A. INTRODUCTION

This section of Chapter 3 examines the potential impacts from the proposed Rockaway Boardwalk reconstruction project on natural resources[1] and floodplains within the project site. The project site comprises the existing boardwalk footprint and access points from Beach 20th to Beach 126th Streets, locations of access points to the beach over the United States Army Corps of Engineers (USACE) restored dunes between Beach 126th and Beach 149th Streets, and the section of beach between Beach 9th and Beach 20th Streets where the project would maintain five existing at-grade crossings through existing dunes.

In accordance with the 2012 *City Environmental Quality Review (CEQR) Technical Manual* and the National Environmental Policy Act (NEPA), this chapter describes:

- The regulatory programs that protect groundwater, floodplains and the New York State Department of Environmental Conservation (NYSDEC) Coastal Erosion Hazard Areas (CEHA), wetlands, wildlife, threatened or endangered species, or other natural resources within the project site;
- The current condition of the groundwater, floodplains and CEHA, wetlands, and natural resources within the project site and study area, including terrestrial biota and threatened or endangered species and species of special concern;
- The groundwater, floodplains and CEHA, and natural resources conditions in the future without the proposed project (the No-Action condition); and
- The potential impacts of the proposed project on the groundwater, floodplains CEHA, wetlands, and natural resources (the With-Action condition).

As described below, the analysis concludes that the proposed project would not result in significant adverse impacts to natural resources.

B. REGULATORY CONTEXT

FEDERAL

- **Section 1424(e) of the Safe Drinking Water Act.** Section 1424(e) of the Safe Drinking Water Act of 1974 [P.L. 93-523] authorizes the Administrator of the US Environmental Protection Agency (USEPA) to designate an aquifer for special protection if it is the sole or principal drinking water resource for an area (i.e., it supplies 50 percent or more of the

[1] The 2012 *CEQR Technical Manual* defines natural resources as "(1) the City's biodiversity (plants, wildlife and other organisms); (2) any aquatic or terrestrial areas capable of providing suitable habitat to sustain the life processes of plants, wildlife, and other organisms; and (3) any areas capable of functioning in support of the ecological systems that maintain the City's environmental stability."

drinking water in a particular area), and if its contamination would create a significant hazard to public health. No commitment for federal financial assistance may be entered into for any project that the Administrator determines may contaminate such a designated aquifer so as to create a significant hazard to public health. The project site is within the Brooklyn-Queens Aquifer System, a sole source aquifer system identified by the USEPA under the Act.

- **National Flood Insurance Act of 1968 (44 CFR § 59) and Floodplain Management Executive Order 11988 (42 FR 26951).** Development in floodplains defined by Federal Emergency Management Agency (FEMA) mapping is regulated at the federal level by the Floodplain Management Executive Order 11988 and National Flood Insurance Act of 1968 (44 CFR § 59). Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
- **Executive Order 11990, "Protection of Wetlands."** In accordance with Executive Order 11990, "Protection of Wetlands," federal agencies must avoid undertaking or providing assistance for new construction in wetlands unless there is no practical alternative to such construction and the proposed action includes all practicable measures to minimize harm to the wetland.
- **Endangered Species Act of 1973 (16 USC §§ 1531 to 1544).** The Endangered Species Act of 1973 recognizes that endangered species of wildlife and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. The Act provides for the protection of critical habitats on which endangered or threatened species depend for survival. The Act also prohibits the importation, exportation, taking, possession, and other activities involving illegally taken species covered under the Act, and interstate or foreign commercial activities.
- **Migratory Bird Treaty Act [50 CFR 10, 20, 21, Executive Order 13186].** The Migratory Bird Treaty Act (MBTA) of 1918 was implemented following the 1916 convention between the U.S. and Great Britain (on behalf of Canada) for the protection of birds migrating between the U.S. and Canada. Subsequent amendments implemented treaties between the U.S. and Mexico, Japan, and the former Soviet Union. The MBTA makes it unlawful to pursue, hunt, take, capture, kill or sell birds listed therein. Over 800 species are currently protected under the Act. The statute applies equally to both live and dead birds, and grants full protection to any bird parts, including feathers, eggs, and nests.

STATE

- **Tidal Wetlands Act, Article 25, Environmental Conservation Law (ECL), Implementing Regulations 6 NYCRR Part 661.** Tidal wetlands regulations apply anywhere tidal inundation occurs on a daily, monthly, or intermittent basis. In New York, tidal wetlands occur along the tidal waters of the Hudson River up to the salt line and along the saltwater shore, bays, inlets, canals, and estuaries of Long Island, New York City, and Westchester County. NYSDEC administers the tidal wetlands regulatory program and the mapping of the state's tidal wetlands. A permit is required for almost any activity that would alter wetlands or the adjacent areas (up to 300 feet inland from wetland boundary or up to 150 feet inland within New York City). NYSDEC-regulated wetlands exist along the shoreline within the project site.
- **Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern (ECL, Sections 11-0535[1]-[2], 11-0536[2], [4], Implementing Regulations 6 NYCRR Part**

182). The Endangered and Threatened Species of Fish and Wildlife, Species of Special Concern Regulations prohibit the taking, import, transport, possession, or selling of any endangered or threatened species of fish or wildlife, or any hide, or other part of these species as listed in 6 NYCRR §182.6. Under these regulations, adverse modification of occupied habitat of endangered or threatened species is prohibited without authorization from NYSDEC.

- Removal of Trees and Protected Plants (ECL, Section 9-1503). Section 9-1503 of the ECL states that: "[n]o person shall, in any area designated by such list or lists, knowingly pick, pluck, sever, remove, damage by the application of herbicides or defoliants, or carry away without the consent of the owner thereof, any protected plant."
- **Coastal Erosion Hazard Areas Law, Article 34, ECL, Implementing Regulations 6 NYCRR Part 505.** The Coastal Erosion Hazard Areas Law authorizes NYSDEC to identify and map coastal erosion hazard areas and to regulate certain activities and development within those areas under 6 NYCRR Part 505. A coastal erosion management permit is required for construction or placement of a structure, or any action or use of land which materially alters the condition of land, including grading, excavating, dumping, mining, dredging, filling or any disturbance of soil.

C. METHODOLOGY

STUDY AREA

The project site represents the study area for the floodplains and natural resources assessment with the exception of threatened or endangered species, which were considered for a distance of a ½ mile from the project site.

EXISTING CONDITIONS

Existing conditions for floodplains and natural resources within the study area were summarized using:

- FEMA preliminary Flood Insurance Rate Maps (FIRMs) published December 5, 2013;
- USEPA Region 2 information on the Brooklyn-Queens aquifer system (http://www.epa.gov/region02/water/aquifer/brooklyn/brooklyn.htm);
- United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps and Information, Planning and Conservation System (IPaC) list of federally threatened and endangered species in Queens County;
- NYSDEC wetlands maps and CEHA maps, 2000-2005 Breeding Bird Atlas results for Blocks 5949C and 5949D, and Herp Atlas Project results for the Far Rockaway Quadrangle;
- New York State Department of State (NYSDOS) Significant Coastal Fish and Wildlife mapping;
- The Final Environmental Impact Statement for the Arverne Urban Renewal Area (2003, NYC Department of Housing Preservation and Development (HPD), CEQR#:02 HPD 004 Q);
- Responses to requests for information on rare, threatened and endangered species and special habitats within the vicinity of the study area made to the New York Natural Heritage Program (NYNHP); and
- Observations made during October 4, 8, and 23, 2013 natural resources reconnaissance surveys within the study area.

THE FUTURE WITHOUT THE PROPOSED PROJECT

The future without the proposed project was assessed by considering potential effects to natural resources from activities that would be expected to be completed near the project site by 2017, independent of the proposed project. The most notable projects that were considered were the USACE ongoing beach fill renourishment being conducted from Beach 19th Street to Beach 149th Street to restore this area to the original design profile for the Rockaway Beach coastal storm risk reduction project, and the Arverne East redevelopment of the Arverne Urban Renewal Area ("Arverne URA," see http://www.farroc.com/downloads/). The USACE beach fill renourishment project will alter the topography and flood regime of the areas of beach immediately north and south of the boardwalk through the restoration of the dune to elevation 14 to 16 feet North American Vertical Datum 1988 (NAVD88), and in turn, alter habitat conditions for plants and wildlife. Routine USACE beach nourishment activities that will continue to occur in the future without the proposed project were considered to be a part of the existing condition because these activities have been regularly occurring within the study area since the 1970's. According to the 2003 Final Environmental Impact Statement for the Arverne URA, construction of Arverne East will result in the development of an approximately 80-acre portion of the Arverne URA and will include up to 1,300 units of housing, up to 500,000 square feet of commercial/recreational space, 15.5 total acres of nature preserve (in a narrow linear strip from Beach 32nd to Beach 44th Streets, between the boardwalk and the residential/commercial development that will occur to the north), and about 3 acres of active and/or passive open space.

Independent of the proposed project, the New York City Department of Parks and Recreation (DPR) will plant cape beach grass (*Ammpholia brevilugata*) on the crest and seaward side of the USACE dune from Beach 73rd to Beach 149th Streets, beyond the piping plover nesting colony. Planting will occur during the March 1 to April 30 growing season, and planted areas will be protected by sand fencing until the vegetation becomes established. Following USFWS recommendations for avoiding disturbance to piping plovers and piping plover nesting habitat, beach grass planting between Beach 20th and Beach 73rd Streets will be limited to the crest of the USACE dune and will occur prior to March 31 (see Appendix B). No adverse effects to other natural resources would be expected to occur from this work. Also independent of the proposed project, DPR intends to erect two parallel rows of sand fencing between Beach 9th and Beach 20th Streets to aid in the gradual formation of a sand dune that would provide flood protection to communities beyond the eastern end of the USACE dune. Since the new dune would be landward of the existing natural dunes, there would be no impact to natural resources. Existing pedestrian access at Beach 19th Street will be maintained outside of the plover nesting season, and restricted by DPR as necessary during the piping plover nesting season if there is nesting activity in the area, as recommended by USFWS (Appendix B). DPR will also use interim connections to temporarily repair sections of boardwalk surface between Beach 35th and Beach 39th Streets that are missing due to storm damage. The interim connections will consist of salvaged *ipe* stringers that were recovered from the damaged boardwalk. These stringers will be placed on and anchored to the existing concrete piles, with timber decking placed on the stringers. All work will be completed before April 2014 to avoid potential disturbance to nesting piping plovers. No other impacts to natural resources would be expected to occur from this temporary repair work.

POTENTIAL IMPACTS OF THE PROPOSED PROJECT

Because the proposed project consists primarily of the reconstruction of an existing boardwalk mainly within its original footprint, along with some additive features such as a sand-retaining wall underneath the boardwalk that would prevent sand migration, and access to the beach across the dunes being restored as part of the USACE renourishment project, potential impacts

to natural resources are limited. Potential impacts from the proposed project were assessed by considering the effects to vegetation, groundwater, the floodplain, NYSDEC CEHA and tidal wetland adjacent areas that could occur from land disturbance during project construction and disturbances to wildlife (including federally- and state-listed species) from noise and human activity generated during construction and operation.

D. EXISTING CONDITIONS

Rockaway Beach is a barrier beach on the southern end of the Rockaway Peninsula that has been heavily engineered since the late 1800's, when its natural dunes were leveled, low areas were filled, and streets were mapped in the areas behind the beach that would eventually become residential neighborhoods (Boretti et al. 2007). Residential development to the north of the beach cut off processes by which storm overwash once maintained back-barrier lagoons and fans that are characteristic of a natural coastal ecosystem (Tanacredi and Badger 1995). The beach continues to be highly human-modified, primarily from ongoing USACE beach renourishment efforts. As part of an initial beach replenishment effort authorized by Congress, USACE placed approximately 6.3 million cubic yards of sand between Beach 19th Street and Beach 149th Street in the 1970s to construct a 100-foot-wide beach at an elevation of 10 feet above mean sea level. This project also included construction of one groin/jetty at Beach 149th Street. USACE conducted beach renourishment to maintain the beach in 1980, 1982, 1984, 1986, and 1988. Several subsequent storms seriously eroded the shoreline and a second major beach fill renourishment was undertaken between 1995 and 2004.

Human recreational use of the beach is extensive in the warmer months and puts further pressure on the coastal ecosystem. Yet, largely due to natural resources management, some natural features of the system remain and the beach continues to support regionally significant populations of plants and animals, including threatened and endangered species (Boretti et al. 2007), as described below.

As part of the Arverne-by-the-Sea project developed within approximately 78 acres of the Western Portion of the Arverne URA, 8.5 acres of beachfront preserve ("Dune Preservation Area") was established from Beach 60th to Beach 73rd, between the Rockaway Boardwalk and Beach Front Road, to be owned and managed by the New York City Department of Parks and Recreation (DPR). The preserve was to incorporate the existing dune north of the boardwalk, and maintain the topography and vegetation present within the area through fencing and providing limited access through the area (HPD 2003).

SOILS, GEOLOGY AND GROUNDWATER

Soil within the vicinity of the project site consists of naturally occurring sand as well as sand dredged from Rockaway Inlet and offshore borrow areas and placed on the beach by USACE as part of the Rockaway Beach constructed coastal storm risk reduction project.

The project site is located within the Brooklyn-Queens Aquifer System, which is composed of the Upper Glacial, Jameco, Lloyd, and Magothy aquifers, and is a designated Sole Source Aquifer (USEPA 1983). This aquifer system consists of deposits of unconsolidated gravel, sand, silt, and clay from the Holocene, Pleistocene, and Late Cretaceous age, and reaches a maximum total thickness of about 1,050 feet in the southeast corner of Queens County (USEPA 1983). Groundwater is not used as a potable water supply in Queens and non-potable use is limited. Potable water in Queens is provided by New York City's public water supply, which originates from a network of upstate reservoirs.

FLOODPLAINS AND COASTAL EROSION HAZARD AREA

FEMA released preliminary FIRMs on December 5, 2013 that precede the future publication of new, duly adopted, final FIRMs. The preliminary maps represent the Best Available Flood Hazard Data (BAFHD) at this time. FEMA encourages communities to use the preliminary maps when making decisions about floodplain management and post-Hurricane Sandy recovery efforts.

The project site is located within the 100-year floodplain (area with a 1 percent chance of flooding each year). Based on the preliminary FIRMs, the project site falls within Zone VE, which is an area of high flood risk subject to inundation by the 1% annual-chance flood event, with additional hazards due to storm-induced velocity wave action (a 3-foot or higher breaking wave) (see **Figure 3E-1**). The preliminary FIRM 100-year flood elevations along the project site range from +13 to +17 feet NAVD 88 (**Table 3E-1**). Existing elevations of the tops of the pile caps for the boardwalk range from +10.4 to +14.56 feet NAVD 88.

The floodplain within and adjacent to the study area is affected by coastal flooding (e.g., long and short wave surges that affect the shores of the Atlantic Ocean). Coastal floodplains are influenced by astronomic tide and meteorological forces (e.g., nor'easters and hurricanes) (FEMA 2007).

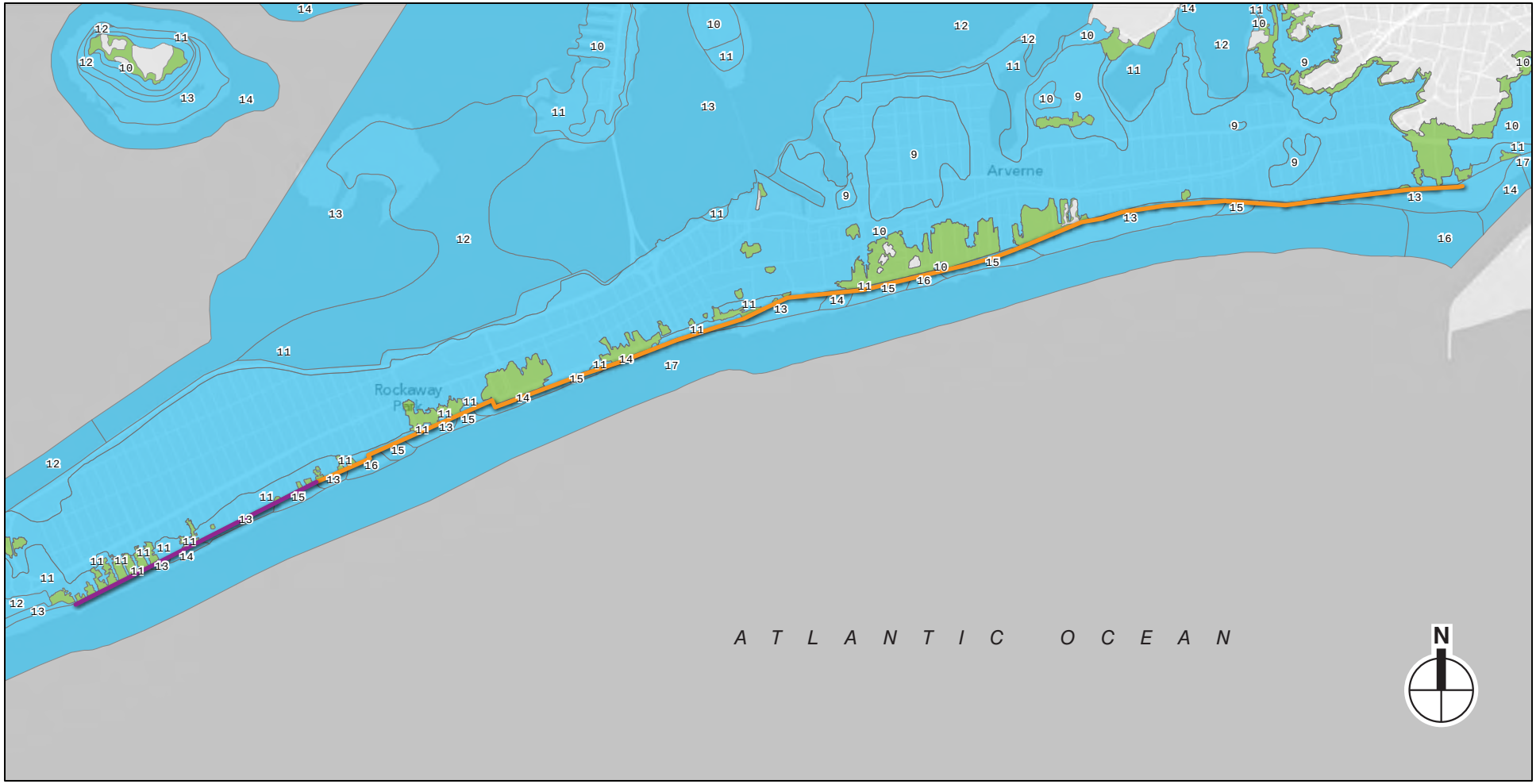
WETLANDS

Figures 3E-3 and **3E-3a** show the NYSDEC-mapped tidal wetlands within the vicinity of the project site. NYSDEC littoral zone tidal wetlands[1] are mapped outside the project site along Rockaway Beach, extending seaward from the Mean High Water (MHW) elevation. NYSDEC-regulated tidal wetland Adjacent Area occurs within the project site. Authorization under ECL Article 25 would be required from NYSDEC for the proposed project.

Figures 3E-4 and **3E-4a** show the USFWS NWI-mapped wetlands in the vicinity of the project site. The portion of the beach seaward of the boardwalk is mapped as M2US2P (marine, intertidal, unconsolidated shore, sand, irregularly flooded). This NWI category consists of unvegetated marine tidal areas that are flooded less often than daily with a substrate dominated by sand. The more regularly flooded portion of the beach closer to the ocean is mapped as M2US2N (marine, intertidal, unconsolidated shore, sand, regularly flooded). This NWI category consists of unvegetated marine tidal areas that are inundated and exposed daily with a substrate dominated by sand. The Atlantic Ocean is mapped as M1UBL (marine, subtidal, unconsolidated bottom, subtidal). This NWI category consists of unvegetated marine habitats that are always inundated. These NWI-mapped wetlands do not possess the characteristics of wetland soils, hydrology or hydrophytic vegetation to be under federal jurisdiction of the USACE as wetlands, but would be regulated by the USACE as waters of the United States. The typical elevation of the beach within the project site is at approximately +9 feet NAVD88, which is above the approximate mean high water spring (MHWS) elevation of +6.2 feet NAVD88 and outside the jurisdiction of the USACE.

[1] The tidal wetlands zone, which includes all lands under tidal waters not included in any other category, and that are no deeper than six feet at mean low water.

12.31.13



0 1 MILE
SCALE

Boardwalk

Proposed Crossing Structures

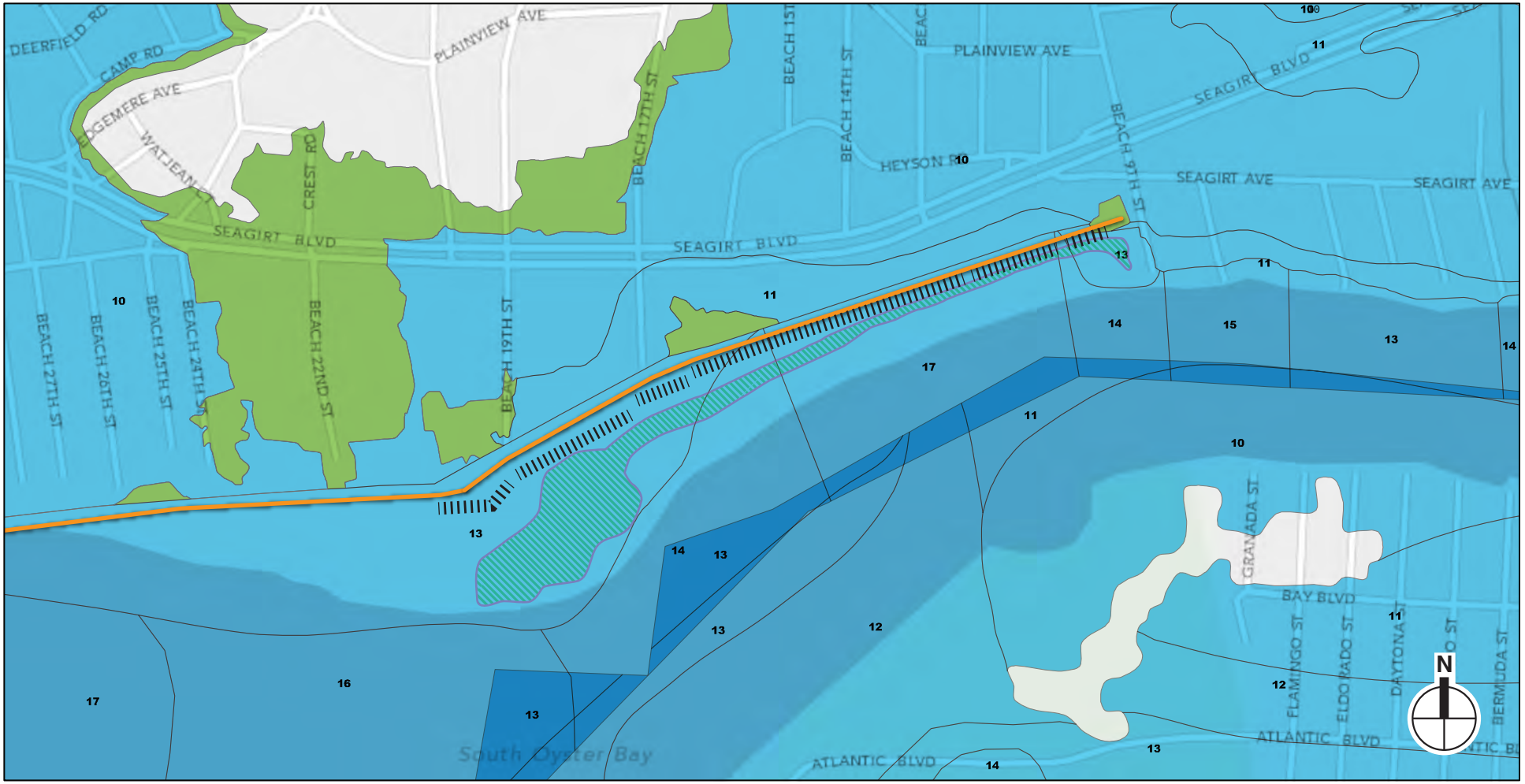
Preliminary Flood Insurance Rate Map Flood Zones

13 *100-year floodplain (Zones AE, AO, VE) with Base Flood Elevation where applicable*

500-year floodplain (shaded X)

Flood Hazard Zones
Federal Emergency Management Agency
Figure 3E-1

1.22.14



Boardwalk

Existing Dunes

Proposed (No-Action) Sand Fencing

Preliminary Flood Insurance Rate Map Flood Zones

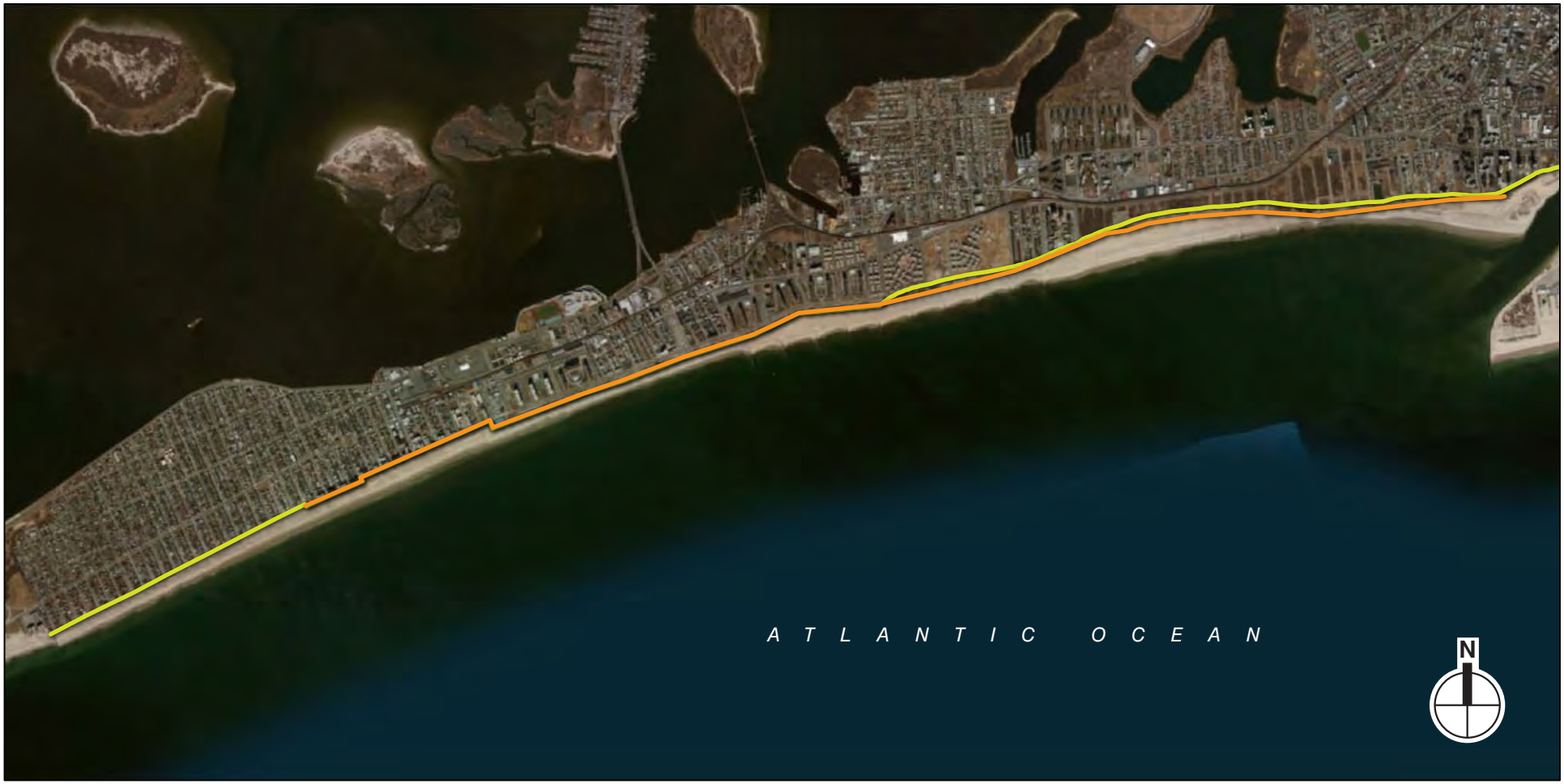
13 *100-year floodplain (Zones AE, AO, VE) with Base Flood Elevation where applicable*

500-year floodplain (shaded X)

ROCKAWAY BOARDWALK RECONSTRUCTION

Flood Hazard Zones
Federal Emergency Management Agency
Figure 3E-1a

12.31.13



Boardwalk

CEHA Boundary

0 1 MILE

SCALE

ROCKAWAY BOARDWALK RECONSTRUCTION

NYSDEC Coastal Erosion Hazard Area

Figure 3E-2

1.22.14

Boardwalk

Existing Dunes

CEHA Boundary

USACE Dune

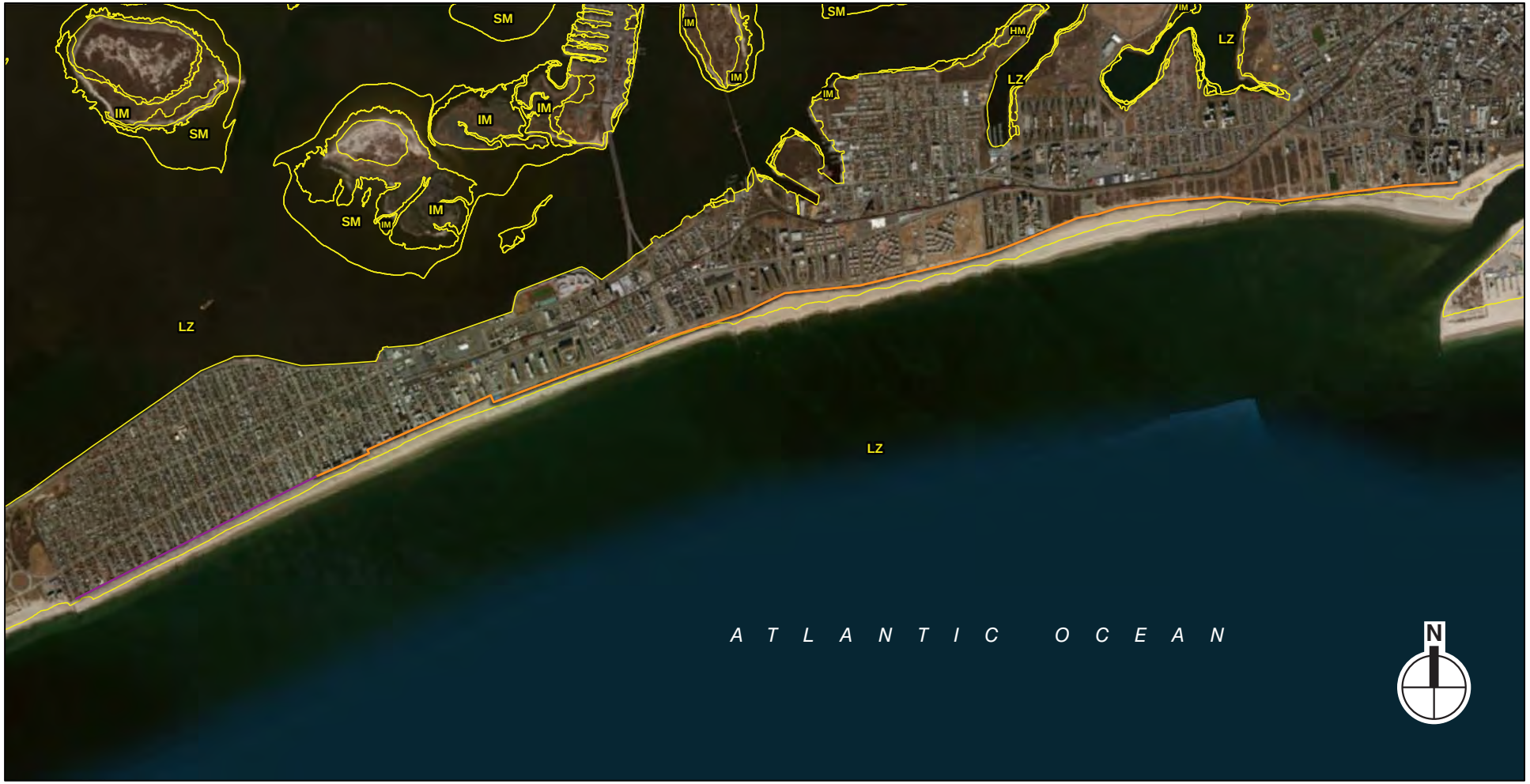
Proposed (No-Action) Sand Fencing

ROCKAWAY BOARDWALK RECONSTRUCTION

NYSDEC Coastal Erosion Hazard Area

Figure 3E-2a

12.31.13



Boardwalk

Proposed Crossing Structures

NYSDEC Tidal Wetlands Boundary

WETLANDS CATEGORIES

IM *Intertidal Marsh*

HM *High Marsh or Salt Meadow*

SM *Coastal Shoals, Bars and Mud Flats*

LZ *Littoral Zone*

0 5000 FEET

SCALE

NYSDEC Tidal Wetlands

Figure 3E-3

1.22.14

Boardwalk

Existing Dunes

NYSDEC Tidal Wetlands Boundary

USACE Dune

Proposed (No-Action) Sand Fencing

WETLANDS CATEGORIES

IM *Intertidal Marsh*

HM *High Marsh or Salt Meadow*

SM *Coastal Shoals, Bars and Mud Flats*

LZ *Littoral Zone*

0 400 1000 FEET

SCALE

ROCKAWAY BOARDWALK RECONSTRUCTION

NYSDEC Tidal Wetlands

Figure 3E-3a

12.31.13

Boardwalk

Proposed Crossing Structures

0 1 MILE

SCALE

Wetlands

Estuarine and Marine Deepwater

Estuarine and Marine

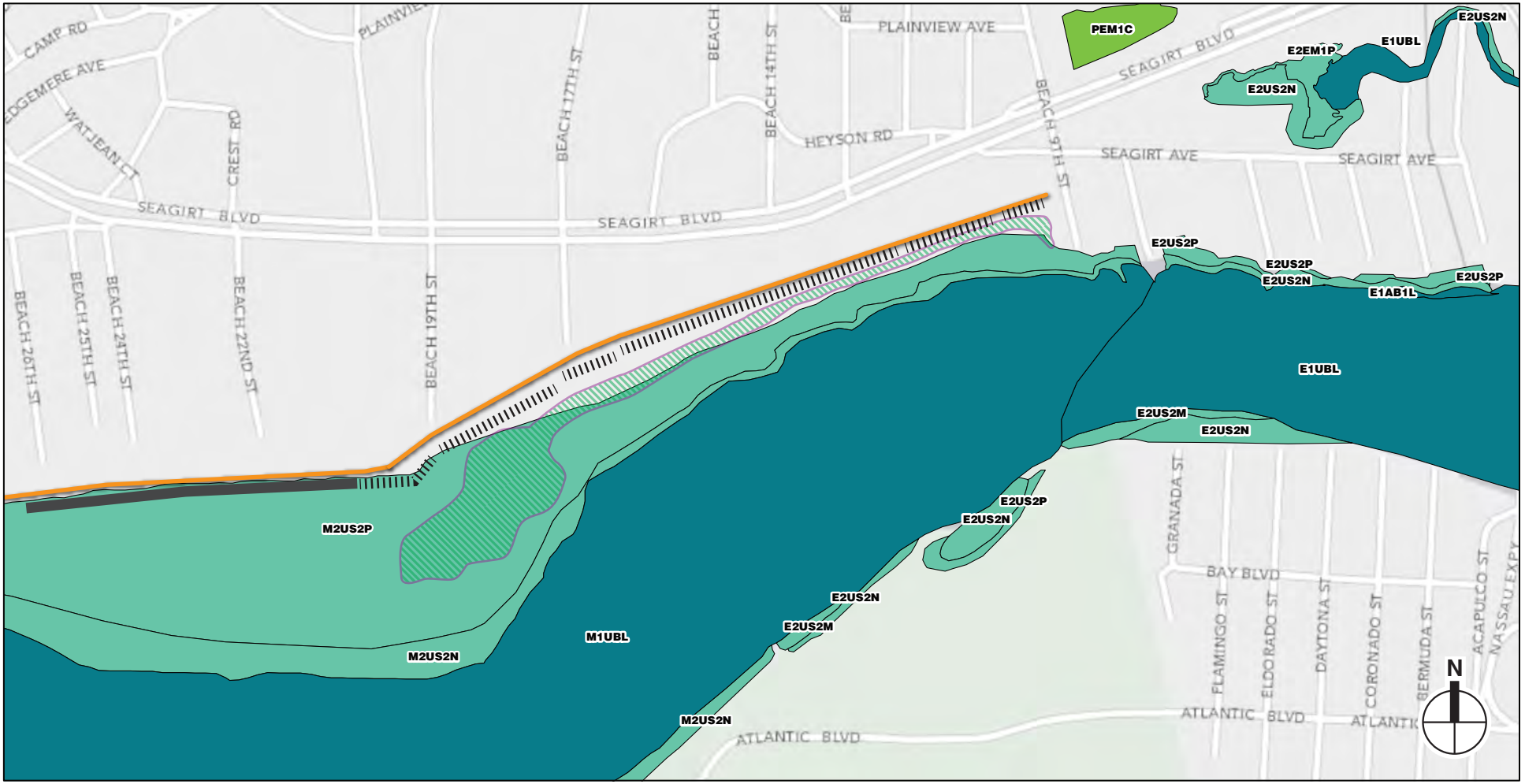
Wetlands data downloaded from www.fws.gov on January 10, 2013

ROCKAWAY BOARDWALK RECONSTRUCTION

USFWS National Wetlands Inventory

Figure 3E-4

1.22.14



Boardwalk

Existing Dunes

USACE Dune

Proposed (No-Action) Sand Fencing

Wetlands

Freshwater Emergent

Estuarine and Marine Deepwater

Estuarine and Marine

Wetlands data downloaded from www.fws.gov on January 10, 2013

0 400 1000 FEET

SCALE

ROCKAWAY BOARDWALK RECONSTRUCTION

USFWS National Wetlands Inventory

Figure 3E-4a

Table 3E-1

Existing and Proposed Boardwalk Elevations and Preliminary and Current 100-year Flood Elevations within Project Site

Boardwalk section	Existing Boardwalk Elevations (NAVD 88 feet)	Proposed Boardwalk Elevations (NAVD 88 feet)	FEMA Preliminary FIRM 100-Year Flood Elevations (NAVD 88 feet; December 2013)	Current FIRM Map 100-Year Flood Elevations (NGVD 29 feet, September 2007)
9th – 11th	10.4-10.5	16	VE13	AE10
11th – 16th	10.4-10.5	17-20	VE17	AE10
16th – 35th	10.4-15.58	16-20	VE13	AE10
35th – 36th	15.3-15.4	20	VE17	AE10
36th – 38th	15.3-15.36	20	VE17	AE11
38th – 40th	15.36-15.45	18-20	VE15	AE11
40th – 59th	15.27-15.74	16-18	VE13	AE11
59th – 67th	15.21-15.47	16-19	VE15	AE11
67th – 68th	15.25	19	VE16	AE11
68th – 74th	Not Available	18	VE15	AE11
74th – 77th	Not Available	17	VE14	AE11
77th – 98th	15.4-15.52	16-19	VE13	AE11
98th – 102nd	15.4-15.6	17	VE14	AE11
102nd – 104th	15.32	18	VE15	AE11
104th – 111th	12-15.51	17	VE14	AE11
111th – 112th	12.08-12.2	17-18	VE15	AE11
112th – 117th	12.08-13.06	16-18	VE13	AE11
117th – 120th	12.14-13.06	18	VE15	AE11
120th – 123rd	12.16-12.29	16-19	VE16	AE11
123rd – 126th	12.16-12.47	16-19	VE13	AE11
126th – 130th	12.4	19	VE15	AE11
130th – 137th	NA	NA	VE13	AE11
137th – 140th	NA	NA	VE14	AE11
140th – 142nd	NA	NA	VE13	AE11
142nd – 149th	NA	NA	VE17	AE11

Notes:
Zone AE denotes an area of high flood risk subject to inundation by the 1% annual-chance flood event.
Zone VE denotes an area of high flood risk subject to inundation by the 1% annual-chance flood event with additional hazards due to storm-induced velocity wave action (a 3-foot or higher breaking wave).
NA=Not Applicable
Sources:
Existing boardwalk elevations surveyed on August 5, 2013.
FEMA preliminary, new FIRMs released on December 5, 2013
FEMA currently effective FIRMs, published September 2007

ECOLOGICAL COMMUNITIES

Ecological communities within the study area are characteristic of maritime dunes[1] and of maritime beach, as defined by Edinger et al. (2002). Edinger et al. (2002) defines the maritime dunes community as: "a community dominated by grasses and low shrubs that occurs on active and stabilized dunes along the Atlantic coast. This community consists of a mosaic of vegetation patches. This mosaic reflects past disturbances such as sand deposition, erosion, and dune migration. The composition and structure of the vegetation is variable depending on stability of the dunes, amounts of sand deposition and erosion, and dune distance from the ocean. Characteristic species of the active maritime dunes, where sand movement is greatest, include beachgrass (*Ammophila breviligulata*), dusty-miller (*Artemisia stelleriana*), beach pea (*Lathyrus japonicus*), sedge (*Carex silicea*), seaside goldenrod (*Solidago sempervirens*), and sand-rose (*Rosa rugosa*). Characteristic species of stabilized maritime dunes include beach heather (*Hudsonia tomentosa*), bearberry (*Arctostaphylos uva-ursi*), beachgrass (*Ammophila breviligulata*), cyperus (*Cyperus polystachyos* var. *macrostachyus*), seaside goldenrod (*Solidago sempervirens*), beach pinweed (*Lechea maritima*), jointweed (*Polygonella articulata*), sand-rose (*Rosa rugosa*), bayberry (*Myrica pensylvanica*), beach-plum (*Prunus maritima*), poison ivy (*Toxicodendron radicans*), and the lichens *Cladina submitis* and *Cetraria arenaria*."

Within the project site, this community forms a narrow swath that parallels existing portions of the boardwalk on its landward side, and forms small communities within the footprint of the boardwalk where only bents are present. Where present between bents, this community comprises predominantly pioneer species or invasive/non-native species, and shows evidence of frequent disturbance from foot traffic and other human uses. To the north of the project site, the maritime dune community is bordered by residential and commercial development and undeveloped land consisting of a coastal scrub/shrub community. Within the project site, this community is characterized by disturbance, both natural (i.e., sand deposition and erosion) and human (i.e., foot traffic, development). The vegetation within this community occurs in patches interspersed by bare sand. The herbaceous vegetation observed within the maritime dune community within the study area include predominately American beachgrass (*Ammophila breviligulata*), sea rocket (*Cakile edentula*), crabgrass (*Digitaria* spp.), seaside goldenrod (*Solidago sempervirens*), beach clotbur (*Xanthium echinatum*), and common mugwort (*Artemisia vulgaris*). The maritime dunes community also has a shrub layer dominated by rugosa rose (*Rosa rugosa*), northern bayberry (*Myrica penslyvanica*), autumn olive (*Elaeagnus umbellata*), and winged sumac (*Rhus copallina*), and a sparse tree layer dominated by European black pine (*Pinus nigra*). **Table 3E-2** lists the plant species observed during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

Edinger et al. (2002) defines the maritime beach community as "a community with extremely sparse vegetation that occurs on unstable sand, gravel, or cobble ocean shores above mean high tide, where the shore is modified by storm waves and wind erosion." Within the project site, the vegetation within this community is mostly sparse, although patches of vegetated maritime beach habitat are present in some areas. Herbaceous species that were observed in this community consist of those observed in the maritime dune community, described above. The maritime beach community lacks both a shrub and tree layer.

[1] Although the maritime dune community is not a protected ecological community by the state, the New York Natural Heritage Program defines this community as a significant ecological community.

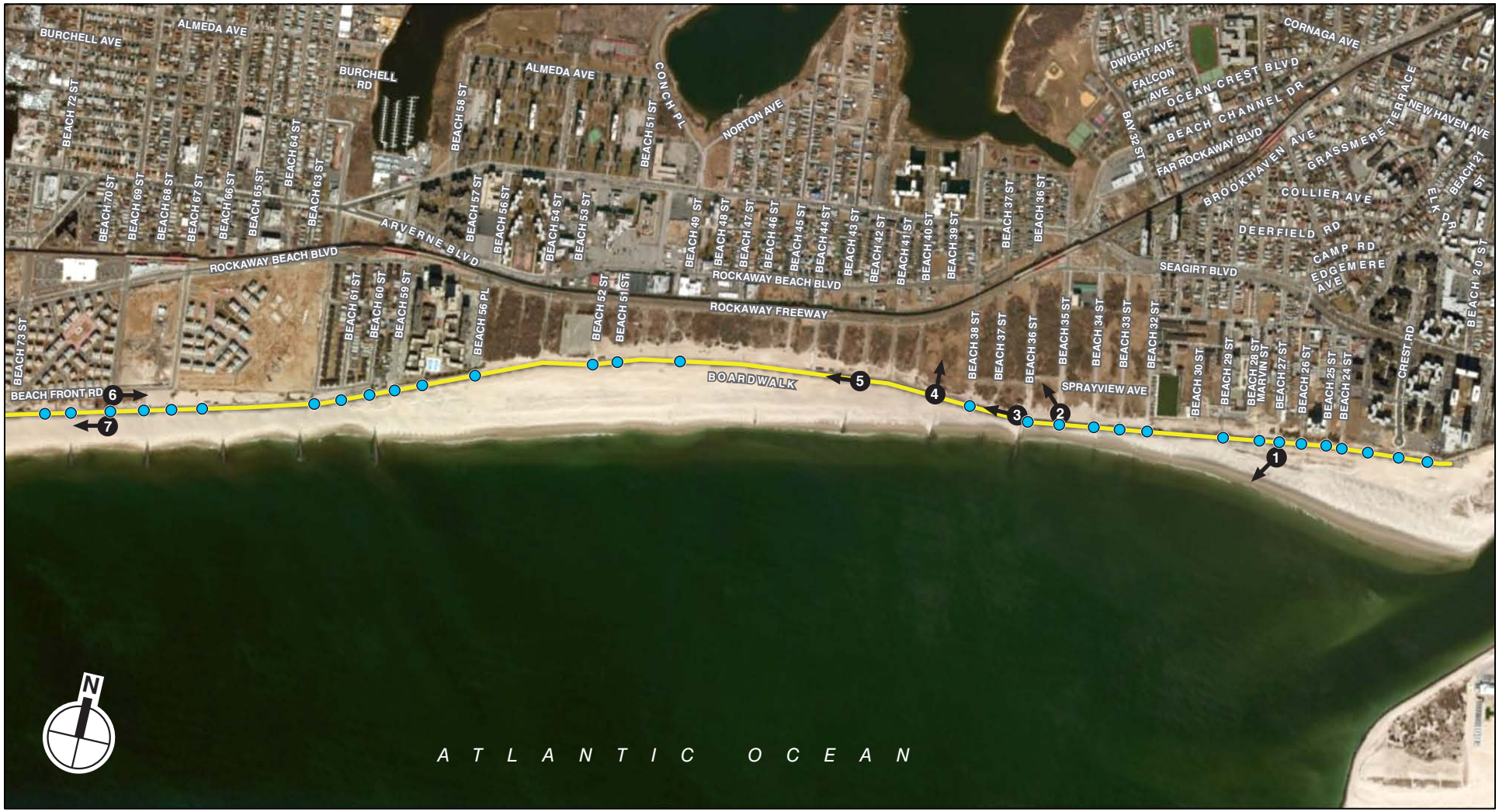
Table 3E-2
Vegetation Observed within the Study Area

Common name	Scientific name	Stratum
Box elder	*Acer negundo*	Tree
Tree-of-heaven	*Ailanthus altissima*	Tree
Mimosa tree	*Albizia julibrissin*	Shrub
Tumbleweed	*Amaranthus albus*	Herbaceous
American beachgrass	*Ammophila breviligulata*	Herbaceous
Porcelainberry	*Ampelopsis brevipedunculata*	Herbaceous
Common mugwort	*Artemisia vulgaris*	Herbaceous
Common milkweed	*Asclepias syriaca*	Herbaceous
Bushy aster	*Aster dumosus*	Herbaceous
Sea rocket	*Cakile edentula*	Herbaceous
Asiatic bittersweet	*Celastrus orbiculatus*	Herbaceous
Hackberry	*Celtis occidentalis*	Tree
Dune sandbur(1)	*Cenchrus tribuloides*	Herbaceous
Lamb's quarters	*Chenopodium album*	Herbaceous
Dogwood	*Cornus* sp	Shrub
Queen Anne's lace	*Daucus carota*	Herbaceous
Crabgrass	*Digitaria* sp	Herbaceous
Autumn olive	*Elaeagnus umbellata*	Shrub
Seaside spurge	*Euphorbia polygonifolia*	Herbaceous
Cottontail	*Froelichia gracilis*	Herbaceous
Sweet everlasting	*Gnaphalium obtusifolium*	Herbaceous
Camphorweed	*Heterotheca subaxillaris*	Herbaceous
White mulberry	*Morus alba*	Tree
Northern bayberry	*Myrica pensylvanica*	Shrub
Virginia creeper	*Parthenocissus quinquefolia*	Herbaceous
Common reed	*Phragmites australis*	Herbaceous
Pokeweed	*Phytolacca americana*	Herbaceous
European black pine	*Pinus nigra*	Tree
Japanese knotweed	*Polygonum cuspidatum*	Herbaceous
Eastern cottonwood	*Populus deltoides*	Tree
Black cherry	*Prunus serotina*	Tree
Winged sumac	*Rhus copallina*	Shrub
Smooth sumac	*Rhus glabra*	Shrub
Black locust	*Robinia pseudoacacia*	Tree
Rugosa rose	*Rosa rugosa*	Shrub
Little bluestem	*Schizachyrium scoparium*	Herbaceous
Seaside goldenrod	*Solidago sempervirens*	Herbaceous
Saltmeadow cordgrass	*Spartina patens*	Herbaceous
Trailing wild bean	*Strophostyles helvola*	Herbaceous
Poison ivy	*Toxicodendro radicans*	Herbaceous
Elm	*Ulmus* sp	Tree
Common mullein	*Verbascum thapsus*	Herbaceous
Beach clotbur	*Xanthium echinatum*	Herbaceous

Note: (1) State-listed threatened plant species
Source: Reconnaissance investigations on October 4 and 23, 2013.

The ecological communities within the project site occur in four distinct segments (see **Figure 3E-5a through Figure 3E-5i**). The segment between Beach 9th and Beach 20th Streets contains a maritime dune community to the south of the existing boardwalk structure, and park facilities to the north of the existing boardwalk structure. The segment between Beach 20th and Beach 62nd Streets contains a

12.31.13



0 800 1600 FEET

SCALE

Boardwalk

Boardwalk Access

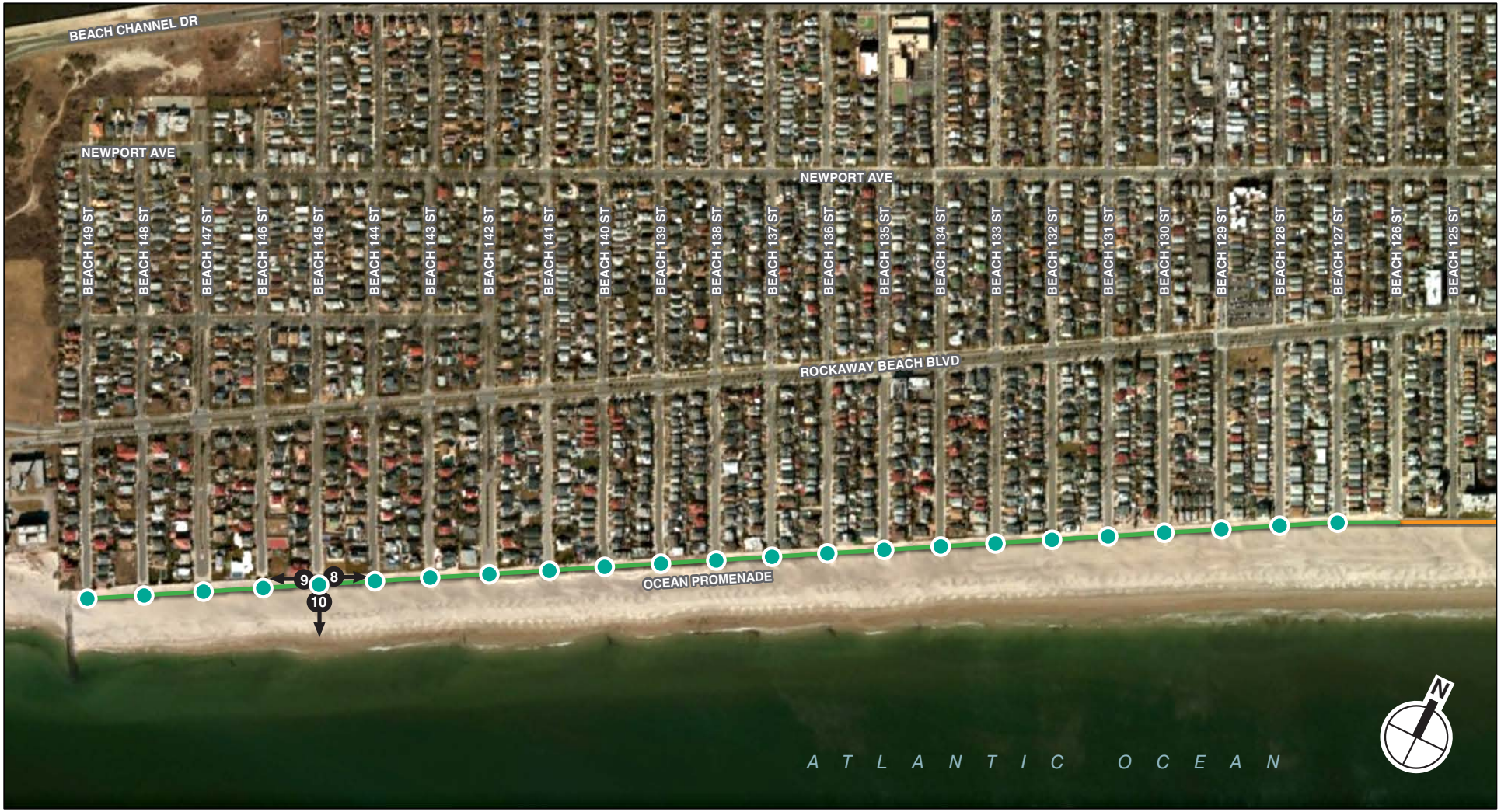
Photograph View Direction and Reference Number

ROCKAWAY BOARDWALK RECONSTRUCTION

Natural Resources Photograph Locations

Figure 3E-5a

12.31.13



Boardwalk

USACE Dune

Proposed Crossing Structure

8 *Photograph View Direction and Reference Number*

0 400 800 FEET

SCALE

ROCKAWAY BOARDWALK RECONSTRUCTION

Natural Resources
Photograph Locations
Figure 3E-5b

1.22.14

Boardwalk

Existing Dunes

USACE Dune

Proposed (No-Action) Sand Fencing

11 *Photograph View Direction and Reference Number*

0 500 FEET

SCALE

ROCKAWAY BOARDWALK RECONSTRUCTION

Natural Resources Photograph Locations

Figure 3E-5c

Photograph taken on October 4, 2013

View of the maritime beach and maritime dunes communities near Beach 27th Street, facing southwest **1**

Photograph taken on October 4, 2013

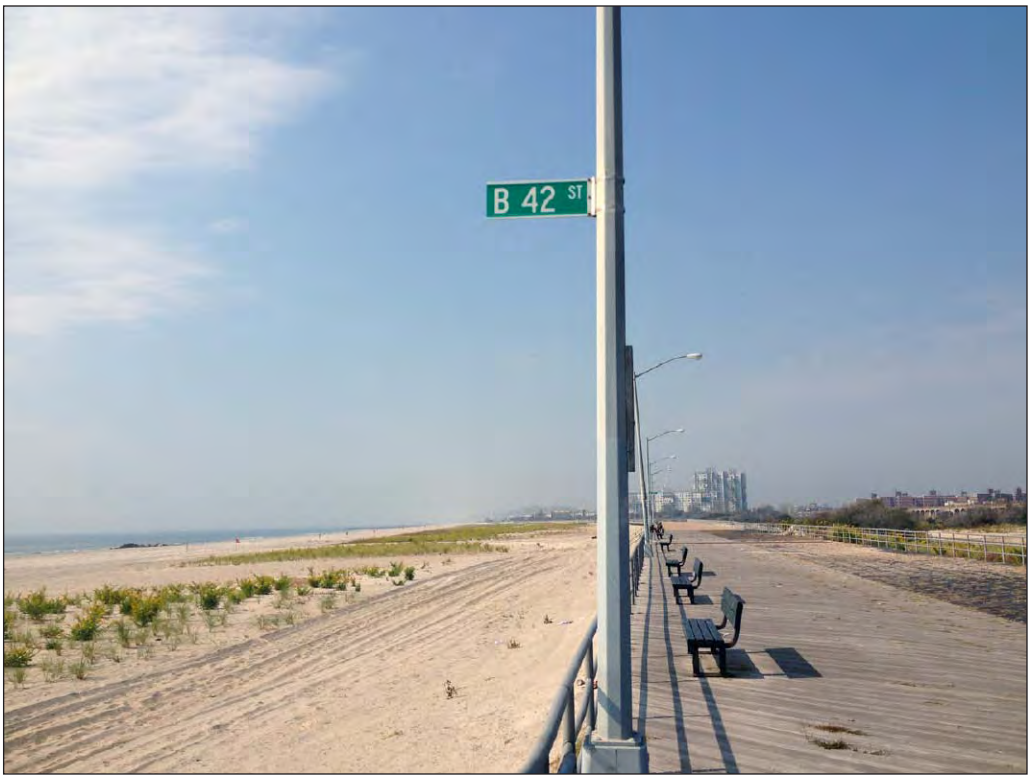
View of the maritime beach and maritime dunes communities near Beach 35th Street, facing northwest **2**

Photograph taken on October 4, 2013

View of the maritime beach and maritime dunes communities, and boardwalk foundation near Beach 36th Street, facing west **3**

Photograph taken on October 4, 2013

View of the maritime dunes community near Beach 39th Street, facing north **4**



Photograph taken on October 4, 2013

View of the maritime beach community to the left and maritime dunes community to the right near Beach 42nd Street, facing west **5**

Photograph taken on October 4, 2013

View of the maritime dunes community near Beach 69th Street, facing east **6**

Photograph taken on October 4, 2013

View of the maritime beach community and boardwalk foundation near Beach 69th Street, facing west **7**

Photograph taken on October 4, 2013

View of the United States Army Corps of Engineers (USACE) berm to the right near Beach 145th Street, facing east **8**

Photograph taken on October 4, 2013

View of the USACE berm to the left near Beach 145th Street, facing west **9**

Photograph taken on October 4, 2013

View of the unvegetated beach and Atlantic Ocean from the top of the USACE berm near Beach 145th Street, facing south **10**

Photograph taken on October 23, 2013

View of the maritime dunes community near Beach 16th Street, facing west **11**

Photograph taken on October 23, 2013

View of the maritime dunes community near Beach 16th Street, facing east **12**

maritime beach community to the south of the existing boardwalk structure, and a maritime dunes community to the north and south of the existing boardwalk structure. The segment between Beach 62nd and Beach 109th Streets contains a maritime beach community on the south side of the existing boardwalk structure and a maritime dunes community to the north. The Dune Preservation Area established in the Western Portion of the Arverne URA between Beach 60th and Beach 73rd contains the maritime dune community it was established to preserve, along with limited access walkways and paths within the preserve area. The third segment of the project site, between Beach 109th and Beach 149th Streets, contains only unvegetated beach.

WILDLIFE

Habitat available to wildlife within the study area consists primarily of oceanfront, sandy beach. The beach is bounded to the south by the Atlantic Ocean and to the north by paved streets and residential development. In some areas, such as between Beach 32nd and Beach 56th Streets, patches of maritime dune and vegetated maritime beach habitat are present between the open beach and the development to the north. The beach supports numerous species of coastal wildlife, including several sensitive and/or listed species that benefit from spatial and temporal restrictions on human activity in the area, habitat management, predator control, and direct protection of breeding sites.

BIRDS

The New York State Breeding Bird Atlas is a periodic census of the distribution of the State's breeding birds. The most recent census was conducted from 2000 to 2005 and documented 35 species as confirmed or probable/possible breeders within the census blocks in which the project site is located (Blocks 5949C and 5949D) (**Table 3E-3**). These 3-square mile census blocks also span dredge spoil islands, salt marshes, ponds and freshwater wetlands, and other habitat types within the Jamaica Bay complex that do not occur within the study area. On the basis of their habitat associations (Poole 2005), 19 of these 35 species documented by the Breeding Bird Atlas are considered to have the potential to nest within the study area (see **Table 3E-3**). The beaches of Rockaway Peninsula, including those within the study area, are known to host breeding colonies of several beach-nesting waterbirds, including least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), and American oystercatcher (*Haematopus palliatus*) (Fowle and Kerlinger 2001, Boretti et al. 2007, DPR 2013).

During spring and fall migration, numerous waterbirds use the beaches of the Rockaway Peninsula as a staging area for rest and refueling. Examples of migrating shorebirds that are expected to regularly occur within the study area during these times of year include sanderling (*Calidris alba*), semipalmated plover (*Charadrius semipalmatus*), semipalmated sandpiper (*Calidris pusilla*), and ruddy turnstone (*Arenaria interpres*) (Fowle and Kerlinger 2001, Boretti et al. 2007). Birds of prey, such as Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), and merlin (*Falco columbarius*) also commonly pass through the Rockaway Peninsula during migration, particularly during autumn (Fowle and Kerlinger 2001). The bird community in the study area is expected to be most sparse during winter, particularly on the areas of open beach, where non-migratory gulls, such as great black-backed gull (*Larus marinus*), are likely among the only species present. Birds that can likely be found wintering in the areas of coastal scrub/shrub habitat or in the residential areas north of the project site include European starling (*Sturnus vulgaris*), rock dove (*Columbia liva*), white-throated sparrow (*Zonotrichia albicollis*), dark-eyed junco (*Junco hyemalis*), northern cardinal (*Cardinalis cardinalis*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), American goldfinch (*Spinus tristis*), and yellow-rumped warbler (*Setophaga coronata*).

Table 3E-3
Birds Documented by the 2000-2005 Breeding Bird Atlas in Blocks 5949C and 5949D

Common Name	Scientific Name
Northern Bobwhite	*Colinus virginianus*
Piping plover	*Charadrius melodus*
Ring-necked Pheasant	*Phasianus colchicus*
Killdeer	*Charadrius vociferus*
American Oystercatcher	*Haematopus palliatus*
Willet	*Tringa semipalmata*
Least Tern	*Sternula antillarum*
Common Tern	*Sterna hirundo*
Herring Gull	*Larus argentatus*
Great Black-backed Gull	*Larus marinus*
Rock Pigeon	*Columba livia*
Mourning Dove	*Zenaida macroura*
Barn Owl	*Tyto alba*
Chimney Swift	*Chaetura pelagica*
Barn Swallow	*Hirundo rustica*
American Crow	*Corvus brachyrhynchos*
Willow Flycatcher	*Empidonax traillii*
Black-capped Chickadee	*Poecile atricapillus*
Carolina Wren	*Thryothorus ludovicianus*
Marsh Wren	*Cistothorus palustris*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
European Starling	*Sturnus vulgaris*
Eastern Towhee	*Pipilo erythrophthalmus*
Yellow Warbler	*Dendroica petechia*
Common Yellowthroat	*Geothlypis trichas*
Seaside Sparrow	*Ammodramus maritimus*
Song Sparrow	*Melospiza melodia*
Northern Cardinal	*Cardinalis cardinalis*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Boat-tailed Grackle	*Quiscalus major*
Brown-headed Cowbird	*Molothrus ater*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*

Notes: Boldface indicates the subset of species considered to have the potential to nest within the study area, on the basis of their habitat associations.

The following species of birds were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013: American crow (*Corvus brachyrhynchos*), American goldfinch, common yellowthroat (*Geothlypis trichas*), double-crested cormorant (*Phalacrocorax auritus*), great black-backed gull, herring gull (*Larus argentatus*), house finch, house sparrow, laughing gull (*Leucophaeus atricilla*), northern mockingbird (*Mimus polyglottos*), ring-billed gull (*Larus delawarensis*), rock dove, semipalmated plover, song sparrow, swamp sparrow (*Melospiza georgiana*), white-throated sparrow, and yellow-rumped warbler.

MAMMALS

On the basis of the mammals that are known to occur on other barrier beaches of southern Long Island (USACE 2004) and in the coastal scrub/shrub habitat of nearby Floyd Bennett Field (Bourque 2007), the following species are considered to have the potential to occur within the study area: house mouse (*Mus musculus*), meadow vole (*Microtus Pennsylvanicus*), woodland vole (*Microtus pinetorum*), muskrat (*Ondatra zibethicus*), white-footed mouse (*Peromyscus leucopus*), raccoon (*Procyon lotor*), Norway rat (*Rattus norvegicus*), gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). Feral cats (*Felis catus*) are known to occur on Rockaway Beach and are a problematic source of predation for nesting shorebirds (Boretti et al. 2007). No mammals were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013.

REPTILES AND AMPHIBIANS

Few species of reptiles and amphibians of New York State occur in coastal habitats (Gibbs et al. 2007). The NYSDEC Herp Atlas Project, a survey conducted from 1990 to 1999 to document the geographic distribution of New York's reptile and amphibian species, recorded 16 species in the census block in which the project site is located (Far Rockaway USGS quadrangle; **Table 3E-4**). However, this census block spans the majority of the Jamaica Bay estuary and includes dredge spoil islands, salt marshes, ponds and freshwater wetlands, and other habitat types that do not occur within the study area. Of these 16 species, only gray treefrog (*Hyla versicolor*), spring peeper (*Pseudacris c. crucifer*), Fowler's toad (*Bufo fowleri*), and northern brown snake (*Storeria d. dekayi*) are considered to have the potential to occur within the study area, on the basis of their association with beach and coastal scrub/shrub habitats (Gibbs et al. 2007) and information on their status and distribution within the Jamaica Bay complex (Tanacredi and Badger 1995; Cook 2002, 2004). The eastern spadefoot toad and eastern box turtle were documented by the Herp Atlas Project in the Far Rockaway quadrangle and also inhabit sandy, coastal habitats, but the only eastern spadefoot toads and eastern box turtles in the Jamaica Bay area are those that were recently reintroduced to Floyd Bennet Field and/or the Jamaica Bay Wildlife Refuge (Cook 2002, 2004). No reptiles or amphibians were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013.

TERRESTRIAL THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Federally endangered, threatened, candidate, or proposed species listed by the USFWS IPaC System as occurring in Queens County include piping plover (threatened), roseate tern (*Sterna dougalli*; endangered), *rufa* subspecies of the red knot (*Calidris canutus rufa*; proposed threatened), northern long-eared bat (*Myotis septentrionalis*; proposed endangered), and seabeach amaranth (*Amaranthus pumilus*; threatened) (**Appendix B**). In response to a request for information on state-listed species and significant natural communities documented within 0.5 miles of the project site, NYNHP (NYSDEC 2013) provided the following recent records: piping plover (NYS endangered), common tern (NYS threatened), least tern (NYS threatened), black skimmer (NYS special concern), checkered white butterfly (*Pontia protodice*; NYS special concern), dune sandspur (*Cenchrus tribuloides*; NYS threatened), seabeach amaranth (NYS threatened), seabeach knotweed (*Polygonum glaucum*; NYS rare); cut-leaved evening-primrose (*Oenothera laciniata*; NYS endangered), narrow-leaf sea-blite (*Suaeda linearis*; NYS endangered), and roland's sea-blite (*Suaeda rolandii;* NYS endangered). In addition, NYNHP noted the following historical records within 0.5 miles of the project site: retrorse flatsedge

(*Cyperus retrorsus var. retrorsus*; NYS endangered) and slender crabgrass (*Digitaria filiformis*; NYS endangered) (**Appendix B**). These species are described in detail below. There are no significant natural communities, as mapped by NYSDEC, or significant coastal fish and wildlife habitats, as mapped by NYSDOS, within the vicinity of the project site. However, as described above, maritime dunes habitat, a NYNHP-designated significant ecological community, was observed within the study area. The maritime dunes habitat was observed to the north and south of the existing boardwalk, between Beach 20th and Beach 62nd Streets, and to the north of the boardwalk, in the segment between Beach 62nd and Beach 109th Streets.

Table 3E-4
Reptiles and Amphibians Documented by the NYSDEC Herp Atlas Project in the Far Rockaway Census Quadrangle

Common Name	Scientific Name
Spotted Salamander	*Ambystoma maculatum*
Red-spotted Newt	*Notophthalmus v. viridescens*
Northern Redback Salamander	*Plethodon c. cinereus*
Eastern Spadefoot	*Scaphiopus holbrookii*
Fowler's Toad	*Bufo fowleri*
Gray Treefrog	*Hyla versicolor*
Northern Spring Peeper	*Pseudacris c. crucifer*
Green Frog	*Rana clamitans melanota*
Common Snapping Turtle	*Chelydra s. serpentina*
Eastern Box Turtle	*Terrapene c. carolina*
Northern Diamondback Terrapin	*Malaclemys t. terrapin*
Painted Turtle	*Chrysemys picta*
Northern Brown Snake	*Storeria d. dekayi*
Common Garter Snake	*Thamnophis sirtalis*
Northern Black Racer	*Coluber c. constrictor*
Eastern Milk Snake	*Lampropeltis t. triangulum*

Notes: Boldface indicates the subset of species that are considered to have the potential to occur within the study area on the basis of their habitat associations (Gibbs et al. 2007) and information on their status and distribution within the Jamaica Bay area (Tanacredi and Badger 1995; Cook 2002, 2004).

Piping plover (U.S. threatened, NYS endangered), least tern (NYS threatened), and common tern (NYS threatened) were the only federally- or state-listed bird species that were documented by the 2000-2005 Breeding Bird Atlas in the census blocks in which the project site is located. Federally- or state-listed species that were documented by the Herp Atlas Project in the Far Rockaway Quadrangle include the eastern spadefoot toad (NYS endangered) and eastern box turtle (NYS special concern), but as discussed above, these species are not known to occur in the study area (Tanacredi and Badger 1995; Cook 2002, 2004). The eastern hognose snake (*Heterodon platyrhinos*) is a NYS species of special concern that inhabits sandy, shrub/scrub habitats along Long Island's coasts, but the only eastern hognose snakes that are known to occur in the Jamaica Bay area are those that were recently reintroduced to Breezy Point on the western tip of the Rockaway Peninsula and in the Jamaica Bay Wildlife Refuge (Tanacredi and Badger 1995, Cook 2002). Eastern hognose snakes are not known to occur outside of these reintroduction sites and are not expected to occur within the study area.

Dune sandspur, a state-listed threatened grass, was observed during the October 4, 2013 reconnaissance investigation within the maritime dune habitat in the portion of the study area between Beach 20th and Beach 35th Streets; and during the October 23, 2013 reconnaissance investigation within the maritime dune habitat in the portion of the project site between Beach 9th and Beach 20th Street. No other federally- or state-listed species of plants or wildlife were observed within the study area during the October 4, 8, and 23, 2013 reconnaissance investigations.

PIPING PLOVER

The piping plover is a migratory shorebird that nests on sandy beaches along the Atlantic coast and around the Great Lakes. Steep population declines, primarily due to extensive coastal development, beach engineering activities that alter natural coastal processes (e.g., jetty construction, nourishment), and disturbance from human recreational use of nesting beaches, led to the species' listing under the federal Endangered Species Act in 1986. Intensive management actions, such as closures of nesting areas to recreation, trapping and removal of nest predators, and control of vegetation have had success, and population sizes have since more than doubled (Elliot-Smith and Haig 2004, Hecht and Melvin 2009). Recovery goals for the Atlantic Coast population are 1600 pairs and a productivity of 1.5 chicks/pair (USFWS 1996). The target of 575 pairs in the New York-New Jersey recovery unit of the Atlantic Coast population has nearly been reached, but average productivity (1.18) is below the goal of 1.5 (Hecht and Melvin 2009). Unless additional nesting habitat is provided, further increases in population size and productivity may be incompatible goals because productivity is density dependent and suitable plover habitat remaining in the region may already be at its carrying capacity (Seavey 2009). However, predation, mainly by feral cats, rats, crows, and species that have adapted to human development, continues to be a major hindrance to piping plover productivity in New York and elsewhere (Elliot-Smith and Haig 2004, Doherty and Heath 2011).

The breeding range of the piping plover within New York State is limited to the coastlines of Long Island, where plovers nest from Queens to eastern Suffolk County (Wasilco 2008a). Most piping plover colonies on Long Island have grown steadily in recent decades in response to protection and management (Houghton 2005, Boretti et al. 2007, Wasilco 2008a, Seavey 2009) and currently represent approximately 24 percent of the total Atlantic Coast population (Hecht and Melvin 2009). Despite extensive oceanfront development, high recreational usage, a long history of beach engineering, and heavily urbanized surroundings, piping plovers sporadically nested on Rockaway Beach in Queens throughout the 1900's. In 1996, DPR began monitoring and actively managing the beach to promote plover nesting success. Management actions included protective fencing (at least 50 meters [164 feet] from nests) and predator exclosures around nest sites, rodenticides, educational signage, and law enforcement patrols. As a result, the number of nesting pairs increased from 6 to 15 between 1996 and 2003. Productivity increased from 0.5 to 2.0 and averaged 1.42 over this time period (Boretti et al. 2007). Since then, however, the number of breeding pairs has fluctuated inconsistently (with a high of 25 breeding pairs in 2007 and a low of 9 breeding pairs in 2013) and overall productivity has steadily fallen (DPR, unpublished data). Nestling predation continues to be a major limiting factor (USFWS 2013a), and productivity has been at or close to zero in recent years. The Rockaway Beach piping plover colony could therefore be considered a local population sink or ecological trap under current conditions. The piping plover colony on Rockaway Beach typically extends between Beach 35th and Beach 73rd Streets (Boretti et al. 2007), with most nests occurring between Beach 45th and Beach 56th Streets (DPR 2013) where a wide buffer of maritime dune

habitat separates the beach from the developed area to the north. During the 2013 breeding season, piping plovers nested between Beach 39th and Beach 59th Streets, and also nested between Beach 19th and Beach 23rd Streets (USFWS 2013a). Piping plovers therefore occur within the study area during the nesting season which, in New York, is generally from about March 31 to July 31 (Elliot-Smith and Haig 2004, Sommers 2008), but varies from year to year. Piping plovers would not be expected to occur in the study area outside of this period. No piping plovers were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013.

RED KNOT

The *rufa* subspecies of the red knot migrates up to 30,000 miles round trip between primary wintering grounds in South America and breeding grounds in the high arctic, with conditions for refueling at staging areas along the Atlantic coast being critical determinants of migration and reproductive success and overall survival (Baker et al. 2004, Morrison et al. 2007). Delaware Bay is the most significant migration staging area for *rufa* red knots, which time their springtime arrival in the bay to coincide with the peak horseshoe crab spawning period (Baker et al. 2004, Niles et al. 2009). Red knots are dependent on a superabundance of horseshoe crab eggs as a food source in order to almost double their body mass and fuel the remaining leg of their migration to the high arctic (Baker et al. 2004, Morrison and Hobson 2004). Delaware Bay is the only place in the Western Hemisphere where horseshoe crabs spawn in numbers that enable red knots to do so (Niles 1999). Steep declines in the number of horseshoe crabs spawning in Delaware Bay in recent decades, despite stricter harvest restrictions, has significantly hindered the ability of red knots to refuel at sufficient rates, and in turn, led to rapid population declines (Niles et al. 2008, 2009). Monomoy National Wildlife Refuge in Cape Cod, Massachusetts appears to be among the most significant staging areas for red knots during their southbound autumn migration (Harrington et al. 2010, Burger et al. 2012).

In addition to these primary staging areas in Delaware Bay and Cape Cod, migrating red knots may commonly stage, albeit in much lower densities, elsewhere along the Atlantic coast (Harrington 2001, Burger et al. 2012). Although migrating red knots are known to occur along Long Island (e.g., Jamaica Bay [Tanacredi and Badger 1995:104, Fowle and Kerlinger 2001:81]), none of its beaches, bays, or estuaries are known to be high-use staging areas that support large concentrations of individuals. Instead, red knots are usually seen on Long Island in small groups (e.g., Wells 1996:59) relative to the tens of thousands of birds observed staging together in Delaware Bay and Cape Cod. On Rockaway Beach, migrant red knots are noted as regularly occurring between Beach 35th and Beach 73rd Streets (Boretti et al. 2007), which is likely due to the freedom from human disturbance in this area provided by the protective roping around the piping plover colony. Red knots are highly sensitive to human disturbance at staging sites (Burger et al. 2004, 2007), and given the heavy recreational use of the other segments of Rockaway Beach alongside the project site (Boretti et al. 2007), red knots are considered unlikely to stage outside of the protected area between Beach 35th and Beach 73rd Streets.

NORTHERN LONG-EARED BAT

The northern long-eared bat is a temperate, insectivorous bat whose life cycle can be coarsely divided into two primary phases - reproduction and hibernation. Northern long-eared bats hibernate in caves or mines during winter and then emerge in early spring, with males dispersing and remaining solitary until mating season at the end of the summer, and pregnant females forming maternity colonies in which to rear young. Summer habitat of the northern long-eared

bat generally includes mature, intact, upland and riparian forest within heavily forested landscapes (Ford et al. 2005, Henderson et al. 2008). The long-eared bat is considered a forest-dependent species that is sensitive to fragmentation and requires interior forest for both foraging and breeding (Foster and Kurta 1999, Broders et al. 2006, Henderson et al. 2008). Although they have been documented in urbanized areas (Whitaker et al. 2004, Johnson et al. 2008) and will occasionally utilize buildings and other artificial structures rather than trees for roosting (Timpone et al. 2010, USFWS 2013b), urban northern long-eared bats tend to occur near large, forested parks or other expansive green spaces with abundant tree cover towards the city's outskirts (Johnson et al. 2008). Because the project site is on a beach and there are no caves, mines, or small or large woodlands nearby, northern long-eared bats are not considered to have the potential to occur in the area during either the breeding or non-breeding period. Therefore, the proposed project would not result in adverse impacts to northern long-eared bats.

ROSEATE TERN

More than 90 percent of New York State's population of roseate terns is made up by a single colony on Great Gull Island, off Long Island's eastern end. The remainder occurs in small groups of often just one or two breeding pairs in variable locations along the south shore of eastern Long Island (Mitra 2008). Roseate terns have sporadically nested within the Jamaica Bay estuary in the past (e.g., 2 pairs in 1996; Wells 1996), but during the most recent Breeding Bird Atlas, they were not documented anywhere west of Suffolk County (Mitra 2008). Roseate terns are not among the beach-nesting bird species that nest on Rockaway Beach (Boretti et al. 2007). The potential for roseate terns to occur in the study area is considered extremely low and limited to migrants moving through the area en route to nesting sites elsewhere in the region or to wintering grounds in the southern hemisphere. No roseate terns were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013.

LEAST TERN

The least tern is a colonial seabird that nests on open, sparsely vegetated sand beaches and dredge spoil sites. New York State's populations of least terns declined 21 percent during the 1980's and 1990's (Rosenberg and Burger 2008), but appear to have since stabilized at around 3,000 pairs (Wasilco 2008b). Approximately 80 to 120 pairs nest between Beach 35th to Beach 73rd Streets on Rockaway Beach each year, with some additional nests usually also occurring elsewhere to the east and west along the peninsula's shoreline (Boretti et al. 2007). Least terns are therefore known to occur within the study area during the breeding season, which in Atlantic coast populations, is roughly from late April to the end of August (Thompson et al. 1997, Sommers 2008). Least terns do not overwinter in New York, and no least terns were observed within the study area during the reconnaissance surveys conducted on October 4 and 8, 2013.

COMMON TERN

The common tern is a state-threatened species that occurs in the New York Harbor region and along the shores of Long Island. As of 1996, Long Island's common tern population stood at approximately 18,000 breeding pairs, with more than half of these pairs occurring on Great Gull Island, off the eastern end of Long Island (Nisbet 2002, Hays 2007, Richmond 2008). The Jamaica Bay complex usually supports around 2000-3000 breeding pairs of common terns per year (Wells 1996), but only 1 to 2 pairs per year typically nest on Rockaway Beach (Boretti et al. 2007). Common terns are known to nest in the study area (Boretti et al. 2007). The breeding season for common terns on coastal beaches of New York is from about late April to the end of

July (Nisbet 2002). Common terns do not overwinter in New York, and no common terns were observed in the study area during the October 4 and 8, 2013 reconnaissance surveys.

BLACK SKIMMER

Black skimmers are coastal waterbirds that are listed as a species of special concern in New York State. Their breeding range within New York State is limited to the shores of Long Island, with nearly all of the state's approximately 500 breeding pairs occurring in just two colonies on the beaches of Breezy Point, Queens and on Nickerson Beach in the town of Lido Beach, Nassau County (NYSDEC 2013). Breezy Point is at the far western end of Rockaway Peninsula and is the only part of the peninsula on which black skimmers are known to nest (Fowle and Kerlinger 2001). Black skimmers are not among the birds that nest in the area of beach between Beach 35th and Beach 73rd Streets, where piping plovers, common terns, and least terns nest (Boretti et al. 2007). In addition, black skimmers were not documented by the 2000-2005 Breeding Bird Atlas in the two census blocks in which the project site is located. Breezy Point is more than 3 miles away from the westernmost extent of the project site, and black skimmers breeding on this part of Rockaway Peninsula would not have the potential to be affected by the proposed project.

CHECKERED WHITE BUTTERFLY

The checkered white butterfly is common and abundant throughout the majority of North America, but it is relatively rare in New York because the state is at the northern extreme of its range in the east (Layberry et al. 1998, Brock and Kaufman 2003). Checkered white butterflies occur in a wide variety of disturbed, open habitats, such as roadsides, vacant lots, and weedy fields (Layberry et al. 1998, Brock and Kaufman 2003, BMNA 2013). Although it is unlikely because the species is uncommon as far north as New York, the checkered white butterfly has the potential to occur near the project site. NYNHP has a record of checkered white butterflies occurring near the terminus of Beach 44th Street, near the project site, in 1990.

MARITIME DUNES COMMUNITY

As described above, NYNHP has identified maritime dunes habitat to be a significant ecological community within New York State (NYNHP 2013a). Within the study area, the maritime dunes community forms a narrow swath that is located between the landward side of the boardwalk and undeveloped (coastal shrub/scrub habitat) and developed land (residential and commercial), and forms small communities within the footprint of the boardwalk where only bents are present. This community is characterized by disturbance, both natural (i.e., sand deposition and erosion) and human (i.e., foot traffic, development).

SEABEACH AMARANTH

Seabeach amaranth is a federally and state-listed threatened annual herbaceous plant that was thought to be extinct in New York State until it was rediscovered in 1990. It grows along sandy beaches of the Atlantic coast in areas of accreting shoreline, upper beach, foredune, or overwash flat, as well as beach nourishment sites. Boretti et al. (2007) noted that seabeach amaranth occurs in broad swaths close to the tide line of Rockaway Beach, generally in the areas between Beach 35th and Beach 73rd Streets. NYNHP has a record of seabeach amaranth in the vicinity of Beach 60th to Beach 69th Streetsfrom 2004. In 2013, a small population of approximately 20 individual plants was documented between Beach 39th and Beach 56th Streets (USFWS 2013c).

However, no seabeach amaranth was observed within the study area during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

DUNE SANDSPUR

Dune sandspur is a state-listed threatened annual grass that grows on dunes and other coastal sands (Gleason and Cronquist 1991). Dune sandspur requires disturbed sands of maritime beach, maritime dunes, and maritime grassland communities to flourish (NYNHP 2013b). NYNHP has a record of dune sandspur in the vicinity of Beach 60th to Beach 69th Streets in 1998. Dune sandspur was identified immediately adjacent to the landward side of the existing boardwalk structure between Beach 20th and Beach 35th Streets during the October 4, 2013 reconnaissance investigation, and throughout the existing maritime dunes south of the boardwalk between Beach 20th and Beach 9th Streets during the October 23, 2013 reconnaissance investigations.

SEABEACH KNOTWEED

Seabeach knotweed is a state-listed rare annual plant that is a member of the Buckwheat family that grows on maritime beaches and the margins of adjacent dunes and salt marshes. It grows on a variety of substrates, including sand, silt, pebbles or cobbles, and dredging spoils (NYNHP 2013c). NYNHP has a record of seabeach knotweed along the beach in the vicinity of Beach 60th to Beach 69th Streets in 2002, and just west of the project site along Jacob Riis Beach in 1990. Seabeach knotweed was not observed during the October 4, 2013 and October 23, 2013 reconnaissance investigations**.**

CUT-LEAVED EVENING-PRIMROSE

Cut-leaved evening-primrose is a state-listed endangered annual plant that grows on successional old fields, sandy embankments, and disturbed areas of maritime grasslands (NYNHP 2013d). NYNHP has a record of cut-leaved evening primrose north of the project site at Vernam Barbadoes Peninsula on the north shore of the Rockaways along Jamaica Bay in 1998. This species was not observed during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

NARROW-LEAF SEA-BLITE

Narrow-leaf sea-blite is a state-listed endangered annual plant that grows in a variety of maritime habitats near the high tide mark, including the upper edges of high salt marsh, interdunal swales with salt water influences, beaches, and trail or road edges (NYNHP 2013e). NYNHP has a record of narrow-leaf sea-blite north of the project site at Vernam Barbadoes Peninsula on the north shore of the Rockaways along Jamaica Bay in 1997. This species was not observed during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

ROLAND'S SEA-BLITE

Roland's sea-blite is a state-listed endangered annual herbaceous plant that grows in open, salt-influenced wetlands, including the upper portions of high salt marshes, in salt pannes or swales within brackish tidal marsh, and similar habitats occurring on dredge spoils (NYNHP 2013f). NYNHP has a record of Roland's sea-blite north of the project site at Vernam Barbadoes Peninsula on the north shore of the Rockaways along Jamaica Bay in 1997. On the basis of its habitat requirements, individuals of this plant species are not expected to occur within the

project site and were not observed during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

RETRORSE FLATSEDGE

Retrorse flatsedge is a state-listed endangered perennial plant that grows in sandy coastal habitats including maritime dunes and the upper edges of salt marshes (NYNHP 2013g). NYNHP has an historical record of retrorse flatsedge north of the project site in Edgemere (north shore of the Rockaways, near Beach 46th Street) in 1902. Retrorse flatsedge was not observed within the study area during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

SLENDER CRABGRASS

Slender crabgrass is a state-listed endangered annual grass that grows on sandy, open, often disturbed habitats near the coast, including dunes, sandy roadsides and fencerows, and the edges of brackish meadows and salt marshes (NYNHP 2013h). NYNHP has an historical record of slender crabgrass in Rockaway Neck (the Rockaway Peninsula) in 1873. Slender crabgrass was not observed within the study area during the October 4, 2013 and October 23, 2013 reconnaissance investigations.

E. THE FUTURE WITHOUT THE PROPOSED PROJECT

USACE is currently conducting—on an emergency basis in response to beach erosion that occurred due to Hurricane Sandy and other recent severe storms—beach fill renourishment along Rockaway Beach to generally restore the project area to its original design profile from Beach 19th to Beach 149th Streets (see Figure 1-7). In addition, a new dune constructed at an elevation of 14 to 16 feet will be constructed along the north edge of the beach and adjacent to the oceanside edge of the existing boardwalk right-of-way. Approximately 3.5 million cubic yards of sand dredged from East Rockaway Inlet and an offshore borrow area will be placed along the beach within the project area. USACE beach fill renourishment is ongoing and is expected to be completed by summer 2014. USACE intends to maintain the dune and the beach and renourish them as necessary. While this project is independent of the proposed project and is separately funded, the City's reconstruction of the boardwalk is intended not to preclude any future resiliency and protection measures that may be undertaken by the USACE.

In particular, USACE is also undertaking a long term reformulation study that will look at beach renourishment and other erosion control measures, and flood protection for the entire Rockaway Peninsula. That study is expected to begin a public review and planning process in 2014 that will identify and select a long-term plan. USACE is expected to issue final erosion and flood protection recommendations in 2015 with implementation thereafter.

The ongoing USACE beach fill activities, and any beach renourishment and other erosion control measures implemented in the future will alter existing topography, hydrology, vegetation, and other features of the beach within its footprint, and affect undeveloped areas to the north by blocking storm overwash. Inhibition of overwash processes by the USACE dune will affect existing habitat conditions for plants and wildlife. While still a maritime habitat, conditions will likely become drier, less saline, and more densely vegetated, and support a lower abundance of invertebrates (Elias et al. 2000, McIntyre and Heath 2011) as the USACE dune

and beach nourishment area are maintained over time. In addition, salt-intolerant and invasive common reed (*Phragmites australis*) may become more prevalent (McIntyre and Heath 2011).

In the future with or without the proposed project, DPR will plant cape beach grass (*Ammpholia brevilugata*) on the crest and seaward side of the USACE dune from Beach 73rd to Beach 149th Streets, beyond the piping plover nesting colony. Planting will occur during the March 1 to April 30 growing season, and planted areas will be protected by sand fencing until the vegetation becomes established. Following USFWS recommendations (see Appendix B), beach grass planting will be limited to the crest of the USACE dune between Beach 20th and Beach 73rd Streets and will occur prior to March 31 to avoid affecting nesting habitat quality and causing disturbance to piping plovers in this area. No adverse impacts to other natural resources would be expected to occur from this work.

In the future with or without the proposed project and in order to provide flood protection to communities between Beach 9th and Beach 20th Streets beyond the eastern end of the USACE dune, DPR intends to erect sand fencing that would aid in the gradual formation of a sand dune. (see Figure 1-6). The sand fencing would be placed in two parallel rows approximately 20 feet apart, adjacent to and in approximate alignment with the eastern terminus of the USACE dune, and landward of the natural dunes that occur in this area in order to avoid impacts to potential piping plover nesting habitat, in accordance with USFWS required conservation measures (see Appendix B). No temporary or permanent land disturbance would occur in the natural dune area.

In the future with or without the proposed project, DPR will use interim connections to temporarily repair sections of boardwalk surface between Beach 35th and Beach 39th Streets that are missing due to storm damage. The interim connections will consist of salvaged *ipe* stringers that were recovered from the damaged boardwalk. These stringers will be placed on and anchored to the existing concrete piles, with timber decking placed on the stringers. All work will be completed before April 2014 to avoid potential disturbance to nesting piping plovers. Implementing these temporary repairs would result in limited disturbance within the boardwalk footprint where the repairs are being conducted and would result in minimal impact to natural resources.

DPR would also continue to manage the Dune Preservation Area established as part of the Arverne-by-the-Sea project developed within the Western Portion of the Arverne URA from Beach 60th to Beach 73rd Streets, and would begin management of the 15.5 acres of nature preserve/open space that would result from the development of the Eastern Portion of the Arverne URA between Beach 44th and Beach 32nd. Clearing activities within the Eastern Portion of the Arverne URA outside the nature preserve/open space would directly affect the ecological communities within these areas and wildlife individuals using these areas. DPR would also be expected to continue to implement management measures to protect nesting piping plovers.

Development within the Eastern Portion of the Arverne URA will likely have consequences for the piping plover nesting colony between Beach 35th and Beach 73rd Streets by eliminating large areas of maritime dune and coastal scrub habitat that currently separate the nesting sites from the urban development to the north, beyond Rockaway Beach Boulevard. The Eastern Portion of the Arverne URA will eliminate a large portion of this buffer and bring development and elevated levels of human activity to within close proximity of the nesting colony in some areas, which may cause some piping plovers to abandon the site or experience reduced reproductive success under the modified conditions. These areas also provide foraging habitat for piping plovers in the years following periodic storm disturbances that reduce vegetation density and/or provide ephemeral wet areas. For example, disturbance from Hurricane Sandy

improved foraging conditions for piping plovers north of the boardwalk, and piping plovers were observed using these areas during the 2013 nesting season, particularly around Beach 49th Street (USFWS 2013a). Such areas behind beaches that periodically receive storm overwash are usually high quality and preferred foraging habitat for piping plovers (Elias et al. 2000, McIntyre and Heath 2011). Plovers with access to these dynamic habitats are in better energetic condition, and have higher reproductive success and survival rates than plovers that are limited to foraging on ocean beachfront (Loegering and Fraser 1995, Elias et al. 2000, McIntyre and Heath 2011). As such, loss of some of these areas to develop the Eastern Portion of the Arverne URA may reduce the productivity and viability of the nesting colony on this segment of Rockaway Beach.

Construction and continued maintenance of the USACE dune may also have consequences for the piping plovers that nest between Beach 17th and Beach 73rd Streets by cutting off nesting areas on the beach from any potential foraging habitat remaining to the north after the development within the Arverne URA is completed. Piping plovers would not be expected to walk or fly over the constructed dune to reach any potential foraging habitat to the north, and would instead limit themselves to foraging in the wrack zone and on areas of open beach. Additionally, the USACE dune will reduce the suitability of any remaining undeveloped areas north of the boardwalk as piping plover foraging habitat by blocking storm overwash. While still a maritime habitat, conditions will likely become drier, less saline, and more densely vegetated, and support a lower abundance of invertebrates (Elias et al. 2000, McIntyre and Heath 2011) as the USACE dune and beach nourishment area is maintained over time.

Ongoing beach fill renourishment activities by the USACE may temporarily reduce the quality of Rockaway Beach as staging habitat for red knots in the future without the proposed project by reducing prey availability (Convertino et al. 2011). The Arverne East development will impact coastal shrub/scrub and maritime dune habitats that are not likely used by migrating red knots, and is therefore unlikely to affect the species. Red knots would be expected to have the same potential to occur on Rockaway Beach in the future without the proposed project as at present.

In addition to the USACE dune construction and other beach engineering projects, the future without the proposed project includes a new comfort station that is planned for construction by DPR along the boardwalk at Beach 67th Street as part of the Phase I targeted repairs that are almost complete. Construction of the comfort station will require minimal land disturbance and will not significantly alter the existing condition of natural resources in this area. Overall, in the future without the proposed project, natural resources in the study area are expected to remain much the same as under the existing condition.

F. THE FUTURE WITH THE PROPOSED PROJECT

As described in detail in Chapter 1, “Project Description,” the proposed project would complete the reconstruction of the boardwalk from Beach 20th Street to Beach 126th Street, increasing the resiliency by raising the boardwalk to elevations up to three feet higher than the BAFE 100 year flood elevation indicated on the Preliminary FIRMS. The proposed project would incorporate a sand-retaining wall underneath the northern (upland) edge of the rebuilt boardwalk. The wall would retain sand placed between it and the USACE-constructed dune, reducing the drift of sand into the neighboring community. Following USFWS recommendations, the sand fill would be generally consistent with the grain size of the naturally occurring beach sand (see Appendix B). The narrow gap of sand infill between the seaward edge of the boardwalk and the USACE dune may be planted with vegetation only where piping plover, common and least tern nesting habitat would not have the potential to be adversely affected. The wall is being designed to retain the

force of saturated sand fill behind it (and therefore the static pressure of water). It has not been designed to withstand the dynamic energy of waves since the wall will be protected by the USACE dune, the sand between the dune and the wall, and the renourished beach that will be extended 200 feet seaward from the USACE dune. The USACE intends to maintain the dune and the beach and renourish them as necessary. In addition, as a result of an ongoing Reformulation Study, USACE may provide additional protective measures to further protect the coastal structures. The proposed wall design consists of a series of H-piles, driven up to 22 feet from the surface, supporting concrete panels between the flanges. The panels would be attached to the piles so that the bottom of the slab is two feet above the calculated erosion depth of +5 feet NAVD88 (the lowest elevation assumed by the USACE in the absence of any beach nourishment). During an extreme storm event, the scour would open a gap beneath the wall, allowing some of the water to pass under the wall.

As described in Chapter 1, "Project Description," most of the boardwalk would be reconstructed in its pre-existing alignment; however, in certain sections, the alignment would be straightened to provide a more continuous boardwalk length but would remain above the MHWS elevation and outside USACE jurisdiction. Testing and evaluation of the original concrete foundations (also referred to as "bents" and consisting of four concrete piles attached by a concrete pile cap) revealed chloride contamination that would prohibit them from being used to support the reconstructed boardwalk. Therefore, a new pile foundation system would support the rebuilt boardwalk. The new foundation system would likely consist of steel bents on two piles driven no more than 27 feet, spaced approximately 30 feet apart.

Between Beach 126th and Beach 149th Streets, the proposed project would include new access to the beach with stairs and ramps across the new dune that is currently being constructed by the USACE. These structures would be used until USACE approves and implements a long term management plan. It is expected that the new structures would be located at the terminus of each street, and four locations would also have access ramps that are compliant with the Americans with Disabilities Act (ADA).

Construction for this boardwalk project would be phased, beginning in 2014, with all construction anticipated to be completed in 2017. Intermediated protection measures, comprising sand retaining elements, would be included as part of the project. Phase 1 of the reconstruction project would take place between Beach 86th and Beach 97th Streets; Phase 2 would take place between Beach 98th and Beach 108th Streets, Phase 3 would take place between Beach 109th and Beach 126th Streets, Phase 4 would take place between Beach 60th and Beach 86th Streets, and Phase 5 would take place between Beach 19th and Beach 60th Streets. Overall, the reconstruction program would comprise approximately 10 sections, with work proceeding on several sections concurrently depending on the availability of construction crews and equipment and seasonal restrictions. For each section, construction activities would include demolition and preparation of bents, pile driving using hydraulic pile driver and sand-retaining wall installation, placement of sand infill, installation of concrete pile cap and boardwalk planks, and finishing activities (e.g., installation of railings, lights, benches, drinking water fountains, beach showers, etc.). All work would be staged from the landward side of the boardwalk. Much of the proposed project's construction staging would occur at street ends near the boardwalk, thereby limiting any effects on ecological communities, wildlife and threatened or endangered species. Chapter 3, Section F, "Construction Impacts," provides a detailed description of the anticipated construction activities.

SOILS, GEOLOGY AND GROUNDWATER

The installation of piles to support the sand-retaining wall and boardwalk, and control of sand drift through placement of the sand-retaining wall, would not adversely affect the soils, geology, or groundwater resources within the study area. The driving of the H-piles for the sand-retaining wall up to 22 feet into the sand would not result in the loss of sand resources. Sand placed below the boardwalk between the sand-retaining wall and the USACE dune will be compatible with the existing beach sand and would not affect the nature of the existing sand resources within the project site. Within the project site, the depth of sand below the surface extends more than 45 feet. Therefore, piles driven for the sand-retaining wall and the replacement boardwalk (no more than 27 feet), would not extend to bedrock and would not have the potential to affect geologic resources.

Construction and operation of the proposed project would not adversely affect the Brooklyn-Queens sole source aquifer, or drinking water supplies. Groundwater is not used as a potable water supply in the area, and the proposed project would not result in groundwater withdrawal. Therefore, the proposed project would not have the potential to result in significant adverse impacts to groundwater resources on or in the vicinity of the project site, and would be compliant with Section 1424(e) of the Safe Drinking Water Act.

FLOODPLAINS AND COASTAL EROSION HAZARD AREA

While the proposed reconstruction of the boardwalk would occur within the 100-year floodplain, the boardwalk would be raised to an elevation of up to 3 feet above the 100-year flood elevation based on the preliminary FIRMs (see **Table 3F-1**) and would incorporate other measures to increase resilience to future storm events. The proposed sand-retaining wall and fill between the USACE dune and the boardwalk would prevent sand migration and restrict blowing sand from passing under the boardwalk from the beach to the inland area, thereby providing additional resilience to communities to the north. Overall, construction and operation of the proposed project would not result in significant adverse impacts to flood levels, flood risk, or the flow of flood waters in the project site or surrounding areas. Therefore, the proposed project would be compliant with the National Flood Insurance Act of 1968 (44 CFR § 59) and Floodplain Management Executive Order 11988 (42 FR 26951).

Additionally, in compliance with Executive Order 11988, the project has completed the 8-step process for activities in a floodplain. Both the Early and Final notices were published, on September 20, 2013 and December 13, 2013, respectively (see **Appendix D**). As described in the attached 8-step process (see Appendix D), it has been determined that there is no practicable alternative to the reconstruction of the boardwalk in the floodplain, and the proposed project will elevate the boardwalk above the 100-year FEMA storm surge levels.

The proposed sand-retaining wall has been designed to retain the force of saturated sand fill behind it and would be protected from the dynamic energy of waves by the USACE dune, the sand infill between the retaining wall and the USACE dune, and the USACE beach renourishment that would extend about 200 feet seaward from the USACE dune. While USACE intends to maintain the beach and the dune and renourish them as necessary, the sand-retaining wall has been designed to minimize the potential for beach erosion in the event that the USACE dune fails, the USACE renourished beach erodes, and the sand infill between the wall and the dune erodes. In the unlikely event that this should occur under an extreme storm event, the 2 foot gap between the bottom of the sand-retaining wall panels and the calculated erosion depth of +5 feet NAVD88 (the lowest beach level assumed by the USACE in the absence of any beach

nourishment) would allow the scour to open a gap beneath the wall, allowing some of the water to pass under it. Any scouring that may occur in front of the wall during such a storm condition would be expected to be localized in front of the wall and would not cause general erosion of the beach. The boardwalk foundation, the boardwalk planks, access elements (stairs and ramps), lighting, railings and other finishing items have been designed in accordance with American Society of Civil Engineers standards for Flood Resistant Design and Construction (Standard 24-05) and are suitable for placement within the CEHA. Therefore, elements of the reconstructed boardwalk would not be expected to break apart and become hazards to people and wildlife during future storm events.

The construction and operation of the proposed project would not adversely affect the functioning of the renourished beach as a natural protective feature area as identified under CEHA and its functioning to protect the community against erosion or high water, or adversely affect existing erosion protection structures, and would meet the standards for issuance of a coastal erosion management permit.

WETLANDS

The proposed project will require authorization from NYSDEC under ECL Article 25 Tidal Wetlands. Construction and operation of the proposed project would not adversely affect the buffering function of the NYSDEC tidal wetlands adjacent area within the project site to protect the NYSDEC littoral zone tidal wetlands mapped along the ocean side portion of the beach. The proposed project is the replacement of the previously existing boardwalk generally within the same footprint. As described in Chapter 1, "Project Description," certain locations may have a "bump-out" to accommodate stair and ramp landing areas (particularly in creating ADA-compliant access points to the new boardwalk height) and other facilities such as locations for benches and other amenities. New bump-outs could be up to 5 feet in additional width and would be built on the pier caps. Existing footprint bump-outs could be up to 15 feet in width. In addition, the boardwalk alignment may be straightened out by shifting the footprint in the north or south direction between 5 and 10 feet to provide a continuous boardwalk length. The reconstructed boardwalk would be located above the MHWS elevation and would, therefore, be outside USACE jurisdiction. In general, the boardwalk reconstruction would have minimal impact to the beach landward of the boardwalk (limited disturbance to allow construction access) and would not result in an increase in impervious surface that would affect the buffering capacity of the beach waterward of the boardwalk to protect NYSDEC mapped littoral zone tidal wetlands along the shoreline. Therefore, the proposed project would meet the requirements for authorization under Article 25 of the ECL for activities within the NYSDEC tidal wetland adjacent area and would be compliant with federal Executive Order 11990 ("Protection of Wetlands").

ECOLOGICAL COMMUNITIES

The proposed sand fencing between Beach 9th and Beach 20th Streets, which would be installed with or without the proposed project, would be placed well landward of the natural maritime dunes that occur in the area to avoid impacts or disturbance to this ecological community. The sand fencing would be constructed in the future without the proposed project to be nearly contiguous and in alignment with the eastern terminus of the USACE dune, in an area of disturbed, heavily trafficked and unvegetated beach that lacks maritime dune ecological community features.

The proposed reconstruction of the boardwalk would generally occur within its original footprint, and all access points would be constructed on disturbed areas within the boardwalk right-of-way and would not have a significant adverse impact on the existing maritime dunes community. Therefore, the proposed project would result in only minimal loss of vegetation that may have grown in these areas in the time since the storm damage to the boardwalk occurred in October 2012 and that may be present within the area of disturbance for the proposed project. This minimal loss of vegetated maritime dunes community would not result in significant adverse impacts on the abundance and distribution of this community within the study area or the New York metropolitan region. Furthermore, should any maritime dunes habitat be disturbed during the reconstruction of the boardwalk, they would be restored with native maritime plant species. These plantings would occur on the seaward and landward sides of the boardwalk where feasible and where these plantings would not have the potential to adversely affect piping plover and common and least tern nesting habitat. Therefore, the proposed project would not result in a significant adverse impact on the maritime dunes community within the vicinity of the project site. Through the restoration program, the proposed project has the potential to enhance this community in many locations along the project site.

The access structures that would be constructed between Beach 126th and Beach 149th Streets would be built within areas of unvegetated beach and over the newly constructed dune. Therefore, these structures would not have the potential to result in the loss of, or impacts to, vegetation or ecological communities. Overall, the proposed project would not have significant adverse impacts to plants or ecological communities in the vicinity of the project site.

WILDLIFE

As discussed above, the dune currently being constructed by USACE will impede storm overwash from reaching maritime dune habitat that remains behind the maritime beach habitat in some places, and will thereby have the potential to result in gradual changes in vegetation composition and density, and other habitat conditions for wildlife. In addition, portions of the Eastern Portion of the Arverne URA outside the nature preserve/parks and dune preserve area would be directly lost to complete the construction of the Arverne Urban Renewal Project. These changes will occur entirely independent of the proposed project. The proposed project would not result in significant adverse impacts to wildlife or wildlife habitat. The boardwalk would be reconstructed largely within its original footprint, and new construction would be limited to modified access points within currently disturbed areas in the right-of-way between Beach 20th and Beach 126th Streets, a sand-retaining wall beneath the boardwalk, access stairs and ramps over the constructed USACE dune between Beach 126th and Beach 149th Streets, and sand fencing between Beach 20th and Beach 9th Streets (which would be installed with or without the proposed project) to extend flood protection to communities east of the eastern end of the USACE dune. None of these actions would significantly affect the quantity, quality, or types of habitat that would be available to wildlife in the study area. Because of the existing boardwalk's low profile in most sections and the dune being built by USACE independently of the proposed project, the sand-retaining wall would not further impede any movement of wildlife between areas of open beach and areas of maritime dune habitat to the north of the boardwalk. In the future without the proposed project, the proposed sand fencing between Beach 20th and Beach 9th Streets would be placed landward of the natural dunes that occur in this area in order to avoid impacts to potential piping plover nesting habitat (see "Terrestrial Threatened, Endangered, and Special Concern Species" below).

Noises and increased human activity that would be generated during the construction of the proposed project would likely cause disturbances to and displace some wildlife, but these effects would be temporary and localized to the specific segments of the project site undergoing construction activities (i.e., the entire project site would not be under construction at once). Because baseline levels of human disturbance in the area are already high due to extensive recreational use of the beach, foot traffic on the boardwalk, beach engineering and maintenance activities (e.g., beach renourishment), and various background noises associated with the urban surroundings (e.g., motor vehicles, train passage on the elevated A train tracks), wildlife communities in the study area are dominated by urban-adapted, generalist species (e.g., great black-backed gulls, herring gulls, rock doves, American crows) that may habituate to and tolerate the construction activity. Any wildlife displaced by construction activities would be expected to move to suitable available habitat sufficiently distant from any given segment of the project site that is under construction. Construction between Beach 17th and Beach 73rd Streets, where piping plovers, least terns, and common terns nest, and in the vicinity of Beach 19th Street, where piping plovers also occasionally nest, would be limited to the non-breeding period (early fall to late winter) to avoid potential impacts to these sensitive, listed species. Because the nesting phenology of piping plovers can vary from year to year (i.e., in some years, nesting may be completed much earlier or later than on average), it would be confirmed with USFWS and DPR piping plover monitors that the piping plovers on Rockaway Beach were finished nesting for the season before any work would begin on the segments of boardwalk near the nesting sites. The vast majority of maritime dune habitat and other natural habitat (e.g., coastal shrub/scrub) for wildlife in the study area occurs between Beach 35th and Beach 73rd Streets, and limiting construction in the segment of the project site between Beach 17th and Beach 73rd Streets to the fall and winter would also avoid potential disturbance to any other species of birds that nest in this area.

Operation of the proposed project would not significantly differ from that of the boardwalk prior to the storm damage sustained in 2012 and, therefore, would not have significant adverse impacts to wildlife occupying the area under those conditions. The sand-retaining wall would not affect the wildlife habitats that would occur as a result of the USACE-constructed dune and beach renourishment. The USACE intends to maintain the dune and beach and renourish them as necessary with or without the sand-retaining wall proposed as part of the proposed project. Overall, neither construction nor operation of the proposed project would be expected to have significant adverse impacts to wildlife at the individual or population level. Therefore, the proposed project would comply with the federal Migratory Bird Treaty Act and New York State's Endangered and Threatened Species of Fish and Wildlife Act.

TERRESTRIAL THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Federally- and/or state-listed species, and rare, threatened or special concern species that are known to, or considered to have the potential to, occur within the study area include piping plover, least tern, common tern, checkered white butterfly, seabeach amaranth, dune sandspur, seabeach knotweed, cut-leaved evening-primrose, narrow-leaf sea-blite, retrorse flatsedge, and slender crabgrass. The red knot, which has been proposed for federal listing as threatened, may also occur in the area during migration.

Mixed nesting colonies of piping plover, least tern, and common tern occur on the areas of open beach south of the boardwalk between Beach 35th and Beach 73rd Streets, and are managed by DPR to protect nest sites from human disturbance, reduce vegetation cover, and limit nest

predation (Boretti et al. 2007, DPR 2013). Piping plovers have also recently nested between Beach 19th and Beach 23rd Streets. As discussed above, in accordance with conservation measures requested by USFWS, construction of the proposed project between Beach 17th and Beach 73rd Streets would be limited to the non-breeding period (early fall to late winter) to avoid disturbance to these species (see Appendix B).

No elements of the proposed project would occupy or otherwise impact piping plover or tern nesting sites between Beach 35th and Beach 73rd Streets. Development of the Eastern Portion of the Arverne URA will likely affect piping plovers and terns nesting nearby by eliminating potential foraging habitat (for piping plovers), eliminating much of the buffer that separates the plover and tern nest sites from the development north of Rockaway Beach Boulevard, and increasing levels of human activity in the area. The dune currently being constructed by USACE will impede storm overwash from reaching any undeveloped areas remaining behind these nest sites after completion of the Arverne URA, which will likely reduce the quality of these areas as potential foraging habitat for the piping plovers nesting nearby (cf. Elias et al. 2000, McIntyre and Heath 2011). The dune is also likely to physically block piping plovers from accessing these areas. However, these potential effects on piping plovers from construction of the USACE dune and the Eastern Portion of the Arverne East URA would occur independently of the proposed project. Because the landward edge of the USACE dune will be immediately adjacent to, and nearly flush and level with, the seaward edge of the boardwalk and will be maintained as such over time, independent of the proposed project, the proposed boardwalk and sand-retaining wall would not be expected to further impede overwash processes or any movement of piping plovers between areas of open beach and remaining areas of maritime dune habitat to the north of the boardwalk. No other impacts to piping plovers or their habitat would result from construction of the proposed project. Planting of vegetation within the narrow gap between the seaward edge of the boardwalk and the USACE dune would occur where this vegetation would not have the potential to adversely affect piping plover and common and least tern nesting habitat, as determined in consultation with the USFWS (see Appendix B).

Following USFWS required conservation measures, the proposed sand fencing between Beach 9th and Beach 20th Streets would, in the future with or without the proposed project, be constructed inland from the natural dunes amongst which piping plovers nested in 2013 in order to avoid impacting piping plovers or their habitat in this area. Vegetation thinning, increased channelization between the natural dunes to improve penetration of storm overwash, or other measures that may improve habitat quality for piping plovers in this area would be considered in consultation with USFWS. Common and least terns on the Rockaway Peninsula nest on open beach and forage (for fish) over the ocean, and therefore, neither nesting nor foraging habitat for terns would be significantly impacted by the USACE dune or the proposed project.

Constructing the project between Beach 17th and Beach 73rd Streets during only early fall to late winter to avoid disturbance to nesting piping plovers would also avoid the potential for disturbance to red knots that are known to occasionally occur in the plover nesting area during spring and fall migration, which is generally from late April to late May and early August to late August, respectively. As discussed above, high levels of human disturbance make it unlikely that red knots would stage elsewhere along the project site. Because the boardwalk would be primarily reconstructed within its pre-existing alignment, no loss of, or other significant impact to, red knot staging habitat would result from the proposed project.

Operation of the proposed project would not significantly differ from that of the boardwalk prior to the storm damage sustained in 2012 and, therefore, would not have significant adverse

impacts to piping plovers, least terns, and common terns occupying the area under those conditions. These species would be expected to occur in the study area with the same likelihood and in the same abundance as in the future without the proposed project, and have the same levels of reproductive success and survival.

Checkered white butterflies are uncommon as far north as New York, but have the potential to occur near the project site. As discussed above, checkered white butterflies are disturbance-tolerant and occupy a variety of highly degraded habitats. The proposed project would not result in the loss of checkered white butterfly habitat and would not reduce the suitability of the surrounding areas as habitat for the species. No individuals would be expected to be directly lost or otherwise impacted from the construction and operation of the proposed project. Checkered white butterflies would have the same potential to occur in the area as at present. Overall, construction and operation of the proposed project would not have significant adverse impacts to the checkered white butterfly or its habitat.

Because dune sandspur is known to occur within the project site in the maritime dunes habitat, and seabeach amaranth, seabeach knotweed, cut-leaved evening-primrose, narrow-leaf sea-blite, retrorse flatsedge, and slender crabgrass have the potential to occur within the project site, surveys for these species (i.e., documenting locations and numbers of individual plants) would be conducted within the finalized areas of disturbance prior to construction. A planting and propagation program for the dune sandspur, and any other confirmed rare, threatened or endangered plant species within the project site would be developed in coordination with DPR and/or NYSDEC/NYNHP. Because dune sandspur and the other rare, threatened, endangered, or rare plant species are annuals (with the exception of retrorse flatsedge, which is perennial), the protection program may include seed collection from dune sandspur and other plant individuals that would otherwise fall within the area of disturbance. Dune sandspur seeds were collected from within the project site by DPR in November 2013 for storage. Collected dune sandspur seeds, and any other rare plant species seeds collected within the area of disturbance, will be directly seeded as part of the maritime dunes habitat restoration program in the disturbed locations in the autumn following completion of construction activities. In addition, any retrorse flatsedge individuals within the footprint of disturbance would be transplanted when practical as part of the maritime dunes habitat restoration program. Following USFWS required conservation measures, surveys of seabeach amaranth within the area of disturbance would be conducted prior to construction (see Appendix B). Should seabeach amaranth individuals be found within the area of disturbance, their protection program (e.g., seed harvesting and propagation) would be developed in coordination with USFWS. Dune sandspur that occurs in large numbers (thousands of individuals) on the dunes between Beach 9th and Beach 20th Streets would be unaffected by the proposed sand fencing, which would be placed landward of the natural dunes in the future with or without the proposed project. With these measures in place, neither construction nor operation of the proposed project would be expected to result in significant adverse impacts to federally-or state-listed species at the individual or population level. The USFWS has concurred with the determination that the proposed project would not be likely to adversely affect any federally-listed species (see **Appendix B**).The proposed project would comply with the federal Endangered Species Act and New York State's Endangered and Threatened Species of Fish and Wildlife Act and Removal of Trees and Protected Plants regulations.

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