because the adults will be offshore during construction. |
| Spanish Mackeral | *Scomberomorus maculatus* | | It is anticipated that no impacts to adults would occur at the Barnegat construction sites because the adults will be offshore during construction. |
| Cobia | *Rachycentron canadum* | | It is anticipated that no impacts to adults would occur at the Barnegat construction sites because the adults will be offshore during construction. |
| Clearnose Skate | *Raja eglanteria* | June to November | It is anticipated that temporary impacts to adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Little Skate | *Leucoraja erinacea* | Year-Round | It is anticipated that temporary impacts to adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |
| Winter Skate | *Leucoraj ocellata* | December to May and September to November | It is anticipated that temporary impacts to adults and their benthic prey may occur from turbidity in the water column due to dike breaching construction at the Barnegat impoundments. The impacts would be short-term and are not considered a significant adverse effect because the breaching operations would be complete within a couple of weeks. |

# 7 OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

**Table 7**. Other NOAA-trust resources impact assessments (Data Source: NOAA 2016)

| Species Known To Occur | Scientific Name | Habitat Type |
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| Alewife | *Alosa pseudoharengus* | Alewife are anadromous fish and can tolerate a wide range of salinities. Adults spend most of their lives offshore in the ocean and return to rivers only to spawn. Eggs and larvae are found near or downstream of spawning grounds. Juveniles start to move downstream in late summer as water temperatures begin to drop and end up in freshwater tributaries. Spawning adults prefer sand, gravel, or coarse stone substrate, SAV and organic detritus (ASMC 2016a; NJDEP 2005b).<br><br>Juvenile alewife could potentially be near Brick A, Brick B, and Good Luck Point project areas during construction since these project areas are closer to the Metedeconk River (NJDEP 2005) and juveniles and adults may be passing through this area between September and late December. It is not anticipated that Stouts Creek, Forked River, or the Barnegat project areas would impact alewife because of their location. |
| American eel | *Anguilla rostrata* | Eels are a catadromous fish species, mostly inhabiting freshwater and estuarine areas for their entire life and migrating as adults to the open ocean to reproduce and die. Adults feed mostly on fish and benthic invertebrates, such as insects, crayfish, snails, and worms (ASMFC 2008).<br><br>It is anticipated that there may be temporary impacts to adult prey in all the project areas but all efforts will be made to minimize impacts. |
| Blue crab | *Callinectes sapidus* | Blue crabs are benthic feeders and their prey primarily consists of snails, SAV, small fish, detritus, dead fish, and oysters. They prefer shallow, brackish water and are most abundant in the summer months in shallow areas of the bay associated with sandy open sandy bottoms and SAV habitat. Juveniles prefer to associate with SAV beds. They spawn in September and October (Able, K., P. Jivoff, T.M Grothues, and R. Hagan 2012). Adults are known to hibernate in the winter months in deeper channels of the bay (BarnegatShellfish 2013). |

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| | | It is anticipated that temporary impacts to larvae, juveniles, and adults may be occur from the construction at all the project areas, but mitigation measures such as turbidity curtains will be utilized. |
| Blueback herring | *Alosa aestivalis* | Blueback herring are an anadromous fish. They live in the ocean and return to freshwater to spawn. Adults return to freshwater in the spring to spawn in fast flowing rivers and tributaries. Adults migrate quickly downstream after spawning. Juveniles stay in freshwater tributaries during spring and summer, but they begin their migration to more saline water in the fall (ASMC 2016b; VDGIF 2016). Their primary prey is small fish, crustaceans, fish eggs, zooplankton, and shrimp.<br><br>It is anticipated that temporary impacts to juveniles and their prey may occur at the Brick A, Brick B, and Good Luck Point project areas.<br><br>It is anticipated that no impacts to blueback herring will occur at the impoundment sites. |
| Eastern oyster | *Crassostrea virginica* | Oysters spawn in the summer when physical parameters such as salinity and water temperature are optimal for the release of eggs and sperm. Free-swimming larvae then appear and eventually transform into spat that settle on hard bottom (NOAA 2007). The optimum range of larvae salinity is 14 to 28 ppt and the optimal temperature range for larvae is 68°F to 86°F (NOAA 2007). Adults are found on hard and soft bottom. Oysters are filter feeders and primarily feed on plankton and algae in suspension.<br><br>There is a known oyster reef east of the Good Luck Point project area in Barnegat Bay (**Figure 12a**). This area will be avoided by the dredging equipment. It is anticipated that temporary impacts from turbidity at the three sediment enrichment sites including the culvert location at Good Luck Point may occur.<br>It is anticipated that no impacts to oysters would occur at the impoundment restoration sites because the habitat preferences of oysters are not optimal at the impoundment project areas (i.e. salinity). |
| Quahog | *Mercenaria mercenaria* | Quahogs are an intertidal species that occurs throughout Barnegat Bay. Its optimal depth range is between 0 to 60 feet and salinities greater than 12 ppt. Quahogs are filter feeders and their primary prey is plankton and algae where flows are strong enough to deliver a constant food supply. Quahogs are found in a variety of |

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| | | substrates such as sand and mud but prefer sandy sediments (Ford 1997).<br><br>It is anticipated that temporary impacts may occur to soft-shell clams along the bayside of the three sediment enrichment sites, but not at the impoundment project areas. Since quahogs are filter feeders, turbidity might be a concern but turbidity curtains and containment barriers will be used during construction to keep the sediments contained. |
| Soft-shell clams | *Mya arenaria* | Soft-shell clams are similar to quahogs in their habitat preference and primary prey (BarnegatShellfish 2013).<br><br>It is anticipated that temporary impacts may occur to quahogs along the bayside of the three sediment enrichment sites, but not at the impoundment project areas. Since quahogs are filter feeders, turbidity might be a concern but turbidity curtains and containment barriers will be used during construction to keep the sediments contained. |
| Striped bass | *Morone saxatilis* | Striped bass are anadromous and return to freshwater to spawn between April to June. Adult striped bass can be found in Barnegat Bay between April and December and prefer structured bottom and temperatures between 57°F to 68°F. They eat fish and crustaceans (Ng, C.L, K.W. Able, and T.M. Grothues 2007).<br><br>It is anticipated that no impacts to striped bass would occur at any of the project sites because they are mobile and can move out of the way of construction and spawning will occur outside of the construction window of September to late December. |

# 8 PROPOSED MITIGATION

Every possible avoidance action is going to be considered to avoid and minimize the effects on EFH and managed species during sediment enrichment construction, culvert enhancement, and impoundment restorations.

Proposed mitigation at the sediment enrichment sites will be considered:

- Construction techniques such as containment barriers at the sediment enrichment sites will be used to contain the dredge material.
- Turbidity curtains will also be used at all the project areas to mitigate the effects from sediment disturbances to the water column.
- Strict oversight will be done by the contractor Amec Foster Wheeler and by the Service during the construction phase.

- Prohibit dredging activities during the period from January 1st to May 31st to protect winter flounder spawning. Possible restrictions may exist between 3/1 and 6/30 in some areas for anadromous fish migration and 4/1 to 9/30 in areas adjacent to SAV.

Proposed mitigation at the tidal flow restoration sites will be considered:

- Turbidity curtains will also be used at all the project areas to mitigate the effects from sediment disturbances to the water column.
- Strict oversight will be done by the contractor Amec Foster Wheeler and by the Service during the construction phase.

This Assessment summarizes the natural resources in the project areas and the types of restoration actions that are proposed. As designs are further developed for sediment enrichment and tidal flow restoration, additional mitigation measures will be added to this Assessment.

# 9 CONCLUSION and NMFS AGENCY VIEW

Sediment Enrichment:

Sediment enrichment construction at Brick A, Brick, B, and Good Luck Point project areas will likely have short-term adverse impacts to EFH for several federally managed species and their prey. The short-term adverse impacts include increased turbidity in the water column from suspended solids due to dredging activities and entrainment of managed species in the dredge. However, all adverse impacts on federal species and their prey are expected to be temporary, and the long-term benefits of raising the elevation of the marsh will encourage low salt marsh plants to re-establish areas they previously existed, protect the upland habitat from further salt water intrusion and provide larval, nursery, and prey habitat for federally managed EFH species.

Dike Breaching:

Breaching the dikes at Stouts Creek, Forked River, and Barnegat impoundment project areas will likely have short-term adverse impacts to EFH for several federally managed species and their prey. From the EFH Assessment done for the three impoundments, there is a very low probability the three impoundments will contain any federally managed species, and the effects upon any biota within the project areas would include increased turbidity in the water column from suspended solids due to the breaching of the dikes. However, all adverse impacts on federal species and their prey are expected to be temporary, and the long-term benefits of opening up the impoundments to tidal flow will restore and improve tidal flow to the sites to allow better tidal exchange and fish passage for federally managed EFH species and their prey.

Culvert Enhancement:

The culvert enhancement along Bayview Avenue in the Good Luck Point project area will likely have short-term adverse impacts to EFH for several federally managed species and their prey. The short-term adverse impacts include increased turbidity in the water column from suspended solids due the breaching of the dikes. However, all adverse impacts on federal species and their prey are expected to be temporary, and the long-term benefits of enhancing the culvert will restore and

improve tidal flow to the site to allow better tidal exchange and fish passage for federally managed EFH species and their prey.

With the careful use of mitigation measures and BMP's during project implementation, the temporary adverse impacts described in this Assessment are not anticipated to have significant, long-term adverse impacts to any federally managed EFH species.

Therefore, based on the previous discussion, it is concluded by the USFWS, that there would not be any significant adverse impacts to federally managed EFH species as a result of the proposed sediment enrichment, dike breaching, or culvert enhancement activities and the activities will improve EFH for some species in the longer term as tidal flow and wetlands are restored.

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# APPENDIX E

# THREATENED AND ENDANGERED SPECIES FINDINGS

# INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

| | | | |
|---|---|---|---|
| **Project Name:** | Marsh Enhancement Project (37c) | **Originating Person:** | Amy Drohan |
| **Townships:** | Brick, Berkeley, Lacey, Barnegat | **Telephone Number:** | 609-748-1535 |
| **County:** | Ocean | **Email Address:** | amy_drohan@fws.gov |
| **Date:** | July 6, 2016 | | |

**Distance to nearest town:** Adjacent

I. **Region:** 5

II. **Service Activity (Program):** NWRS, Edwin B. Forsythe NWR (Refuge)

III. **Pertinent Species and Habitat:**

The species listed and/or their critical habitat was combined from six separate IPAC reports for related project areas.

A. **Listed species and/or their critical habitat within the action area:**

*Birds*

Red Knot (*Calidris canutus rufa*)

*Flowering Plants*

Knieskern's Beaked-rush (*Rhynchospora knieskernii*)

Seabeach Amaranth (*Amaranthus pumilus*)

Swamp Pink (*Helonias bullata*)

*Mammals*

Northern Long-eared Bat (*Myotis septentrionalis*)

B. **Proposed species and/or proposed critical habitat within the action area:**

None

C. **Candidate species within the action area:**

None

D. **Include species/habitat occurrences on a map.**

We have attached the Information for Planning and Conservation (IPaC) trust resources list, which includes a broad scale map and a list of the species that occur in the Brick A, Brick B, Good Luck Point, Stouts Creek, Forked River and Barnegat Project Areas. All work will take place on Edwin B. Forsythe National Wildlife Refuge (refuge). Additional maps for each project area are included in this submittal.

Red Knots may occur near the Good Luck Point project area. Knieskern's beaked-rush is not known to exist in the six project areas. Swamp pink is not known to occur in the project areas. Seabeach Amaranth may occur in the Good Luck Point project area east of

Bayview Avenue along sections of sandy beach. Summer habitat for Northern long-eared bats may occur in the forested areas near but not within the project areas.

**IV. Description of proposed action (attach additional pages as needed):**

The proposed action is to improve the overall health and increase the resiliency of approximately 500 acres of estuarine-salt marsh habitat to impacts from sea level rise, large storm events, and other ecosystem stressors within the U.S. Fish and Wildlife Service (the Service) Edwin B. Forsythe National Wildlife Refuge (the Refuge) at six (6) project areas. The proposed action is the second phase of the Service's Marsh Enhancement and Telephone Pole Array Removal Project.

The proposed action will target significantly degraded areas that have been negatively impacted by activities such as grid-ditching and salt hay farming, as well as those areas that were historically impounded for mosquito control. The primary restoration activities at the six (6) project areas include tidal flow restoration and sediment enrichment (Table 1). Tidal flow restoration will improve water circulation within the marshes and contribute to increased plant vigor and marsh health. Sediment enrichment will "jump start" natural accretion processes in the marsh through the deposition of a thin layer of clean and suitable sediment to the marsh. Sediment enrichment will provide both nutrients to encourage plant vigor and elevation that will encourage increased tidal flushing and overall marsh health in the face of sea level rise. Sediment will be provided by the New Jersey Department of Transportation from dredging nearby, existing shipping channels. The exact locations of the dredging work will be determined during the permitting and design process and are contingent on the availability and suitability of sediment in the area.

The construction for the tidal flow restoration at Good Luck Point, Stouts Creek, Forked River, and Barnegat is anticipated to start after September 1, 2016 and be finished by March 1, 2017. The sediment enrichment construction is anticipated to start after September 1, 2017 and be finished by December 31, 2017.

**Table 1**. Summary of acres for sediment enrichment and tidal flow restoration

| **Six Project Areas (from north to south)** | | |
|---|---|---|
| Project Area Location Name | Township | Acres |
| Brick A | Brick | 42 |
| Brick B | Brick | 62 |
| Good Luck Point | Berkeley | 19 |
| Stouts Creek Impoundment | Lacey | 127 |
| Forked River- Wrangle Impoundment | Lacey | 18 |
| Barnegat Impoundment | Barnegat | 226 |
| **TOTAL** | | **494** |

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

### Project Areas

*Sediment Enrichment*
*Brick A, Brick B and Good Luck Point*:

Sediment enrichment involves depositing a layer of sediment in selected areas to increase the elevation of the marsh. Generally, sediment less than 6 in. thick results in revegetation by sprouting of native seed stock, while sediment deposits greater than 6 in. smother and kill the vegetation requiring revegetation with new plant material (Ford, M. A., D. R. Cahoon, and J. C. Lynch 1999).

Refuge biologists developed biological target elevations for sediment enrichment sites to achieve high salt marsh (HSM) and low salt marsh (LSM) for 8 cells at Brick A, 6 cells at Brick B, and one cell at Good Luck Point. The biological target elevations are based on site-specific vegetation, elevation, hydrologic, and orthoimagery data (Figure 1, 2, and 3). These areas are comprised of a mixture of high and low salt marsh, as well as small patches of maritime shrubs. The areas have been ditched for mosquito control, and other anthropogenic alterations have occurred. The marsh is increasingly waterlogged, likely due to the inability of the marsh to keep pace with sea level rise. The salt marsh may benefit from sediment enrichment to increase/reestablish an elevation for optimum *Spartina sp.*and *Distichlis spicula* growth.

Elevations for the actual placement of sediments will likely be greater to account for consolidation and settlement of sediments and underlying substrate after placement. The additional elevation required to meet the biological target elevations will be developed by consulting engineers. It is also likely that the number of cells to receive material at each project area will be reduced depending on the final construction elevation and the amount of dredge material available.

The Refuge consulted with the New Jersey Department of Transportation (NJDOT), who will place the sediment on the marsh, as well as with U.S. Army Corp of Engineers-Engineering, Research, and Development Center (ERDC). They concur that material placement in the field is generally possible to within one inch of the target elevation. Elevations for the actual placement of sediments will likely be greater to account for consolidation and settlement of sediments and underlying substrate after placement. The additional elevation required to meet the biological target elevations will be developed by consulting engineers. It is also likely that the number of cells to receive material at each project area will be reduced depending on the final construction elevation and the amount of dredge material available. The sediment placed on the marsh will be designed and constructed by the NJDOT subcontractor. The project entails putting sediment from NJDOT channels via hydraulic pipeline. The estimated quantity of volume of fill, and the number of cells may be reduced depending on the sediment analyses of the dredge

channels, needed for Brick A is approximately 125,986 CY, for Brick B is approximately 59,125 CY, and Good Luck Point is approximately 17,082 CY.

*Tidal flow restoration: Culvert Enhancement*
*Good Luck Point*

The addition or enhancement of an existing culvert at the Good Luck Point project area will allow the waterlogged marsh west of Bayview Avenue to drain during tidal cycles and also provide the mechanism for sediment transport to enhance the rate of marsh development (Figure 3). Undersized culverts restrict tidal flow and can alter the natural hydrology and water chemistry of inland areas. Reduced tidal flow can subsequently reduce sediment deposition on the marsh platform, decreasing accretion and resilience of the marsh to adapt to sea level rise. This is the case at the Good Luck Point Project Area where undersized culverts beneath Bayview Avenue act as tidal restrictors. Therefore, replacement of the undersized culverts, by constructing a new, appropriately sized culvert would improve tidal flow and better support resilient salt marsh habitat. The designs for the culvert enhancement/addition have not been developed yet, but the refuge is going to work with its contractor Amec and the Ocean County Planning and Engineering Department to develop the designs. The refuge is anticipating the equipment that will be used during culvert enhancement will include an excavator, crane, and/or skid steer. Consequently, the exact dimensions and footprints of the areas impacted by the project and the scope of the activities to take place within the APE are still to be determined.

*Tidal flow Restoration: Berm Breaches*

Tidal flow will be restored to former salt marshes that were previously impounded. The berms in coastal impoundments located at Stouts Creek, Forked River, and Barnegat will be breached in multiple locations as a first step in restoring these coastal impoundments to salt marsh. Below are some generalities of all three projects and then specifics for each project area. The Ocean County Mosquito Commission (OCMC) will perform the work for the work for the Refuge through a Special Use Permit. The OCMC used various historical maps to look at the areas before impoundments were in place. OCMC conducted field surveys and aerial surveys of the impoundments to see if any weak points or non-functioning water control structures (WCS) were present. Using this information, they identified the best locations to place breaches within the impoundment walls. All of the proposed breaches are in weak spots (breached or semi-breached), have non-functioning WCS present, or are located where a past creek was situated. The Commission will leave the functioning WCS's in place at Barnegat and Stouts Creek and the non-functioning WCS's will be removed and replaced with a breach. An amphibious excavator or a low-ground pressure excavator will be used for construction at all three project areas.

*Stouts Creek:*

The Stouts Creek impoundments contain two large impoundments constructed for mosquito control purposes by the Ocean County Mosquito Commission decades ago and one smaller impoundment. The impoundment system is created by a 7,900-foot-long "U shaped" perimeter dike with one dike across Stouts Creek. A total of 14 breaches that are 3 to 4 feet wide and 3 feet deep are proposed at Stouts Creek (Figure 4). There are two functioning water control structures (WCS) that will remain in place. Removal or breaching of existing berms will increase the tidal flow, increase salinity, and restore a more natural hydrologic regime within the Stouts Creek Project Area impoundment.

*Forked River - Wrangle Creek:*

Two breaches will be put into place, one on each impoundment wall (Figure 5). The breach will be constructed just north of the existing WCS on both impoundments. The existing cement WCS will be cleaned of sediment and debris but otherwise left untouched. The breaches will have a channel 3-4ft wide. In addition to the 3-foot deep breach channel, the berm wall will be removed to the marsh surface elevation for 8-10ft on either side of the channel to the present salt marsh elevation, which will allow the excavator access to the area and allow water flow over the salt marsh during high tides.

*Barnegat:*

A total of 13 breaches that are 3 to 4 feet wide and 3 feet deep will be constructed on the five impoundments, two of them being where non-functioning water control structures will be removed (Figure 6). Increasing the tidal exchange in this area will help to introduce more fish and invertebrate species into the area and help create a habitat that is suitable for the re-vegetation of salt marsh grasses.

## V. Determination of effects:

### A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):

Red Knots migrate through coastal wetlands in spring and fall and spend winters along coastal waters in Central and South America. In the spring, they are concentrated on Delaware Bay beaches, feeding on horseshoe crab (*Limulus polyphemus*) eggs. Impacts on red knots are anticipated to be minimal as this work will not be occurring along any beaches where red knots would be concentrated, but if any disturbance to red knots does occur, it would be a minimal disruption to their feeding and resting activities.

Knieskern's Beaked-rush is an obligate freshwater wetland species and is not known to exist on this part of this refuge. This work will not occur in any freshwater wetlands, so is unlikely to affect this species.

Seabeach Amaranth exists on coastal beaches. This work will occur on salt marshes and not occur in any coastal beach areas, so is unlikely to affect this species.

Swamp pink is an obligate freshwater wetland species and is not known to occur in any of the project areas. This work will not occur in any freshwater wetlands, so is unlikely to affect this species.

Northern long-eared bats may exist in the forested parts of the refuge adjacent to project areas, but these areas will not be impacted by the proposed work.

**B. Explanation of actions to be implemented to reduce adverse effects:**
All areas will be surveyed for threatened and endangered species before work will begin. Additionally, staff will be educated on the identification of threatened and endangered species and instructed to avoid impacting these species and to report any sightings of these species to refuge management.

## VI. Effect determination and response requested: [* = optional]

### A. Listed species/designated critical habitat:

| Determination | Response requested |
|---|---|
| No effect/no adverse modification (Species: _Knieskern's Beaked-rush, Swamp Pink, Northern Long-eared Bat, Red Knot, Seabeach Amaranth) | __X_Concurrence |
| May affect, but is not likely to adversely affect species/adversely modify critical habitat (Species:_____) | ___ *Concurrence |
| May affect, and is likely to adversely affect species/adversely modify critical habitat (Species:_____) | ____ Formal Consultation |

### B. Proposed species/proposed critical habitat:

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

| **Determination** | **Response requested** |
|---|---|
| No effect on proposed species/no adverse modification of proposed critical habitat (Species:_____) | ____ *Concurrence |
| Is likely to jeopardize proposed species/ adversely modify proposed critical habitat (Species:_____) | ____ Conference |

**C. Candidate species:**

| **Determination** | **Response requested** |
|---|---|
| No effect (species:_____) | ____ *Concurrence |
| Is likely to jeopardize candidate species (species:_____) | ____ Conference |

Amy Drohen
Project Biologist/Supervisor (Requestor)

7/6/16
Date

**VII. Reviewing ESFO Evaluation:**

**A. Concurrence** ✓ **Nonconcurrence**_____

**B. Formal consultation required**_____

**C. Conference required**_____

**D. Informal conference required**_____

**E. Remarks (attach additional pages as needed):**

Additional conservation measures will be implemented to protect the red knot. Please see the ~~see~~ attached e-mails.

Amy Mahan
Endangered Species Biologist (Reviewer),
New Jersey Field Office

8-22-2016
Date

**INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION**

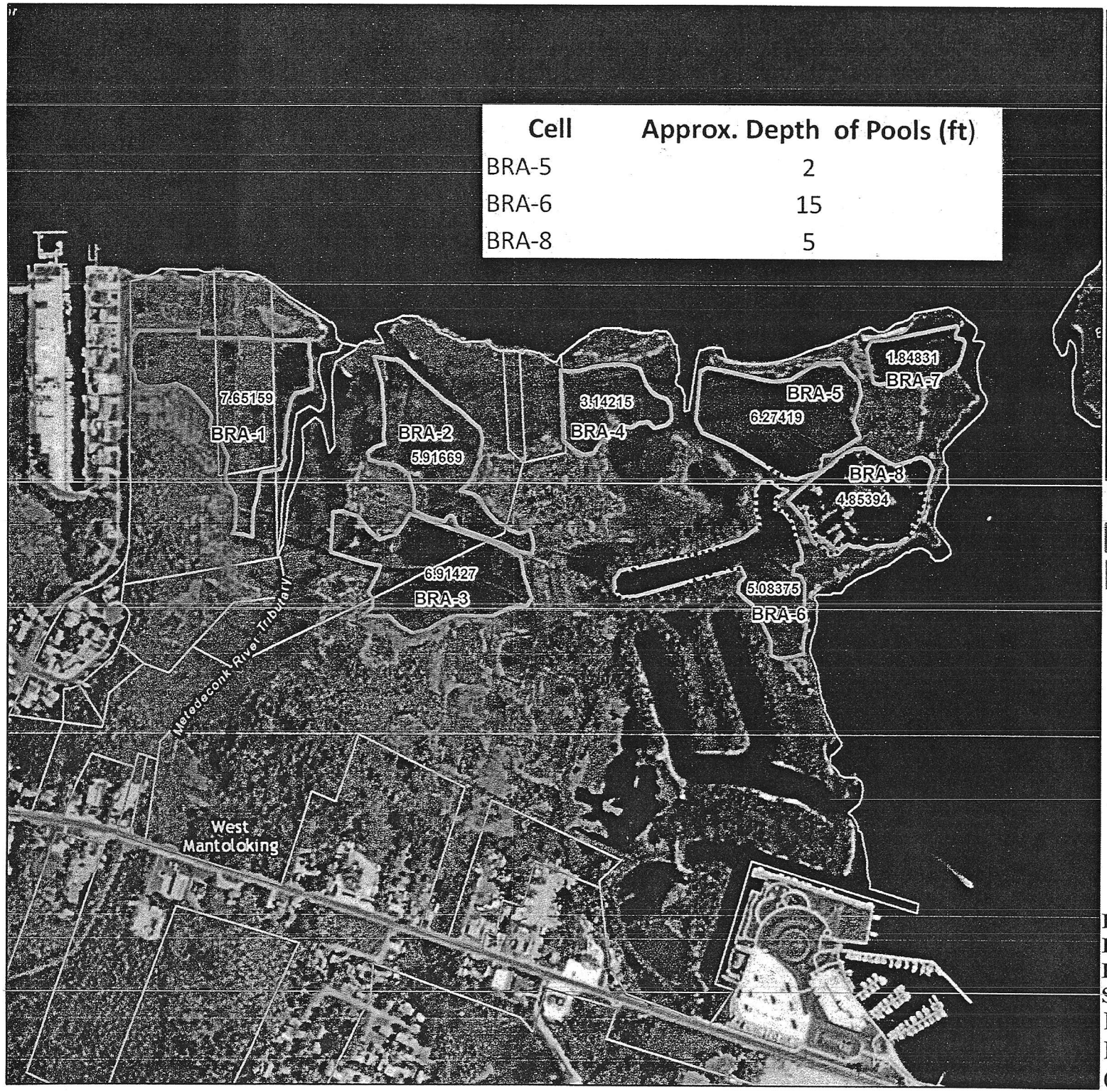
Assistant Supervisor, New Jersey Field Office

23 Aug 16
Date

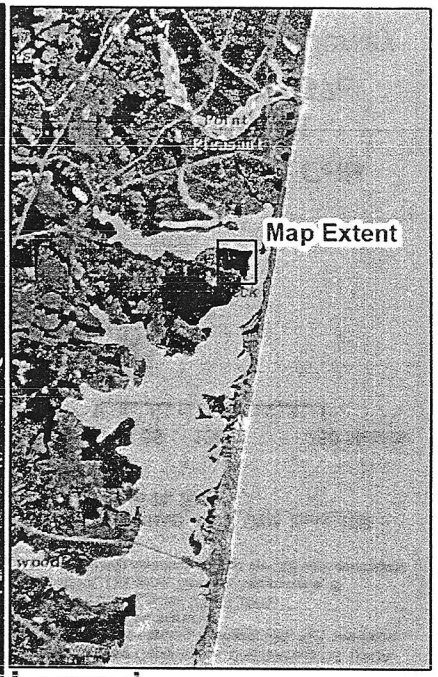
**VIII. Map and IPaC printout**
Information for Planning and Conservation (IPaC): http://ecos.fws.gov/ipac/
Additional maps: MarshPrj_fig1_6.pdf

**References:**

Ford, M. A., D. R. Cahoon, and J. C. Lynch. 1999. "Restoring Marsh Elevation in a Rapidly Subsiding Salt Marsh by Thin-Layer Deposition of Dredged Material." *Ecological Engineering* 12: 189-205.




| Cell | Approx. Depth of Pools (ft) |
|---|---|
| BRA-5 | 2 |
| BRA-6 | 15 |
| BRA-8 | 5 |




**Legend**

- Sediment Enrich. Cells/Acres
- Refuge Boundary
- Pools

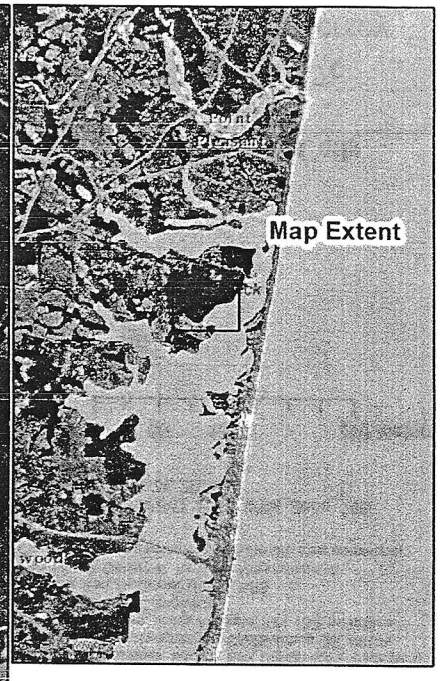
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Esri, HERE, DeLorme, TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 65 130 260 Meters

**Figure 1**
**Brick A**
**Proposed**
**Sediment Enrichment Cells**
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey




## Legend

Sediment Enrich. Cells/Acres

Refuge Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
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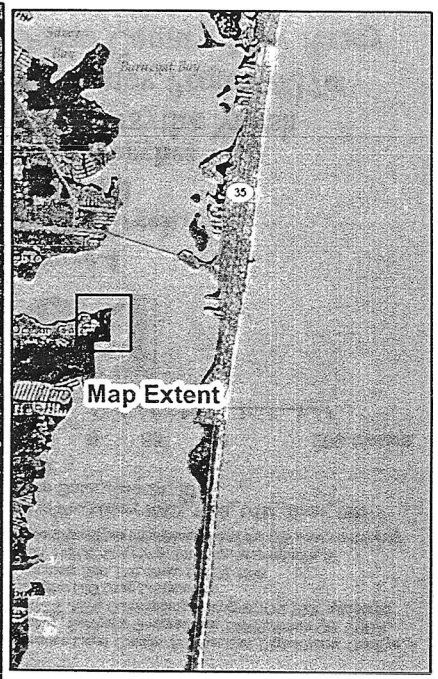
Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 65 130 260 Meters

**Figure 2**
**Brick B**
**Proposed**
**Sediment Enrichment Cells**

E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey




## Legend

- Sediment Enrich. Cell/Acres
- Refuge Boundary
- Aprx. location of proposed culvert

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
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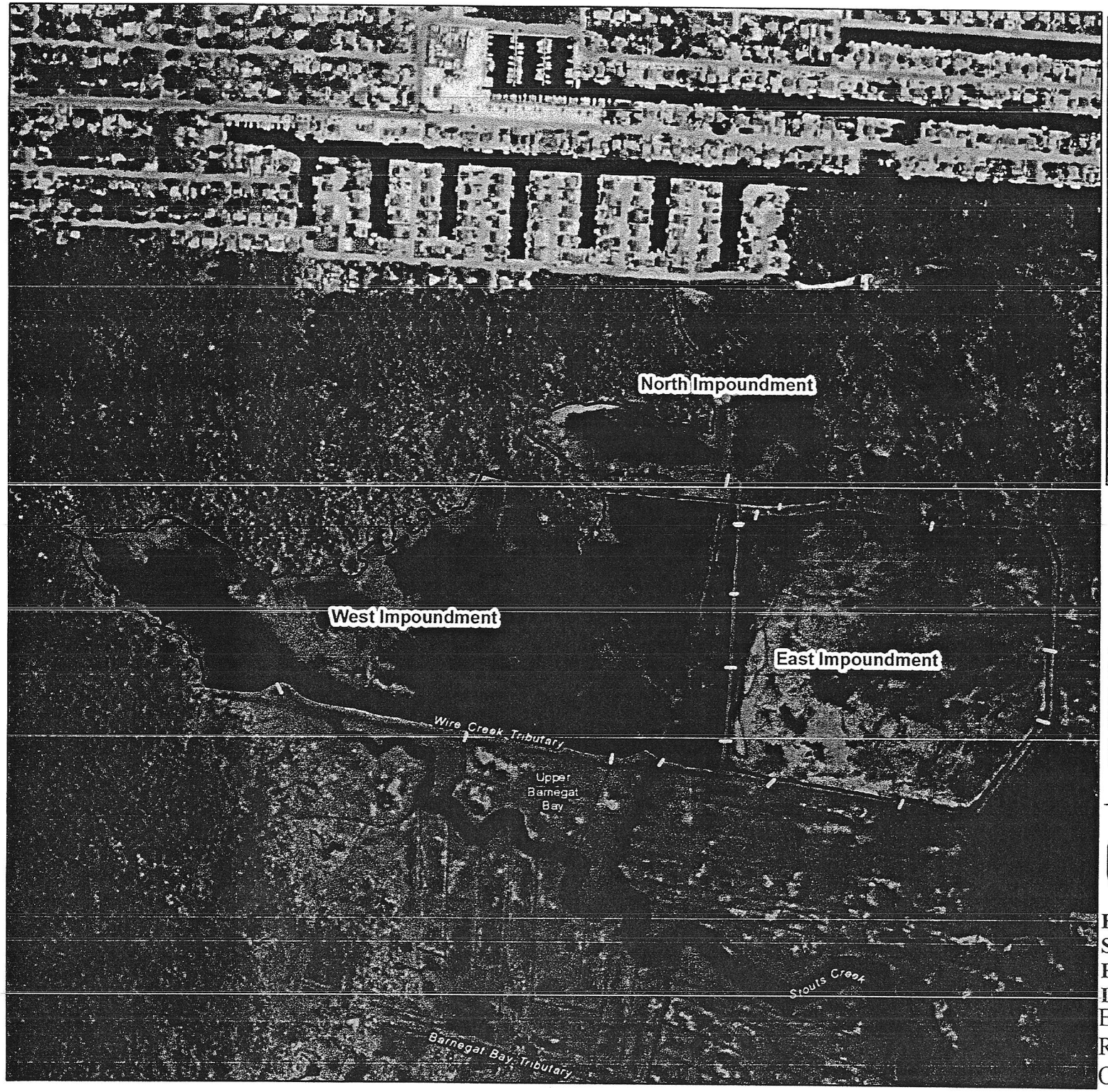
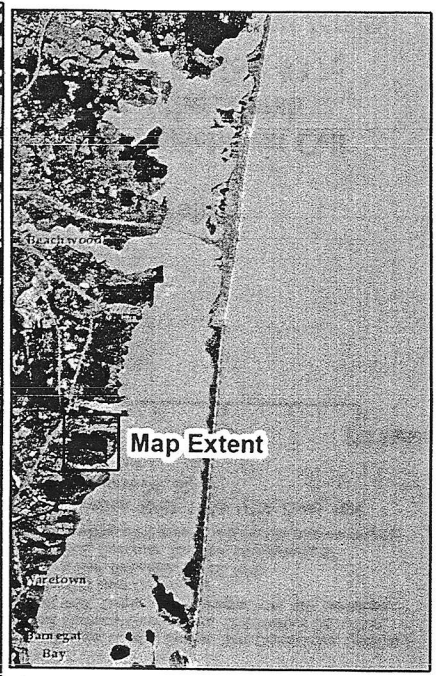
Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 55 110 Meters

**Figure 3**
**Good Luck Point**
**Proposed**
**Sediment Enrichment Cell**
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey




**Legend**

**Functional Water Control Structure**

- no
- yes
- Proposed Breaches
- Project Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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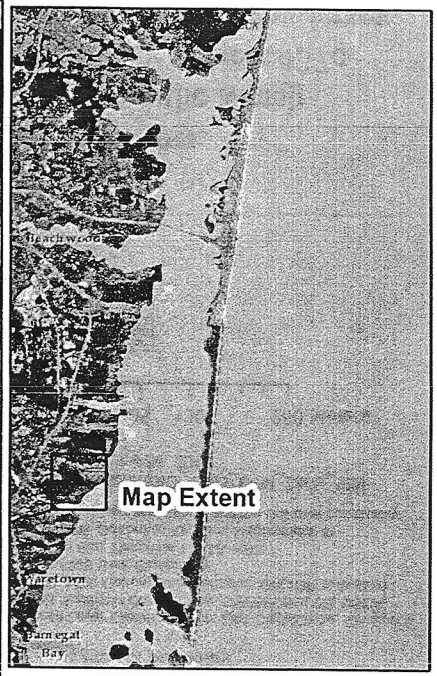
Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 65 130 260 Meters

**Figure 4**
**Stouts Creek**
**Proposed**
**Dike Breaches**
E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey




**Legend**

Proposed Breaches

Project Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Esri, HERE, DeLorme, TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

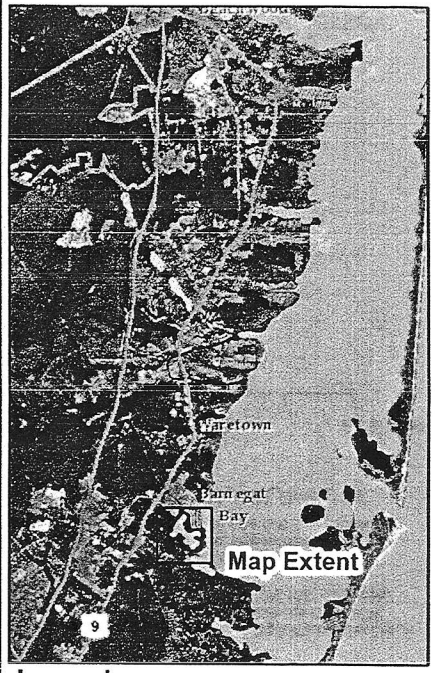
Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 45 90 Meters

**Figure 5**
**Forked River**
**Proposed**
**Dike Breaches**

E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey




**Legend**

Proposed Breaches

**Functionin**

no

yes

Project Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
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Map Projection: NAD_1983_UTM_Zone_18N
Map Date: June 24, 2016

N

0 65 130 260 Meters

**Figure 6**
**Barnegat**
**Proposed**
**Dike Breaches**

E.B. Forsythe Marsh
Resiliency Project #37c
Ocean County, New Jersey

# EMAIL CORRESPONDENCE ON RED KNOT

**Drohan, Amy <amy_drohan@fws.gov>**

# Re: 37c Marsh Project EBF Section 7

1 message

**Drohan, Amy** <amy_drohan@fws.gov> Mon, Aug 22, 2016 at 12:33 PM
To: "Markuson, Jeremy" <jeremy_markuson@fws.gov>
Cc: Paul Castelli <paul_castelli@fws.gov>, Virginia Rettig <virginia_rettig@fws.gov>, Wendy Walsh <wendy_walsh@fws.gov>, Ron Popowski <ron_popowski@fws.gov>, Rich Albers <rich_albers@fws.gov>

Thanks Jeremy for all your help.
Amy

On Mon, Aug 22, 2016 at 12:32 PM, Markuson, Jeremy <jeremy_markuson@fws.gov> wrote:

> Thanks Amy
>
> I've signed and dated the Section 7 form. After Ron signs the form either myself or Chris McGhee will send you a signed copy.
>
> Jeremy
>
> Jeremy Markuson
> Fish and Wildlife Biologist
> U.S. Fish and Wildlife Service
> New Jersey Field Office
> 4 East Jimmie Leeds Road, Unit 4
> Galloway, New Jersey 08205-4465
> Phone: 609-382-5266
> Fax: 609-646-0352
>
> On Thu, Aug 11, 2016 at 12:56 PM, Drohan, Amy <amy_drohan@fws.gov> wrote:
>
> > Hi Jeremy,
> > I spoke with Paul, and the Refuge can incorporate the monitoring activities that Wendy suggested.
> >
> > Thanks,
> > Amy
> >
> > On Wed, Aug 10, 2016 at 3:18 PM, Markuson, Jeremy <jeremy_markuson@fws.gov> wrote:
> >
> > > Hi Paul,
> > >
> > > Please see the response from Wendy and let me know if the project can incorporate a couple of changes to the monitoring activities.
> > >
> > > Thanks,
> > >
> > > Jeremy
> > >
> > > Jeremy Markuson
> > > Fish and Wildlife Biologist
> > > U.S. Fish and Wildlife Service
> > > New Jersey Field Office
> > > 4 East Jimmie Leeds Road, Unit 4
> > > Galloway, New Jersey 08205-4465
> > > Phone: 609-382-5266
> > > Fax: 609-646-0352
> > >
> > > ——— Forwarded message ———
> > > From: **Walsh, Wendy** <wendy_walsh@fws.gov>

Date: Mon, Aug 1, 2016 at 2:39 PM
Subject: Fwd: 37c Marsh Project EBF Section 7
To: Jeremy Markuson <jeremy_markuson@fws.gov>

Jeremy -

Since there have been systematic site-specific bird surveys finding no knot use, I'm fine dropping my first two recommendation.

Regarding veg monitoring, I'm fine if they continue with the methods they've been using. I'd request extract whatever data they can about bare areas and provide us with a summary at the end of their post-construction monitoring.

Regarding monitoring, I'm pretty open as far as the intensity (frequency/duration) of monitoring in the week prior to the start of construction. As long as they go around low tide, I think we can be flexible on the other details of monitoring plan since there has been no documented knot use to date.

Thanks.
Wendy

——— Forwarded message ———
From: **Markuson, Jeremy** <jeremy_markuson@fws.gov>
Date: Fri, Jul 29, 2016 at 4:40 PM
Subject: Re: 37c Marsh Project EBF Section 7
To: "Castelli, Paul" <paul_castelli@fws.gov>
Cc: Amy Drohan <amy_drohan@fws.gov>, Virginia Rettig <virginia_rettig@fws.gov>, Ron Popowski <ron_popowski@fws.gov>, Wendy Walsh <wendy_walsh@fws.gov>

Thanks Paul,

I'll be at NCTC next week. When I get back I'll check with Wendy about the first two conservation measures and the point-intercept vegetation monitoring.

Have a good weekend.

Jeremy

Jeremy Markuson
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
New Jersey Field Office
4 East Jimmie Leeds Road, Unit 4
Galloway, New Jersey 08205-4465
Phone: 609-382-5266
Fax: 609-646-0352

On Fri, Jul 29, 2016 at 4:30 PM, Castelli, Paul <paul_castelli@fws.gov> wrote:

> Hi Jeremy;
>
> Amy forwarded your recommended conservation measures for our sediment enrichment projects at Metedeconk, Reedy Creek, and Ocean Gate. I wanted to provide the following information that we believe demonstrates that these areas are not habitats used by red knots as well as a bit more detail on the rationale, objective, scale, and level of control of these projects.
>
> - Avoid alterations that would either flood or promote vegetation of mud flats, salt pans, marsh blow outs, etc.
>
> Response: This project is designed to add sediment to specific salt marsh areas to raise the elevation in an effort to establish healthy native salt marsh vegetation. The rationale for these projects is that the salt marshes in the area appear to be progressing from high marsh to low marsh to mud to open water; presumably due to

accelerated sea level rise. In the absence of any intervention we expect that they will end up as open water. These 3 project areas are in the upper Barnegat Bay on the western shore, where there is a micro-tidal environment and no substantial mudflats. We have not found any evidence of use by red knots during surveys of these areas 3x per year from May-July as follows:

Metedeconk: 10 points surveyed 3x per year in 2013, 2015, 2016

Reedy Creek: 16 points surveyed 3x per year in 2012, 2015, 2016

Ocean Gate: 4 points surveyed 3x per year in 2013, 2015, 2016

I also have touched base with Wendy Walsh to examine eBird, International Shorebird Survey, and bandedbird.com for records of red knots on our project areas. The nearest records were from Barnegat inlet, which is over 11 miles from our nearest project site. In summary, we can find no evidence of red knot use of these areas.

- Incorporate new bare areas (mud flats, salt pans, marsh blow outs, etc.) into the project design if feasible.

Response: As explained above, the goal of the project is to create a native vegetated salt marsh. Given that we do not have fine scale control over the outcome of the restoration, it is not feasible to design mud flats, salt pannes, or marsh blow outs into the project, although there is a potential that these features will occur in the newly created habitat.

- Assuming habitat monitoring is already a part of the project, keep track of the net change in bare areas (mud flats, salt pans, marsh blow outs, etc.) before and some time after the project.

Response: Our vegetation monitoring is via point intercept method, not spatial mapping. We have pre-treatment sampling for at least three years on each site using the same points as the bird surveys and have applied for funding to continue that monitoring. Bare areas are reflected in the point-intercept data, but we would not have the ability to make direct net change calculations from these data.

If the project is carried out during spring or fall migration seasons (fall migration season is 7/15 to 11/15. Spring 5/1 to 6/15), survey the project areas for the week before the start of work. If any knots are detected, continue monitoring during and after work. Coordinate monitoring with NJFO.

Response: The project can only be constructed from Sept 1 - Dec 31 in any given year due to permit restrictions, which would include the fall migration period. As stated above, we plan to continue spring bird monitoring, subject to funding. We could incorporate red knot monitoring the week before the start of work. If any knots are detected, we could continue monitoring during and after work and coordinate monitoring with NJFO.

These three project areas are microtidal (6-8 inch tide difference) marshes on the western shore of Barnegat Bay that do not appear to have the habitat features that red knots are observed using elsewhere, such as extensive intertidal areas, extensive sandbars/ mudflats, or mussel beds. We could not find any evidence of use of these project area habitats by red knots based on three years of spring surveys and searches of other bird data bases. I do not believe the proposed actions will have any effect or adverse modification of red knot habitat. In fact, if we reestablish healthy native salt marshes that persist longer into the future they would have a greater potential to become red knot habitat than if left to deteriorate.

I request the first two conservation measures be reconsidered in light of the above information. I also request approval of the proposed point-intercept vegetation monitoring. The refuge will comply with the fourth conservation measure as written. Please do not hesitate to contact me if I can provide further information.

Best Regards;

Paul

——— Forwarded message ———
From: **Drohan, Amy** <amy_drohan@fws.gov>
Date: Mon, Jul 25, 2016 at 4:24 PM
Subject: Fwd: 37c Marsh Project EBF Section 7
To: Virginia Rettig <virginia_rettig@fws.gov>, Paul Castelli <paul_castelli@fws.gov>, Charles Harman <charles.harman@amecfw.com>, John Peterson <john.peterson@amecfw.com>, Carl Gustafson <carl_gustafson@fws.gov>, Vinny Turner <vinny_turner@fws.gov>, John Sauer <john_c_sauer@fws.gov>, Tom Bonetti <tom_bonetti@fws.gov>, Bartholomew Wilson <bartholomew_wilson@fws.gov>, Rich Albers <rich_albers@fws.gov>

Hello Everybody,
The NJFO got back to us regarding our Section 7 for the Marsh project. I am forwarding Jeremy's response so everybody is kept in the loop, and we can discuss on the call tomorrow.

Thanks,
Amy

——— Forwarded message ———
From: **Markuson, Jeremy** <jeremy_markuson@fws.gov>
Date: Mon, Jul 25, 2016 at 4:18 PM
Subject: Re: 37c Marsh Project EBF Section 7
To: "Drohan, Amy" <amy_drohan@fws.gov>
Cc: Ron Popowski <ron_popowski@fws.gov>

Hi Amy,

I asked Wendy to take a look at this project for potential impacts on red knots. Here are some conservation measures she recommended:

- Avoid alterations that would either flood or promote vegetation of mud flats, salt pans, marsh blow outs, etc.
- Incorporate new bare areas (mud flats, salt pans, marsh blow outs, etc.) into the project design if feasible.
- Assuming habitat monitoring is already a part of the project, keep track of the net change in bare areas (mud flats, salt pans, marsh blow outs, etc.) before and some time after the project.
- If the project is carried out during spring or fall migration seasons (fall migration season is 7/15 to 11/15. Spring 5/1 to 6/15), survey the project areas for the week before the start of work. If any knots are detected, continue monitoring during and after work. Coordinate monitoring with NJFO.

Please let me know if these conservation measures can be incorporated into the project designs.

Thanks,

Jeremy

Jeremy Markuson
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
New Jersey Field Office
4 East Jimmie Leeds Road, Unit 4
Galloway, New Jersey 08205-4465
Phone: 609-382-5266
Fax: 609-646-0352

On Fri, Jul 15, 2016 at 1:53 PM, Drohan, Amy <amy_drohan@fws.gov> wrote:
> Hi Ron,

I am just following up with your office to make sure you received the Section 7 I sent last week for EBF's Marsh Project.

Also, in the coming days I will be submitting a Section 7 for our Telephone Pole removal project at Good Luck Point. Our contractor Amec would like to test drop some poles after September 1st to refine their construction costs.

Thanks for your help,
Amy

On Wed, Jul 6, 2016 at 10:15 AM, Drohan, Amy <amy_drohan@fws.gov> wrote:

> Hi Ron,
> I'm resubmitting our Section 7 for the Marsh Project. We originally submitted a Section 7 for this project back on February 5, 2016, but we've had many revisions to this project. Please see our revised Section 7 and supplemental documents.
>
> Please let me know if you need more information or clarification,
> Regards,
> Amy
>
> --
> Amy Drohan
> Fish and Wildlife Biologist
> Edwin B. Forsythe National Wildlife Refuge
> U.S. Fish and Wildlife Service
> PO Box 72, 800 Great Creek Road
> Oceanville, NJ 08231
> 609-748-1535 or 609-204-9260 (cell)
> http://www.fws.gov/refuge/edwin_b_forsythe

–
Amy Drohan
Fish and Wildlife Biologist
Edwin B. Forsythe National Wildlife Refuge
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http://www.fws.gov/refuge/edwin_b_forsythe

–
Paul M. Castelli, Wildlife Biologist
Edwin B. Forsythe National Wildlife Refuge
800 Great Creek Road
Oceanville, NJ 08231
609 748 1535 office
609 432 4297 Cell
609 748 2731 Fax

> > > > paul_castelli@fws.gov

–
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# THREATENED AND ENDANGERED SPECIES RESULTS FOR THE BRICK TOWNSHIP PROJECT AREA

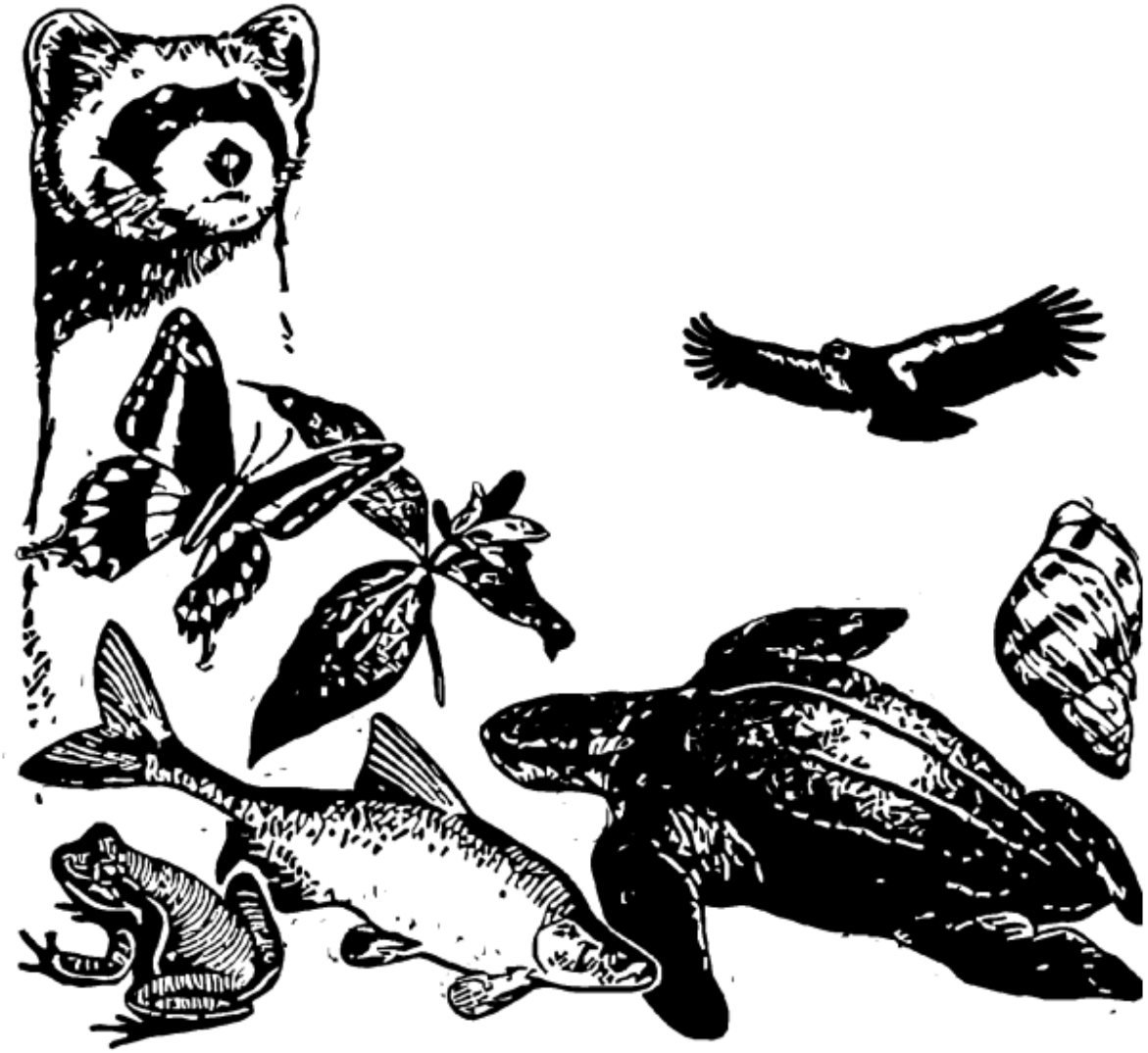
U.S. Fish & Wildlife Service

# Brick Project Area A

## *IPaC Trust Resource Report*

Generated October 19, 2015 02:48 PM MDT

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Brick Project Area A

PROJECT CODE

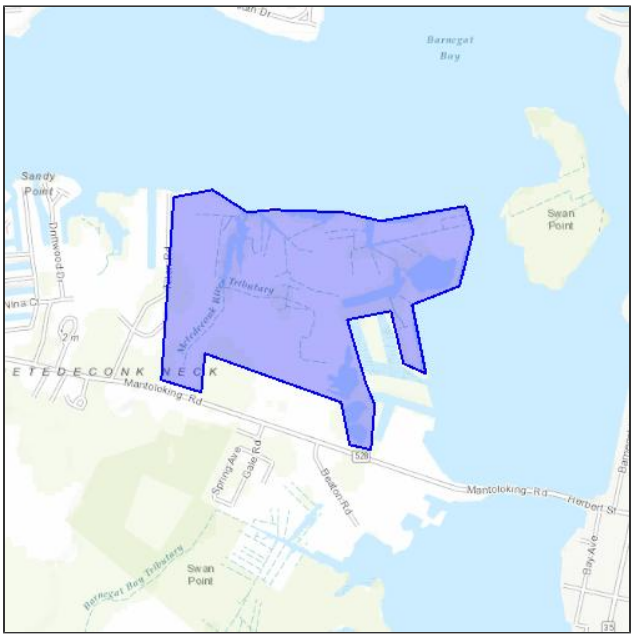
UE53C-6IL55-BC7L5-AIN2S-4D5GYQ

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Seabeach Amaranth** Amaranthus pumilus **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2MZ

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Great Shearwater** Puffinus gravis **Bird of conservation concern**
Season: Migrating

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JV

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Saltmarsh Sparrow** Ammodramus caudacutus **Bird of conservation concern**
Season: Breeding

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

## Edwin B. Forsythe National Wildlife Refuge

39,342.08 acres

PHONE (609) 652-1665

ADDRESS
800 Great Creek Road
Oceanville, NJ 08231

http://www.fws.gov/refuges/profiles/index.cfm?id=52510

# Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

## Estuarine And Marine Deepwater

| | |
|---|---|
| **E1UBL** | 120000.0 acres |
| **E1UBLx** | 10.8 acres |

## Estuarine And Marine Wetland

| | |
|---|---|
| **E2EM1Pd** | 110.0 acres |
| **E2EM1P** | 6.52 acres |
| **E2SS1/4P** | 6.32 acres |
| **E2SS1P** | 5.09 acres |
| **E2ABM** | 4.64 acres |
| **E2SS4P** | 2.55 acres |

## Freshwater Forested/shrub Wetland

| | |
|---|---|
| **PFO1B** | 30.0 acres |
| **PFO1E** | 7.22 acres |
| **PFO4/1B** | 3.84 acres |
| **PFO4B** | 0.865 acre |

U.S. Fish & Wildlife Service

# Brick Project Area B

## *IPaC Trust Resource Report*

Generated October 19, 2015 02:52 PM MDT

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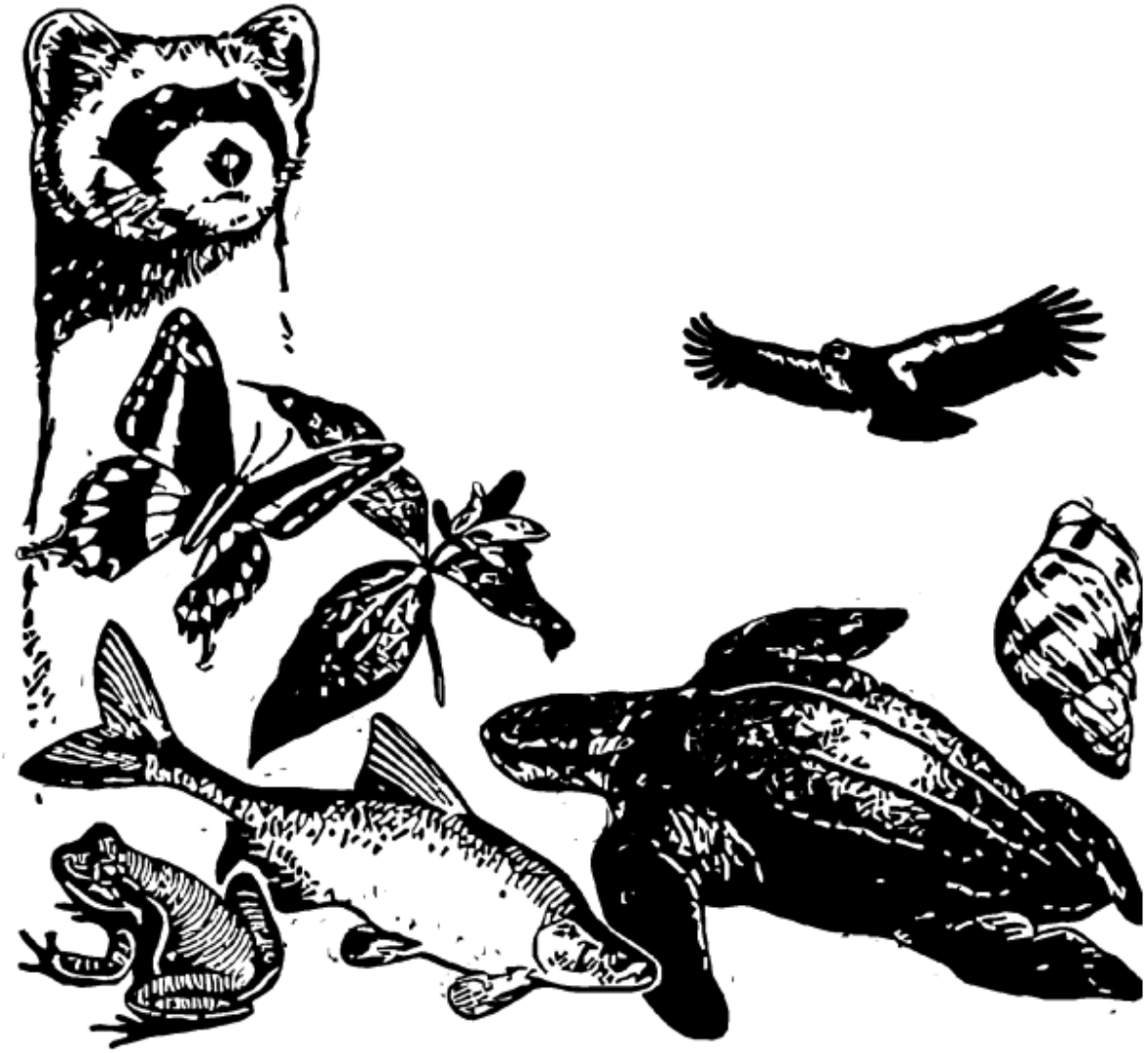


US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Brick Project Area B

PROJECT CODE

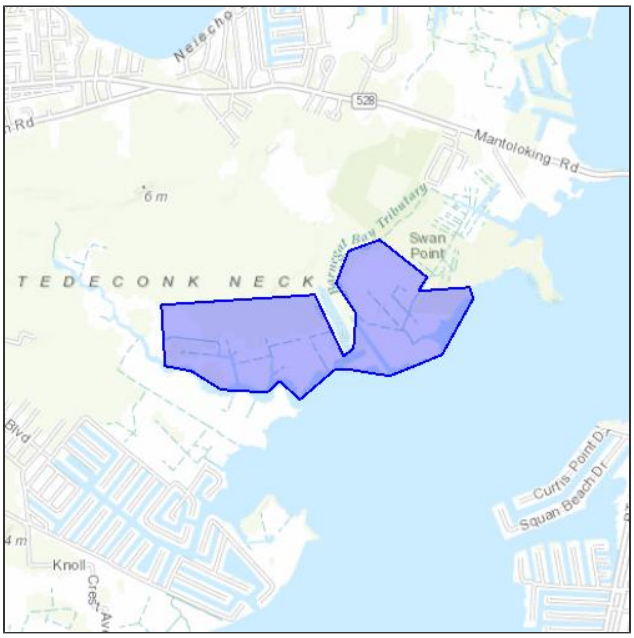
HXLUK-RO6WV-BB5LT-TD3VG-3A7YKA

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

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A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Seabeach Amaranth** Amaranthus pumilus **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2MZ

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Bald Eagle** Haliaeetus leucocephalus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Great Shearwater** Puffinus gravis **Bird of conservation concern**
Season: Migrating

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JV

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Saltmarsh Sparrow** Ammodramus caudacutus **Bird of conservation concern**
Season: Breeding

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

## Edwin B. Forsythe National Wildlife Refuge

39,342.08 acres

PHONE (609) 652-1665

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http://www.fws.gov/refuges/profiles/index.cfm?id=52510

# Wetlands

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Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

## Estuarine And Marine Deepwater

| | |
|---|---|
| **E1UBL** | 120000.0 acres |
| **E1UBLx** | 7.52 acres |

## Estuarine And Marine Wetland

| | |
|---|---|
| **E2EM1Pd** | 328.0 acres |
| **E2EM1Nd** | 32.1 acres |
| **E2SS1P** | 11.0 acres |
| **E2EM1P** | 1.97 acres |
| **E2SS4P** | 0.909 acre |
| **E2SS1/4P** | 0.796 acre |

## Freshwater Emergent Wetland

**PEM1E** 1.07 acres

## Freshwater Forested/shrub Wetland

**PFO4/1C** 113.0 acres

**PFO4/1B** 9.33 acres

**PFO1B** 7.68 acres

**PFO4/1E** 7.64 acres

**PFO4B** 0.557 acre

## Freshwater Pond

**PUBH** 0.429 acre

State of New Jersey

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
*Commissioner*

October 9, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: Marsh Enhancement Design / Build Project (Brick)
Brick Township, Ocean County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Brick Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

NHP File No. 15-4007411-8533

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 15-4007411-8533

*Table 1: On Site Data Request Search Results (7 Possible Reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 3. Natural Heritage Priority Sites On Site | No | 0 pages included |
| 4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | Yes | 1 page(s) included |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Caspian Tern | Hydroprogne caspia | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Great Blue Heron | Ardea herodias | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Least Tern | Sternula antillarum | Foraging | 4 | NA | State Endangered | G4 | S1B,S1N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Northern Harrier | Circus cyaneus | Breeding Sighting | 4 | NA | State Endangered | G5 | S1B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |

# Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1519 |

Total number of records: 1



Friday, October 09, 2015

NHP File No.: 15-4007411-8533

# Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|
| ***Invertebrate Animals*** | | | | | |
| Cicindela patruela consentanea | New Jersey Pine Barrens Tiger Beetle | | | G3T1T3 | S2S3 |

Total number of records: 1



Friday, October 09, 2015

NHP File No.: 15-4007411-8533

*Table 2: Vicinity Data Request Search Results (6 possible reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 2. Natural Heritage Priority Sites within the Vicinity | No | 0 pages included |
| 3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | Yes | 1 page(s) included |

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Caspian Tern | Hydroprogne caspia | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Great Blue Heron | Ardea herodias | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Least Tern | Sternula antillarum | Foraging | 4 | NA | State Endangered | G4 | S1B,S1N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Northern Harrier | Circus cyaneus | Breeding Sighting | 4 | NA | State Endangered | G5 | S1B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |

# Vernal Pool Habitat
# In the Immediate Vicinity of Project Site
# Based on Search of
# Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1519 |

Total number of records: 1



Friday, October 09, 2015

NHP File No.: 15-4007411-8533

# Other Animal Species
# In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|
| ***Invertebrate Animals*** | | | | | |
| Cicindela patruela consentanea | New Jersey Pine Barrens Tiger Beetle | | | G3T1T3 | S2S3 |

Total number of records: 1



Friday, October 09, 2015

NHP File No.: 15-4007411-8533

# THREATENED AND ENDANGERED SPECIES RESULTS FOR THE GOOD LUCK POINT PROJECT AREA

U.S. Fish & Wildlife Service

# Former AT&T Good Luck Point Site

## *IPaC Trust Resource Report*

Generated August 31, 2015 01:16 PM MDT

US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Former AT&T Good Luck Point Site

PROJECT CODE

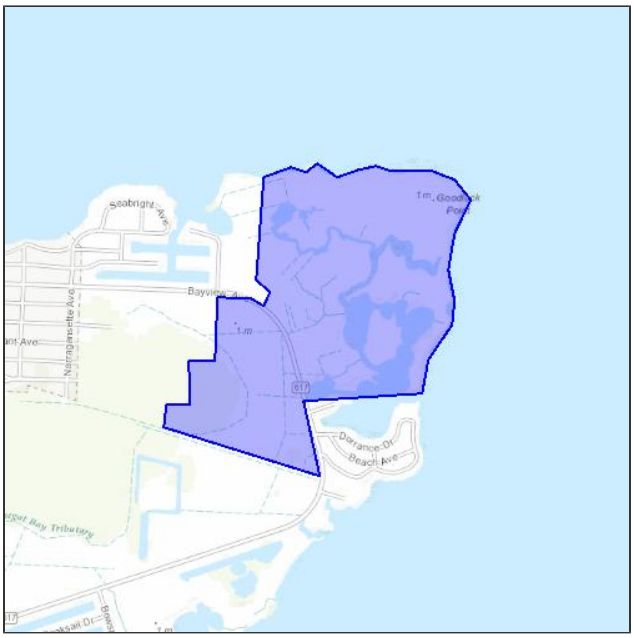
WJHXB-JMTIR-FG3EA-MOX4O-G5LQO4

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an Official Species List from the regulatory documents section.

## Birds

**Red Knot** Calidris canutus rufa **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Seabeach Amaranth** Amaranthus pumilus **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2MZ

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Great Shearwater** Puffinus gravis **Bird of conservation concern**
Season: Migrating

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding

**Horned Grebe** Podiceps auritus **Bird of conservation concern**
Season: Wintering

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Saltmarsh Sparrow** Ammodramus caudacutus **Bird of conservation concern**
Season: Breeding

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

Refuge data is unavailable at this time.

# Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

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Wetland data is unavailable at this time.

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

| | | | |
|---|---|---|---|
| **Project Name:** | Marsh Enhancement and Telephone Pole Removal Project (37c) | **Originating Person:** | Rebecca Reeves |
| **Townships:** | Ocean Gate- Berkeley Township<br>AT&T Manahawkin- Stafford Township | **Telephone Number:** | 609-748-1535 |
| **County:** | Ocean County | **Email Address:** | rebecca_reeves@fws.gov |
| **Date:** | November 4, 2015 | | |

**Distance to nearest town:** Adjacent

I. **Region:** 5
II. **Service Activity (Program):** NWRS, Edwin B. Forsythe NWR (Refuge)
III. **Pertinent Species and Habitat:**

A. **Listed species and/or their critical habitat within the action area:**

***Good Luck Point***

*Birds*

Red knot (*Calidris canutus rufa*)

*Flowering Plants*

Knieskern's Beaked-rush (*Rhynchospora knieskernii*)
Seabeach Amaranth (*Amaranthus pumilus*)
Swamp Pink (*Helonias bullata*)

*Mammals*

Northern Long-eared Bat (*Myotis septentrionalis*)

***AT&T Manahawkin***

*Birds*

Red knot (*Calidris canutus rufa*)

*Flowering Plants*

Knieskern's Beaked-rush (*Rhynchospora knieskernii*)
Swamp Pink (*Helonias bullata*)

*Mammals*

Northern Long-eared Bat (*Myotis septentrionalis*)

B. **Proposed species and/or proposed critical habitat within the action area:**
None

C. **Candidate species within the action area:**

None

**D. Include species/habitat occurrences on a map.**
We have attached the Information for Planning and Conservation (IPaC) trust resources list, which includes a broad scale map and a list of the species that occur in the Good Luck Point and AT& T Manahawkin Project Areas.

**IV. Description of proposed action (attach additional pages as needed):**
The Proposed Action is the safe removal of abandoned telephone and shortwave antenna poles and associated support structures (guy-wires, above ground pieces of foundation, and other debris) (Project) within the U.S. Fish and Wildlife Service (the Service) Edwin B. Forsythe National Wildlife Refuge saltmarshes. This Project will be conducted as a component of the Service's Marsh Enhancement and Telephone Pole Array Removal Project (Contract # P11PC00121) for two former American Telephone & Telegraph (AT&T) facilities; Good Luck Point, and AT&T Manahawkin.

The Good Luck Point Project Area (222 acres) is located within Berkeley Township, Ocean County along Bayview Avenue (Route 617). It contains approximately 340 poles with associated guy wires and anchor pipes, as well as twelve several large metal antennas on concrete foundations. The Manahawkin Project Area (390 acres) is located in Stafford Township, Ocean County at the end of Beach Avenue. It contains approximately 113 poles with associated guy wires and anchor pipes, along with seven large metal antennas on concrete foundations. The poles will be cut as close to the ground as possible, transported to central staging areas at each Project Area, and managed for disposal purposes. Cables and other metal debris will be collected and managed for recycling purposes. The above-ground limits of metal anchors and concrete foundations will be removed, but no material will be removed from below-ground. Materials will be removed between January and April, 2016 and work will be conducted primarily by airboat.

**V. Determination of effects:**

**A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):**
Red Knot migrate through coastal wetlands in the spring and fall and spend winters along coastal waters in Central and South America. In the spring, they are generally concentrated on Delaware Bay beaches, feeding on horseshoe crab (*Limulus polyphemus*) eggs. Impacts on Red Knot are anticipated to be minimal as this work will primarily occur in winter (January- April) when Red Knot will either have migrated south or are concentrated on Delaware Bay beaches.

Knieskern's Beaked-rush is an obligate freshwater wetland species and is not known to exist on this part of this refuge. This work will not occur in any freshwater wetlands, so will not affect this species.

Seabeach Amaranth exists on coastal beaches. This work will occur on salt marshes and not occur on any coastal beach areas, so will not affect this species.

Swamp Pink is an obligate freshwater wetland species and is not known to occur in either project area. This work will not occur in any freshwater wetlands, so will not affect this species.

Northern Long-eared Bats may exist in the forested parts of the refuge adjacent to project areas, but these areas will not be impacted by the proposed work. Furthermore, work will be conducted outside of the active season (April 1- September 30) for these bats, so pole removal activities will have no effect on this species.

**B. Explanation of actions to be implemented to reduce adverse effects:**
All areas will be surveyed for threatened and endangered species before work will begin. Additionally, staff will be educated on the identification of threatened and endangered species and instructed to avoid impacting these species. Staff will report any sightings of these species to refuge management.

**VI. Effect determination and response requested: [* = optional]**

**A. Listed species/designated critical habitat:**

| **Determination** | **Response requested** |
|---|---|
| No effect/no adverse modification (Species: Red Knot, Knieskern's Beaked-rush, Seabeach Amaranth, Swamp Pink, Northern Long-eared Bat) | X Concurrence |
| May affect, but is not likely to adversely affect species/adversely modify critical habitat (Species:_____) | ___ *Concurrence |
| May affect, and is likely to adversely affect species/adversely modify critical habitat (Species:_____) | ____ Formal Consultation |

**B. Proposed species/proposed critical habitat:**

| **Determination** | **Response requested** |
|---|---|
| No effect on proposed species/no adverse | |

modification of proposed critical habitat
(Species:_____) ____ *Concurrence

Is likely to jeopardize proposed species/
adversely modify proposed critical habitat
(Species:_____) ____ Conference

**C. Candidate species:**

| **Determination** | **Response requested** |
|---|---|
| No effect (species:_____) | ____ *Concurrence |
| Is likely to jeopardize candidate species (species:_____) | ____ Conference |

Rebecca A Reeves
Project Biologist/Supervisor (Requestor)

11/4/15
Date

**VII. Reviewing ESFO Evaluation:**

**A. Concurrence** X **Nonconcurrence**_____

**B. Formal consultation required**_____

**C. Conference required**_____

**D. Informal conference required**_____

**E. Remarks (attach additional pages as needed):**

Endangered Species Biologist (Reviewer),
New Jersey Field Office

11-9-15
Date

Assistant Supervisor, New Jersey Field Office

9 Nov 15
Date

**VIII. Map and Official Species List** (attached)

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
PHONE: (609)646-9310 FAX: (609)646-0352
URL: www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Consultation Code: 05E2NJ00-2016-SLI-0083 November 03, 2015
Event Code: 05E2NJ00-2016-E-00069
Project Name: Good Luck Point Project Area

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species that may occur in your proposed action area and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.* )

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA

is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Good Luck Point Project Area

# Official Species List

**Provided by:**

New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
(609) 646-9310
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

**Consultation Code:** 05E2NJ00-2016-SLI-0083
**Event Code:** 05E2NJ00-2016-E-00069

**Project Type:** ** OTHER **

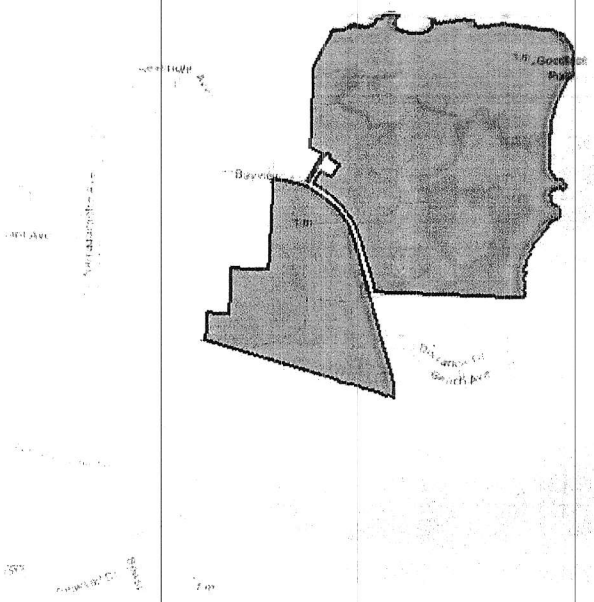
**Project Name:** Good Luck Point Project Area
**Project Description:** During the winter (2016) the Edwin B Forsythe Refuge intends to remove antennae poles and metal towers at the Good Luck Point Project Area.

**Please Note:** The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

United States Department of Interior
Fish and Wildlife Service

Project name: Good Luck Point Project Area

**Project Location Map:**



**Project Coordinates:** The coordinates are too numerous to display here.

**Project Counties:** Ocean, NJ

United States Department of Interior
Fish and Wildlife Service

Project name: Good Luck Point Project Area

# Endangered Species Act Species List

There are a total of 5 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

| **Birds** | **Status** | **Has Critical Habitat** | **Condition(s)** |
|---|---|---|---|
| Red Knot *(Calidris canutus rufa)* | Threatened | | |
| **Flowering Plants** | | | |
| Knieskern's Beaked-rush *(Rhynchospora knieskernii)* | Threatened | | |
| Seabeach amaranth *(Amaranthus pumilus)* | Threatened | | |
| Swamp pink *(Helonias bullata)* | Threatened | | |
| **Mammals** | | | |
| Northern long-eared Bat *(Myotis septentrionalis)* | Threatened | | |

United States Department of Interior
Fish and Wildlife Service

Project name: Good Luck Point Project Area

# Critical habitats that lie within your project area

There are no critical habitats within your project area.

State of New Jersey

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
*Commissioner*

September 11, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: Former AT&T Good Luck Point Pole Removal Project
Block(s) - 1206 / 1207, Lot(s) - 1 and 1.01 / 2.01 and 2.02
Berkeley Township, Ocean County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Berkeley Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 15-3907481-8296

*Table 1: On Site Data Request Search Results (7 Possible Reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 3. Natural Heritage Priority Sites On Site | No | 0 pages included |
| 4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

## Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Paspalum dissectum | Mudbank Crown Grass | | | HL | G4? | S2 | Y - Yes | 198?-??-?? | Berkeley Township, ca. 1/8 mile east of intersection of Arverne Avenue and Narragansette Avenue in Ocean Gate. 3/4 mile west of Barnegat Bay; ca. 3/8 mile north of Bayview Avenue. |

Total number of records: 1

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| *Aves* | | | | | | | | |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Caspian Tern | Hydroprogne caspia | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Least Tern | Sternula antillarum | Foraging | 4 | NA | State Endangered | G4 | S1B,S1N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Peregrine Falcon | Falco peregrinus | Nest | 4 | NA | State Endangered | G4 | S1B,S3N |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |

# Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1359 |

Total number of records: 1

*Table 2: Vicinity Data Request Search Results (6 possible reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 2. Natural Heritage Priority Sites within the Vicinity | No | 0 pages included |
| 3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

## Immediate Vicinity of the Project Site
## Based on Search of Natural Heritage Database
## Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Paspalum dissectum | Mudbank Crown Grass | | | HL | G4? | S2 | Y - Yes | 198?-??-?? | Berkeley Township, ca. 1/8 mile east of intersection of Arverne Avenue and Narragansette Avenue in Ocean Gate. 3/4 mile west of Barnegat Bay; ca. 3/8 mile north of Bayview Avenue. |

Total number of records: 1

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| *Aves* | | | | | | | | |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Brown Thrasher | Toxostoma rufum | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Caspian Tern | Hydroprogne caspia | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Least Tern | Sternula antillarum | Foraging | 4 | NA | State Endangered | G4 | S1B,S1N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Peregrine Falcon | Falco peregrinus | Nest | 4 | NA | State Endangered | G4 | S1B,S3N |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |



Friday, September 11, 2015

NHP File No.: 15-3907481-8296

# Vernal Pool Habitat
# In the Immediate Vicinity of Project Site
# Based on Search of
# Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1359 |

Total number of records: 1

# THREATENED AND ENDANGERED SPECIES RESULTS FOR THE STOUTS CREEK PROJECT AREA

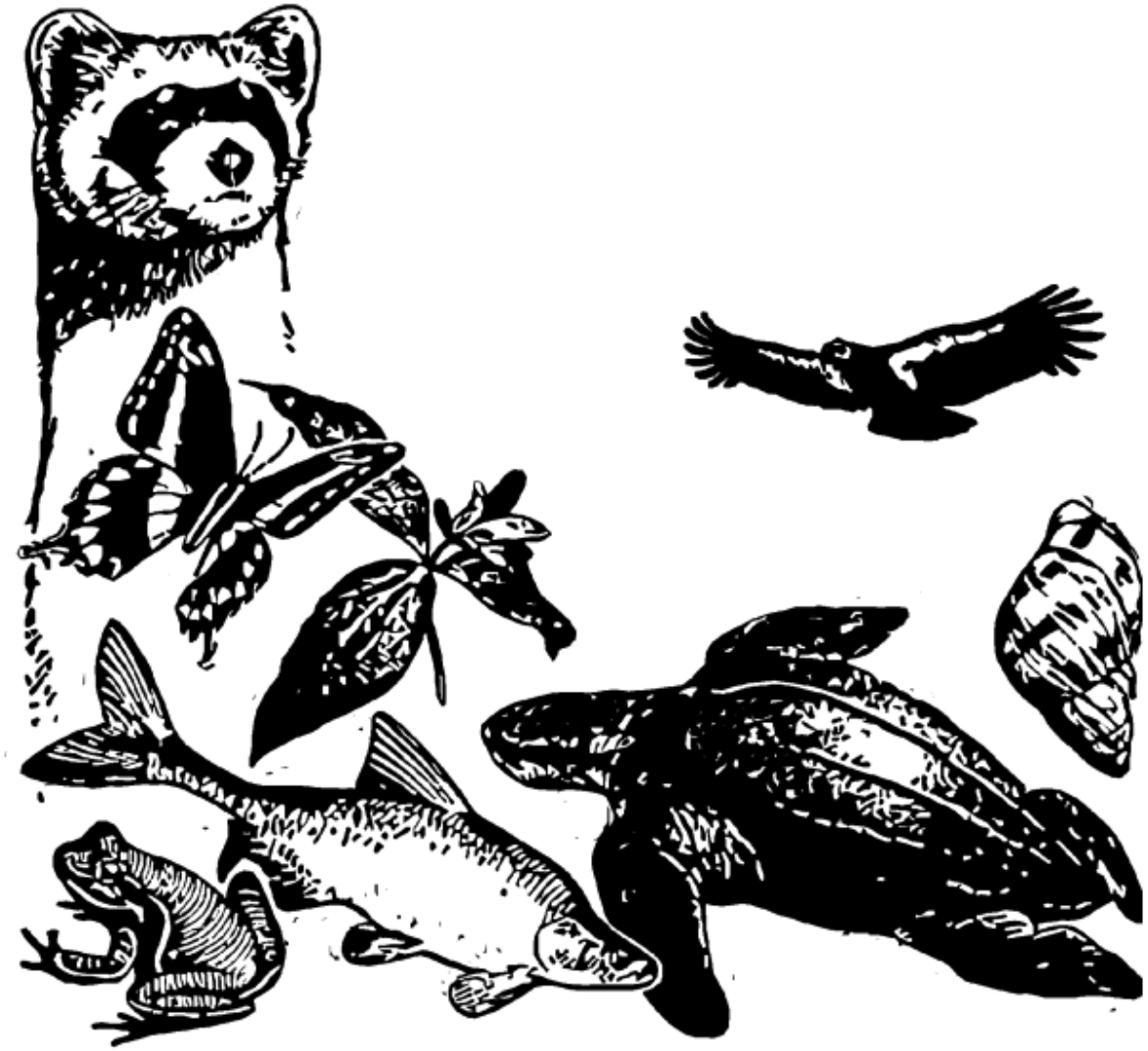
U.S. Fish & Wildlife Service

# Stouts Creek Site

## *IPaC Trust Resource Report*

Generated October 19, 2015 02:56 PM MDT

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Stouts Creek Site

PROJECT CODE

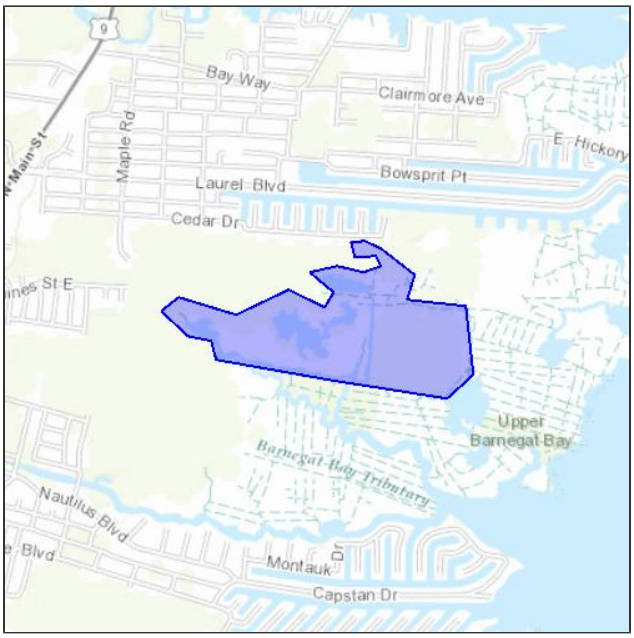
IJDKO-BUXIF-AUPB2-W3XLU-XLKPMM

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

## Birds

**Red Knot** Calidris canutus rufa **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Bald Eagle** Haliaeetus leucocephalus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JV

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Lesser Yellowlegs** Tringa flavipes **Bird of conservation concern**
Season: Wintering

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Prothonotary Warbler** Protonotaria citrea **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

## Edwin B. Forsythe National Wildlife Refuge

40,986.13 acres

PHONE (609) 652-1665

ADDRESS
800 Great Creek Road
Oceanville, NJ 08231

http://www.fws.gov/refuges/profiles/index.cfm?id=52510

# Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

## Estuarine And Marine Deepwater

| | |
|---|---|
| **E1UBL** | 120000.0 acres |
| **E1AB3L** | 5.8 acres |

## Estuarine And Marine Wetland

| | |
|---|---|
| **E2EM1Pd** | 392.0 acres |
| **E2EM1Nd** | 49.9 acres |
| **E2EM1N** | 16.2 acres |
| **E2EM5P** | 12.7 acres |
| **E2SS1/4P** | 5.28 acres |

## Freshwater Emergent Wetland

| | |
|---|---|
| **PEM1C** | 1.2 acres |

| | |
|---|---|
| **PEM1E** | 0.48 acre |

## Freshwater Forested/shrub Wetland

| | |
|---|---|
| **PFO1/4C** | 60.1 acres |
| **PFO4/1E** | 56.2 acres |
| **PFO4B** | 20.4 acres |
| **PFO1B** | 9.22 acres |
| **PFO4/1C** | 8.58 acres |
| **PFO1C** | 3.36 acres |
| **PFO4C** | 0.752 acre |
| **PFO4E** | 0.186 acre |

State of New Jersey

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
*Commissioner*

October 9, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: Marsh Enhancement Design / Build Project (Stouts Creek)
Lacey Township, Ocean County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Lacey Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

NHP File No. 15-3907472-8531

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 15-3907472-8531

*Table 1: On Site Data Request Search Results (7 Possible Reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 3. Natural Heritage Priority Sites On Site | No | 0 pages included |
| 4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 2 page(s) included |
| 5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Barred Owl | Strix varia | Breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| ***Reptilia*** | | | | | | | | |
| | Atlantic Green Turtle | Chelonia mydas | Occupied Habitat | 5 | Federally Listed Threatened | State Threatened | G3 | S1 |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| | Atlantic Loggerhead | Caretta caretta | Occupied Habitat | 5 | Federally Listed Threatened | State Endangered | G3 | S1 |
| | Kemp's or Atlantic Ridley | Lepidochelys kempii | Occupied Habitat | 5 | Federally Listed Endangered | State Endangered | G1 | S1 |

# Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1260 |
| Potential vernal habitat area | 1263 |

Total number of records: 2

*Table 2: Vicinity Data Request Search Results (6 possible reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 2. Natural Heritage Priority Sites within the Vicinity | No | 0 pages included |
| 3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1 | Yes | 1 page(s) included |
| 5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

# Immediate Vicinity of the Project Site
# Based on Search of Natural Heritage Database
# Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Listera australis | Southern Twayblade | | | LP, HL | G4 | S3 | Y - Yes | 1991-05-01 | Murray Grove: ca. 1 mile east of Route 9, south of Stouts Creek. |
| Listera australis | Southern Twayblade | | | LP, HL | G4 | S3 | Y - Yes | 1991-05-04 | CA. 0.7 MILE EAST OF MURRAY GROVE, LACEY TWP. REACHED FROM RT. 9 MURRAY GROVE VIA DIRT ROAD WHICH ORIGINATES AT PAVED BUT UNDEVELOPED ROAD. |

Total number of records: 2

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Barred Owl | Strix varia | Breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| ***Reptilia*** | | | | | | | | |
| | Atlantic Green Turtle | Chelonia mydas | Occupied Habitat | 5 | Federally Listed Threatened | State Threatened | G3 | S1 |
| | Atlantic Loggerhead | Caretta caretta | Occupied Habitat | 5 | Federally Listed Threatened | State Endangered | G3 | S1 |
| | Kemp's or Atlantic Ridley | Lepidochelys kempii | Occupied Habitat | 5 | Federally Listed Endangered | State Endangered | G1 | S1 |

# Vernal Pool Habitat
# In the Immediate Vicinity of Project Site
# Based on Search of
# Landscape Project 3.1

| Vernal Pool Habitat Type | Vernal Pool Habitat ID |
|---|---|
| Potential vernal habitat area | 1260 |
| Potential vernal habitat area | 1263 |

Total number of records: 2



Friday, October 09, 2015

NHP File No.: 15-3907472-8531

# THREATENED AND ENDANGERED SPECIES RESULTS FOR THE FORKED RIVER-WRANGLE CREEK PROJECT AREA

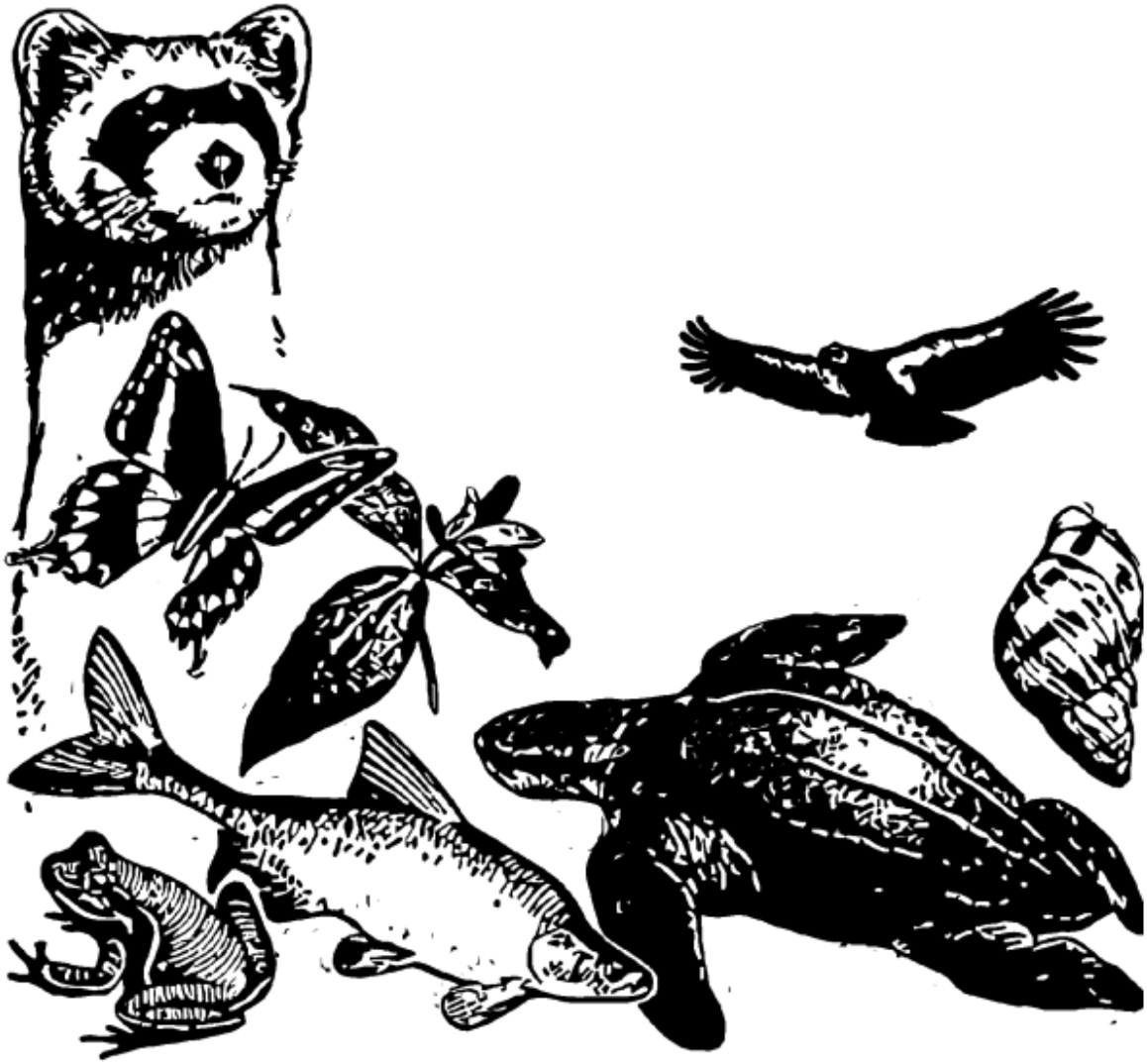
U.S. Fish & Wildlife Service

# Forked River - Wrangle Creek Site

## *IPaC Trust Resource Report*

Generated October 19, 2015 02:58 PM MDT

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Forked River - Wrangle Creek Site

PROJECT CODE

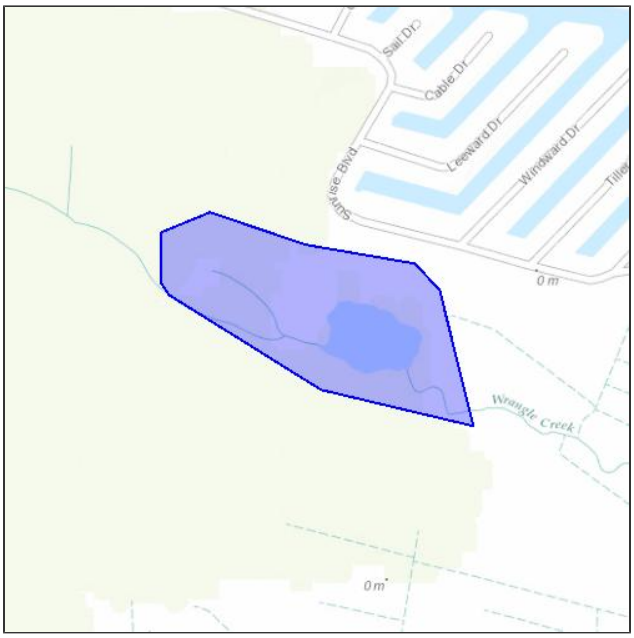
ZWCIL-T7EJB-DSZDS-EQKCX-WVRYFA

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

## Birds

**Red Knot** Calidris canutus rufa **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Bald Eagle** Haliaeetus leucocephalus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JV

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Lesser Yellowlegs** Tringa flavipes **Bird of conservation concern**
Season: Wintering

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Prothonotary Warbler** Protonotaria citrea **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

## Edwin B. Forsythe National Wildlife Refuge

39,342.08 acres

PHONE (609) 652-1665

ADDRESS
800 Great Creek Road
Oceanville, NJ 08231

http://www.fws.gov/refuges/profiles/index.cfm?id=52510

# Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

## Estuarine And Marine Deepwater

| | |
|---|---|
| **E1UBL** | 3.41 acres |

## Estuarine And Marine Wetland

| | |
|---|---|
| **E2EM1Pd** | 394.0 acres |
| **E2SS1P** | 9.26 acres |

## Freshwater Forested/shrub Wetland

| | |
|---|---|
| **PFO1B** | 23.2 acres |
| **PFO1C** | 10.5 acres |

State of New Jersey

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
*Commissioner*

October 9, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: Marsh Enhancement Design / Build Project (Forked River)
Block(s) - 315, Lot(s) - 38.02 (partial)
Lacey Township, Ocean County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Lacey Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

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PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 15-3907472-8534

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| 2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 3. Natural Heritage Priority Sites On Site | Yes | See emailed attachments |
| 4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 2 page(s) included |
| 5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1 | No | 0 pages included |
| 6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Bald Eagle | Haliaeetus leucocephalus | Nest | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Barred Owl | Strix varia | Breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Barred Owl | Strix varia | Non-breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Cooper's Hawk | Accipiter cooperii | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Northern Harrier | Circus cyaneus | Breeding Sighting | 4 | NA | State Endangered | G5 | S1B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |

*Table 2: Vicinity Data Request Search Results (6 possible reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 2. Natural Heritage Priority Sites within the Vicinity | Yes | See emailed attachments |
| 3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 1 page(s) included |
| 4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1 | No | 0 pages included |
| 5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

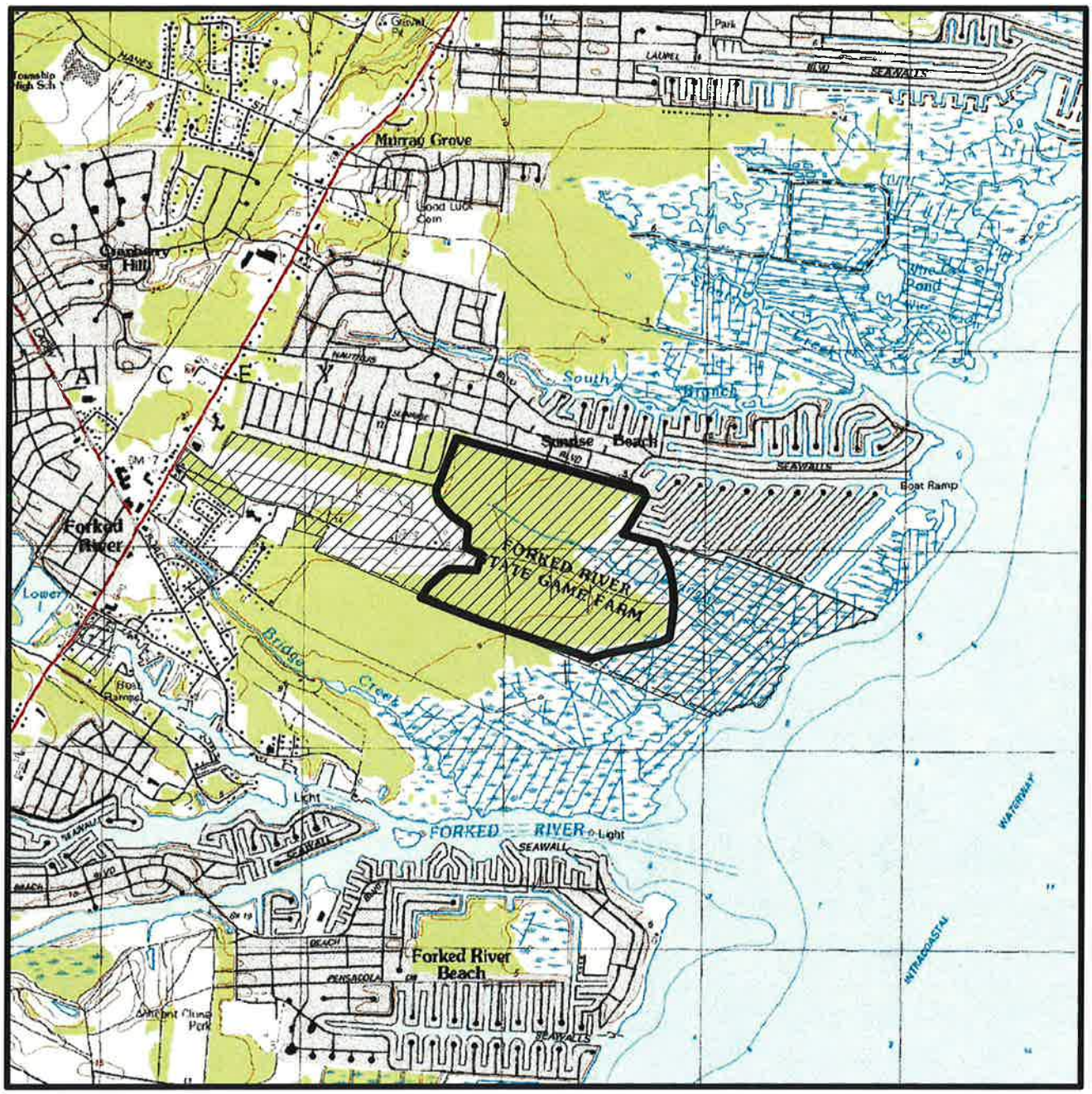
# Immediate Vicinity of the Project Site
# Based on Search of Natural Heritage Database
# Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Asclepias lanceolata | Smooth Orange Milkweed | | | HL | G5 | S2 | Y - Yes | 2004-07-04 | Forked River Game Farm, located 1.5 miles east-southeast of the intersection of Lacey Rd. and Route 9, 0.15 mile south of Wrangle Creek, in Forked River, Lacey Township. |
| Listera australis | Southern Twayblade | | | LP, HL | G4 | S3 | Y - Yes | 198?-??-?? | SOUTH SIDE OF ROAD TO MARSHES ON STATE GAME FARM GROUNDS, 1.25 MILES EAST OF FORKED RIVER. |

Total number of records: 2

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Aves*** | | | | | | | | |
| | Bald Eagle | Haliaeetus leucocephalus | Foraging | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Bald Eagle | Haliaeetus leucocephalus | Nest | 4 | NA | State Endangered | G5 | S1B,S2N |
| | Barred Owl | Strix varia | Breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Barred Owl | Strix varia | Non-breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Cooper's Hawk | Accipiter cooperii | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Northern Harrier | Circus cyaneus | Breeding Sighting | 4 | NA | State Endangered | G5 | S1B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |




Natural Heritage Priority Site

# Forked River Woods

Ocean County

NJ Department of Environmental Protection
Division of Parks and Forestry
**Natural Lands Management**

Miles
0.4 0.2 0 0.4

Priority Sites
Public Land

4

Natural Heritage Priority Site

# Forked River Woods

### *Locational Information*

**Quad Name:** Forked River
**County:** Ocean
**Municipality:** Lacey Twp

### *Description of Site*

Wet deciduous woods.

### *Boundary Justification*

South and north boundaries include habitat for rare plant species; west boundary follows edge of open field; east boundary follows ecotone of salt marsh.

### *Biodiversity Rank B5*

One state imperiled plant species.

**March, 2007**
***Site Code:*** **S.USNJHP1*235**

# THREATENED AND ENDANGERED SPECIES RESULTS FOR THE BARNEGAT PROJECT AREA

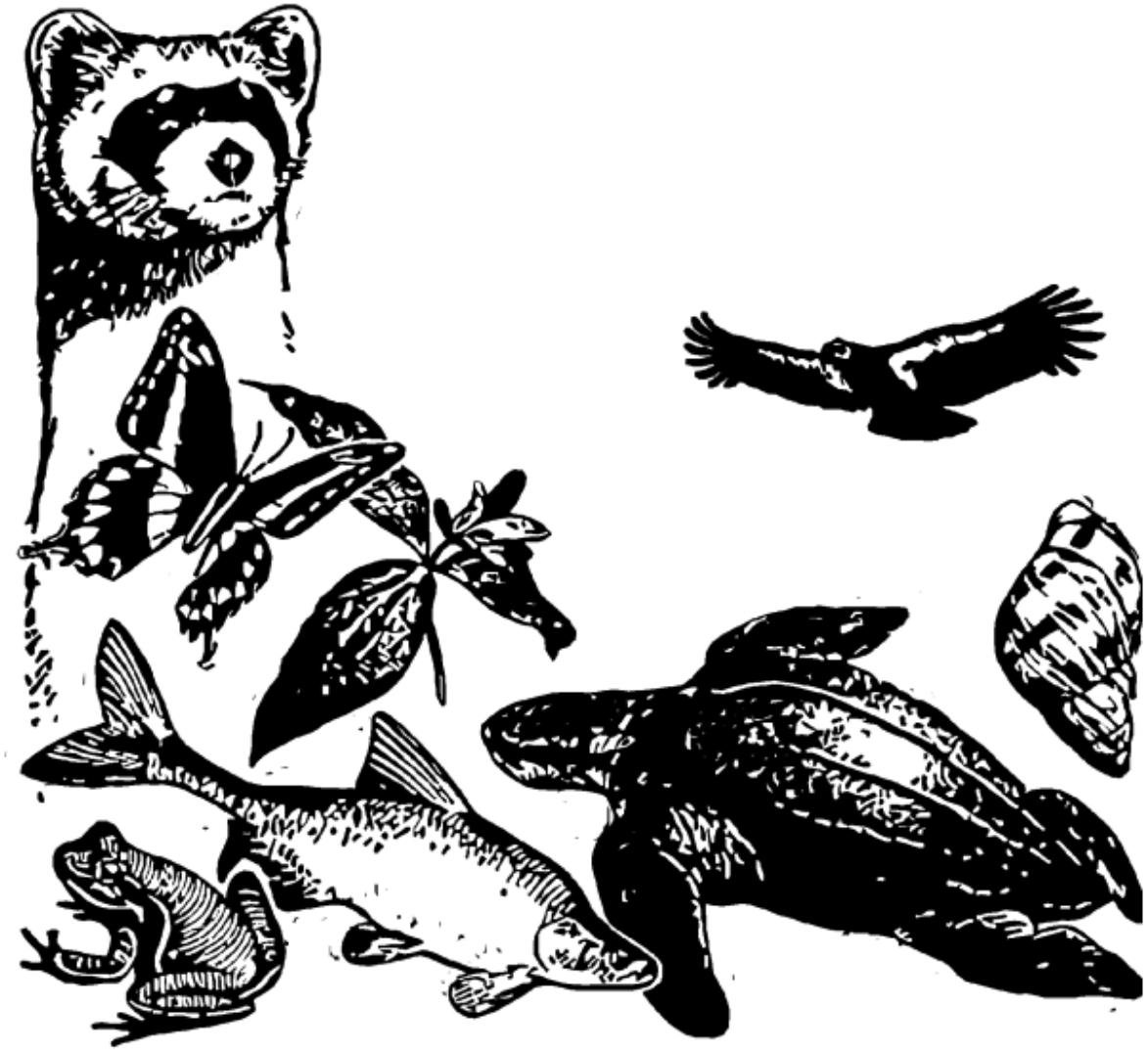
U.S. Fish & Wildlife Service

# Barnegat Site

## *IPaC Trust Resource Report*

Generated October 19, 2015 03:02 PM MDT

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



US Fish & Wildlife Service

# IPaC Trust Resource Report

## Project Description

NAME

Barnegat Site

PROJECT CODE

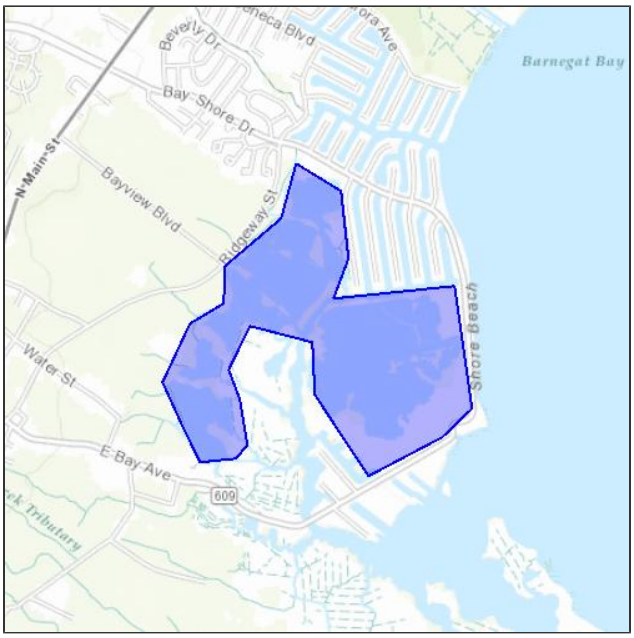
BJYQP-T3GXF-FCFPB-N6JI7-EX3TIM

LOCATION

Ocean County, New Jersey

DESCRIPTION

No description provided




## U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

**New Jersey Ecological Services Field Office**
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

# Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

## Birds

**Red Knot** Calidris canutus rufa **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

## Flowering Plants

**Knieskern's Beaked-rush** Rhynchospora knieskernii **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216

**Swamp Pink** Helonias bullata **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8

## Mammals

**Northern Long-eared Bat** Myotis septentrionalis **Threatened**

CRITICAL HABITAT
**No critical habitat** has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

## Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

# Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

**American Oystercatcher** Haematopus palliatus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G8

**American Bittern** Botaurus lentiginosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F3

**Bald Eagle** Haliaeetus leucocephalus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

**Black Skimmer** Rynchops niger **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0EO

**Black-billed Cuckoo** Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

**Blue-winged Warbler** Vermivora pinus **Bird of conservation concern**
Season: Breeding

**Fox Sparrow** Passerella iliaca **Bird of conservation concern**
Season: Wintering

**Gull-billed Tern** Gelochelidon nilotica **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JV

**Horned Grebe** Podiceps auritus **Bird of conservation concern**
Season: Wintering

**Hudsonian Godwit** Limosa haemastica **Bird of conservation concern**
Season: Migrating

**Least Bittern** Ixobrychus exilis **Bird of conservation concern**
Season: Breeding

**Least Tern** Sterna antillarum **Bird of conservation concern**
Season: Breeding

**Lesser Yellowlegs** Tringa flavipes **Bird of conservation concern**
Season: Wintering

**Peregrine Falcon** Falco peregrinus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

**Pied-billed Grebe** Podilymbus podiceps **Bird of conservation concern**
Year-round

**Prairie Warbler** Dendroica discolor **Bird of conservation concern**
Season: Breeding

**Prothonotary Warbler** Protonotaria citrea **Bird of conservation concern**
Season: Breeding

**Purple Sandpiper** Calidris maritima **Bird of conservation concern**
Season: Wintering

**Red Knot** Calidris canutus rufa **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM

**Rusty Blackbird** Euphagus carolinus **Bird of conservation concern**
Season: Wintering

**Seaside Sparrow** Ammodramus maritimus **Bird of conservation concern**
Year-round

**Short-eared Owl** Asio flammeus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

**Snowy Egret** Egretta thula **Bird of conservation concern**
Season: Breeding

**Upland Sandpiper** Bartramia longicauda **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC

**Wood Thrush** Hylocichla mustelina **Bird of conservation concern**
Season: Breeding

**Worm Eating Warbler** Helmitheros vermivorum **Bird of conservation concern**
Season: Breeding

# Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

## Edwin B. Forsythe National Wildlife Refuge

39,342.08 acres

PHONE (609) 652-1665

ADDRESS
800 Great Creek Road
Oceanville, NJ 08231

http://www.fws.gov/refuges/profiles/index.cfm?id=52510

# Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

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.

## Estuarine And Marine Deepwater

| | |
|---|---|
| **E1UBL** | 120000.0 acres |
| **E1AB3L** | 63.9 acres |
| **E1UBLx** | 19.9 acres |

## Estuarine And Marine Wetland

| | |
|---|---|
| **E2EM1Pd** | 154.0 acres |
| **E2ABM** | 11.2 acres |
| **E2EM1N** | 9.47 acres |
| **E2EM5P** | 3.48 acres |
| **E2USN** | 2.3 acres |
| **E2SS1P** | 1.12 acres |

## Freshwater Forested/shrub Wetland

| | |
|---|---|
| **PFO1/4C** | 33.5 acres |
| **PFO1C** | 19.3 acres |
| **PFO1B** | 16.7 acres |
| **PFO4B** | 3.68 acres |
| **PSS1B** | 1.7 acres |

## Freshwater Pond

| | |
|---|---|
| **PUBHx** | 1.08 acres |

State of New Jersey

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
*Commissioner*

October 9, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: Marsh Enhancement Design / Build Project (Barnegat)
Barnegat Township, Ocean County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Barnegat Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

NHP File No. 15-3907472-8532

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 15-3907472-8532

*Table 1: On Site Data Request Search Results (7 Possible Reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | No | 0 pages included |
| 2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 3. Natural Heritage Priority Sites On Site | No | 0 pages included |
| 4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 2 page(s) included |
| 5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1 | No | 0 pages included |
| 6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

# On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Juncus caesariensis | New Jersey Rush | | E | LP, HL | G2G3 | S2 | Y - Yes | 1919-09-10 | E. [OF] BARNEGAT. |

Total number of records: 1

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Amphibia*** | | | | | | | | |
| | Cope's Gray Treefrog | Hyla chrysoscelis | Vernal Pool Breeding | 4 | NA | State Endangered | G5 | S1 |
| ***Aves*** | | | | | | | | |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Brown Thrasher | Toxostoma rufum | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| ***Reptilia*** | | | | | | | | |

## Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| | Atlantic Green Turtle | Chelonia mydas | Occupied Habitat | 5 | Federally Listed Threatened | State Threatened | G3 | S1 |
| | Atlantic Loggerhead | Caretta caretta | Occupied Habitat | 5 | Federally Listed Threatened | State Endangered | G3 | S1 |
| | Kemp's or Atlantic Ridley | Lepidochelys kempii | Occupied Habitat | 5 | Federally Listed Endangered | State Endangered | G1 | S1 |

*Table 2: Vicinity Data Request Search Results (6 possible reports)*

| Report Name | Included | Number of Pages |
|---|---|---|
| 1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database | Yes | 1 page(s) included |
| 2. Natural Heritage Priority Sites within the Vicinity | No | 0 pages included |
| 3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches | Yes | 2 page(s) included |
| 4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1 | No | 0 pages included |
| 5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File | No | 0 pages included |
| 6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program | No | 0 pages included |

# Immediate Vicinity of the Project Site
# Based on Search of Natural Heritage Database
# Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

| Scientific Name | Common Name | Federal Protection Status | State Protection Status | Regional Status | Grank | Srank | Identified | Last Observed | Location |
|---|---|---|---|---|---|---|---|---|---|
| ***Vascular Plants*** | | | | | | | | | |
| Gentiana autumnalis | Pine Barren Gentian | | | LP, HL | G3 | S3 | Y - Yes | 1915-09-21 | Head of streamlet east of Barnegat. |
| Juncus caesariensis | New Jersey Rush | | E | LP, HL | G2G3 | S2 | Y - Yes | 1919-09-10 | E. [OF] BARNEGAT. |
| Schizaea pusilla | Curly Grass Fern | | | LP, HL | G3G4 | S3 | Y - Yes | 1915-09-21 | Head of streamlet east of Barnegat. |

Total number of records: 3

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| ***Amphibia*** | | | | | | | | |
| | Cope's Gray Treefrog | Hyla chrysoscelis | Vernal Pool Breeding | 4 | NA | State Endangered | G5 | S1 |
| ***Aves*** | | | | | | | | |
| | Barred Owl | Strix varia | Breeding Sighting | 3 | NA | State Threatened | G5 | S2B,S2N |
| | Black Skimmer | Rynchops niger | Foraging | 4 | NA | State Endangered | G5 | S1B,S1N |
| | Black-crowned Night-heron | Nycticorax nycticorax | Foraging | 3 | NA | State Threatened | G5 | S2B,S3N |
| | Brown Thrasher | Toxostoma rufum | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Common Tern | Sterna hirundo | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Glossy Ibis | Plegadis falcinellus | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Little Blue Heron | Egretta caerulea | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Osprey | Pandion haliaetus | Foraging | 3 | NA | State Threatened | G5 | S2B |
| | Osprey | Pandion haliaetus | Nest | 3 | NA | State Threatened | G5 | S2B |
| | Roseate Tern | Sterna dougallii dougallii | Foraging | 5 | Federally Listed Endangered | State Endangered | G4T3 | S1B,S1N |
| | Snowy Egret | Egretta thula | Foraging | 2 | NA | Special Concern | G5 | S3B,S4N |
| | Tricolored Heron | Egretta tricolor | Foraging | 2 | NA | Special Concern | G5 | S3B,S3N |
| | Veery | Catharus fuscescens | Breeding Sighting | 2 | NA | Special Concern | G5 | S3B |
| ***Reptilia*** | | | | | | | | |

## Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

| Class | Common Name | Scientific Name | Feature Type | Rank | Federal Protection Status | State Protection Status | Grank | Srank |
|---|---|---|---|---|---|---|---|---|
| | Atlantic Green Turtle | Chelonia mydas | Occupied Habitat | 5 | Federally Listed Threatened | State Threatened | G3 | S1 |
| | Atlantic Loggerhead | Caretta caretta | Occupied Habitat | 5 | Federally Listed Threatened | State Endangered | G3 | S1 |
| | Kemp's or Atlantic Ridley | Lepidochelys kempii | Occupied Habitat | 5 | Federally Listed Endangered | State Endangered | G1 | S1 |

# APPENDIX F

# RESULTS OF SHPO/NJSM FILE SEARCH

Department of the Interior
United States Fish and Wildlife Service
Edwin B. Forsythe National Wildlife Refuge
800 Great Creek Road
P. O. Box 72
Oceanville, New Jersey 08231-0072

June 30, 2016

Mr. Daniel D. Saunders
Deputy State Historic Preservation Officer
New Jersey Historic Preservation Office
P.O. Box 420
Trenton, NJ 08625-0420

Dear Mr. Saunders:

The U.S. Fish and Wildlife Service (Service) requests your comment under Section 106 of the National Historic Preservation Act regarding the effect of an undertaking that will contribute to tidal marsh restoration in Ocean County at multiple project areas within the Edwin B. Forsythe National Wildlife Refuge (refuge). The Service owns the properties and is the lead agency for the project. The project is funded by the Disaster Relief Appropriations Act of 2013 (Public Law 113-12).

The overarching goal of this project is the enhancement of coastal marsh habitats by increasing marsh resiliency from impacts of sea level rise, large storm events, and other ecosystem stressors. This project will improve approximately 500 acres of estuarine-salt marsh habitat by significantly enhancing and restoring currently degraded areas that have been negatively impacted by activities such as grid-ditching, salt hay farming, erosion, and sea level rise. The six (6) areas proposed for enhancement are deficient in sediment deposition and tidal flow or have been altered by anthropogenic actions. Additionally, there are other tidal flow barriers (e.g., berms, defunct water control structures, and under-sized culverts) that degrade the marshes and will be addressed. The Service has a contract with Amec Foster Wheeler Environmental and Infrastructure to do the designs and permitting for the sediment enrichment and design and construction for the culvert work. Also, the Service is partnering with the Ocean County Mosquito Commission to conduct the tidal flow restoration work and the New Jersey Department of Transportation (NJDOT) and their sub-contractor to conduct the sediment enrichment construction.

The proposed activities will be performed in the following project areas within the refuge property, listed from north to south (please refer to Enclosure): Brick A (42 acres in Brick Township); Brick B (62 acres in Brick Township); Good Luck Point (19 acres in Berkeley Township); Stouts Creek (127 acres in Lacey Township); Forked River (18 acres in Lacey Township); and Barnegat (225 acres in Barnegat Township).

The proposed activities in the respective Marsh project areas consist of the following: Brick A – sediment enrichment (fine to medium grain sands intermixed with finer grained silts and clays dredged from nearby NJDOT channels will be applied to adjacent marsh surfaces within specific cells, increasing elevation to either high marsh or low marsh biological target elevations (Figure 1). Final elevations for the actual placement of sediments will likely be greater to account for consolidation and settlement of sediments and the underlying substrate after placement. The additional elevation required to meet the biological target elevations will be developed by NJDOT consulting engineers. It is also likely that the number of cells to receive material at each project area will be reduced depending on the final construction elevation and the amount of dredge material available; Brick B – sediment enrichment (same method, Figure 1); Good Luck Point - sediment enrichment (same method except one cell is targeted for high marsh, Figure 2), in addition to the replacement of undersized culverts beneath Bayview Avenue with a new, appropriately sized culvert (Figure 2); Stouts Creek – impoundment berms will be breached with an excavator at 14 locations (Figure 3). The breaches will be 3 to 4 feet wide and 3 feet deep; Forked River – impoundment berms will be breached at 2 locations that are 3 to 4 feet wide and 3 feet deep (Figure 3); and Barnegat – impoundment berms will be breached at 13 locations (Figures 3 and 4) that are 3 to 4 feet wide and 3 feet deep (two of the breaches will be located where non-functioning water control structures will be removed).

An Environmental Assessment (EA) was prepared for this undertaking. In accordance with the National Historic Preservation Act (Sec. 106), consideration was given to the project's potential for effect on historic properties that are eligible for listing on the National Register of Historic Places. Background research was conducted at the New Jersey Historic Preservation Office and the New Jersey State Museum, and historic and archaeological sensitivity was evaluated for the project's Area of Potential Effect (APE) within the respective refuge project areas. The only inventoried historic property within the APE was identified at the Good Luck Point project area, which contains the antenna field of a former AT&T shortwave transmitter building (SHPO ID No. 4723). In compliance with the NHPA (Sec. 106), the Service has executed a two-party Memorandum of Agreement (MOA) with the New Jersey SHPO that prescribes the mitigation measures the Service will enact to resolve the adverse effect of a separate pole removal project at Good Luck Point (SHPO Project Review No. 15-3524). The separate pole removal project is anticipated to occur between December 2016 and February 2017. There are no other inventoried historic properties within the APE of the marsh restoration project that is the subject of the present submittal. The archaeological sensitivity of the marsh restoration APE is variable, with some upland zones exhibiting moderate to high sensitivity for possible Native American sites. However, the EA determined that there is no potential for effect on archaeological resources because the project design does not include ground alteration.

Where sediment enrichment (or "thin-layer deposition") will occur, the existing channels that will serve as sources of sediment dredge are not archaeologically sensitive. The objective for sediment enrichment at the Brick A and Brick B sites is to raise the elevation of the marsh in specific areas to allow for the reintroduction of native marsh grasses such as *Spartina alterniflora* and *S. patens* which already inhabit the project areas but in low abundances. Where berms are to be breached, the berms lack historical significance and archaeological

sensitivity. Installation of a new culvert beneath Bayview Avenue at Good Luck Point will have no effect on historic properties. The project activities will not incur any visual impacts on significant historic structures or historic districts, and will not involve new ground alteration for staging areas or access.

Consequently, we believe that the project will cause no adverse effect on significant historic properties under the National Historic Preservation Act (Sec. 106). We would appreciate receiving your concurrence with this finding of no effect within 30 days, as prescribed in the Regulations of the Advisory Council on Historic Preservation [36 CFR 800.4 (d)]. If you have any questions or need further information, please contact me at (609) 652-1665.

Sincerely,

Virginia Rettig

Virginia Rettig
Refuge Manager

Enclosure 1 –

Enclosure 2 –

Cc: Timothy Binzen, NWRS

The New Jersey Historic Preservation Office concurs with the U.S. Fish and Wildlife Service that the undertaking described above will have no adverse effect on National Register-eligible historic properties.

_____ _____

Signature Date

# RESULTS OF SHPO/NJSM FILE SEARCH FOR THE BRICK TOWNSHIP PROJECT AREA

**Cultural Resource GIS Digitizing Form**

**Name:** Mantoloking Marine Historic District

**Inv. ID:** 3512 **Attrib. ID:** _____ **HSI ID:** _____

**Date:** 5/8/08 **Staff Name:** JHammond

**Applicable Layers:**

- ✓ HD_PLY
- ✓ PR_PLY
- ___ PR_PT
- ___ AD_PLY
- ___ ST_PLY
- ___ ST_PT

**Issues Revealed:**

- ___ Address
- ___ Block / Lot
- ___ Boundary / Extent
- ___ Demolished / Destroyed

**Notes:**

TYPE:
- [x] New District
- [ ] Individually Eligible
- [ ] Individual and Contributing
- [ ] Contributing Only

- [x] Mapped
USGS Quad Name Point Pleasant Quad
Quad Reference Number 17
Digital Identification Number _____

# ELIGIBLE PROPERTY WORKSHEET

Name Mantoloking Marine HD A.K.A. _____

Address /Location _____

_____ Block / Lot ____ / ____

County and Municipality Ocean Cty / Brick Twp

District (If applicable) _____

- [x] SHPO OPINION - [ ] DOE - [ ] COE - [ ] ITC (HPCA-Part 1)

DATE SIGNED 5/5/96 CHRONO D96-51 LOG 96-729 AUTHOR AT

REPORT (Accession Number) Historic Bridge Alternative Analysis for Mantoloking Rd. over Barnegat Bay Jan. 1994

SURVEY FORM# (Historic Sites Inventory, Historic Bridge Survey) _____

---

Enclosure Checklist

- ✓ SHPO Signed Document
- ___ NPS Signed Document
- ✓ Report Information (Title Page, Photograph copies, Relevant Sections)
- ___ Property Information (Survey forms)
- ___ Photographs (Historic and Current)
- ___ HABS/HAER documentation
- ✓ Maps (Copy of Historic Properties USGS Quad, Historic, Tax)
- ___ Other _____

PROJECT FILE NAME DCE-Brick / Mantoloking Road Bridge Replacement

CABINET LOCATION OF FILE Andrea

COVENANT / AGREEMENT _____

STATUS OF THE PROPERTY _____

Prepared by: KGarnick Date: 12/26/00

Chrono

# State of New Jersey

Christine Todd Whitman
*Governor*

Department of Environmental Protection

Robert C. Shinn, Jr.
*Commissioner*

DIVISION OF PARKS AND FORESTRY
HISTORIC PRESERVATION OFFICE
CN-404
TRENTON, N.J. 08625-0404
TEL: (609) 292-2023
FAX: (609) 984-0578

May 5, 1996
HPO-D96-51

Andras Fekete, Manager
Bureau of Environmental Analysis
New Jersey Department of Transportation
1035 Parkway Avenue
CN 600
Trenton, NJ 08625-0600

Dear Mr. Fekete:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the Federal Register on September 2, 1986 (51, 169, 31115-31125), I am providing Additional Consultation Comments for the following project:

**Ocean County, Brick Township & Mantoloking Borough**
**Mantoloking Road (CR 528) Bridge over Barnegat Bay and Intracoastal Waterway (Str. #1506006)**
**Bridge Replacement Project**
**NJDOT Project #4510-095**

These comments are in response to your letter of January 25, 1996 requesting Historic Preservation Office (HPO) consultation comments. My comments are based on the following reports:

"An Archaeological Survey (Level of Action Assessment [LOAA]) in Connection with the Proposed Replacement of the Mantoloking Road Bridge, Brick Township, Ocean County, New Jersey," by Hunter Research for McCormick, Taylor & Assoc., Inc. (June 1995).

"Replacement of Mantoloking Bridge, County Route 528 over Barnegat Bay, Brick Township and Mantoloking Borough, Ocean County, New Jersey, Historic Resources Survey," by historical Perspectives, Inc. for McCormick, Taylor & Assoc., Inc. (December 1995).

These reports were augmented by an addendum to the architectural survey report received at the Historic Preservation Office on February 26, 1996.

SUMMARY: There are three architectural properties within the APE which are eligible to be listed in the National Register of Historic Places. The project will have an Adverse Effect on cultural resources. I look forward to working with you and your staff on ways to avoid, minimize or mitigate the effect of your project on cultural resources.

---

800.4 Identifying Historic Properties

The reported investigation was adequate to identify archaeological historic properties in the APE, if any had been present. I agree with the conclusion of the archaeological report that there are no archaeological historic properties in the APE. No further archaeological identification efforts are recommended.

As Deputy Historic Preservation Officer for New Jersey, I concur with the recommendation of the New Jersey Historic Bridge Survey that Str. #1506006 is individually eligible to be listed in the National Register of Historic Places under Criterion C as embodying the characteristics of a distinctive type (single leaf trunnion bascule).

The Mantoloking Historic District was previously identified as eligible to be listed in the National Register of Historic Places by my opinion dated ~~April~~ March 8, 1996. Please note that the boundaries of the historic district delineated by that opinion are different than those identified by the reviewed report. The boundaries of the eligible historic district, given in the context of your project to widen Route 35, include most of the borough. These boundaries are applicable to this project and should be used for all future planning.

The Lotus was listed on the New Jersey Register of Historic Places on July 9, 1985 as part of a multi-property designation for type 'A' catboats; also listed were the Bat, the Mary Ann, and the Spy. All four of these boats are individually eligible to be listed in the National Register of Historic Places. The Ghost is individually eligible to be listed in the National Register of Historic Places for the same reasons as the other type 'A' catboats as described in the New Jersey Register application.

It is also my opinion that the following resources are eligible to be listed in the National Register of Historic Places under Criteria A & C as the Mantoloking Marine Historic District: the Beaton Boat Yard, located at 72 Beaton Road in Brick Township; the Winter Yacht Basin, located at 5 Mantoloking Road in Brick Township; and the Mantoloking Yacht Club, located on Block 30 Lot 6 in Mantoloking Borough. Together these three complexes represent the continued existence of a vibrant and

interconnected marine industry. At these locations important developments in boat building occurred, resulting in important regional boat designs such as the type 'A' catboat. The surviving type 'A' catboats currently maintained at the Beaton Boat Yard -- the Lotus and the Ghost -- contribute to the significance of this historic district.

**800.5 Assessing Effects**

The demolition of Str. #1506006, an eligible resource, will be an Adverse Effect. The new structure should be designed to be compatible with the two adjacent historic districts. Conversations between our staffs indicate that the replacement bridge will be a bascule design, somewhat higher in elevation than existing. This is an important, and much appreciated, step towards compatibility. However, I encourage you to explore architectural treatments for the bridge (such as balustrade design and substructure aesthetics) to further enhance compatibility with its surroundings. I look forward to continuing to work with you and your staff on this project.

**Report Comments**

REGARDING THE ARCHAEOLOGICAL REPORT:

We would like to have either a final report with original photos or a set of original photos to mount on the photo figure pages.

REGARDING THE ARCHITECTURE REPORT:

Under Section 106 the Federal Agency has an obligation to offer firm eligibility opinions on evaluated resources for SHPO comment. The language used in the reviewed report to describe the eligibility of evaluated resources was at times inconclusive; phrases such as 'could be eligible' or 'might be eligible' were used. This language unnecessarily complicates the review process resulting in longer review times.

Architectural survey reports are much more clear, persuasive, and easy to review when the architectural description, eligibility assessment, and photographs are organized by individual property rather than as separate sections of the report. In fact the entire report would have benefitted from a better integration of text and visuals.

On a more positive note, the reviewed report contained excellent quality photographs; clearly and consistently identified properties by street address, block and lot numbers, and name when appropriate; and contained an interesting and well written history of catboats.

Should you have any questions, please contact Mike Gregg for archaeology or Andrea Tingey for architecture at (609) 292-2028.

Sincerely,

Dorothy P. Guzzo

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

cc: Robin Schroeder, FHWA
T.J. Chandler, FHWA
Helene Cook, FHWA
ACHP
Lauralee Rappleye-Marsett, NJDOT, BEA
Janet Fittipaldi, NJDOT, BEA

DG:AT (C:\wpwin\96-729)

DRAFT

OCE
F
299b

ID8655

# Survey of Historic Architectural Resources, Addendum to KSK Study of 1995 (Revised 2002)

# and

# Determination of Effect Analysis

## New Jersey Route 35 Pavement Restoration from Mileposts 9.0 to 12.5

Ocean County: Mantoloking, Bay Head, and
Point Pleasant Beach Boroughs

*Prepared by:*

McCormick, Taylor & Associates, Inc.
Two Commerce Square, 10th Floor
2001 Market Street
Philadelphia, PA 19103
215.592.4200

*Prepared for:*

New Jersey Department of Transportation
Division of Project Management
E&O Building, 3rd Floor
1035 Parkway Avenue, PO Box 600
Trenton, NJ 08625-0600

**September 2003**

# HISTORIC BRIDGE ALTERNATIVES ANALYSIS

*for*

## MANTOLOKING ROAD (CR 528)
## OVER BARNEGAT BAY
## (Structure No. 1506006)
## Township of Brick and Borough of Mantoloking
## Ocean County, New Jersey

***Prepared for:***

Ocean County Engineering Department
129 Hooper Avenue • P.O. Box 2191
Toms River, New Jersey 08754-2191

***Prepared by:***

McCormick, Taylor & Associates, Inc.
51 Haddonfield Road, Suite 200
Cherry Hill, New Jersey 08002

**January 1999**

## C. Mantoloking Historic District

The period of most significance for the development of Mantoloking is the era 1882 to 1936, from the laying out of the town to the closure of the old bridge to the mainland, which served the community from 1884 to 1936. During this time, the community began to grow around the Philadelphia and Long Branch Railroad and many shingled houses were built in the area bounded by Herbert Avenue, Princeton Avenue, the Atlantic Ocean and Barnegat Bay. The railroad ran up the middle of the block between Bay and Ocean Avenues. This area retains a significant concentration of historic residential structures in a good state of architectural integrity. The NJHPO has rendered two DOE opinions for the Mantoloking Historic District, dated 4/96 and 5/96 **(Appendix B)**.

The Mantoloking Historic District focuses on the architectural resources of the cohesive recreational/residential community, characterized by wood frame houses built primarily between 1880 and 1935. Based on the standards of Criterion C, the historic district represents a significant and distinguishable community important in the development of the Barnegat Bay area. These two-and-a-half story dwellings share a number of features, most notably their wooden shingle siding, wood frame sash windows, front and side porches, and generally an irregular silhouette, marked by projecting gables, dormers, and sleeping porches. The community is unified by the setbacks of the houses and their surrounding grassy lawns. **Figure 3** indicates the extent of the historic district, and the relationship of the Mantoloking Bridge to this district.

The bridge into Mantoloking over Barnegat Bay is a completely utilitarian feature of the historic community. The original settlement had no bridge to the mainland, except for railroad connections found much farther south on the barrier island. Although the founders of Mantoloking had much to say about the appearance of houses and lawns, and although they actively built docks on the bay and boardwalks at the ocean, there is no recorded expression of concern or interest in a bridge to connect the resort community with the mainland.

Beyond the historic district, which is bounded by Herbert Street, Princeton Avenue, the Atlantic Ocean and Barnegat Bay, there are a few scattered old houses, but no other significant concentrations of historic resources. The study area for the Mantoloking Bridge includes the northern section of the historic district, located primarily south of the bridge. Herbert Street itself includes historic resources only along its northern side, and a few more on Barnegat Lane, marking the edge of development in the 1930s, at the end of the period of significance.

## D. Mantoloking Marine Historic District

The area immediately south of the Mantoloking Bridge is significant in the history of yachting and boat building. The Mantoloking Marine Historic District includes the Beaton Boat Yard, the Winter Yacht Basin, and the Mantoloking Yacht Club **(Figure 3)**. On the mainline side of the bridge, the Beaton Boat Yard and the Winter Yacht Basin continue the tradition of repairing and

maintaining boats at these sites. The Mantoloking Yacht Club in Mantoloking was determined eligible for the National Register by a NJHPO-sponsored survey in 1980. Mantoloking Yacht Club members depend primarily on the repair, maintenance and storage services of the Beaton Yard and Winter Yacht Basin across the bay. The yards and the club have been informally identified with each other for many years. In its DOE for the Mantoloking Marine Historic District, dated 5/96, the NJHPO stated that "together these three complexes represent the continued existence of a vibrant and interconnected marine industry" **(Appendix B).** Within the Mantoloking Marine Historic District, the surviving type 'A' catboat, the Ghost, is maintained and contributes to the significance of this historic district. This location also provided important developments in the regional boat designs of the type 'A' catboat. The NJHPO has rendered a DOE for the Ghost, dated 5/96 **(Appendix B)**.

# III. Statement of Project Purpose and Need

The Mantoloking Bridge over Barnegat Bay and the ICW is part of County Route 528, an important arterial. The bridge provides a roadway connection between Mantoloking Borough on the east shore with Brick Township on the west shore. Due to structural deficiencies, functional obsolescence, and current and anticipated long range traffic uses, the Ocean County Engineering Department has recommended the replacement of this structure.

The following sections address issues appropriate to documenting the purpose and need for the Mantoloking Bridge replacement project. The issues include the existing physical conditions of the structure and roadway, structural deficiencies, and functional obsolescence.

## A. Existing Physical Conditions

This is a description of Structure No. 1506006 as reported in the Bridge Evaluation Survey Report (W.J. Castle, P.E. & Associates, P.C., 1993). The evaluation report conforms to state practices for inspections and current NJDOT standards. The Structure Inventory and Appraisal Sheet included in **Appendix D** was utilized for specific bridge data. Photographs, presented at the end of this section, depict the existing physical conditions of the span.

### 1. Structure

**Deck: Reinforced concrete and steel grid**

The deck of the approach spans consists of three-span continuously reinforced concrete T-beams which forms a concrete roadway. The fixed span consists of a 12-inch thick reinforced concrete deck supported by six steel floor beams and two variable depth, riveted plated girders. The

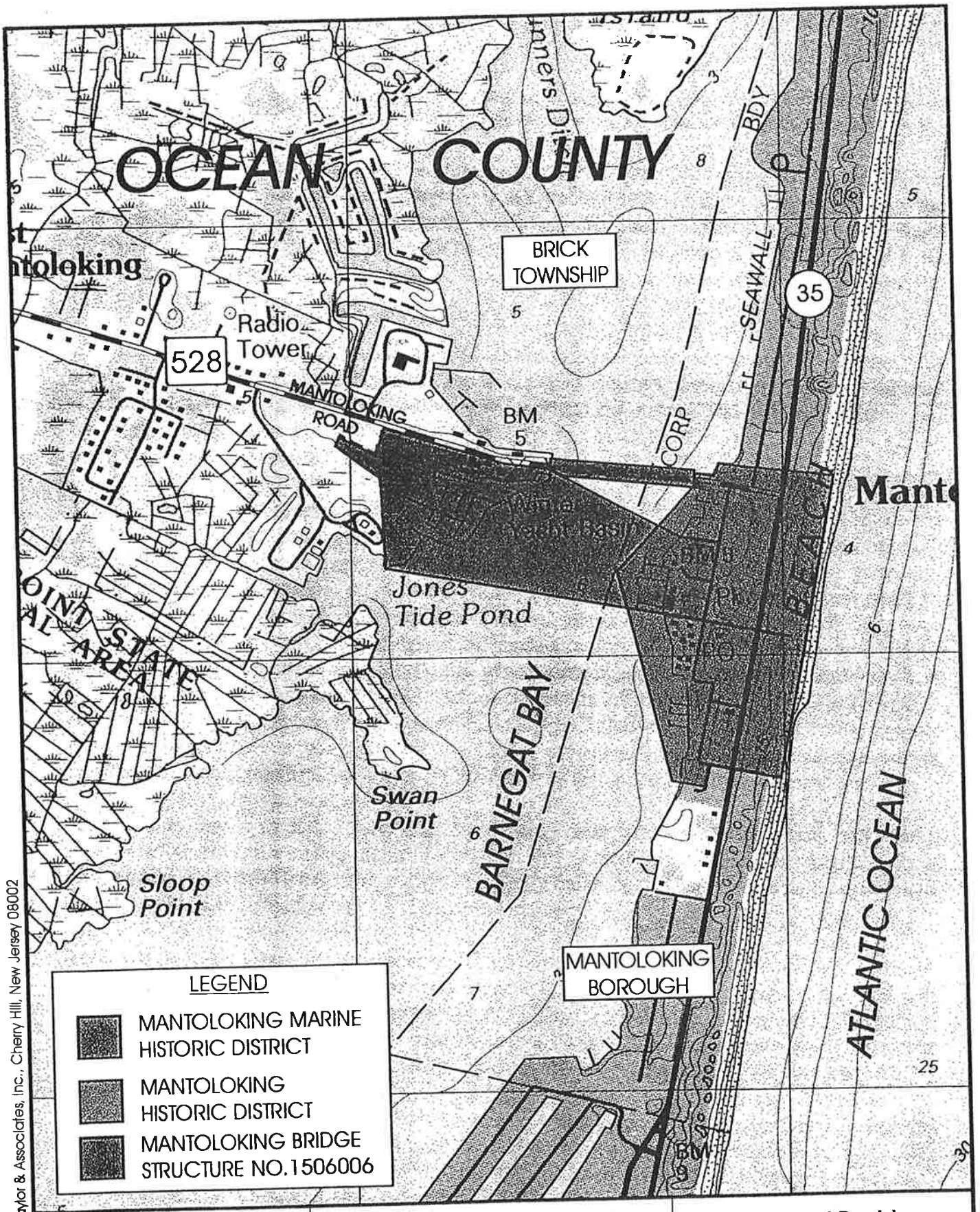
Historic Sites

The proposed project will result in the "use" of two historic sites (Mantoloking Bridge and the Mantoloking Historic District) as property would be permanently acquired and incorporated into the high-level fixed bridge alternative. Since land would be acquired from historic properties, this is considered a direct use and Section 4(f) is applicable.

This project would also result in a "constructive use" on the Mantoloking Marine Historic District, a Section 4(f) property. A "use" of a Section 4(f) property occurs indirectly when the proximity impacts of a transportation project on a Section 4(f) site (without property acquisition) are so great that the characteristics which qualify the resource as a Section 4(f) site are substantially impaired.

As stated previously, the Adverse Effect to this district would be due to the height of the proposed fixed bridge, nearly 70 ft, directly across from the Winter Yacht Basin. Also, the design of the proposed bridge would be incompatible with the existing historic bridge. Since the Winter Yacht Basin is fronted by Mantoloking Road and the western abutment of the existing historic bridge, the high-level fixed bridge would cause an intrusion that is visually detrimental to the Mantoloking Marine Historic District, a Section 4(f) resource. In addition to the visual impacts, the proposed bridge would create shadow effects within the district. Cumulatively, these effects would substantially impair the resource.

The Winter Yacht Basin is one of three complexes within the Mantoloking Marine Historic District that represents "the continued existence of a vibrant and interconnected marine industry." A qualifying characteristic of the Mantoloking Marine Historic District is its moderate scale and uninterrupted vistas toward Barnegat Bay. The proposed design as well as the height of the fixed bridge at this location introduces visual, audible and atmospheric elements that are out of character with the setting of the Mantoloking Marine Historic District.




Base Mapping Source: U.S.G.S. Topographic Quadrangle - Pennington, NJ-PA, 1981.

0 .5km

0 1000ft

National Register Eligible Resources

McCormick, Taylor & Associates, Inc., Cherry Hill, New Jersey 08002

Figure: 3

# RESULTS OF SHPO/NJSM FILE SEARCH FOR THE GOOD LUCK POINT PROJECT AREA

**Cultural Resource GIS Digitizing Form**

**Name:** AT + T Transmitter Building and Antenna Field

**Inv. ID:** 4723 **Attrib. ID:** _____ **HSI ID:** _____

**Date:** 8/27/08 **Staff Name:** JHammond

**Applicable Layers:**

___ HD_PLY
✓ PR_PLY
✓ PR_PT
___ AD_PLY
___ ST_PLY
___ ST_PT

**Issues Revealed:**

___ Address
___ Block / Lot
___ Boundary / Extent
___ Demolished / Destroyed

**Notes:**

TYPE:
- [ ] New District
- [x] Individually Eligible
- [ ] Individual and Contributing
- [ ] Contributing Only

- [x] Mapped
USGS Quad Name Seaside Park
Quad Reference Number 7
Digital Identification Number 4723

# ELIGIBLE PROPERTY WORKSHEET

Name AT&T Transmitter Building & Transmitter Field A.K.A. Ship-to-Shore

Address /Location 83 Bayview Avenue (Ocean Co. Rte. 617)

Block / Lot /

County and Municipality Ocean Co., Berkeley Twp.

District (If applicable)

- [ ] SHPO OPINION
- [ ] DOE
- [x] COE
- [ ] ITC (HPCA-Part 1)

DATE SIGNED 7/30/2007 CHRONO G07-169 LOG 07-1424 AUTHOR B. Craig + C. Brady

REPORT (Accession Number)

SURVEY FORM# (Historic Sites Inventory, Historic Bridge Survey)

---

Enclosure Checklist

- [x] SHPO Signed Document
- [ ] NPS Signed Document
- [x] Report Information (Title Page, Photograph copies, Relevant Sections)
- [x] Property Information (Survey forms)
- [x] Photographs (Historic and Current)
- [x] HABS/HAER documentation
- [x] Maps (Copy of Historic Properties USGS Quad, Historic, Tax)
- [ ] Other

PROJECT FILE NAME

CABINET LOCATION OF FILE

COVENANT / AGREEMENT

STATUS OF THE PROPERTY

Prepared by: B. Craig Date: 8/7/08

# REVIEW COVER SHEET

## PROJECT 12128

| Log#: | ProjectName | ☐ Bridge Bond ☐ ISTEA/TEA-21 | PrimeStaff |
|---|---|---|---|
| 07-1424 | AT&T Ship to Shore shortwave radio transmitter station | | Fimbel, Deb |

**Project Sponsor:** Citizen

**HPO Section:** TS

**Local Government** ○ County ○ Municipal

**Consultant / Citizen / Non-Profit** John M. Bench, Tesla Radio Club and Museum

**Location(s)**

| County | Municipality | Primary Loc. | CLG |
|---|---|---|---|
| OCEAN | Berkeley Township | ☑ | ☐ |

**Parcels:**

| Block | Lot |
|---|---|
| 1207 | 2.01 |
| 1207 | 2.02 |
| 1206 | 1.01 |

**Address** | **Apartment** | **Zip**

**FileLocation** CENTRAL FILE (County-Municipality)

**Old Log #(s)** | **Agency Project Number**

## REVIEW (OBLIGATION) 19445

| Review Log#: | Staff: | Received: | Due: | Complete: ☐ | Chrono |
|---|---|---|---|---|---|
| 07-1424-1 | Fimbel, Deb | 5/30/2007 | 6/29/2007 | | |

| Review Process | Review Step |
|---|---|
| TA | Technical Assistance - Project Specific |

**Received From:** Citizen

**Local Government:** ○ County ○ Municipal

**Consultant / Citizen / Non-Profit** John M. Bench, Tesla Radio Club and Museum

**Description:** Rec'd email regarding Tesla Radio Museum (Block Block 1207 Lot 2.01 (1.671 acres) and shortwave radio transmitter antennas (Block 1207 Lot 2.02 (161.014 acres) and Block 1206 Lot 1.01 (50.66 acres) US F&W/USACE 106 and NJDEP, Land Use Regulation CAFRA (Coastal Zone Management area)

**Submitted:** ☐ Plans ☐ Specs ☐ Photos ☐ Report ☐ Nomination ☐ Map ☐ Other

**Report ID:** 0 **Accession #:**

**Notes**

**OCEAN** **Berkeley Township** **07-1424**

**AT&T Ship to Shore shortwave radio transmitter station**

HPO-G2007-169 Prod
HPO Log# 07-1424

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Natural and Historic Resources, Historic Preservation Office
PO Box 404, Trenton, NJ 08625
TEL: (609) 292-2023 FAX: (609) 984-0578
www.state.nj.us/dep/hpo

JON S. CORZINE
*Governor*

LISA P. JACKSON
*Commissioner*

July 30, 2007

## CERTIFICATION OF ELIGIBILITY

Mr. Yuri Blanarovich
83 Bayville Avenue
Bayville, NJ 08804

Dear Yuri

This letter is in response to your request for a formal certification of eligibility for the AT&T transmitter building and antenna field along Bayview Avenue (a.k.a. Ocean County Route 617) in the town of Bayview, Berkeley Township, Ocean County, for inclusion in the New Jersey and National Registers of Historic Places.

Based on a review of the current preliminary application, together with a site visit made by Mr. Robert Craig of my staff, it is my opinion, as Deputy State Historic Preservation Officer, that the AT&T transmitter building and associated antenna field is eligible for listing in the New Jersey and National Registers of Historic Places under National Register criterion A for its association with the early implementation and expansion of ship-to-shore telephony. Broad based ship-to-shore telephony was a major step forward in communications in that it allowed replacement of the Morse code telegraph system as the primary means of communication with voice based telephone service. This service was in commercial use until the advent of satellite based voice communications late in the 20th century. The AT&T transmitter building and its associated antenna field is also eligible under criterion C, as a representative, substantially intact example of an early shortwave transmitter building with its associated antenna field. The antenna field is especially interesting for the degree to which it remains intact, despite extensive theft of distribution wire linking the antennae to the transmitters. The transmitter building and antenna field were built and placed into service in 1931 and remained in service until 1999. The AT&T transmitter building is located, on Berkeley Township Block 1207, lot 2.01 and the adjacent antenna field is located on Block 1207 lot 2.02 and Block 1206 lot 1.01.

If you have further questions, please contact Mr. Robert Craig of my staff, at (609) 984-0541, or by email at bob.craig@dep.state.nj.us

Sincerely,

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG/BC/CB\G169

Department of the Interior
United States Fish and Wildlife Service
800 Great Creek Road
P. O. Box 72
Oceanville, New Jersey 08231-0072

April 30, 2007

Yuri Baranovich
P. O. Box 282
Pine Brook, NJ 07058

Dear Mr. Baranovich,

This replaces my April 11 letter sent to you at 83 Bayview Avenue, Bayville, NJ 08721, which the United States Postal Service returned to sender. This letter responds to your presentation on March 9 to refuge staff about the Tesla Radio Club and Museum.

You proposed to establish an amateur radio station and museum at the former Ocean Gate AT&T shortwave radio transmitter station in three phases.

| | |
|---|---|
| Phase One | Restore the AT&T transmitter building, establish the Club station and repair antennas. |
| Phase Two | Set up a multimedia theater and meeting room in the former AT&T transmitter building. |
| Phase Three | Start furnishing the museum and setup of exhibits and collection of historical materials in the former AT&T transmitter building. |

The former AT&T transmitter building and its immediate surroundings is on property owned by Berkeley Township. This property is Block 1207, Lot 2.01 and it encompasses 1.671 acres.

The Service has no issues with any of the Tesla Radio Club and Museum proposal related to Block 1207, Lot 2.01. However, the Service's Right-of-Way through the property to Block 1207, Lot 2.02 may not be compromised.

All the former AT&T shortwave radio transmitter station antennas are on properties that are now part of the Edwin B. Forsythe National Wildlife Refuge (Service tracts 122,a). The properties are, Block 1207, Lot 2.02 (161.014 acres) and Block 1206, Lot 1.01 (50.66 acres).

The Service has issues with repairing, maintaining and using the former AT&T shortwave radio station transmitter antennas. The Service has a Policy on Appropriate Refuge Uses (603 FW 1). The policy applies to all proposed and existing uses in the

National Wildlife Refuge System over which the Service has jurisdiction. I have completed a Finding of Appropriateness on using the existing antennas for radio transmission, and have determined that the use is not appropriate. Uses that are not appropriate may not be permitted within the National Wildlife Refuge System. A copy of my finding is enclosed.

The Service also has issues related to the Service interim guidelines for recommendations on communications tower siting, construction, operation, and decommissioning. http://www.fws.gov/migratorybirds/issues/towers/comtow.html One of the recommendations is, "Towers should not be sited in or near wetlands, other known bird concentration areas (*e.g.*, state or Federal refuges, staging areas, rookeries), in known migratory or daily movement flyways, or in habitat of threatened or endangered species."

There are also issues related to the New Jersey Department of Environmental Protection (NJDEP) Deed of Conservation Restriction on the properties containing the antennas, because the properties were purchased in part with NJDEP Green Acre Program funding. A copy of the document is enclosed.

In summary the Service has no issue with the Tesla Radio Club establishing a museum at the former AT&T transmitting station. However, the Service and the NJDEP have issues with repairing, maintaining and using the antennas that are now located on refuge properties.

If you have any questions, please call me at (609) 652-1665.

Sincerely,

Stephen P. Atzert

Stephen P. Atzert
Refuge Manager

Enclosures

cc: Janet Kennedy, USFWS
John Flynn, NJDEP, Green Acres Program
Brian Braudis, USFWS

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Edwin B. Forsythe National Wildlife Refuge

Use: Repair, maintenance and use of antennas at former Ocean Gate AT&T transmitting station for HAM radio transmission

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| Decision Criteria: | YES | NO |
|---|---|---|
| (a) Do we have jurisdiction over the use? | X | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)? | | X |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | | X |
| (d) Is the use consistent with public safety? (I cannot address without financial information from the group proposing the use.) | | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | | X |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? (This is the first time the use has been proposed.) | X | |
| (g) Is the use manageable within available budget and staff? | | X |
| (h) Will this be manageable in the future within existing resources? | | X |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | X |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | | X |

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.
Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate** X **Appropriate** ____

Refuge Manager: Stephen P. Ritzert Date: 4/11/2007

If a new use is found **Not Appropriate**, the refuge supervisor does not need to sign concurrence.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If a use is found **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

**A compatibility determination is required before the use may be allowed.**

**Attachment**

b) The proposed use does not comply with the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd-668ee), as amended.
http://www.fws.gov/laws/laws_digest/NWRSACT.HTML
All refuge uses must be compatible with the Mission of the National Wildlife Refuge System and the purposes for which a refuge was established.
The 1997 amend to the National Wildlife Refuge System Administration Act (Public Law 105-106) defined and established a hierarchy of activities on refuges:

1. Wildlife First
2. Priority Public Uses
3. Other Uses

Wildlife first means that within the National Wildlife Refuge System, "...the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitat...for the benefit of present and future generations of Americans." is the number one priority.

Priority Public Uses are compatible wildlife-dependent recreational uses. These uses are: hunting, fishing, wildlife observation, photography, environmental education and interpretation. These uses receive priority consideration in refuge planning and management.

c) The proposed use is not consistent with the Service Appropriate Refuge Uses policy.
http://www.fws.gov/policy/603fw1.html

d) Many of the antennas are in poor condition. A substantial amount of funding will be required to repair and maintain them.

e) The proposed use is not consistent with the refuge Comprehensive Conservation Plan (CCP) approved by the Regional Director in June 2004.
http://www.library.fws.gov/CCPs/ebf_final04.pdf
The refuge intends to remove the antennas when demolition funding becomes available.

g) The refuge recently lost two permanent fulltime positions and closed the Barnegat Division office in Barnegat Township, Ocean County.

h) The National Wildlife Refuge System budget is projected to remain relatively unchanged over the nest several fiscal years.

The following article is from the March 14, 1930 edition of the *Toms River Courier* newspaper.

Thanks to Jerry Beer of the Berkeley County Historical Society for providing the article, and to Sam Etler for transcribing it.

---

# Toms River Center of Ship to Shore Telephone System

## Work at the Barnegat Pier Ocean Gate being pushed to complete sending station

Construction work now being done by the American Telephone and Telegraph Company will make Toms River an important center of a radio telephone system that is expected eventually to link Bell System telephones with the principal liners plying the Atlantic Ocean. One unit, the receiving station at Forked River, is already practically complete and has handled messages between the S. S. Leviathan of the United States Lines, and shore telephones. The second unit, the transmitting station at Ocean Gate, is under construction and will probably be in operation by the early part of next year.

Ship-to-shore telephone service was formally inaugurated last December, when passengers on the Leviathan conversed with people in a score of cities as far west as California and as far south as Washington. Service is available to the entire Bell System. For the present it is confined to the Leviathan, but it may ultimately be extended to practically all large passenger ships. The calls are routed through the long distance lines in New York, the ship transmitting to Forked River, where radio and wire-lines join. Until the completion of the Ocean Gate station, the outgoing circuit will [be?] by way of the Bell Telephone Laboratories experimental station at Deal Beach, transmitting to the liner.

The transmitting station at Ocean Gate is located on a 175 acre tract of salt marshes, across the river from Toms Rover, unobstructed to seaward and therefore suitable for radio transmission in that direction.

Due to the nature of the ground the building construction work called for unusual measures. The average elevation is about 18 inches above high water mark. While the surface is soft to a depth of about three feet, the underlying stratum of "hard-pan" was unexpectedly hard, and required the use of dynamite.

The building is to be modernistic in exterior design, accentuating the vertical lines and is

so arranged that it can be extended at the sides and towards the front to provide for future growth. It will house the transmitting sets and associated equipment, the apparatus employed to link radio and wire circuits, and the auxiliary machinery necessary to operate the station.

The structure will be 79 feet across and 48 feet deep, two stories high and with a small basement under one end for the heating plant. On the first floor will be the generators that supply current for the transmitters and the transformers that raise the outside power supply to various required voltages, and other machinery. The transformers, which are of unusual size and power, will be set in vaults of rugged construction, with specially heavy foundations. A water-cooling system will be provided for large vacuum tubes used in the final stages of the transmitters. Large air blowers will cool the circulating water.

On this floor also will be the "line terminal room" where the wire lines from the long distance office terminate. This room will be completely sheathed in copper, to prevent the radio waves from the antennas outdoors from coming back and impairing operation of the apparatus in the room. Cork insulation under the foundations of the rotary machinery in the power room will avoid the effects of vibration on delicate radio apparatus.

On the second floor will be the transmitting sets. In the rear is to be a rectifier, to convert the alternating current from the outside power source into the direct current required in the vacuum tubes.

The structural part of the building will be of reinforced concrete. The exterior walls will consist of 12-inch brick with two-inch "furring" on the inside. All partitions inclosing transformer vaults will be of concrete to insure adequate protection.

The foundations for the building will consist of spread reinforced concrete carried to an average depth of five feet below the natural grade. The basement will go to a depth of ten and a half feet.

With the natural grade only 18 inches above high water, the excavation work presented an unusual problem but by using the "well-point" process of drainage, the work has been accomplished with out difficulty. The excavated area was kept perfectly dry.

Galvanized pipes equipped with heavy points, above which the pipes were perforated, were driven 20 feet into the ground all four sides of the area, seven feet back from the building line at three-foot intervals. The pipes were tightly connected to a six inch common drain pipe at the surface, which in turn was connected to a centrifugal pump. By constant pumping at about 450 gallons per minute the entire area to be excavated was kept dry.

In order to guard against seepage of water into the basement all the foundation walls, as well as the floor slab, are designed to be reinforced and thoroughly water-proofed. As an

additional precaution a sump-pit with automatic pump will be located in the boiler room.

Initially one transmitter will be installed at Ocean Gate. This will be a set similar to those now in use for transatlantic telephone service at the Lawrenceville station, having a power of 15 kilowatts. It will be maintained at the desired frequency by means of a quartz crystal control circuit, the crystals for this circuit being located in heat-insulated ovens, the temperature of which is accurately and automatically regulated.

In the final or output stage of the transmitter there will be six 10-kilowatt wave-cooled vacuum tubes operating at a plate voltage of about 10,000 volts. This produce [*sic*]an enormous amplification for the current transmitted to the antenna.

The two antennas will be of the "curtain" type and consist of networks of wires in the form of coarse-mesh curtains suspended from 70-foot poles, the line poles broadside to the direction of transmission to give a highly "directional" transmission. The line of poles for the longer wave-length antenna will be 500 feet long and for the shorter 255 feet.

Due to the arrangement and interconnection of these wires the signals sent out have a marked directional effect. The range over which the antennas transmit will cover the principal steamship lanes to Europe. The efficiency of each antenna will be further increased by suspending a similar curtain behind the active one. This will serve to reflect radio energy that ordinarily would go toward the west with full power.

The receiving set at Forked River is a specially designed set using screen grid tubes and equipped for automatic volume control. It is arranged to operate over a wide range of frequencies and is provided with switching devices to permit connection to any one of the several antennas. There are at present two antennas [*sic*]"arrays." Each of these arrays consists of a series of brass pipes arranged in a "wall of Troy" vertical formation and mounted on a wooden frame-work. These antennas also have marked directional characteristics, their respectivity being confined to approximately the same arc as that covered by the Ocean Gate transmitter. By means of concentric copper pipes, laid a few feet above the ground in an undulatory form, antennas and receiving set are connected with a minimum of outside interference.

The Forked River station is located on a 292-acre tract of marsh land. A small frame building houses the receiving set, the line terminal equipment and the power apparatus.

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## Return to...


- Ocean Gate page
- Long Lines facilities index
- Long Lines main page

Created on September 9, 2004 at 21:20 by Albert LaFrance

LAPRINCE@ATT.NET

# AT&T Long Lines

-BUENOS AIRES-
- LIMA, SANTIAGO-

# Ocean Gate, NJ

- 3 SHIP ANTENNA
- BERNE, ROME
- LONDON, BERLIN
- HONOLULU
- STOCKHOLM +

## History

+ SHIP ANTENNA
+ SHIP ANTENNA
+ 2 SHIP ANNIA
+ CAPETOWN

Ocean Gate was a high-frequency (shortwave) radio transmitting station providing telephone communications to ships at sea (high-seas service) and to overseas locations, under callsign WOO. In addition, the June 1958 List of Coast Stations issued by the International Telecommunications Union identifies Ocean Gate Radio (WOO) as "open to correspondence with aircraft", one of 19 US coast stations so authorized.

A local newspaper article from 1930 describes the station's purpose, design and construction.

A drawing dated 1955, with revisions through 1982, shows the site containing 29 rhombic antennas, plus several antennas of other types. A rhombic antenna, which is highly directional, consists of a diamond-shaped loop of wire supported in a horizontal plane by insulators. Some of the rhombics at Ocean Gate were over 700 feet long. Ian Cummings' Rhombic Antenna Home Page offers information about the history, design and use these antennas.

The graphic portion of the drawing shows destinations of Buenos Aires, San Juan, Panama, Bermuda and Rio de Janeiro. The drawing's change notes identify former destinations of Paris, Frankfort, Santiago and London.

A 1970 Long Lines route map shows Ocean Gate having wire-pair carrier cable links going north to the Asbury Park microwave station and south to Ocean Gate's companion site, the shortwave receiving station at Manahawkin.

In 1999, the Federal Communications Commission authorized AT&T to discontinue high-seas service from Ocean Gate and its sister stations at Dixon, CA and Pennsuco, FL. The land containing the antenna field is now a wildlife refuge, managed by the U.S. Fish and Wildlife Service. The building is owned by the local government, Berkeley Township.

## Exterior - south side

*Photographed March 26, 2004*
Select an image to view a larger version

**Background & Trends**
- Internet Background
- Silicon to Internet Valley
- Silicon Valley History
- Bay Area Guide

**Industry Leaders**
- Top 100 Banks Online
- Top 100 IT Companies
- Top 100 IT Magazines

**Web Influence**
- Case Study: IBM
- Criteria of Influence
- IFactor

**NetValley**
- Community
- Feedback

# ... a chronology of **Telegraph, Telephone** and **Radiotelephone**, the three services reaching across the Atlantic **before** the 1960 Echo satellite.

By Alan Leon Varney, AT&T Network Systems

## TELEGRAPH

**1837** - Charles Wheatstone patents "electric telegraph"
**1844** - Samuel Morse demonstrates "Morse code" -- but this is the old version, where a number is assigned to each possible word. Alfred Vail helps him later with a "variable-length letter code".
**1845** - General Oceanic telegraph Co. registered in NYC to link Europe and North America (was this just another stock swindle?)
**1847** - Gutta-percha (an inelastic latex) is discovered. It serves as a reliable insulator in water (reliable, but not great capacitance).
**1849** - England to France telegraph cable goes into service -- and fails after 8 days.
**1850** - Morse patents "clicking" telegraph.
**1851** - England-France commercial telegraph service begins. This one uses gutta-percha, and survives.
**1858** - August 18 - First transatlantic telegraph messages via wire. Cyrus Field (a 35-year-old retired merchant) & John Pender formed a British company, "The Atlantic Telegraph Co." The cable deteriorated quickly, and failed after 3 weeks.
**1861** - First USA transcontinental telegraph cable begins service.
**1868** - First commercially successful transatlantic telegraph cable completed between UK and Canada, with land extension to USA.
(Lack of repeaters & cable capacitance in insulation restricted the cable to 2 words/minute -- signaling speed was inversely proportional to square of length, per Lord Kelvin's prediction. A "siphon receiving" mechanism raised that rate to 20 WPM in 1870.
Even 2 WPM beat the next fastest method; 10 days by steamship.)
Also, Werner Siemens patents a keyboard perforator for Morse code.
**1874** - Baudot invents a practical Time Division Multiplexing scheme or telegraph. Uses 5-bit codes & 6 time slots -- 90

bps max. rate. Both Western Union and Murray would use this as the basis of multiplex telegraph systems.
**1875** - Typewriter invented.
**1880** - Oliver Heaviside's analysis shows that a uniform addition of inductance into a cable would produce distortionless transmission.
(It would be 40 more years before Bell Labs devised a practical method
of producing uniform inductance -- "permalloy" magnetic ribbon spiral
winding around a conductor. This would permit 400 WPM on the
New York-Azores Western Union cable in 1925.)
**1901** - Donald Murray links typewriter to high-speed multiplex system, later used by Western Union.[ The beginnings of **Teletype** ? ]

---

TELEPHONE

**1876** - Bell patents telephone.
**1877** - Bell attempts to use telephone over the Atlantic telegraph cable. The attempt fails.
**1883** - Test calls placed over five miles of under-water cable.
**1884** - San Francisco-Oakland gutta-percha cable begins telephone service.
**1910** - Chesapeake Bay cable is first to use loading (inductor) coils underwater. Contained 17 pairs of 13-guage conductors.
**1915** - USA transcontinental telephone service begins (NY-San Francisco).
(Used 2500 tons of 8 guage copper on 180,000 poles, with loading coils every 8 miles. Three vacuum tube repeaters were initially used -- by 1918, that was increased to 8 repeaters. In 1920, all loading was removed and 12 improved repeaters installed. This resulted in doubling of the bandwidth (to 3 kHz), halving of the loss and a 3.5-fold increase in propagation speed. The reduction in echo was very obvious.) (A 3-minute call was $20.70)
**1921** - Key West-Havana cable begins service, using continuous loading via "permalloy" wrap and a blend of rubber and gutta-percha.
**1928** - Design of a continuously-loaded Newfoundland-Ireland cable begins,
as a joint AT&T-British Post Office project. The planned loss was 165 dB over 1800 miles. It used 4 layers of Perminvar tape for loading. Manufacturing in Germany began in 1930. The Depression caused all work to be abandoned. By the late 1930s, submerged repeaters and multiplexing promised more circuits at the same cost.
**1947** - Polyethylene replaces rubber & gutta-percha as preferred insulator.
**1949** - "SB" submarine cable developed by AT&T, using polyethylene + 5% butyl rubber dielectric. The cable was made up of a core of several dozen steel wires, covered by a

copper tube, then about .2 inches of dielectric and another copper tube, covered by a plastic jacket and armor.
**1950** - Repeatered SB submarine cable used on Key West-Havana route.
**1952** - Joint AT&T-BPO meetings at Dollis Hill lab to begin transatlantic cable project.
**1953** - Canada (Canadian Overseas Telecommunications Corp.) joins in project,
along with Eastern Telephone & Telegraph Co. (AT&T's subsidiary in Canada).
**1955** - June 28, HMTS "Monarch" leaves Clarenville, Newfoundland laying cable. After weathering Hurricane Ione, it reaches the Firth of Lorne in Oban, Scotland on September 26.
**1956** - June 4, "Monarch" leaves Oban to lay the other cable (these are
uni-directional repeaters). Final splice at Clarenville, August 14. All links and channels were tested within 6 weeks. A total of 102 repeaters were needed on the main cables.

Connections at the North American end:
USA (29 circuits of the 35 originally available) White Plains, NY (via L1 coaxial cable) to Albany, NY or West Haven, Connecticut Albany/West Haven (via K-carrier) to Portland, Maine Portland (via TD-2 microwave) to Sydney Mines, Nova Scotia Sydney Mines (via BPO underwater cable) to Clarenville.
Canada (6 circuits) Montreal (via carrier on cable and open wire) to Saint John, New Brunswick
St. John (via TD-2 microwave) to Sydney Mines (as above).

Sept. 25, **1956** at 11 am EST, Chairman Craig of AT&T calls Dr. Charles Hill,
Her Majesty's Postmaster General. This initiates the first long-term transatlantic telephone service, using the TAT-1 cable. [In 1966, after ten years of service, the 1608 tubes in the repeaters had not suffered a single failure. In fact, more than 100 million tube hours over all AT&T undersea repeaters were without failure.]
**1963** - First cable from New Jersey to England.
**1965** - First cable from New Jersey to France.

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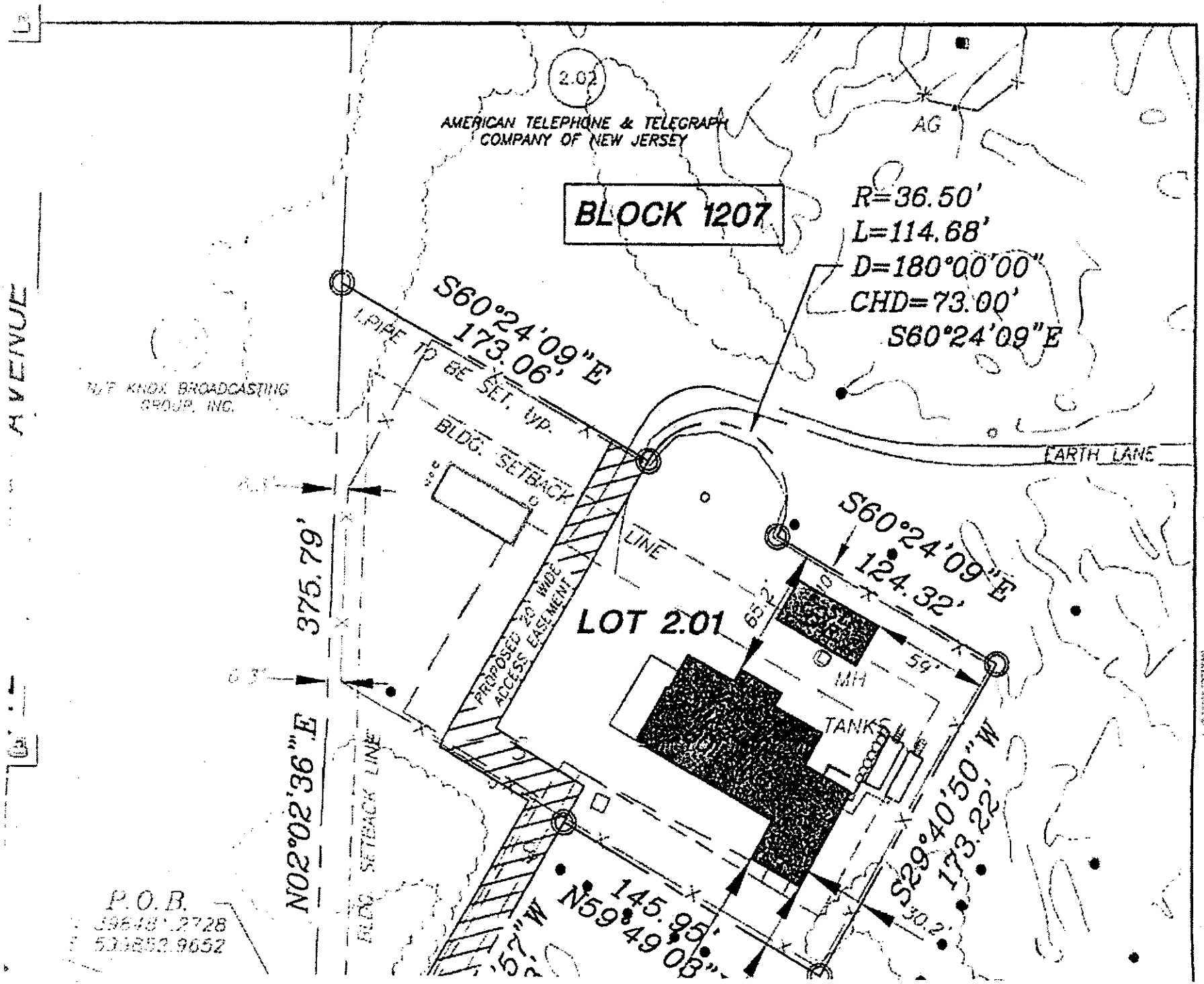
**RADIOTELEPHONE** (cable's competition)

**1920s**- Catalina Island telephone service to mainland via radio system.
Replaced by cable in 1923 so frequencies could be used for broadcast.
For 6 weeks, a "privacy" system was tested, using inverted sidebands
and a "wobbling" carrier. Later systems used 4 or 5 "bands",
re-ordered before transmission. Some bands were inverted.
The band arrangement was changed a few times per minute, in synch.

**1921** - British "Marconi Co." offers 3 MHz calls between England and Norway.
**1923** - Amateur radio proves that high frequency radio can reach long distances (sometimes). Transatlantic transmission demonstrated.
**1927** - first commercial transatlantic radio telephone service begins.
This uses low frequency radio from RCA's Rocky Point, Long Island & Rugby, England transmitters. Receivers were in Houlton, Maine and Cupar, Scotland. The 2800 Hz bandwidth was modulated to 33 kHz carrier & then 92 kHz, with the lower sideband then at about 60 kHz. Three 250-watt tubes in parallel amplified this, and fed a 2-stage
water-cooled final stage of up to 35 tubes, yielding 150-200 kW. Low frequencies were considered more "reliable". HF radio took 30 dB losses over day-long periods between Deal, New Jersey and New Southgate, England during magnetic disturbances. On those
same days, LF radio actually gained a couple of dB. (A 3-minute call was $75.)
**1929** - HF radio begins commercial transatlantic service (2 circuits!). Transmitters in Lawrenceville, New Jersey and Rugby, England; receivers in Netcong, New Jersey and Baldock, Hertfordshire. (Calls used which ever radio system was working "best" at the time. By 1931, HF was the choice 80% of the time.)
**1930** - HF radio service begins to Buenos Aires.
**1931** - Dixon/Point Reyes, California radio begins transpacific service.
**1932** - Florida sites begin Caribbean & Central American service.
**1937** - USA can call 68 countries via HF radio -- 93% of the world's telephones are interconnected via wires & radio waves.

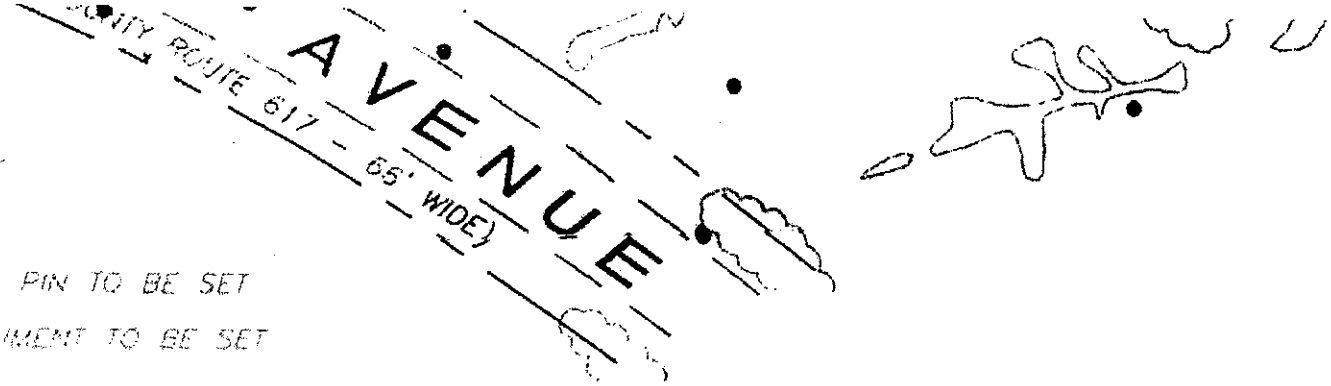
# Ocean Gate, NJ



,060.03
18.87'
2°38'29"
D=87.87'
N64°28'00"W

PROPOSED IRON PIN TO BE SET

CONCRETE MONUMENT TO BE SET




**NOTES**

1. THIS SURVEY IS REFERENCED TO A TITLE REPORT PREPARED BY CHICAGO TITLE INSURANCE COMPANY, COMMITMENT No. 3621-01233, EFFECTIVE DATE AUGUST 30, 2001.
2. OVERHEAD WIRES ARE TOO NUMEROUS TO ILLUSTRATE HEREON.
3. SITE IS LOCATED IN FLOOD ZONE 'AE' AS PER FEMA FLOOD INSURANCE RATE MAP #340369 0015 D DATED 7-15-92.
4. COORDINATES SHOWN HEREON ARE BASED ON THE NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD 1983 DATUM.
5. DEED REFERENCE: DB 842, PG 201 & DB 844, PG 323.
6. SITE IS SUBJECT TO A RIPARIAN GRANT IN DB 844, PG 316.
7. LOT CONTAINS 72,795 155 sq.ft. (1.671 acres), MORE OR LESS.

TOWNSHIP

the best of my knowledge and belief, this map or survey made on Nov. 11, 2002, by me in accordance with the rules and promulgated by the "STATE BOARD OF PROFESSIONAL LAND SURVEYORS",

this map correctly represents the conditions at the date of the field survey, except such encroachments, if any, below the surface and not visible.

been issued to the above named parties except

Telephone & Telegraph Co. of NJ;
The Insurance Company;
for Public Land.

not contain a raised impression seal not an authorized original document and

MICHAEL R. VARGO

# MAP OF SURVEY

## TAX LOT 2.01, BLOCK 1207

BERKELEY TOWNSHIP
OCEAN COUNTY , NEW JERSEY

VARGO ASSOCIATES LAND SURVEYING & PLANNING
2771 DELSEA DRIVE - P.O. BOX 647
FRANKLINVILLE, N.J. 08322 (856) 694-1716
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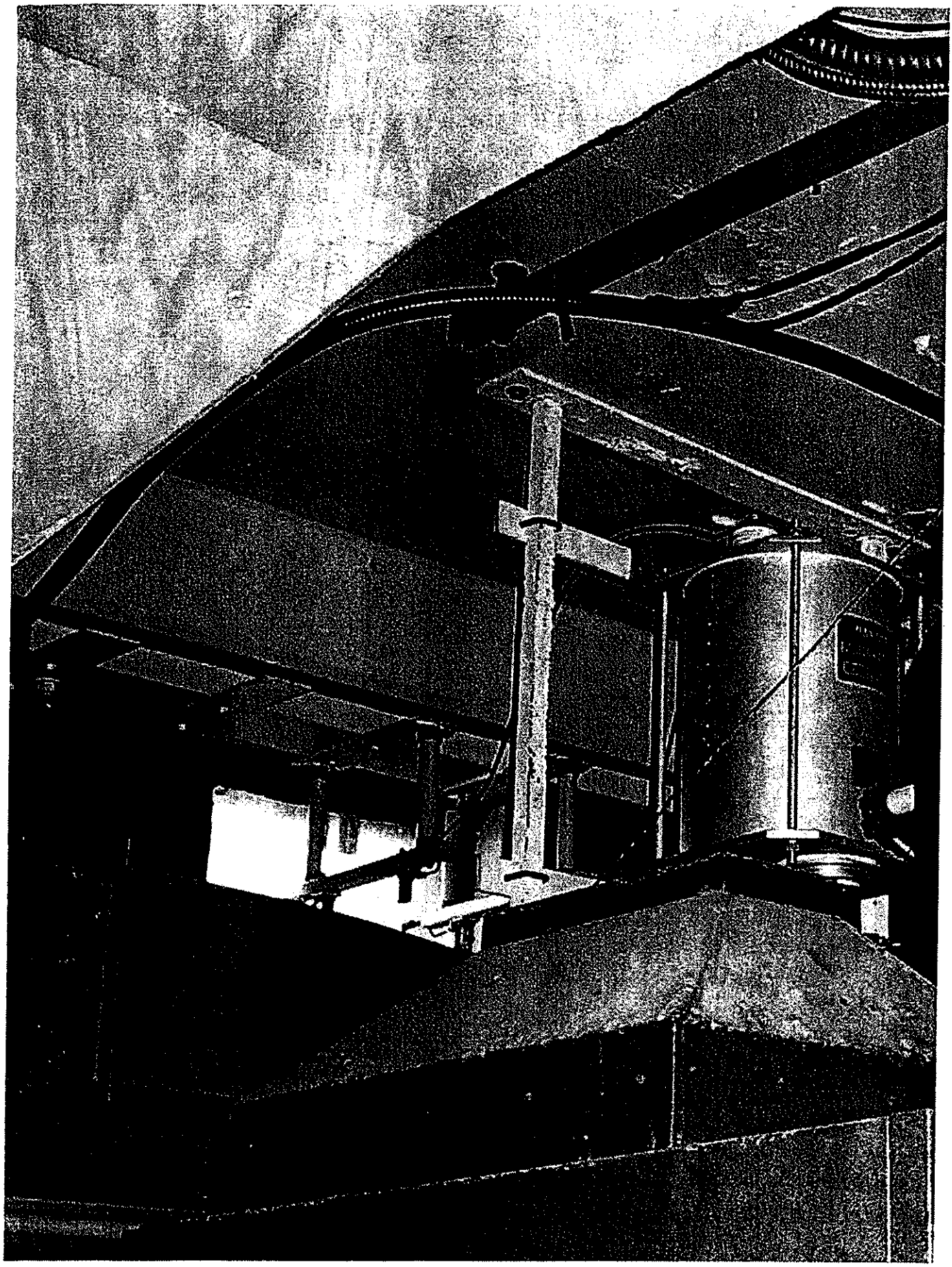
| DATE | SCALE | DRAWN BY | F.BK./PG. | PROJ. NO |
|---|---|---|---|---|
| 10/11/02 | 1"=50' | MRV | 0/0 | 021875 |



HPO Project No. 16-2069-1
HPO-G2016-237


# State of New Jersey

MAIL CODE 501-04B
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NATURAL & HISTORIC RESOURCES
HISTORIC PRESERVATION OFFICE
P.O. Box 420
Trenton, NJ 08625-0420
TEL. (609) 984-0176 FAX (609) 984-0578

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

BOB MARTIN
*Commissioner*


July 27, 2016

Virginia Rettig
Refuge Manager
U.S. Fish and Wildlife Service
Edwin B. Forsythe National Wildlife Refuge
800 Great Creek Road
P.O. Box 72
Oceanville, New Jersey 08231

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR 800: Protection of Historic Properties, as published in the Federal Register on December 12, 2000 (65 FR 777698-77739) and as amended on July 6, 2004 (69 FR 40544-40555), I am providing Continuing Consultation Comments for the following proposed project:

**Ocean County, Multiple Municipalities**
**Edwin B. Forsythe National Wildlife Refuge**
**Tidal Marsh Restoration**
**U.S. Fish and Wildlife Service**

---

Thank you for providing the New Jersey Historic Preservation Office (HPO) with the opportunity to review and comment on the potential for the above-referenced undertaking to affect historic and archaeological resources. The proposed project involves the restoration and improvement of 500 acres of salt marsh in six discontinuous sections of the Edwin Forsythe National Wildlife Refuge. Brick A and B sections involve sediment enrichment, the Good Luck Point section involves the replacement of undersized culverts and sediment enrichment, and the Forked River, Stouts Creek, and Barnegat sections involve breaching impoundment berms. The Barnegat section will also have two water control structures removed.

**800.4 Identification of Historic Properties**

HPO staff has identified the National Register of Historic Places-eligible AT&T Transmitter Building and Antenna Field (SHPO Opinion 11/13/2015) within the Good Luck Point section of the proposed project. Based on information at the HPO, there is one identified Pinelands archaeological site within the Forked River section, three Pinelands sites within the Stouts Creek project area, and three Pinelands sites within the Barnegat Section. There are no identified archaeological sites within Brick A, Brick B, or Good Luck Point, but these areas encompass a large amount of acreage that possess similar environmental attributes as the three locations with identified Pinelands sites. Therefore, the Brick A, Brick B, and Good Luck Point sections have the potential to contain previously unidentified archaeological sites.

**800.5 Assessment of Adverse Effects**

Communication between HPO staff member Kristin Swanton and Amy Drohan, (US F&WS), determined that low ground pressure vehicles will be used to minimize any disturbance of the marsh surface. Heavy equipment access will be stabilized with geotech fabric and stone, thus no rutting will occur. Existing berms can be used as staging areas for the impoundment breaches at Forked River, Stouts Creek, and Barnegat sections, although staging areas have yet to be determined for Brick A, Brick B, and Good Luck Point. Information provided in the submission indicates that the direct archaeology APE will be outside of the identified archaeological sites. Based on this information, the HPO recommends a finding of *No Historic Properties Adversely Effected* provided that the project is completed as proposed. Pursuant to 36 CFR § 800.4 (d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation, pursuant to 36 CFR § 800.13.

**Additional Comments**

Thank you for providing this opportunity to review and comment on this proposed project. If additional consultation with the HPO is needed for this undertaking, please reference the HPO project number 16-2069 in any future calls, emails, submissions or written correspondence to help expedite your review and response. If you have any questions, please feel free to contact Vincent Maresca at 609-633-2395 with questions regarding archaeology or Michele Craren at 609-292-0032 with questions regarding historic architecture and historic landscapes.

Sincerely,

Katherine J. Marcopul

Katherine J. Marcopul
Deputy State Historic
Preservation Officer

KJM/VM/ks

# APPENDIX G

# PHASE 1A CULTURAL RESOURCES ASSESSMENT REPORT

# PHASE IA CULTURAL RESOURCES ASSESSMENT of the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37c) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey

**December 21, 2015**
Project No. 3617157355.81.01
CONTRACT NO. P11PC00121
TASK ORDER NO. F15PD00834
HPO Project Number 15-3524

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Submitted to:

U.S. Fish and Wildlife Service
Edwin B. Forsythe National Wildlife Refuge
800 Great Creek Road
Galloway, NJ 08205

# Phase IA Cultural Resources Assessment Of the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37c) (Restoring Coastal Marshes in New Jersey National Wildlife Refuges) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey

Project No. 3617157355.81.01
HPO Project Number 15-3524

By

Raymond D. Pasquariello, MA, RPA
David E. Breetzke, MA, RPA

Amec Foster Wheeler Environment & Infrastructure, Inc.
One Richmond Square, Suite 121F
Providence, Rhode Island 02906-5139

Signature

Raymond D. Pasquariello, RPA
Project Principal Investigator
21 December 2015

## ABSTRACT

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) prepared a Phase IA Cultural Resources Assessment for the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37c) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey (Project), in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36CFR800).

The Project involves the removal of abandoned poles and associated support structures (guy-wires, above ground pieces of foundation, and other debris) within the U.S. Fish & Wildlife Service Edwin B. Forsythe National Wildlife Refuge (the refuge). This Project will be conducted as a component of the Service's Marsh Enhancement and Telephone Pole Array Removal Project (Contract # P11PC00121) for two former American Telephone & Telegraph (AT&T) facilities. The first Project area is located in Stafford Township, also known as the Manahawkin Project area. The second Project area is located within Berkeley Township, also known as the Ocean Gate/Good Luck Point Project area.

This assessment report addresses the known historic properties at the respective project areas; the AT&T shortwave receiving station and antenna field at Manahawkin, and the AT&T shortwave transmitting station and antenna field at Ocean Gate/Good Luck Point. This report also considers the archaeological sensitivity of the Areas of Potential Effects (APEs) of both project areas.

In 2007, the New Jersey State Historic Preservation Office (SHPO) made a Certification of Eligibility stating that the transmitter building and antenna field at Ocean Gate/Good Luck Point is a historic property that is eligible for listing on the National Register of Historic Places (NRHP). The Manahawkin Project area was the companion facility to Ocean Gate/Good Luck Point. **The Manahawkin Project area's National Register eligibility status has not yet undergone review by the SHPO, but the finding/management recommendation is that the Manahawkin Project Area is also eligible for listing on the National Register.** Both properties are eligible under National Register Criterion A for their association with the early implementation and expansion of ship-to-shore telephony and under National Register Criterion C as representative, substantially intact examples of early shortwave facilities with their associated antenna fields.

No other known historic properties are within the vicinity of the Ocean Gate/Good Luck Point Project area; the closest known archaeological sites are recorded northwest of the project area north of Toms River. But, environmental and archaeological data indicates non-wetland land is located at the southwestern portion of the Project area and this area may be conducive for archaeological sites. **If the project design includes new ground alteration in areas of medium to high archaeological sensitivity, then an archaeological Phase IB testing survey would be recommended.**

At the Manahawkin Project area, the southwestern portion of the Project area is partially located within archaeological site grid EK229. Therefore, archaeological site(s) have been identified within this larger area, although most likely further west of the Manahawkin Project area. There are no recorded historic structures or historic districts within the Project area, but its relative proximity to known archaeological sites warrants further review of the Project area as it relates to proposed project impacts. **If the project design includes new ground alteration in areas of medium to high archaeological sensitivity, then an archaeological Phase IB testing survey would be recommended.**

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# 1.0 INTRODUCTION

## 1.1 Project Overview

Amec Foster Wheeler conducted a Phase IA Cultural Resources Assessment within the refuge for the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37c) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey (Project), in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36CFR800) and the New Jersey State Historic Preservation Office (NJ SHPO).

The Project involves the removal of the abandoned poles and associated material found at the former AT&T Manahawkin and Ocean Gate/Good Luck Point Project areas, both units of the refuge. The poles were erected between 1929 and 1938 for the purpose of providing telephone communications to ships at sea and to overseas locations. It should be noted that from the 1930s until 1999, the AT&T Manahawkin Project area provided a primary interface between shortwave reception and America's telephone network as well as ship-to-shore transmissions. Because of this, there are also many telephone poles located at the Manahawkin Project area. However, most of the poles at Ocean Gate/Good Luck Point Project area were not "telephone poles" but were "antenna poles". Regardless, many of the poles are in a state of disrepair and several have fallen down into the marsh as a result of weathering decades of tidal surges and storms. A review of historical aerial photographs indicates that the Project areas historically contained salt marsh typical of the surrounding estuarine environment.

Approximately 113 poles have been identified for removal at the Manahawkin Project area and approximately 340 poles have been identified for removal at the Ocean Gate/Good Luck Point Project area. The poles will be cut as close to the ground as possible, transported to central staging areas at each location and managed for disposal purposes. Cables and other metal debris will be collected and managed for recycling purposes. Additionally, there are a limited number of metal antennae at each of the locations. These will be dismantled and removed, with the resulting metal debris managed for recycling purposes.

In 2007, the NJ SHPO made a Certification of Eligibility (COE) stating that the transmitter building and antenna field at Ocean Gate/Good Luck Point is a historic property that is eligible for listing on the NRHP. The Manahawkin transmitter building and antenna field was the companion facility to Ocean Gate/Good Luck Point, but the Manahawkin Site's National Register eligibility status has not yet undergone review by the SHPO, but the finding/management recommendation by the U.S. Fish and Wildlife Service is that the Manahawkin site is eligible for listing on the National Register.

The purpose of this Phase IA assessment was to (1) assess the overall integrity of the Manahawkin Project area when compared to the Ocean Gate/Good Luck Point Project area so that its National Register eligibility status could be evaluated and (2) identify previously recorded cultural resources that could be impacted by the proposed pole removals, review prior cultural resource surveys, and to provide a general assessment of the Project area's potential to contain unrecorded prehistoric and historic archaeological sites.

## 1.2 Area of Potential Effects

The Area of Potential Effects (APE) is located within two Project areas: Manahawkin and Ocean Gate/Good Luck Point. The first Project area is located in Stafford Township (also known as the

Manahawkin Project area) and is identified by Stafford Township as a portion of Block 296, Lot 63 and all of Lot 108, located at the end of Beach Avenue (**Figure 1**). The Manahawkin Project area is approximately 390 acres in size and generally situated between Marshelder Pond to the east, Standing Pond and Log Creek Pond to the south, additional marshland to the north, and Cedar Creek to the west. The Project area is located in the Coastal Plain physiographic section of the state, within the Barnegat Bay Watershed Management Area (**Figures 2-5 and 6**).

The second Project area is located within Berkeley Township (also known as the Ocean Gate/Good Luck Point Project area) and is identified by Berkeley Township as Block 1207, Lots 2.01 and 2.02 and Block 1206, Lots 1 and 1.01, located along Bayview Avenue (**Figure 7**). The Ocean Gate/Good Luck Point Project area is approximately 222 acres, generally situated between Barnegat Bay to the east, E. Atlantic Avenue to the south, Toms River to the north, and residential properties to the west. This Project area is also located within the Coastal Plain physiographic section of the state and the Barnegat Bay Watershed Management Area (**Figures 8, 9 and 10**).

The APE for archaeological resources at both Manahawkin and Ocean Gate/Good Luck Point is the location of the pole removals, any associated project ground disturbance related to this activity (i.e. staging areas, access roads, etc.), and any associated activities or materials related to the pole removal or their functions. The APE for architectural resources at each Project area is the antenna field.

Since the stations were originally constructed in the late 1920s and late 1930s, the antenna arrays were modified to improve communication with ships at sea and to develop a reliable interface between these ships and the country's ever expanding telephone system. The addition of antennas resulted in a higher number of transmissions from both ship-to-shore and land transmissions all over the world. Manahawkin and Good Luck Point were essential in communications to Europe. In fact, during World War II, the station at Ocean Gate was under armed guard. Messages that were transmitted from the Ocean Gate station were critical to the war effort (Ocean County News Journal 1976).

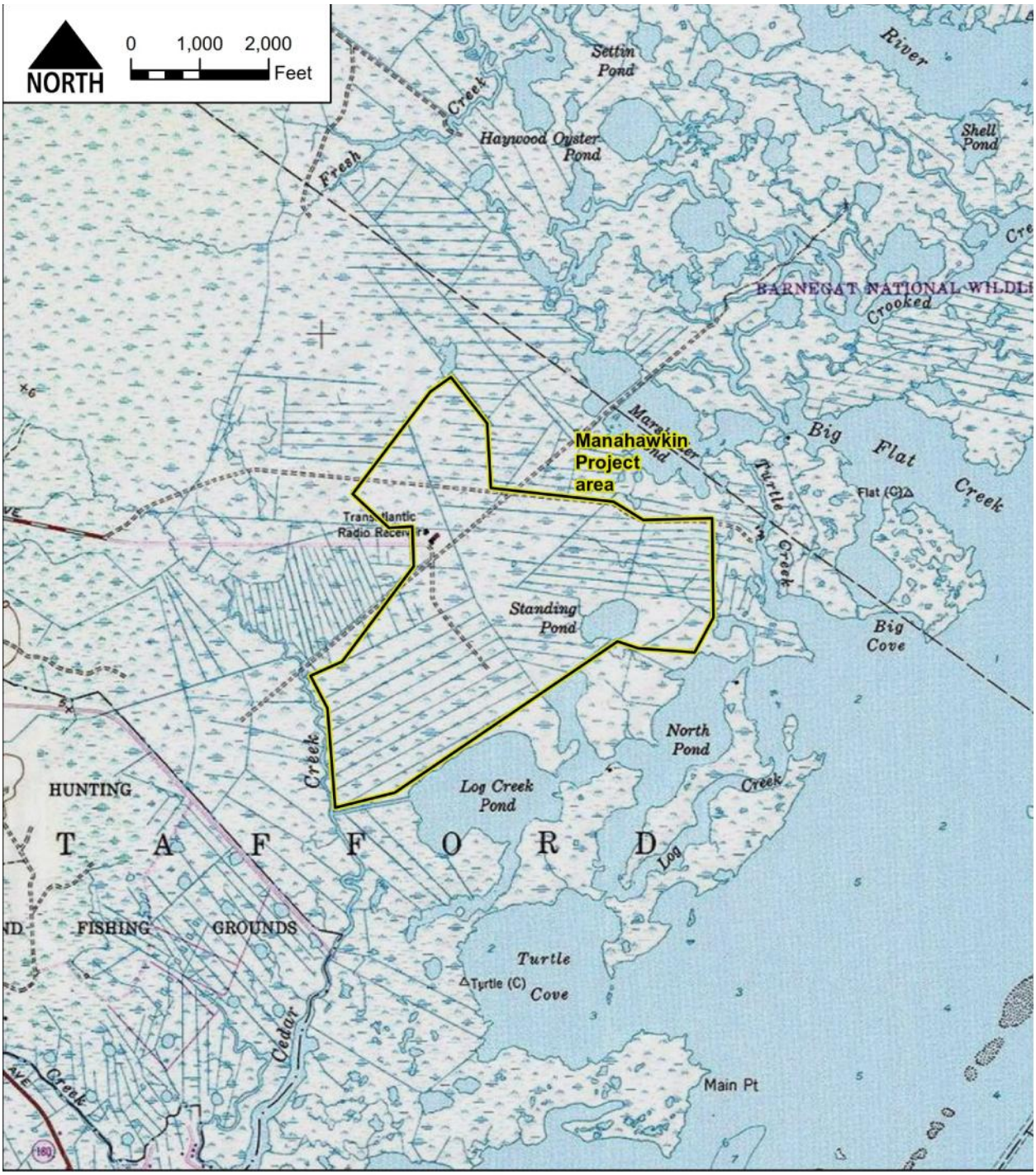


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**Figure 1. USGS Topo of the Manahawkin Project area.**

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**Figure 2. Aerial Image of the Manahawkin Project area.**

**Figure 3. Photo of the Manahawkin Receiver Station.**

**Figure 4. Photo of the Manahawkin Receiver Station.**

**Figure 5. Photo of a Manahawkin Curtain Antenna.**

**Figure 6. Photo of a Manahawkin Rhombic Antenna.**

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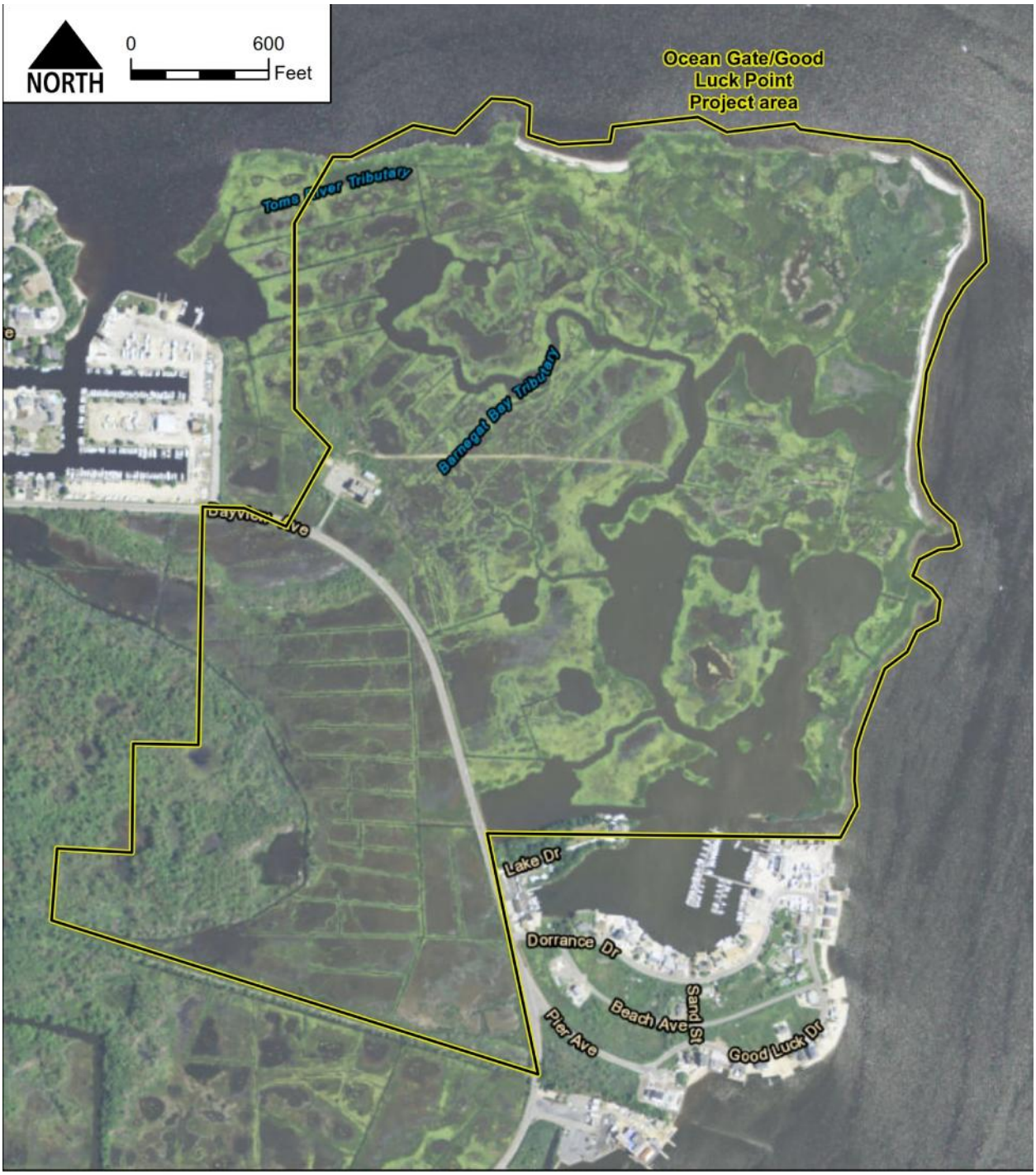
**Figure 7. USGS Topo of the Ocean Gate/Good Luck Point Project area.**

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Imagery: ESRI

**Figure 8. Aerial Image of the Ocean Gate/Good Luck Point Project area.**

**Figure 9. Photo of the Ocean Gate/Good Luck Point Transmitter Station.**

**Figure 10. Photo of the Ocean Gate/Good Luck Point Antenna Field.**

## 1.3 Physiography, Streams and Soils

### 1.3.1 Manahawkin Project Area

The topography of and surrounding the Manahawkin Project area is relatively flat and is situated between zero and five feet above mean sea level. Net local surface water drainage from the marsh drains into the adjacent creeks and ponds. The Manahawkin Project area is located within the outer Coastal Plain Physiographic section of New Jersey (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 across 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 as sea level (NJDEP 1999). The bedrock geology on this project area is made up of the Wildwood Member of the Kirkwood Formation. The Wildwood Member is described as late early and early middle Miocene Era aged clay rock with secondary silt, massive to finely bedded, dark-gray to olive-gray, locally interbedded with thin beds of light-colored sand and containing small shell fragments, primarily at the base (USGS 2015).

The surficial geology over the Manahawkin Project area is listed as 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 are deposited in salt-marshes, estuaries, and tidal channels and can be as thick as 300 feet in some areas. They were deposited during the Holocene Era and contain abundant organic matter (NJDEP 2014).

The majority of this project area is mapped to occur on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0-1% slopes. This complex is described as mucky silt loam, silt loam and mucky peat associated with tidal marshes (Maser 2012). A small portion is mapped as containing Atsion Sand, tide flooded soils with 0-2% slopes. This soil is described as sand to loamy sand and is associated with frequent flooding and ponding within tidal marshes (Maser 2012) [**Figure 11**].

The Service's National Wetlands Inventory (NWI) indicates that the water bodies surrounding the Manahawkin Project area to the east, south and west (including Marshelder Pond, Standing Pond, Log Creek Pond and Cedar Creek) are classified as follows (**Figure 12**):

- Estuarine, subtidal, unconsolidated bottom estuarine and deepwater habitats (E1UB L).

The NWI indicates that the wetlands within the Manahawkin Project boundaries are classified as follows:

- Estuarine, subtidal, unconsolidated bottom estuarine and deepwater habitats (E1UB L).
- Estuarine, intertidal, emergent, persistent, regularly flooded, partially drained/ditched (E2EM1Nd),
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched (E2EM1Pd),
- Estuarine, intertidal, emergent, persistent, regularly flooded (E2EM1N), and
- Estuarine, intertidal, aquatic bed, irregularly exposed wetlands (E2ABM).

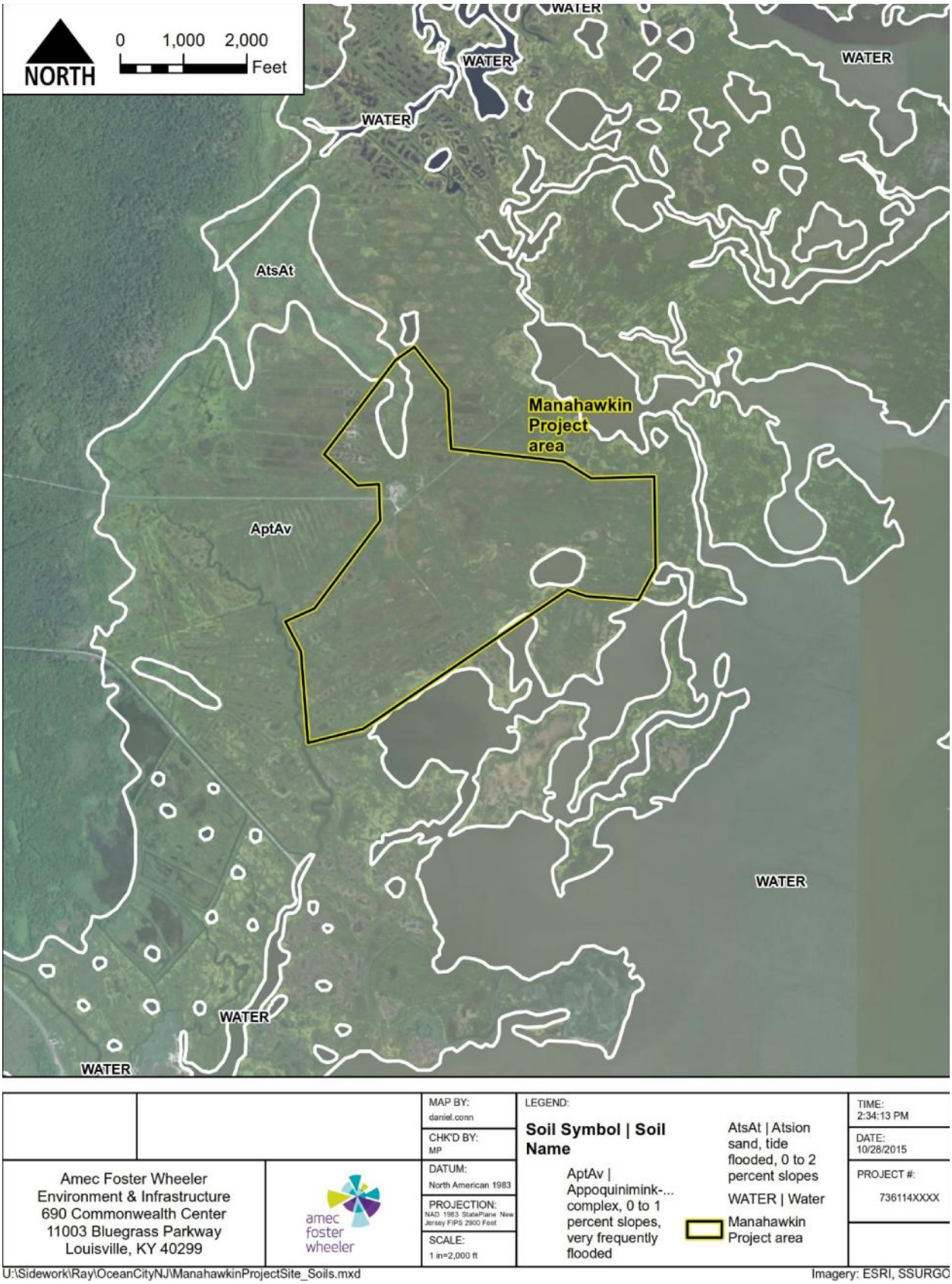


**Figure 11. Soils Map of the Manahawkin Project area.**

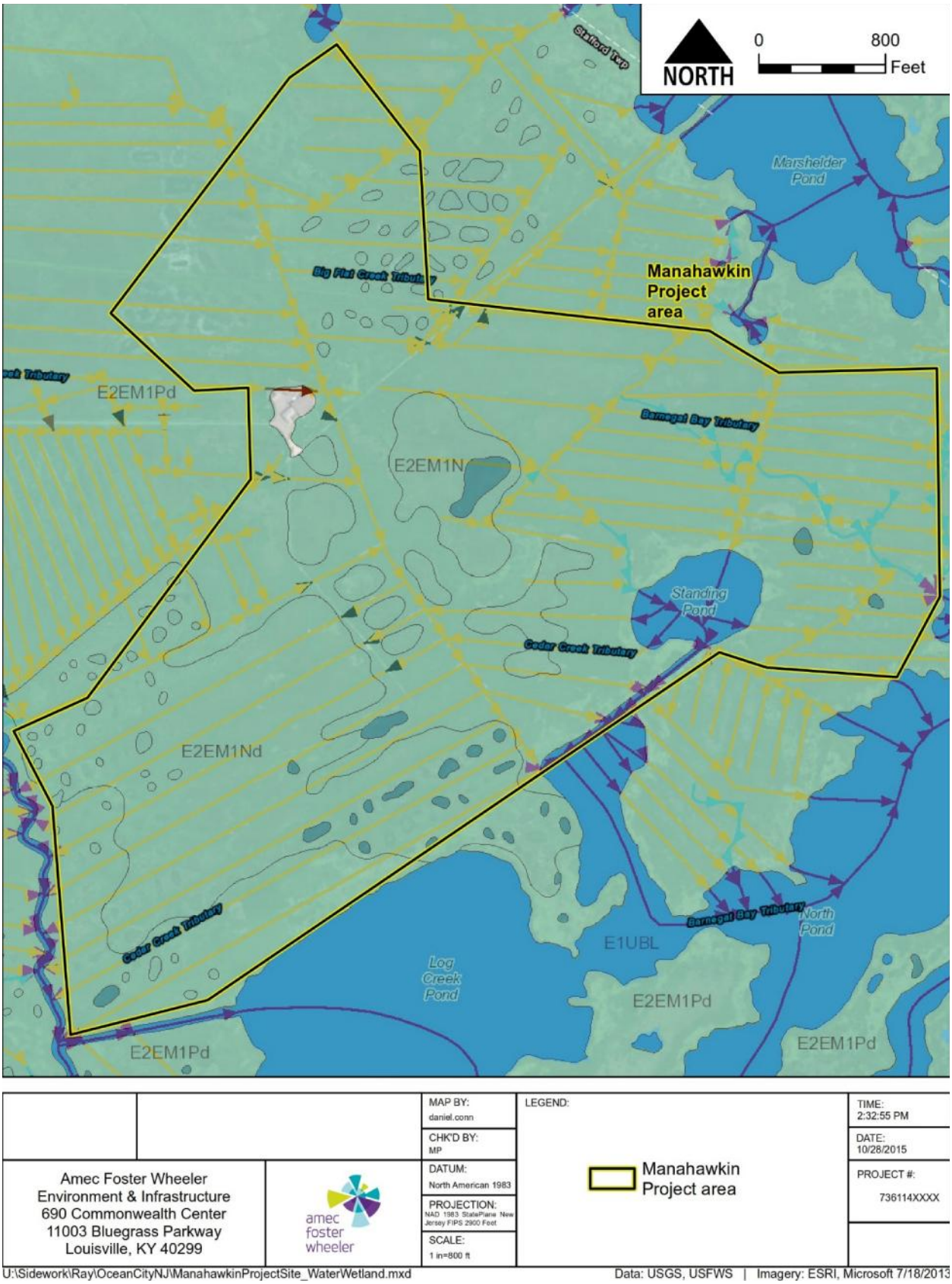


**Figure 12. Wetland Map of the Manahawkin Project area.**

### 1.3.2 Ocean Gate/Good Luck Point Project Area

The topography of the Ocean Gate/Good Luck Point Project area is relatively flat and is situated between zero and five feet above mean sea level. Net local surface water drainage from the marsh ultimately drains into the adjacent Toms River or Barnegat Bay. This project area is not unlike the Manahawkin Project area in that it is located within the outer Coastal Plain Physiographic section of New Jersey and the bedrock geology is classified as the Wildwood Member of the Kirkwood Formation (NJDEP 2014).

The surficial geology over the eastern half of the Ocean Gate/Good Luck Point Project area is listed as Salt-Marsh and Estuarine Deposits. These soils are described as dark in color, ranging from brown, dark brown, gray, or black, and comprised 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 (NJDEP 2014).

The surficial geology over the western half of this Project area is listed as Cape May Formation, Unit 2. These soils are described as lighter in color, ranging from very pale brown, yellow, reddish yellow, white, olive yellow or gray, and comprised of sand, pebble gravel, minor silt, clay, peat, and cobble gravel. They were deposited during the late Pleistocene Era as marine terraces and can be as thick as 200 feet in some areas (NJDEP 2014).

The majority of this project area is similar to the Manahawkin Project area in that it is also mapped to occur on Appoquinimink-Transquaking-Mispillion complex, very frequently flooded, soils with 0-1% slopes. However, a small portion is mapped as containing Berryland Sand, rarely flooded soils with 0-2% slopes. This soil is described as very poorly drained, sandy, eolian deposits and/or fluviomarine sediments creating broad, nearly level areas adjacent to swamps and in bottoms of closed depressions at levels just above the tidal mark (USDA 2015) [**Figure 13**].

The Service's NWI indicates that the water bodies surrounding the Ocean Gate/Good Luck Point Project area to the north and east (including Toms River and Barnegat Bay) are classified as (**Figure 14**):

- Estuarine, subtidal, unconsolidated bottom estuarine and deepwater habitats (E1UBL).

The NWI indicates that the wetlands within the Ocean Gate/Good Luck Point Project area boundaries are classified as follows:

- Estuarine, subtidal, unconsolidated bottom estuarine and deepwater habitats (E1UBL),
- Estuarine, intertidal, emergent, persistent, regularly flooded, partially drained/ditched (E2EM1Nd),
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched (E2EM1Pd),
- Estuarine, intertidal, emergent, persistent, irregularly flooded (E2EM1P),
- Palustrine, scrub-shrub, needle-leaved evergreen, seasonally flooded (PSS4C),
- Palustrine, emergent, persistent, seasonally flooded (PEM1C),
- Palustrine, forested, broad-leaved deciduous/palustrine, forested, needle-leaved evergreen, saturated (PFO1/4B),
- Palustrine, forested, needle-leaved evergreen/palustrine, forested, broad-leaved deciduous, saturated (PFO4/1B) wetlands, and
- Palustrine, unconsolidated bottom, permanently flooded freshwater ponds (PUBH)

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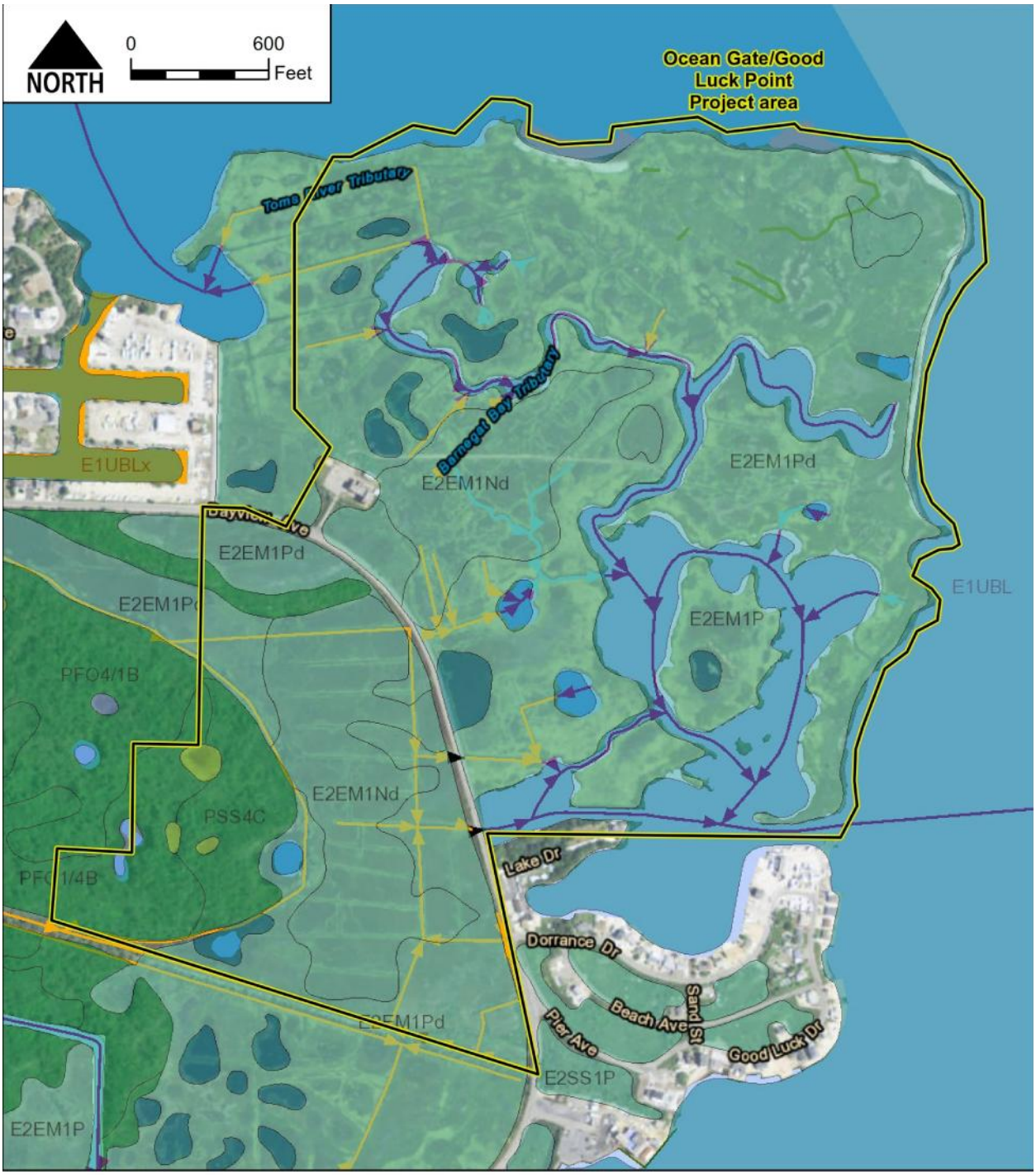
Imagery: ESRI, SSURGO

**Figure 13. Soils Map of the Ocean Gate/Good Luck Point Project area**

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Data: USGS, USFWS | Imagery: ESRI, Microsoft 7/30/2013

**Figure 14. Wetland Map of the Ocean Gate/Good Luck Point Project area.**

# 2.0 PREHISTORIC AND HISTORIC CONTEXTS

## 2.1 Paleoindian Period (12,000-8,000 BC)

Our knowledge of the Paleoindian occupation of central New Jersey, and the Northeast in general, is limited by post depositional taphonomic processes. These include deposition, erosion, and in coastal areas, sea level rise. Urbanization and development have further exacerbated site losses across the Northeast. Despite this, archaeologists have recovered important data with regard to the environment, subsistence and settlement patterning, chronology, lithic materials use, and migration/regional adaptation.

The Paleoindian use of the current New Jersey coastline is largely unknown, as sea levels were rising rapidly during the early Paleoindian period. Around 12,000 years ago (Terminal Pleistocene) as much as 62 miles (100 km) of additional coastline could have been available for habitation. This landscape would have exhibited a variety of vegetation including spruce, pine and fir, and tundra-like zones around swamps and on elevated landforms (Marshall 1982). In general, the Paleoindian period was cold and dominated by the development of pre-boreal spruce and pine forests (Stewart 1991). The Early Holocene environment was a dynamic one in which the boreal parkland forest, with a temperate hardwood component, overspread the area after the Younger Dryas stadial, around 12,000 BP (McWeeney 1999; Newby et al. 2005).

Paleoindian sites tend to be located on low order streams, around upland lakes and wetlands, or on dunes and high points within former glacial lakebeds (Curran and Dincauze 1977). Large occupation sites, such as Bull Brook (Robinson 2009, Byers 1954), are few, and may represent either repeated visitations over time by moderately-sized bands, or pioneering base camps from which smaller groups radiated out to colonize the surrounding landscape (Dincauze 1993).

Subsistence-wise, the human population had to have been small, mobile, and adapted to a generalist subsistence strategy (Curran and Dincauze 1977). There is no clear evidence associating large Ice Age mammal remains with Paleoindian artifacts, but a few calcined bones (extrapolated to be Caribou) and several unidentified berry seeds have been reported from Maine (Spiess et al. 1998) and fluted points and caribou bones were recovered from the same strata at the Dutchess Quarry Site in New York (Marshall 1982).

Paleoindian lithic materials sources are varied, with widespread use of only a few cryptocrystalline silicates, quartzites, and rhyolites (Boisvert 1998; Bonnichsen et al. 1980; Moeller 1980). However, the view of far-ranging Paleoindian groups covering great distances for lithic procurement and subsistence has been challenged by new models of settling-in and utilization of localized sources (Jacobson 2001). Typologically, Paleoindian point styles appear to fit into a chronological order of early (Gainey/Bull Brook points), middle (Barnes/Neponset points), and late un-fluted, parallel flaked Holcombe or Eden-like points (Spiess et al. 1998). These style groups evince a great deal of attribute overlap, and intermediate forms are common. More than one style may appear in a given site, supporting the idea of continuous habitation following initial colonization.

Significant Paleoindian sites in New Jersey include the Zierdt Site in Sussex County, the Plenge Site in Warren County, and the Turkey Swamp Site in Monmouth County. These sites should be interpreted in association with sites from nearby portions of New York and Pennsylvania, including the Port Mobil Site on Staten Island, the Shawnee-Minisink Site, and the West Athens Hill Site. When interpreted as a group, these sites indicate that Paleoindian habitation in and around the study area was well established by the end of the Paleoindian period, including base camps, short

term hunting camps, and quarry sites. In addition, isolated fluted point finds have been recovered from all of New Jersey's physiographic provinces within the study area, although with less frequency than in the northern parts of the state (Marshall 1982).

## 2.2 Archaic Period (8,000-1,000 BC)

The Early Archaic environment was a time of great change, with sea levels rising and the climate becoming warmer and dryer. A mixed pine-hardwood forest began establishing itself over most of the northeast and human groups quickly developed home territories based on post-glacial river and lake systems, as well as other physiographic features (Nicholas 1988).

In the Southeast United States, lanceolate Paleoindian points gave way to new, smaller projectile points that reflected technological adjustments to warmer and dryer forest conditions. The chronological sequence demonstrates that projectile point forms evolved from the Dalton point to side-notched points, then into corner-notched forms, and finally culminated with bifurcate base points (Broyles 1971; Coe 1964; Tuck 1984). These styles appear thinly distributed into the Northeast between 11,500 and 10,000 BP Bifurcate base points become dominant around 9000 BP throughout the Eastern Woodlands and represents an Early Archaic temporal marker. For the project area, these points are reported primarily from farmed fields or findspots. It is likely that most of the significant sites in the area were submerged by rising sea levels, filled for industrial use, (i.e. the nearby Meadowlands Sports Complex and Newark Airport), or disturbed by urban development (Kraft and Mounier 1982). In spite of limited evidence the majority of projectile points from New Jersey show clear influence from the Carolina Piedmont, although new point forms not present in the Piedmont also appear during this period (Kraft and Mounier 1982).

These point styles appear to have diffused rapidly into the Northeast. Kinsey (1972) reported a number of bifurcate points as surface finds in the Upper Delaware Valley. Further evidence for this progression in the Upper Delaware Valley comes from two Early Archaic components in superposition above the Shawnee-Minisink Paleoindian finds. At the Shawnee-Minisink Site, the earliest Early Archaic component appeared to be transitional between Paleoindian and later Early Archaic forms (Dent 1991). A single projectile point type having a broad-bladed corner-notched form with a weakly notched base was recovered. Numerous bifaces, scrapers, drills, blades, knives, gravers, cores, choppers, and hammerstones also were present. These site components are estimated to date to approximately 10,000 years ago. Dent (1991) surmised that this site represented a field camp established to exploit nearby chert resources.

During this time, Dent believes that a change in forest ecology had occurred. This change occurred around 10,000 years ago when the boreal pine-birch forest gave way to a pine-oak boreal forest. After 9211 BP, an oak-hemlock deciduous forest became established in the Upper Delaware Valley. Dent believes that the succeeding Early Archaic components, estimated to date to between 9500 and 7000 years ago are linked to this later forest pattern. According to Dent, the Fitting-Ritchie hypothesis is not supported by these data, as population increase and adjustment to changing environments were clearly taking place at Shawnee-Minisink.

The Middle Archaic presence in New Jersey first was recognized in surface collections by their similarities to the Middle Archaic projectile point forms of New England and the Carolina Piedmont (i.e., Stark, Neville, Merrimack, Stanley Stemmed, and Morrow Mountain). Middle Archaic sites with undisturbed deposits are extremely rare near the study area, with notable exceptions on Staten Island and the banks of the Lower Hudson River (Kraft and Mounier 1982). These similarities may represent human populations or technologies that spread northward as the mixed oak forest ecosystem expanded into the Northeast. Outside the study area, the Rockelein Site

yielded a Middle Archaic level in addition to its Early Archaic component (Dumont and Dumont 1979). The Middle Archaic locus produced Stanley/Neville points and associated tools. One unique artifact from this locus was an incised stone tablet. Coe (1964) reported several similar tablets from the Hardaway and Doerschuk sites in North Carolina and an additional tablet has been reported from southeastern Massachusetts. The function of these incised slates is unknown.

Late Archaic population growth is inferred from the large number of archaeological sites found throughout the Northeast. This population increase coincides, shortly after 6000 BP, with the final stages of the Middle Holocene. By this time, the Laurentide ice sheet had wasted away (Delcourt and Delcourt 1981). Large areas of eastern Canada became available for plant, animal, and human colonization, and rising sea levels with warming ocean waters saw a steady northward increase in bountiful finfish and shellfish habitats. Deciduous trees spread north into what had previously been less productive boreal forests. These forests included nut-bearing hickory, beech, and chestnut trees. These species would have increased the amount of mast food available to humans and wild game, increasing the carrying capacity of the land and favoring human population increase (Snow 1980).

Human populations adapted well to modern forests. The common presence of large storage pits indicates rich surpluses, while evidence of burial practices provides insights into the complex social and ideological aspects of cultures at this time (Dincauze 1975). The Late Archaic became a time of regional diversification in which several food-getting adaptations have been identified (Tuck 1978).

Generally, the economic adaptation of all Late Archaic groups was that of foraging in a bountiful forest environment. Their social systems were those of large groups living at continuously occupied base camps, with small seasonal task sites distributed over a home territory. Technologically, all traditions relied upon various forms of projectile points. Other tools included stone knives, blades, scrapers, various woodworking tools (some utilizing beaver incisors), grinding tools, net sinkers, and various forms of ground stone axes and adzes. The manipulation of these tools allowed Late Archaic groups to generate durable-container technology (Emerson 2009) such as the carved steatite bowl that appeared with the Susquehanna Tradition (Ritchie 1969). The widespread distribution of non-local lithic materials points to an elaborate exchange system.

Three distinct lithic traditions operated in the Late Archaic. The Small-Stemmed Point Tradition was characterized by a series of narrow stemmed, notched, and triangular points commonly made of quartz and quartzite, although chert and other materials are sometimes noted. The Small-Stemmed Point Tradition appears to be a continuation of Middle Archaic Merrimack antecedents (Dincauze 1976). The Laurentian Tradition, in contrast, tends to have broad-bladed notched and stemmed projectile points of chert, rhyolite, quartzite, and to a lesser extent, quartz. In the Lake Forest region of what is now New York and adjacent areas, Ritchie (1969) identified the Laurentian Tradition on the basis of thick, parallel-sided notched or stemmed projectile points, drills, knives, ground slate, and ivory or bone points. The third tradition, Susquehanna, tends to be later in time and technologically more complex than either Laurentian or Smallstemmed traditions. However, all three overlap spatially and temporally to some extent and there appears to be a wide range of variation from patterns of resource and food procurement to mortuary practices (Dincauze 1968; 1975). Other ground stone tools included axes, adzes, gouges, and ulus. These are recognized by two phases in the Hudson Valley, the Vosburg and Vergennes phases.

## 2.3 Woodland Period (1,000 BC to A.D. 1000)

The Early Woodland Period is defined by the introduction and wide use of Vinette I pottery approximately 3000 years ago. Culturally, this may not represent a significant change in ideology, as burials appear to consistently lack ceramics as grave offerings (Tuck 1978). In addition, some Early Woodland cremation burials are found in cemeteries used initially by Terminal Late Archaic peoples, making it possible to argue for cultural continuity (Leveille 1999).

The eastern equivalent of this Terminal Late Archaic/Early Woodland trajectory is the Meadowood phase (Ritchie 1969). Similar to Archaic sites, Meadowood sites tend to be located on sizable streams and small lakes and ponds and have yielded evidence that foraging continued to provide the subsistence base. Meadowood artifact complexes include thin, side or corner-notched projectile points that often are made from thin trianguloid bifaces. Drills and end scrapers round out this lithic toolkit.

Ceramics consisted of Vinette I pottery, and cigar-shaped smoking pipes. Bone awls and harpoon forms are reported from western New York, as well as antler flaking tools. Ground stone objects included gorgets, birdstones, boatstones, and other objects often associated with burial contexts. Meadowood burial complexes were distributed eastward from western and northern New York, and northward into southeastern Ontario and southern Quebec.

In southern New England, the characteristic projectile point types were Adena, Rossville, Lagoon, and Meadowood. The Early Woodland artifact inventory also includes trapezoidal gorgets, ovate cache blades, birdstones, boatstones, bar amulets, and tubular pipes. Blocked end tubular pipes, copper, and shell ornaments identified from Adena related Middlesex burial complexes further round out the artifact assemblage (Dincauze 1974).

Tuck (1978) asserted that these Early Woodland mortuary practices were an outgrowth of a general Northeast Burial Cult with several regional manifestations. Ideologies centered on commonly-held traits. They included elaborate mortuary ceremonialism, red ocher covered burials, and numerous grave offerings. All appear to have been manifestations of a pan-northeastern credence.

In the New York, New Jersey, and Southern New England region, these mortuary practices are called the Middlesex complex (Ritchie 1969). While some archaeologists have considered it a complex of mortuary practices “grafted” onto Meadowood cultures, such a characterization appears simplistic when one considers the complexity of cultural systems and the archaeological record.

Snow (1980) is likely correct in assigning Middlesex as the mortuary subsystem of Meadowood. The diffusion of Adena-like mortuary traits (lacking mound building in New England) continues to remain unresolved. Some hypothesize that it was the actual migration of the Adena people from the Midwest to the Atlantic Coast (Ritchie and Dragoo 1959). Others suggest that acculturation is the best explanation (Griffin 1961).

For the Early Woodland, there is no evidence for settlement and subsistence change. Fiedel (2001) hypothesized that something in this period caused a severe, region-wide population decline. This hypothesis also may be attributed to a shift in cultural practices that diminished the archaeological visibility of sites. For example, many radiocarbon dated sites lacking in diagnostic artifacts, fall within this time span and are associated with decidedly non-diagnostic Small Stemmed quartz industries. Multi-component sites, where subsequent Middle to Late Woodland

occupations may have obscured evidence of Early Woodland habitation, also have not been considered.

Early Woodland components at the Zimmerman and Faucett sites appeared similar to those of the Terminal Late Archaic with scrapers, drills, netweights, hammerstones, adzes and celts. Ground stone also included gorgets and pendants. Blade caches also are known. Some fire pits yielded charred nutshells and large stone-filled hearths also were reported. In the Upper Delaware, Meadowood-associated pottery is primarily early series exterior cord-marked interior smoothed with conoidal bottoms (Kinsey 1972). Kraft (1975b), however, indicates that the picture is not so clear for the region. He notes that the earliest ceramic vessels are Marcey Creek Plain, which appear in the Terminal Late Archaic and continue into the Early Woodland. Vinette I pottery generally is contemporary with Marcey Creek, and has been found on numerous sites in the Upper Delaware Valley, although in small quantities. Other Early Woodland ceramics include Kinsey's (1972) early series and the Abbott Horizontal Dentate, located in southern New Jersey (Cross 1956).

The Middle Woodland begins approximately 1700 years ago with the evolution of Point Peninsula-style pottery, decorated by applying various stamping and corded stick impression techniques (Kenyon 1983). Concurrently, the elbow pipe is introduced and projectile point forms included Green, Fox Creek, and Jack's Reef varieties. Cache blade concentrations also persist (Feder 2004). As in the rest of the Northeast, the Middle Woodland remains poorly documented and understood in New Jersey. There is no evidence of settlement and subsistence change for the Middle Woodland, although larger sedentary coastal settlements appeared and rudimentary horticulture may have begun (Cross 1956). Cross (1956) characterizes the Early and Middle Woodland periods as displaying a large degree of cultural continuity, with behaviors changing very gradually over time. These observations have led academics to consider the Early and Middle Woodland stages as a single phase within New Jersey.

Approximately 1000 years ago, the appearance of Owasco-like ceramics, decorated with cord marking, dentate stamping and other designs, ushered in the Late Woodland. The study area would have been part of the broad region within New Jersey, eastern Pennsylvania, southern New York, and the northern portions of Delaware and Maryland that was the homeland of the Lenape (Delaware) Indians (Kraft and Mounier 1982).

Late Woodland sites in coastal locations often occur with shell middens, which reflect an intensification of shellfish collecting and marine resource use. Late Woodland subsistence patterns show a general shift toward the incorporation of horticulture into an already bountiful foraging economy, so that, after A.D. 1100 and clearly by A.D. 1500, maize, beans, and squash are common in the archaeological record. The degree to which prehistoric groups became dependent upon horticulture, however, is unclear as foraging continued to be important. Many archaeologists have inferred steady population growth throughout the Late Woodland due to clear increases in artifact frequencies and site sizes. The Late Woodland dates from A.D. 1000 to the time of European contact. During this span of 500 years or more, Native American cultures underwent a period of intensification in terms of food production; technologic, economic, political and social complexity; and population increase. Settlement patterns show that Late Woodland groups were becoming more sedentary and that regional cultural differentiation was taking place.

Artifacts recovered from Late Woodland sites show little change in lithic toolkits. Late Woodland groups appear to have favored the triangular Levanna and Madison projectile points over earlier notched, lanceolate, and stemmed forms. Triangular points first appear in terminal Middle Woodland times (about A.D. 900) and continue into the historic period. During the contact and

historic periods, analogs of brass and copper appear to have been made or traded. Ceramic styles appear similar to Owasco and later collared vessels found throughout New Jersey, New England, and coastal regions. More sumptuary items, especially decorative and personal artifacts also are found in Late Woodland sites. Objects such as bone, clay, trade glass beads, and ceramic pipes are numerous. Also common were human face motifs consisting of incised eyes and a mouth (Kraft 1975b). In the historic period, European trade items of metal and glass were added to the assemblage. It is not clear if these were by direct or indirect trade. In discussing the aboriginal industrial traditions in these assemblages, the term "Terminal Woodland" often is used. During this time, settlement appears to be that of extended family, dispersed horticultural communities along the river bottomlands. Unlike in central New York, there is no evidence for stockaded villages until the wars of the late seventeenth and eighteenth centuries (Kinsey 1983; Kraft 2001).

## 2.4 Contact Period (A.D. 1500-1700s)

The interface of coastal New Jersey and European exploration, exploitation, and colonization, constitutes a rich and varied set of texts that begin with some of the earliest explorers to reach North America. Recent scholarship has suggested that the first European to pass along the coast of present-day New Jersey was John Cabot in 1498 (Jones 2007 and 2009). The subsequent exploration and early settlement of the New York and New Jersey area was undertaken by the Dutch during the first quarter of the seventeenth century. Later known as the Dutch Golden Age, this period pushed the Netherlands to the forefront of art, architecture, science, and discovery (Huey 1991). The first expedition to this part of the world was conducted by Italian explorer Giovanni da Verrazano. He anchored in New York Harbor in 1524 and was welcomed by members of the Lenape or Delaware, a group of loosely affiliated tribes who spoke Munsee dialects (Goddard 1978). The warm greeting implies that by the sixteenth century the natives in this area were familiar with European explorers. In 1609, Englishman Henry Hudson, while searching for a passage to Asia, discovered the river that eventually bore his name. Hudson sailed north as far as Albany, where he profitably traded beaver and otter pelts with the Mahicans, relatives of the Lenape (Steele 1994). Maps produced in the seventeenth century provide additional details about the specific bands of Lenape who would have populated the project area between the Raritan and Elizabeth rivers. Goddard's (1978) synthetic map of seventeenth century bands identifies the Raritans living within the project area, while a seventeenth century map of New Netherlands identifies the Sahicans as occupying the land between the Raritan and Hackensack rivers. It is likely that the Sahicans and Raritans were analogous groups, as early European records often interchanged or confused the names of native bands.

### 2.4.1 Dutch Colonization

Henry Hudson's failed expedition to Asia was an undertaking of the Dutch East India Company, which held a 21-year monopoly on trade there. Upon the return of Hudson, the relatively small New Netherlands Company was created and incorporated in 1615 to exploit trade opportunities in North America. This new company was granted monopoly rights in North America between the 40th and 45th parallels for a period of three years. (O'Callaghan 1855). The company was responsible for relatively few settlements, although it should be noted that they did construct Fort Nassau, located in present-day Albany. After the expiration of the New Netherlands Company's monopoly, the shareholders continued their trade in North America until the incorporation of the larger Dutch West India Company (DWIC) in 1621. It was under the auspices of the DWIC that European activity within the project area first began.

Under Peter Minuit, the appointed director of the New Netherlands, the DWIC began to purchase land rights from the native peoples. In 1626, when the DWIC decided that a permanent settlement

would be established on Manhattan Island, land rights were purchased not only for Manhattan Island but also Staten Island “and some other places in that vicinity” (O’Callaghan 1855). It is possible that this transaction or transactions included the land at Ocean Gate/Good Luck Point and Manahawkin. In New Jersey, given the lack of recorded Dutch Settlements in the area, it is unlikely that there was an impetus to purchase the rights to this land. In 1638, Willem Kieft was appointed the fifth director of New Netherlands. Under his rule, the Dutch colonists entered a turbulent period in their history. Beginning in 1640, Kieft undertook a series of actions that antagonized both the Raritan/Sahicans on the New Jersey Mainland, and the Wecquaesgeeks, who lived north of the Harlem River (O’Callaghan 1855).

### 2.4.2 English Colonization

King Charles II gave the land in the project area to the inhabitants of Connecticut when the new Connecticut Charter was enacted in 1662. This lead to cursory inquiries for permission to settle this land in 1663 by members of the Connecticut Colony. However, disputes with then Governor Stuyveasant and the Dutch Government about the level of autonomy the colonists from Connecticut would have prevented settlement (Hatfield 1868). Subsequently, in March of 1664, the King granted a second charter for this same land, including the land between the Connecticut River and Delaware Bay, to his brother James the Duke of York. The Duke, commander of the navy, assembled an expedition that consisted of 4 warships. After arriving in New York Harbor in August, the Dutch surrendered their settlements to English control. The government of this land was left to Richard Nicholls, commander of the expedition that secured the surrender of New Netherlands (Hatfield 1868).

## 2.5 Historic Period (Ocean County)

In 1850, Ocean County separated from Monmouth County and became the second largest county in the state (Oxenford 1992; Miller 2000). The county is one of four New Jersey counties that border the Atlantic Ocean, and includes some of the busiest shipping lanes in the world. The region’s proximity to the ocean served as the catalyst for most of the early development, and arguably accounts for the majority of development during the late twentieth century. In 1685, the Proprietors of the Province of East Jersey began to buy land within present-day Ocean County from the Native Americans. The Proprietors then sold much of this land to settlers, attracting many from New England and Long Island. The original land patents for this area were awarded to William Penn and Dr. Daniel Cox in 1690. Around 1700, Penn and Cox hired Jarvus Pharo to survey their 12,000 acres of land, which extended from the Atlantic Ocean to west of present-day West Creek.

Early settlers were drawn to Ocean County by the economic opportunity presented by its natural resources and the religious freedom it offered. The area was heavily wooded at that time, and the numerous streams provided ample waterpower to establish mills. The forests contained plentiful game, and the accessible Barnegat Bay contained numerous varieties of fish, shellfish, and waterfowl. The region’s earliest residents were mostly Baptists, Quakers, and Presbyterians (Oxenford 1992; Miller 2000).

The numerous waterways leading into Barnegat Bay were the primary means of transportation in Ocean County until the mid-nineteenth century. Early roads supplemented the waterways and usually followed Native American trails. Eventually, the paths connecting landing points along the bay to settlements developed into roads along the shore connecting settlements. By 1716, the Main Shore Road, following the path of present-day Route 9, had developed into a popular route used frequently by Quakers traveling for trade and to attend monthly religious meetings. By the

end of the century, the Main Shore Road connected a string of shore villages from Toms River to Cape May. Fishermen from Egg Harbor, Barnegat, and Absecon used the Main Shore Road to transport their catch of oysters, fish, and clams to the Delaware River (Oxenford 1992:67-68; Allaback 1995).

Small villages developed around mills across Ocean County. These mills provided timber essential for the shipbuilding industry that developed in the county. Residents also made a living fishing, oystering, clamming, and hunting waterfowl for sale in the urban markets. Ocean County also served as the center of New Jersey's bog iron production from the end of the American Revolution to the mid-nineteenth century (Oxenford 1992; Allaback 1995).

As noted, during these early periods, and until 1850, Ocean County remained a part of Monmouth County. Eventually, Joel Haywood of West Creek led a movement to separate from Monmouth County. Haywood's family was among Stafford Township's early residents and Haywood was a Methodist minister, local Whig Party leader, and former New Jersey assemblyman. Haywood wrote a letter to the state legislature in 1849 proposing that Monmouth County be divided, with the southern half below the Manasquan River becoming a new county. Haywood's proposal came from an ongoing complaint of Stafford Township residents that the Monmouth County Board of Freeholders did not spend adequate funds for roads, bridges, and other needs in the southern part of the county (Snyder 1969:201-209).

The legislature approved the bill in 1850. The newly formed Ocean County had 10,032 residents. The newly created county consisted of Brick, Dover, Jackson, Plumsted, Union, and Stafford Townships (Snyder 1969:201-209). By the time Ocean County was established, the depletion of hardwood trees had already caused a decline in the regions sawmills and shipbuilding industry. As a result, many of the settlements in Ocean County declined, and agriculture became the prominent industry, with cranberries being widely grown. Eventually the region became a popular vacation destination, and the opening of the Tuckerton Railroad in 1871 allowed greater access to the general public. A group of local hotel owners and Philadelphia businessmen sponsored the rail line, which ran from Whiting to Tuckerton. The rail line cut through the wooded Pine Barrens, and made stops in the settlements of Waretown, Barnegat, Manahawkin, West Creek, and Parkertown, before reaching the turntable at Tuckerton (Miller 2000:294). This endeavor allowed an influx of seasonal residents and development within the region, including construction of a passenger station at Waretown Junction (Miller 2000:397). Ultimately, the construction of automobile bridges across Barnegat and Little Egg Harbor bays in 1914 provided more open access to the bay and shore areas. As the tourist trade increased, hotels were built in Waretown, Barnegat, Tuckerton, Manahawkin, and West Creek, but these remained simple with little to distinguish them from earlier boarding houses. The first modem hotel was the Resort House in Point Pleasant Beach which opened in 1878; it was soon followed by other elegant resort hotels along the shore in Long Beach Island and Seaside Park (Miller 2000:294; Oxenford 1992:67-71, 103-104).

Ocean County grew rapidly in the twentieth century as improved transportation brought increased tourism and housing development. When the county was formed in 1850, it was New Jersey's second largest in area, but the least densely populated. As noted, the automobile brought new visitors and residents to the county for leisure and tourism. These weekend middle class tourists replaced the upper class visitors that came for a season. The Main Shore Road developed into a popular route for automobile tourists on their way to resorts along the Jersey Shore. In 1904, the Board of Freeholders constructed the first gravel road in Ocean County to link Lakewood and Point Pleasant (Oxenford 1992:79). Subsequent construction included roads that connected Point Pleasant and Seaside Park, and one that traversed Long Beach Island. The County continued

shore road improvement projects throughout the 1920s and 1930s. As roads improved, tourism increased and tourism-related businesses, such as campgrounds, motels, and diners lined Ocean County highways (Kise, Straw & Kolodner 2001:27-53).

Improved highways brought new residents to the county, and the population reached 56,622 by 1950 (Miller 2000:568; Kise, Straw & Kolodner 2001:27-53). In the 1950s, construction of the Garden State Parkway served as the catalyst for the rapid population explosion in the county. The parkway linked higher-paying jobs in northern New Jersey with affordable housing in southern New Jersey. Farmland and small villages were transformed into bedroom communities for people working in northern New Jersey, Atlantic City, and Philadelphia.

### 2.5.1 The American Telephone and Telegraph Company (AT&T)

In 1929, AT&T selected and subsequently developed the Ocean Gate/Good Luck Point Project area as a high-frequency, shortwave radio transmitting station that was designed to provide telephone ship to shore service and to overseas locations. The station was identified as Ocean Gate Radio that operated under the call sign WOO (Whiskey Oscar Oscar). The original installation included a large array of curtain antennas. In the mid-1950s, the curtain array was replaced by a cluster of rhombic antennas.

In addition to the high-seas service, Ocean Gate Radio transmitted for 70 years to Paris, Frankfurt, Santiago, London, Buenos Aires, San Juan, Panama, Bermuda and Rio di Janeiro. Ocean Gate's companion location, constructed in the late 1930s, was the shortwave receiving station at Manahawkin.

Located 10 miles south, below Forked River, Manahawkin was the main receiver facility for WOO and the U.S. terminal for the sole undersea cable from Bermuda. The later development of numerous undersea cables across the Atlantic and the expansion of satellite communication led to the closure of Ocean Gate/Good Luck Point and Manahawkin in 1999 (Mounier 1990).

The information provided below is a brief history of the AT&T shortwave transmitting station at Ocean Gate/Good Luck Point and was synthesized from an article written in the *Toms River Courier* on March 14, 1930.

The transmitting station was located on a tract of salt marshes that was unobstructed to the sea which made the location suitable for radio transmissions. In addition to the antenna, the transmitting station had a building that housed the transmitting sets and associated equipment that would link radio and wire circuits, and the auxiliary machinery necessary to operate the station. This building was constructed of 12-inch concrete block. All of these facilities were constructed only 18 inches above the high water line. The main building was constructed two stories high and with a small basement under one end for the heating plant. The foundation for the building was constructed of reinforced concrete to a depth of five feet below the natural grade. The basement was constructed to a depth of ten and a half feet below grade.

The first floor of the building housed the generators that would supply current for the transmitters and the transformers that raise the outside power supply to various required voltages, and other machinery. The heavy-duty transformers, were placed in vaults. In order to cool the system, a water-cooling system and large air blowers were also needed to cool the circulating water.

Also on the first floor was the "line terminal room" where the wire lines from the long distance office terminated. This room was completely sheathed in copper, to prevent the radio waves from

the antennas, located outdoors, from coming back and impairing operation of the equipment in the room. All of the machinery on this floor was insulated with cork to avoid any vibration from their operation that would have disrupted their delicate radio equipment.

The second floor was where the transmitting sets were housed. The rectifier was located in the back of the building that was used to convert the alternating current from the outside power source into the direct current required in the vacuum tubes.

The two antennas were the "curtain" type and consisted of networks of wires in the form of coarse-mesh curtains suspended from 70-foot poles, the line poles broadside to the direction of transmission to give a highly "directional" transmission.

The signals from this facility covered a range over which the antennas could transmit and cover the principal steamship lanes to Europe. The efficiency of each antenna was further increased by suspending a similar curtain behind the active one. This served to reflect radio energy that ordinarily would have gone toward the west with full power.

#### 2.5.1.1 Long Lines Short Wave Radiotelephone Receiving Station at Manahawkin

By the late 1920s, studies had indicated that improvements were needed to improve radiotelephone communications from ship-to-shore that could handle the increased communication traffic. A new system (MUSA – Multiple Unit Steerable Antenna) had been developed by Bell Telephone Laboratories that with its associated apparatus, MUSA would allow clearer radio circuits and would add more time to the radio day (i.e., the time in a day during which the channels are available commercially). MUSA was especially important because now it was possible to monitor the incoming radio waves, provide a selective system for their reception, and furnish the means for combining the waves into a single telephone circuit. For radiotelephone communications, this was extremely important and greatly improved communications over long distances. To do this it was necessary to use a number of rhombic antennas, in fact, the more antennas used the better the results or the sharper the "steering" (Hoyt 1939:4 and 5; Fink and Bennett 1930).

This new MUSA communication system required a new and improved antenna array. The length of the new antenna system, along with other technical requirements made it necessary to find a new location for this new system. The transatlantic short wave receiving station at Netcong, New Jersey could not handle this new system. The receiving station at Forked River, New Jersey was also reviewed as an alternative location but was also found to be inefficient for the needs of the new system. For these reasons, in December 1936, The Maritime Division of the American Telephone and Telegraph Company (AT&T) began searching for a suitable location for the new MUSA antenna system (Borthwick 1939).

The land requirements that needed to be met included: an area three miles square which needed to be free of roads, electric railroads, power lines, towns, and all sources of interference (Weber 1938). In addition, the land should be as level as possible and the area should have a uniform water table. After review of 25 potential locations in Long Island and New Jersey, were field reviewed and then submitted to legal for potential land costs, a location in Manahawkin, New Jersey was chosen as a suitable location in the salt marshes of New Jersey (Borthwick 1939).

The task to build the communication facility and antenna array proved to be a challenge. Construction of the roads, buildings and antenna system began in 1938. First, roads were required to access the new property. Due to the marshy conditions in this part of New Jersey, the

roads were built to float on top of the marsh. This type of road was constructed in this manner. First, a covering of pine planks was put down. Next, salt hay was laid on top of the pine planks and then a sod wall was built to keep the plank and hay road material together. This road construction made the road rise about three feet above the surface of the marsh (Fink and Bennett 1939).

The construction of the receiver building and garage also proved to have their own challenges. Because of the constant changing water levels, muck, and sand. The buildings were constructed on yellow pine “piles” that were driven deep into the salt marsh. The tops of these clusters of piles were at about the marsh surface. Above the piles were caps of concrete. The floor of the buildings were then tied together by a grid system of reinforced concrete beams which rests on these concrete caps (Fink and Bennett 1939).

Because the receiving station was constructed out in an open marsh, it was susceptible to strong winds and driving rain. Because of this, it was particularly important to construct the receiving building in such a way as to withstand moisture from the sides as well as the roof. Therefore, the brick outside walls of the station were painted with waterproofing cement. Another way of keeping the moisture out was to create a space between the outer wall and the inner wall two-and-a-half inches. This would allow any water or moisture penetrating the outer wall to run down this open space to an area below the floor so as to avoid corrosion and mold issues inside the receiving station. In addition to these measures, an overhanging ornamental iron cornice gutter protruded approximately two feet from the face of the walls. This protected them from heavy rains by acting as a small canopy or visor. In addition, to withstand weather conditions at the shore, the roof had been made of copper (Fink and Bennett 1930; 1939). The main building, incidentally, was heated by a hot water circulating system which included an oil burner.

The construction of the antenna system proved to have its own set of construction issues. The transmission array required the erection of sixty-eight poles with guy wires and anchors. The antenna system was a “rhombic” (diamond shape) antenna which is a broadband directional wire antenna used in the high frequency or shortwave band. The antenna system consisted of one to three parallel wires suspended above the ground in a diamond shape, supported by poles at each vertex to which the wires were attached by insulators (Bennett and Moroze 1939).

On the Manahawkin Project area, 16 rhombic antennas, consisting of 64 poles (four poles for each antenna), were placed end to end over about two miles. The poles were approximately 65 feet above ground and were set in the diamond shape about 600 feet long. To erect the poles in the muck of the salt marsh, it was necessary to first remove as much muck as possible, then, stand the pole in the hole, and then with high pressure water force the sand and clay out until proper depths (between nine to ten feet) were achieved and the pole settled. Depending on its location in the individual antenna, each pole was permanently braced with one or three guy wires to secure it in place (Bennett and Moroze 1939).

Each of the rhombic antennas required a coaxial cable for the transmission lines connected to the receiving equipment in the building. The transmission lines were laid underground (approximately 30 inches deep) to avoid temperature changes which would have had an adverse effect on transmission of the radio waves. Due to the marsh environment and in order to protect the copper pipe from corrosion, it was necessary to have the lines covered by an application of heavy layers of coal tar enamel. This was then reinforced with an asbestos wrap (Bennett and Moroze 1939).

Since the station was originally constructed, additional antennas have been added to the array. The addition of the antenna resulted in an even higher number of transmissions from both ship-to-shore and land transmissions all over the world. In fact, the stations in New Jersey were critical in communications to Europe. During World War II, the station at Ocean Gate/Good Luck Point was under armed guard. Messages that were transmitted from the Ocean Gate/Good Luck Point station were critical to the war effort (Ocean County News Journal 1976).

# 3.0 BACKGROUND RESEARCH

## 3.1 Research at the SHPO, NJSM and AT&T Archives and History Center

The background research focused on the examination of historical and contextual information to create an understanding of how the land within the Project areas was used and developed over time. This research identified known architectural and archaeological resources within the Project areas and a 1.5-mile buffer around the Project areas. Records on file on the NJ GeoWeb and at the offices of the NJ SHPO located in the New Jersey Department of Environmental Protection (NJDEP) and the NJ State Museum (NJSM) in Trenton were examined to identify known archaeological sites, architectural resources and prior cultural resource surveys of the Project areas. In addition, relevant information stored at the AT&T Archives and History Center in Warren, New Jersey, was also reviewed.

The NJSM houses both prehistoric and historical site files for the state as well as select cultural resource management (CRM) reports. The NJ SHPO is a repository for CRM reports of investigations conducted throughout the state, as well as for the list of properties on the NRHP. Historic maps of the Project area were also reviewed to identify historic houses, cemeteries, and other historic structures indicative of potential archaeological sites.

Completion of this background research accomplishes the following: (1) indicates areas previously surveyed, whether previously recorded archaeological sites or architectural resources are located in the area, (2) provides information on the types of unrecorded archaeological sites that could be present in the Project areas, and (3) provides a basis for specifically gauging archaeological potential within undisturbed and unsurveyed portions of the Project APE. This research also helps to develop a cultural resources context within the Phase IA report; a critical component in assessing the cultural significance of individual sites, and assisting in the development of site-specific management recommendations.

The objective of the background research was also to assess the potential for the proposed action to impact archaeological, cultural, and historical resources on the Ocean Gate/Good Luck Point and Manahawkin Project areas. The background research indicated there are no historic properties listed on the NRHP within the immediate vicinity of the Ocean Gate/Good Luck Point Project area. However, on the Manahawkin Project area, in the southwestern portion of the Project area is the boundaries of archaeological site grid EK229. Archaeological site(s) have been identified within this site grid area, but not within the proposed Manahawkin Project area APE. There are no recorded historic structures or historic districts within the Manahawkin Project area.

The Ocean Gate/Good Luck Point Project area went through the Certification of Eligibility process to the New Jersey Register of Historic Places in 2007 (AT&T Transmitter Building and Antenna Field [ID#4723]). To the west of the project area is the “Spy” historic property (ID#2277). No other known historic properties are within the vicinity of the project area. Known archaeological sites are recorded northwest of the Project area north of Toms River.

The Ocean Gate/Good Luck Point Project area was determined eligible by NJ SHPO in 2007; the facilities and antenna at the Manahawkin Project area has an equivalent degree of integrity and is also considered eligible using the same rationale as was applied by NJ SHPO to the Ocean Gate/Good Luck Point Project area. Both properties are eligible under National Register Criterion A for their association with the early implementation and expansion of ship-to-shore telephony and under National Register Criterion C as representative, substantially intact examples of early shortwave facilities with their associated antenna fields.

### 3.1.1 Previously Reported Archaeological Sites within 1.5 miles of the Ocean Gate/Good Luck Point Project Area

At the NJSM and the NJ SHPO, information on six recorded archaeological sites were collected and are compiled in Table 3.1.1 that were within 1.5-mi (2.4-km) of the project APE for Ocean Gate/Good Luck Point (Table 1).

**Table 1. Archaeological Sites within 1.5 miles of the Ocean Gate/Good Luck Point Project Area**

| Site Number | Site Type/Cultural Affiliation | Distance From Project area | Reported Information, Date | NRHP Status | Recommendation |
|---|---|---|---|---|---|
| 28Oc30 | Prehistoric – Village and Cemetery | Within 1.5 miles | ASNJ Bulletin 9:1949 | Not assessed | None Listed – Site destroyed |
| 28Oc31 | Prehistoric – Cemetery | Within 1.5 miles | ASNJ Bulletin 1:1948 | Not assessed | None Listed |
| 28Oc75 | Prehistoric – Shell Mound | Within 1.5 miles | Local Informant | Not assessed | None Listed |
| 28Oc141 | Prehistoric – Cemetery | Within 1.5 miles | ASNJ Bulletin 1:1948 | Not assessed | None Listed |
| 28Oc142 | Prehistoric – Humus Rings "wigwam rings" | Within 1.5 miles | ASNJ Bulletin 1:1948 | Not assessed | None Listed |
| 28Oc143 | Prehistoric – Workshop/Procurement Site | Within 1.5 miles | ASNJ Bulletin 1:1948 | Not assessed | None Listed |

### 3.1.2 Previous Archaeological Survey Summaries for the Ocean Gate/Good Luck Point Project Area

The literature review produced the following three reports on cultural resource surveys that fell within or near the current Project area at Ocean Gate/Good Luck Point. Below is a brief description of these cultural resource surveys.

In 1994, R. Alan Mounier (Mounier 1994) completed a Phase I archaeological survey of proposed improvements of Fischer Boulevard in Dover Township, Ocean County, New Jersey for Normandeau Associates, Inc. A total of 1.48 miles were included in this survey. No archaeological sites were identified during this survey based on the heavy disturbance noted within the project alignment. No further work was recommended for this project.

In 1994, Rutgers University, Center for Public Archaeology (Martin et al. 1994) completed a Phase I archaeological survey of the Bayview Avenue Segment of the Rivera Beach/Good Luck Point Sanitary Sewage Facilities in Berkeley Township, Ocean County, New Jersey for Kupper Associates. A total of 2,035 linear feet were included in this survey. No archaeological sites were identified during this survey. The project area had been submitted to extensive infilling of the area to cover the tidal marsh. No further work was recommended for this project.

In 1988, Historic Sites Research (Kardas and Larrabee 1988) completed a cultural resource survey of two of the three proposed sewer projects in Berkeley Township, Ocean County, New Jersey for Kupper Associates. No archaeological sites were identified during this survey for either the JFK Blvd work area or the Ocean Gate/Good Luck Point project area. A survey was not performed on the Holly Park portion of the project area. The project areas were located in what were marshy tidal areas which would have been unattractive to prehistoric habitation sites. The

areas were extensively altered by extensive infilling of the area to cover the tidal marsh. No further work was recommended for the completed portions of the project.

### 3.1.3 Architectural Overview Survey for the Ocean Gate/Good Luck Point Project Area

The historic architecture background review methods consisted of a preliminary assessment of existing historic inventory forms on file at the NJ SHPO in Trenton, New Jersey, to gain a sense of what resources have been previously identified. In addition to the National Register Eligible Ocean Gate/Good Luck Point AT&T Transmitter Building and Antenna Field, another 11 historic structures have been documented within 1.5 miles of the APE (Table 2).

**Table 2. Historic Structures within 1.5 miles of the Ocean Gate/Good Luck Point Project Area**

| Address/Name | Architectural Style | Historic Use | Activity | Date | Recommendation |
|---|---|---|---|---|---|
| 1000 Barnegat Avenue Seaside Heights, New Jersey | Not Listed | Bible School/Meeting House | Original Construction | 1910-20 | Not Recommended NRHP Eligible |
| Island Heights Historic District | Multiple | Historic District | Methodist Camp Meeting Resort | 1878 | NRHP |
| "Mary Ann" A-Cat racing catboat | Boat | Sailing | Original Construction | 1922 | None Listed |
| "Bat" A-Cat racing catboat | Boat | Sailing | Original Construction | 1923 | None Listed |
| "Spy" A-Cat racing catboat | Boat | Sailing | Restored | 1924 | None Listed |
| Ocean Gate School 126 West Avenue, Ocean Borough, Ocean County, New Jersey | One-Room School house | School House | Original Construction | 1914 | NRHP, Criterion C |
| 12 Williams Lane, Berkeley Township, Ocean County, New Jersey | Vernacular | Single Dwelling | Original Construction | 1930 | None Listed |
| Seaside Park Yacht Club 209 South Bayview, Seaside Park, New Jersey | Vernacular Queen Anne | Yacht Club Boat House | Original Construction | 19th Century | None Listed |
| 600 South Bayview, Seaside Park, New Jersey | Vernacular | Boat House | Original Construction | 1895 | None Listed |
| 412 South Bayview, Seaside Park, New Jersey | Vernacular Queen Anne | Single Dwelling | Original Construction | 1890 | None Listed |
| Berkley Township, Seaside Park Borough, Seaside Heights Borough, and Dover Township | Vernacular Residential | Multiple (136 structures) | Original Construction | 1880-1945 | Not Recommended NRHP Eligible |

### 3.1.4 Previously Reported Archaeological Sites or Architectural Resources within 1.5 Miles of the Manahawkin Project APE

At the NJSM and the NJ SHPO, no archaeological sites or architectural resources were identified within 1.5-mi (2.4-km) of the Manahawkin Project APE.

### 3.1.5 Previous Cultural Resource Survey Summaries for the Manahawkin Project Area

The literature review yielded the following five reports on cultural resource surveys that fell on or near the Manahawkin Project area. Below is a brief description of these cultural resource surveys.

In 2008, Richard Grubb and Associates, Inc. (Lore 2008) completed a Phase I archaeological survey on two tracks of land at the Edwin B Forsyth National Wildlife refuge, Stafford Township, Ocean County, New Jersey. No archaeological sites were identified during this survey. No further work was recommended for the completed for this project.

In 1993, Rutgers University, Center for Public Archaeology (Cavallo et al. 1993) completed a Stage I archaeological survey of the Lawrence Avenue/East Holly Park Sanitary Sewage Facilities in Berkeley Township, Ocean County, New Jersey for Kupper Associates. A total of 26,500 linear feet were included in this survey. No archaeological sites were identified during this survey. The project area had been submitted to extensive infilling of the area to cover the tidal marsh. No further work was recommended for this project.

In 2006, URS Corporation, Inc. (Morin 2006) completed a Phase I cultural resources survey for the New Jersey Department of Transportation for the Route 72 and Manahawkin Bridge Project in Stafford Township, Ship Bottom Borough, Ocean County, New Jersey. No archaeological sites were identified during the archaeological portion of the survey. No further archaeological work was recommended for the project. For the architectural portion of the survey, URS evaluated 37 historic architectural resources but none were determined to be NRHP eligible. However, URS determined that Margo's Marina was considered NRHP eligible under Criterion A. The project was determined to have a no adverse effect on the National Register-eligible property.

In 2009, Richard Grubb and Associates, Inc. (Lore and Leynes 2009) completed a cultural resources investigation for improvements to Route 72 Manahawkin Bay Bridges and Marsha Drive Intersection Stafford Township, Ship Bottom Borough, Ocean County, New Jersey. Due to the low potential for prehistoric or historic archaeological resources, no archaeological survey was recommended. No further archaeological work was recommended for the project. For the architectural portion of the survey, Richard Grubb and Associates, Inc. evaluated four historic architectural resources but three were determined to not be NRHP eligible. However, Richard Grubb and Associates, Inc. determined that the Dorland J. Henderson Memorial Bridge (1513-152) was considered NRHP eligible under Criterion C. The project was determined to have an adverse effect on the National Register-eligibility of the bridge and a HAER documentation was recommended.

In 2005, URS Corporation, Inc. (Morin 2005) completed a Phase I cultural resources survey for the New Jersey Department of Transportation for the Route 72 and Marsha Drive Intersection in Stafford Township, Ocean County, New Jersey. No archaeological sites were identified during the archaeological portion of the survey. No further archaeological work was recommended for the project. For the architectural portion of the survey, URS evaluated historic resources within the lagoon development of Beach Haven West and determined that none of the structures were considered NRHP eligible individually or as a district.

In 1990, R. Alan Mounier (Mounier 1994) completed a Phase I archaeological survey of proposed AT&T Trans-Atlantic Telecommunications Cable No. 9 (TAT-9), Stafford Township, Ocean County, New Jersey for Baker Engineers. No archaeological sites were identified during this survey based on disturbances noted within the project alignment and tidal marsh. No further work was recommended for this project.

### 3.1.6 A Review of the Archaeological Sites Inventory of Ocean County, 1978

The Archaeological Sites Inventory of Ocean County Project (Archaeological Sites Inventory of Ocean County 1978) identified all known prehistoric archaeological sites in Ocean County, New Jersey. The 1978 study was designed as a management tool for other researchers to identify areas of sensitivity with regard to prehistoric cultural resources in the county. The information compiled in this survey included artifacts recovered (temporal information if possible) by amateur archaeologists and collectors in the county as well as maps of the specific site locations (i.e.,

proximity to water) and current condition descriptions of the areas; developed vs. undeveloped and the potential for the destruction of the sites.

The recordation of the sites in Ocean County consisted of oral interviews with individuals familiar with artifacts collected in Ocean County. These interviews lead to the recordation of 99 sites (67 were coastal sites - east of the Garden State Parkway and 32 were inland sites - west of the Garden State Parkway) throughout the county. The team also visited some sites with the local informants but were unable to visit all 99 sites identified during the oral interviews. After viewing certain collections, the researchers photographed some of the collections (Waretown, West Creek, Tuckerton, Manahawkin, Barnegat, Jackson, New Egypt and Forked River) to record the temporal span of Native Americans living in Ocean County.

For this project research, sites were classified in one of four categories: a scattered find; shell midden; burial site; and collection. The definition of these categories were as follows. A scattered find refers to an area where only one artifact was found through surface collecting. A shell midden was defined as garbage heaps consisting of oyster shells, with some hard clam and ribbed mussel shells within the collection that were discarded by Native Americans. A burial site refers to an area where human bones were identified. The final designation, collection, refers to where a site was identified by individuals who collected an assemblage of projectile points and other stone tools.

A breakdown of the 99 sites recorded were as follows. Fifteen sites were identified as scattered finds, 13 sites were identified as shell middens, seven sites were recorded as burial sites and 62 sites were recorded as collections (two were the result of the Cross survey), one was recorded as a collection with a burial (Cross survey) and one did not record any artifacts or burials (Wilson Survey).

From the evidence gathered from the sites reviewed for this inventory survey, there is evidence that Ocean County was continuously occupied by aboriginal groups from the late Pleistocene or early Holocene times to European contact. The authors concluded that based on the number of sites that they recorded as part of their research, the potential for uncovering additional sites within Ocean County was likely.

Specific to the AT&T Project areas for this current study, the authors concluded that the coastline from Cedar Creek south to Tuckerton should be considered an area of sensitivity. This area covers the AT&T shortwave receiving station and antenna field at Manahawkin, and is only a few short miles south of the AT&T shortwave transmitting station and antenna field at Ocean Gate/Good Luck Point.

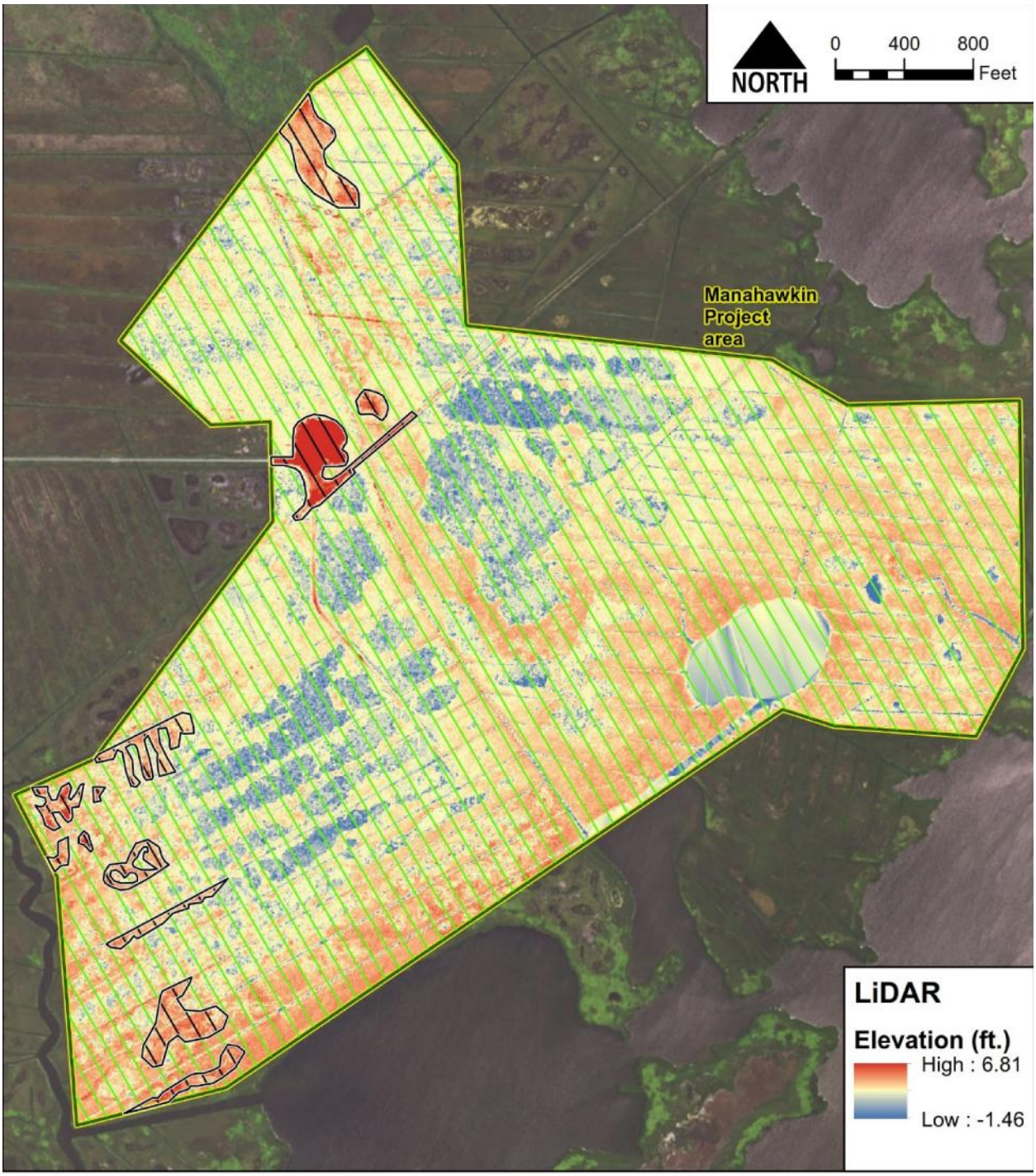
### 3.1.7 Predictive Modeling for Archaeological Sites

Background research indicates that the most common prehistoric sites that could be found in the project area would likely consist of open-air campsites that would be situated in proximity to wetlands. In fact, archaeological investigations in the Outer Coastal Plain Physiographic Province provide evidence that the majority of prehistoric sites are located within 300 feet of water and wetlands (Hasenstab 1991; Cavallo and Mounier 1982; Pagoulatos and Walwer 1991; Ranere and Hansell 1987). Settlement data from previously identified prehistoric sites also provides evidence that prehistoric sites are more likely to be situated in areas with well-drained soils, raised topography (islands - flat ground in the middle of the marshes), historic trails, and a good vantage point for hunting and protection (Pagoulatos and Walwer 1991). Areas of raised elevation and

well drained soils should be considered moderate to high potential for prehistoric sites (Figure 15 and Figure 16).

Over the last 20 years there have been increasingly more discussions on the Paleo environment of the Continental Shelf by prehistoric peoples. Sea levels have been rising which has altered the coastal environments from what they once were and as a result, what would have been the original coastline is now under water. These now inundated coastline areas would likely have been utilized by Paleoindians. Evidence for the early use of the Continental Shelf by the Paleoindians can be found in the discovery of Paleoindian projectile points washed up on coastal shores. Recently, likely as the result of Hurricane Sandy, three Paleoindian projectile points were recovered from three separate locations in New Jersey (Beach Haven, Seaside Heights and Long Beach) that are in close proximity to the AT&T shortwave receiving station and antenna field at Manahawkin and the AT&T shortwave transmitting station and antenna field at Ocean Gate/Good Luck Point. This information indicates that the present day coastal areas could have been used by Native Americans and have the potential for early Native American sites.

Historic archaeological sensitivity is based on the results of background research and a review of historic maps. A review of nineteenth-century maps indicates that development occurred surrounding the project area by at least the mid nineteenth century. However, the Project APE is almost exclusively located within wetland marshes. The 1872 Beers Atlas does show the position of Good Luck Station that was already established on the point but shows no roads or other structures surrounding this station. A review of twentieth-century maps and aerial photographs indicates that no substantial development has occurred within the APE until the AT&T facility was constructed. Based on an examination of historic maps and aerial photographs, the potential for significant historic period archaeological resources are considered to be low to moderate.

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|---|---|---|---|
| | | MAP BY: daniel.conn | LEGEND: **Sensitivity Model** |
| | | CHK'D BY: MP | High / Medium |
| Amec Foster Wheeler<br>Environment & Infrastructure<br>690 Commonwealth Center<br>11003 Bluegrass Parkway<br>Louisville, KY 40299 | amec foster wheeler | DATUM: North American 1983 | Low |
| | | PROJECTION: NAD 1983 StatePlane New Jersey FIPS 2900 Feet | Manahawkin Project area |
| | | SCALE: 1 in=800 ft | |

TIME: 2:58:23 PM
DATE: 12/21/2015
PROJECT #: 3617157355.81.01

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Imagery: ESRI, SSURGO

**Figure 15. Archaeological Sensitivity Map of the Manahawkin Project Area**

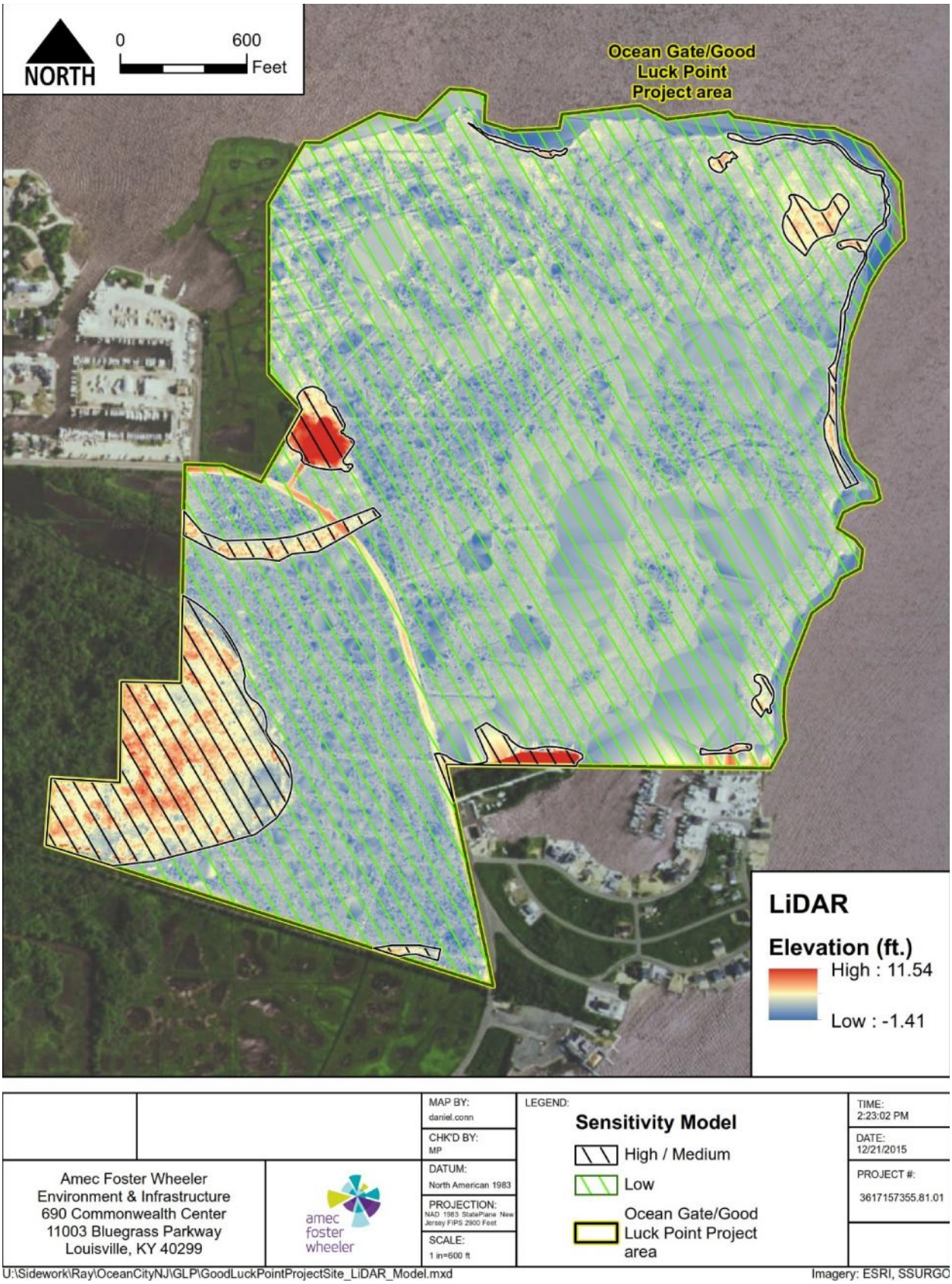


**Figure 16 – Archaeological Sensitivity Map of the Ocean Gate/Good Luck Point Project Area**

## 4.0 MANAGEMENT RECOMMENDATIONS AND POTENTIAL FOR ARCHAEOLOGICAL SITES

Amec Foster Wheeler understands that the proposed removal of poles and related materials at Ocean Gate/Good Luck Point would cause an adverse effect. This is based on the fact that the Ocean Gate/Good Luck Point Project area has been through the Certification of Eligibility process to the National Register of Historic Places in 2007 (AT&T Transmitter Building and Antenna Field [ID#4723]. Amec Foster Wheeler will support USFWS as needed with ACHP consultation and with the drafting of a two-party Memorandum of Agreement (MOA). At this time, USFWS is compiling a list of public constituencies that USFWS should contact to seek comment on the anticipated adverse effect on historic properties.

As for the Manahawkin Project area, this preliminary research recommends that the Manahawkin Project area possesses similar integrity when compared to the Ocean Gate/Good Luck Point Project area. Even though many of the poles are in a state of disrepair and several have fallen down into the marsh as a result of weathering decades of tidal surges and storms, the Project area's overall integrity, when compared to that of Ocean Gate/Good Luck Point's, suggests that the Manahawkin AT&T transmitter building and antenna field are also eligible for listing on the National Register of Historic Places under Criterion A and C.

The two proposed project areas encompass approximately 612 acres combined (Manahawkin, 390 acres and Ocean Gate/Good Luck Point, 222 acres) that are almost exclusively located on tidal marsh land. Portions of the Project areas may have also been submitted to infilling to raise the elevation. Because of this, a large portion of the project areas may not require any archaeological surveys. However, areas of slightly higher elevations, could have been used by prehistoric occupants as resource procurement locations.

The project areas have areas of moderate to high potential based on elevational data (Figures 15 and 16). Areas that are above sea level may have been areas of activity during prehistoric times and could have the potential for archaeological sites. If these areas are submitted to disturbance by the removal of the poles in the antenna field, they should be submitted to an archaeological survey. In addition, if the poles to be removed will only be cut and hauled away with little to no ground disturbance, then no archaeological testing is recommended. However, if the antenna poles are pulled from the ground, an archaeological monitor should be on site to monitor that no deeply buried archaeological sites are destroyed.

Amec Foster Wheeler recommends that once the proposed work plan for all ground disturbing activities is finalized, it should be reviewed for areas of high, medium and low archaeological potential. If the project design includes new ground alteration in areas of medium to high archaeological sensitivity, then an archaeological Phase IB testing survey and/or monitoring program would be recommended.

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# APPENDIX A

## Historic Property Inventory Forms

# BASE FORM

**Historic Sites #:**

**Property Name:** AT&T Transmitter Building and Antenna Field at Good Luck Point

**Street Address:** *Street #:* _____ *(Low)* _____ *(High)* *Apartment #:* _____ *(Low)* _____ *(High)*

*Prefix:* _____ *Street Name:* Bayview Avenue *Suffix:* _____ *Type:* _____

**County(s):** Ocean **Zip Code:** 08721

**Municipality(s):** Berkeley Township **Block(s):** 1206/1207

**Local Place Name(s):** AT&T Ocean Gate and/or Good Luck Point **Lot(s):** 1, 1.01/2.01, 2.02

**Ownership::** U.S. Fish and Wildlife Service **USGS Quad(s)** Seaside Park, NJ

**Photograph:**

**Description:** AT&T Ocean Gate/Good Luck Point contains an extensive, inactive shortwave antenna field that is comprised of hundreds of tall wooden poles distributed across the tidal marsh, in addition to cables, wires, metal towers, and concrete blocks. Associated with the antenna field is a shuttered, brick shortwave transmitter building. AT&T placed the shortwave facility into service in 1931, and it remained in service until 1999. The municipality owns the building itself, and the small tract of land that is occupied by the building and its paved parking lot. Under the call sign WOO, the shortwave facility at Good Luck Point (known as Ocean Gate) was a renowned transmitting station, which helped broadcast Voice of America around the globe after 1944 and enabled communication with ships at sea throughout the twentieth century. In 2007, the New Jersey SHPO certified that the historic property (AT&T Transmitter Building and Antenna Field, ID No. 4723) was eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the early implementation and expansion of ship-to-shore telephony, and under Criterion C as a substantially intact example of an early shortwave transmitter building with its associated antenna field.

**Registration and Status Dates:**

| | | | |
|---|---|---|---|
| National Historic Landmark: | | SHPO Opinion: | |
| National Register: | | Local Designation: | |
| New Jersey Register: | | Other Designation: | |
| Determination of Eligibility: | 7/30/2007 | Other Designation Date: | |

# BASE FORM

**Historic Sites #:**

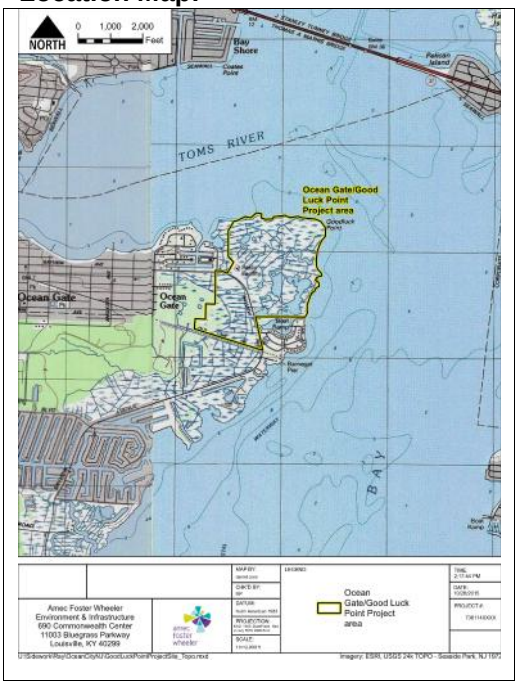
Survey Name:

Date: January 8, 2016

Surveyor:

Organization: Amec Foster Wheeler

**Location Map:**




**Site Map:**

**Bibliography/Sources:** Pasquariello, Raymond D. and David E. Breetzke, 2015, Phase IA Cultural Resources Assessment of the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37C) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey.

**Additional Information:**

**More Research Needed?** X☐ Yes ☐ No

**INTENSIVE LEVEL USE ONLY**

**Attachments Included:** X☐ Building ☐ Structure ☐ Object ☐ Bridge ☐ Landscape ☐ Industry

**Within Historic District?** ☐ Yes X☐ No

**Status:** ☐ Key-Contributing ☐ Contributing ☐ Non-Contributing

**Associated Archaeological Site/Deposit?** ☐ Yes
(Known or potential Sites – if yes, please describe briefly)

# BASE FORM

**Historic Sites #:**

**THIS PAGE TO BE COMPLETED ONLY AT INTENSIVE LEVEL**
**AND**
**ONLY IF PROPERTY IS A FARM COMPLEX**

**Historic Farm Name:** _____

**Period of Agricultural Use:** _____ To _____ **Source** _____

**Agriculture Type:** _____

**Remaining Historic Fabric** _____

**Acreage:** _____

**Farm Description:**

# BUILDING ATTACHMENT

**Historic Sites #:**

**Common Name:** AT&T Ocean Gate/Good Luck Point
**Historic Name:** Ocean Gate
**Present Use:** None
**Historic Use:** Shortwave radio transmission station from 1929 to 1999
**Construction Date:** 1929 **Source:**
**Alteration Date(s):** **Source:**
**Designer:** * **Physical Condition:** *
**Builder:** * **Remaining Historic Fabric:** *
**Style:** *
**Form:** * **Stories:** *
**Type:** * **Bays:** *
**Roof Finish Materials:** *
**Exterior Finish Materials** Brick and concrete

**Exterior Description:** The transmitting station was located on a tract of salt marshes that was unobstructed to the sea which made the location suitable for radio transmissions. In addition to the antenna, the transmitting station had a building that housed the transmitting sets and associated equipment that would link radio and wire circuits, and the auxiliary machinery necessary to operate the station. This building was constructed of 12-inch concrete block. All of these facilities were constructed only 18 inches above the high water line. The main building was constructed two stories high and with a small basement under one end for the heating plant. The foundation for the building was constructed of reinforced concrete to a depth of five feet below the natural grade. The basement was constructed to a depth of ten and a half feet below grade.

**Further detail, pending site visit.*

# BUILDING ATTACHMENT

**Historic Sites #:**

**Interior Description:** The information provided below is a brief history of the AT&T shortwave transmitting station at Ocean Gate/Good Luck Point and was synthesized from an article written in the *Toms River Courier* on March 14, 1930.

The first floor of the building housed the generators that would supply current for the transmitters and the transformers that raise the outside power supply to various required voltages, and other machinery. The heavy-duty transformers, were placed in vaults. In order to cool the system, a water-cooling system and large air blowers were also needed to cool the circulating water.

Also on the first floor was the "line terminal room" where the wire lines from the long distance office terminated. This room was completely sheathed in copper, to prevent the radio waves from the antennas, located outdoors, from coming back and impairing operation of the equipment in the room. All of the machinery on this floor was insulated with cork to avoid any vibration from their operation that would have disrupted their delicate radio equipment.

The second floor was where the transmitting sets were housed. The rectifier was located in the back of the building that was used to convert the alternating current from the outside power source into the direct current required in the vacuum tubes.

The two antennas were the "curtain" type and consisted of networks of wires in the form of coarse-mesh curtains suspended from 70-foot poles, the line poles broadside to the direction of transmission to give a highly "directional" transmission.

The signals from this facility covered a range over which the antennas could transmit and cover the principal steamship lanes to Europe. The efficiency of each antenna was further increased by suspending a similar curtain behind the active one. This served to reflect radio energy that ordinarily would have gone toward the west with full power.

**Further detail, pending site visit.*

**Setting:** In 1929, AT&T selected and subsequently developed the Ocean Gate/Good Luck Point Project area as a high-frequency, shortwave radio transmitting station that was designed to provide telephone ship to shore service and to overseas locations. The station was identified as Ocean Gate Radio that operated under the call sign WOO (Whiskey Oscar Oscar). The original installation included a large array of curtain antennas. In the mid-1950s, the curtain array was replaced by a cluster of rhombic antennas.

In addition to the high-seas service, Ocean Gate Radio transmitted for 70 years to Paris, Frankfurt, Santiago, London, Buenos Aires, San Juan, Panama, Bermuda and Rio di Janeiro. Ocean Gate's companion location, constructed in the late 1930s, was the shortwave receiving station at Manahawkin.

Located 10 miles south, below Forked River, Manahawkin was the main receiver facility for WOO and the U.S. terminal for the sole undersea cable from Bermuda. The later development of numerous undersea cables across the Atlantic and the expansion of satellite communication led to the closure of Ocean Gate/Good Luck Point and Manahawkin in 1999 (Mounier 1990).

# BASE FORM

**Historic Sites #:**

**Property Name:** AT&T Receiver Building and Antenna Field at Manahawkin

**Street Address:** *Street #:* _____ *(Low)* _____ *(High)* *Apartment #:* _____ *(Low)* _____ *(High)*

*Prefix:* _____ *Street Name:* Beach Avenue *Suffix:* _____ *Type:* _____

**County(s):** Ocean **Zip Code:** 08050

**Municipality(s):** Stafford Township **Block(s):** 296

**Local Place Name(s):** AT&T Manahawkin **Lot(s):** 63, 108

**Ownership::** AT&T **USGS Quad(s)** Seaside Park, NJ

**Photograph:**

**Description:** AT&T Manahawkin is the companion site to the National Register Eligible AT&T Transmitter Building and Antenna Field at Good Luck Point. AT&T Manahawkin consisted of a shortwave receiving station and antenna field of more than one hundred poles, as well as metal antennas, distributed across the tidal marsh. Via Manahawkin, shortwave communications from ships at sea were linked to America's telephone network from the 1930s until 1999.

**Registration and Status Dates:**

National Historic Landmark: _____ SHPO Opinion: _____

National Register: _____ Local Designation: _____

New Jersey Register: _____ Other Designation: _____

Determination of Eligibility: _____ Other Designation Date: _____

Survey Name: _____ Date: January 8, 2016

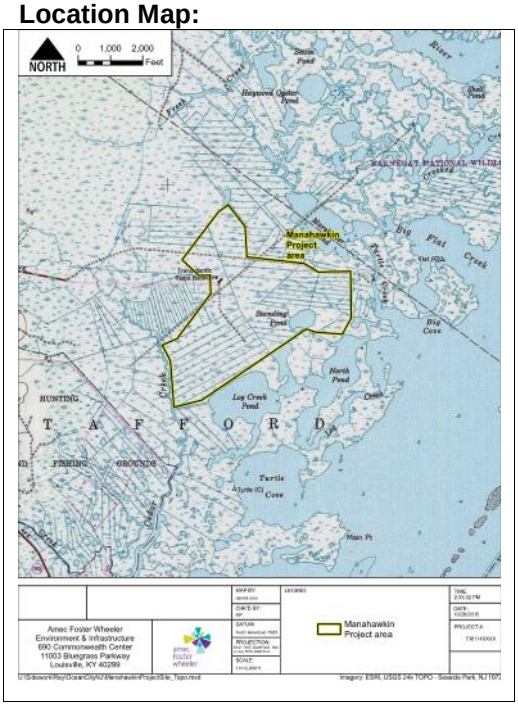
Surveyor: _____

Organization: Amec Foster Wheeler

# BASE FORM

**Historic Sites #:**

**Location Map:**




**Site Map:**

**Bibliography/Sources:** Pasquariello, Raymond D. and David E. Breetzke, 2015, Phase IA Cultural Resources Assessment of the Marsh Enhancement and Pole Removal Hurricane Sandy Resiliency Project #37 (37C) for Ocean Gate/Good Luck Point and Manahawkin, Ocean County, New Jersey.

**Additional Information:**

**More Research Needed?** X☐ Yes ☐ No

**INTENSIVE LEVEL USE ONLY**

**Attachments Included:** X☐ Building ☐ Structure ☐ Object ☐ Bridge
☐ Landscape ☐ Industry

**Within Historic District?** ☐ Yes X☐ No

**Status:** ☐ Key-Contributing ☐ Contributing ☐ Non-Contributing

**Associated Archaeological Site/Deposit?** ☐ Yes
(Known or potential Sites – if yes, please describe briefly)

# BASE FORM

**Historic Sites #:**

**THIS PAGE TO BE COMPLETED ONLY AT INTENSIVE LEVEL**
**AND**
**ONLY IF PROPERTY IS A FARM COMPLEX**

**Historic Farm Name:** _____

**Period of Agricultural Use:** _____ To _____ **Source** _____

**Agriculture Type:** _____

**Remaining Historic Fabric** _____

**Acreage:** _____

**Farm Description:**

# BUILDING ATTACHMENT

**Historic Sites #:**

**Common Name:** AT&T Manahawkin
**Historic Name:** AT&T Manahawkin
**Present Use:** None
**Historic Use:** Shortwave radio receiver station from 1938 to 1999
**Construction Date:** 1938 **Source:**
**Alteration Date(s):** **Source:**
**Designer:** * **Physical Condition:** *
**Builder:** * **Remaining Historic Fabric:** *
**Style:** *
**Form:** * **Stories:** *
**Type:** * **Bays:** *
**Roof Finish Materials:** *
**Exterior Finish Materials** *

**Exterior Description:** ***Pending site visit.***

**Interior Description:** ***Pending site visit.***

**Setting:** By the late 1920s, studies had indicated that improvements were needed to improve radiotelephone communications from ship-to-shore that could handle the increased communication traffic. A new system (MUSA – Multiple Unit Steerable Antenna) had been developed by Bell Telephone Laboratories that with its associated apparatus, MUSA would allow clearer radio circuits and would add more time to the radio day (i.e., the time in a day during which the channels are available commercially). MUSA was especially important because now it was possible to monitor the incoming radio waves, provide a selective system for their reception, and furnish the means for combining the waves into a single telephone circuit. For radiotelephone communications, this was extremely important and greatly improved communications over long distances. To do this it was necessary to use a number of rhombic antennas, in fact, the more antennas used the better the results or the sharper the "steering" (Hoyt 1939:4 and 5; Fink and Bennett 1930).

This new MUSA communication system required a new and improved antenna array. The length of the new antenna system, along with other technical requirements made it necessary to find a new location for this new system. The transatlantic short wave receiving station at Netcong, New Jersey could not handle this new system. The receiving station at Forked River, New Jersey was also reviewed as an alternative location but was also found to be inefficient for the needs of the new system. For these reasons, in December 1936, The Maritime Division of the American Telephone and Telegraph Company (AT&T) began searching for a suitable location for the new MUSA antenna system (Borthwick 1939).

# BUILDING ATTACHMENT

**Historic Sites #:**

The land requirements that needed to be met included: an area three miles square which needed to be free of roads, electric railroads, power lines, towns, and all sources of interference (Weber 1938). In addition, the land should be as level as possible and the area should have a uniform water table. After review of 25 potential locations in Long Island and New Jersey, were field reviewed and then submitted to legal for potential land costs, a location in Manahawkin, New Jersey was chosen as a suitable location in the salt marshes of New Jersey (Borthwick 1939).

The task to build the communication facility and antenna array proved to be a challenge. Construction of the roads, buildings and antenna system began in 1938. First, roads were required to access the new property. Due to the marshy conditions in this part of New Jersey, the roads were built to float on top of the marsh. This type of road was constructed in this manner. First, a covering of pine planks was put down. Next, salt hay was laid on top of the pine planks and then a sod wall was built to keep the plank and hay road material together. This road construction made the road rise about three feet above the surface of the marsh (Fink and Bennett 1939).

The construction of the receiver building and garage also proved to have their own challenges. Because of the constant changing water levels, muck, and sand. The buildings were constructed on yellow pine “piles” that were driven deep into the salt marsh. The tops of these clusters of piles were at about the marsh surface. Above the piles were caps of concrete. The floor of the buildings were then tied together by a grid system of reinforced concrete beams which rests on these concrete caps (Fink and Bennett 1939).

Because the receiving station was constructed out in an open marsh, it was susceptible to strong winds and driving rain. Because of this, it was particularly important to construct the receiving building in such a way as to withstand moisture from the sides as well as the roof. Therefore, the brick outside walls of the station were painted with waterproofing cement. Another way of keeping the moisture out was to create a space between the outer wall and the inner wall two-and-a-half inches. This would allow any water or moisture penetrating the outer wall to run down this open space to an area below the floor so as to avoid corrosion and mold issues inside the receiving station. In addition to these measures, an overhanging ornamental iron cornice gutter protruded approximately two feet from the face of the walls. This protected them from heavy rains by acting as a small canopy or visor. In addition, to withstand weather conditions at the shore, the roof had been made of copper (Fink and Bennett 1930; 1939). The main building, incidentally, was heated by a hot water circulating system which included an oil burner.

The construction of the antenna system proved to have its own set of construction issues. The transmission array required the erection of sixty-eight poles with guy wires and anchors. The antenna system was a “rhombic” (diamond shape) antenna which is a broadband directional wire antenna used in the high frequency or shortwave band. The antenna system consisted of one to three parallel wires suspended above the ground in a diamond shape, supported by poles at each vertex to which the wires were attached by insulators (Bennett and Moroze 1939).

On the Manahawkin Project area, 16 rhombic antennas, consisting of 64 poles (four poles for each antenna), were placed end to end over about two miles. The poles were approximately 65 feet above ground and were set in the diamond shape about 600 feet long. To erect the poles in the muck of the salt marsh, it was necessary to first remove as much muck as possible, then, stand the pole in the hole, and then with high pressure water force the sand and clay out until proper depths (between nine to ten feet) were achieved and the pole settled. Depending on its location in the individual antenna, each pole was permanently braced with one or three guy wires to secure it in place (Bennett and Moroze 1939).

Each of the rhombic antennas required a coaxial cable for the transmission lines connected to the receiving equipment in the building. The transmission lines were laid underground (approximately 30 inches deep) to avoid temperature changes which would have had an adverse effect on transmission of the radio waves. Due to the marsh environment and in order to protect the copper pipe from corrosion, it was necessary to have the lines covered by an application of heavy layers of coal tar enamel. This was then reinforced with an asbestos wrap (Bennett and Moroze 1939).

Since the station was originally constructed, additional antennas have been added to the array. The addition of the antenna resulted in an even higher number of transmissions from both ship-to-shore and land transmissions all over the world. In fact, the stations in New Jersey were critical in communications to Europe. During World War II, the station at Ocean Gate/Good Luck Point was under armed guard. Messages that were transmitted from the Ocean Gate/Good Luck Point station were critical to the war effort (Ocean County News Journal 1976).

# BUILDING ATTACHMENT

**Historic Sites #:**

Survey Name:

Date: January 8, 2016

Surveyor:

Organization: Amec Foster Wheeler

# APPENDIX H

# DRAFT FONSI

**NEPA - Finding of No Significant Impact (FONSI)**

**Marsh Enhancement Design/Build Project**
**Edwin B. Forsythe National Wildlife Refuge, Ocean County, NJ**

**August 2016**

The Edwin B. Forsythe National Wildlife Refuge (refuge) consists of more than 47,000 acres, and is owned and managed by the U. S. Fish and Wildlife Service (Service). The proposed project is the enhancement and/or restoration of approximately 500 acres of coastal marsh habitat (Project) at six separate locations within the refuge that have been selected for their long history of anthropogenic alterations, their advanced state of degradation, and their vulnerability to sea level rise and other stressors. The Project areas include:

- Brick Township Project Area - Located in Brick Township, Ocean County and is divided into two distinct regions: Brick Project Area A and Brick Project Area B.
    - Brick Project Area A - 42 acres on multiple lots within Blocks 68 and 68.02.
    - Brick Project Area B. 62 acres on multiple lots within Blocks 109 and 195.
- Good Luck Point Project Area - 19 acres located within Berkeley Township, Ocean County and is identified as Block 1206, Lots 1 and 1.01.
- Stouts Creek Project Area - 127 acres located within Lacey Township, Ocean County and covers multiple lots within Blocks 520 and 630.
- Forked River-Wrangle Creek Project Area – 17.5 acres located within Lacey Township, Ocean County and covers a small portion of Block 315, Lot 38.02.
- Barnegat Project Area – 226 acres located within Barnegat Township, Ocean County and covers multiple lots within Blocks 208 and 239.

In some areas of the refuge, increase in water levels (i.e., sea level rise) and prolonged duration of inundation have led to a decrease in plant density (die-back). While tidal marsh plants are able to tolerate some waterlogging, excessive saturation can cause soil oxygen deficiency, which impacts plant growth and functions such as stomatal opening, photosynthesis, water and mineral uptake, and hormonal balance (Tiner 1999). In addition to the direct effects that the hydroperiod has on plants, there are secondary effects that can impact plant productivity, such as changes to marsh soil chemistry (e.g. redox potential, nutrient delivery). Additional stressors on the marsh include thousands of miles of grid ditches that were created in New Jersey's saltmarshes in the early 20th century to reduce the mosquito population by draining standing water where mosquitos bred (USFWS 2015a). The impacts of ditching on salt marshes included a decrease in the time flood

waters took to recede off the salt marsh platform, a decrease in the temporal scale of standing water in the marsh platform during ebb tides, vegetation changes, and associated impacts on fish and bird habitat.

The proposed action includes increasing the marsh surface elevation to reduce vegetation die-back due to prolonged inundation and improve rates of accretion, altering hydrologic conditions to promote optimal tidal flow, and addressing the negative impacts of anthropogenic structures (e.g., roads, berms, defunct water control structures (WCSs), dikes, undersized culverts) or actions (e.g., grid-ditching, salt hay farming, and erosion). The purpose of this Project is to increase the resiliency of the salt marsh against the detrimental effects of impending sea level rise, past storm events, and other environmental stressors such as culverts, dikes, etc. upon coastal marshes.

Management of the salt marshes to counteract these negative effects is necessary to uphold the Service's mission to the public regarding conservation and protection of fish and wildlife resources, as well as the conservation of extremely sensitive and highly important salt marsh habitat.

The appropriate State, Federal and local regulatory approvals for the proposed action are being sought by the New Jersey Department of Environmental Protection (NJDEP), the United States Army Corps of Engineers (USACE), and the Ocean County Soil Conservation District (OCSD).

The preferred alternative, Alternative A, was found to meet the project goals and objectives with a minimum amount of environmental disturbance, while providing the desired ecological enhancement to the marsh for wildlife, and protecting the salt marsh against the detrimental effects of impending sea level rise. The alternatives considered but eliminated, Alternative B, were originally considered as part of data gathering efforts, but were removed from consideration due to disqualifying factors such as cost effectiveness and limited funding for this Project. The no action alternative, Alternative C, was dismissed from further consideration because it would not produce the desired ecological enhancement of the marsh, and would perpetuate the continued deterioration, resulting in a loss of vital habitat that could have detrimental impacts on migrating birds that rely on salt marsh communities for foraging, reproduction and survival. Thus, the no action alternative would not fulfill the proposed action's purpose and need.

The Marsh Enhancement Design/Build Project EA was released for a 30-day public review period in xxx 2016. A public meeting was held……*[to be completed upon completion of public review and comment period]*

I have reviewed the anticipated beneficial and adverse impacts of the preferred alternative presented in Chapter 4 of the EA, and compared them to the alternatives. I reviewed the context and intensity of those predicted impacts over the short- and long-term, and considered the cumulative effects. The review of each of the NEPA factors was conducted to assess whether there will be significant environmental effect resulting from the proposed action in accordance with 40C.F.R. 1508.27.

The proposed action would have long-term beneficial impacts to the salt marsh system by restoring salt marsh bottom elevations and/or altering hydrologic conditions so that prolonged inundation would be reduced, thereby reducing vegetation die-back and improving rates of accretion. The overall effect would be the restoration of ecological function/habitat value of the salt marsh.

Direct and indirect adverse impacts of the proposed action would be localized and short-term in nature, limited to the period of site activities that involve dredging, excavation of sections of dike walls, culvert installation, and the laydown of sediment. This includes the temporary loss of existing vegetation, short-term impacts to water quality, and temporary displacement of wildlife due to construction activity, construction noise, and land disturbance.

Based on the review of the information presented in this document and the analyses contained in the supporting Environmental Assessment, I find that the implementation of the Preferred Alternative (Alternative A) for the Marsh Enhancement Design/Build Project within the Edwin B. Forsythe National Wildlife Refuge will not have a significant impact on the quality of the human environment, in accordance with Section 102(2)(c) of NEPA. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant adverse impacts. Accordingly, the preparation of an Environmental Impact Statement for this action is not required, and this FONSI is appropriate and warranted.

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Scott B. Kahan, Regional Chief
National Wildlife Refuge System Date
U.S. Fish and Wildlife Service