FINAL ENVIRONMENTAL ASSESSMENT FOR THE GANDY'S BEACH/MONEY ISLAND LIVING SHORELINE PROJECT

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The Draft Environmental Assessment (EA) was available for public review and comment for 30 days on Downe Township's website (http://www.downetwpnj.org/) starting on July 22, 2015. No comments were received and the Draft EA has been published as the Final EA by the U.S. Fish and Wildlife Service (Service). Therefore, an Environmental Impact Statement (EIS) will not be prepared and a Finding of No Significant Impact (FONSI) has been issued by the Service. See Section 9 of this EA.

1. INTRODUCTION

The Nature Conservancy's (TNC) Gandy's Beach Preserve (Preserve) includes 2,700 acres of tidal and non-tidal wetlands, upland forests, and old agricultural fields in Downe and Lawrence Townships, Cumberland County, New Jersey (Appendix A-1, A-2, A-3, and A-4). Approximately one mile of the Preserve consists of Delaware Bay shoreline that is important habitat for spawning horseshoe crabs (*Limulus polyphemus*) and foraging migratory shorebirds, such as the red knot (*Calidris canutus rufa*).

Federal funding for a Resiliency Project from the Disaster Relief Appropriations Act of 2013 (Public Law 113-2) was awarded by the Service to TNC to construct 3,000 linear feet of living shoreline. The purpose of the living shoreline is to stabilize shoreline habitats used by red knots and horseshoe crabs; buffer local infrastructure and residences from further erosion; and increase oyster reefs to benefit ecologically and economically important fish and crab species. The living shoreline will consist of nearshore oyster reef breakwaters and coir biologs. Other partners include the Partnership for the Delaware Estuary (PDE) and Rutgers University's Haskin Shellfish Research Laboratory (HSRL).

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852; 42 U.S.C. 4321 et seq.). The purpose of this EA is to analyze the potential environmental impacts of the Gandy's Beach/Money Island Living Shoreline Project (preferred action), alternatives, and potential cumulative effects from past and proposed projects.

2. PURPOSE AND NEED

2.1 Proposed Project

Shoreline erosion and degradation of beaches and tidal marsh habitats is of primary concern to TNC and our partners across New Jersey. The latest report summarizing the status and trends of wetlands in the United States by the Service estimates that coastal watersheds lost 80,000 acres of wetlands annually from 2004 to 2009 (Dahl 2011). In addition, the loss and degradation of beaches adversely impacts the horseshoe crab and migratory shorebird habitat in the Delaware Bayshore. In the wake of Superstorm Sandy, it is critical that we protect and restore our coastal habitats to ensure they are able to continue to function as natural buffers and habitat for wildlife.

Field observations and historic aerial images at the Preserve indicate that significant shoreline erosion has reduced the acreage of beaches and tidal marshes, and degraded the habitats that still remain (Appendix A-5). TNC has estimated shoreline retreat on the natural

shoreline at the Preserve to be about 500 feet between 1930 and 2007. The living shorelines will help stabilize approximately 3,000 linear feet of beach and tidal marsh shorelines.

The goal of the Gandy's Beach/Money Island Living Shoreline Project (the preferred action) is to enhance the resiliency of tidal marsh, beach, and oyster reef habitats to the impacts of sea level rise and more frequent and intense storms. This project will protect and restore habitats to provide a full suite of ecosystem services to the wildlife and human communities within the project area. A combination of living shoreline and habitat restoration techniques, when applied together, may reduce the impacts of sea level rise and storms as habitat condition and function are restored.

More specifically the goals of this project include:

1) Attenuate wave energy to reduce the rate of shoreline retreat along the Preserve's natural shoreline to enhance the habitat value of the shoreline for target species such as fish and crabs, horseshoe crabs, and migratory shorebirds.
2) Increase three-dimensional oyster habitat nearshore of the Preserve to provide unique habitat for ecologically and economically important fish and crab species.
3) Serve as a demonstration project for the use of various living shoreline techniques in enhancing the resiliency of coastal habitats, specifically tidal marshes, beaches, and oyster reefs to the impacts of sea level rise and coastal storms.
4) Enhance beach and tidal marsh habitats at strategic locations to help buffer infrastructure and residences in the towns of Money Island and Gandy's Beach in Downe Township.

To accomplish these goals, the project will apply multiple living shoreline techniques within the project areas and within a gradient of wave energy environments. The techniques employed by the project include nearshore oyster breakwaters constructed of shell bags and oyster castles that recruit oysters, and coir biolog installations along the existing salt marsh edge to stabilize the marsh. The effects of these different breakwaters on wave energy attenuation, coastal habitat composition, fish usage, and oyster recruitment will be monitored before and after the project.

The objectives of Service-funded Hurricane Sandy Resiliency projects are to provide technical and financial assistance to identify, protect, conserve, manage, enhance, or restore habitat and infrastructure on both public and private lands that have been negatively impacted by Hurricane Sandy. This project will enhance shoreline and intertidal habitats, while buffering surrounding communities from storm impacts.

2.2 Other Projects

Other projects have taken place or are being proposed within and in the proximity of the project area. Last year, a living shoreline project was installed by PDE within the Preserve. The U.S. Army Corp of Engineers (USACE), Downe Township, and the American Littoral Society (ALS) have all proposed projects consisting of beach restoration and other shoreline improvements that may occur in the near future. The New Jersey Department of Environmental Protection (NJDEP) has been leading an effort to coordinate these projects.

NJDEP has collected information on all of the projects occurring along Downe Township's shoreline, such as project location, areas of impact, goals, scope, lead contacts, and project schedule. They hosted a meeting with all involved on August 4, 2015 and released this information to all stakeholders. Bi-monthly calls will be scheduled to coordinate these projects.

In 2014, PDE installed two small living shoreline projects within the Preserve in Money Island. The living shoreline projects utilized coir logs, ribbed mussel augmentation, and *Spartina alterniflora* plantings to buffer eroded tidal marsh edges within the Preserve and adjacent to the road leading to the town of Money Island. The projects have been successful in reducing the vulnerability of the roads to additional erosion. These projects will not negatively impact the preferred action's proposed living shoreline at Nantuxent Creek. The projects will most likely be complementary in reducing the vulnerability of Bayview Road to erosion.

The USACE has initiated a feasibility study to reduce flooding due to major storm events along the shoreline of the community of Gandy's Beach, east of the Preserve. The USACE has produced a Federal Interest Determination Report outlining a plan to construct a sand berm but this project may not be acceptable to regulatory agencies due to environmental impacts. The study will conclude in 2016 and will consist of an EA for the selected alternative, a Project Management Plan for the design and implementation phase of the project, and other supporting plans to complete the Feasibility Report. The project is expected to begin within five years and may overlap with the preferred action along the westernmost end of the Gandy's Beach seawall. It is also possible that beach renourishment activities may extend further west along the Preserve. More information about this project is available on USACE's website: http://www.nap.usace.army.mil/Missions/CivilWorks/DowneTownshipFloodRiskManagement.aspx.

Downe Township has been funded by a National Fish and Wildlife Foundation (NFWF) Hurricane Sandy Coastal Resiliency Grant to develop designs for a shoreline stabilization project in front of the community of Gandy's Beach. The current conceptual scope of the project is to renourish the beach, construct jetties or breakwaters to keep the sand in place, build a water and sewage treatment facility, repair bulkheads, create a fishing area and boat access, and build a parking area and public restrooms. This project has not been assessed for environmental impacts. Downe Township's Gandy's Beach Project may overlap with the preferred action within the Preserve along the westernmost end of the seawall.

Downe Township is also proposing a shoreline stabilization project in the community of Money Island, which is not part of the NFWF project, and will contain the same project components as the Gandy's Beach project. The bulkhead portion of Money Island Project has been planned since 2009 and is funded by a grant from the New Jersey Department of Community Affairs. The new bulkhead will replace the existing bulkhead, which is in disrepair, and extend it northward. This portion of the project would likely occur within the next few years. Another component of Downe Township's Money Island project is to construct a water and sewage treatment facility for the entire community. Downe Township's Money Island project areas will not overlap with the preferred action.

TNC and the Service met with Downe Township regarding the coordination of their projects on June 30, 2015. More information about Downe Township's proposed projects is available on the township's website: http://www.downetwpnj.org/.

ALS has also received a NFWF Hurricane Sandy Coastal Resiliency Grant to do a beach restoration project along the Preserve's shoreline. The project would add sand to the beach, which would push the low tide line seaward. TNC and project partners have been communicating with ALS regarding the coordination of these projects. If constructed, the beach restoration project will not affect the construction of the first phase of the project during 2015. ALS, TNC, and the Service have met to coordinate their projects on October 31, 2014 and March 23, 2015. The earliest this project will take place is in the fall of 2015. The Service has participated in weekly calls with ALS as a partner to their NFWF-funded beach restoration projects since September 2014. If the beach restoration project occurs during the winter of 2015-2016 and affects breakwater placement, modified plans will be submitted to permitting agencies for review. More information about ALS's projects is available on their website: http://www.restorenjbayshore.org/.

3. ALTERNATIVES

3.1 Alternate 1- No Action Alternative

As a result of the No Action Alternative, the Service grant would not be used for the construction of this project. The No Action Alternative would potentially prevent project partners from carrying out the preferred action. This would effectively result in continued erosion of the shoreline and adjacent properties. This action does not fulfill the purpose and need of the project.

3.2 Alternate 2- Preferred Action

The preferred action is to construct approximately 3,000 linear feet of living shoreline along the Preserve's shoreline in order to stabilize shoreline habitats used by red knots and horseshoe crabs; buffer local infrastructure and residences from further erosion; and increase oyster reefs to benefit ecologically and economically important fish and crab species. The living shoreline will be comprised of nearshore oyster breakwaters constructed of shell bags and oyster castles that recruit oysters, and coir biolog installations along the existing salt marsh edge.

Summary of Actions:

This site is split into two main project areas (Appendix B). The first project area is located along the shoreline of the Preserve between the communities of Money Island and Gandy's Beach and will be referred to as the Preserve project area. It is divided into five sites called detail plans 1-5. The second project area is located along the southern bank of Nantuxent Creek, upriver of the Money Island Marina, and will be referred to as the Nantuxent Creek site.

This project will be constructed in two phases. The first phase of construction will begin September 2015 and will continue to the end of October 2015. The second phase of the project will occur from April 1 to 15, 2016 and from June 15 to November 8, 2016. No construction will occur during the red knot spring migration season from April 15 to June 15. All project components that are part of the first phase and are not completed by the end of October 2015 will be completed during the second phase of the project. All construction activities will end by November 8, 2016. Depending on the results of monitoring the first phase of the project, the materials used for the second phase may change from oyster castle and/or shell bag to all oyster castles or all shell bags.

Materials will be delivered in pallets by truck either to the Money Island Marina (192 Bayview Road, Newport, New Jersey), Jimmy Allen's property (202 High St. Leesburg, New Jersey), Boat World Marina (69 River Road, Leesburg, New Jersey), or an approved equivalent. If the materials will be used at the Nantuxent Creek site, they will be delivered and stored in the Money Island Marina's parking lot, which will be used as the staging area for this site. If the materials are going to the Preserve project area, the pallets will be transferred to a barge with a crane. The materials will be dropped off into the intertidal zone as close to each project area's designated staging areas as possible. Barges will not touch the bay floor. One to four deliveries by barge will be required for each of the six sites, which include the Nantuxent Creek site and the Preserve's five detail plan areas. All construction will occur in the intertidal zone and along the low tide line. Water quality will not be negatively impacted as a result of this project. During construction, turbidity may increase in the project area, but will quickly subside after construction is complete.

There will be at least a five-foot gap between each of the breakwaters in order to allow marine organisms to move freely through the site and to allow for water currents to freely flow. The placement of the breakwaters may vary slightly from the designs by the angle and location along the low tide line. In some sites, some of the breakwaters may be angled differently than depicted in the designs in order to attenuate waves coming from multiple directions or to find level ground. The straight line of breakwaters depicted in the design may be staggered along the low tide line in the as built survey, with some breakwaters a few feet lower and others a few feet higher than the low tide line.

Gandy's Beach Preserve Site- The Preserve site has been divided into five detail plan areas (Appendix B-1 and Appendix B-2). Detail plans one through three will be constructed during phase one and detail plans four and five will be constructed during phase two. The living shoreline will be constructed from oyster castle pods, shell bag breakwaters, and coir biologs. The seaward breakwaters are located with their seaward toe around the mean low water line. This provides the maximum wave protection under daily wave conditions and water levels while minimizing each castle's footprint. Detail plan one will use all three types of living shoreline and the four other detail plans will use oyster castle pods and shell bag breakwaters. The ends of each detail plan area will have a navigation warning aid that meets U.S. Coast Guard (USCG) requirements.

The oyster castle pod configurations at the Preserve site are: 1) large pods measuring 30 feet by 10 feet at the base, tapering to a 4-foot crest width a height of approximately 3 2/3 feet, and constructed from 1,307 oyster castles; and 2) small pods measuring 20 feet by 10 feet at the base, tapering to a 4-foot crest width at a height of approximately 3 2/3 feet, and constructed from 20 oyster castles. The shell bag breakwater configurations are 1) large shell bag breakwaters measuring 30 feet by 5 feet at the base, tapering to a 2-foot crest with a height of approximately 4 feet, and constructed from 64 shell bags and 120 sand bags; and 2) small shell bag breakwaters 30 feet by 3 feet at the base, tapering to a 2-foot crest with a height of approximately 2 feet, and constructed from 480 shell bags and 30 sand bags (Appendix B-2).

Detail plan five, which is located at the southernmost end of the site at the end of the Gandy's Beach seawall, is included in the design, but it is likely that this portion of the project will not be installed during the one and a half year timeframe for this project or will not be installed at all due to multiple overlapping projects being proposed by different organizations at this location. Projects have been proposed by USACE, Downe Township, and ALS. TNC is in communication with these organizations and other stakeholders to develop a comprehensive plan for this area.

Nantuxent Creek Site- This project area is privately owned. TNC has a written agreement that they are allowed to construct, maintain, and monitor the living shoreline project at this site (Appendix C). The design of this project is based on successful projects implemented along the Maurice River in New Jersey by PDE and the HSRL. The living shoreline will be constructed from oyster castles and coir logs. Specific quantities are listed in Appendix B-1 and Appendix B-3. The oyster castles will be arranged into different shaped pods: "T," "V," small, medium, and large pods (Appendix B-3). If permits are received by August, this site will be constructed during phase one. If permits are not received until September, this site will be constructed during phase two to ensure that there is an adequate spat set during the first year of deployment.

Oyster castle pod configurations:

"T" Oyster Castle Pod- As the name implies, this shape resembles a "T" when viewed from above. The measurement along the top of the "T" is approximately 4.2 feet at the base and approximately 4.2 feet along the stem at the base. The "T" is two blocks high measuring approximately 1.2 feet from the ground and built using nine blocks total.

"V" Oyster Castle Pod- The "V" shaped oyster pod is composed of 11 blocks over two layers. The base of the pod, as measured from point to point, is approximately 6 feet. When measured from the vertex to the point, the pod is approximately 3 feet. The two-layer pod measures approximately 1.2 feet high from the ground.

Small Oyster Castle Pod- The small oyster pod is a simple pyramid constructed using five blocks total. The base of the pod is a square measuring 2 feet by 2 feet (two blocks by two blocks) with a singular block stacked in the center.

Medium Oyster Castle Pod- The medium oyster pod has a rectangular footprint measuring 6 feet long by 3 feet wide. The pod is composed of three layers of concrete blocks, approximately 1.5 feet high, stacked in a pyramid tapering to a crest layer of 4 feet long by 1 foot wide. Prior to the placement of the blocks, a foundation stability mat and crushed stone may be placed in the footprint of the pod if substrate conditions are a concern for settlement. The top two layers are joined together using a marine grade concrete adhesive to prevent top course of blocks from being displaced due to waves or ice.

Large Oyster Pod- The largest oyster pod proposed is a four-layer pyramid with a rectangular footprint measuring 20 feet long by 4 feet wide. The pod is approximately 2 feet high and tapers to a crest 17 feet long by 1 foot wide. Similar to the medium pod, the large pod may require the installation of a foundation stability mat and crushed stone prior to block placement should substrate conditions be of concern for settlement. A marine grade concrete adhesive will also be used to join the top two layers of concrete blocks to prevent the top course of blocks from being displaced due to waves or ice.

Feature Descriptions

Oyster Castle Pods- Oyster castles are prefabricated concrete blocks specifically designed to attract and foster oyster settlement and are manufactured by Allied Concrete Company in Charlottesville, Virginia. Each oyster castle is 1 foot by 1 foot, 8 inches high, and 2 to 3 inches thick (Appendix B-2). The castles are hollow on the inside with a notch cut into each side to allow the blocks to lock together. The oyster castles shall be installed in accordance with manufacturer's recommendations and stacked to achieve maximum interlocking. The top two courses of the oyster castle pods will be adhered together with Sikadur 33 high-strength, rapid curing epoxy paste, as manufactured by Sika Corporation, or an approved equal. The top tiers of the Preserve's oyster castle pods will only be one unit thick, containing only perimeter blocks and no interior blocks, in order to minimize the number of castles and epoxy required to glue them together. If soft sediments are encountered, the medium and large oyster castle pods will be placed on top of .75 to 3 inches of clean crushed stone bedding layer and a Grid Composite System (GCS) from Maccaferri, Inc. or approved equivalent.

Shell Bag Breakwaters- The shell bag breakwaters may be comprised of entirely of shell bags or will have a sand bag core with shell bags on the exterior (Appendix B-2). Sand bags shall be made from woven polypropylene, polyethylene, or polyamide fabric. All sand bag fill material shall be non-cohesive permeable material free from clay and deleterious material.

Each shell bag will be comprised of cured oyster shell, clam shell, or whelk shell in a 6-inch diameter and 12-inch long shell bag with a 0.75-inch by 0.62-inch hole size. The shell bags may be assembled into shell tubes, 1 foot by 1 foot by 3 feet for small shell bag breakwaters (12 shell bags) and 1 foot by 1 foot by 4 feet for large shell bag breakwaters (16 shell bags). The shell tube bags will be comprised of knotted #96 three-strand twisted twine, four-inch by four-inch knotted nylon mesh netting. Each end of the shell tube bag will be secured with #96 three-strand twisted twine.

Ground anchors will be used to strap the shell bags or shell bag tubes in place over the sand bags, approximately every 3 to 4 feet on each side of the breakwater. The ground anchors shall be hot dipped four-foot galvanized steel earth screw anchors with a 6-inch diameter blade (helix). Ground anchors shall be installed in accordance with the manufacturer's recommendations to a minimum capacity as indicated in the contract drawings. Tie cables shall be 0.25-inch galvanized wire with hot dipped galvanized connecting hardware.

Coir Biologs- Coir logs shall consist of machine fabricated cylinders consisting of 100% coconut fiber encased in a high tensile machine spin bristle coconut fiber twine weighing more than 7 pounds per cubic foot and will be at least 10 feet long with a diameter of at least 16 inches (Appendix B-2 and Appendix B-3). All components of the log shall be 100% biodegradable. Adjacent logs shall be placed end to end with no gap between. A minimum of ten stakes shall be installed per log. Stakes shall be 2-inch by 2-inch oak, 4 feet minimum in length with at least 3 feet of embedment.

Coir logs will be arranged into cusps two logs long and two logs high. Coir logs will be installed in two stages, one for each tier. The first tier will raise the elevation from approximately -1.6 feet to -0.3 feet (NAD 83). Shell bags will be placed waterward of the coir fiber logs to protect the logs from being moved by boat wakes and waves. A few months later, the second tier will be installed after sediment has accumulated behind the first tier, raising the elevation from -0.3 feet to +1.0 feet (NAD 83). If the coir log compartments behind the tiers do not naturally fill with sediment, clean sediment with organic content suitable for vegetation growth will be used to fill it in. If the coir logs are first installed during phase one, the first tier will be installed in August 2015 and the second tier will be installed in March 2016. If the coir logs are first installed in phase two, the first tier will be installed in March 2016 and the second tier in June 2016. Vegetation salvaged from the site or plugs may be planted within the compartments to stabilize the sediment. Possible plant species include *Spartina alterniflora*, *Spartina patens*, and *Distichlis spicata*.

Construction Methods

Site Access- Materials will be delivered to the Nantuxent Creek site by truck. The Preserve's design plan areas will be accessed by barge. Materials will be delivered in pallets by truck to a marina (previously identified) where they will be loaded onto a barge with a crane. The pallets will be transferred to a barge with a crane. The materials will be dropped off into the intertidal zone as close to each project area's designated staging areas as possible. Barges will not touch the ocean floor and will spend approximately 1 hour traveling to the site and dropping off materials per load. Barges will not exceed 6 mph. One to four deliveries by barge will be required for each design plan.

Staging Areas- The primary staging area for Nantuxent Creek will be located in the Money Island Marina parking lot at the intersection of Bayview Road and Money Island Road. Staging areas for the Preserve's detail plan areas are located along the shoreline (Appendix B-2, Page 3 for locations). All equipment and unused materials, besides the oyster castles and shell bags delivered by barge, will be stored in the staging area until the next construction event.

Installation- We estimate that the installation of each project phase will require 1,000 volunteer days. One volunteer day is equal to one volunteer working at the site for one day. Work will be conducted three hours before and three hours after low tide. Since work is restricted by the tides, work can only be conducted every other week when the tides are favorable. We estimate that each project area (the Nantuxent Creek site and each of the Preserve's detail plans) will require five to ten days of work onsite. Each phase would require 20 to 30 days of work onsite. Materials will be moved from the staging area to the placement location by hand or with the use of wheelbarrows. Wooden boards will be placed on the ground to facilitate the use of wheelbarrows.

4. AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

4.1. Physical Resources

4.1.1 Geology and Soils

The project areas are located in the Coastal Plain region of New Jersey within the Maurice, Salem, and Cohansey watersheds on the Delaware Bay. The Nantuxent Creek site is located in the Nantuxent Creek subwatershed and the Preserve site is located within the Newport Neck watershed. According to New Jersey Geologic Survey mapping, the project areas are underlain by the Kirkland-Cohansey aquifer.

According to the National Resource Conservation Service (NRCS), the project areas consist of transquaking mucky peat, 0-1 slopes, very frequently flooded, and open water (Appendix A-6). Transquaking mucky peat is found in brackish estuarine marshes along tidally influenced rivers and creeks. They are formed dominantly in moderately decomposed overlying high nitrogen value loamy mineral sediments.

The elevation of the project areas is approximately 3.1 feet below sea level and 4.1 feet above sea level (NAVD 88). The project areas are regularly flooded. Wind and wave erosion has a significant effect on the area. Major storms have been pushing the beach landward, smothering marsh and exposing peat beds to wave erosion. The topography throughout the project areas is gently to moderately sloping with some peat cliffs that are two to four feet tall along the low tide line and along creek edges.

4.1.1.1. No Action Alternative

The No Action Alternative will have no impact on the geology or soils of the area.

4.1.1.2 Preferred Action

The preferred action will have no impact on geology and soils. No excavation or use of heavy equipment will take place onsite.

The preferred action may assist in reducing erosion of the shoreline and may help keep the sand fill proposed by other restoration projects (Downe Township, ALS, and USACE) in place. This area used to have a sandy beach, but erosion and major storms has exposed peat and pushed the beach landward.

4.1.2 Air Quality

National Ambient Air Quality Standards (NAAQS) have been established for six pollutants: carbon monoxide, lead, nitrogen dioxide, 8-hour ozone, and particulate matter (PM-10 and PM-2.5). In Cumberland County, there is one monitoring station in Millville. Cumberland County is in the Philadelphia-Wilmington-Trenton, non-attainment area for failing to meet the national ambient air quality standard for ozone. In 2003, there was one 1-hour average NAAQS exceedance and four 8-hour average NAAQS exceedances. In 2001, Cumberland County reported one percent of days were "unhealthy for sensitive populations." In 2003, the median Air Quality Index (AQI) and 90th Percentile AQI levels were "moderate" and the maximum AQI was classified as "unhealthful."

4.1.2.1 No Action Alternative

The No Action Alternative would have no effect on air quality.

4.1.2.2 Preferred Action

This project will have limited effect on air quality. Emissions from trucks and barges delivering equipment will contribute to emissions. Construction is expected to take 6 to 8 months working intermittently.

Additional proposed projects will also use barges and trucks to transport sand and other materials to the area. The cumulative effect of the preferred action and the additional proposed projects is negligible.

4.1.3 Climate Change

The climate of Downe Township is classified as temperate. Although there are four seasons, the influence of the Atlantic Ocean and the Gulf Stream have a moderating influence on temperatures and generally limits the wide variation of climatic fluctuation that is associated with more interior locations. In Cumberland County, the highest recorded temperature of 104 degrees F has occurred in July and August and the lowest recorded temperature of -8 degrees F has occurred in January and February. Typically, rainfall is uniform throughout the year, with slightly more rainfall in the summer. The average annual rainfall of Cumberland County is 44 inches.

4.1.3.1 No Action Alternative

The No Action Alternative will have no impact on climate.

4.1.3.2 Preferred Action

The preferred action will have no impact on climate.

4.2. Water Resources

4.2.1 Water Quality

All project sites are located in the Maurice, Salem, and Cohansey Watershed Management Area. The Nantuxent Creek site is located in the Back/Cedar/Nantuxent Creek Watershed and the Preserve sites along the Delaware Bay are located in the Dividing Creek Watershed and Delaware Bay Watershed (Cape May Point to Fishing Creek). The Back/Cedar/Nantuxent Creek Watershed and the Dividing Creek Watersheds are small watersheds (18 and 7.5 square miles, respectively) that consist mostly of tidal marshes and drain mostly agricultural and forested lands.

Nantuxent Creek is classified as FW2-NT/SE1. "FW2" is the general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands Waters. "NT" indicates that these are non-trout waters and "SE" indicates the general surface water classification applied to saline water of estuaries.

The Kirkwood-Cohansey water-table aquifer lies beneath the project area. This system is highly permeable due to the dominance of well sorted, medium to coarse grained sand. Groundwater in the Kirkwood-Cohansey Aquifer is typically fresh, acidic, highly corrosive and low in dissolved solids.

On December 12, 2014, the NJDEP suspended shellfish harvest in a portion of the project area that is within the Back/Cedar/Nantuxent Creek watershed (Appendix A-7). Due to shoreline erosion, the sewage tanks of some Money Island and Gandy's Beach homeowners are close to or under water during high tide. During the summer of 2014, NJDEP conducted a study to intensively sample nearshore water quality for bacterial indicators. They found that the fecal coliform levels for all samples were high enough to exceed the National Shellfish Sanitation Program classification criteria for "approved" shellfish harvest and a percentage of the samples exceeded the acceptable level for "special restricted" classification. This shellfish harvest closure will continue until the intermittent pollution episode has ceased and the NJDEP has determined that public health is not at risk from the consumption of shellfish from these waters. Before this closure, these waters were seasonally open from November to April (NJDEP 2014).

According to the NJDEP GIS database, the project site is not listed as a known contaminated site (Appendix A-8 and A-9).

4.2.1.1 No Action Alternative

If no action is taken, the shoreline will continue to erode during storm events which would adversely affect localized water quality and allow continued flooding of the

properties and roadways of Gandy's Beach and Money Island. The rate of shoreline erosion is two feet per year based on historic maps showing shoreline retreat (Appendix A-5).

4.2.1.2 Preferred Action

The Kirkwood-Cohansey aquifer will not be affected by this project.

One of the goals of the preferred action is to increase oyster reefs in the project area; which improve water quality by filtering particulate matter, nutrients, toxins, and fecal coliform from the water. Oyster filtration also improves water clarity by filtering out sediments.

Turbidity may increase during reef placement due to sediment disturbance but will quickly subside post-construction. The additional proposed projects will also likely increase turbidity temporarily at the site. The cumulative effect of the proposed projects and the preferred action on turbidity is negligible.

4.2.2 Floodplains

According to the Flood Insurance Rate Map (FIRM), the Nantuxent Creek site is located in Zone VE (elevation 12, NAD 83), which means that it is a coastal flood zone with velocity hazard (wave action) and the flood zones are mapped (FIRM 34011C0311E). The other project sites along the bay are also classified as Zone VE (elevation 13, NAD 83) (FIRM 34044C0313E) (Appendix A-10).

4.2.2.1 No Action Alternative

If no action is taken, the shoreline will continue to erode due to major storm events and sea level rise, potentially causing flooding of adjacent properties and roadways.

4.2.2.2 Preferred Action

The preferred alternative will reduce erosion in the project areas. The preferred action is designed to withstand impacts associated with the marine environment and to protect natural resources to the greatest extent possible.

The additional proposed projects may add sand to the project site to help restore it to its previous condition. The preferred action will help keep the sand in place. The cumulative impact of the additional proposed projects and the preferred action would enhance the floodplain.

4.2.3 Wetlands

Freshwater wetlands are regulated by the NJDEP and the USACE. According to the Service's National Wetlands Inventory (NWI) database, the area in which the project will

be located is in Estuarine and Marine Wetland and Estuarine and Marine Deepwater (Appendix A-11).

4.2.3.1 No Action Alternative

If no action is taken, wetlands in the project area will continue to erode at the rate of two feet per year.

4.2.3.2 Preferred Action

No freshwater wetlands will be impacted by the preferred action. However, the preferred action will assist in preventing the continued erosion of estuarine wetlands and adverse impacts associated with storm events.

4.3. Coastal Resources

The project is located within the State of New Jersey Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19-1 et seq.) zone. CAFRA regulations are intended to protect coastal waters and the land adjacent to them. Coastal resources and special areas in the project area include: beaches, dunes, wetlands, and public open space (Appendix A-12).

4.3.1 No Action Alternative

The No Action Alternative will not reduce erosion or protect property within this CAFRA zone. The No Action Alternative does not require additional permitting.

4.3.2 Preferred Action

The Service has received a Federal Consistency Determination for the preferred action which addresses CAFRA regulations under the Rules on Coastal Zone Management (N.J.A.C. 7:7E). The Federal Consistency Determination was submitted under the assumption that the proposed activity complies with New Jersey's approved Coastal Zone Management Program and will be conducted in a manner consistent with the program (Appendix D-1). The project is designed to protect the existing coastal resources to the greatest extent possible with the resources available.

4.4. Biological Resources

4.4.1 Endangered and Threatened Species and Critical Habitat

Habitats for endangered and threatened animal species are located within the project area. The federally listed (threatened)/State-listed (threatened) red knot forages along the shoreline of the project area during the spring migration season. The project area is also designated as summer habitat for the federally listed (threatened) northern long-eared bat (*Myotis septentrionalis*).

Federally-listed marine endangered species that may occur within the vicinity of the project area include green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta carreta*), Atlantic sturgeon (*Acipenser oxyrhynchus*), and shortnose sturgeon (*Acipenser brevirostrum*).

State-listed species that may occur within the project area include the erect bindweed (*Calystegia spithamaea* spp.) (endangered), bald eagle (*Haliaeetus leucocephalus*) (endangered), least tern (*Sterna antillarum*) (endangered), northern harrier (*Circus cyaneus*) (endangered), osprey (*Pandion haliaetus*) (endangered), and black-crowned night heron (*Nycticorax nycticorax*) (threatened).

A consulting firm, Water's Edge Environmental, LLC. was contracted to complete a baseline vegetation and wildlife survey, which was completed in December 2014. Although a species survey was not conducted during the nesting season, both nesting and foraging habitat for these wildlife species was evaluated at both project sites. The following information for the northern long-eared bat and red knot was taken from the Intra-Service Section 7 Biological Determination (Appendix D-2).

Terrestrial Federally Listed Species

Northern Long-eared Bat

The northern long-eared bat spends the winter hibernating in caves and abandoned mines. During the summer, they roost in live or dead trees. There is no suitable habitat for northern long-eared bat in the project area because there are no suitable roosting trees.

Red Knot

Across its nonbreeding range, including in Delaware Bay, the spatial distribution of the red knot has been correlated with the distribution of their primary prey species. In Delaware Bay, the primary prey item is horseshoe crab eggs (U.S. Fish and Wildlife Service 2014). Thus, sections of the bayshore with high levels of horseshoe crab spawning activity and egg density typically attract and support high densities of red knot, notwithstanding other factors such as competition, predation, and human disturbance. Although red knot forage on peat banks in some parts of their range, peat bank usage is typically associated with feeding on other prey types such as mussel spat (U.S. Fish and Wildlife Service 2014). Specific to Delaware Bay, active salt marsh and peat bank sediments are unsuitable or, at best, marginal spawning habitat for horseshoe crabs (Botton *et al*. 1988), and are thus generally of minimal value as red knot foraging habitat.

The Preserve project area is currently an actively eroding section of shoreline. Erosion has resulted in exposure of peat deposits in many areas, as well as deposition of sand landward of some areas of active salt marsh. This results in a patchwork of more and less suitable habitats for both spawning horseshoe crab and red knot. Numerous horseshoe crab shells were observed throughout a portion of the area, primarily within the high

marsh habitat in the southern section of the site and narrow low marsh areas along the tidal tributaries. These areas are landward of expansive sand flats that are exposed during low tide. The project area is potential horseshoe crab spawning habitat, and may contain large concentrations of red knot in the spring. The tidal flats, wrackline, and sandy beach areas also exhibit characteristics suitable for numerous other shorebird species that may utilize the area for foraging in the spring.

The Nantuxent Creek project area is smaller than the Preserve area and is largely surrounded by development and disturbance associated with the marina, roadway, and residences. The mudflat and limited beach area along this project site are limited and do not provide an expansive area to be considered red knot foraging habitat. No horseshoe crab shells have been observed in this project area. Therefore, this project area is currently not considered suitable habitat for red knots.

Marine Federally Listed Species

Sea Turtles

Sea turtles occur throughout coastal/marine waters. The coastal areas of New Jersey are not identified as nesting areas; however, the coastal waters are habitat for these species. These turtles are not identified as utilizing river systems. Therefore, it is unlikely that the marine waters associated with the Delaware Bay off of the Preserve project site are suitable sea turtle habitat. The waters off of the Nantuxent Creek project site are associated with the mouth of the Nantuxent Creek, which is not the primarily habitat for these turtles since this is associated with a riverine system. However, due to the proximity to the Delaware Bay marine system, the area may be utilized by these turtles.

Shortnose Sturgeon/Atlantic Sturgeon

Sturgeon habitat is identified as slow moving coastal rivers, estuaries, and near shore marine waters. These species migrate upstream to faster moving freshwater to spawn. Waters along the Delaware Bay are immediately associated with estuaries in the vicinity of major river systems, including the Nantuxent Creek. Therefore, the offshore open water areas along both the Gandy's Beach and Money Island project areas are suitable habitat for the shortnose sturgeon.

State Listed Species

Erect Bindweed

This plant has not been confirmed onsite since 1933. This plant is associated with terrestrial habitat such as dry, sandy, or rocky fields and banks (Britton and Brown 1970). Both project sites are tidal wetland communities and do not exhibit suitable habitat consistent with the life history requirements of this species.

Bald Eagle

The bald eagle may utilize the high marsh areas and tidal tributaries in the easternmost section of the Preserve project site as foraging habitat. Neither project sites exhibit any large artificial structures or large canopy trees that may be suitable perch posts or nesting habitat. The critical habitat for the bald eagle is situated northeast of the Preserve project site along the Nantuxent Creek. A bald eagle pair was observed during field investigations at the Nantuxent Creek project site and an eagle nest was observed. This nest is located greater than 1,000 feet north of the project site in a wooded area along a Nantuxent Creek tributary. There are four (4) known bald eagle nests along the Nantuxent Creek (Smith and Clark 2014).

Least Tern

The least tern nests in colonies on open sandy beach areas and forages in open water habitat. The New Jersey Natural Heritage Program (NHP) identifies the feature type associated with the project sites as "foraging." The open sandy beach habitat within the Preserve is narrow and is not associated with typical rear dune areas that would support a nesting colony, and is also subject to tidal flow that would jeopardize nests. The Nantuxent Creek project site does not exhibit any sandy beach areas that would be suitable for nesting. The open water area along the main tributaries and open water along the shoreline of the Delaware Bay, and the Nantuxent Creek waterway, are suitable foraging habitats for the least tern.

Northern Harrier

The northern harrier utilizes expansive open marsh habitat for both nesting and foraging. The Preserve project site exhibits high marsh habitat composed of monotypic expanses of saltmeadow grass throughout the eastern section of the project area, which will not be impacted by any proposed living shoreline activities. These areas exhibit both suitable foraging and nesting habitat for the northern harrier.

The Nantuxent Creek project site is isolated and surrounded by the Money Island Marina, residences, and Nantuxent Road. The project site does not exhibit a large enough expanse of high marsh habitat that would be considered suitable nesting and/or foraging habitat for the northern harrier. The high marsh tidal community opposite Nantuxent Road to the south does meet the criteria to be suitable northern harrier habitat.

Osprey

Similar to the least tern, the osprey utilizes open water habitat to forage for fish. The open water along the shoreline of the Delaware Bay and the larger tidal tributaries are suitable foraging habitat for the osprey. The species nests primarily on man-made structures, utilizing platforms specifically constructed to facilitate nesting areas. No nesting platforms were observed in the immediate vicinity of the Preserve project area.

The Nantuxent Creek also serves as suitable foraging habitat for the osprey. A nest platform is also present west of the project site, opposite the Money Island Marina.

Black-crowned Night Heron

The black-crowned night heron utilizes scrub-shrub and forested areas in the vicinity of foraging habitat for nesting. The Preserve project site is associated with one isolated small scrub-shrub area, which is not large enough for supporting a black-crowned night heron rookery. However, the shoreline and rear high marsh communities all exhibit suitable foraging habitat for the species, especially the tidal tributary areas.
The Nantuxent Creek project site exhibits limited areas of shrub species, which are primarily within disturbed areas associated with the marina and terminus of Money Island Road, and the isolated camper and driveway area. These are not natural scrub-shrub communities that would be considered suitable nesting habitat for a black-crowned night heron rookery. The shoreline of the Nantuxent Creek may be utilized by for foraging.

4.4.1.1 No Action Alternative

<u>Terrestrial Federally Listed Species</u>

Northern Long-eared Bat

The No Action Alternative will not affect northern long-eared bat because there is no suitable northern long-eared bat habitat within or adjacent to the project area.

Red Knot

The No Action Alternative is likely to adversely affect red knot because it is likely to cause further erosion of the beach, which is used by red knot to rest and forage during migration. The most important prey item for red knots during the spring migration is horseshoe crab eggs. Erosion of the beach causes horseshoe crabs to lay their eggs in exposed salt marsh and peat-bank sediments, which are unsuitable, or at best, marginal spawning habitat (Botton *et al*. 1988). As a result of this degraded habitat at the site, the number of horseshoe crabs spawning onsite may result in less eggs being available to foraging red knots. Additionally, because of the conditions of the degraded habitat, few if any of the spawned eggs would be viable, resulting in decreased recruitment into the horseshoe crab population and fewer eggs for red knots to forage on in the future.

<u>Marine Federally Listed Species</u>

Sea Turtles

The No Action Alternative will not affect sea turtles because sea turtles do not use the eroding beach and salt marsh habitat within and adjacent to the project area.

Shortnose Sturgeon/Atlantic Sturgeon

The No Action Alternative may positively affect shortnose and Atlantic sturgeon because it will result in continued shoreline erosion which could increase the amount of available open water habitat within and adjacent to the project area.

State-Listed Species

Erect Bindweed

The No Action Alternative will not affect erect bindweed because no suitable habitat remains within and adjacent to the project area.

Bald Eagle

The No Action Alternative could negatively affect the bald eagle because it will result in continued erosion of the salt marsh and tidal estuaries, which it uses to forage for fish and water birds.

Least Tern

The No Action Alternative could positively affect least tern because continued erosion will create more open water habitat, providing additional foraging habitat for least tern.

Northern Harrier

The No Action Alternative could negatively affect northern harrier due to further erosion of salt marshes, which it uses to forage for birds and small mammals.

Osprey

The No Action Alternative could positively affect osprey because continued erosion will create more open water, providing additional foraging habitat.

Black-crowned Night Heron

The No Action Alternative could negatively affect black-crowned night heron because it will result in further erosion of salt marsh and tidal creek habitat, which it uses to forage for fish.

4.4.1.2 Preferred Action

Terrestrial Federally Listed Species

The Service received concurrence with the project through Intra-Service Section 7 (Appendix D-2). The preferred action has been designed to create the least possible impact to federally listed species as follows:

Northern Long-eared Bat

There is no suitable habitat for northern long-eared bat in the project area. In addition, there is no tree removal associated with this project; therefore no impacts to northern long-eared bat are anticipated.

Red Knot

One of the goals of the preferred action is to slow or halt erosion of red knot foraging habitat. Slower erosion rates and a more stable shoreline position will protect existing areas of high marsh while allowing zones of low marsh and tidal flats to reform (U.S. Fish and Wildlife Service 2014), resulting in long-term benefits to red knot. In the short term, the project may produce both beneficial and adverse effects on red knot habitat.

The conclusion of the Intra-Service Section 7 is that the project will affect, but will not adversely affect red knot.

The project has the potential to impact red knot in two ways:

1. *Direct impacts: Habitat Loss and Disturbance*- The presence of near-shore reefs may displace otherwise suitable feeding areas for red knot. Monitoring activities have the potential to disturb red knot by flushing birds or causing them to avoid important feeding/resting areas. In addition, the living shoreline may change the quality of foraging habitat behind it.

2. *Indirect impact: Horseshoe Crab Displacement*- If the oyster reef is a barrier to movement or impinges horseshoe crabs, this may result in less egg availability and decreased feeding opportunities for red knot.

Direct Impacts: Habitat Loss

Direct adverse effects to habitat will result from displacement of current intertidal flats by both coir logs and breakwater structures (oyster castles, shell bags). The total area of displacement (footprint of the breakwaters plus all currently unvegetated areas landward of the coir logs) is 19,723 square feet (Appendix B-1). For context, the total area of the intertidal zone (between Mean High Water and Mean Low Water) within

the project area is 795,636 square feet. Thus, the project would directly displace 2.5 percent of total intertidal area. These calculations provide a generalized metric of direct habitat impacts, but do not account for the spatial arrangement of suitable (sandy) and unsuitable (peaty and/or vegetated) habitats within the intertidal zone. Nonetheless, these calculations are sufficient to conclude that project effects from direct habitat loss are insignificant.

Direct Impacts: Red Knot Disturbance

Potential direct impacts to red knots will be avoided through construction timing restrictions, monitoring restrictions, site selection, and pre- and post-restoration habitat surveys.

There will be no construction during the spring migration season from April 15 to June 15. However, if there are no red knots observed using the site by June 1, the Service will contact the appropriate monitoring agencies to determine whether construction will be allowed onsite before June 15. No fish or oyster monitoring, planting, or maintenance activities will occur on the project site under the same conditions.

The project will occur in two phases, the first phase from August 2015 through the end of October 2015 and the second phase during the first half of April 2016 and continuing again June 15 through November 8, 2016.

The living shoreline installed before the horseshoe crab spawning season (May through mid-June) in 2016 will be monitored for horseshoe crab impingement, red knot usage, and horseshoe crab egg counts. Horseshoe crab impingement surveys will occur at low tide one to three times a week surrounding the full and new moons from the beginning of May to mid-June 2016. The Service, TNC, and project partners will receive guidance from ALS and the Conserve Wildlife Foundation as to which protocols to use based on their experience monitoring the Reeds Beach oyster reef breakwater during the 2015 horseshoe crab spawning season. Each horseshoe crab impingement survey will require 1 to 2 hours during low tide.

The NJDEP will also continue surveying for red knot and conducting horseshoe crab egg counts during the horseshoe crab spawning season. Red knot surveys are conducted from behind dunes and cover of beach grass and are designed to avoid flushing birds. Therefore, disturbance to red knot will be minimized or avoided through survey design. Horseshoe crab egg count surveys will be conducted once per week for about 2 hours surrounding the low tide.

Surveyors (impingement and horseshoe crab egg count) will not be onsite for more than 8 hours per week during the horseshoe crab spawning season in order to limit potential disturbance to foraging red knots. Red knot surveys are not included in this restriction because they are designed to avoid flushing birds. The frequency of entry will be one to three times a week. The number of people conducting the surveys (less

than three) and the activity (no motorized equipment) represent a low level of a disturbance.

Indirect effects to habitat may be beneficial, adverse, or both. The precise shoreline response to the project, and the resulting changes to the mosaic of habitat, are difficult to predict and will depend on stochastic events like storms. To measure the effect of these habitat changes on the red knot, the proposed monitoring will include evaluation of red knot habitat availability before and after the project. Botton *et al.* (1988) developed a classification of horseshoe crab spawning habitat (below), which is also a reasonable measure of red knot foraging habitat suitability. The total area of preferred and avoided habitats will be calculated, and their spatial arrangement will be mapped, both before and every year up to 5 years after the project is complete.

Based on the project's expected result of slowing erosion, we anticipate any adverse effects from loss of preferred habitat will be insignificant. However, the monitoring program will ensure that any localized problem areas (higher than expected loss of preferred habitat) can be corrected through adaptive management. The monitoring program will be supplemented by evaluation of localized data on red knot usage and horseshoe crab egg and/or spawning densities, if available.

Indirect Impacts: Displacement of Horseshoe Crabs

Potential negative effects to horseshoe crab include construction timing restrictions, construction specifications to allow crab passage and avoid spawning habitat, and impingement surveys.

The horseshoe crab restriction recommended by the National Oceanic and Atmospheric Administration (NOAA) is April 15 to August 31. Since we are not excavating and the work is in the intertidal zone, the Service has requested that NOAA reduce the timing restriction from April 15 to June 15.

To allow horseshoe crab passage, the oyster breakwaters will be constructed from lengths of 30 feet or less with gaps 5 feet or greater between them to allow marine organisms to move freely through the site. During high tide, there is at least 1 foot of water over the seaward breakwaters. The seaward toe of the majority of the breakwaters is at MLW. Crabs will be able to walk around the structures and if they are unable to walk around the breakwater in time for tide to go out, they will not be out of water for more than 2 hours.

The oyster breakwaters will not cover suitable spawning habitat because they are located along the low tide line. However, coir biologs will be placed along the mid to high tide line. Coir biologs will only be located along the edge of salt marshes in the Nantuxent Creek site and the Preserve's design plan one. These areas are unsuitable horseshoe crab spawning habitat because the spawning substrate consists of eroded peat beds that may only have a few inches of sand. Horseshoe crab larvae require a minimum sand depth of approximately 8 inches in order to hatch (Niles *et al.* 2013).

The sand acts as a buffer between the eggs and the underlying beach, which creates low oxygen conditions that affect egg survival. It is possible that if crabs are using the area, the eggs will be easily accessible for red knot foraging.

The project area will be monitored throughout the spawning season from the beginning of May to mid-June during the 2015 horseshoe crab spawning season. A threshold will be identified at which horseshoe crab impingement or displacement will trigger removal of the reef.

The determination that the project may affect, but will not adversely affect red knot is contingent on the outcomes of post-construction habitat and horseshoe crab impingement monitoring. Short-term impacts on water quality and turbidity are anticipated during construction, but will subside quickly because of the large particle size of the substrate and well before red knot return to feed; therefore construction activities will have no impact to red knot.

The other projects proposed within the proximity of the project area will have a positive effect on red knot habitat by increasing the acreage of sandy beach and will have to go through environmental review to ensure that negative effects are insignificant or minimized. The additional proposed projects and the preferred action will positively affect endangered species within the project area.

Marine Federally Listed Species

Since the project is not expected to require excavation or the use of heavy equipment onsite, the Service determined that the preferred action is not likely to adversely affect any marine listed species. The National Marine Fisheries Service (NMFS) concurred with the Service's determination (Appendix D-3).

State-listed Species

The project will not adversely affect State-listed species that may occur in the area because there are no suitable nesting areas for State-listed birds. Although there is foraging habitat, the project areas are surrounded by alternative habitat that could be utilized by these species. Due to coastal erosion, no suitable habitat remains in the project areas for erect bindweed.

4.4.2 Vegetative Communities

The Preserve project site is a tidal coastal community, associated with a variety of dynamic microhabitats and biotic communities. Refer to Appendix A-13 for maps that illustrate all biotic communities identified. The eastern section of the site is a high tidal area that is largely dominated by *Phragmites* in the northern section of the site along the beach and microdune habitat, which is largely situated above the high tide elevation of 4.1 (NAVD 88) on the survey. This area dominated by *Phragmites* is also composed of occasional open areas of seaside goldenrod (*Solidago sempervirens*) and American

beachgrass (*Ammophila breviligulata*). A high marsh community composes the eastern expanse of the project area, as well as the areas immediately landward of the narrow beach and sand flats in the southern section. This community is dominated by saltmeadow grass (*Spartina patens*), with areas of saltmarsh cordgrass along the tributaries.

A wrackline was evident along the approximate location of the mapped mean high water line (elevation 2.8 feet, NAVD 88). Below the wrackline and mean high water line is a composite of a variety of micro-tidal communities, including isolated low marsh areas composed of monotypic stands of saltmarsh cordgrass, exposed sand flats, and meadow (peat) mats, which are likely to be inundated during high tide events.

The entire coastal community is a dynamic system that has been subject to relatively recent changes due to storm events, including Hurricane Sandy in 2012, and a gradual rise in sea level. This is apparent based on the site investigation and current mapping of biotic communities in relation to the historic aerial imagery from 2012 and earlier. The characteristics of the mudflat areas, especially in the southern section of the project area in the vicinity of elevations 1 to 2 feet (NAVD 88), displays evidence of these changes. This is based on the presence of remaining rootstock of woody shrubs, which were identified as high tide bush (*Iva frutescens*). These historic scrub shrub areas may have been impacted by significant storm events and/or rising sea level over time, or more likely a combination of both. An isolated remaining scrub shrub area remains adjacent to the Delaware Bay tributary in the central section of the project area, which is situated at current elevation 5.0 feet (NAVD 88).

The Nantuxent Creek project site is associated with upland and tidal wetland communities. The area is largely surrounded by existing development and land use associated with the marina to the west, and coastal residences to the east. The wetland line is parallel to and in the vicinity of Nantuxent Road to the south, and also goes around a narrow upland area that is associated with an abandoned trailer and parking area. Areas of concrete and debris surround the location of the trailer, likely placed for stabilization and erosion prevention. Concrete and stone areas are also present associated with the dock and stone parking area in the vicinity of the marina, immediately west of the site.

The tidal wetland area throughout a majority of the site is characterized as a low marsh community, dominated by saltmarsh cordgrass. The area just east of the marina and parking area is characterized as a disturbed high marsh community, composed of saltmarsh cordgrass, saltmeadow grass, seaside goldenrod, hightide bush, and groundsel bush (*Baccharis halimifolia*). Below the low marsh community is a narrow beach area along the Nantuxent Creek, portions of which are associated with few existing oyster castles and shell bags in the eastern section of the site, which would be inundated during high tide.

The roadside is characterized as a disturbed area along Nantuxent Road dominated by *Phragmites*, as well as high tide bush and groundsel bush. An upland area surrounds the abandoned trailer and a boat in the east central section of the site with access from

Nantuxent Road. This area is composed of rock and fill material and is characterized as a scrub shrub area, including eastern red cedar (*Juniperus virginiana*), groundsel bush, high tide bush, saltmeadow grass, and seaside goldenrod.

4.4.2.1 No Action Alternative

The No Action Alternative will have no impact on vegetative communities.

4.4.2.2 Preferred Action

One of the goals of the project is to increase tidal marshes in areas where they are eroding away by placing coir logs and planting salt marsh plants within the logs and in the sediment accumulated behind the logs. This project will increase vegetation in these areas. Approximately 300 linear feet of coir logs will be installed in the Nantuxent Creek site and the Preserve site's design plan area one. The goal of the project is not to increase vegetation in other areas of the project.

4.4.3 Migratory Birds

Migratory birds were included in the Baseline Vegetation and Wildlife Inventory conducted in December 2014. A bald eagle and its nest was observed more than 1,000 feet northeast of the Nantuxent Creek project site. Other bird species observed during this time period include great blue heron (*Ardea herodias*), black-backed gull (*Larus marinas)*, Canada goose (*Branta Canadensis*), herring gull (*Larus argentatus*), black duck (*Anas rubripes*), dunlin (*Calidris alpina*), and red-winged blackbird (*Agelaius phoeniceus*),

Preserve Project Site

The Preserve project site is a coastal community that is composed of numerous microhabitats suitable for a variety of bird species. The species identified above are common species that winter along the Delaware Bay shoreline. The dunlin were observed resting and feeding at the shoreline along the sandy flat area amongst isolated pockets of saltmarsh cordgrass, red-winged blackbirds were observed in the high marsh and isolated scrub shrub habitat, and gull species were observed overhead. Great blue heron tracks were observed in the mudflat along the Delaware Bay tributary at low tide.

Money Island Project Site

The Money Island project site is also a coastal community, but is within developed areas associated with the marina and residences along Nantuxent Road. No bird species were observed on the project site; however, species were observed utilizing the Nantuxent River, and expansive tidal marshes to the north, including the black duck, gull species, geese, and bald eagles.

4.4.3.1 No Action Alternative

The No Action Alternative will have no impact to migrating birds.

4.4.3.2 Preferred Action

The preferred action will have a minimal impact to migrating bird species. Project construction will not occur during the spring migration of shorebird species (April 15-June 15), unless monitoring agencies inform the Service that there have been no birds seen onsite and construction can resume earlier than June 15. Construction will occur during the fall migration. However, the project area is surrounded by similar habitat that migrating birds can use if they are displaced from the site due to construction activities.

The additional proposed projects may cause disturbance to migratory birds. However, the cumulative effect of the additional proposed projects and the preferred action is negligible because the project area is surrounded by similar habitat.

4.4.4 Wildlife and Fish

The Baseline Vegetation and Wildlife Inventory conducted in December 2014 is only evidence of wintering species and would not result in the identification of wildlife that utilize the project area during the breeding season. During this time period, these species or evidence of these species were observed in the project area: eastern oyster (*Crassostrea virginica*), ribbed mussel (*Geukenzia demissa*), horseshoe crab (*Limulus polyphemus*), and raccoon (*Procyon lotor*). At the Preserve site, raccoon tracks were observed in the mudflat along one of the tidal creeks at low tide. Dead horseshoe crabs were also found in scattered locations in the salt marsh grasses above the high tide line. Ribbed mussels were found among the *Spartina alterniflora* at both project sites.

In order to determine the effect of the project on fish species and abundance, HSRL conducted pre-restoration monitoring twice a month from August until the end of October 2014. Different fish monitoring methods were used at the Preserve and the Nantuxent Creek sites. Eighteen-foot seine nets were dragged along the shoreline for 30 meters at three sites along the Preserve from low to mid-tide. At the Nantuxent Creek site a block net (60-foot seine net) was deployed during high tide and attached to stationary PVC (polyvinyl chloride) pipes. As the tide receded, the fish in the marsh and shallow water are funneled into the net. Additional pre-restoration fish monitoring is planned for July through October 2015 using the same methods. Post-restoration fish monitoring will continue for two years after the project is complete, dependent on available funding.

Species collected during the 2014 fish monitoring season include black drum (*Pogonias cromis*), horseshoe crab, summer flounder (*Paralichthys dentatus*), Atlantic mud crab (*Panopeus herbstii*), black cheek tonguefish (*Symphurus plagiusa*), American eel (*Anguilla rostrata*), northern pipefish (*Syngnathus fuscus*), bluefish (*Pomatomus saltatrix*), striped killifish (*Fundulus majalis*), mummichog (*Fundulus heteroclitus*),

Atlantic silverside (*Menidia menidia*), naked goby (*Gobiosoma bosci*), brown shrimp (*Penaeus aztecus*), grass shrimp (*Paleomonetes* spp.), sand shrimp (*Crangon septemspinosa*), bay anchovy (*Anchoa mitchilli*), Atlantic croaker (*Micropogonias undulatus*), weakfish (*Cynoscion regalis*), blue crab (*Callinectes sapidus*), oyster toadfish (*Opsanus tau*), white perch (*Morone americana*), northern kingfish (*Menticirrhus saxatilis*), silver perch (*Bairdiella chrysoura*), and striped bass (*Morone saxatilis*).

In July 2015, pilot reefs consisting either of oyster castles, clam shell bags, or whelk shell bags were placed at two locations along the Preserve site and one location within the Nantuxent Creek site at three tide levels: low tide line, between low and mid-tide, and mid-tide line. The reefs were monitored in November 2014. Ten oysters from each oyster castle pod were measured to estimate size frequency and the fouling/encrusting community was characterized by percent cover and taxonomic group. Spat size ranged from 3 to 60 mm with the largest spat occurring in pods in Nantuxent Creek. The number of oyster spat on the shell bags was estimated in the field and a sub-sample of bags were taken back to the lab to count spat on each individual shell. Oyster castle pods along the mid-tideline recruited less spat than the lower elevation pods. Oyster recruitment occurred in all sites but the castle pods and shell bags in Nantuxent Creek recruited more spat than the Preserve sites.

4.4.3.1 No Action Alternative

If no action is taken, shoreline erosion will continue, degrading beach and tidal marsh habitats used by local wildlife.

4.4.3.2 Preferred Alternative

The preferred action will have a minimal impact on wildlife species during construction. Any wildlife species that may occupy the project site would likely be temporarily displaced. There are ample adjacent areas in which to feed or take cover during construction.

Once construction has been completed, the preferred action should have a positive effect on local wildlife by reducing shoreline erosion and increasing habitat diversity.

The additional proposed projects will displace intertidal mudflat species by placing sand over exposed peat and mudflat. However, there is similar habitat surrounding the area that displaced species could move to. The cumulative effects of the preferred action and the additional proposed projects are negligible.

4.5. Cultural Resources

4.5.1 Historic Properties

The Service has searched the New Jersey and National Registers of Historic Places and has determined that no historic properties are located in or adjacent to the project area.

4.5.1.1 No Action Alternative

The No Action Alternative will have no impact on historic properties.

4.5.1.2 Preferred Action

The New Jersey State Historic Preservation Office (SHPO) has corresponded with the Service through email stating that the project will have no effect on historic resources (Appendix D-4).

4.5.2 American Indian Religious Sites

There are no American Indian religious sites within or surrounding the project area.

4.5.2.1 No Action Alternative

The No Action Alternative will have no impact on American Indian Religious Sites.

4.5.2.2 Preferred Alternative

Since the site is not listed as an American Indian Religious Site and there are no American Indian Religious Sites in the vicinity of the site, the project will not impact an American Indian Religious Site.

Since the project is within historic Lenape territory, the Service has sent out requests for comment regarding the project to all Federally Recognized Delaware/Lenape entities: Delaware Nation of Oklahoma, Delaware Tribe of Indians, and Stockbridge-Munsee. The Service has received letters from the Delaware Nation of Oklahoma, Stockbridge-Munsee, and the Delaware Tribe of Indians concurring that the Service's determination that the proposed project will have no adverse effect on American Indian Religious Sites in the vicinity of the project area (Appendix D-5).

4.6 Socioeconomic Concerns

4.6.1 Environmental Justice

In 1994, Executive Order 12898 was signed to focus federal attention on environmental and human health conditions of minority and low income populations with the goal of achieving environmental protection for all communities. This Order was intended to promote nondiscrimination in federal programs that substantially affect human health and the environment and provides minorities and low income populations with public information and offers public participation in matters relating to human health and the environment.

Downe Township is a sparsely-populated rural township in the poorest county in New Jersey. According to the American Community Survey conducted by the U.S. Census Bureau from 2009 to 2013, the township is comprised of 99.9% Caucasian residents and 10.3% of families living in Downe Township have income levels below the poverty level. However, this township does not classify as containing a significant low income or minority population.

4.6.1.1 No Action Alternative

The No Action Alternative will have no impact on low income or minority populations.

4.6.1.2 Preferred Action

Downe Township does not contain a significant low income or minority population. Therefore, this project will have no effect on low income or minority populations.

4.6.2 Noise

Currently noise factors at the project location include limited local traffic, boat traffic, occasional airplanes, local animal sounds, and people walking on the beach.

4.6.2.1 No Action Alternative

The No Action Alternative has no impact on noise.

4.6.2.2 Preferred Action

Noise levels at the site will be slightly elevated during construction due to the number of people onsite and barges offloading supplies. These elevated levels of noise will cease once construction is complete.

The additional proposed projects will increase noise levels during construction. The cumulative effect of this project and the additional proposed project on noise is negligible.

5. AGENCY COORDINATION, PUBLIC INVOLVEMENT AND PERMITS

The Service has a cooperative agreement with TNC to manage the construction of the preferred action. TNC has contracted HSRL and PDE to assist in the project to draw upon their expertise and experience in constructing living shorelines in the Delaware Bay. The USACE Philadelphia District will participate as a cooperating agency for developing environmental compliance for the project (Appendix D-6). The USACE has reviewed the EA to ensure that sufficient information is included, and will prepare the NMFS Essential Fish Habitat (EFH) Assessment for the preferred action.

The preferred action was presented at the November 12, 2015 New Jersey Joint Permit Processing Meeting. Project partners have presented the preferred action to the public at the Downe Township Horseshoe Crab Festival (May 16, 2015), Bay Day (June 6, 2015), and the Oyster Forum at the Bayshore Center at Bivalve (April 20, 2015). The project was presented at the Downe Township public meeting on July 6, 2015 and the community was informed about the EA's public comment period.

Permits required to construct the living shoreline include:

- Federal Consistency Determination: Submitted by the Service on June 22, 2015. Dated September 4, 2015 (Appendix D-1).
- Intra-Service Section 7 Biological Evaluation: May affect, but is not likely to adversely affect. Dated June 19, 2015 (Appendix D-2).
- NMFS Section 7: Concurrence of no effect received July 17, 2015 (Appendix D-3).
- SHPO: Concurrence of no effect received by May 18, 2015 (Appendix D-4).
- Tribal Consultations: Concurrence of no effect received by July 15, 2015 (Appendix D-5).
- USACE- NWP #27 Aquatic Habitat Restoration, Establishment, and Enhancement Activities: Submitted by TNC on June 15, 2015 (not yet received).
- NMFS EFH Assessment: will be submitted by USACE Philadelphia District as a cooperating agency.
- Tidelands License: will be submitted by TNC.

6. CONCLUSION

After a thorough evaluation of all actions and alternatives considered, as presented in this EA, the preferred action is oyster reef breakwater and coir biolog placement in order to stabilize shoreline habitats used by red knots and horseshoe crabs; buffer local infrastructure and residences from further erosion; and increase oyster reefs to benefit ecologically and economically important fish and crab species. This project will enhance the resiliency of tidal marsh, beach, and oyster reef habitats to the impacts of sea level rise and more frequent and intense storms. These habitats, in turn, help protect the surrounding communities from these

forces as well. If no action is taken, the shoreline of the Preserve will continue to erode and expose the communities of Money Island and Gandy's Beach to additional tidal and storm surge.

7. LIST OF PREPARERS

Katie Conrad, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service

Brian Marsh, Partners for Fish and Wildlife Program Coordinator, U.S. Fish and Wildlife Service

Eric Schrading, Field Supervisor, U.S. Fish and Wildlife Service

8. REFERENCES

Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1988. Beach erosion and geochemical factors: influence on spawning success of horseshoe crabs (*Limulus polyphemus*) in Delaware Bay. Marine Biology 99(3):325-332. 8 pp.

Britton, N.L. and H.A. Brown. 1970. An illustrated flora of the northern United States and Canada- Vol.3. Dover Publications, Inc. New York, NY. 47 pp.

Dahl, T.E. 2011. Status and trends of wetlands in the conterminous United States 2004 to 2009. United States Fish and Wildlife Service. Fisheries and Habitat Conservation. Washington D.C.

New Jersey Department of Environmental Protection (NJDEP). 2014. Public notice of the suspension of harvest from shellfish beds dangerous to health. Signed by Dan Kennedy, Assistant Commissioner, Water Resources Management. December 10. http://www.nj.gov/dep/bmw/publicnotice/121014db.pdf

Niles, L.J., J.A. Smith, D.F. Daly, T. Dillingham, W. Shadel, A.D. Dey, M.S. Danihel, S. Hafner, and D. Wheeler. 2013. Restoration of horseshoe crab and migratory shorebird habitat on five Delaware Bay beaches damaged by Superstorm Sandy. December 27. 18 pp.

U.S. Fish and Wildlife Service. 2014. Rufa red knot background information and threats assessment. Supplement to: endangered and threatened wildlife and plants; Final threatened status for the rufa red knot (*Calidris canutus rufa*). Docket Number FWS-R5-ES-2013-0097; RIN AY17. U.S. Fish and Wildlife Service, Northeast Region, New Jersey Field Office. Pleasantville, New Jersey. November. 383 pp.

Smith, L. and K.E. Clark. 2014. New Jersey bald eagle project, 2014. New Jersey Department of Environmental Protection Division of Fish and Wildlife. Dave Chanda, Director Dave Jenkins, Chief, Endangered and Nongame Species Program. In partnership with Conserve Wildlife and Conserve Wildlife Foundation of New Jersey. 24 pp.

9. Finding of No Significant Impact (FONSI)

FINDING OF NO SIGNIFICANT IMPACT
GANDY'S BEACH/MONEY ISLAND LIVING SHORELINE PROJECT
DOWNE TOWNSHIP, CUMBERLAND COUNTY, NEW JERSEY

The U.S. Fish and Wildlife Service (Service) in conjunction with The Nature Conservancy (TNC) is proposing to construct a living shoreline along the Gandy's Beach Preserve's (Preserve) beaches and tidal marshes in order to stabilize shoreline habitats used by red knot and horseshoe crabs; buffer local infrastructure; and increase oyster reefs to benefit ecologically and economically important fish and crab species. The proposed project will consist of 3,000 linear feet of nearshore oyster reef breakwaters and coir biolog living shorelines. The living shorelines will help stabilize approximately 4,000 linear feet of beaches and tidal marshes. Multiple types of breakwater structures will be used to test the wave attenuation and oyster recruitment capacity of each structure. In addition, this project will demonstrate to local government, state and federal agencies, land owners, and Delaware Bayshore residents how natural shoreline protection projects can function throughout the Delaware Bayshore and across New Jersey. Other partners include the Partnership for the Delaware Estuary and Rutgers University's Haskin Shellfish Research Laboratory.

An Environmental Assessment (EA) was prepared to address the impacts of the proposed project and the no-action alternative. Additional alternative analysis was not necessary because other alternatives would not meet project goals. The Draft EA was posted on Downe Township's website (http://www.downetwpnj.org/default.htm) on July 22, 2015. At the Downe Township public meeting on July 6, 2015 local community members were notified that the Draft EA would be available for public comment later in the month and brochures about the project and contact information have been available since that date at the town hall. Project partners have presented the project to the public at the Oyster Forum at the Bayshore Center at Bivalve (April 20, 2015), the Downe Township Horseshoe Crab Festival (May 16, 2015), and Bay Day in Port Norris (June 6, 2015).

No comments for the Draft EA have been received by August 27, 2015 and the Draft EA has been published as the Final EA. The Final EA and this Finding of No Significant Impact (FONSI) will be posted online on the Downe Township website and on the U.S. Fish and Wildlife Service Hurricane Sandy Gandy's Beach project website (http://www.fws.gov/hurricane/sandy/projects/GandysBeach.html). The first phase of construction is expected to occur mid-September to the end of October 2015. The second phase of the project will occur from April 1 to 15, 2016 and from June 15 to November 8, 2016.

The Service has determined through Intra-Service Section 7 consultation that the proposed project may affect, but is not likely to adversely affect, the federally listed (threatened)/State-listed (threatened) rufa red knot (*Calidris canutus rufa*). The Service and project partners will adhere to all recommended actions outlined in the Section 7 Biological Evaluation to reduce adverse effects. The project area is also designated as summer habitat for the federally listed (threatened) northern long-eared bat (*Myotis septentrionalis*), but the project is not expected to adversely impact this species. Federally listed marine species that may be present in the vicinity of the project area are Atlantic green sea turtle (*Chelonia mydas*), Atlantic hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle

(*Dermochelys coriacea*), loggerhead sea turtle (*Caretta carreta*), and Atlantic sturgeon (*Acipenser oxyrhynchus*). The Service initiated consultation with the National Marine Fisheries Service (NMFS) under Section 7. The NMFS concurred that the project is not likely to adversely affect any federally listed marine species. State-listed species that may forage within the project area include the black-crowned night heron (*Nycticorax nycticorax*) (threatened), bald eagle (*Haliaeetus leucocephalus*) (endangered), least tern (*Sterna antillarum*) (endangered), northern harrier (*Circus cyaneus*) (endangered), and osprey (*Pandion haliaetus*) (endangered). The Service will adhere to all permitted conditions in order to limit the impact of the proposed project on these species.

Based on the results of the analysis of the EA and other supporting documentation, the Service has determined that the proposed project is not a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement for the proposed action is not required. The Service is adopting the Draft EA as the Final EA and is issuing this FONSI.

Field Supervisor

8/27/15

Date

10. APPENDICES

A. Project Maps and Photos

1. Aerial Project Location Map
2. U.S. Geologic Survey (USGS) Topographic Map
3. Tax Map
4. Photos of Site
5. Gandy's Beach Preserve Shoreline History Map
6. Natural Resources Conservation Service (NRCS) Soils Map
7. Suspension of Harvest for Gandy's Beach/Money Island/Nantuxent Cove
8. Known Contaminated Sites Map
9. Groundwater Contamination Area Map
10. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)
11. National Wetlands Inventory (NWI) Map
12. Land Use Map
13. Biotic Community Maps

B. Project Designs

1. Quantities of Materials: Gandy's Beach Preserve and Nantuxent Creek
2. Gandy's Beach Preserve Living Shoreline Design Plans
3. Nantuxent Creek Living Shoreline Design Plans

C. Landowner's Agreement

D. Public Agency Letters of Response

1. U.S. Fish and Wildlife Service (Service)- Intra-Service Section 7 Biological Evaluation
2. State Historic Preservation Office
3. Tribal Correspondence
4. U.S. Army Corp of Engineers (USACE) Philadelphia District Cooperating Agency Letter

Appendix A- Maps & Photos

Environmental Assessment

Gandy's Beach/Money Island Living Shoreline Project

Downe Township, Monmouth County, New Jersey

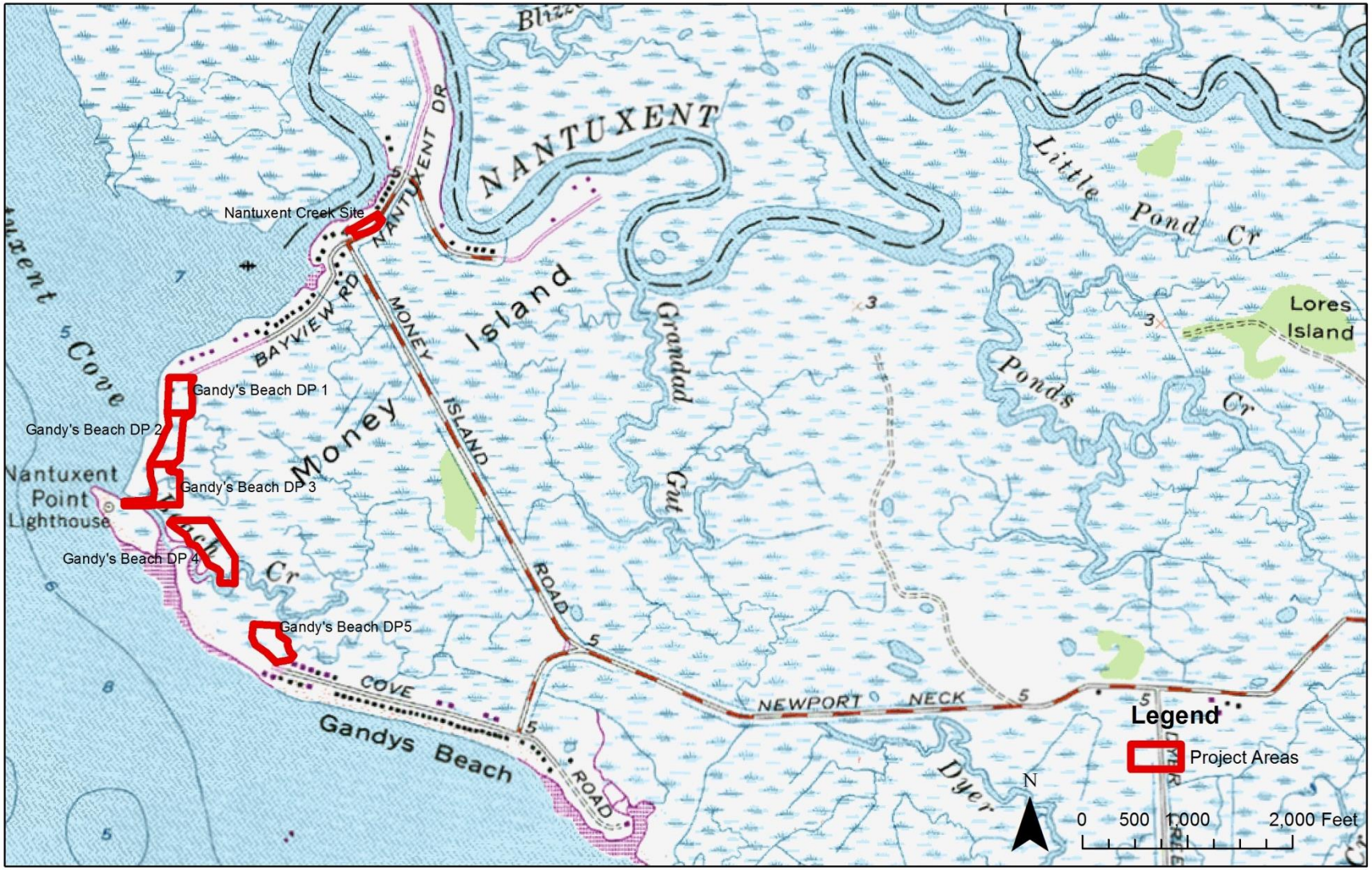
Appendix A-1

Gandy's Beach/Money Island Living Shoreline Project

(2013 Aerial, NJDEP)

Appendix A-2

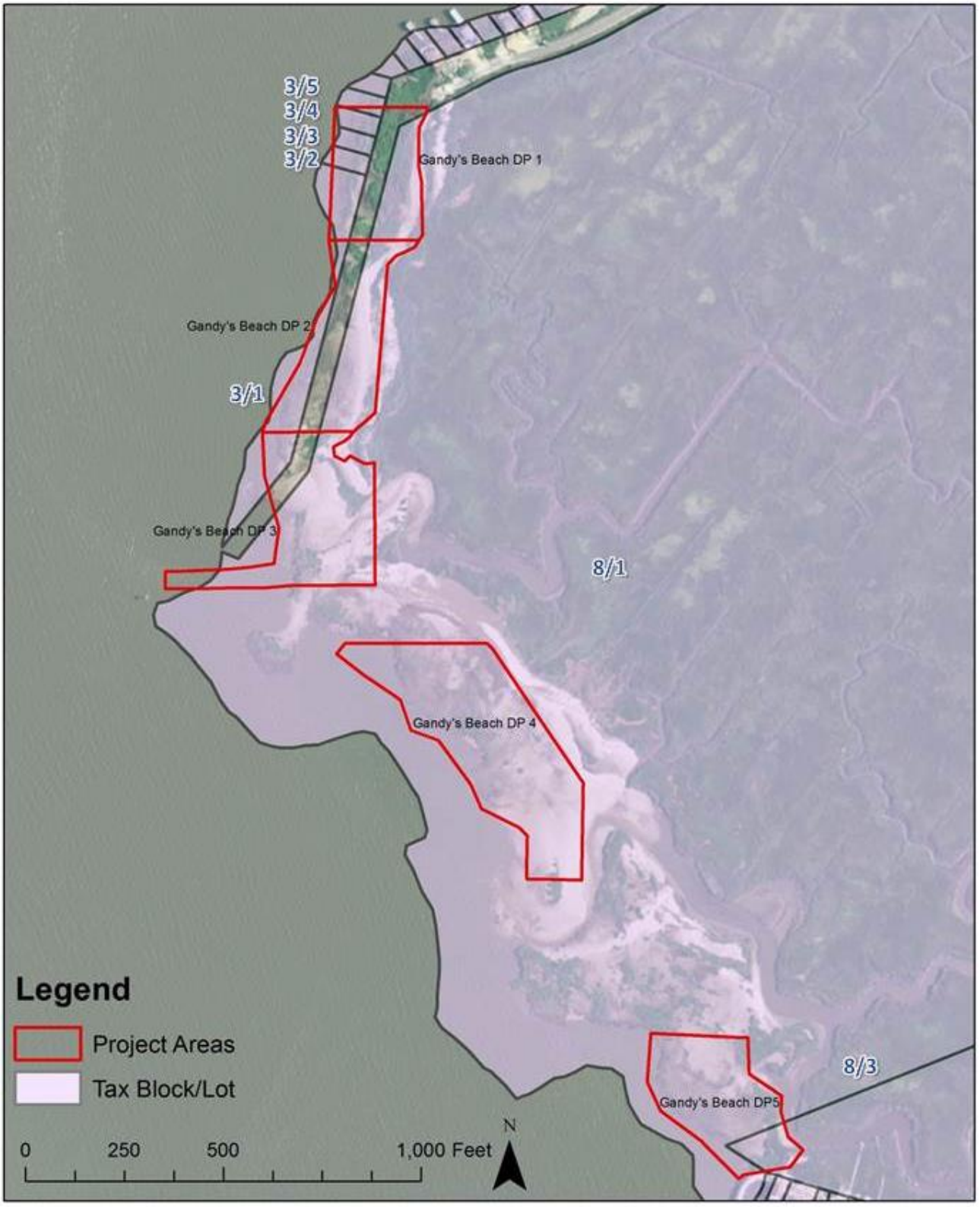
Gandy's Beach/Money Island Living Shoreline Project- USGS Topographic Map



Appendix A-3, Page 1

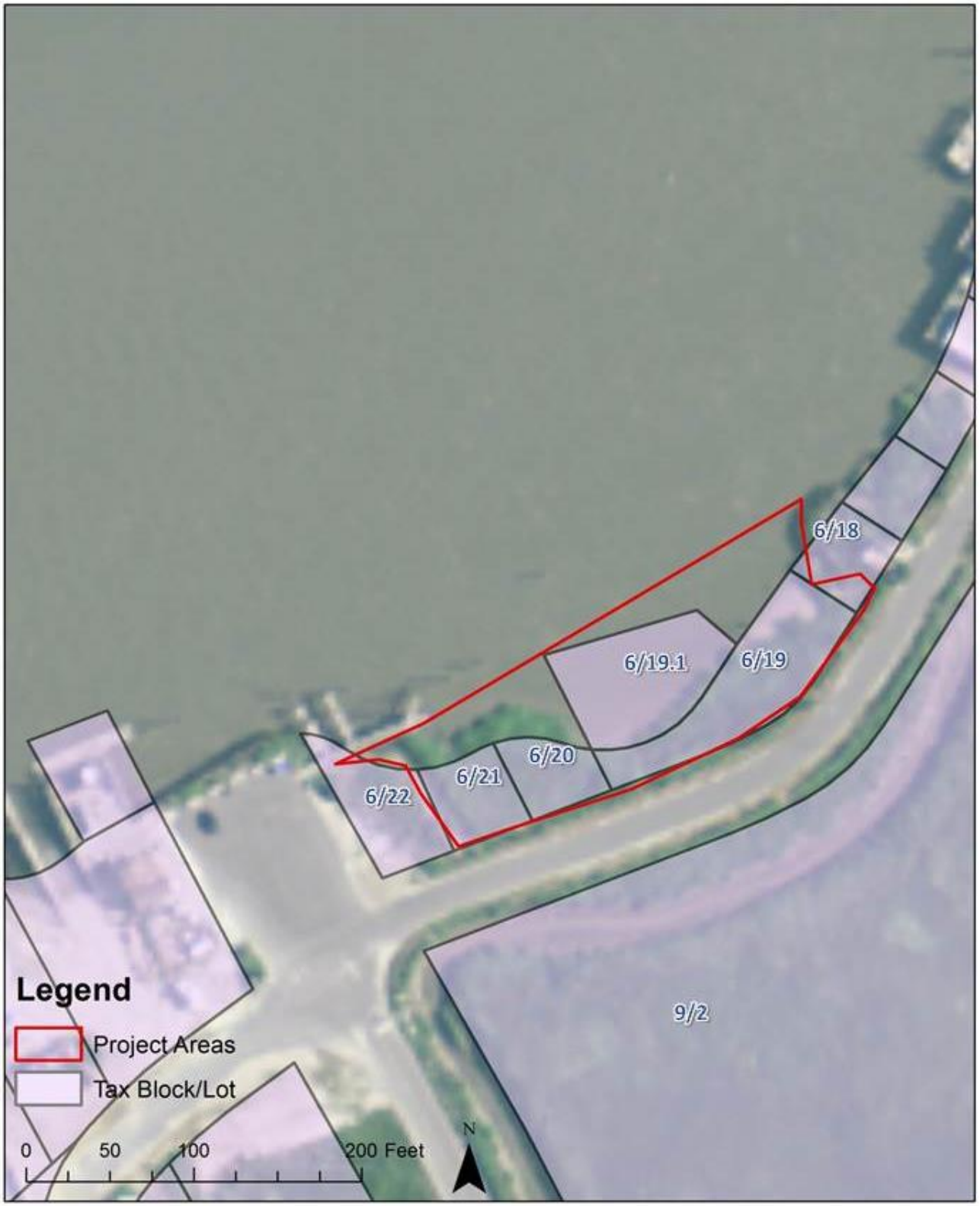
Gandy's Beach/Money Island Living Shoreline Project- Gandy's Beach PreserveTax Map

(2013 Aerial, NJDEP)



Appendix A-3, Page 2

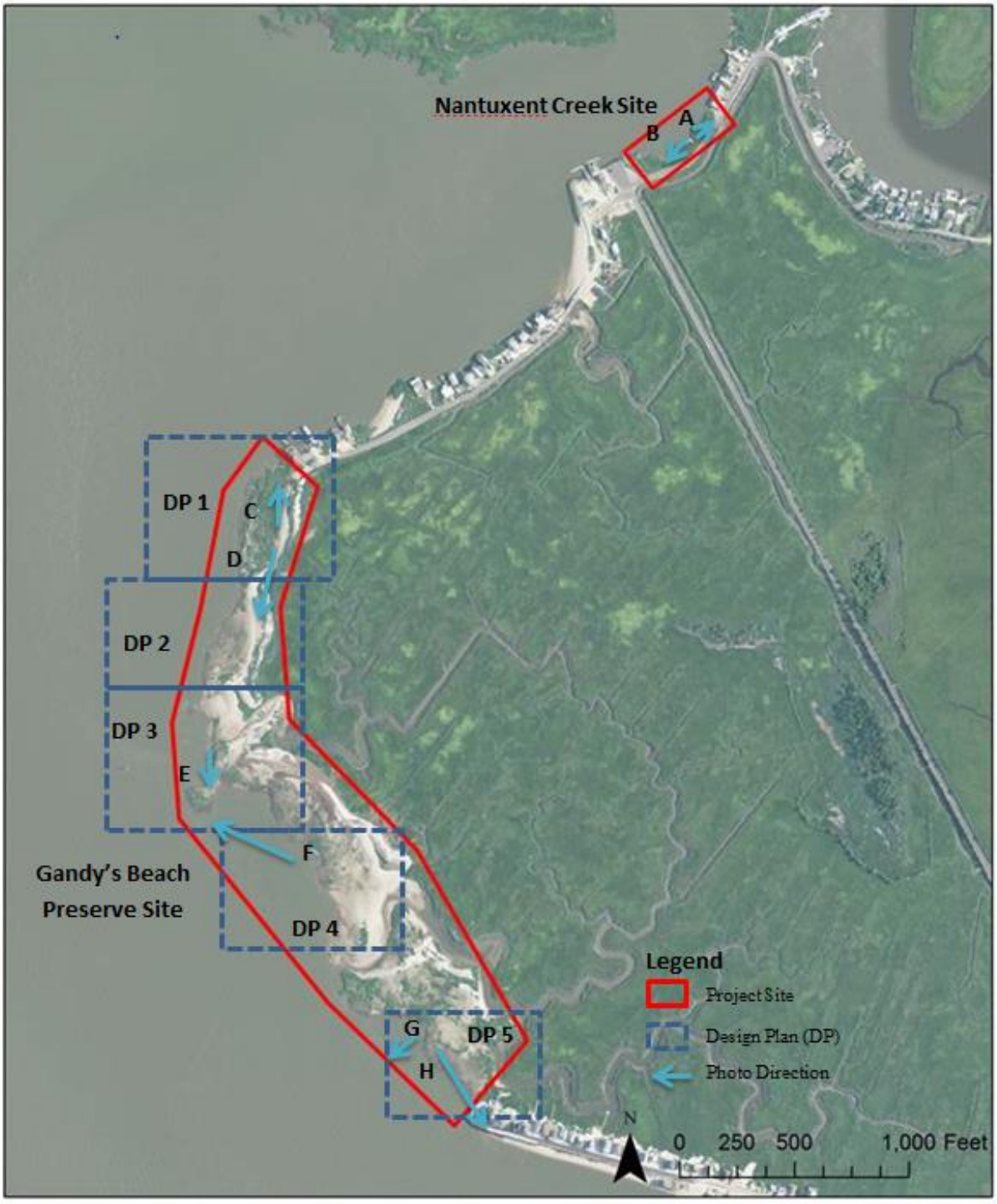
Gandy's Beach/Money Island Living Shoreline Project- Nantuxent CreekTax Map
(2013 Aerial, NJDEP)



Appendix A-4, Page 1

Gandy's Beach/Money Island Living Shoreline Project- Photo Points

(2013 Aerial, NJDEP)



Appendix A-4, Page 2

Photo A. Nantuxent Creek Site, facing north at low tide (10/06/2014).

Photo B. Nantuxent Creek Site, facing south at low tide (10/06/2014).

Appendix A-4, Page 3

Photo C. Gandy's Beach Preserve DP 1, facing north at low tide, wind 10-15 knots (10/06/2014).

Photo D. Gandy's Beach Preserve DP 1, facing southwest towards DP 2 at low tide, wind 10-15 knots (10/06/2014).

Photo E. Gandy's Beach Preserve DP 3, facing south at low tide, wind 10-15 knots (10/06/2014).

Photo F. Gandy's Beach Preserve DP 3, facing northwest at low tide towards DP 2, wind 10-15 knots (10/06/2014).

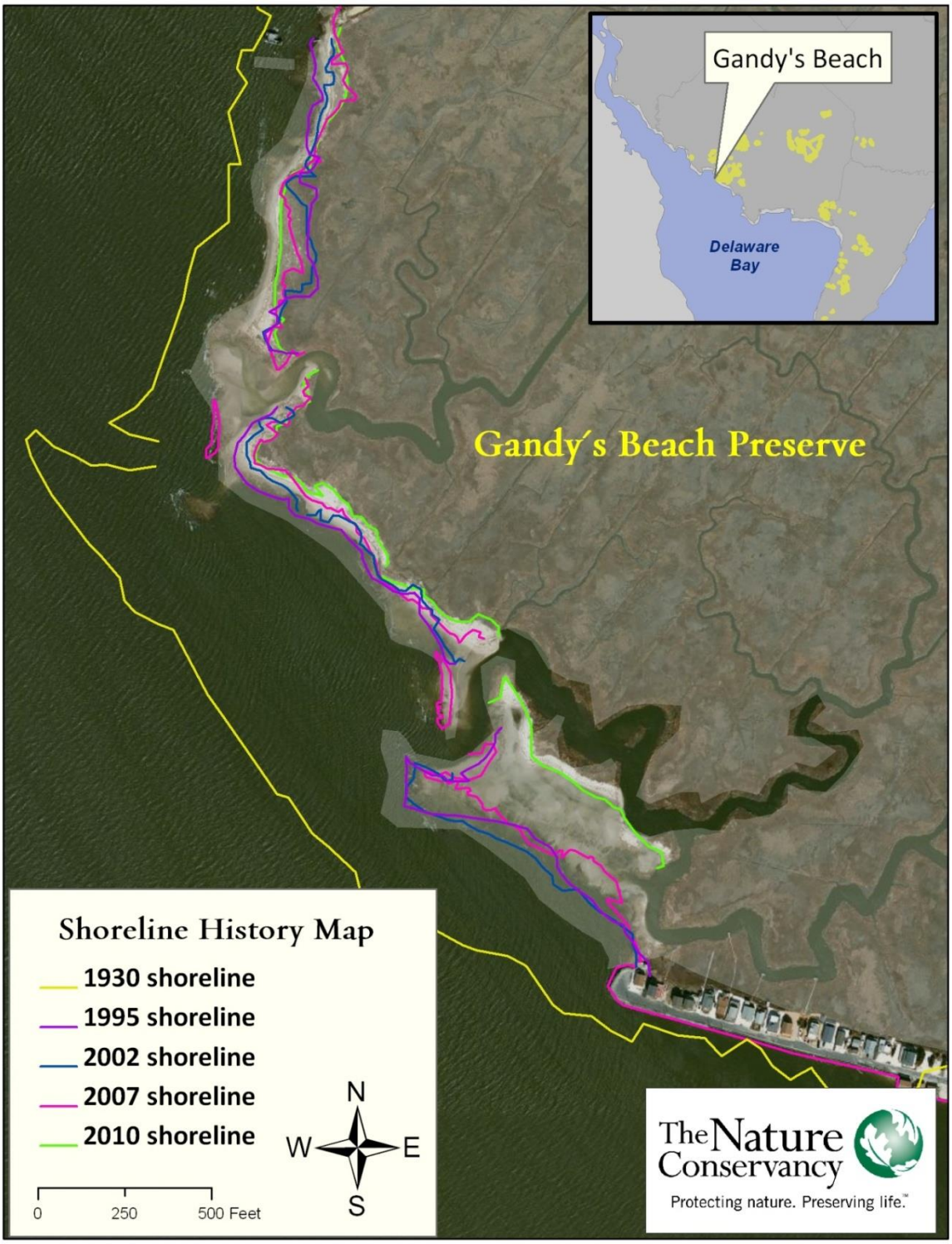
Appendix A-4, Page 6

Photo G. Gandy's Beach Preserve DP 5, facing northwest at low tide, wind 10-15 knots (10/06/2014).

Photo H. Gandy's Beach Preserve DP 5, facing southeast at low tide, wind 10-15 knots (10/06/2014).

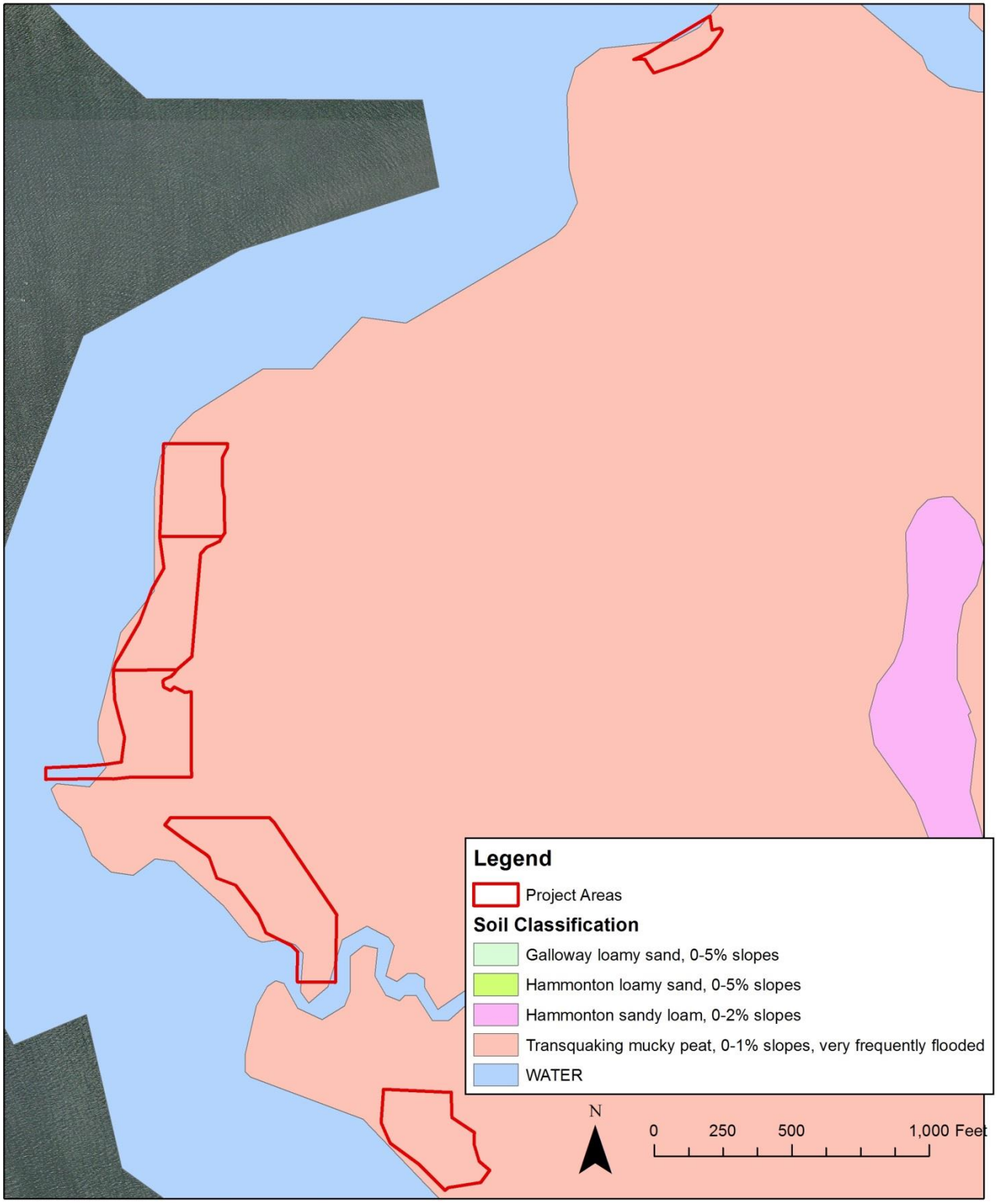
Appendix A-5

Shoreline History Map



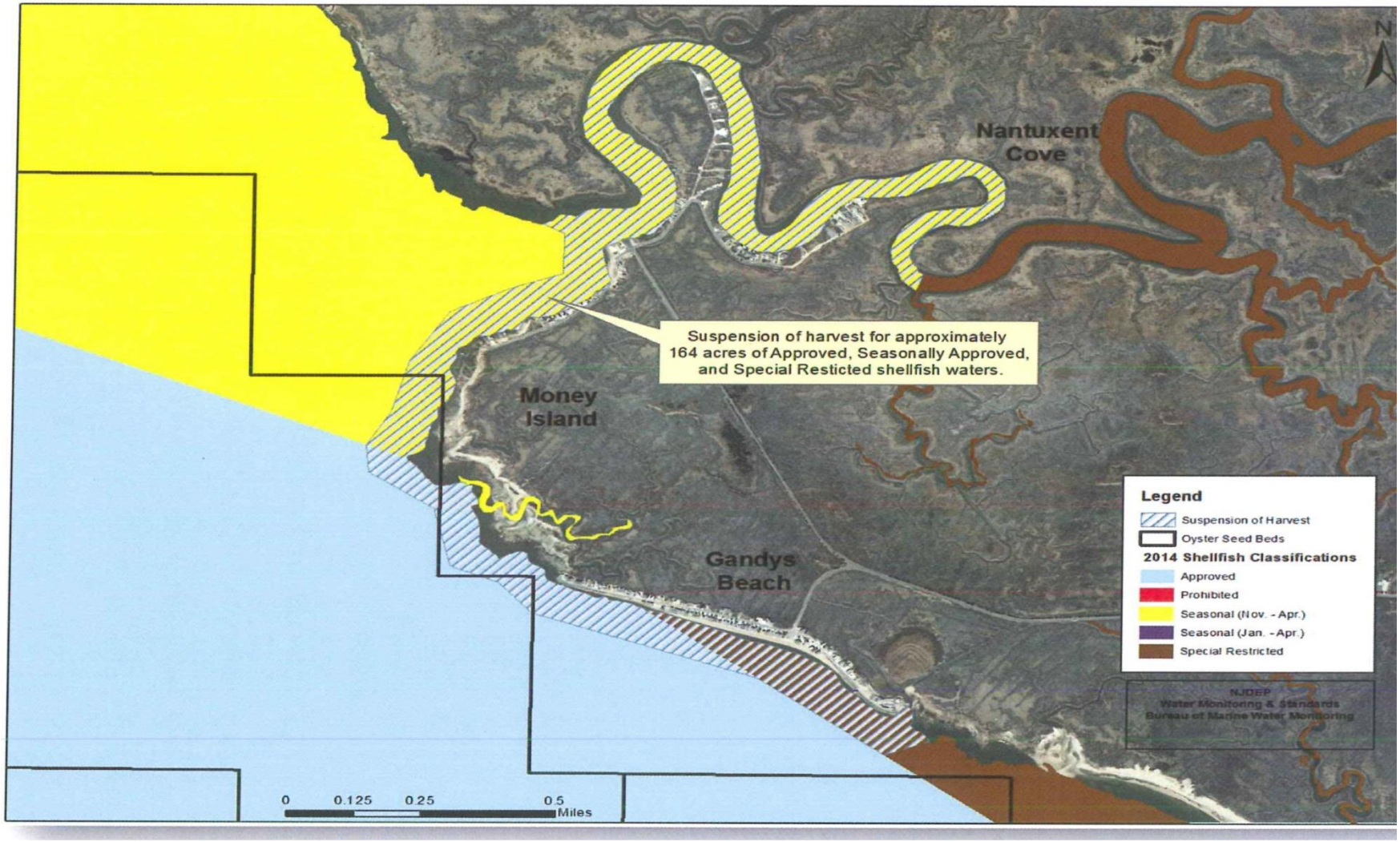
Appendix A-6

Gandy's Beach/Money Island Living Shoreline Project- NRCS Soil Survey 2008



Appendix A-7

Suspension of Harvest for Gandys Beach/Money Island/Nantuxent Cove

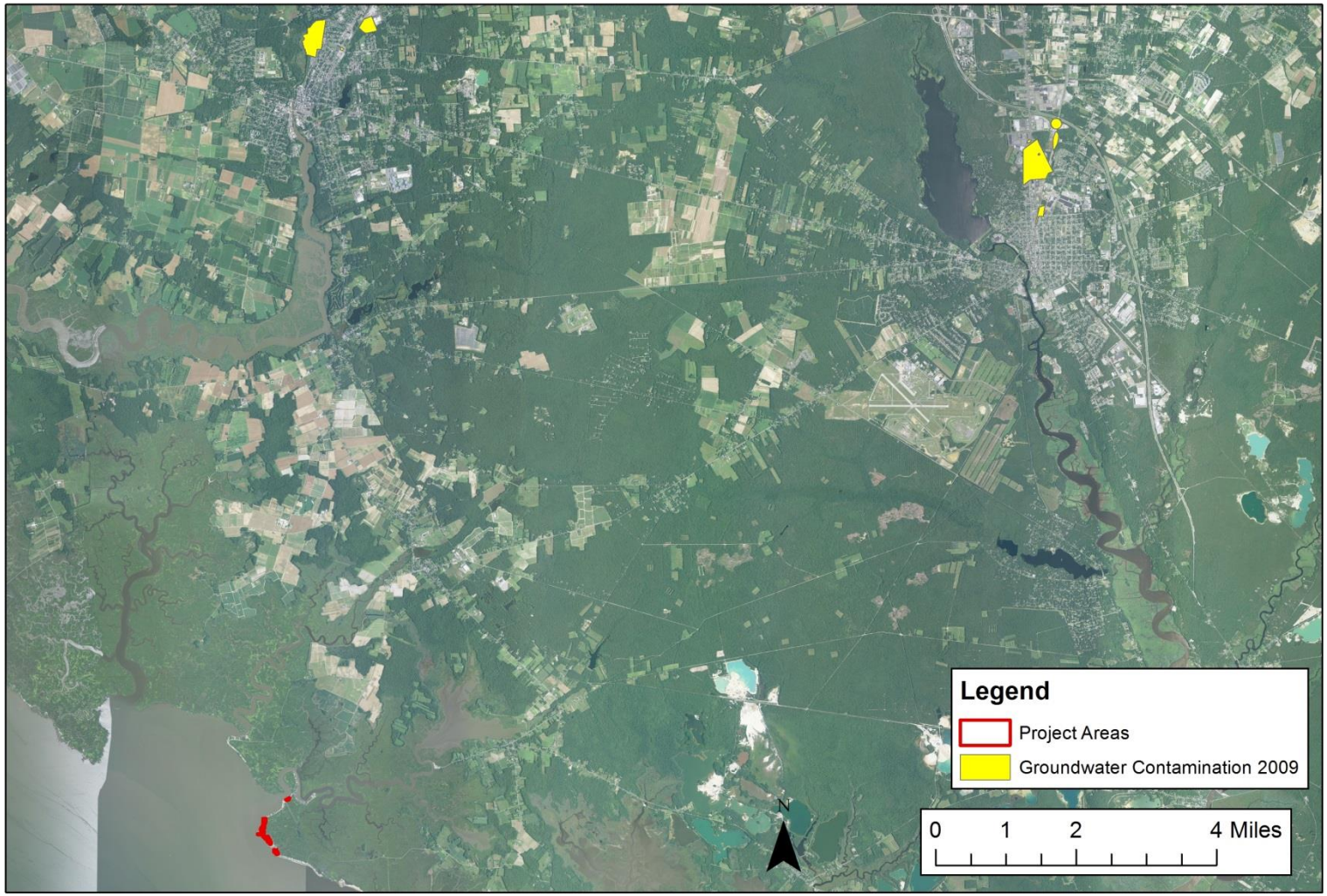


Appendix A-8

Gandy's Beach/Money Island Living Shoreline Project- Known Contaminated Sites 2009

Appendix A-9

Gandy's Beach/Money Island Living Shoreline Project- Groundwater Contamination Sites 2009



Appendix A-10

Money Island FIRM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was New Jersey State Plane (FIPS 2900) zone. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was developed from high-resolution orthophotography provided by the State of New Jersey. This information was derived from digital orthophotos produced at a scale of 1:2400 with a 1-foot pixel resolution from photography dated 2012.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

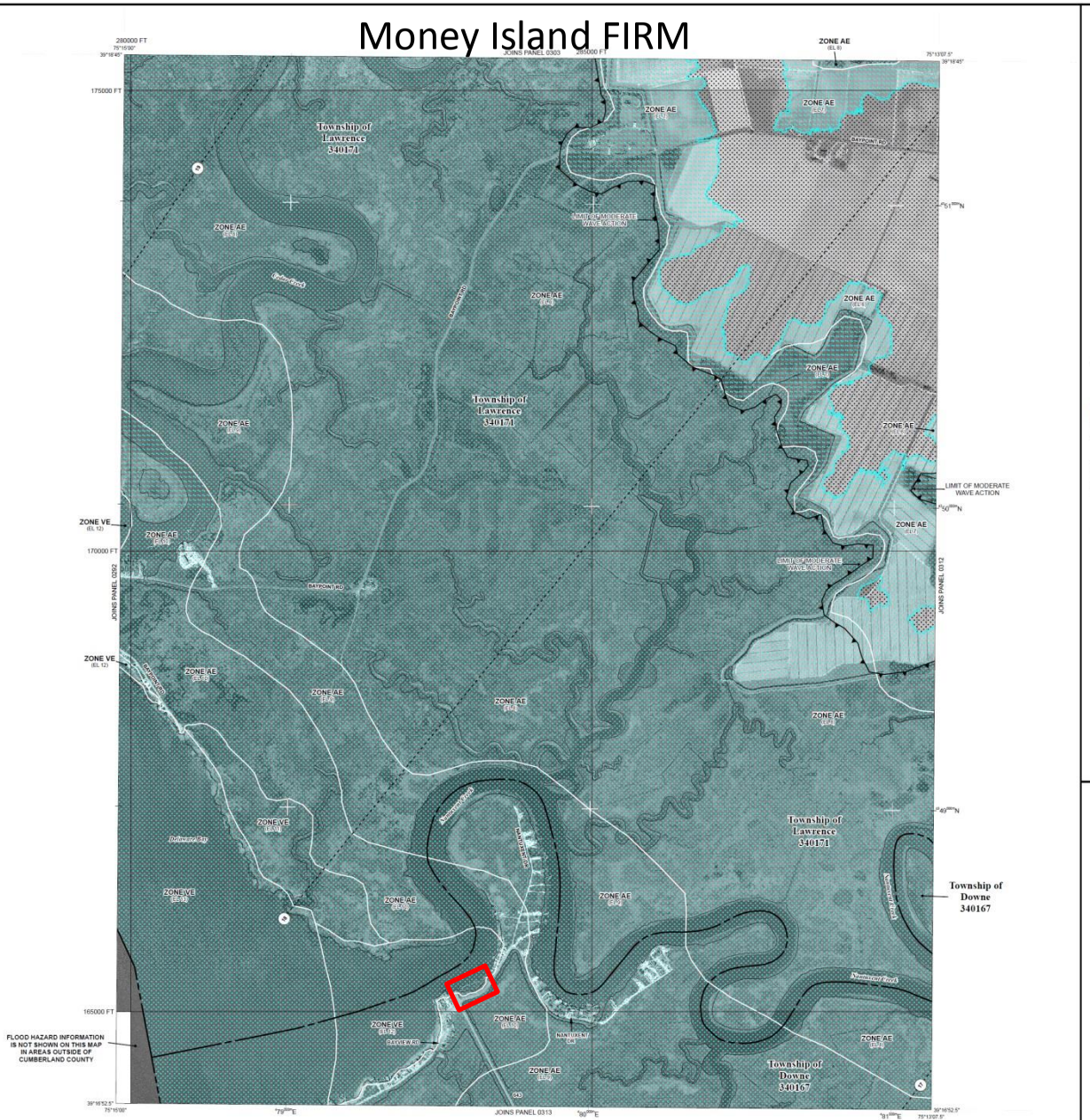
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LIMWA)**. The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (or between the shoreline and the LIMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Limit of Moderate Wave Action
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Limited Detail Cross Section Line
- Transect line
- Culvert, Flume, Pipestock or Aqueduct
- Road or Railroad Bridge
- Footbridge
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000 mN — 1000-meter Universal Transverse Mercator grid values, zone18
- 600000 FT — 5000-foot grid values: New Jersey State Plane coordinate system (FIPSZONE 2900), Transverse Mercator projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0311E

FIRM

FLOOD INSURANCE RATE MAP

CUMBERLAND COUNTY, NEW JERSEY (ALL JURISDICTIONS)

PANEL 311 OF 466

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOWNE, TOWNSHIP OF	340167	0311	E
LAWRENCE, TOWNSHIP OF	340171	0311	E

PRELIMINARY
APRIL 30, 2014

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

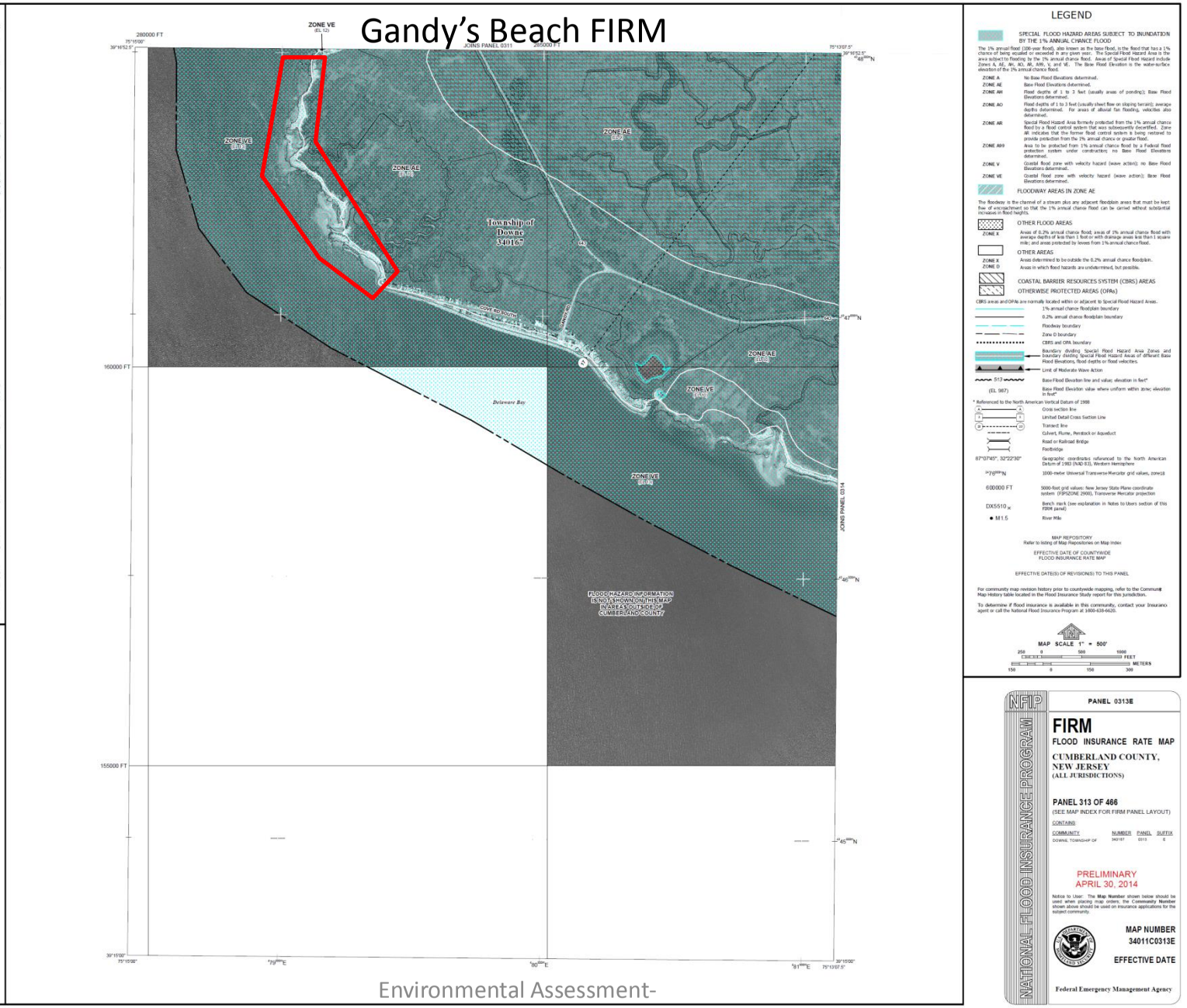
MAP NUMBER
34011C0311E

EFFECTIVE DATE

Federal Emergency Management Agency

Appendix A-10

Gandy's Beach FIRM



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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the State of New Jersey. This information was derived from digital orthophotos produced at a scale of 1:2,400 with a 1-foot pixel resolution from photography dated 2012.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.
ZONE AE — Base Flood Elevations determined.
ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS
ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS
ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Limit of Moderate Wave Action
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988
Cross section line
Limited Detail Cross Section Line
Transect line
Culvert, Flume, Pentock or Aqueduct
Road or Railroad Bridge
Footbridge
87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
2°7'500"N — 1000-meter Universal Transverse Mercator grid values, zone18
600000 FT — 5000-foot grid values: New Jersey State Plane coordinate system (FIPSZONE 2900), Transverse Mercator projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0313E

FIRM
FLOOD INSURANCE RATE MAP
CUMBERLAND COUNTY, NEW JERSEY
(ALL JURISDICTIONS)

PANEL 313 OF 466
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
DOWNE, TOWNSHIP OF	340167	0313	E

PRELIMINARY
APRIL 30, 2014

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

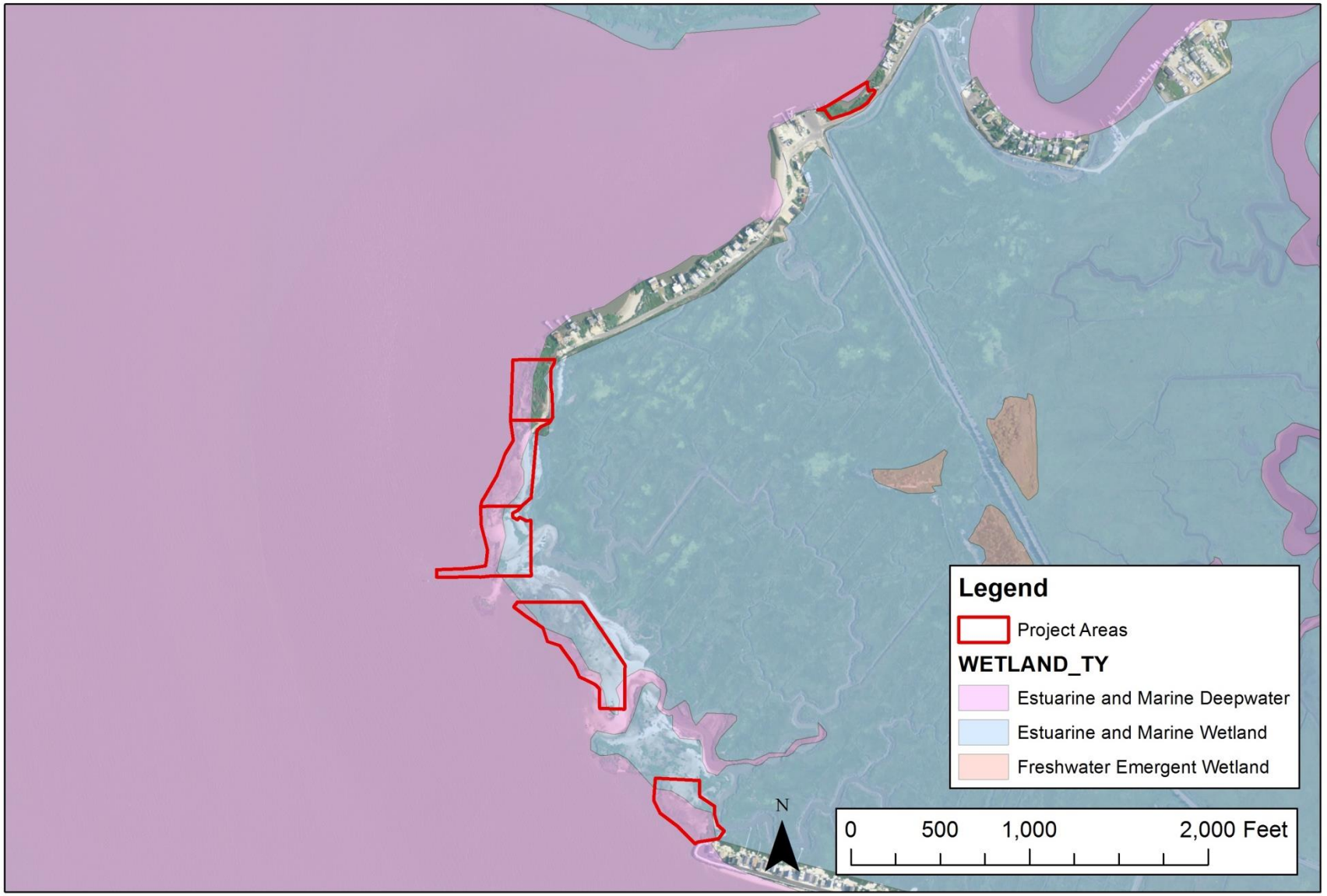
MAP NUMBER
34011C0313E

EFFECTIVE DATE

Federal Emergency Management Agency

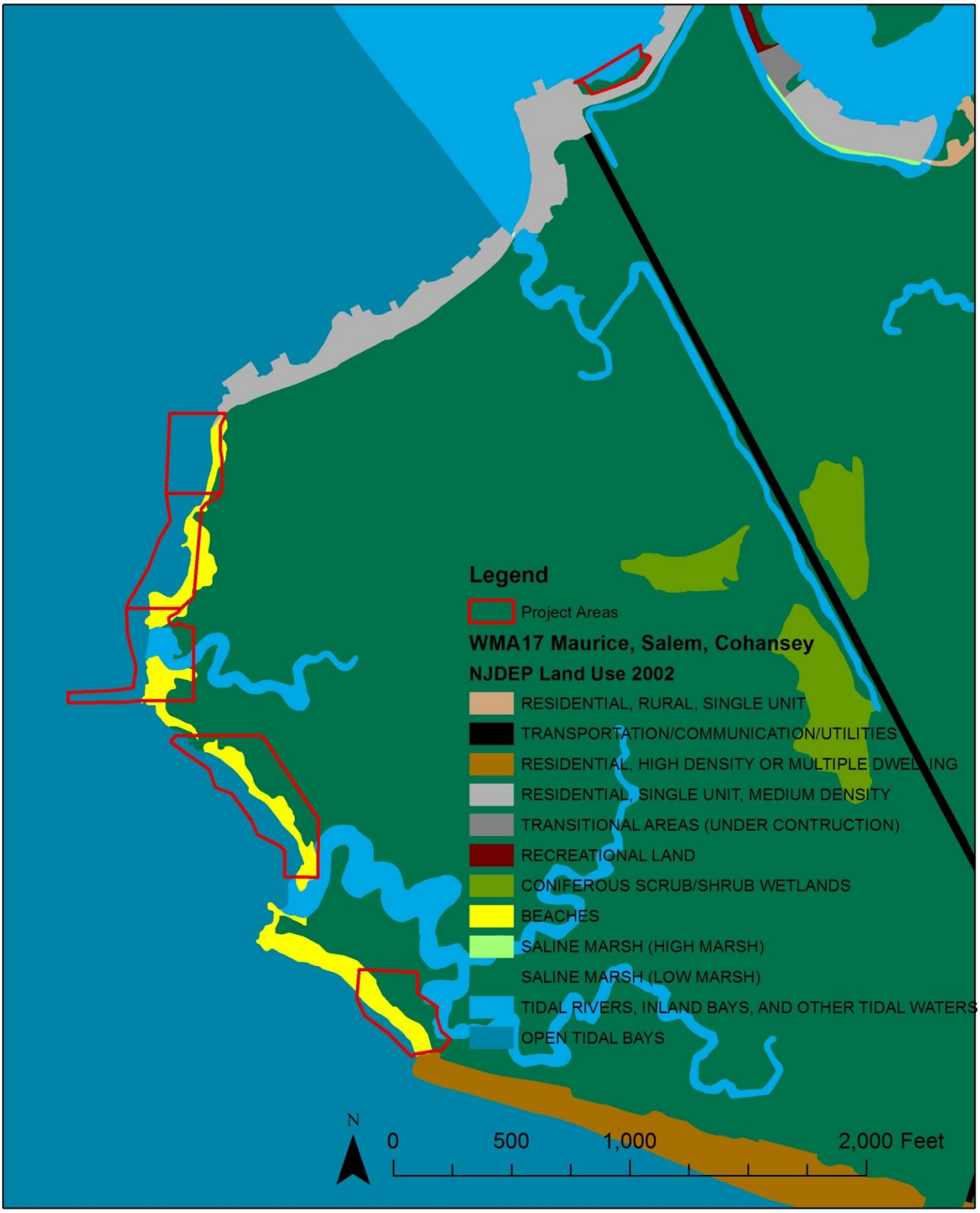
Appendix A-11

Gandy's Beach/Money Island Living Shoreline Project- NWI Map



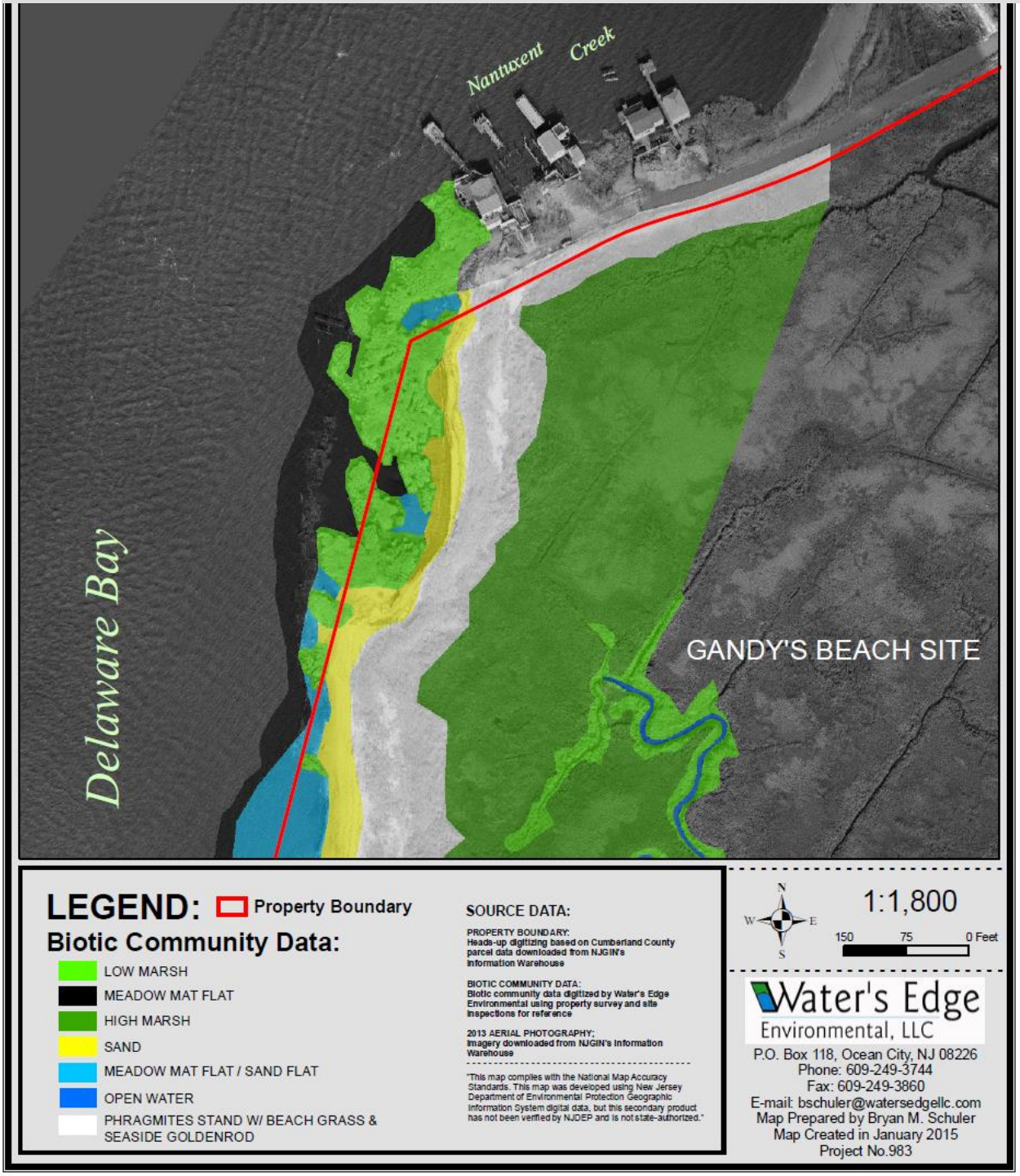
Appendix A-12

Gandy's Beach/Money Island Living Shoreline Project- NJDEP Land Use Map

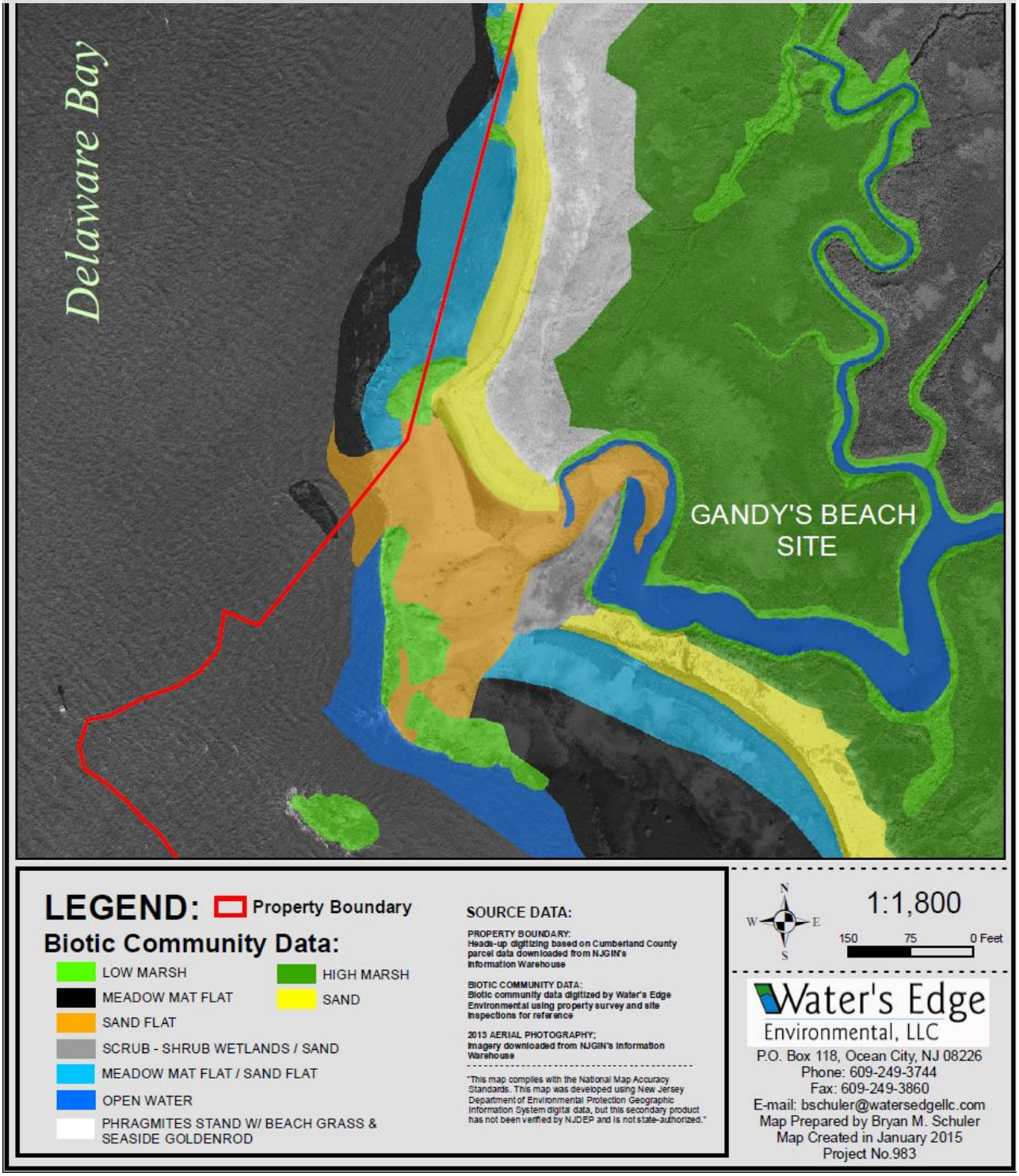


Appendix A-13 Biotic Community Map, Page 1

BIOTIC COMMUNITY MAP: GANDY'S BEACH DESIGN PLAN 1

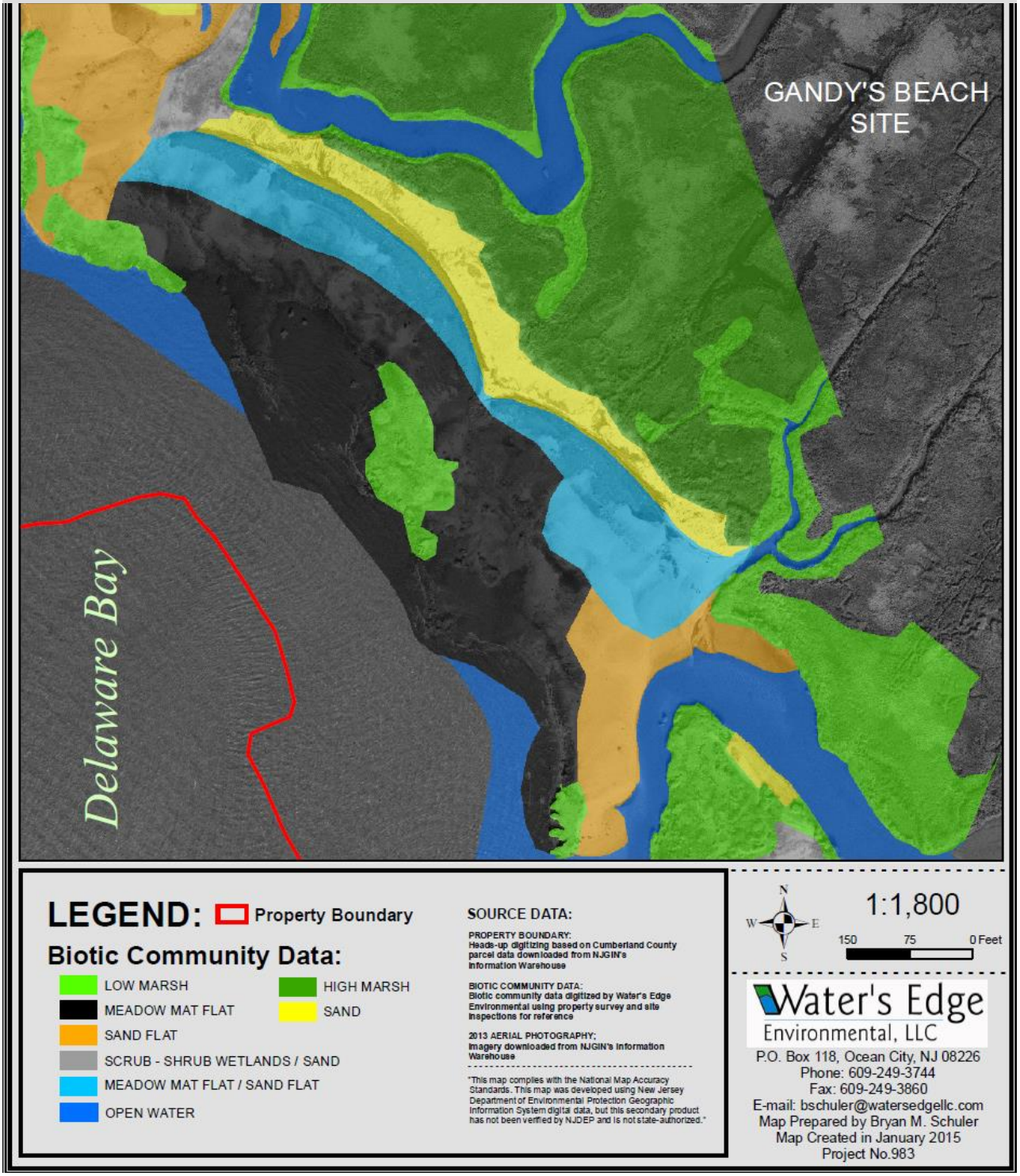


BIOTIC COMMUNITY MAP: GANDY'S BEACH DESIGN PLAN 2 AND 3

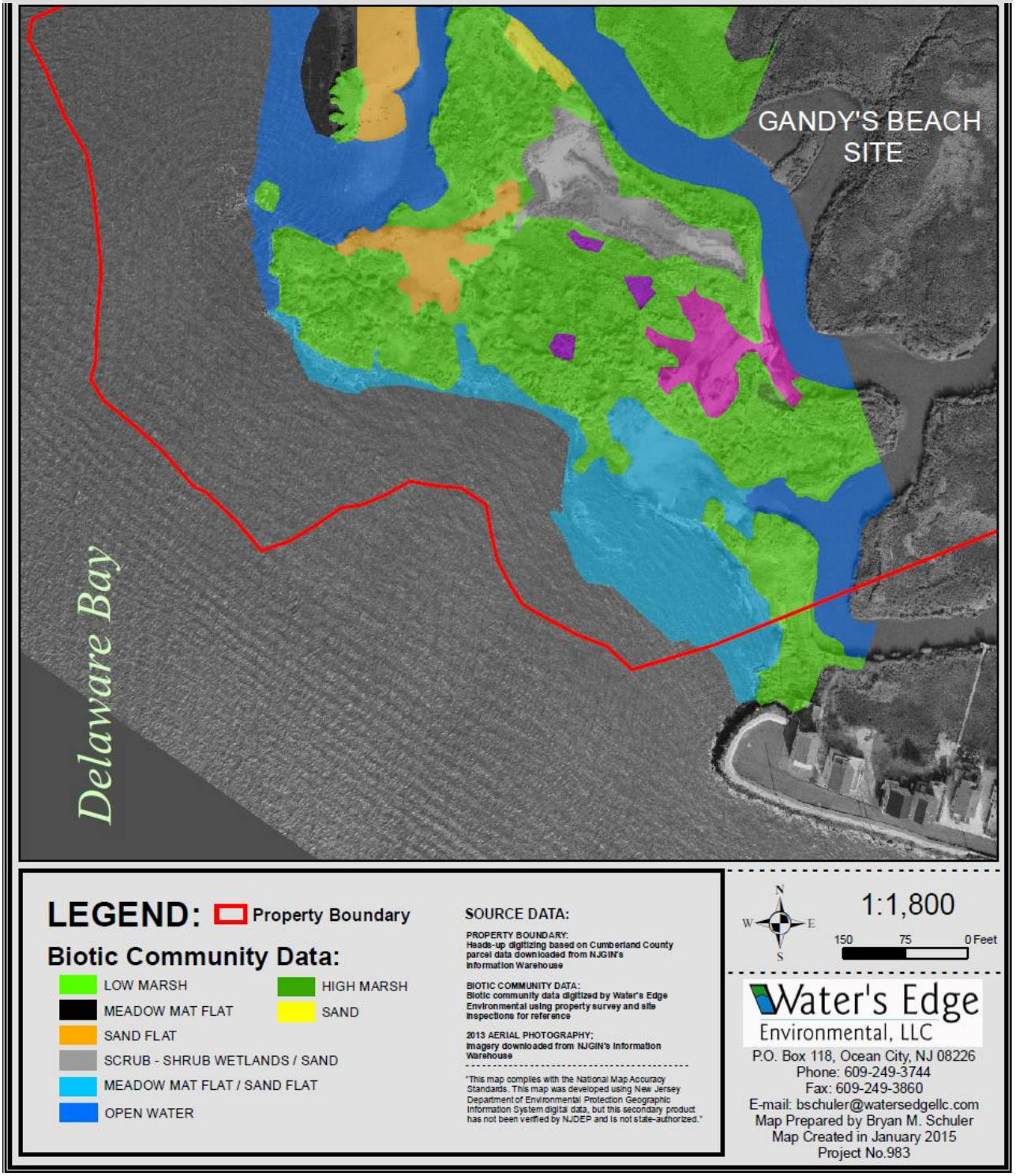


Appendix A-13 Biotic Community Map, Page 3

BIOTIC COMMUNITY MAP: GANDY'S BEACH DESIGN PLAN 4

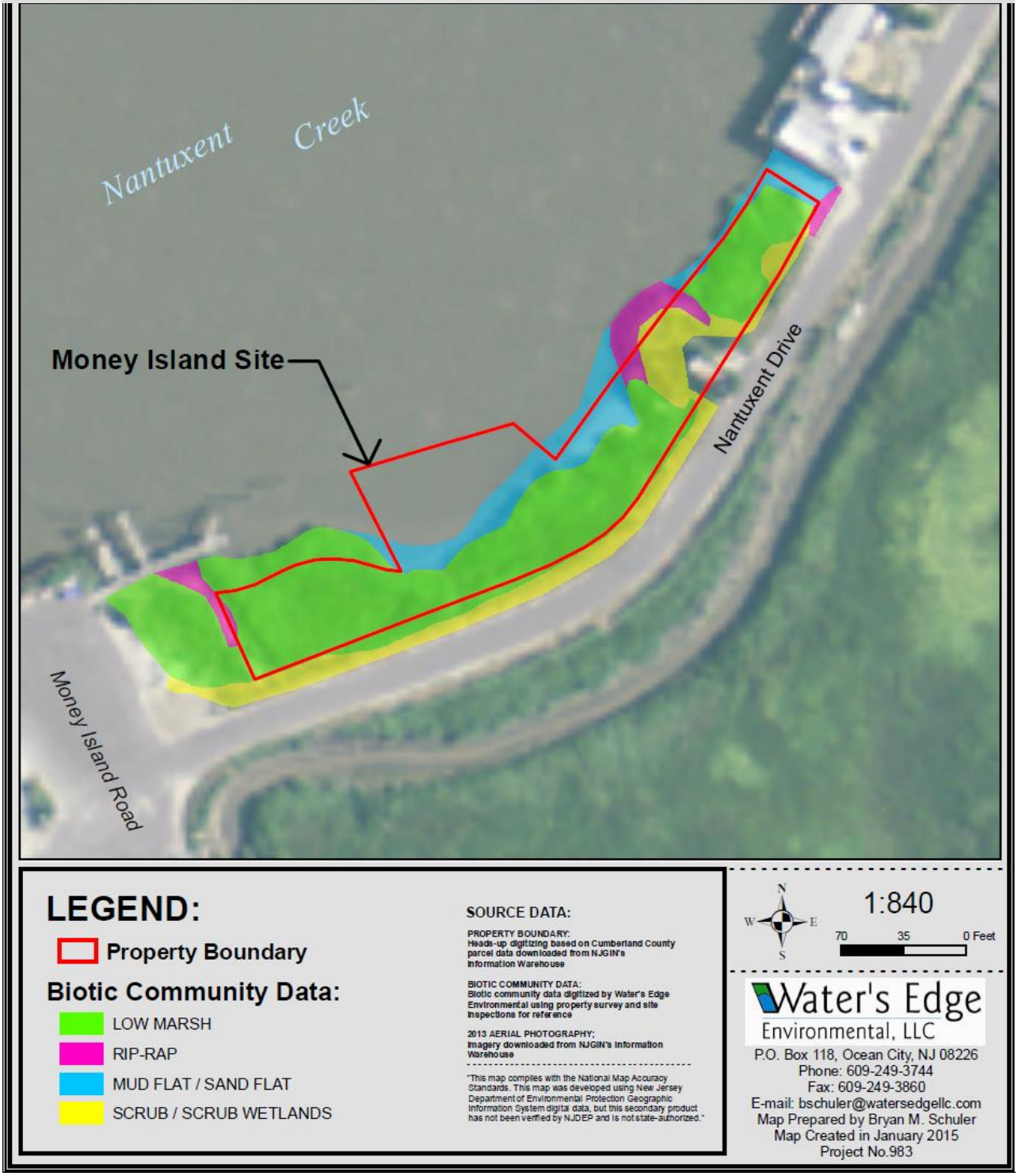


BIOTIC COMMUNITY MAP: GANDY'S BEACH DESIGN PLAN 5



Appendix A-13 Biotic Community Map, Page 5

BIOTIC COMMUNITY MAP: NANTUXENT CREEK SITE



Appendix B- Materials and Designs

ENVIRONMENTAL ASSESSMENT

GANDY'S BEACH/MONEY ISLAND LIVING SHORELINE PROJECT

DOWNE TOWNSHIP, NEW JERSEY

Appendix B-1- Quantities of Materials

Gandy's Beach Preserve Site Materials

Site Name	Phase	Large Castle Pod	LF* of Materials	Units	Ft²	Small Castle Pod	LF of Materials	Units	Ft²		Total # of Units	Total LF of Materials	Total Ft²	Total LF of LS
DP 1	1	8	240	10,456	2,400	0	0	0	0		10,456	240	2,400	300
DP 2	1	5	150	6,535	1,500	3	60	2,511	600		9,046	210	2,100	250
DP 3	1	5	150	6,535	1,500	9	180	7,533	1,800		14,068	330	3,300	480
DP 4	2	8	240	10,456	2,400	4	80	3,348	800		13,804	320	3,200	360
DP 5	2	5	150	6,535	1,500	4	80	3,348	800		9,883	230	2,300	300
TOTALS		31	930	40,517	9,300	20	400	16,740	4,000		57,257	1,330	13,300	1,690

Site Name	Phase	Large Shell Bag Breakwater	LF of Materials	Shell Bags	Sand Bags	Ft²	Small Shell Bag Breakwater	LF of Materials	Shell Bags	Sand Bags	Ft²	Total # of Shell Bags	Total # of Sand Bags	Total LF of Materials	Total Ft²	Total LF of LS
DP 1	1	0	0	0	0	0	3	90	1,440	90	270	1,440	90	90	270	100
DP 2	1	4	120	2,560	480	600	10	300	4,800	300	900	7,360	780	420	1,500	250
DP 3	1	0	0	0	0	0	7	210	3,360	210	630	3,360	210	210	630	250
DP 4	2	0	0	0	0	0	18	540	8,640	540	1,620	8,640	540	540	1,620	400
DP 5	2	0	0	0	0	0	9	270	4,320	270	810	4,320	270	270	810	160
TOTALS		4	120	2,560	480	600	47	1,410	22,560	1,410	4,230	25,120	1,890	1,530	4,830	1,160

Site Name	Phase	Coir log cusp	LF of Materials	Units	Square Feet		Total LF of Materials	Total Ft²	Total LF of LS
DP 1	1	17	340	34	27		340	459	120
DP 1	2	17	340	34	27				

Breakwater Type	Dimensions	Materials per Breakwater	Ft³ per Type	Total Ft³
Large castle pods	30'x10'x4'	1,307 units	1,200	37,200
Small castle pods	20'x10'x4'	837 units	800	16,000
Large Shell bag reefs	30'x5'x4'	640 shell bags and 120	600	2,400
Small Shell bag reefs	30'x3'x2'	480 units, 30 sand bags	180	8,460
Coir log cusp	20'x1'x2'	4 logs per cusp	27	459

Total Castle Pod Ft³
64,060

Site Name	Total LF of all LS Types***	Total LF of Shoreline Protection	Total Ft²
DP 1	300	500	3,129
DP 2	480	680	3,600
DP 3	500	700	3,930
DP 4	720	920	4,820
DP 5	330	530	3,110
Totals	2,330	3,330	18,589

* LF is linear feet

** LS is living shoreline

*** Total LF of all Types is the linear feet along the total length of the design plan

Nantuxent Creek Site Materials

Breakwater Type	Phase	# of Breakwaters	LF* of Materials	Units	Square Feet
Large Castle Pods	1	6	120	1,140	480
Medium Castle Pods	1	5	30	160	90
Small Castle Pods	1	8	16	40	32
"V" Oyster Castle Pod	1	15	90	165	135
"T" Oyster Castle Pod	1	8	34	72	56
TOTALS		42	290	1577	793

Total LF of Constructed LS**	Estimated LF of Shoreline Protection
330	400

Coir Log Cusp	1	21	420	42	567
Coir Log Cusp	2	21	420	42	567
TOTALS		42	840	84	1134

Total LF of constructed LS
180

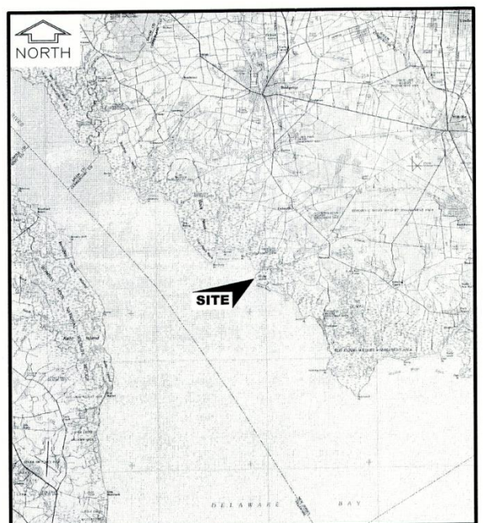
Total LF of all LS Types***	Total LF of Shoreline Protection	Total Ft²
330	400	1,360

Breakwater Type	Dimensions	Materials per Breakwater	Ft³ per Type	Total Ft³	
Large Castle Pods	20'x4'x2'	1,307 units	160	960	
Medium Castle Pods	6'x3'x1.5'	20 units	27	135	Total Oyster Pod Ft³
Small Castle Pods	2'x2'x1.1'	3 units	4	35	
"V" Castle Pod	6'x3'x1.1'	15 units	20	297	1,590
"T" Castle Pod	4.3'x4.3'x1.1'	8 units	20	163	
Coir Log Cusp	10'x2'x1'	4 coir logs	27	567	

THE NATURE CONSERVANCY

2350 ROUTE 47, DELMONT, NJ 08314

GANDY'S BEACH LIVING SHORELINE PROJECT



VICINITY MAP

DRAWING LIST

DWG. NO.	TITLE
214098-5A-01	COVER SHEET AND DRAWING LIST
214098-5A-02	PROJECT NOTES
214098-5A-03	GENERAL SITE PLAN
214098-5A-04	DETAIL PLAN 1 - PHASE 1
214098-5A-05	DETAIL PLAN 2 - PHASE 1
214098-5A-06	DETAIL PLAN 3 - PHASE 1
214098-5A-07	DETAIL PLAN 4 - PHASE 2
214098-5A-08	DETAIL PLAN 5 - PHASE 2
214098-5A-09	SHORELINE SECTIONS
214098-5A-10	SHORELINE TREATMENT DETAILS

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
609.249.3744 info@watersedgellc.com

ISSUED FOR CONSTRUCTION

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

Ocean and Coastal Consultants COWI
Ocean and Coastal Consultants, Inc.
20 E. Clementon Road, Suite 201N, Gibbsboro, NJ 08026
Phone: (856) 248-1200 Fax: (856) 248-1206
Visit us at www.ocean-coastal.com

The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

DESIGNED BY:	TPMA
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT

COVER SHEET AND DRAWING LIST

SCALE AS NOTED | REVISION
DATE 4/23/15
DRAWING NO. 214098-5A-01

C:\Michelle Sarzewski\OCC 214098 TASK 5A\01.dwg Dwg 01 Michelle Sarzewski Fri, 15 May 2015 - 5:02pm

Appendix B-2 Gandy's Beach Design Plans- Project Notes, Sheet 2

PROJECT NOTES

DESIGN CRITERIA

1. THE INTENT OF THIS DESIGN IS A PILOT STUDY TO DETERMINE THE EFFECTIVENESS OF VARIOUS CONFIGURATIONS OF PROPRIETARY WAVE ATTENUATION AND HABITAT ENHANCEMENT SYSTEMS IN AN EFFORT TO REDUCE WAVE INDUCED EROSION AND PROVIDE ECOLOGICAL UPLIFT TO THE SITE.
2. DESIGN CAPACITIES FOR PROPRIETARY SYSTEMS HAVE NOT BEEN EVALUATED.
3. TIDAL DATUM INFORMATION IS TAKEN FROM BENCHMARK SHEET FOR STATION ID 8537121, SHIP JOHN SHOAL, NEW JERSEY, OCTOBER 10, 2015, PUBLISHED BY THE U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEAN SERVICE (NOS).
4. ELEVATIONS REFERENCE NORTH AMERICAN VERTICAL DATUM OF 1998 (NAVD 88) IN FEET.
5. LOCATION OF EXISTING STRUCTURES TAKEN FROM LAND SURVEY BY STEPHEN C. MARTINELLI LAND SURVEYING, LLC. ON DECEMBER 2014 AND JANUARY 2015 AND REPRESENT THE CONDITIONS OF THE SITE AT THE TIME OF THE SURVEY.
6. THE SITE IS KNOWN AS BLOCK 8, LOT 1 ON SHEET #4 OF THE TAX MAP OF THE TOWNSHIP OF DOWNE.
7. THE FOLLOWING REFERENCE DOCUMENTS WERE USED IN CONJUNCTION WITH THE SITE INFORMATION:

DRAWING NO.	COMPANY	DRAWING TITLE
154-1836	NJDEP	NANTUXENT CREEK SOUTH
161-1836	NJDEP	NANTUXENT CREEK

8. HYDROGRAPHIC SURVEY PERFORMED BY STEPHEN C. MARTINELLI LAND SURVEYING, LLC. ON DECEMBER 2014 AND JANUARY 2015 AND REPRESENT THE CONDITIONS OF THE SITE AT THE TIME OF THE SURVEY.
9. THE STRUCTURES HAVE BEEN DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER CONSTRUCTION IS COMPLETE. THE STABILITY OF THE STRUCTURES PRIOR TO COMPLETION IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR. THIS RESPONSIBILITY EXTENDS TO RELATED ASPECTS OF THE CONSTRUCTION ACTIVITY INCLUDING, BUT NOT LIMITED TO, ERECTION METHODS, ERECTION SEQUENCE, CONNECTIONS, TEMPORARY BRACING, FORMS, SHORING, USE OF EQUIPMENT, AND SIMILAR CONSTRUCTION PROCEDURES. REVIEW OF CONSTRUCTION BY THE OWNER AND ENGINEER OF RECORD IS FOR GENERAL CONFORMANCE WITH THE CONTRACT DOCUMENTS ONLY. LACK OF COMMENT BY THE OWNER AND ENGINEER OF RECORD WITH REGARD TO CONSTRUCTION PROCEDURES SHALL NOT BE INTERPRETED AS APPROVAL OR ACCEPTANCE OF SUCH PROCEDURES.

GENERAL CONDITIONS

1. NO GUARANTEE TO THE ACCURACY OF THE REFERENCE DOCUMENTS IS PROVIDED HEREIN AND THE CONTRACTOR SHALL RELY ON HIS OWN FIELD VERIFICATION FOR ITEMS SO REQUIRED.
2. SECTIONS, DETAILS, NOTES, DIMENSIONS AND CONDITIONS ARE APPLICABLE AT ANY OTHER LOCATION WHERE CONDITIONS AND DETAIL ARE SIMILAR BUT ARE NOT SPECIFICALLY NOTED AS SUCH OR ARE NOT SHOWN.
3. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO CONSTRUCTION AND FABRICATION OF CONSTRUCTION MATERIALS.
4. IF, DURING THE PERFORMANCE OF THE WORK, THE CONTRACTOR FINDS A CONFLICT, ERROR, OR DISCREPANCY IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL SO REPORT TO THE ENGINEER OF RECORD IN WRITING AT ONCE. BEFORE PROCEEDING WITH THE WORK AFFECTED THEREBY, THE CONTRACTOR SHALL OBTAIN A WRITTEN INTERPRETATION OR CLARIFICATION FROM THE ENGINEER OF RECORD. WORK DONE BEFORE THE OWNER RENDERS HIS DECISION IS AT THE CONTRACTOR'S SOLE RISK.
5. THE WORK SHALL BE PERFORMED IN A GENERAL SEQUENCE DEVELOPED BY THE CONTRACTOR AND SUBMITTED TO THE OWNER FOR REVIEW, IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND FOR THE SEQUENCES AND PROCEDURES TO BE USED.
6. THE CONTRACTOR SHALL FURNISH AND COORDINATE PLANT, LABOR, SUPERVISION, MATERIALS, EQUIPMENT AND APPLIANCES FOR DEMOLITION AND/OR CONSTRUCTION WORK IN CONNECTION WITH THE DEMOLITION AND/OR CONSTRUCTION OF THE MARINE FACILITIES.
7. THE OWNER HAS SECURED CERTAIN PERMITS REQUIRED BY FEDERAL, AND STATE AUTHORITIES FOR THE PROPOSED ACTIVITIES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM THE WORK IN ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE PERMITS. THE CONTRACTOR SHALL POST COPIES OF THE PERMITS AT THE SITE THROUGHOUT THE COURSE OF THE WORK. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN PERMITS ASSOCIATED WITH THE LEGAL DISPOSAL OF CONSTRUCTION DEBRIS. THE CONTRACTOR SHALL SECURE REQUIRED LOCAL AUTHORIZATIONS AND PERMITS.
8. THE CONTRACTOR SHALL FURNISH MATERIALS FOR INSTALLATION IN THE COMPLETED WORK AS SPECIFIED HEREINAFTER. THE CONTRACTOR SHALL HANDLE THESE MATERIALS AS THEY ARE DELIVERED TO THE SITE OR OFF-SITE WORK AREAS, AND SHALL STORE THEM IN A DESIGNATED STORAGE AREA.
9. THE CONTRACTOR WILL INDEMNIFY AND SAVE HARMLESS THE OWNER AND ENGINEER OF RECORD FROM AND AGAINST ALL LOSSES AND ALL CLAIMS, DEMANDS, PAYMENTS, SUITS, ACTIONS, RECOVERIES, AND JUDGMENTS OF EVERY NATURE AND DESCRIPTION BROUGHT OR RECOVERED AGAINST THE OWNER AND ENGINEER OF RECORD BY REASON OF ANY ACT OR OMISSION OF THE CONTRACTOR, OR OF ANY SUBCONTRACTOR TO THE CONTRACTOR, OR OF ANY PERSON DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR OR ANY SUCH SUBCONTRACTOR, IN THE PERFORMANCE OF ANY WORK FOR, OR THE RENDERING OF ANY SERVICES TO, THE OWNER.
10. THE CONTRACTOR AGREES THAT, AT ITS OWN COST AND EXPENSE, IT SHALL PROCURE AND CONTINUE IN FORCE; INSURANCE COVERAGE AS REQUIRED BY THE OWNER. SUCH INSURANCE SHALL BE WRITTEN BY A COMPANY OR COMPANIES AUTHORIZED TO ENGAGE IN THE BUSINESS OF GENERAL LIABILITY INSURANCE IN THE STATE IN WHICH THE DEMISED PREMISES ARE LOCATED, AND THERE SHALL BE DELIVERED TO THE OWNER WITH THE BID CUSTOMARY CERTIFICATES EVIDENCING SUCH PAID-UP INSURANCE, WHICH CERTIFICATES ARE TO BE ISSUED BY THE INSURANCE COMPANIES. GOOD AND RESPONSIBLE COMPANIES, REASONABLY ACCEPTABLE TO THE OWNER, SHALL WRITE SUCH INSURANCE.
11. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE ACCURACY OF LOCATIONS, DIMENSIONS, AND LEVELS AND NO PLEA AS TO INSTRUCTIONS OR ORDER RECEIVED FROM OTHER SOURCES OTHER THAN INFORMATION CONTAINED ON CONTRACT DRAWINGS, SPECIFICATIONS OR IN WRITTEN ORDERS OF THE OWNER OR ENGINEER OF RECORD SHALL JUSTIFY DEPARTURE FROM THE DIMENSIONS AND ELEVATIONS REQUIRED BY THE CONTRACT DRAWINGS.
12. THE CONTRACTOR SHALL TAKE HIS OWN MEASUREMENTS AT THE SITE, VERIFYING THE SAME WITH THE CONTRACT DRAWINGS AND EXISTING FACILITIES, AND WILL BE HELD RESPONSIBLE FOR THE PROPER FIT AND ALIGNMENT OF COMPLETED WORK IN POSITION.
13. THE CONTRACTOR SHALL GUARANTEE TO THE OWNER MATERIALS AND WORKMANSHIP AGAINST ORIGINAL DEFECTS, OR AGAINST INJURY FROM PROPER AND USUAL WEAR WHEN USED FOR THE PURPOSE INTENDED, FOR TWELVE (12) MONTHS AFTER DATE OF FINAL PAYMENT CERTIFICATIONS, AND SHALL MAINTAIN ITEMS IN PERFECT CONDITION DURING THE PERIOD OF GUARANTEE. DEFECTS APPEARING DURING THE PERIOD OF GUARANTEE SHALL BE MADE GOOD BY THE CONTRACTOR AT HIS EXPENSE UPON DEMAND OF THE OWNER, IT BEING REQUIRED THAT WORK SHALL BE IN PERFECT CONDITION WHEN THE PERIOD OF GUARANTEE SHALL HAVE ELAPSED. IN THE EVENT OF DEFAULT BY THE CONTRACTOR, THE COMPANY SHALL HAVE THE RIGHT TO MAKE GOOD DEFECTS AND BILL THE CONTRACTOR COST PLUS 15% FOR ADMINISTRATION FEES.
14. AT THE CONTRACTOR'S EXPENSE, THE CONTRACTOR'S WORKING AREAS SHALL BE CLEANED BY HIM ON A DAY-TO-DAY BASIS, WITH RUBBISH REMOVED FROM THE SITE AND WORK AREAS CLEANED AT THE END OF EACH DAY. AT FINAL COMPLETION OF WORK THE CONTRACTOR SHALL LEAVE THE ENTIRE PREMISES, WITHIN THE SITE OF HIS OPERATIONS, CLEAN AND FREE FROM THE RUBBISH RESULTING FROM HIS CONSTRUCTION OPERATIONS.
15. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE AND MAINTAIN UTILITIES HE DEEMS NECESSARY TO AFFECT THE WORK.
16. THE CONTRACTOR SHALL PROVIDE FIELD ENGINEERING SERVICES REQUIRED FOR PROPER COMPLETION OF THE WORK INCLUDING, BUT NOT NECESSARILY LIMITED TO: ESTABLISHING AND MAINTAINING LINES AND LEVELS; STRUCTURAL DESIGN OF SHORES, FORMS, AND SIMILAR ITEMS PROVIDED BY THE CONTRACTOR AS PART OF HIS MEANS AND METHODS OF CONSTRUCTION.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN AT HIS EXPENSE REQUIRED FIRE PROTECTION SYSTEMS AND DEVICES AS NECESSARY TO SAFELY PERFORM THE WORK IN ACCORD WITH THE APPLICABLE REGULATIONS. IT SHALL BE OPERATIONAL THROUGHOUT THE PERIOD OF CONSTRUCTION.
18. THE OWNER SHALL HAVE THE RIGHT TO WITHHOLD WITHOUT PENALTY PAYMENT DESCRIBED ABOVE, OR SECTIONS REFERENCED HEREIN, FOR COMPLETED WORK SHOULD THE CONTRACTOR FAIL TO MEET OBLIGATIONS OR REQUIREMENTS OF THE CONTRACT. WITHHELD PAYMENT SHALL BE PROMPTLY MADE UPON THE CONTRACTOR'S FULL COMPLIANCE WITH THE CONTRACT.
19. COMPLY WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR PROTECTION OF THE ENVIRONMENT DURING THE WORK. PRIOR TO WORK COMMENCEMENT, CONTRACTOR SHALL SUBMIT A COMPREHENSIVE PLAN DESCRIBING THE MEANS AND METHODS TO BE EMPLOYED FOR PROTECTION, CONTAINMENT, AND CLEAN UP. ENSURE THAT PERSONNEL ARE PROPERLY TRAINED AND THAT SUFFICIENT EQUIPMENT AND MATERIALS ARE READILY AVAILABLE FOR USE IF REQUIRED. ABIDE BY STATE AND FEDERAL SPILL REPORTING REQUIREMENTS.
20. THE OWNER RESERVES THE RIGHT TO CHARGE THE CONTRACTOR FOR ADDITIONAL ENGINEERING SERVICES IF REQUIRED DUE TO THE CONTRACTOR'S ACTIONS OR INACTIONS.
21. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SAFETY OF HIS OPERATIONS. THE CONTRACTOR SHALL TAKE REASONABLE PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE REASONABLE PROTECTION TO PREVENT DAMAGE, INJURY, OR LOSS TO PERSONS EMPLOYED BY THE CONTRACTOR IN PERFORMANCE OF THE WORK, AND PERSONS NEARBY THAT MAY BE AFFECTED BY THE CONTRACTOR'S OPERATIONS OR THE WORK, INCLUDING EQUIPMENT AND MATERIALS WHICH WILL BE INCORPORATED IN THE WORK, AND OTHER PROPERTIES AND STRUCTURES AT THE SITE, OR ON ADJACENT PROPERTIES.
22. OBSTRUCTIONS ARE DEFINED AS UNFORESEEN OBJECTS, WHICH IMPEDE PROGRESS. OBJECTS, WHICH ARE MADE KNOWN TO THE CONTRACTOR, WILL NOT BE CONSIDERED TO BE OBSTRUCTIONS. NOTIFY THE ENGINEER OF RECORD IMMEDIATELY UPON ENCOUNTERING UNFORESEEN OBJECTS. NO CONSIDERATION WILL BE GIVEN FOR ADDITIONAL COMPENSATION ON THIS ACCOUNT WITHOUT THIS TIMELY NOTIFICATION.
23. SUBSTITUTIONS MAY BE FURNISHED FOR MATERIALS SPECIFIED HEREIN PROVIDED THE CONTRACTOR SECURES ACCEPTANCE FROM THE OWNER.

FOUNDATION STABILITY MAT

1. FOUNDATION STABILITY MAT SHALL BE GRID COMPOSITE SYSTEM (GCS) AS MANUFACTURED BY MACCAFERRI, INC., WILLIAMSPORT, MD, (301) 223-6910, OR EQUIVALENT ACCEPTED BY THE OWNER.
2. THE GCS SHALL BE INSTALLED BENEATH THE OYSTER CASTLE FORMATIONS IF SOFT SOILS ARE ENCOUNTERED. THE GCS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
3. ACTUAL EXTENT OF FOUNDATION STABILITY MAT MAY VARY WITH FIELD CONDITIONS AND THE CONTRACTOR'S METHODOLOGY.

EPOXY ADHESIVE

1. EPOXY ADHESIVE SHALL BE SIKADUR 33, HIGH-STRENGTH, RAPID CURING EPOXY PASTE, AS MANUFACTURED BY SIKA CORPORATION, LYNDHURST, NJ, (800) 933-7452, OR EQUIVALENT APPROVED BY OWNER.
2. EPOXY PASTE SHALL BE MIXED AND PLACED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

GROUND ANCHORS

1. GROUND ANCHORS SHALL BE HOT DIPPED GALVANIZED STEEL EARTH SCREW ANCHOR WITH 6 INCH BLADE DIAMETER (HELIX) AS MANUFACTURED BY GME SUPPLY, (800) 940-6762, WWW.GMESUPPLY.COM, OR EQUIVALENT ACCEPTED BY THE OWNER.
2. GROUND ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO A MINIMUM CAPACITY AS INDICATED IN THE CONTRACT DRAWINGS.
3. TIE CABLES SHALL BE ¼ INCH GALVANIZED WIRE WITH HOT DIPPED GALVANIZED CONNECTING HARDWARE.

OYSTER CASTLES®

1. OYSTER CASTLE® SHALL BE 12" SQUARE BY 8" HIGH PREFABRICATED CONCRETE BLOCK UNITS MANUFACTURED BY ALLLIED CONCRETE COMPANY, CHARLOTTESVILLE, VA, (434) 220-3202, OR EQUIVALENT ACCEPTED BY THE OWNER.
2. OYSTER CASTLES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND STACKED TO ACHIEVE MAXIMUM INTERLOCKING.

COIR LOGS

1. COIR LOGS SHALL CONSIST OF MACHINE FABRICATED CYLINDERS CONSISTING OF 100 PERCENT COCONUT FIBER ENCASED IN A HIGH TENSILE MACHINE SPIN BRISTLE COCONUT FIBER TWINE.
2. THE UNIT WEIGHT OF COIR LOGS SHALL BE NO LESS THAN SEVEN POUNDS PER CUBIC FOOT. THE MINIMUM LENGTH OF THE COIR LOGS SHALL BE 10 FEET AND THE DIAMETER OF COIR LOGS SHALL BE NO LESS THAN 16 INCHES.
3. OUTER NETTING SHALL BE CONSTRUCTED OF THREE PLY HIGH STRENGTH COIR TWINE OR YARN. THE AVERAGE BREAKING STRENGTH OF THE COIR TWINE OR YARN SHALL BE A MINIMUM OF 90 POUNDS. MINIMUM DIAMETER OF THE TWINE OR YARN SHALL BE 3/8 INCH.
4. ALL COMPONENTS OF THE LOG SHALL BE 100 PERCENT BIODEGRADABLE.
5. BOTH ENDS OF THE COIR LOG SHALL BE REINFORCED WITH ADDITIONAL COIR TWINES AND FLAT ENDS FOR BETTER JOINTS. ADJACENT LOGS SHALL BE PLACED END TO END WITH NO GAP BETWEEN.
6. A MINIMUM OF TEN (10) STAKES SHALL BE INSTALLED PER LOG. STAKES SHALL BE 2"X2" GREEN OAK, 4 FEET MINIMUM IN LENGTH WITH AT LEAST 3 FEET OF EMBEDMENT.

SAND BAGS

1. SAND BAGS SHALL BE WOVEN POLYPROPYLENE, POLYETHYLENE OR POLYAMIDE FABRIC, MINIMUM UNIT WEIGHT 135 G/M2 (FOUR OUNCES PER SQUARE YARD), MULLEN BURST STRENGTH EXCEEDING 2,070 kPa (300 psi) IN CONFORMANCE WITH THE REQUIREMENTS IN ASTM DESIGNATION D3786, AND ULTRAVIOLET STABILITY EXCEEDING 70% IN CONFORMANCE WITH THE REQUIREMENTS IN ASTM DESIGNATION D4355. USE OF BURLAP IS NOT ACCEPTABLE.
2. ALL SAND BAG FILL MATERIAL SHALL BE NON-COHESIVE, PERMEABLE MATERIAL FREE FROM CLAY AND DELETERIOUS MATERIAL.

Water's Edge Environmental, LLC
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609.249.3744 info@watersedgellc.com

ISSUED FOR CONSTRUCTION

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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Ocean and Coastal Consultants, Inc.
20 E. Clementon Road, Suite 201N, Gibbsboro, NJ 08026
Phone: (856) 248-1200 Fax: (856) 248-1206
Visit us at www.ocean-coastal.com

The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

DESIGNED BY:	TPMA
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

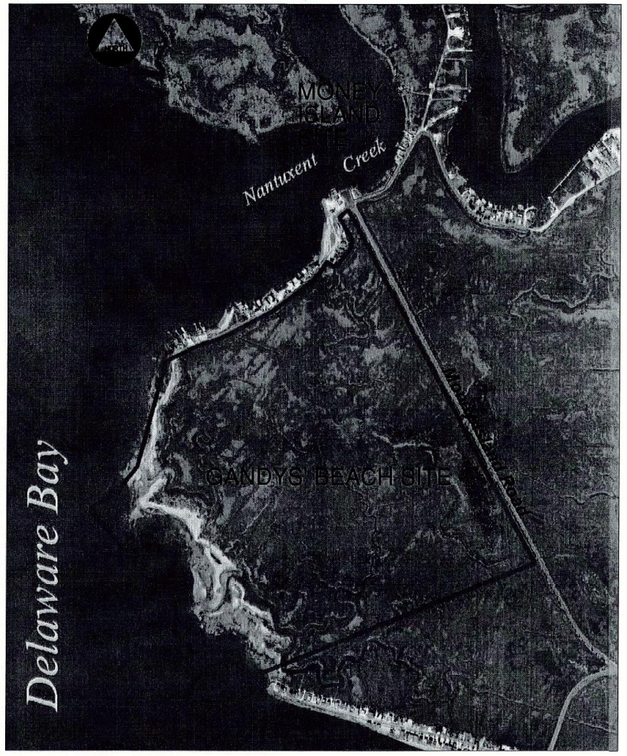
GANDY'S BEACH LIVING SHORELINE PROJECT

SCALE NONE | DATE 4/23/15 | REVISION

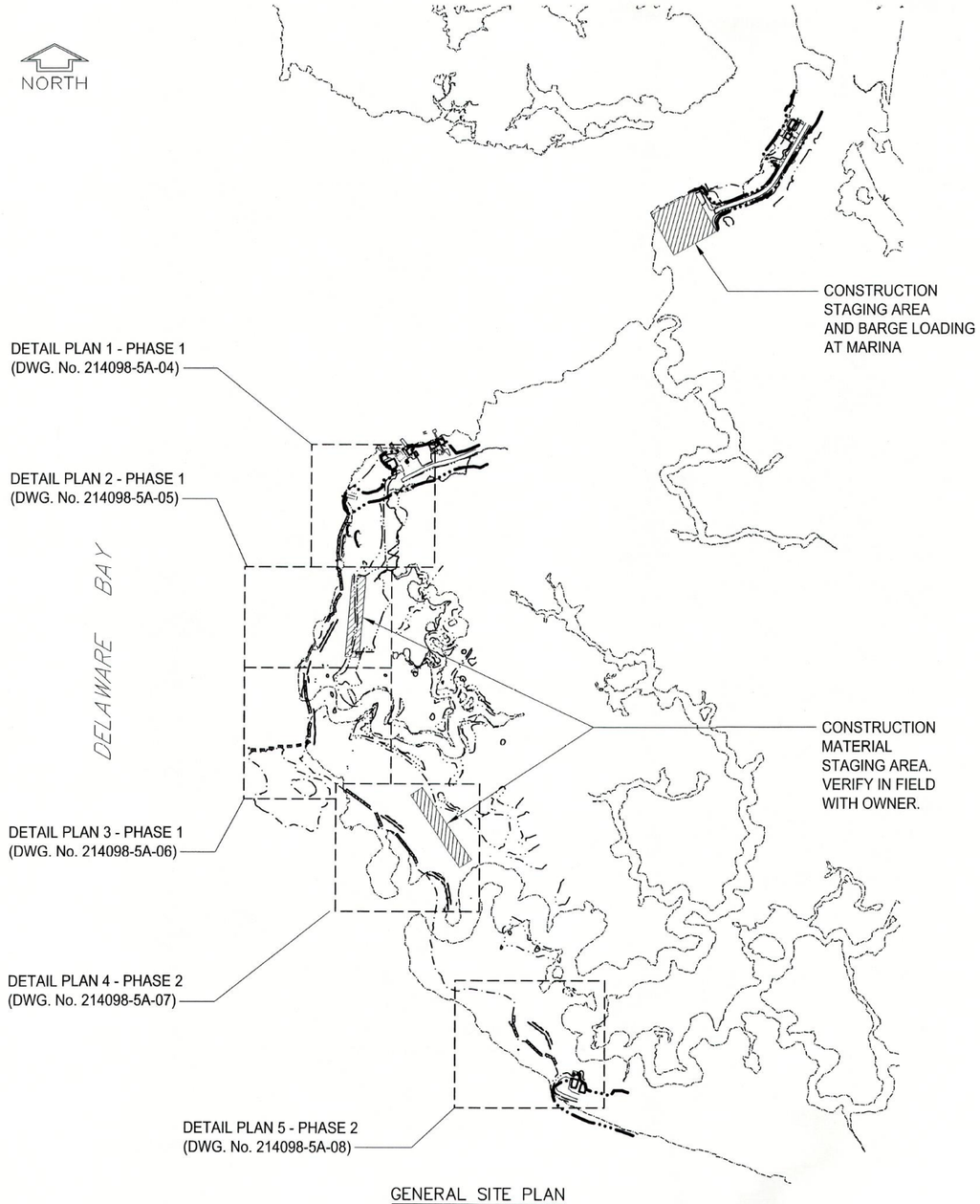
PROJECT NOTES

DRAWING NO. 214098-5A-02

Appendix B-2 Gandy's Beach Design Plans- General Site Plan, Sheet 1



2012 ORTHOPHOTOGRAPH MAP SCALE: 1" = 1,000'
(DOWNE TOWNSHIP, CUMBERLAND COUNTY, NJ)



GENERAL SITE PLAN
SCALE 1"=300'-0"

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (-3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP MAP No. 154-1836 "NANTUXENT CREEK SOUTH" MAP No. 161-1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
- EDGE ROAD
- MAPPED UPPER WETLANDS BOUNDARY PER NJDEP NJDEP COASTAL WETLANDS MAPS No. 154-1836 "NANTUXENT CREEK SOUTH" No. 161-1836 "NANTUXENT CREEK"

GENERAL NOTE

FOR PROJECT NOTES SEE DWG. NO. 214098-5A-02.

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=300'-0" 0 300 600 FT.

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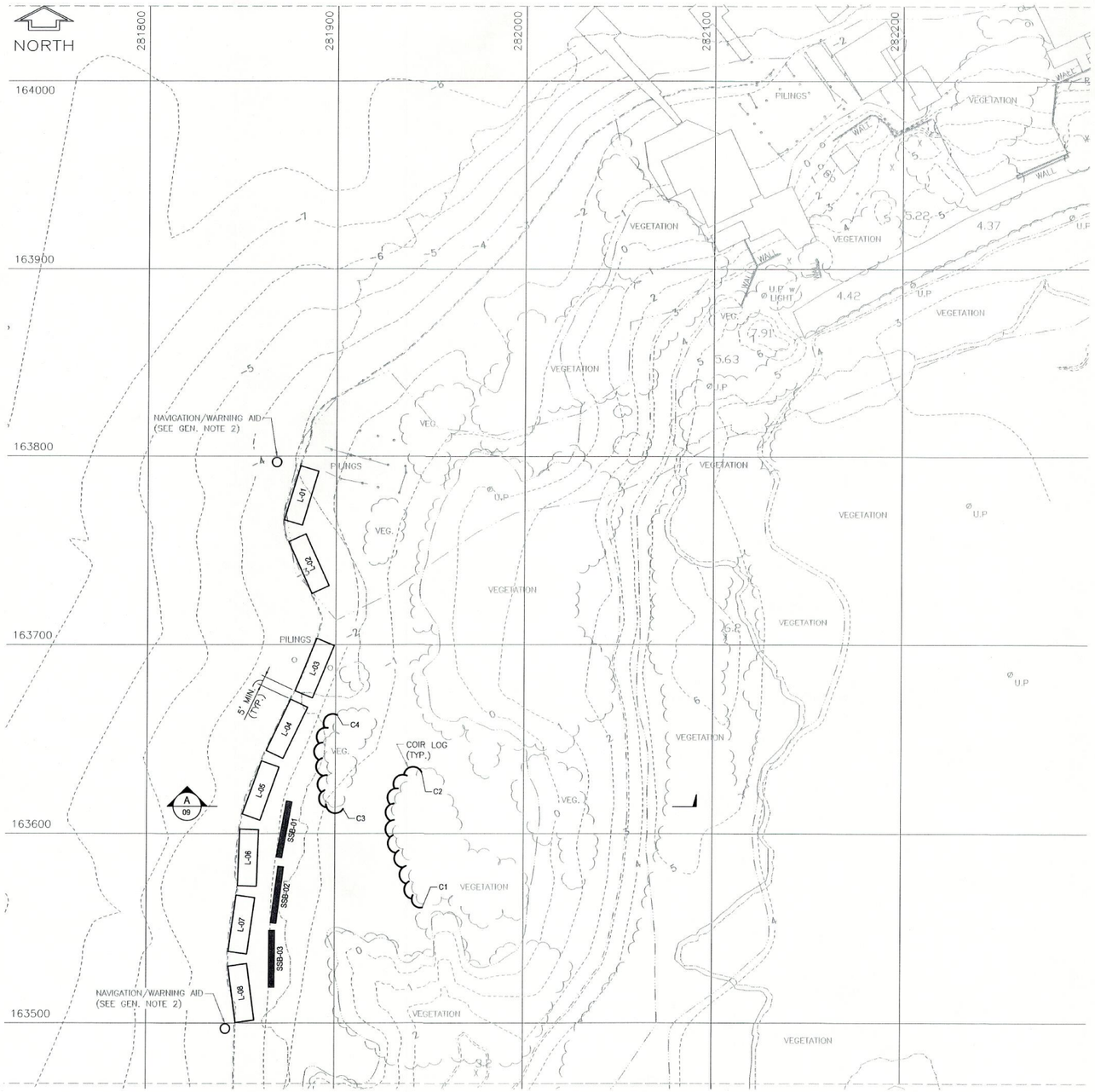
GANDY'S BEACH LIVING SHORELINE PROJECT

GENERAL SITE PLAN

SCALE AS NOTED | REVISION
DATE 4/23/15
DRAWING NO. 214098-5A-03

Appendix B-2 Gandy's Beach Design Plans- Detail Plan 1, Sheet 4



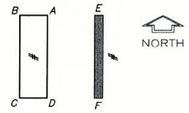
OYSTER CASTLE DESIGNATION	*CORNER "A"* NORTHING: EASTING:	*CORNER "B"* NORTHING: EASTING:	*CORNER "C"* NORTHING: EASTING:	*CORNER "D"* NORTHING: EASTING:
L-01	N: 163792 E: 281891	N: 163795 E: 281881	N: 163766 E: 281872	N: 163763 E: 281882
L-02	N: 163759 E: 281884	N: 163754 E: 281875	N: 163727 E: 281887	N: 163731 E: 281896
L-03	N: 163699 E: 281899	N: 163703 E: 281890	N: 163676 E: 281878	N: 163672 E: 281888
L-04	N: 163667 E: 281885	N: 163671 E: 281876	N: 163644 E: 281863	N: 163640 E: 281872
L-05	N: 163635 E: 281870	N: 163639 E: 281861	N: 163610 E: 281851	N: 163607 E: 281860
L-06	N: 163602 E: 281859	N: 163602 E: 281849	N: 163572 E: 281848	N: 163572 E: 281858
L-07	N: 163566 E: 281858	N: 163567 E: 281848	N: 163538 E: 281844	N: 163536 E: 281853
L-08	N: 163531 E: 281853	N: 163530 E: 281844	N: 163500 E: 281848	N: 163502 E: 281857

SHELL BAG DESIGNATION	*CENTER "E"* NORTHING: EASTING:	*CENTER "F"* NORTHING: EASTING:
SSB-01	N: 163617 E: 281876	N: 163587 E: 281870
SSB-02	N: 163582 E: 281871	N: 163553 E: 281867
SSB-03	N: 163549 E: 281867	N: 163519 E: 281867

COIR LOG CUSP DESIGNATION	NORTHING: EASTING:
C1	N: 163561 E: 281946
C2	N: 163633 E: 281946
C3	N: 163613 E: 281904
C4	N: 163663 E: 182901

NORTHINGS AND EASTINGS ARE GIVEN IN NEW JERSEY STATE PLANE COORDINATES IN FEET. LOCATIONS ARE APPOXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

COORDINATE CONVENTION



A – NORTH EAST
B – NORTH WEST
C – SOUTH WEST
D – SOUTH EAST
E – NORTH, CENTER
F – SOUTH, CENTER
 # – TYPE & NUMBER DESIGNATION

SHORELINE TREATMENT LEGEND

- S-01 — "S" OYSTER CASTLE (20'x10'x4')
- L-01 — "L" OYSTER CASTLE (30'x10'x4')
- SSB-01 — SMALL SHELL BAG BREAKWATER (30'x3'x2')
- LSB-01 — LARGE SHELL BAG BREAKWATER (20'X5'X4')
- COIR LOG CUSP [16"ø, (2) 10' LOGS PER CUSPS]

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (–3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP
  MAP No. 154–1836 "NANTUXENT CREEK SOUTH"
  MAP No. 161–1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
- EDGE ROAD
- MAPPED UPPER WETLANDS BOUNDARY PER NJDEP
  NJDEP COASTAL WETLANDS MAPS
  No. 154–1836 "NANTUXENT CREEK SOUTH"
  No. 161–1836 "NANTUXENT CREEK"

GENERAL NOTES

1. FOR PROJECT NOTES SEE DWG. NO. 214098–5A–02.
2. NAVIGATION/WARNING AID TO BE COORDINATED WITH USCG AS REQUIRED

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=30'–0" 0 30 60 FT.

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QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT

DETAIL PLAN 1 – PHASE 1

SCALE 1"=30'–0" | REVISION
DATE 4/23/15
DRAWING NO. 214098–5A–04

Appendix B-2 Gandy's Beach Design Plans- Detail Plan 2, Sheet 5

OYSTER CASTLE DESIGNATION	CORNER "A" NORTHING: EASTING:	CORNER "B" NORTHING: EASTING:	CORNER "C" NORTHING: EASTING:	CORNER "D" NORTHING: EASTING:
L-09	N: 163462 E: 281857	N: 163460 E: 281847	N: 163431 E: 281854	N: 163433 E: 281863
L-10	N: 163428 E: 281865	N: 163426 E: 281855	N: 163396 E: 281860	N: 163398 E: 281869
L-11	N: 163392 E: 281870	N: 163391 E: 281860	N: 163362 E: 281862	N: 163362 E: 281872
L-12	N: 163341 E: 281867	N: 163347 E: 281858	N: 163322 E: 281842	N: 163317 E: 281850
L-13	N: 163312 E: 281847	N: 163316 E: 281838	N: 163288 E: 281827	N: 163284 E: 281837
S-01	N: 163279 E: 281838	N: 163278 E: 281828	N: 163258 E: 281831	N: 163260 E: 281841
S-02	N: 163249 E: 281832	N: 163257 E: 281826	N: 163245 E: 281810	N: 163237 E: 281816
S-03	N: 163232 E: 281814	N: 163237 E: 281805	N: 163219 E: 281796	N: 163214 E: 281805

SHELL BAG DESIGNATION	CENTER "E" NORTHING: FASTING:	CENTER "F" NORTHING: EASTING:
SSB-04	N: 163224 E: 281849	N: 163198 E: 281835
SSB-05	N: 163213 E: 281828	N: 163187 E: 281814
SSB-06	N: 163194 E: 281833	N: 163167 E: 281818
SSB-07	N: 163182 E: 281812	N: 163156 E: 281797
SSB-08	N: 163163 E: 281816	N: 163136 E: 281802
SSB-09	N: 163151 E: 281795	N: 163125 E: 281781
SSB-10	N: 163132 E: 281799	N: 163106 E: 281785
SSB-11	N: 163121 E: 281778	N: 163094 E: 281764
SSB-12	N: 163101 E: 281783	N: 163075 E: 281768
LSB-01	N: 163115 E: 281745	N: 163099 E: 281733
LSB-02	N: 163094 E: 281731	N: 163076 E: 281722
LSB-03	N: 163071 E: 281719	N: 163052 E: 281712
LSB-04	N: 163048 E: 281711	N: 163029 E: 281704
SSB-13	N: 163032 E: 281724	N: 163003 E: 281716

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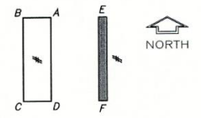
COORDINATE CONVENTION



A – NORTH EAST
B – NORTH WEST
C – SOUTH WEST
D – SOUTH EAST
E – NORTH, CENTER
F – SOUTH, CENTER
 # – TYPE & NUMBER DESIGNATION

SHORELINE TREATMENT LEGEND

S-01 "S" OYSTER CASTLE (20'x10'x4')

L-01 "L" OYSTER CASTLE (30'x10'x4')

SSB-01 SMALL SHELL BAG BREAKWATER (30'x3'x2')

LSB-01 LARGE SHELL BAG BREAKWATER (20'X5'X4')

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (–3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP MAP No. 154–1836 "NANTUXENT CREEK SOUTH" MAP No. 161–1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
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CHECK GRAPHIC SCALES BEFORE USING

1"=30'–0" 0 30 60 FT.

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DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT

DETAIL PLAN 2 – PHASE 1

SCALE	REVISION
1"=30'–0"	
DATE 4/23/15	

DRAWING NO. 214098–5A–05

C:\Michelle Saraswati\OCC 214098 TASK 5A\03.dwg 214098–5A–05 Michelle Saraswati Fri, 15 May 2015 – 5:00pm

Appendix B-2 Gandy's Beach Design Plans- Detail Plan 3, Sheet 6

OYSTER CASTLE DESIGNATION	CORNER "A" NORTHING: EASTING:	CORNER "B" NORTHING: EASTING:	CORNER "C" NORTHING: EASTING:	CORNER "D" NORTHING: EASTING:
S-04	N: 162941 E: 281703	N: 162941 E: 281693	N: 162921 E: 281694	N: 162921 E: 281704
S-05	N: 162916 E: 281704	N: 162916 E: 281694	N: 162896 E: 281696	N: 162896 E: 281706
S-06	N: 162654 E: 281725	N: 162663 E: 281721	N: 162655 E: 281702	N: 162646 E: 281706
S-07	N: 162639 E: 281682	N: 162648 E: 281680	N: 162645 E: 281661	N: 162635 E: 281662
S-08	N: 162633 E: 281638	N: 162643 E: 281638	N: 162642 E: 281618	N: 162632 E: 281618
S-09	N: 162631 E: 281596	N: 162641 E: 281596	N: 162641 E: 281576	N: 162631 E: 281576
S-10	N: 162623 E: 281554	N: 162633 E: 281554	N: 162633 E: 281534	N: 162623 E: 281534
S-11	N: 162614 E: 281512	N: 162624 E: 281512	N: 162624 E: 281492	N: 162614 E: 281492
S-12	N: 162614 E: 281470	N: 162624 E: 281470	N: 162624 E: 281450	N: 162614 E: 281450
L-14	N: 162892 E: 281706	N: 162890 E: 281696	N: 162861 E: 281700	N: 162862 E: 281710
L-15	N: 162857 E: 281712	N: 162854 E: 281703	N: 162826 E: 281711	N: 162829 E: 281721
L-16	N: 162823 E: 281723	N: 162821 E: 281713	N: 162792 E: 281719	N: 162794 E: 281729
L-17	N: 162745 E: 281730	N: 162747 E: 281720	N: 162717 E: 281714	N: 162715 E: 281724
L-18	N: 162710 E: 281723	N: 162710 E: 281713	N: 162680 E: 281713	N: 162680 E: 281723

SHELL BAG DESIGNATION	CENTER "E" NORTHING: EASTING:	CENTER "F" NORTHING: EASTING:
SSB-14	N: 162998 E: 281714	N: 162969 E: 281707
SSB-15	N: 162962 E: 281711	N: 162932 E: 281716
SSB-16	N: 162811 E: 281738	N: 162781 E: 281743
SSB-17	N: 162776 E: 281743	N: 162746 E: 281743
SSB-18	N: 162741 E: 281743	N: 162712 E: 281746
SSB-19	N: 162706 E: 281747	N: 162676 E: 281745
SSB-20	N: 162671 E: 281744	N: 162641 E: 281742

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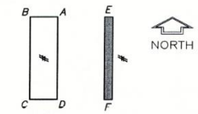

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LEGEND

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CHECKED BY:	JOMA
QC REVIEW:	AZSL

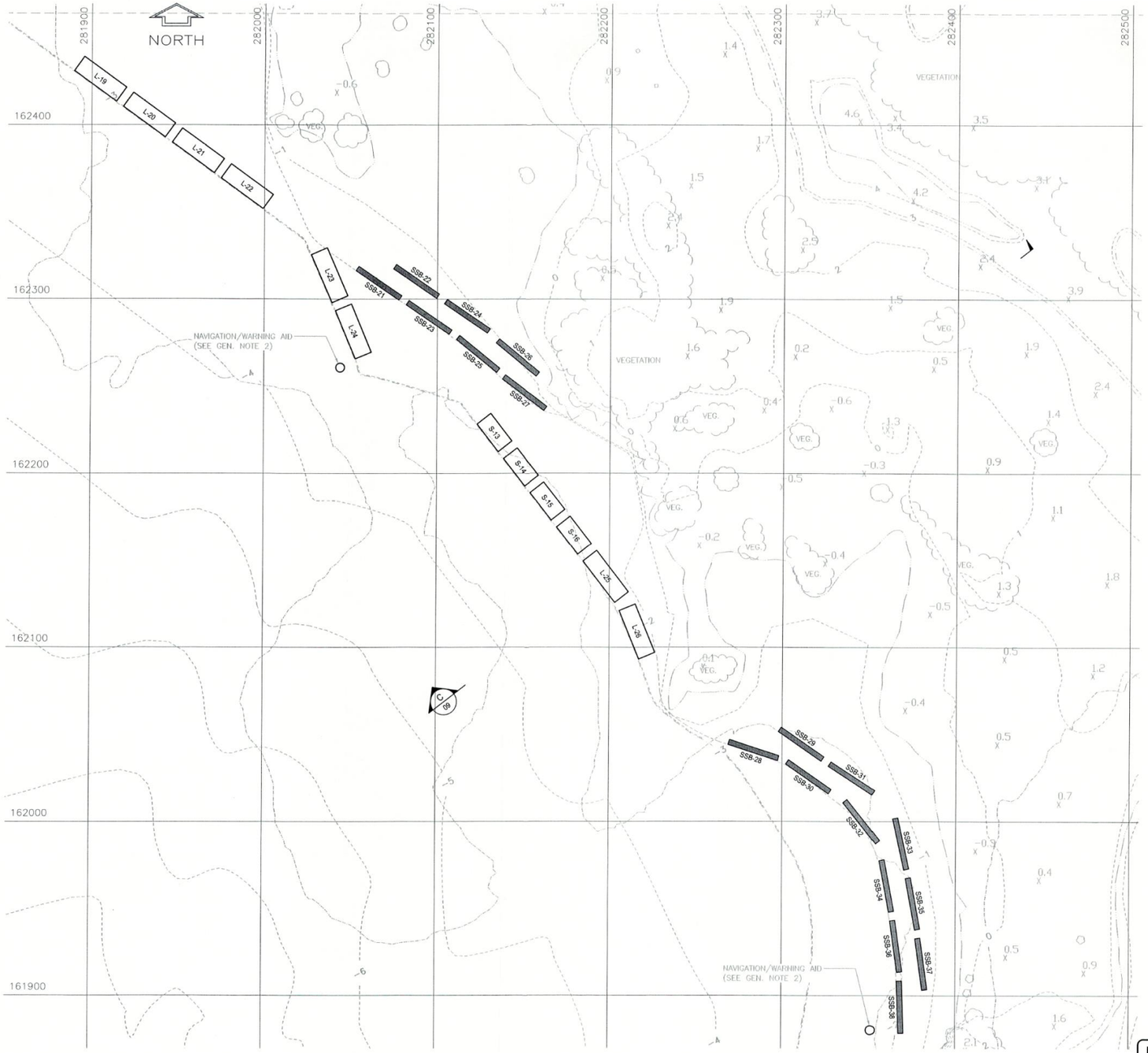
GANDY'S BEACH LIVING SHORELINE PROJECT

DETAIL PLAN 3 – PHASE 1

SCALE 1"=30'–0" | DATE 4/23/15 | REVISION

DRAWING NO. 214098–5A–06

Appendix B-2 Gandy's Beach Design Plans- Detail Plan 4, Sheet 7

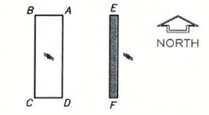


OYSTER CASTLE DESIGNATION	CORNER "A" NORTHING: EASTING:	CORNER "B" NORTHING: EASTING:	CORNER "C" NORTHING: EASTING:	CORNER "D" NORTHING: EASTING:
L-19	N: 162439 E: 281896	N: 162431 E: 281890	N: 162413 E: 281914	N: 162422 E: 281920
L-20	N: 162419 E: 281924	N: 162411 E: 281918	N: 162393 E: 281942	N: 162401 E: 281948
L-21	N: 162398 E: 281952	N: 162390 E: 281946	N: 162372 E: 281971	N: 162380 E: 281977
L-22	N: 162378 E: 281981	N: 162369 E: 281975	N: 162352 E: 281999	N: 162360 E: 282005
L-23	N: 162329 E: 282036	N: 162325 E: 282027	N: 162298 E: 282039	N: 162302 E: 282048
L-24	N: 162297 E: 282050	N: 162293 E: 282041	N: 162266 E: 282053	N: 162269 E: 282062
S-13	N: 162234 E: 282131	N: 162228 E: 282123	N: 162212 E: 282135	N: 162219 E: 282143
S-14	N: 162215 E: 282146	N: 162208 E: 282138	N: 162193 E: 282151	N: 162199 E: 282159
S-15	N: 162195 E: 282162	N: 162189 E: 282154	N: 162173 E: 282166	N: 162179 E: 282174
S-16	N: 162175 E: 282177	N: 162169 E: 282169	N: 162153 E: 282182	N: 162159 E: 282189
L-25	N: 162155 E: 282193	N: 162149 E: 282185	N: 162126 E: 282203	N: 162132 E: 282211
L-26	N: 162125 E: 282215	N: 162121 E: 282206	N: 162093 E: 282217	N: 162097 E: 282226

SHELL BAG DESIGNATION	CENTER "E" NORTHING: EASTING:	CENTER "F" NORTHING: EASTING:
SSB-21	N: 162317 E: 282054	N: 162301 E: 282079
SSB-22	N: 162319 E: 282075	N: 162302 E: 282100
SSB-23	N: 162298 E: 282083	N: 162281 E: 282108
SSB-24	N: 162299 E: 282105	N: 162282 E: 282130
SSB-25	N: 162278 E: 282112	N: 162259 E: 282135
SSB-26	N: 162276 E: 282135	N: 162257 E: 282158
SSB-27	N: 162255 E: 282139	N: 162237 E: 282162
SSB-28	N: 162046 E: 282269	N: 162036 E: 282298
SSB-29	N: 162053 E: 282299	N: 162036 E: 282323
SSB-30	N: 162034 E: 282303	N: 162017 E: 282327
SSB-31	N: 162033 E: 282327	N: 162017 E: 282352
SSB-32	N: 162012 E: 282336	N: 161988 E: 282355
SSB-33	N: 162002 E: 282365	N: 161973 E: 282372
SSB-34	N: 161978 E: 282357	N: 161948 E: 282363
SSB-35	N: 161968 E: 282373	N: 161938 E: 282378
SSB-36	N: 161943 E: 282364	N: 161914 E: 282368
SSB-37	N: 161933 E: 282378	N: 161903 E: 282382
SSB-38	N: 161908 E: 282368	N: 161878 E: 282369

NORTHINGS AND EASTINGS ARE GIVEN IN NEW JERSEY STATE PLANE COORDINATES IN FEET. LOCATIONS ARE APPOXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

COORDINATE CONVENTION



A – NORTH EAST
B – NORTH WEST
C – SOUTH WEST
D – SOUTH EAST
E – NORTH, CENTER
F – SOUTH, CENTER
– TYPE & NUMBER DESIGNATION

SHORELINE TREATMENT LEGEND

- S-01 — "S" OYSTER CASTLE (20'x10'x4')
- L-01 — "L" OYSTER CASTLE (30'x10'x4')
- SSB-01 — SMALL SHELL BAG BREAKWATER (30'x3'x2')
- LSB-01 — LARGE SHELL BAG BREAKWATER (20'X5'X4')

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (–3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP
  MAP No. 154–1836 "NANTUXENT CREEK SOUTH"
  MAP No. 161–1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
- EDGE ROAD
- MAPPED UPPER WETLANDS BOUNDARY PER NJDEP
  NJDEP COASTAL WETLANDS MAPS
  No. 154–1836 "NANTUXENT CREEK SOUTH"
  No. 161–1836 "NANTUXENT CREEK"

GENERAL NOTES

1. FOR PROJECT NOTES SEE DWG. NO. 214098–5A–02.
2. NAVIGATION/WARNING AID TO BE COORDINATED WITH USCG AS REQUIRED

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=30'–0" 0 30 60 FT.

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
609.249.3744 info@watersedgellc.com

ISSUED FOR CONSTRUCTION

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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Visit us at www.ocean-coastal.com

The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

5/10/15

DESIGNED BY:	TPMA
DRAWN BY:	REBU
CHECKED BY:	MADN
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
EXISTING CONDITIONS PLAN

DETAIL PLAN 4 – PHASE 2

SCALE 1"=30'–0" | DATE 1/23/15 | REVISION

DRAWING NO. 214098–5A–07

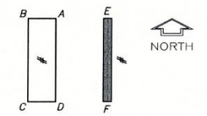
Appendix B-2 Gandy's Beach Design Plans- Detail Plan 5, Sheet 8

OYSTER CASTLE DESIGNATION	CORNER "A" NORTHING: EASTING:	CORNER "B" NORTHING: EASTING:	CORNER "C" NORTHING: EASTING:	CORNER "D" NORTHING: EASTING:
L-27	N: 161387 E: 282679	N: 161387 E: 282669	N: 161357 E: 282669	N: 161357 E: 282679
L-28	N: 161352 E: 282674	N: 161349 E: 282664	N: 161321 E: 282674	N: 161324 E: 282684
L-29	N: 161320 E: 282685	N: 161316 E: 282676	N: 161288 E: 282688	N: 161292 E: 282697
S-17	N: 161275 E: 282737	N: 161267 E: 282731	N: 161254 E: 282745	N: 161261 E: 282752
S-18	N: 161258 E: 282756	N: 161250 E: 282749	N: 161237 E: 282764	N: 161244 E: 282770
S-19	N: 161241 E: 282774	N: 161233 E: 282767	N: 161220 E: 282782	N: 161227 E: 282789
S-20	N: 161224 E: 282792	N: 161216 E: 282786	N: 161203 E: 282801	N: 161211 E: 282807
L-30	N: 161213 E: 282826	N: 161204 E: 282822	N: 161191 E: 282849	N: 161200 E: 282853
L-31	N: 161194 E: 282862	N: 161190 E: 282853	N: 161163 E: 282867	N: 161167 E: 282876

SHELL BAG DESIGNATION	CENTER "E" NORTHING: EASTING:	CENTER "F" NORTHING: EASTING:
SSB-39	N: 161358 E: 282739	N: 161341 E: 282763
SSB-40	N: 161359 E: 282761	N: 161341 E: 282785
SSB-41	N: 161338 E: 282767	N: 161320 E: 282792
SSB-42	N: 161338 E: 282789	N: 161320 E: 282814
SSB-43	N: 161317 E: 282796	N: 161299 E: 282820
SSB-44	N: 161317 E: 282824	N: 161291 E: 282840
SSB-45	N: 161294 E: 282823	N: 161267 E: 282835
SSB-46	N: 161283 E: 282844	N: 161255 E: 282853
SSB-47	N: 161262 E: 282837	N: 161234 E: 282846

NORTHINGS AND EASTINGS ARE GIVEN IN NEW JERSEY STATE PLANE COORDINATES IN FEET. LOCATIONS ARE APPOXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

COORDINATE CONVENTION



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B – NORTH WEST
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– TYPE & NUMBER DESIGNATION

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- SSB-01 — SMALL SHELL BAG BREAKWATER (30'x3'x2')
- LSB-01 — LARGE SHELL BAG BREAKWATER (20'X5'X4')

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (–3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP
  MAP No. 154–1836 "NANTUXENT CREEK, SOUTH"
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  No. 161–1836 "NANTUXENT CREEK"

GENERAL NOTES

1. FOR PROJECT NOTES SEE DWG. NO. 214098–5A–02.
2. NAVIGATION/WARNING AID TO BE COORDINATED WITH USCG AS REQUIRED

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=30'–0" 0 30 60 FT.

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
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ISSUED FOR CONSTRUCTION

REVISIONS

DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

DESIGNED BY: TPMA
DRAWN BY: CAMA
CHECKED BY: JOMA
QC REVIEW: AZSL

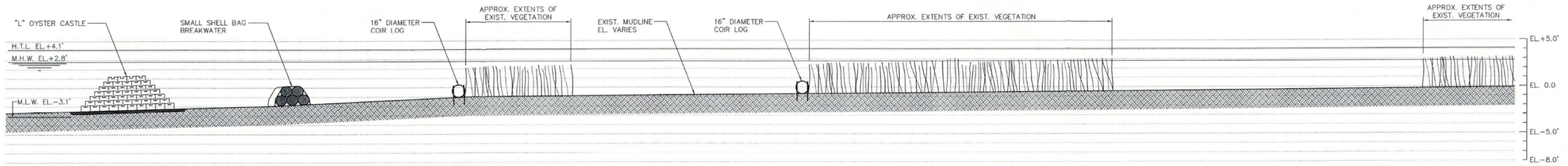
GANDY'S BEACH LIVING SHORELINE PROJECT

DETAIL PLAN 5 – PHASE 2

SCALE 1"=30'–0"
DATE 4/23/15
REVISION

DRAWING NO. 214098–5A–08

Appendix B-2 Gandy's Beach Design Plans- Shoreline Sections, Sheet 9



SECTION A–A
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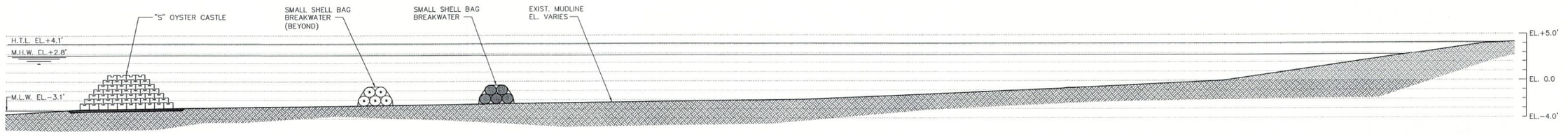
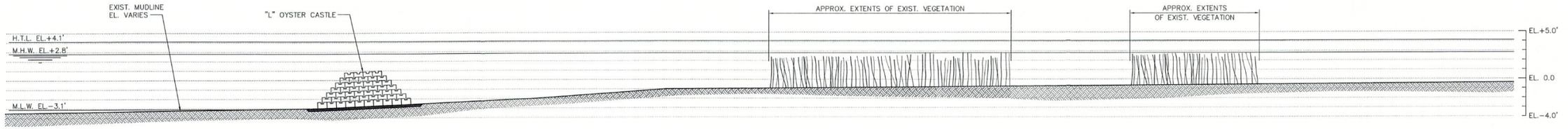
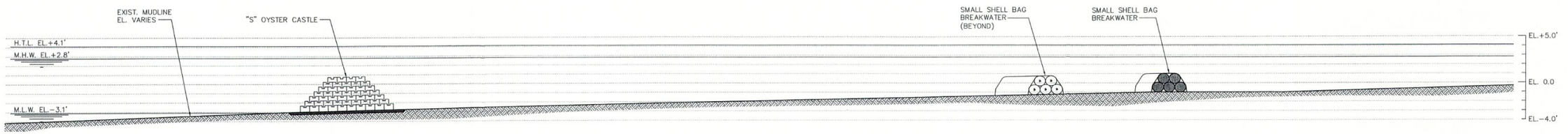


SECTION B–B
SCALE 1"=5'–0"



SECTION C–C
SCALE 1"=5'–0"



SECTION D–D
SCALE 1"=5'–0"

GENERAL NOTES

1. FOR PROJECT NOTES SEE DWG. NO. 214098–5A–02.
2. FOR LOCATION OF SECTION A–A, SEE DWG. NO. 214098–5A–04.
3. FOR LOCATION OF SECTION B–B, SEE DWG. NO. 214098–5A–05.
4. FOR LOCATION OF SECTION C–C, SEE DWG. NO. 214098–5A–07.
5. FOR LOCATION OF SECTION D–D, SEE DWG. NO. 214098–5A–08.

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=5'–0" 0 5 10 FT.

ISSUED FOR CONSTRUCTION

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
609.249.3744 info@watersedgellc.com

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

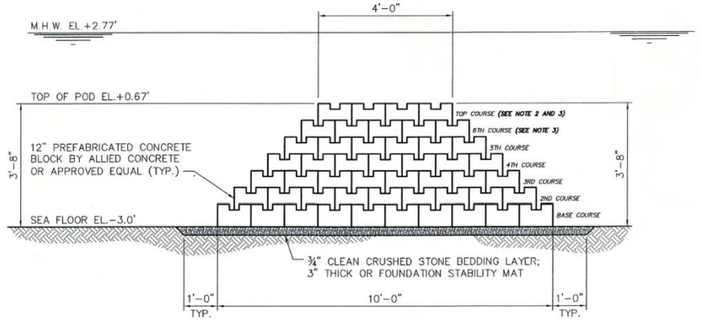
DESIGNED BY:	TPMA
DRAWN BY:	REBU
CHECKED BY:	MADN
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
EXISTING CONDITIONS PLAN

SHORELINE SECTIONS

SCALE 1"=5'–0" | REVISION
DATE 4/23/15
DRAWING NO. 214098–5A–09

Appendix B-1 Gandy's Beach Design Plans- Shoreline Treatment Details, Sheet 10

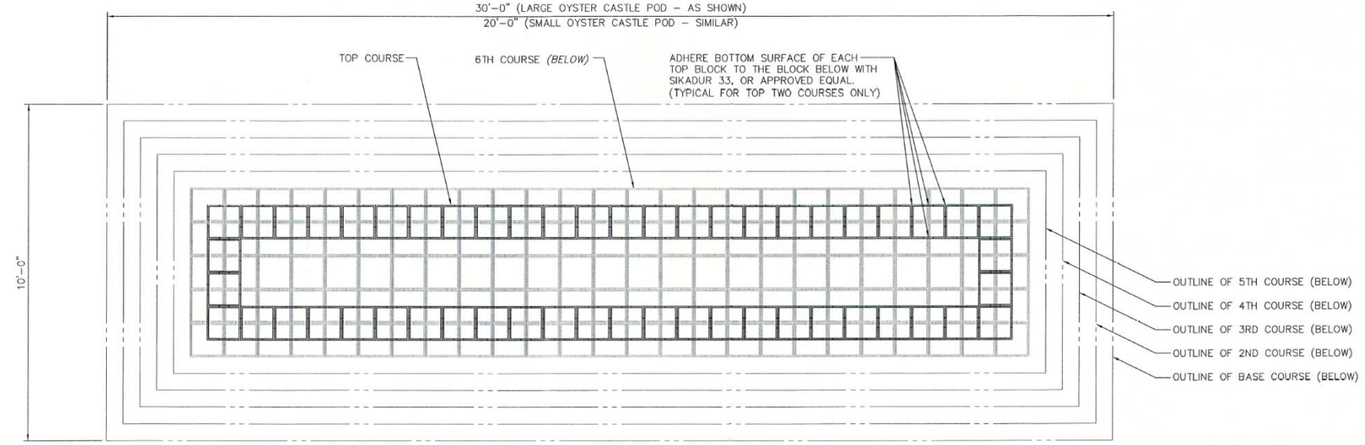


NOTES

1. SMALL OYSTER CASTLE POD MEASURES 10'x20' AT THE BASE. LARGE OYSTER CASTLE POD MEASURES 10'x30' AT THE BASE.
2. TOP COURSE CONTAINS ONLY PERIMETER BLOCKS; NO INTERIOR BLOCKS.
3. ADHERE TOP TWO COURSES TOGETHER WITH SIKADUR 33 HIGH-STRENGTH, RAPID CURING EPOXY PASTE, AS MANUFACTURED BY SIKA CORPORATION, OR APPROVED EQUAL.

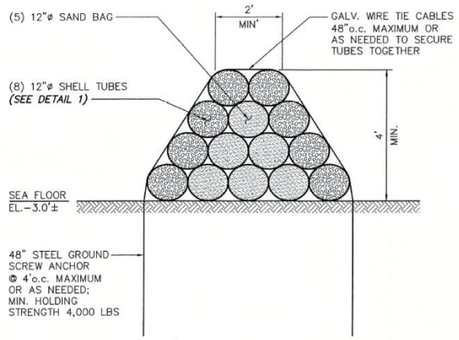
TYPICAL OYSTER CASTLE POD ELEVATION

SCALE ½"=1'-0"



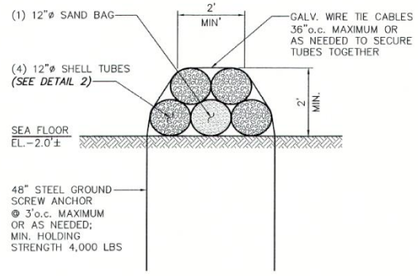
OYSTER CASTLE POD PLAN VIEW – TOP TWO COURSES SHOWN
LARGE OYSTER CASTLE POD SHOWN – SMALL OYSTER CASTLE POD SIMILAR

SCALE ½"=1'-0"



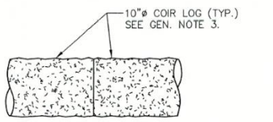
LARGE SHELL BAG BREAKWATER DETAIL

SCALE ½"=1'-0"

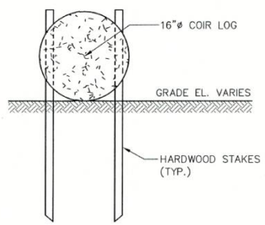


SMALL SHELL BAG BREAKWATER DETAIL

SCALE ½"=1'-0"



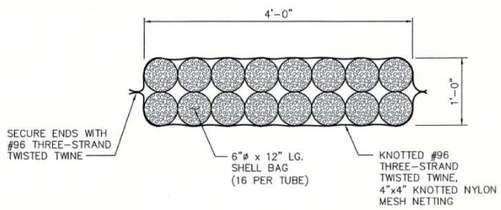
PLANVIEW



SECTION

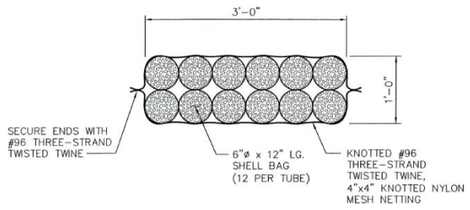
COIR LOG DETAILS

SCALE 1"=1'-0"



DETAIL 1 – PLAN VIEW
SHELL TUBE SECTION FOR LARGE SHELL BAG BREAKWATER

SCALE 1"=1'-0"



DETAIL 2 – PLAN VIEW
SHELL TUBE SECTION FOR SMALL SHELL BAG BREAKWATER

SCALE 1"=1'-0"

GENERAL NOTES

1. FOR PROJECT NOTES SEE DWG. NO. 214098-5A-02.
2. STONE BEDDING LAYER OR FOUNDATION STABILITY MAT MAY BE REQUIRED FOR OYSTER CASTLE PODS IF SUBSTRATE IS SOFT SOIL MATERIAL SUCH AS PEAT DEPOSIT, VERIFY IN FIELD.
3. ADJACENT LOGS SHALL BE PLACED END TO END WITH NO GAPS BETWEEN.

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

½"=1'-0" 0 1 4 FT.

1"=1'-0" 0 1 2 FT.

Water's Edge Environmental, LLC
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The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

DESIGNED BY:	TPMA
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT

SHORELINE TREATMENT DETAILS

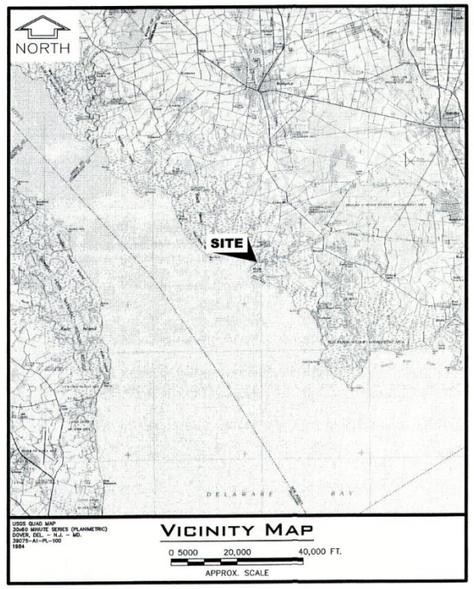
SCALE AS NOTED | REVISION
DATE 4/23/15
DRAWING NO. 214098-5A-10

THE NATURE CONSERVANCY

2350 ROUTE 47, DELMONT, NJ 08314

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

BLOCK 6, LOTS 16, 17, 18, 19, 19.01, 20 & 21 ON NANTUXENT DRIVE, TOWNSHIP OF DOWNE, NJ



DRAWING LIST

DWG. NO.	TITLE
214098-5B-01	COVER SHEET AND DRAWING LIST
214098-5B-02	PROJECT NOTES
214098-5B-03	EXISTING SITE PLAN
214098-5B-04	SITE REHABILITATION PLAN
214098-5B-05	REHABILITATION SECTIONS
214098-5B-06	OYSTER CASTLE POD AND COIR LOG DETAILS

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
609.249.3744 info@watersedgellc.com

ISSUED FOR CONSTRUCTION

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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The Nature Conservancy
2350 Route 47, Delmont, NJ 08314

5/18/15

DESIGNED BY:	AZSL
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

COVER SHEET AND DRAWING LIST

SCALE 1"=30'-0" | REVISION
DATE 4/20/15
DRAWING NO. 214098-5B-01

C:\Michelle Sarsawati\OCC 214098 TASK 5B\01.dwg Dwg 01 Michelle Sarsawati Fri, 08 May 2015 - 2:39pm

Appendix B-Nantuxent Creek Design Plans- Project Notes, Sheet 2

PROJECT NOTES

DESIGN CRITERIA

1. THE INTENT OF THIS DESIGN IS A PILOT STUDY TO DETERMINE THE EFFECTIVENESS OF VARIOUS CONFIGURATIONS OF PROPRIETARY WAVE ATTENUATION AND HABITAT ENHANCEMENT SYSTEMS IN AN EFFORT TO REDUCE WAVE INDUCED EROSION AND PROVIDE ECOLOGICAL UPLIFT TO THE SITE.
2. DESIGN CAPACITIES FOR PROPRIETARY SYSTEMS HAVE NOT BEEN EVALUATED.
3. TIDAL DATUM INFORMATION IS TAKEN FROM BENCHMARK SHEET FOR STATION ID 8537121, SHIP JOHN SHOAL, NEW JERSEY, OCTOBER 10, 2015, PUBLISHED BY THE U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEAN SERVICE (NOS).
4. ELEVATIONS REFERENCE NORTH AMERICAN VERTICAL DATUM OF 1998 (NAVD 88) IN FEET.
5. LOCATION OF EXISTING STRUCTURES TAKEN FROM LAND SURVEY BY STEPHEN C. MARTINELLI LAND SURVEYING, LLC. ON DECEMBER 2014 AND JANUARY 2015 AND REPRESENT THE CONDITIONS OF THE SITE AT THE TIME OF THE SURVEY.
6. THE SITE IS KNOWN AS BLOCK 6, LOTS 16, 17, 18, 19, 19.01, 20 & 21 ON SHEET #3 OF THE TAX MAP OF THE TOWNSHIP OF DOWNE.
7. THE FOLLOWING REFERENCE DOCUMENTS WERE USED IN CONJUNCTION WITH THE SITE INFORMATION.

DRAWING NO.	COMPANY	DRAWING TITLE
154-1836	NJDEP	NANTUXENT CREEK SOUTH
161-1836	NJDEP	NANTUXENT CREEK

8. HYDROGRAPHIC SURVEY PERFORMED BY STEPHEN C. MARTINELLI LAND SURVEYING, LLC. ON DECEMBER 2014 AND JANUARY 2015 AND REPRESENT THE CONDITIONS OF THE SITE AT THE TIME OF THE SURVEY.
9. THE STRUCTURES HAVE BEEN DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER CONSTRUCTION IS COMPLETE. THE STABILITY OF THE STRUCTURES PRIOR TO COMPLETION IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR. THIS RESPONSIBILITY EXTENDS TO RELATED ASPECTS OF THE CONSTRUCTION ACTIVITY INCLUDING, BUT NOT LIMITED TO, ERECTION METHODS, ERECTION SEQUENCE, CONNECTIONS, TEMPORARY BRACING, FORMS, SHORING, USE OF EQUIPMENT, AND SIMILAR CONSTRUCTION PROCEDURES. REVIEW OF CONSTRUCTION BY THE OWNER AND ENGINEER OF RECORD IS FOR GENERAL CONFORMANCE WITH THE CONTRACT DOCUMENTS ONLY. LACK OF COMMENT BY THE OWNER AND ENGINEER OF RECORD WITH REGARD TO CONSTRUCTION PROCEDURES SHALL NOT BE INTERPRETED AS APPROVAL OR ACCEPTANCE OF SUCH PROCEDURES.

GENERAL CONDITIONS

1. NO GUARANTEE TO THE ACCURACY OF THE REFERENCE DOCUMENTS IS PROVIDED HEREIN AND THE CONTRACTOR SHALL RELY ON HIS OWN FIELD VERIFICATION FOR ITEMS SO REQUIRED.
2. SECTIONS, DETAILS, NOTES, DIMENSIONS AND CONDITIONS ARE APPLICABLE AT ANY OTHER LOCATION WHERE CONDITIONS AND DETAIL ARE SIMILAR BUT ARE NOT SPECIFICALLY NOTED AS SUCH OR ARE NOT SHOWN.
3. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO CONSTRUCTION AND FABRICATION OF CONSTRUCTION MATERIALS.
4. IF, DURING THE PERFORMANCE OF THE WORK, THE CONTRACTOR FINDS A CONFLICT, ERROR, OR DISCREPANCY IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL SO REPORT TO THE ENGINEER OF RECORD IN WRITING AT ONCE. BEFORE PROCEEDING WITH THE WORK AFFECTED THEREBY, THE CONTRACTOR SHALL OBTAIN A WRITTEN INTERPRETATION OR CLARIFICATION FROM THE ENGINEER OF RECORD. WORK DONE BEFORE THE ENGINEER OF RECORD RENDERS HIS DECISION IS AT THE CONTRACTOR'S SOLE RISK.
5. THE WORK SHALL BE PERFORMED IN A GENERAL SEQUENCE DEVELOPED BY THE CONTRACTOR AND SUBMITTED TO THE OWNER FOR REVIEW, IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND FOR THE SEQUENCES AND PROCEDURES TO BE USED.
6. THE CONTRACTOR SHALL FURNISH AND COORDINATE PLANT, LABOR, SUPERVISION, MATERIALS, EQUIPMENT AND APPLIANCES FOR DEMOLITION AND/OR CONSTRUCTION WORK IN CONNECTION WITH THE DEMOLITION AND/OR CONSTRUCTION OF THE MARINE FACILITIES.
7. THE OWNER HAS SECURED CERTAIN PERMITS REQUIRED BY FEDERAL, AND STATE AUTHORITIES FOR THE PROPOSED ACTIVITIES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM THE WORK IN ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE PERMITS. THE CONTRACTOR SHALL POST COPIES OF THE PERMITS AT THE SITE THROUGHOUT THE COURSE OF THE WORK. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN PERMITS ASSOCIATED WITH THE LEGAL DISPOSAL OF CONSTRUCTION DEBRIS. THE CONTRACTOR SHALL SECURE REQUIRED LOCAL AUTHORIZATIONS AND PERMITS.
8. THE CONTRACTOR SHALL FURNISH MATERIALS FOR INSTALLATION IN THE COMPLETED WORK AS SPECIFIED HEREINAFTER. THE CONTRACTOR SHALL HANDLE THESE MATERIALS AS THEY ARE DELIVERED TO THE SITE OR OFF-SITE WORK AREAS, AND SHALL STORE THEM IN A DESIGNATED STORAGE AREA.
9. THE CONTRACTOR WILL INDEMNIFY AND SAVE HARMLESS THE OWNER AND ENGINEER OF RECORD FROM AND AGAINST ALL LOSSES AND ALL CLAIMS, DEMANDS, PAYMENTS, SUITS, ACTIONS, RECOVERIES, AND JUDGMENTS OF EVERY NATURE AND DESCRIPTION BROUGHT OR RECOVERED AGAINST THE OWNER AND ENGINEER OF RECORD BY REASON OF ANY ACT OR OMISSION OF THE CONTRACTOR, OR OF ANY SUBCONTRACTOR TO THE CONTRACTOR, OR OF ANY PERSON DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR OR ANY SUCH SUBCONTRACTOR, IN THE PERFORMANCE OF ANY WORK FOR, OR THE RENDERING OF ANY SERVICES TO, THE OWNER.
10. THE CONTRACTOR AGREES THAT, AT ITS OWN COST AND EXPENSE, IT SHALL PROCURE AND CONTINUE IN FORCE; INSURANCE COVERAGE AS REQUIRED BY THE OWNER. SUCH INSURANCE SHALL BE WRITTEN BY A COMPANY OR COMPANIES AUTHORIZED TO ENGAGE IN THE BUSINESS OF GENERAL LIABILITY INSURANCE IN THE STATE IN WHICH THE DEMISED PREMISES ARE LOCATED, AND THERE SHALL BE DELIVERED TO THE OWNER WITH THE BID CUSTOMARY CERTIFICATES EVIDENCING SUCH PAID-UP INSURANCE, WHICH CERTIFICATES ARE TO BE ISSUED BY THE INSURANCE COMPANIES. GOOD AND RESPONSIBLE COMPANIES, REASONABLY ACCEPTABLE TO THE OWNER, SHALL WRITE SUCH INSURANCE.
11. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE ACCURACY OF LOCATIONS, DIMENSIONS, AND LEVELS AND NO PLEA AS TO INSTRUCTIONS OR ORDER RECEIVED FROM OTHER SOURCES OTHER THAN INFORMATION CONTAINED ON CONTRACT DRAWINGS, SPECIFICATIONS OR IN WRITTEN ORDERS OF THE OWNER OR ENGINEER OF RECORD SHALL JUSTIFY DEPARTURE FROM THE DIMENSIONS AND ELEVATIONS REQUIRED BY THE CONTRACT DRAWINGS.
12. THE CONTRACTOR SHALL TAKE HIS OWN MEASUREMENTS AT THE SITE, VERIFYING THE SAME WITH THE CONTRACT DRAWINGS AND EXISTING FACILITIES, AND WILL BE HELD RESPONSIBLE FOR IHE PROPER FIT AND ALIGNMENT OF COMPLETED WORK IN POSITION.
13. THE CONTRACTOR SHALL GUARANTEE TO THE OWNER MATERIALS AND WORKMANSHIP AGAINST ORRIGINAL DEFECTS, OR AGAINST INJURY FROM PROPER AND USUAL WEAR WHEN USED FOR THE PURPOSE INTENDED, FOR TWELVE (12) MONTHS AFTER DATE OF FINAL PAYMENT CERTIFICATIONS, AND SHALL MAINTAIN ITEMS IN PERFECT CONDITION DURING THE PERIOD OF GUARANTEE. DEFECTS APPEARING DURING THE PERIOD OF GUARANTEE SHALL BE MADE GOOD BY THE CONTRACTOR AT HIS EXPENSE UPON DEMAND OF THE OWNER, IT BEING REQUIRED THAT WORK SHALL BE IN PERFECT CONDITION WHEN THF PERIOD OF GUARANTEE SHALL HAVE ELAPSED. IN THE EVENT OF DEFAULT BY THE CONTRACTOR, THE COMPANY SHALL HAVE THE RIGHT TO MAKE GOOD DEFECTS AND BILL THE CONTRACTOR COST PLUS 15% FOR ADMINISTRATION FEES.
14. AT THE CONTRACTOR'S EXPENSE, THE CONTRACTOR'S WORKING AREAS SHALL BE CLEANED BY HIM ON A DAY-TO-DAY BASIS, WITH RUBBISH REMOVED FROM THE SITE AND WORK AREAS CLEANED AT THE END OF EACH DAY. AT FINAL COMPLETION OF WORK THE CONTRACTOR SHALL LEAVE THE ENTIRE PREMISES, WITHIN THE SITE OF HIS OPERATIONS, CLEAN AND FREE FROM THE RUBBISH RESULTING FROM HIS CONSTRUCTION OPERATIONS.
15. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE AND MAINTAIN UTILITIES HE DEEMS NECESSARY TO AFFECT THE WORK.
16. THE CONTRACTOR SHALL PROVIDE FIELD ENGINEERING SERVICES REQUIRED FOR PROPER COMPLETION OF THE WORK INCLUDING, BUT NOT NECESSARILY LIMITED TO: ESTABLISHING AND MAINTAINING LINES AND LEVELS; STRUCTURAL DESIGN OF SHORES, FORMS, AND SIMILAR ITEMS PROVIDED BY THE CONTRACTOR AS PART OF HIS MEANS AND METHODS OF CONSTRUCTION.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN AT HIS EXPENSE REQUIRED FIRE PROTECTION SYSTEMS AND DEVICES AS NECESSARY TO SAFELY PERFORM THE WORK IN ACCORD WITH THE APPLICABLE REGULATIONS. IT SHALL BE OPERATIONAL THROUGHOUT THE PERIOD OF CONSTRUCTION.
18. THE OWNER SHALL HAVE THE RIGHT TO WITHHOLD WITHOUT PENALTY PAYMENT DESCRIBED ABOVE, OR SECTIONS REFERENCED HEREIN, FOR COMPLETED WORK SHOULD THE CONTRACTOR FAIL TO MEET OBLIGATIONS OR REQUIREMENTS OF THE CONTRACT. WITHHELD PAYMENT SHALL BE PROMPTLY MADE UPON THE CONTRACTOR'S FULL COMPLIANCE WITH THE CONTRACT.
19. COMPLY WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR PROTECTION OF THE ENVIRONMENT DURING THE WORK. PRIOR TO WORK COMMENCEMENT, CONTRACTOR SHALL SUBMIT A COMPREHENSIVE PLAN DESCRIBING THE MEANS AND METHODS TO BE EMPLOYED FOR PROTECTION, CONTAINMENT, AND CLEAN UP. ENSURE THAT PERSONNEL ARE PROPERLY TRAINED AND THAT SUFFICIENT EQUIPMENT AND MATERIALS ARE READILY AVAILABLE FOR USE IF REQUIRED. ABIDE BY STATE AND FEDERAL SPILL REPORTING REQUIREMENTS.
20. THE OWNER RESERVES THE RIGHT TO CHARGE THE CONTRACTOR FOR ADDITIONAL ENGINEERING SERVICES IF REQUIRED DUE TO THF CONTRACTOR'S ACTIONS OR INACTIONS.
21. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SAFETY OF HIS OPERATIONS. THE CONTRACTOR SHALL TAKE REASONABLE PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE REASONABLE PROTECTION TO PREVENT DAMAGE, INJURY, OR LOSS TO PERSONS EMPLOYED BY THE CONTRACTOR IN PERFORMANCE OF THE WORK, AND PERSONS NEARBY THAT MAY BE AFFECTED BY THE CONTRACTOR'S OPERATIONS OR THE WORK, INCLUDING EQUIPMENT AND MATERIALS WHICH WILL BE INCORPORATED IN THE WORK, AND OTHER PROPERTIES AND STRUCTURES AT THE SITE, OR ON ADJACENT PROPERTIES.
22. OBSTRUCTIONS ARE DEFINED AS UNFORESEEN OBJECTS, WHICH IMPEDE PROGRESS. OBJECTS, WHICH ARE MADE KNOWN TO THE CONTRACTOR, WILL NOT BE CONSIDERED TO BE OBSTRUCTIONS. NOTIFY THE ENGINEER OF RECORD IMMEDIATELY UPON ENCOUNTERING UNFORESEEN OBJECTS. NO CONSIDERATION WILL BE GIVEN FOR ADDITIONAL COMPENSATION ON THIS ACCOUNT WITHOUT THIS TIMELY NOTIFICATION.
23. SUBSTITUTIONS MAY BE FURNISHED FOR MATERIALS SPECIFIED HEREIN PROVIDED THE CONTRACTOR SECURES ACCEPTANCE FROM THE OWNER.

FOUNDATION STABILITY MAT

1. FOUNDATION STABILITY MAT SHALL BE GRID COMPOSITE SYSTEM (GCS) AS MANUFACTURED BY MACCAFERRI, INC., WILLIAMSPORT, MD, (301) 223-6910, OR EQUIVALENT ACCEPTED BY THE OWNER.
2. THE GCS SHALL BE INSTALLED BENEATH THE MEDIUM AND LARGE OYSTER CASTLE FORMATIONS IF SOFT SOILS ARE ENCOUNTERED. THE GCS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
3. ACTUAL EXTENT OF FOUNDATION STABILITY MAT MAY VARY WITH FIELD CONDITIONS AND THE CONTRACTOR'S METHODOLOGY.

EPOXY ADHESIVE

1. EPOXY ADHESIVE SHALL BE SIKADUR 33, HIGH-STRENGTH, RAPID CURING EPOXY PASTE, AS MANUFACTURED BY SIKA CORPORATION, LYNDHURST, NJ, (800) 933-7452, OR EQUIVALENT APPROVED BY OWNER.
2. EPOXY PASTE SHALL BE MIXED AND PLACED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

OYSTER CASTLES®

1. OYSTER CASTLE® SHALL BE 12" SQUARE BY 8" HIGH PREFABRICATED CONCRETE BLOCK UNITS MANUFACTURED BY ALLIED CONCRETE COMPANY, CHARLOTTESVILLE, VA, (434) 220-3202, OR EQUIVALENT ACCEPTED BY THE OWNER.
2. OYSTER CASTLES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND STACKED TO ACHIEVE MAXIMUM INTERLOCKING.

COIR LOGS

1. COIR LOGS SHALL CONSIST OF MACHINE FABRICATED CYLINDERS CONSISTING OF 100 PERCENT COCONUT FIBER ENCASED IN A HIGH TENSILE MACHINE SPIN BRISTLE COCONUT FIBER TWINE.
2. THE UNIT WEIGHT OF COIR LOGS SHALL BE NO LESS THAN SEVEN POUNDS PER CUBIC FOOT. THE MINIMUM LENGTH OF THE COIR LOGS SHALL BE 10 FEET AND THE DIAMETER OF COIR LOGS SHALL BE NO LESS THAN 16 INCHES.
3. OUTER NETTING SHALL BE CONSTRUCTED OF THREE PLY HIGH STRENGTH COIR TWINE OR YARN. THE AVERAGE BREAKING STRENGTH OF THE COIR TWINE OR YARN SHALL BE A MINIMUM OF 90 POUNDS. MINIMUM DIAMETER OF THE TWINE OR YARN SHALL BE 3/8 INCH.
4. ALL COMPONENTS OF THE LOG SHALL BE 100 PERCENT BIODEGRADABLE.
5. BOTH ENDS OF THE COIR LOG SHALL BE REINFORCED WITH ADDITIONAL COIR TWINES AND FLAT ENDS FOR BETTER JOINTS. ADJACENT LOGS SHALL BE PLACED END TO END WITH NO GAP BETWEEN.
6. A MINIMUM OF TEN (10) STAKES SHALL BE INSTALLED PER LOG. STAKES SHALL BE 2"x2" GREEN OAK, 4 FEET MINIMUM IN LENGTH WITH AT LEAST 3 FEET OF EMBEDMENT.

Water's Edge Environmental, LLC
P.O. Box 118 Ocean City, NJ 08226
609.249.3744 Info@watersedgellc.com

ISSUED FOR CONSTRUCTION

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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DESIGNED BY:	AZSL
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

PROJECT NOTES

SCALE	REVISION
NONE	
DATE	
4/20/15	

DRAWING NO.
214098-5B-02

C:\Michelle Sarasvati\OCC 214098 TASK 5B\02.dwg Dwg 02 Michelle Sarasvati Fri, 08 May 2015 - 2:42pm

Appendix B-3 Nantuxent Creek Design Plans- Existing Site Plan, Sheet 3

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (−3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP
  MAP No. 154−1836 "NANTUXENT CREEK SOUTH"
  MAP No. 161−1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
- EDGE ROAD
- MAPPED UPPER WETLANDS BOUNDARY PER NJDEP
  NJDEP COASTAL WETLANDS MAPS
  No. 154−1836 "NANTUXENT CREEK SOUTH"
  No. 161−1836 "NANTUXENT CREEK"

GENERAL NOTE

FOR PROJECT NOTES SEE DRAWING NO. 214098−5B−02.

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=30'−0" 0 30 60 FT.

ISSUED FOR CONSTRUCTION

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QC REVIEW:	AJM

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

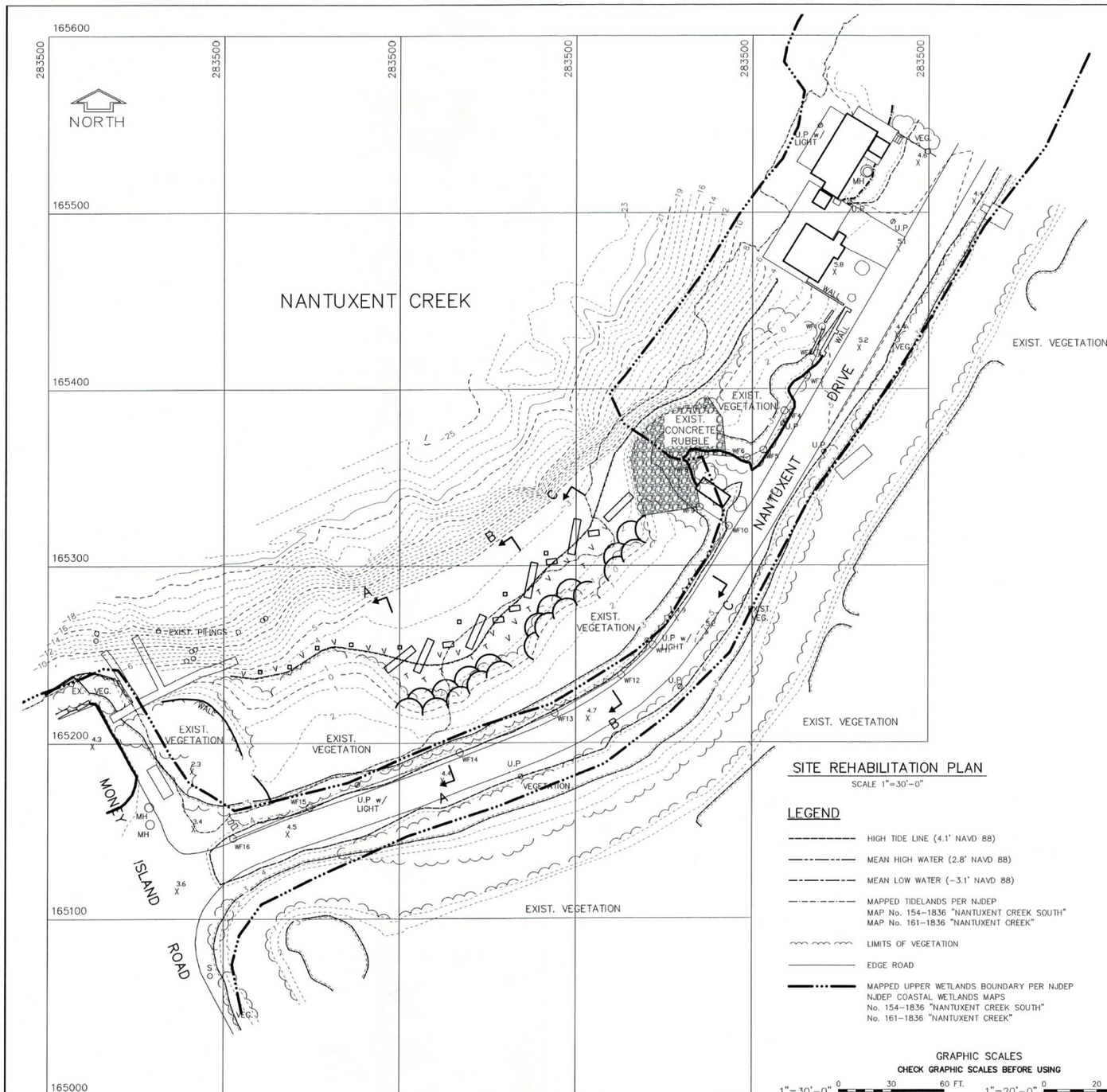
EXISTING SITE PLAN

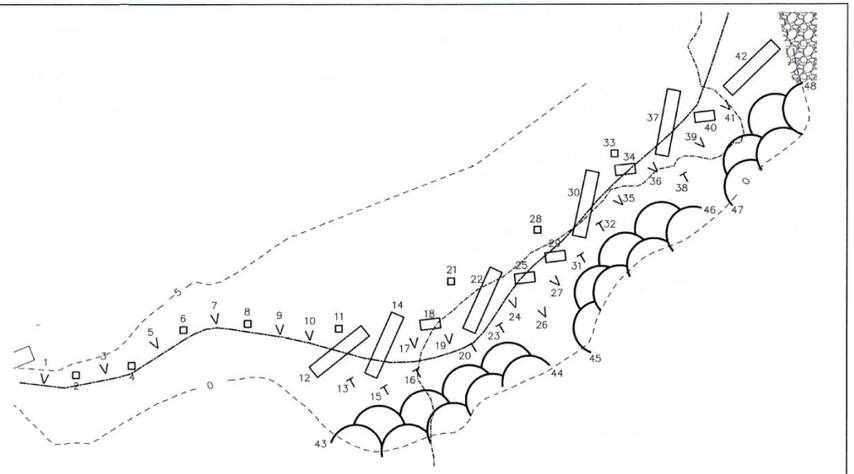
SCALE 1"=30'−0" | DATE 4/20/15 | REVISION

DRAWING NO. 214098−5B−03

C:\Michelle Saraswati\OCC 214098 TASK 5B\03.dwg Dwg 03 Michelle Saraswati Fri, 08 May 2015 − 2:34pm

Appendix B-3 Nantuxent Creek Design Plans- Site Rehabilitation Plan, Sheet 4





SITE REHABILITATION PLAN

SCALE 1"=30'-0"

LEGEND

- HIGH TIDE LINE (4.1' NAVD 88)
- MEAN HIGH WATER (2.8' NAVD 88)
- MEAN LOW WATER (-3.1' NAVD 88)
- MAPPED TIDELANDS PER NJDEP MAP No. 154-1836 "NANTUXENT CREEK SOUTH" MAP No. 161-1836 "NANTUXENT CREEK"
- LIMITS OF VEGETATION
- EDGE ROAD
- MAPPED UPPER WETLANDS BOUNDARY PER NJDEP NJDEP COASTAL WETLANDS MAPS No. 154-1836 "NANTUXENT CREEK SOUTH" No. 161-1836 "NANTUXENT CREEK"

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

1"=30'-0" 0 30 60 FT.

1"=20'-0" 0 20 40 FT.

OYSTER CASTLE DESIGNATION	NORTHING/EASTING (APPROX. CENTER OF OYSTER CASTLE POD)	SHORELINE TREATMENT TYPE
1	N: 165239/E: 283611	"V" OYSTER CASTLE POD
2	N: 165241/E: 283621	SMALL OYSTER CASTLE POD
3	N: 165242/E: 283629	"V" OYSTER CASTLE POD
4	N: 165243/E: 283638	SMALL OYSTER CASTLE POD
5	N: 165250/E: 283645	"V" OYSTER CASTLE POD
6	N: 165254/E: 283653	SMALL OYSTER CASTLE POD
7	N: 165257/E: 283663	"V" OYSTER CASTLE POD
8	N: 165256/E: 283672	SMALL OYSTER CASTLE POD
9	N: 165254/E: 283682	"V" OYSTER CASTLE POD
10	N: 165252/E: 283691	"V" OYSTER CASTLE POD
11	N: 165254/E: 283700	SMALL OYSTER CASTLE POD
12	N: 165248/E: 283700	LARGE OYSTER CASTLE POD
13	N: 165238/E: 283704	"T" OYSTER CASTLE POD
14	N: 165249/E: 283714	LARGE OYSTER CASTLE POD
15	N: 165236/E: 283714	"T" OYSTER CASTLE POD
16	N: 165241/E: 283724	"T" OYSTER CASTLE POD
17	N: 165250/E: 283723	"V" OYSTER CASTLE POD
18	N: 165256/E: 283728	MEDIUM OYSTER CASTLE POD
19	N: 165251/E: 283733	"V" OYSTER CASTLE POD
20	N: 165249/E: 283741	"T" OYSTER CASTLE POD
21	N: 165269/E: 283734	SMALL OYSTER CASTLE POD
22	N: 165263/E: 283743	LARGE OYSTER CASTLE POD
23	N: 165254/E: 283749	"T" OYSTER CASTLE POD
24	N: 165262/E: 283753	"V" OYSTER CASTLE POD
25	N: 165270/E: 283756	MEDIUM OYSTER CASTLE POD
26	N: 165259/E: 283762	"V" OYSTER CASTLE POD
27	N: 165268/E: 283766	"V" OYSTER CASTLE POD
28	N: 165284/E: 283760	SMALL OYSTER CASTLE POD
29	N: 165276/E: 283765	MEDIUM OYSTER CASTLE POD
30	N: 165292/E: 283774	LARGE OYSTER CASTLE POD
31	N: 165275/E: 283773	"T" OYSTER CASTLE POD
32	N: 165285/E: 283779	"T" OYSTER CASTLE POD
33	N: 165307/E: 283783	SMALL OYSTER CASTLE POD
34	N: 165302/E: 283786	MEDIUM OYSTER CASTLE POD
35	N: 165293/E: 283785	"V" OYSTER CASTLE POD
36	N: 165302/E: 283795	"V" OYSTER CASTLE POD
37	N: 165316/E: 283799	LARGE OYSTER CASTLE POD
38	N: 165300/E: 283804	"T" OYSTER CASTLE POD
39	N: 165310/E: 283809	"V" OYSTER CASTLE POD
40	N: 165318/E: 283810	MEDIUM OYSTER CASTLE POD
41	N: 165321/E: 283817	"V" OYSTER CASTLE POD
42	N: 165333/E: 283824	LARGE OYSTER CASTLE POD

OYSTER CASTLE IDENTIFICATION KEY PLAN

SCALE 1"=20'-0"

SHORELINE TREATMENT LEGEND

- T "T" OYSTER CASTLE POD
- V "V" OYSTER CASTLE POD
- SMALL OYSTER CASTLE POD
- MEDIUM OYSTER CASTLE POD
- LARGE OYSTER CASTLE POD
- COIR LOG CUSP

COORDINATE DESIGNATION	NORTHING/EASTING (APPROX. CENTER OF OYSTER CASTLE POD)	SECTION
43	N: 165220/E: 283698	SECTION A-A
44	N: 165243/E: 283764	
45	N: 165247/E: 283776	SECTION B-B
46	N: 165291/E: 283809	
47	N: 165291/E: 283819	SECTION C-C
48	N: 165328/E: 283840	

NORTHINGS AND EASTINGS ARE GIVEN IN NEW JERSEY STATE PLANE COORDINATES IN FEET. LOCATIONS ARE APPOXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. ORIENTATION OF STRUCTURES SHALL BE IN ACCORDANCE WITH THE PLAN.

GENERAL NOTE

FOR PROJECT NOTES SEE DRAWING NO. 214098-5B-02.

ISSUED FOR CONSTRUCTION

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CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

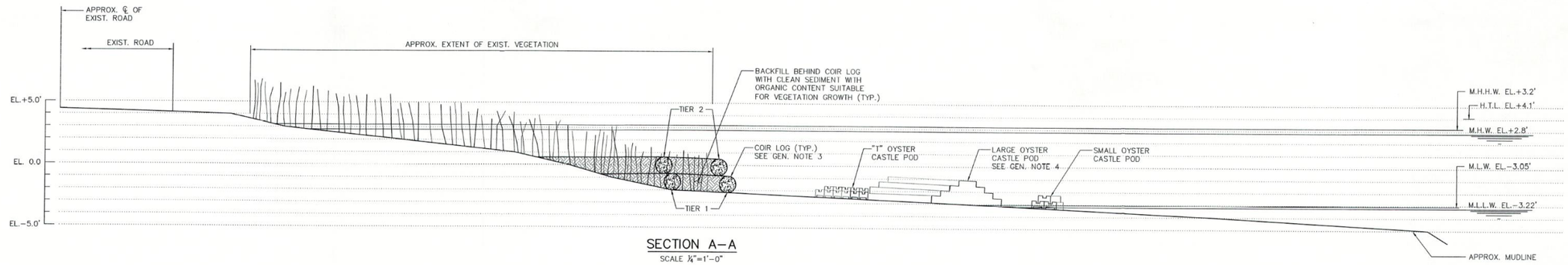
SITE REHABILITATION PLAN

SCALE	REVISION
AS NOTED	
DATE	
4/20/15	

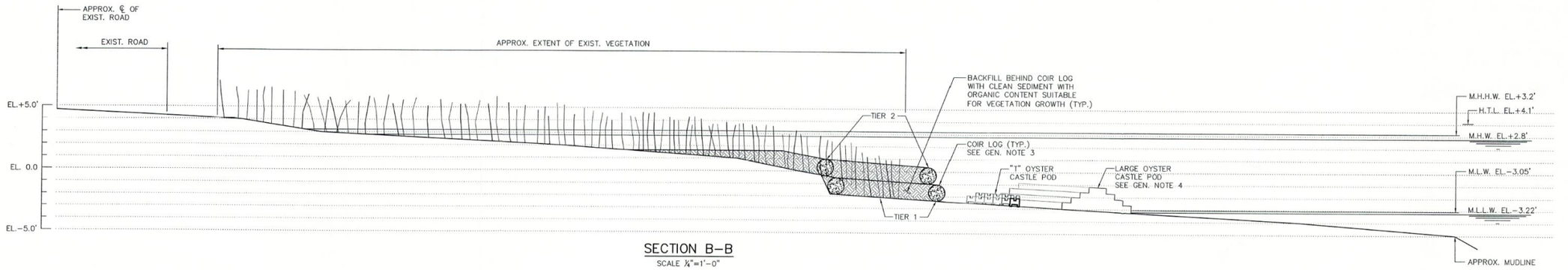
DRAWING NO.
214098-5B-04

L:\Michelle Saraswati\UGC\ 214098 ASK 38\04.dwg Dwg 04 Michelle Saraswati Fri, 08 May 2015 - 2:44pm

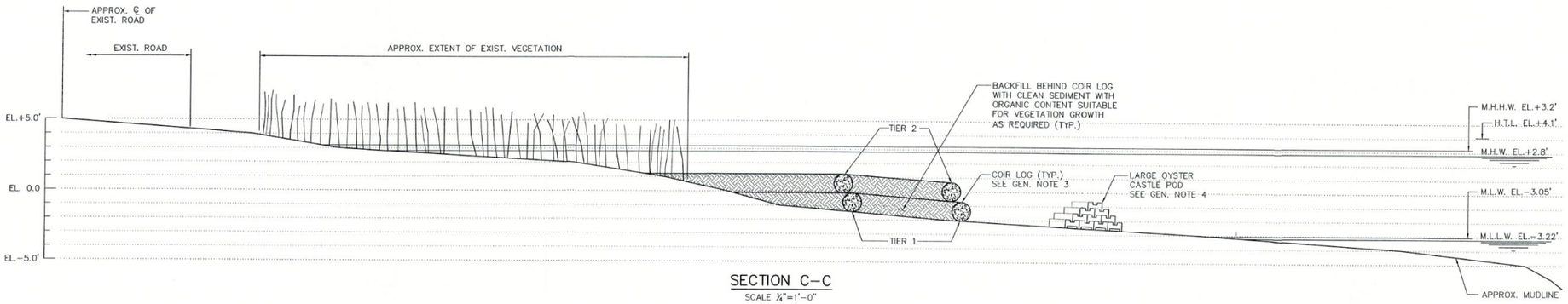
Appendix B-3 Nantuxent Creek Design Plans- Rehabilitation Sections, Sheet 5



SECTION A–A
SCALE ¼"=1'–0"



SECTION B–B
SCALE ¼"=1'–0"



SECTION C–C
SCALE ¼"=1'–0"

GENERAL NOTES

1. FOR PROJECT NOTES, SEE DWG. NO. 214098-5B-02.
2. FOR LOCATIONS OF SECTIONS A–A THRU C–C, SEE DWG. NO. 214098-5B-04.
3. TIER 1 INSTALLED IN PHASE 1 TO RAISE ELEVATION FROM APPROX. –1.6' TO –0.3'. TIER 2 INSTALLED IN PHASE 2 TO RAISE ELEVATION FROM –0.3' TO +1.0'. ADAPTIVE MANAGEMENT MAY BE REQUIRED PRIOR TO INSTALLATION OF TIER 2. IF COIR LOG COMPARTMENTS DO NOT NATURALLY FILL WITH SEDIMENT, BACKFILL WITH CLEAN SEDIMENT WITH ORGANIC CONTENT SUITABLE FOR VEGETATION GROWTH. VEGETATION SALVAGED FROM THE SITE MAYBE REPLANTED OR VEGETATION PLUGS ADDED AS NEEDED TO STABILIZE THE COMPARTMENTS.
4. LARGE OYSTER CASTLE PODS ARE TO PLACED SUCH THAT THERE IS APPROXIMATELY 4 FEET OF WATER ABOVE THE CREST DURING MEAN HIGH WATER AT THE OFFSHORE EDGE AND APPROXIMATELY 2 FEET OF WATER ABOVE THE CREST DURING MEAN HIGH WATER AT THE INSHORE EDGE.

GRAPHIC SCALES
CHECK GRAPHIC SCALES BEFORE USING

¼"=1'–0" 0 4 8 FT.

ISSUED FOR CONSTRUCTION

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REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

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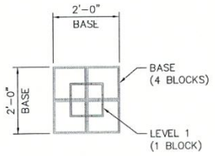
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

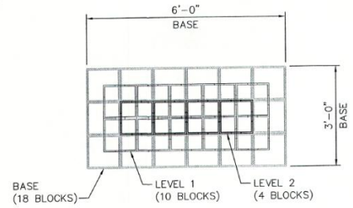
REHABILITATION SECTIONS

SCALE 1/4"=1'-0" | REVISION
DATE 4/20/15
DRAWING NO. 214098-5B-05

Appendix B-3 Gandy's Beach Design Plans- Details, Sheet 6



PLAN VIEW



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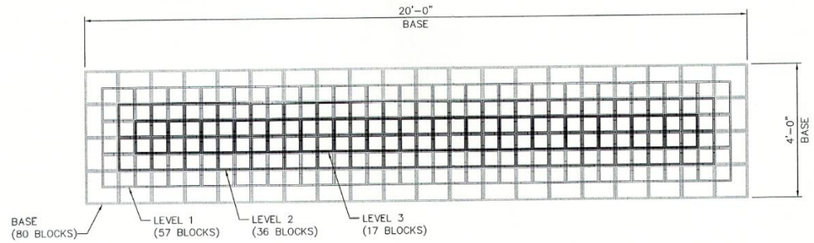
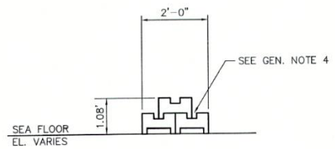


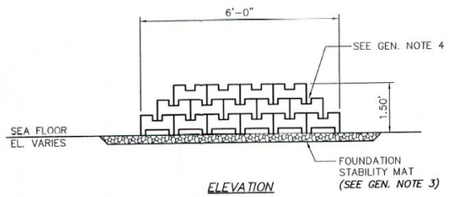
PLAN VIEW



ELEVATION

SMALL OYSTER CASTLE POD

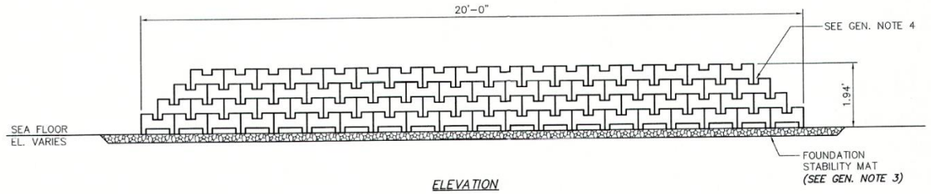
SCALE ½"=1'-0"



ELEVATION

MEDIUM OYSTER CASTLE POD

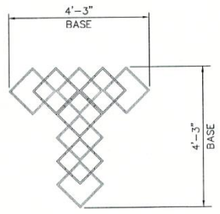
SCALE ½"=1'-0"



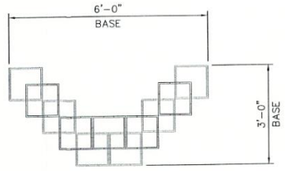
ELEVATION

LARGE OYSTER CASTLE POD

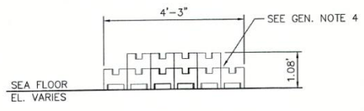
SCALE ½"=1'-0"



PLAN VIEW



PLAN VIEW



ELEVATION

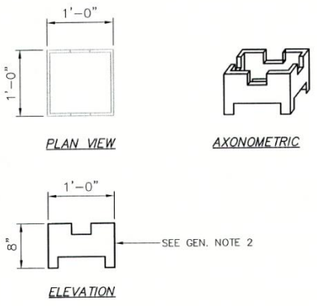
"T" OYSTER CASTLE POD

SCALE ½"=1'-0"

ELEVATION

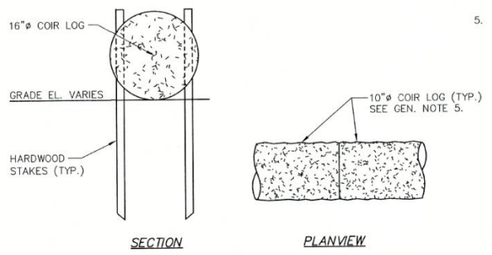
"V" OYSTER CASTLE POD

SCALE ½"=1'-0"



TYPICAL INDIVIDUAL OYSTER DETAILS

SCALE 1"=1'-0"



COIR LOG DETAILS

SCALE 1"=1'-0"

GENERAL NOTES

1. FOR PROJECT NOTES, SEE DWG. NO. 214098-5B-02.
2. OYSTER CASTLE 12" PREFABRICATED CONCRETE BLOCK BY ALLIED CONCRETE OR APPROVED EQUIVALENT.
3. FOUNDATION STABILITY MAT MAY BE REQUIRED FOR MEDIUM AND LARGE OYSTER CASTLE PODS IF SUBSTRATE IS SOFT SOIL MATERIAL SUCH AS PEAT DEPOSIT.
4. ADHERE TOP TWO COURSES TOGETHER WITH SIKADUR 33 HIGH-STRENGTH, RAPID CURING EPOXY PASTE, AS MANUFACTURED BY SIKA CORPORATION, OR APPROVED EQUAL.
5. ADJACENT LOGS SHALL BE PLACED END TO END WITH NO GASP BETWEEN.

GRAPHIC SCALES

CHECK GRAPHIC SCALES BEFORE USING

½"=1'-0" 0 1 4 FT.

1"=1'-0" 0 1/2 1 2 FT.

ISSUED FOR CONSTRUCTION

Water's Edge Environmental, LLC

P.O. Box 118 Ocean City, NJ 08226

609.249.3744 info@watersedgellc.com

REVISIONS	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

Ocean and Coastal Consultants COWI

Ocean and Coastal Consultants, Inc.

20 E. Clementon Road, Suite 201N, Gibbsboro, NJ 08026

Phone: (856) 248-1200 Fax: (856) 248-1206

Visit us at www.ocean-coastal.com

The Nature Conservancy

2350 Route 47, Delmont, NJ 08314

DESIGNED BY:	AZSL
DRAWN BY:	CAMA
CHECKED BY:	JOMA
QC REVIEW:	AZSL

GANDY'S BEACH LIVING SHORELINE PROJECT
NANTUXENT CREEK

OYSTER CASTLE POD
AND COIR LOG DETAILS

SCALE 1/2"=1'-0" | REVISION

DATE 4/20/15

DRAWING NO. 214098-5B-06

Appendix C- Landowner's Agreement

ENVIRONMENTAL ASSESSMENT

GANDY'S BEACH/MONEY ISLAND LIVING SHORELINE PROJECT

DOWNE TOWNSHIP, NEW JERSEY

C-1 TNC's Landowner's Agreement for Money Island, Page 1

LICENSE AND AGREEMENT

This License and Agreement ("License") is made and entered into by and between **The Nature Conservancy,** a non-profit corporation under the laws of the District of Columbia, having its local office at 2350 Route 47 Delmont, New Jersey ("the Conservancy") and **Money Island Marina LLC**, having an address at P.O. Box 333, Newport NJ 08345 ("the Licensor").

Whereas, Licensor is the owner of the following land parcels located in Downe Township, Cumberland County, New Jersey: Block 6, lots 19, 19.01, 20, 21,22; and being more particularly described in the attached Exhibit A ("the Property"); and

Whereas, the Conservancy desires to use the Property for the purposes of the installation of a living shoreline project to enhance wildlife habitat and reduce shoreline erosion. More particularly, the Conservancy and our partners plan to install about 300 feet of COIR biologs along the tidal marsh edges of the property and construct multiple living breakwater structures that possibly include shell bags and concrete oyster castle structures. The living shoreline will be installed with the help of staff and volunteers during the summer of either 2015 or 2016 depending on when federal and state permits are granted. The total time for installation is anticipated at two to three weeks. In addition, maintenance of the structures will most likely occur after installation, as well as monitoring of the ecological response of the site and the structural integrity of the living shoreline.

Whereas, the Licensor is willing to permit the use of the Property by the Conservancy for the purpose described above, upon the terms and conditions set forth in this License;

NOW, THEREFORE, in consideration of the covenants and other consideration hereinafter set forth, the Conservancy and the Licensor agree as follows:

1. GRANT OF LICENSE. The Licensor grants to the Conservancy, its employees, contractors and volunteers a license to use the Property for the purpose described above.

2. TERM. This License shall become effective when signed by both parties and shall continue in effect through December 31, 2016, unless terminated earlier as provided herein.

3. CONSIDERATION. The fee for this License is $0.

4. LIABILITY. The Conservancy hereby assumes all responsibility for any injury to persons or damages to property to the extent caused by the Conservancy's use of the Property pursuant to this License. Notwithstanding the foregoing, Licensor hereby releases the Conservancy for any claim of loss or damage to Licensor's real or personal property arising from the Conservancy's use of the Property pursuant to this License

5. TERMINATION. Licensor and the Conservancy may terminate this License with respect to all or a part of the Property upon two (2) weeks' prior written notice to the address listed above or such other address as may be provided by the party receiving the notice.

C-1 TNC's Landowner's Agreement for Money Island, Page 2

6. CHOICE OF LAW. This License is being executed and is intended to be performed in the State of New Jersey, and it shall be governed in all respects by the laws of that state.

7. ENTIRE AGREEMENT/BINDING EFFECT. This License contains the entire agreement by the parties, and the License may not be amended except by the written consent of the parties. This License shall not be effective until it is executed by both parties. Any recital or preliminary statement in this License and all exhibits referred to in this License are an integral part of and are incorporated by reference into this License.

The parties have executed this instrument as of the date of last signature below.

THE NATURE CONSERVANCY

By: _____

Its: Robert Allen, Assistant State Director

Date: 5/19/2015

MONEY ISLAND MARINA LLC

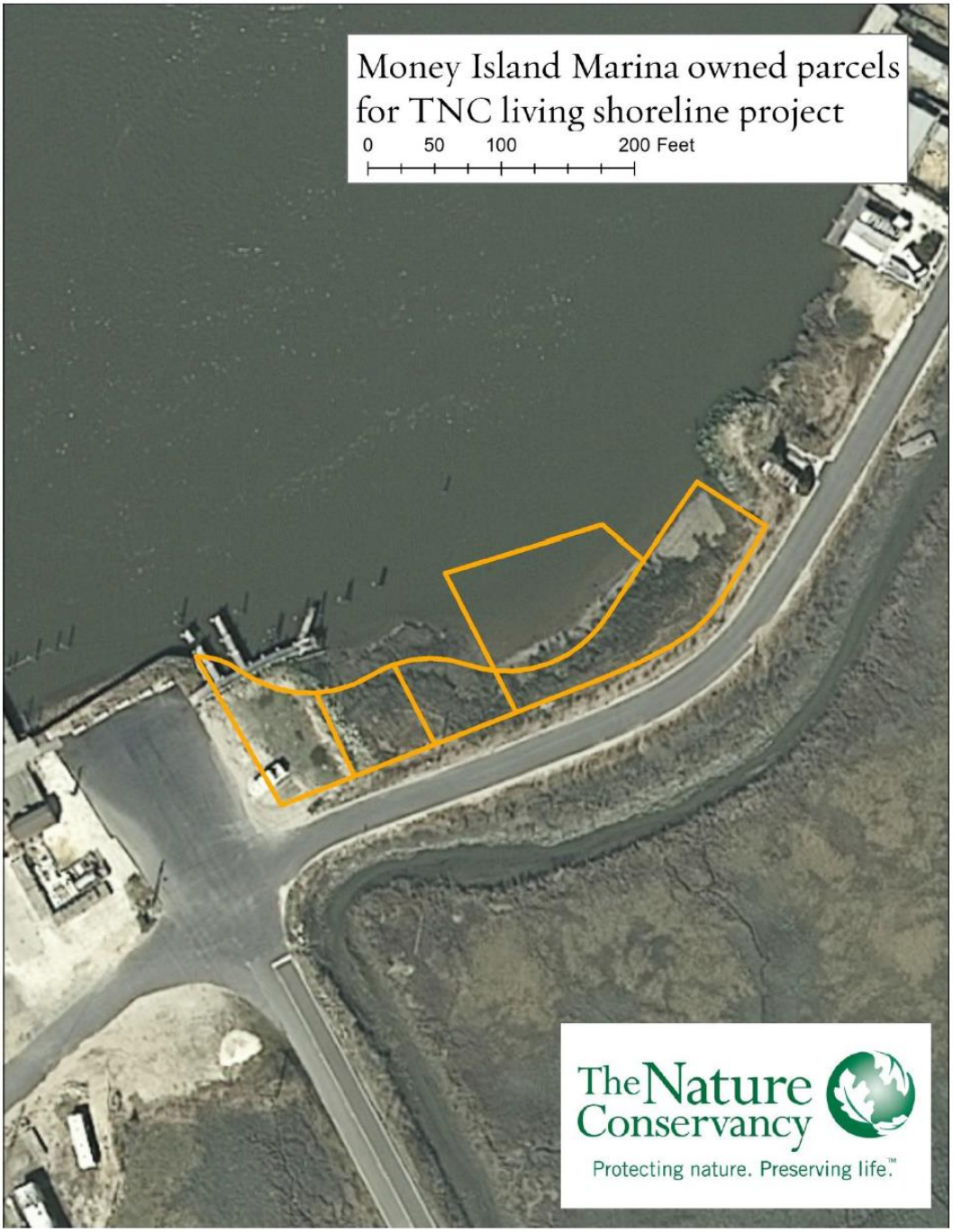
By: _____
Tony Novak

Its: Authorized Representative

Date: 5/20/2015

C-1 TNC's Landowner's Agreement for Money Island, Page 3

EXHIBIT A – MAP OF THE PROPERTY



Appendix D- Permit Correspondence

ENVIRONMENTAL ASSESSMENT

GANDY'S BEACH/MONEY ISLAND LIVING SHORELINE PROJECT

DOWNE TOWNSHIP, NEW JERSEY

Appendix D-1 Federal Consistency Determination, Page 1

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Land Use Regulation
Mail Code 501-02A
P.O. Box 420
Trenton, New Jersey 08625-0420
www.state.nj.us/dep/landuse

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

SEP 4 201

Eric Schrading
Field Supervisor
USFWS-NJ Field Office
927 N. Main Street, Suite D
Pleasantville, NJ 08232

Moses Katkowski
Marine Conservation Coordinator
The Nature Conservancy
250 Route 47
Delmont, NJ 08314

Re: Federal Consistency Determination and Water Quality Certificate
DLUR File No. 0604-15-0019.1 CDT 150001
Gandy's Beach and Money Island Shoreline Protection Project
Downe Township, Cumberland County

Dear Mr. Schrading and Mr. Katkowski:

The New Jersey Department of Environmental Protection, Division of Land Use Regulation, acting under Section 307 of the Federal Coastal Management Act (P.L. 92-583) as amended, finds the U.S. Fish and Wildlife Service's (Service) and The Nature Conservancy's (TNC) proposed construction of living shorelines along Gandy's Beach and Money Island, in Downe Township, Cumberland County, consistent with the approved New Jersey Coastal Management Program.

The Service and TNC are proposing to construct two hybrid living shoreline projects in an effort to reduce shoreline erosion and the degradation of tidal marsh habitat. The techniques employed by the project include nearshore oyster breakwaters constructed of shell bags and oyster castles that recruit oysters, and coir biolog installations along the existing salt marsh edge to stabilize the marsh.

The first site is located along the shoreline of the Gandy's Beach on the Delaware Bay between the towns of Money Island and Gandy's Beach and includes the construction of between 2,000 to 3,000 linear feet of living shoreline attenuating structures consisting of two "Levels". The first level will be placed at about mean low water with a second level of wave attenuating break water reefs located 20 to 30 feet landward of the first level. The first level consists of a combination of oyster castle pods and shell bag breakwater reefs. The second level consists of shell bag breakwater reefs and finally coir biologs will be installed along the edges of the tidal marsh vegetation (See plan sheets referenced on page 2 entitled: "Gandy's Beach Living Shoreline Project").

The second site is located along the southern bank of Nantuxent Creek, just upriver from the Money Island Marina and approximately 2,000 feet from the mouth of the Nantuxent Creek where it enters the Delaware Bay, north of the Gandy's Beach living shoreline site. The proposed project consists of the installation of approximately 330 linear feet of hybrid living shoreline using wave attenuating structures, coir biologs, marsh vegetation plantings, and ribbed mussel augmentation. The installation will occur in

Appendix D-1 Federal Consistency Determination, Page 2

multiple phases. The initial installation of 16" diameter, 12' long coir logs in a terrace formation will trap sediment increasing the elevation at the front of the treatment. After this row of logs naturally fills with sediment, another installation of coir logs will be added increasing the elevation at the front of the treatment to about mean high water, the optimum planting zone for *Spartina alterniflora*. After this row of logs fills with sediment *Spartina alterniflora* will be planted in the logs and behind the logs. In addition to coir biolog installations the Nantuxent Creek site will also include nearshore breakwater reefs constructed of oyster castle pods. The breakwater reefs will be installed at about mean low water to maximize wave attenuation and oyster recruitment, growth, and survival. The oyster castle breakwater reefs at Nantuxent Creek will be arranged in five different configurations.

1. Large oyster castle pods are 20 feet long by 3 feet wide at the base, and about 2 feet high.
2. Medium oyster castle pods are 6 feet long by 3 feet wide at the base, and about 1.5 feet high.
3. Small oyster castle pods are 2 feet long by 2 feet wide at the base, and about 1 foot high.
4. "T" oyster castle pods are arranged in a "T" shape about 4 feet by feet at the base.
5. "V" oyster castle pods are arranged in a "V" shape about 6 feet by 3 feet at the base.

Live oysters will not be placed at either of the project sites. The Division has reviewed the submitted information and has determined that the project is consistent, to the maximum extent practicable, and with the conditions implemented below, with New Jersey's Rules on Coastal Zone Management N.J.A.C. 7:7-1.1 et seq., (as amended on July 6, 2015).

The Gandy's Beach section of the project is shown on 10 sheets, all sheets are prepared by Ocean and Coastal Consultants, Inc., dated April 23, 2015, unrevised (unless otherwise noted) and entitled:

"GANDY'S BEACH LIVING SHORELINE PROJECT"

"COVER SHEET AND DRAWING LIST", sheet 214098-5A-01;
"PROJECT NOTES", 214098-5A-02;
"GENERAL SITE PLAN", 214098-5A-03;
"DETAIL PLAN 1-PHASE 1", 214098-5A-04;
"DETAIL PLAN 2-PHASE 1", 214098-5A-05;
"DETAIL PLAN 3-PHASE 1", 214098-5A-06;
"DETAIL PLAN 4-PHASE 2", 214098-5A-07
"DETAIL PLAN 5-PHASE 2", 214098-5A-08;
"SHORELINE SECTIONS", 214098-5A-09;
"SHORELINE TREATMENT DETAILS 2", 214098-5A-10.

The Nantuxent Creek section of the project is shown on 6 sheets, all sheets are prepared by Ocean and Coastal Consultants, Inc., dated April 20, 2015, unrevised (unless otherwise noted) and entitled:

"GANDY'S BEACH LIVING SHORELINE PROJECT NANTUXENT CREEK"

"COVER SHEET AND DRAWING LIST", 214098-5B-01;
"PROJECT NOTES", sheet 2 of 7, 214098-5B-02;
"EXISTING SITE PLAN", 214098-5B-03;
"SITE REHABILITATION PLAN", 214098-5B-04;
"REHABILITATION SECTIONS", 214098-5B-05;
"OYSTER CASTLE POD AND COIR LOG DETAILS", 214098-5B-06;

This consistency determination is issued subject to compliance with the following conditions:

1. No regulated work may commence until such time as you have obtained a Department of the Army authorization.

Appendix D-1 Federal Consistency Determination, Page 3

2. The applicant shall apply for and receive a tidelands grant lease or license from the Bureau of Tidelands prior to construction. Failure to comply with this condition will result in fines up to $1000 plus $100 per day, a higher fee for the conveyance and possible prosecution by the Attorney General's Office to remove unauthorized structures and to pay use and occupancy charges.

3. In protect the Federally-listed (threatened) Red Knot, the authorized work (including restoration of any kind, construction vehicle access and equipment stockpiling) shall not occur during the spring migration from April 15th to June 15th for any given year.

4. There shall be no disturbance to the wetlands/wetland buffers located on-site.

5. As a condition of this determination, all areas of temporary disturbance shall be restored to its pre-existing condition and grade, including but not limited to beach and dune disturbances.

6. This permit does not obviate you from obtaining any other necessary federal, state or local approvals.

7. Public access to the waterfront must be maintained during and after project construction.

This Federal Consistency is authorized pursuant to all parties following the guidelines set forth, and agreed upon, for the proposed work.

Pursuant to 15 CFR 930.44, the Division reserves the right to object and request remedial action if this proposal is conducted in a manner, or is having an effect on, the coastal zone that is substantially different than originally proposed.

Thank you for your attention to and cooperation with New Jersey's Coastal Zone Management Program. If you have any questions with regard to this determination, please do not hesitate to contact Kara Turner, at the above address or at 609-633-2289.

Sincerely,

David B. Fanz
Assistant Director
Bureau of Coastal Regulation

cc. Enforcement
Elizabeth Semple, Division of Coastal and Land Use Planning

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Project Name: Shoreline Protection Project **Originating Person:** Katie Conrad
Township: Downe Township **Telephone Number:** 609-383-3938 ext. 39
County: Cumberland **Date:** 2015 (rev. 6/16)
Shape file at: G:\user\Katie\Intra-Section_7\Gandys
Distance to nearest town: Project Area 1 is along the shoreline of The Nature Conservancy's Gandy's Beach Preserve between the communities of Gandy's Beach and Money Island, Project Area 2 is along the southern shore of Nantuxent Creek north of the Money Island Marina.

I. Region: 5

II. Service Activity (Program)

U.S. Fish and Wildlife Service, Region 5, Ecological Services, New Jersey Field Office (NJFO) and project partners propose to construct 2,500 to 3,000 linear feet of coir living shoreline and oyster breakwaters.

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

Rufa red knot (*Calidris canutus rufa*) and 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.

See attached.

IV. Description of proposed action (attach additional pages as needed):

See attached project description, design plans, aerial map of the intertidal zone, and list of materials and quantities for each site.

VII. 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):

The project area contains foraging habitat for rufa red knot (*Calidris canutus rufa*) and potential summer habitat for northern long-eared bat (*Myotis septentionalis*).

Northern long-eared bat: there is no suitable habitat for Northern long-eared bat in the project area. In addition, there is no tree removal associated with this project; therefore no impacts to Northern long-eared bat are anticipated.

This project may affect, but will not adversely affect rufa red knot. One of the goals of the project is to install breakwaters to reduce erosion of rufa red knot foraging habitat. The project has the potential to impact rufa red knot in two ways.

1. *Direct impact to rufa red knot.* The presence of near-shore reefs may displace otherwise suitable feeding areas for rufa red knot. Monitoring activities have the potential to disturb rufa red knot by flushing birds or causing them to avoid important feeding/resting areas. In addition, the living shoreline may change the quality of foraging habitat behind it.
2. *Indirect impact: displace horseshoe crabs.* If the oyster reef is a barrier to movement or impinges horseshoe crabs, this may result in less egg availability and decreased feeding opportunities for rufa red knot.

Across the nonbreeding range, including in Delaware Bay, the spatial distribution of red knots has been correlated with the distribution of their primary prey species. In Delaware Bay, the primary prey item is horseshoe crab eggs (USFWS 2014). Thus, sections of the bayshore with high levels of horseshoe crab spawning activity and egg density typically attract and support high densities of red knots, notwithstanding other factors such as competition, predation, and human disturbance. Although red knots forage on peat banks in some parts of their range, peat bank usage is typically associated with feeding on other prey types such as mussel spat (USFWS 2014). Specific to Delaware Bay, active salt marsh and peat-bank sediments are unsuitable or, at best, marginal spawning habitat for horseshoe crabs (Botton et al. 1988), and are thus generally of minimal value as red knot foraging habitat.

The project area is currently an actively eroding section of shoreline. Erosion has resulted in exposure of peat deposits in many areas, as well as deposition of sand landward of some areas of active salt marsh. This results in a patchwork of more and less suitable habitats for both spawning horseshoe crabs and red knots. The purpose of the proposed project is to slow or halt erosion. Slower erosion rates and a more stable shoreline position will protect existing areas of high marsh while allowing zones of low marsh and tidal flats to reform (USFWS 2014), resulting in long-term benefits to red knots. In the short term, the project may produce both beneficial and adverse effects on red knot habitat.

Direct adverse effects to habitat will result from displacement of current intertidal flats by both coir logs and breakwater structures (oyster castles, shell bags). The total area of displacement (footprint of the breakwaters plus all currently unvegetated areas landward of the coir logs) is 19,723 square feet (see attached Nantuxent Creek and Gandy's Beach Site Materials). For context the total area of the intertidal zone (between MHW and MLW) within the project area is 795,636 square feet (see Table 1 and attached intertidal zone map). Thus, the project would directly displace 2.5 percent of total intertidal area. These calculations provide a generalized metric of direct habitat impacts, but do not account for the spatial arrangement of suitable (sandy) and unsuitable (peaty and/or vegetated) habitats within the intertidal zone. Nonetheless, these calculations are sufficient to conclude that project effects from direct habitat loss are insignificant.

Total Square Footage of Intertidal Zone	
Gandy's Beach Area	**Area (sq ft)**
DP 1, 2, 3	251,721
Area between DP 3 and 4	43,957
DP 4	319,849
Area between DP 4 and 5	162,039
DP 5	124,408
Total Gandy's Beach Area	777,566
Nantuxent Creek Area	
Nantuxent Creek	18,070
Total Area	795,636

Table 1. Total square footage of intertidal zone.

B. Explanation of actions to be implemented to reduce adverse effects:

Northern Long-eared Bat

There is no suitable habitat for Northern long-eared bat in the project area. In addition, there is no tree removal associated with this project; therefore no impacts to Northern long-eared bat are anticipated.

Rufa Red Knot

Direct Impacts: Rufa Red Knot Disturbance and Habitat Loss

Potential negative effects to rufa red knots will be avoided through construction timing restrictions, monitoring restrictions, site selection, and habitat surveys.

There will be no construction during the spring migration season from April 15 to June 15. However, if there are no rufa red knots observed using the site by June 1, the Service will contact the appropriate monitoring agencies to determine whether construction will be allowed onsite before June 15. No fish or oyster monitoring, planting, or maintenance activities will occur on the project site under the same conditions.

The project will occur in two phases, the first phase from August 2015 through the end of October 2015 and the second phase during the first half of April 2016 and continuing again June 15 through November 8, 2016.

The living shoreline installed before the horseshoe crab spawning season (May through mid-June) in 2016 will be monitored for horseshoe crab impingement, red knot usage, and horseshoe crab egg counts. Horseshoe crab impingement surveys will occur at low tide one to three times a week surrounding the full and new moons from the beginning of May to mid-June 2016. The Service, The Nature Conservancy, and project partners will receive guidance from the American Littoral Society and the Conserve Wildlife Foundation as to which protocols to use based on their experience monitoring the Reeds Beach oyster reef breakwater during the 2015 horseshoe crab spawning season. Each horseshoe crab impingement survey will require 1-2 hours during low tide.

The New Jersey Department of Environmental Protection will also continue surveying for red knots and conducting horseshoe crab egg counts during the horseshoe crab spawning season. Red knot surveys are conducted from behind dunes and cover of beach grass and are designed to avoid flushing birds. Therefore, disturbance to red knot will be minimized or avoided through survey design. Egg count surveys will be conducted once per week for about 2 hours around the low tide.

The impact of monitoring will be similar to disturbance recommended for the recommendations for Nationwide Permit 48 (NWP 48) for applications for the Army Corp of Engineers Aquaculture Permit. Surveyors (impingement and horseshoe crab egg count) will not be onsite for more than 8 hours per week during the horseshoe crab spawning season in order to limit potential disturbance to foraging rufa red knots. Red knot surveys are not included in this restriction because they are designed to avoid flushing birds. The frequency of entry (one to three times a week) may exceed the recommendations for NWP 48 (twice a week), but the total time and amount of disturbance will be the same as that associated with aquaculture: two hours before, and two hours after low tide for a total of eight hours of disturbance per week. However, the number of people conducting the surveys (less than three) and the activity (no motorized equipment) represent less of a disturbance than the activities associated with tending cultured oysters.

The oyster breakwaters will be located in the lower intertidal zone on exposed peat beds. Since the breakwaters will not be located on sand, it is not considered prime rufa red knot feeding habitat. Within the Preserve project area (Project Area 1), approximately 18,130 square feet of intertidal zone will be covered with living shoreline. Within the Nantuxent Creek site (Project Area 2), approximately 1,360 square feet of intertidal zone will be covered with living shoreline (see Gandy's Beach Preserve Materials and Nantuxent Creek Site Materials for a further breakdown based on type of breakwater and location).

Short-term impacts on water quality and turbidity are anticipated during construction, but will subside quickly because of the large particle size of the substrate and well before

rufa red knot return to feed; therefore construction will have no impact to rufa red knot.

Indirect effects to habitat may be beneficial, adverse, or both. The precise shoreline response to project, and the resulting changes to the mosaic of habitat, are difficult to predict and will depend on stochastic events like storms. To measure the effect of these habitat changes on the red knot, the proposed monitoring will include evaluation of red knot habitat availability before and after the project. Botton *et al.* (1988) developed a classification of horseshoe crab spawning habitat (below), which is also a reasonable measure of red knot foraging habitat suitability. The total area of preferred and avoided habitats will be calculated, and their spatial arrangement will be mapped, both before and 5 years after the project. Based on the project's expected result of slowing erosion, we anticipate any adverse effects from loss of preferred habitat will be insignificant. However, the monitoring program will ensure that any localized problem areas (higher than expected loss of preferred habitat) can be corrected through adaptive management. The monitoring program will be supplemented by evaluation of localized data on red knot usage and horseshoe crab egg and/or spawning densities, if available.

Horseshoe Crab Spawning Habitat Suitability (Botton *et al.* 1988):

Preferred habitat:
(a) Optimal: undisturbed sandy beach
(b) Suitable: sandy beach, with small areas of peat and/or development

Avoided habitat:
(a) P1: lower and middle intertidal zone consists of eroding peat, with sand present in the upper intertidal
(b) P2: step formation of peat, sandy beach lacking or if present, appears well behind the peat and is probably inaccessible to horseshoe crabs
(c) Salt Marsh: active salt marsh vegetation fringing the shoreline, no sandy beach at all
(d) Disturbed: eroded sandy beach which has been extensively bulkheaded or filled with debris
(e) Mixes of the above

Indirect Impacts: Displacement of Horseshoe Crabs
Potential negative effects to horseshoe crab include construction timing restrictions, construction specifications to allow crab passage and avoid spawning habitat, and impingement surveys.

The horseshoe crab restriction recommended by the National Oceanic and Atmospheric Administration (NOAA) is April 15 to August 31. Since we are not excavating and the work is in the intertidal zone, the Service has requested that NOAA reduce the timing restriction from April 15 to June 15.

To allow horseshoe crab passage, the oyster breakwaters will be constructed from lengths of 30 feet or less with gaps 5 feet or greater between them to allow marine organisms to move freely through the site. During high tide, there is at least one foot of water over the

seaward breakwaters. The seaward toe of the majority of the breakwaters is at MLW. Crabs will be able to walk around the structures and if they are unable to walk around the breakwater in time for tide to go out, they will not be out of water for more than 2 hours.

The oyster breakwaters will not cover suitable spawning habitat because they are located along the low tide line. However, coir biologs will be placed along the mid to high tide line. Coir biologs will only be located along the edge of salt marshes in the Nantuxent Creek site and the Preserve's design plan 1. These areas are unsuitable horseshoe crab spawning habitat because the spawning substrate consists of eroded peat beds that may have a few inches of sand. Horseshoe crab larvae require a minimum sand depth of 20 cm in order to hatch (Niles et al. 2013). The sand acts as a buffer between the eggs and the underlying beach, which creates low oxygen conditions that affect egg survival. It is possible that if crabs are using the area, the eggs will be easily accessible for red knot foraging.

The project area will be monitored throughout the spawning season from the beginning of May to mid-June. A threshold will be identified at which horseshoe crab impingement or displacement will trigger removal of the reef. Since the reef will be removed before impacts to horseshoe crabs will impact red knot, the reef is not likely to adversely affect rufa red knot.

The determination that the project may affect, but will not adversely affect rufa red knot is contingent on the outcomes of post-construction habitat and horseshoe crab impingement monitoring.

Literature Cited

Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1988. Beach Erosion and Geochemical Factors: Influence on Spawning Success of Horseshoe Crabs (*Limulus polyphemus*) in Delaware Bay. Marine Biology 99(3):325-332.

Niles, L.J., J.A. Smith, D.F. Daly, T. Dillingham, W. Shadel, A.D. Dey, M.S. Danihel, S. Hafner, and D. Wheeler. Restoration of Horseshoe Crab and Migratory Shorebird Habitat on Five Delaware Bay Beaches Damaged by Superstorm Sandy. December 27, 2013.

U.S. Fish and Wildlife Service [USFWS]. 2014. Rufa Red Knot Background Information and Threats Assessment. Supplement to: Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (*Calidris canutus rufa*). Docket Number FWS-R5-ES-2013-0097; RIN AY17. U.S. Fish and Wildlife Service, Northeast Region, New Jersey Field Office. Pleasantville, New Jersey. November.

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VIII. Effect determination and response requested: **[* = optional]**

A. Listed species/designated critical habitat:

Determination	**Response requested**
no effect/no adverse modification (northern long-eared bat)	X *Concurrence
may affect, but is not likely to adversely affect species/adversely modify critical habitat species: (rufa red knot)	X Concurrence
may affect, and is likely to adversely affect species/adversely modify critical habitat (species:_____)	____ Formal Consultation

_____ **(rev. 6/16)**
Project Biologist (Requestor), New Jersey Field Office Date

IX. Reviewing ESFO Evaluation:

A. Concurrence ✓ **Nonconcurrence**_____

B. Formal consultation required_____

C. Conference required_____

D. Informal conference required_____

E. Remarks (attach additional pages as needed):

Wendy Walsh 6/18/15
Endangered Species Biologist (Reviewer), New Jersey Field Office Date

19 June 15
Assistant Supervisor, New Jersey Field Office Date

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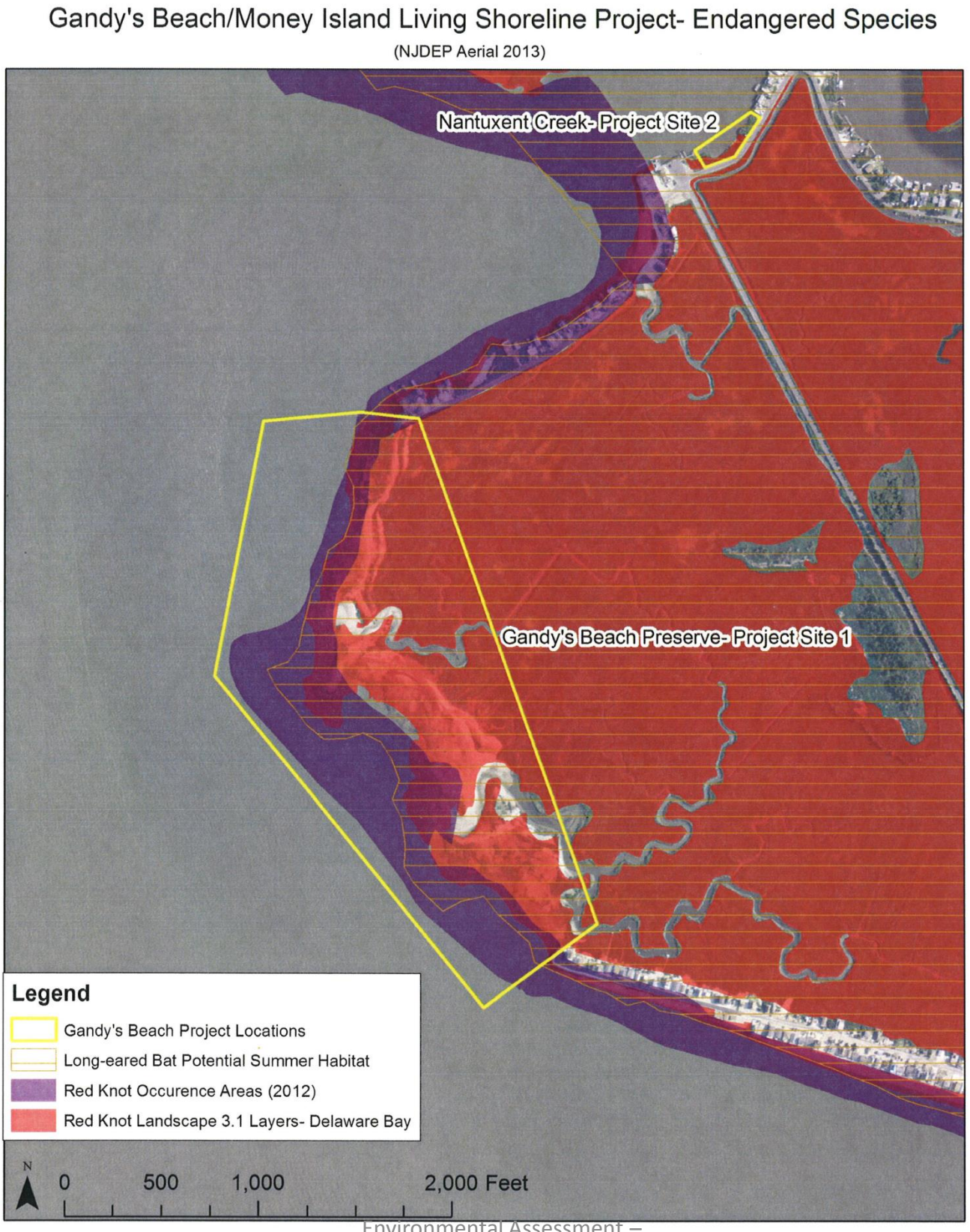

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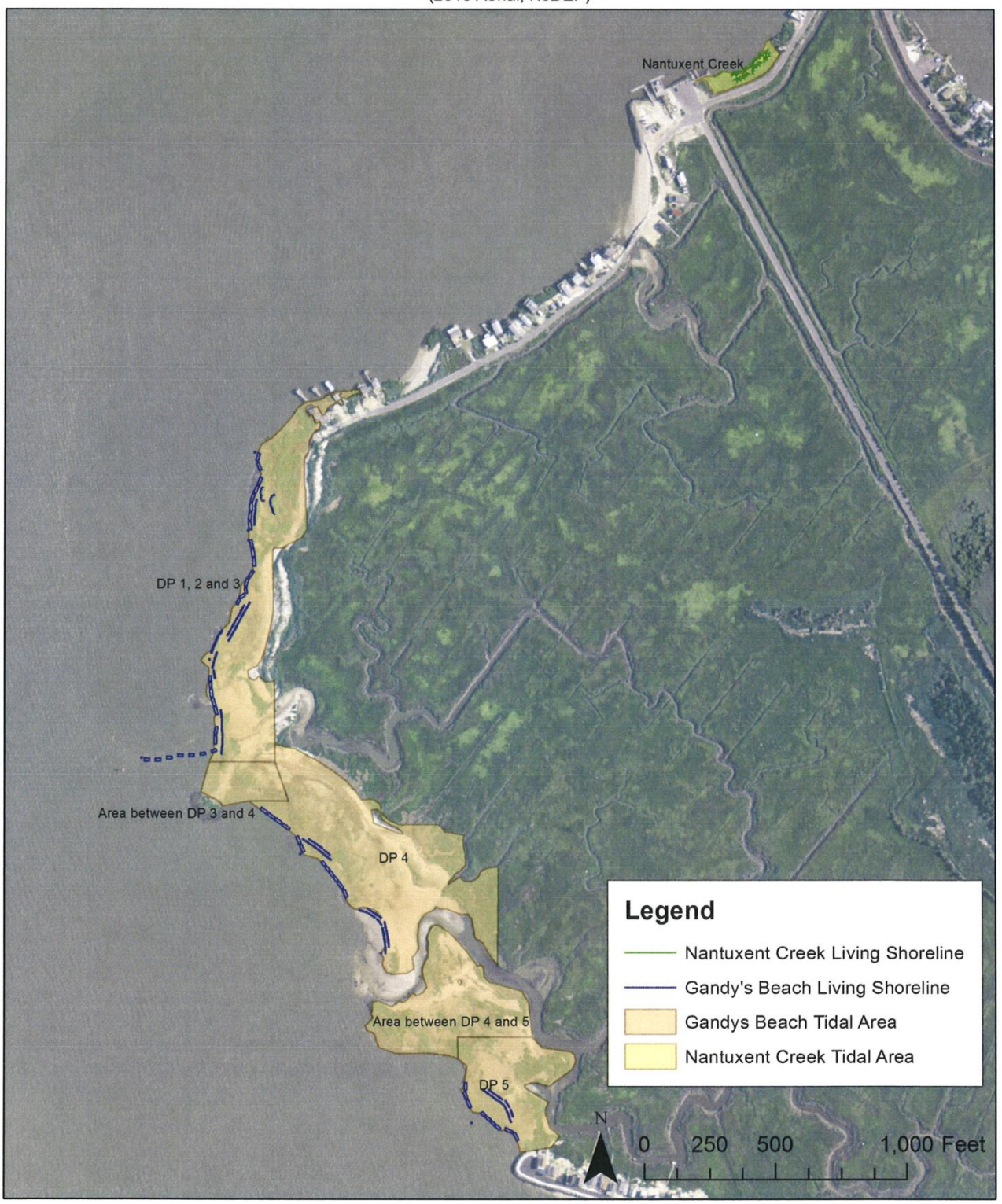
Gandy's Beach/Money Island Living Shoreline Project Intertidal Area

(2013 Aerial, NJDEP)



Appendix D-3 NMFS Section 7, Page 1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

JUL 17 2015

Eric Shrading
Field Supervisor
US Department of the Interior
Fish and Wildlife Service
New Jersey Field Office, Ecological Services
927 North Main Street, Building D
Pleasantville, NJ 08232

Re: Gandy's Beach Living Shoreline Project

Dear Mr. Shrading:

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to your letter dated December 31, 2014 and additional information received on January 14, 2015, and on June 10, 2015. We concur with your determination that the proposed project is not likely to adversely affect any species listed by us as threatened or endangered under the ESA of 1973, as amended. Our supporting analysis is provided below.

Proposed Project
The U.S. Fish and Wildlife Service (FWS) and its partners, including The Nature Conservancy, propose to construct approximately 2,000 feet of living shoreline adjacent to tidal marshes and beaches at The Nature Conservancy's Gandy's Beach Preserve and Nantuxent Creek, and on adjacent subtidal lands located in Downe Township, Cumberland County, New Jersey. Field observation and historical aerial images at the Preserve indicate that significant shoreline erosion has reduced the shoreline of beaches and tidal marshes by about 500 feet since 1930, which has reduced habitat for spawning horseshoe crabs and foraging rufa red knots and has increased flooding in surrounding communities.

To stabilize approximately 2,000 feet of shoreline, FWS, working with partners, proposes to create nearshore oyster reef breakwaters along high energy shorelines, place "coir biolog"[1] living shorelines on low energy sites, and use both techniques in hybrid locations.

The project is divided into 6 areas. The Nantuxent Creek site is one and the Gandy's Beach Preserve site is divided into 5 design plan areas, called "DP1" through "DP5." Maps showing the six sites are below.

[1] Coir biologs are logs constructed of coconut fibers wrapped in mesh netting. They are waterproof and resistant to damage by seawater, and help stabilize areas prone to erosion. Coir biologs will be placed on beaches only.

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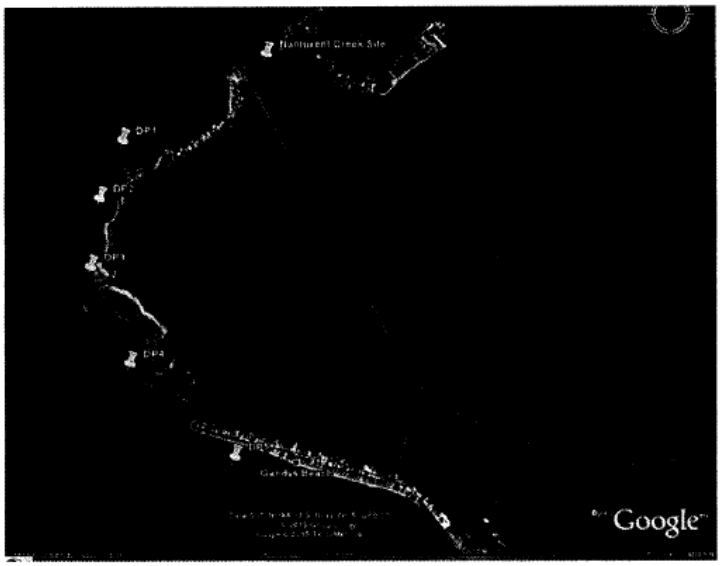

Figure 1: Project Sites

Figure 2: Nantuxent Site

2

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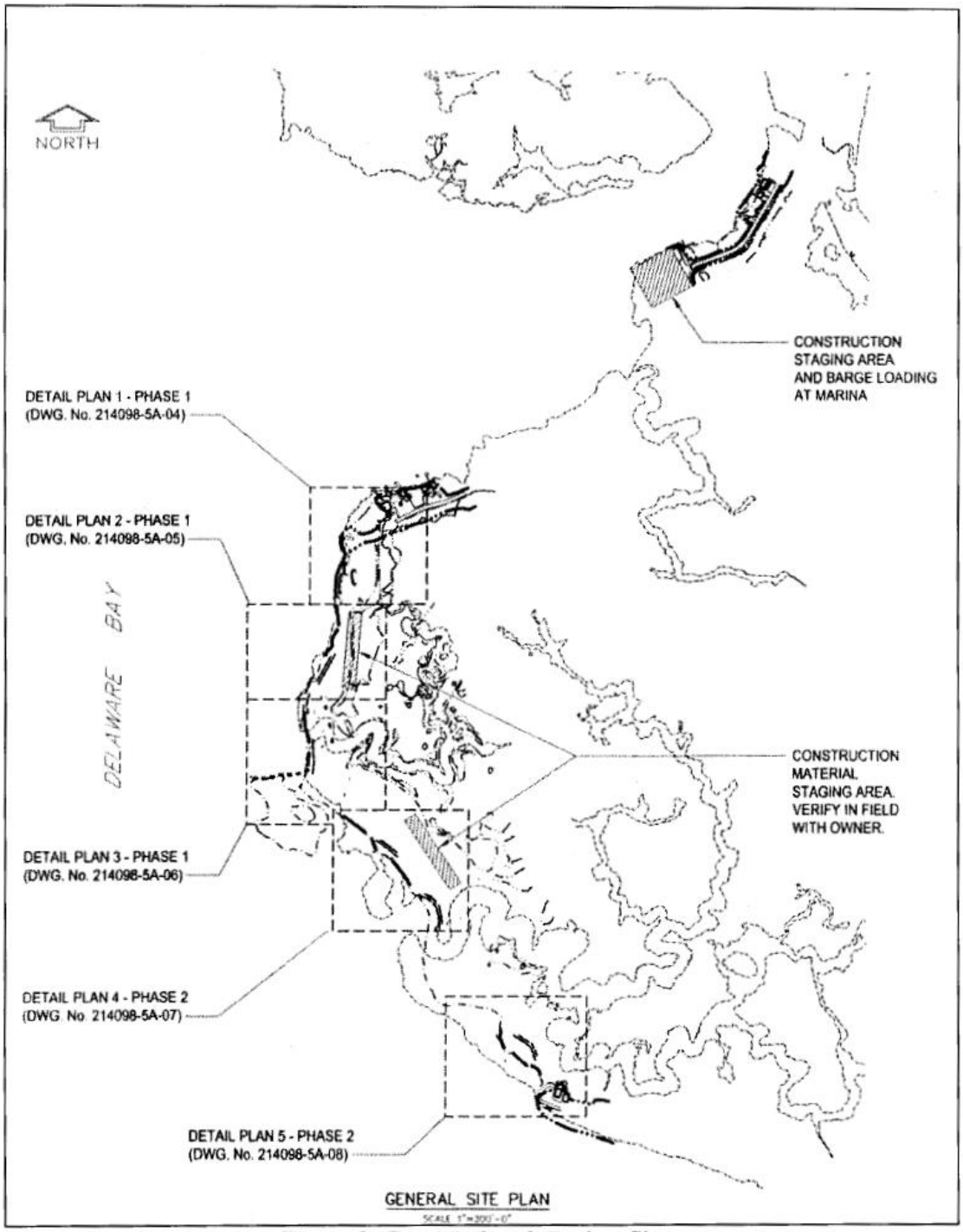

Figure 3: Gandy's Beach Project Sites

At each site, you propose to place a combination of rectangular shellbag breakwaters, t-shellbag breakwaters, v-shaped oyster castle breakwaters, square style oyster castle breakwaters, rectangular small, medium, and large oyster castle breakwaters, and coir biologs in shallow waters (up to 1 meter in depth at Mean High Water, and in the dry at Mean Low Water) within 150 feet of the shoreline (see attachments A and B for a breakdown of the types and amounts of materials placed at each site). You have calculated that a total of approximately 20,000 square feet of bottom (1,360 square feet for the Nantuxent Creek site and 18,589 square feet for the five Gandy's Beach sites) will be covered by oyster reef breakwaters. You plan to deliver all materials by a single barge, which will have adequate clearance so as not to touch the seafloor. All materials will be placed by hand on the seafloor from the barge.

You plan to construct the project in two phases:

- Phase 1: August to the end of October 2015.
- Phase 2: April 1-15, 2016 and June 15-November 8, 2016.

No construction will occur from April 15 to June 15 of any year.[2]

You estimate that each project area will require five to ten days of work onsite. Since you will only be able to work a few hours on either side of low tide, these five to ten days will span one to three weeks. Each of the two phases will require 20 to 30 days of work onsite.

Materials used at the Nantuxent Creek site will be delivered by truck and stored in the Money Island Marina's parking lot, which will be used as the staging area for this site. One to four deliveries by barge will be required for each of the other five sites along the Gandy's Beach Preserve. The materials will be dropped off into the intertidal zone as close to the placement location within each project area as possible. Barges will not touch the ocean floor and will not exceed a speed of 6 nautical miles per hour. Only one barge will be used. One to two deliveries will be made per day.

Description of the Action Area

The proposed action will occur in Delaware Bay, off Downe Township, Cumberland County, New Jersey, at approximately River Mile (RM) 32 The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For this project, the action area includes the project footprint as well as the underwater area where effects of habitat modification and vessel traffic will be experienced. The action area is that area within Delaware Bay located between 50 and 150 feet from the shoreline along 2,000 feet of shoreline at the six project locations shown in Figure 1. This area is expected to encompass all of the direct and indirect effects of the proposed project.

[2] The horseshoe crab restriction recommended by the NOAA Fisheries Habitat Conservation Division is April 15 to August 31. Since the applicants are not excavating and the work is in the intertidal zone, the Service has requested that NOAA reduce the timing restriction from April 15 to June 15. For the purposes of this analysis, so as to cover as broad a scope of activity as possible, we are assuming that project activity may take place between June 15 and August 31, as well.

The action area is shallow, less than two meters (6.6 feet) in depth at mean high water, and the bottom consists of mucky peat and sand. No seagrass or shellfish beds are in the action area. There are some tidal marsh grasses in the intertidal zone, which are exposed at low tide and up to 3 feet in depth at high tide. Because the action area is subject to frequent shoaling, high quality forage habitat for ESA-listed species is not likely to be abundant within its boundaries.

ESA-Listed Species in the Action Area

Sea Turtles

Four species of federally threatened or endangered sea turtles under our jurisdiction may be found seasonally in the coastal waters of New Jersey: the federally threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead (*Caretta caretta*), and the federally endangered Kemp's ridley (*Lepidochelys kempi*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles, although the latter species is found in deeper, more offshore waters and is unlikely to occur in the action area. Sea turtles are expected to be in these waters in warmer months, generally when water temperatures are greater than 15°C. This typically coincides with the months of May through mid-November, with the highest concentration of sea turtles present from June through October (Morreale 1999; Morreale 2003; Morreale and Standora 2005). This timing overlaps with the proposed project's timeline, with activities occurring between April and November of 2015 and 2016.

Studies have indicated that sea turtles mainly occur in areas where the water depth is between 16 and 49 feet and the waters are slow-moving or still (*i.e.*, less than 2 knots) (Ruben and Morreale 1999). The habitat characteristics of the project area (*i.e.*, depths of around 3-6 feet) where the proposed project activities will occur (e.g., placement of materials) are inconsistent with the preferred habitats of sea turtles in New Jersey waters, though they may still be present. Sea turtles are not expected to forage in the nearshore, extremely shallow areas (depths of 3 feet or less) containing tidal marsh grasses. The barge carrying the materials may also traverse areas where sea turtles occur.

Atlantic Sturgeon

There are five DPSs of Atlantic sturgeon listed as threatened or endangered. Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic, and Carolina DPSs are listed as endangered, while the Gulf of Maine DPS is listed as threatened. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida.

Atlantic sturgeon spawn in their natal river, with spawning migrations generally occurring during February-March in southern systems, April-May in Mid-Atlantic systems, and May-July in Canadian systems (Murawski and Pacheco 1977; Smith 1985; Bain 1997; Smith and Clugston 1997; Caron *et al.* 2002). Young remain in the river/estuary until approximately age 2 and at lengths of 30-36 inches before emigrating to the open ocean as subadults (Holland and Yelverton 1973; Dovel and Berggren 1983; Dadswell 2006; ASSRT 2007). At around three years of age, subadults exceeding 70 centimeters in total length begin to migrate to marine waters (Bain *et al.* 2000). After emigration from the natal river/estuary, subadults and adult Atlantic sturgeon travel within the marine environment, typically in waters less than 50 m in depth, using coastal bays, sounds, and ocean waters (ASSRT 2007). In rivers and estuaries, Atlantic sturgeon typically use

the deepest waters available; however, Atlantic sturgeon also occur over shallow (2.5 m), tidally influenced flats and mud, sand, and mixed cobble substrates (Savoy and Pacileo 2003). Atlantic sturgeon are not known to occur in intertidal marsh grass habitats. Occurrence in shallow waters is thought to be tied to the presence of benthic resources for foraging. Although the action area does not have high quality forage for Atlantic sturgeon, benthic prey resources may be present. Based on the above information, adult and subadult Atlantic sturgeon from any of the five DPSs may occur in the action area.

Shortnose Sturgeon

Shortnose sturgeon occur in the Delaware River from the lower bay upstream to at least Lambertville, New Jersey (RM 148). Tagging studies by O'Herron et al. (1993) found that the most heavily used portion of the river appears to be between RM 118 below Burlington Island and RM 137 at the Trenton Rapids. Shortnose sturgeon spawn in upper freshwater areas (RM 130-145, O'Herron *et al.* 1993, ERC 2009), and feed and overwinter in both fresh and saline habitats. Based on the best available information, eggs and larvae will not occur in the action area. Due to the benthic, adhesive nature of the eggs, they only occur in the immediate vicinity of the spawning area, located approximately 100 miles upstream of the action area. Larvae are also limited to an area close to the spawning grounds, and therefore, not likely to occur in the action area. Little is known about young of the year behavior and habitat use, though they are typically found in channel areas within freshwater habitats upstream of the salt wedge for about one year (Dadswell *et al.* 1984, Kynard 1997). Distribution of adult and juvenile shortnose sturgeon in Delaware River is influenced by seasonal water temperature, the distribution of forage items, and salinity.

While shortnose sturgeon do not undertake the significant marine migrations seen in Atlantic sturgeon, telemetry data indicates that shortnose sturgeon do make localized coastal migrations. Interbasin movements have been documented among rivers within the GOM and between the GOM and the Merrimack, between the Connecticut and Hudson rivers, the Delaware River and Chesapeake Bay, and among the rivers in the Southeast. The interbasin movements between Delaware River and Chesapeake Bay, however, are known to occur via the C-D Canal (RM 58).

Although they have been documented in waters with salinities as high as 31 parts per thousand (ppt), shortnose sturgeon are typically concentrated in areas with salinity levels of less than 3 ppt (Dadswell *et al.* 1984). The distribution of salinity in the Delaware estuary exhibits significant variability on both spatial and temporal scales, and at any given time reflects the opposing influences of freshwater inflow from tributaries versus saltwater inflow from the Atlantic Ocean. The salinity in the action area is polyhaline (18-30 ppt). Based on this information and the known tolerances and preferences of shortnose sturgeon to salinity, shortnose sturgeon are most likely to occur upstream of RM 44 where salinity is typically less than 5 ppt. As tolerance to salinity increases with age and size, large juveniles and adults are likely to be present through the mesohaline area extending to RM 34. Due to the typical high salinities experienced in the polyhaline zone (below RM 34), shortnose sturgeon are expected to be rare in the action area (RM 32); however, occasional shortnose sturgeon may occur in the action area.

Effects of the Action

Turbidity

The placement of oyster breakwaters and shellbags may disturb bottom sediments and cause a temporary minor increase in suspended sediment in the nearshore area. This suspended sediment may not be detectable above background levels, and is expected to settle out of the water column within a few hours. Reported levels of ambient turbidity in a similar environment ranged between 18.5 and 70.5 mg/L (ACOE 2012). The additional TSS caused by the material placement may not be detectable above background levels, and would be extremely unlikely to cause any changes in movement or behavior. If sea turtles or sturgeon do alter their normal movements to avoid the plume, movements could amount to several feet to exit the area of slightly increased TSS levels. Any such movements would be so minor that they would not be detectable, and would not affect migration or foraging ability of sea turtles or sturgeon. Based on this information, the effect of suspended sediment resulting from breakwater and shellbag placement activities on sea turtles and sturgeon will be insignificant.

Habitat Modification

Sturgeon and sea turtles are highly mobile, and are able to temporarily avoid the area while oyster breakwaters and shellbags are being placed. Any species in the area will be able to continue normal behaviors in nearby waters. Additionally, the proposed activity will not alter the habitat in any way that prevents sturgeon or sea turtles from moving through the action to other waters of the Delaware Bay that may be more suitable for foraging. Therefore, any changes to essential behaviors such as migrating or foraging for either species would not be measurable or detectable. Any effects of the placement of oyster breakwaters and shellbags are therefore insignificant.

The proposed placement of approximately 20,000 square feet of bottom-covering oyster breakwaters and shellbags will result in a change to the peat and sand bottom substrate in the action area. The project area currently does not contain high quality habitat for foraging (areas with seagrass or shellfish beds), and is characterized as a predominantly sand and peat environment subject to shoaling, which would suggest that most benthic organisms are small and adapted to a high energy environment (*i.e.*, small worms, mollusks, amphipods, etc.). Due to the lack of high quality forage and the shallow area, sea turtles and sturgeon are extremely unlikely to use the area as a foraging ground, and it is therefore extremely unlikely that any impacts to foraging sea turtles or sturgeon will occur. Thus, effects to foraging sea turtles and sturgeon are discountable.

You have reported that implementation of other oyster reef breakwater living shorelines projects around the country has resulted in positive outcomes, including increases in fish habitat, abatement of pollutants, and reductions in erosion.

Vessel Traffic

The proposed project will use a barge to place the breakwater materials in the shallow, nearshore areas. Because the exact routes of the barge are unknown at this time, we assume they will remain in the Delaware Bay. Since sturgeon and sea turtles may occur in the action area,

including along the routes the barges will use to travel from land to the work area, we have considered whether this project raises the risk of a vessel strike to sturgeon or sea turtles.

Sea turtles and sturgeon can be killed as a result of being struck by boat hulls or propellers. The factors relevant to determining the risk to these species from vessel strikes vary, but may be related to the size and speed of the vessels, navigational clearance (*i.e.,* depth of water and draft of vessel) in the area where the vessel is operating, and the behavior of individuals in the area (*e.g.,* foraging, migrating, etc.).

While sea turtles occur at the water's surface and are therefore susceptible to interactions with vessels, we expect sea turtles to appear in the action area only occasionally, and therefore, interactions between sea turtles and the single barge associated with this project are extremely unlikely. Furthermore, the localized increase in vessel traffic (one barge) associated with the proposed project will be very small in comparison to the amount of vessel traffic in Delaware Bay. Thus, impacts from vessels associated with the project are discountable.

As noted in the 2007 Status Review and the final listing rules for Atlantic sturgeon (77 FR 5914, 77 FR 5880, Feb. 6, 2012) in certain geographic areas vessel strikes have been identified as a threat to Atlantic sturgeon. While the exact number of Atlantic sturgeon killed as a result of being struck by boat hulls or propellers is unknown, it is an area of concern in the Delaware and James rivers. Brown and Murphy (2010) examined 28 dead Atlantic sturgeon observed in the Delaware River from 2005 to 2008, and found that 14 (50%) of the mortalities resulted from apparent vessel strikes and 10 of the 14 (71%) had injuries consistent with being struck by a large vessel (Brown and Murphy 2010).

The factors relevant to determining the risk to Atlantic sturgeon from vessel strikes are currently unknown, but they may be related to size and speed of the vessels, navigational clearance (*i.e.*, depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of Atlantic sturgeon in the area (e.g., foraging, migrating, etc.). Large vessels have been implicated because of their deep drafts (up to 40-45 feet) compared to smaller vessels (15 feet), which increases the probability of vessel collision with demersal fishes like sturgeon, even in deep water (Brown and Murphy 2010). Smaller vessels and those with relatively shallow drafts provide more clearance with the river bottom and reduce the probability of vessel strikes. Because the barge has a relatively shallow draft and will be going very slowly (up to 6 nm per hour), the chances of barge-related mortalities are expected to be low.

Given the small increase in vessel traffic (one barge) and the slow speed (6 nm per hour) of the barge, and that the project area is not a known overwintering, foraging, or spawning area, it is extremely unlikely that there would be any detectable increase in the risk of vessel strike. Thus, effects to Atlantic sturgeon from the increase in vessel traffic are discountable.

There is limited information on the effects of vessel operations on shortnose sturgeon. It is generally assumed that, as shortnose sturgeon are benthic species, their movements are limited to the bottom of the water column and that vessels operating with sufficient navigational clearance would not pose a risk of vessel strike. Shortnose sturgeon may not be as susceptible due to their

smaller size in comparison to Atlantic sturgeon that are larger and for which vessel strikes have been documented more frequently. However, anecdotal evidence suggests that shortnose sturgeon at least occasionally interact with vessels, as evidenced by wounds that appear to be caused by propellers. There has been only one confirmed incidence of a vessel strike on a shortnose sturgeon (Kennebec River, Maine, <20 foot boat) and two suspected vessel strike mortalities (Delaware River).

Aside from these incidents, no information on the characteristics of vessels that are most likely to interact with shortnose sturgeon is available, and there is no information on the rate of interactions. However, assuming that the likelihood of interactions increases with the number of vessels present in an area, below, we consider the likelihood that an increase in the number of vessels operating in the action area, compared to baseline conditions, would increase the risk of interactions between shortnose sturgeon and vessels in the action area generally.

Given the small increase in vessel traffic (one barge) and the slow speed (6 nm per hour) of the barge, and that shortnose sturgeon are rare in the area, it is extremely unlikely that there would be any detectable increase in the risk of vessel strike. Thus, effects to shortnose sturgeon from the increase in vessel traffic are discountable.

Conclusions

Based on the analysis that all effects of the proposed project will be insignificant or discountable, we concur with your determination that the Gandy's Beach Living Shoreline project, as described above, is not likely to adversely affect any listed species under our jurisdiction. Therefore, no further consultation pursuant to Section 7 of the ESA is required.

Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required. Should you have any questions about this correspondence please contact Jennifer Goebel at 978-281-9373 or by email (Jennifer.Goebel@noaa.gov).

Essential Fish Habitat Comments

NMFS Habitat Conservation Division (HCD) is responsible for overseeing programs related to Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act and other NOAA trust resources under the Fish and Wildlife Coordination Act. The Delaware Estuary provides habitat for a wide variety of NOAA trust resources including striped bass, alewife, blueback herring, American shad, horseshoe crabs, American oyster, winter flounder, summer flounder, bluefish and many others. Depending upon the nature and extent of the work proposed, seasonal work windows may be required to minimize impacts to these resources. Additional coordination with the Habitat Conservation Division by FWS is ongoing to determine if seasonal work window or other best management practices are needed. In

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addition, Essential Fish Habitat (EFH) has been designated within the project area. Further EFH consultation by FWS may be required. For a listing of EFH and further information, please go to our website www.greateratlantic.fisheries.noaa.gov/habitat. If you wish to discuss this further, please call 732-872-3023 or email karen.greene@noaa.gov.

Sincerely,

Kimberly B. Damon-Randall
Assistant Regional Administrator
for Protected Resources

Enclosures: Attachments A and B

EC: Greene NMFS/NER/HCD, Goebel NMFS/NER, Katie Conrad USFWS

FileCode Section 7\Non-Fisheries\FWS\Informal\2015\USFWS GandysBeachMoneyIsland LOC
PCTS: NER-2015-12359

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References

USACE (U.S. Army Corps of Engineers). 2012. Sturgeon Take Records from Dredging Operations 1990-2010. Unpublished Report submitted to NMFS Northeast Regional Office. 5 pp.

Atlantic Sturgeon Status Review (ASSRT). 2007. http://www.nero.noaa.gov/prot_res/CandidateSpeciesProgram/AtlSturgeonStatusReviewReport.pdf

Bain, M. B. 1997. Atlantic and shortnose sturgeons of the Hudson River: Common and Divergent Life History Attributes. Environmental Biology of Fishes 48: 347-358.

Brown, J.J. and G.W. Murphy. 2010. Atlantic sturgeon vessel strike mortalities in the Delaware River. Fisheries 35(2):72-83.

Caron, F., D. Hatin, and R. Fortin. 2002. Biological characteristics of adult Atlantic sturgeon (*Acipenser oxyrinchus*) in the Saint Lawrence River estuary and the effectiveness of management rules. Journal of Applied Ichthyology 18: 580-585.

Dadswell, M.J. 1979. Biology and population characteristics of the shortnose sturgeon, *Acipenser brevirostrum* LeSueur 1818 (*Osteichthyes: Acipenseridae*), in the Saint John River estuary, New Brunswick, Canada. Canadian Journal of Zoology 57:2186-2210.

Dadswell, M.J., B.D. Taubert, T.S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum* Lesueur 1818. NOAA Technical Report, NMFS 14, National Marine Fisheries Service. October 1984. 45 pp.

Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. Fisheries 31: 218-229.

Dovel, W. L. and T. J. Berggren. 1983. Atlantic sturgeon of the Hudson River estuary, New York. New York Fish and Game Journal 30: 140-172.

ERC (Environmental Research and Consulting, Inc.). 2006. Acoustic Telemetry Study of the Movements of Shortnose Sturgeon in the Delaware River and Bay. Progress Report for 2003-2004. Prepared for NOAA Fisheries. Environmental Research and Consulting, Inc., Kennett Square, PA. March 20, 2006.

Holland, B.F., Jr. and G.F. Yelverton. 1973. Distribution and biological studies of anadromous fishes offshore North Carolina. North Carolina Department of Natural and Economic Resources, Division of Commercial and Sports Fisheries, Morehead City. Special Scientific Report 24:1-132.

Kynard, B. 1997. Life history, latitudinal patterns, and status of the shortnose sturgeon, Acipenser brevirostrum. Environmental Biology of Fishes 48:319–334.

Morreale, S.J. 1999. Oceanic migrations of sea turtles. PhD Thesis. Cornell University.

Morreale, S.J. 2003. Assessing health, status, and trends in Northeasten sea turtle populations. Interim report: Sept. 2002-Nov. 2003.

Morreale, SJ. and E.A Standora. 2005. Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. Chel. Conserv. Biol. 4(4):872-882.

Murawski, S.A. and A.L. Pacheco. 1977. Biological and fisheries data on Atlantic Sturgeon, *Acipenser oxyrinchus* (Mitchill). National Marine Fisheries Service Technical Series Report 10: 1-69.

O'Herron, J.C., K.W. Able, and R.W. Hastings.1993. Movements of shortnose sturgeon (Acipenser brevirostrum) in the Delaware River. Estuaries 16:235-240.

Appendix D-3 NMFS Section 7, Page 12

Ruben, H. J., and Morreale, S. J. 1999. Draft Biological Assessment for Sea Turtles: New York and New Jersey Harbor Complex. Unpublished Biological Assessment submitted to the National Marine Fisheries Service.

Savoy, T. and D. Pacileo. 2003. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society 132: 1-8.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs 6: 43-67.

Smith, T. I. J. 1985. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 14(1): 61-72.

Smith, T. I. J. and J. P. Clugston. 1997. Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 48: 335-346.

Appendix D-4 SHPO Concurrence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice/

RECEIVED
MAY 22 2015
HISTORIC PRESERVATION OFFICE
MAY 18 2015

15-0512-2 JWR
HPO-F2015-238

Daniel Saunders
State Historic Preservation Officer
New Jersey Department of Environmental Protection
Historic Preservation Office
P.O. Box 420
501 East State Street
Trenton, New Jersey 08625

Re: Section 106 Review for Gandy's Beach/Money Island Shoreline Protection Project, Downe Township, Cumberland County, New Jersey

Dear Mr. Saunders:

In October 2014, the U.S. Fish and Wildlife Service (Service) initiated consultation for our Gandy's Beach/Money Island Shoreline Protection Project with the State Historic Preservation Office (SHPO) under Section 106 of the National Historic Preservation Act of 1966 (NHPA; Public Law 89-665; 16 U.S.C. 470 et seq.). We propose to construct approximately 3,000 feet of living shoreline on intertidal and subtidal lands adjacent to The Nature Conservancy's Gandy's Beach Preserve (Preserve) located in Downe Township, Cumberland County, New Jersey. Partners include The Nature Conservancy, Partnership for the Delaware Estuary, and Rutgers University.

We have continued discussions with the SHPO and have agreed that an archaeological survey will not be necessary for this project since it will not include excavation or the use of heavy equipment onsite. Therefore, the subject project will have no effect on historic or archaeological resources. The Service is requesting your concurrence under Section 106 to complete the consultation process. If you have any further questions or need additional information regarding this determination, please contact Katie Conrad at (609) 383-3938 x 39.

CONCUR

DS /Km

6/19/2015

Daniel D. Saunders
DEPUTY STATE HISTORIC PRESERVATION OFFICER

DATE

Sincerely,

Eric Schrading
Field Supervisor

Appendix D-5 Tribal Correspondence, Delaware Nation

The Delaware Nation
Cultural Preservation Office
P.O. Box 825 - 31064 State Highway 281- Anadarko, OK 73005
Phone: 405/247-2448 – Fax: 405/247-8905

NAGPRA ext. 1403
Section 106 ext. 1181
Museum ext. 1181
Library ext. 1196
Clerk ext. 1182

December 1, 2014

RE: Proposal to construct approximately 3,000 feet of living shoreline adjacent to tidal marshes and beaches within the Nature Conservancy's Gandy's Beach Preserve

Ms. Conrad,

The Delaware Nation Cultural Preservation Department received correspondence regarding the above referenced project. Our office is committed to protecting sites important to tribal heritage, culture and religion. Furthermore, the tribe is particularly concerned with archaeological sites that may contain human burials or remains, and associated funerary objects.

As described in your correspondence and upon research of our database(s) and files, we find that the Lenape people occupied this area either prehistorically or historically. However, the location of the project does not endanger cultural or religious sites of interest to the Delaware Nation. Please continue with the project as planned. However, should this project inadvertently uncover an archaeological site or object(s), we request that you halt all construction and ground disturbance activities and immediately contact the appropriate state agencies, as well as our office (within 24 hours).

Please Note the Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians are the only Federally Recognized Delaware/Lenape entities in the United States and consultation must be made only with designated staff of these three tribes. We appreciate your cooperation in contacting the Delaware Nation Cultural Preservation Office to conduct proper Section 106 consultation. Should you have any questions regarding this email or future consultation feel free to contact our offices at 405-247-2448 or by email nalligood@delawarenation.com.

Sincerely,

Nekole Alligood
Director

Appendix D-5 Tribal Correspondence, Stockbridge-Munsee, Page 1

RECEIVED
10-23-14

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice/

0-0-a

OCT 20 2014

Ms. Kimberley Vele, President
Stockbridge-Munsee Band of the Mohican Nation
N. 8476 Moh Ne Con Nick Road
P. O. Box 70
Bowler, Wisconsin 54416

Dear President Vele:

The U.S. Fish and Wildlife Service (Service) and its partners propose to construct approximately 3,000 feet of living shoreline adjacent to tidal marshes and beaches within The Nature Conservancy's Gandy's Beach Preserve (Preserve) and on adjacent subtidal lands located in Downe Township, Cumberland County, New Jersey. Partners include The Nature Conservancy, the Partnership for Delaware Estuary, and Rutgers University. The Service has searched the New Jersey and National Registers of Historic Places and has determined that no historic properties are located in or adjacent to the project area. The Service is requesting consultation with the New Jersey State Historic Preservation Office (SHPO) pursuant to requirements under Section 106 of the National Historic Preservation Act of 1966 (NHPA; Public Law 89-665; 16 U.S.C. 470 et seq.).

Field observations and historic aerial images at the Preserve indicate that significant shoreline erosion has reduced the acreage of beaches and tidal marshes and degraded the habitats that still remain. The Nature Conservancy estimates shoreline retreat to be about 500 feet between 1930 and 2007. Shoreline retreat negatively impacts local communities and habitats. The communities of Money Island and Gandy's Beach have experienced increased flooding during high tide events and major storms due to the reduction of surrounding salt marsh and beach buffers. The Preserve's beach is gradually disappearing, reducing habitat for spawning horseshoe crabs (*Limulus polyphemus*) and foraging habitat for migratory shorebirds such as the rufa red knot (*Calidris canutus rufa)*, which is proposed for listing as threatened under the Endangered Species Act (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq.).

Project partners propose to create nearshore oyster reef breakwaters along high energy shoreline, coir biolog living shoreline on low energy sites, and hybrid living shoreline that uses both techniques in one location. The living shoreline will help stabilize approximately 3,000 feet of

beach and tidal marsh shoreline. Multiple structures will act as the foundation for the breakwaters to test the wave attenuation and oyster recruitment capacity of each structure. The Service's determination, based on the proposed activities, is that the subject project will not adversely affect properties eligible for the National Register or other historic or archaeological areas.

Enclosed please find a map of the project area. The Service respectfully requests your comment on this finding within 30 days of your receipt of this letter.

If you have any further questions or need additional information regarding our request, please contact the Fish and Wildlife Biologist coordinating this work, Katie Conrad, at (609) 383-3938 x 39.

Sincerely,

Eric Schrading
Field Supervisor

Enclosure: USGS quadrangle showing the location of the proposed Gandy's Beach/Money Island Shoreline Protection Project.

Enclosure 2: Aerial photograph map showing the location of the proposed Gandy's Beach/Money Island Project.

cc: Sherry White, THPO
W13447 Camp 14 Road
PO Box 70
Bowler, Wisconsin 54416

The Stockbridge-Munsee Band of the Mohican Nation concurs with the U.S. Fish and Wildlife Service that the undertaking described above will have no adverse effect on National Register-eligible historic resources in the project area.

Sherry L White /gj — Signature

10-23-14 — Date

2

Appendix D-5 Tribal Correspondence, Delaware Tribe

Delaware Tribe Historic Preservation Representatives
Department of Anthropology
Gladfelter Hall
Temple University
1115 W. Polett Walk
Philadelphia, PA 19122
temple@delawaretribe.org

July 15, 2015

United States Department of the Interior
Fish and Wildlife Service
Attn: Katie Conrad
New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232

Re: Gandy's Beach Preserve, Downe Township, Cumberland County, NJ

Dear Katie Conrad,

Thank you for providing the updated project details for the above referenced project. The Delaware Tribe is committed to protecting sites important to our tribal heritage, culture and religion. Our review indicates that there are no religious or culturally significant sites within the selected project area and we have no objection to the proposed project. We defer further comment to your office.

We ask that if any archaeological remains (artifacts, subsurface features, etc.) are discovered during the construction process that construction be halted until an archaeologist can view and assess the finds. Furthermore, we ask that if any human remains are accidentally unearthed during the course of the project that you cease development immediately and inform the Delaware Tribe of Indians of the inadvertent discovery. If you have any questions, feel free to contact this office by phone at (609) 220-1047 or by e-mail at temple@delawaretribe.org.

Sincerely,

Blair Fink

Blair Fink
Delaware Tribe Historic Preservation Representatives
Department of Anthropology
Gladfelter Hall
Temple University
1115 W. Polett Walk
Philadelphia, PA 19122

Appendix D-6 USACE Cooperating Agency Letter, Page 1

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT CORPS OF ENGINEERS
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA. PENNSYLVANIA 19107-3390

REPLY TO
ATTENTION OF

JUN 24 2015

Regulatory Branch
Application Section II

SUBJECT: CENAP-OP-R-2013-1123-24
The Nature Conservancy Gandy's Beach Living Shoreline Project CU

Mr. Eric P. Schrading
Field Supervisor
New Jersey Field Office
U.S. Fish and Wildlife Service
927 North Main Street, Building D
Pleasantville, New Jersey 08232

Dear Mr. Schrading:

This is in response to your letter dated April 20, 2015, regarding the subject proposal by The Nature Conservancy (TNC) to construct approximately 3,000 linear feet of living shoreline within TNC's Gandy's Beach Preserve and on adjacent sub-tidal areas located in Downe Township, Cumberland County, New Jersey. As you noted, your agency is providing federal funding for the project, which requires a Department of the Army permit. Your letter invited the United States Army Corps of Engineers (Corps), Philadelphia District, to participate as a cooperating agency for establishing environmental compliance for this project. This environmental compliance would include the preparation of an Environmental Assessment (EA), as well as other federal compliance items.

The Philadelphia District accepts your invitation to serve as a cooperating agency in the development of the EA. By participating as a cooperating agency, the Corps can work with the your office and the applicant to ensure that sufficient information is included in the EA for the Corps to adopt the environmental document, conduct a timely review of the permit application, and make a final decision with respect to our authority under Section 10 of the Rivers and Harbor Act of 1899 and Section 404 of the Clean Water Act. In addition, as you have noted, the Corps will prepare the Essential Fish Habitat Assessment for this action, which we will provide to you for review and comment prior to our consultation with the National Marine Fisheries Service (NMFS).

We note that the Service will be the lead federal agency for compliance with Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act. It is our understanding that your Section 7 consultation will include species under the jurisdiction of NMFS. Furthermore, for Section 106, please coordinate directly with Ms. Nicole Minnichbach of our office. She is the District Cultural Resources Specialist and Tribal Liaison. She can be reached at (215) 656-6556, or by electronic mail at Nicole.C.Minnichbach@usace.army.mil.

We are looking forward to working with you as a cooperating agency. If you have any questions regarding this matter, please contact Dr. James Boyer of my office by calling (215) 656-5826, by electronic mail to James.N.Boyer@usace.army.mil, or by writing to the above address.

Sincerely,

for Frank J. Cianfrani
Chief, Regulatory Branch