

## **11.0 INTRODUCTION**

This chapter examines the potential impacts to sewer and water infrastructure from the implementation of one or more proposed initiatives (Proposed Actions) intended to enhance coastal and social resiliency along the Tottenville shoreline of the South Shore of Staten Island, NY. These initiatives include the Living Breakwaters Project (Breakwaters Project) and Tottenville Shoreline Protection Project (Shoreline Project).

In accordance with the 2014 *City Environmental Quality Review (CEQR) Technical Manual* and the National Environmental Policy Act (NEPA), the chapter describes:

- Existing wastewater and stormwater conveyance, and wastewater treatment;
- Wastewater and stormwater conveyance, and wastewater treatment conditions in the future without the Proposed Actions (the No Action Alternative); and
- Potential impacts of the Proposed Actions on wastewater and stormwater systems under three proposed alternatives (Alternative 2: the Layered Strategy, or the Preferred Alternative; Alternative 3: the Breakwaters Project without the Shoreline Project; and Alternative 4: the Shoreline Project without the Breakwaters Project).

## **11.1 PRINCIPAL CONCLUSIONS**

The Proposed Actions would result in the implementation of one of three alternatives analyzed in this environmental impact statement (EIS); Alternative 2 includes both the Breakwaters Project and the Shoreline Project; Alternative 3 includes only the Breakwater Project component; and Alternative 4 includes only the Shoreline Project component.

The proposed breakwaters system would be installed within Raritan Bay off the south shore of Staten Island and the Shoreline Project elements and proposed Water Hub element of the Breakwaters Project would be implemented along the shoreline and in upland areas almost entirely within Conference House Park. The study area is within the portion of Staten Island that is partially sewer, with some areas serviced by separate sanitary and storm sewers, and the remaining area served by septic systems for the treatment of sanitary waste.

During the placement of sand for shoreline restoration, measures would be implemented to protect the existing stormwater outfall in Raritan Bay at the end of Loretto Street. During construction of the Shoreline Project, measures developed in consultation with New York City Department of Environmental Protection (NYCDEP) would be implemented to protect the stormwater outfalls at the end of Loretto Street, Sprague Avenue, Joline Avenue and Bedell Avenue from the physical impact of the additional sand and associated additional loads that would be placed on these outfalls. Additionally, construction of shoreline elements (Shoreline Project and proposed Water Hub if sited at Potential Location 1) would be undertaken in accordance with erosion and sediment control plans and best management practices (e.g., silt

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fencing and hay bales) incorporated into the SWPPP prepared for the Proposed Actions under the SPDES General Permit GP-0-15-002 for Stormwater Discharges from Construction Activity and would not result in adverse impacts to storm sewers. Therefore, construction of the Proposed Actions would not result in significant adverse impacts to stormwater infrastructure.

Should a sanitary sewer be constructed in Page Avenue, as indicated in the City's approved Drainage Plan by the 2020 build year, the discharge of 1,350 gallons per day (gpd) of sanitary waste from the Proposed Water Hub (at Potential Location 1) as estimated in accordance with the *CEQR Technical Manual*<sup>1</sup> would not be expected to adversely affect the operation of this sanitary sewer. Should a sanitary sewer not be available to receive sanitary waste from the proposed Water Hub at Potential Location 1, similar to other areas within the study area, sanitary waste would be discharged to a septic system designed in accordance with NYCDEP, New York City Department of Buildings (NYCDOB), New York City Department of Health and Mental Hygiene (DOHMH), New York State Department of Environmental Conservation (NYSDEC), and New York State Department of Health (NYSDOH) requirements and standards. If programming of the Water Hub is sited at Potential Location 2 within an existing New York City Department of Parks and Recreation (NYC Parks) building, sanitary waste would be discharged to the existing septic system. As part of the repurposing either NYC Parks structure, the septic system will be evaluated and upgrades made as necessary to accommodate the new use.

The Breakwaters Project has been designed to reduce wave energy at the shoreline, and prevent or reverse shoreline erosion, without adversely affecting tidal flushing within the study area. The Breakwaters Project will be designed to avoid interfering in the current functionality of the existing outfalls maintained by NYCDEP. Therefore, the Proposed Actions would not result in significant adverse impacts to the operation of the stormwater outfalls on Loretto Street, Sprague Avenue, Joline Avenue, and Bedell Avenue due to increased sedimentation of the outfalls.

The Shoreline Project has been designed to reduce risk for the shoreline area of Tottenville from wave action, but is not being designed to protect the shoreline from storm surge in Raritan Bay. These measures would be porous in nature, and seepage through the system (earthen berm, hybrid dune, eco-revetment) is likely to be slowed and of lower volume than with free flowing water entering the land without the project. In these situations, high water in Raritan Bay would penetrate through and under these risk-reduction structures to the approximate elevation of the storm tide. This would occur with or without the implementation of the Shoreline Project, however the Shoreline Project would provide a benefit by reducing or delaying this flooding. Therefore, the Shoreline Project would not adversely affect the way the existing stormwater collection system operates. While the Shoreline Project would address the impacts of coastal flooding (i.e., it is not designed to avoid flooding caused by severe storms, but would reduce or delay flooding of inland areas and reduce damage to inland structures), during extreme surge events, stormwater outfalls along the coastline may experience backflow inundation leading to flooding of inland catch basins. Backflow flooding along the shoreline would be experienced with or without the Shoreline Project.

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<sup>1</sup> *CEQR Technical Manual*, March 2014, p. 13-12.

Additionally, the measures integrated into the Shoreline Project in consultation with NYCDEP to address the increased loads on stormwater outfalls within the Shoreline Project footprint would avoid potential impacts to the stormwater infrastructure.

The Shoreline Project has integrated green infrastructure measures such as bioswales into the design for the eco-revetment and the raised edge where possible to minimize potential impacts to storm sewers. Similarly the parking lot design for the Water Hub would incorporate green infrastructure measures. Other green infrastructure measures will be considered, as necessary, as design progresses. With these measures in place, runoff resulting from the Proposed Actions would not have the potential to significant adverse impacts the storm sewer collection system.

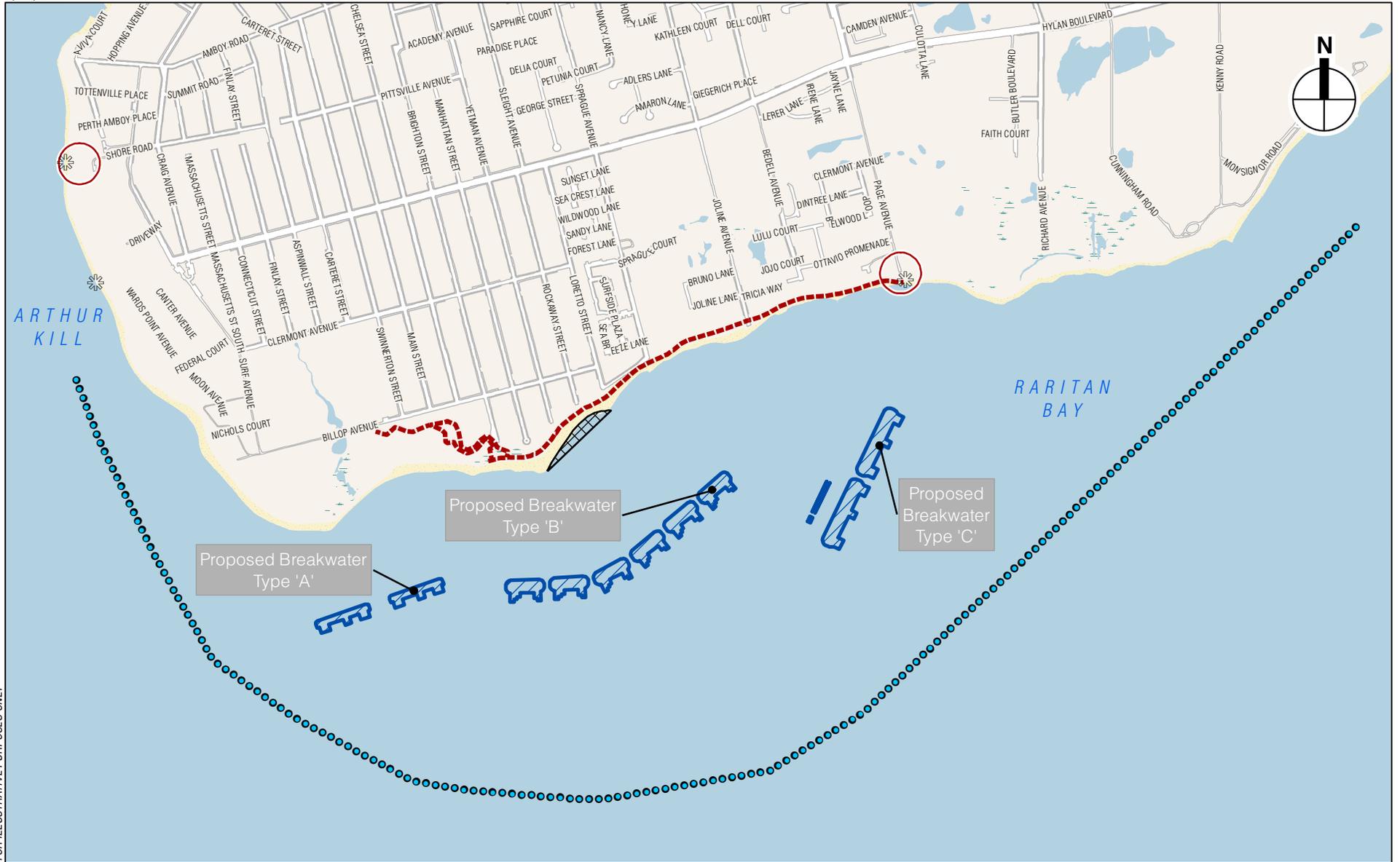
## 11.2 METHODOLOGY

### 11.2.1 STUDY AREA

The Proposed Actions would be undertaken in the Tottenville area of Staten Island, along the neighborhood's southern shoreline and just offshore within the waters of Raritan Bay. Tottenville is located at the southwestern tip of Staten Island, and is the southernmost neighborhood in New York City (**Figure 11-1**). It is bounded by water on three sides, with the Arthur Kill to the west and north and Raritan Bay to the south.

The Breakwaters Project would comprise approximately 3,900 linear feet off the Tottenville shoreline of Staten Island (**Figure 11-1**). With the exception of a small portion of the Shoreline Project proposed within an unbuilt portion of the New York City Department of Transportation (NYCDOT) Surf Avenue right-of-way, the Shoreline Project, and the Water Hub component of the Breakwaters Project at Proposed Location 1, would occupy the portion of the south shore of Staten Island within Conference House Park from approximately west of the intersection of Swinnerton Street and Billop Avenue to Page Avenue and would be tailored to the changing character of the shoreline along this stretch (**Figure 11-1**). The proposed Water Hub at Location 1 would be located on the waterfront in one of two possible locations at the terminus of Page Avenue. The Hub would include onshore and near-shore elements that would include a building, parking area, seasonal boat launch and landscaping elements. It would provide a place for access to the waterfront, orientation, education, information on coastal resiliency, gathering space and equipment storage. The new facility will host restoration and educational programs including field science monitoring activities for local community and school groups, as well as expand on the existing stewardship, educational and other community activities which currently take place in Conference House Park. Should Water Hub programming be located at Potential Location 2, a small facility would be located at Potential Location 1 to provide seating, wayfinding potential storage for kayaks and beach cleaning equipment. This structure would be a pavilion, shed or other light structure with a footprint of 1,600 square feet or less connected to public water but without sanitary facilities. The existing parking facilities at the terminus of Page Avenue would be used to access this facility.

The Water Hub at Potential Location 2 would occupy the north-western portion of Conference House Park between approximately Hylan Boulevard and Shore Road. At this location, the Water Hub would include the adaptive reuse of one of two existing NYC Parks buildings (either the Henry-Hogg Biddle House or the Rutan-Beckett House).



FOR ILLUSTRATIVE PURPOSES ONLY

-  Proposed Breakwater Features
-  Proposed Shoreline Project Elements
-  Proposed Floating Dock and Oyster Nursery
-  Aquatic Resources Study Area (Outer Boundary)
-  Proposed Shoreline Restoration Area
-  Potential Location of Proposed Water Hub (exact location to be determined)
-  Potential Water Access

For the purposes of this assessment, the study area for sewer and water infrastructure comprises the infrastructure systems bounded by Hylan Boulevard to the north, Raritan Bay to the south, Finlay Street and portions of Conference House Park to the west, and Page Avenue to the east.

### 11.2.2 WATER SUPPLY

According to the *CEQR Technical Manual*, a preliminary water supply analysis is needed if a project would result in an exceptionally large demand of water (over 1,000,000 gpd), or if it is located in an area that experiences low water pressure (i.e., an area at the end of the water supply distribution system such as the Rockaway Peninsula or Coney Island). The Proposed Actions are located in Tottenville, Staten Island, an area not indicated as experiencing low water pressure.

The proposed Water Hub (a component of the Breakwaters Project) is the only element of the Proposed Actions which would require connection to the New York City water supply system. The proposed Water Hub facility (if sited at Potential Location 1) would be an enclosed approximately 5,000-square-foot building elevated above the 100-year flood elevation by 3 feet and approximately 35,500 square feet of site improvements that would include landscaping, parking and utility spaces and designated space for the use of NYC Parks vehicles and equipment. An approximately 210-foot-long by 8-foot wide accessory seasonal boat launch would extend from the shoreline into the water for use by shallow draft research vessels. It is anticipated that the facility would be used by the New York Harbor Foundation, NYC Parks, and schools and community groups. Should Water Hub programming be located at Potential Location 2, the small facility that would be located at Potential Location 1 for kayak storage would be connected to the public water supply.

Siting the Water Hub programming at Potential Location 2 includes the adaptive reuse of one of two existing NYC Parks buildings (either the Henry-Hogg Biddle House or the Rutan-Beckett House). Both of these existing buildings are connected to the public water supply.

The proposed Water Hub (at either location) will host restoration and educational programs including field science monitoring activities for local community and school groups, as well as expand on the existing stewardship, educational and other community activities which currently take place in Conference House Park.

Future water demand and sanitary sewage generation from the proposed Water Hub are calculated based on use generation rates set by the *CEQR Technical Manual*.<sup>2</sup> On the basis of the proposed Water Hub building size at Potential Location 1, the estimate water usage rate using the Commercial/Office rate with air conditioning would be approximately 1,350 gpd, far below the 1,000,000 gpd that would require analysis of potential impacts to water supply under the *CEQR Technical Manual*. Because the Biddle House (4,960 total square feet) and Rutan-Beckett House (2,760 total square feet) at Potential Location 2, and new small facility (1,600 square feet) that would be located at Potential Location 1 should Location 2 be used for the Water Hub are even smaller, the water usage for these locations would be even less. Therefore, a preliminary infrastructure analysis of potential effects to water supply is not required for the Proposed Actions.

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<sup>2</sup> *CEQR Technical Manual*, March 2014, p. 13-12.

### 11.2.3 WASTEWATER AND STORMWATER CONVEYANCE AND TREATMENT

The *CEQR Technical Manual* indicates that a sewer analysis is warranted if a project site is located in an area that is partially sewer or currently unsewered<sup>3</sup>. The study area is within the portion of Staten Island that has areas that are partially sewer, as described below. Therefore, analysis of the Proposed Action's effects on wastewater and stormwater infrastructure is presented.

## 11.3 EXISTING CONDITIONS

Existing wastewater and stormwater conveyance systems have been characterized on the basis of the Drainage Plans and "design" and "as-built" sewer drawings provided by NYCDEP.

### 11.3.1 WASTEWATER

The study area is located within the portion of Staten Island that contains separate systems for sanitary sewage and stormwater. Additionally, the portion of the study area approximately east of Loretto Street appears to use septic systems to dispose of sanitary sewage. The sanitary collection system west of Loretto Street consists of 10 inch, 12 inch, 15 inch and 18 inch sanitary sewers that discharge into interceptor sewers. Sanitary Interceptors are located in Main Street between Billop Avenue and Hylan Boulevard (24 inch diameter) and in Hylan Boulevard (42 inch diameter). Potential Location 2 for the Water Hub uses septic systems. Currently based on information from NYCDEP, there is no sanitary sewage infrastructure in Page Avenue south of Hylan Boulevard, although such conveyance is planned as per NYCDEP Drainage Plans. The sanitary interceptor in Hylan Boulevard runs in an easterly direction and increases in size to a 48 inch sewer east of Richard Avenue, and eventually conveying sanitary waste to the Oakwood Beach Water Pollution Control Plant (WPCP), which is located outside of the project area, in the eastern portion of Staten Island.

Oakwood Beach WPCP has a drainage area of 10,779 Acres.<sup>4</sup> The drainage area extends to South Avenue to the northwest, to Amsterdam Avenue to the north (south of the Staten Island Expressway), and to Roanoke Street east of La Tourette Park to the eastern shore of Staten Island. It serves approximately 244,918 residents. The average daily sanitary sewage flow rate is roughly 29 million gallons per day (MGD). The Oakwood Beach WPCP has a design dry-weather flow (DDWF) capacity of 39.9 MGD.

### 11.3.2 STORMWATER

The study area is within portions of three Tributary Areas of the NYCDEP Drainage Plans for Tottenville which are bounded by Amboy Road, the Arthur Kill, Raritan Bay and the western portion of Mount Loretto Unique Area. The Tributary Areas are described as follows:

- Western Tributary Area—The western Tributary Area extends from the Arthur Kill to Swinnerton Street.

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<sup>3</sup>[http://www.nyc.gov/html/oec/downloads/pdf/2014\\_ceqr\\_tm/2014\\_ceqr\\_tm\\_ch13\\_water\\_sewer\\_infrastructure\\_sewered\\_and\\_unsewered.pdf](http://www.nyc.gov/html/oec/downloads/pdf/2014_ceqr_tm/2014_ceqr_tm_ch13_water_sewer_infrastructure_sewered_and_unsewered.pdf)

<sup>4</sup> <http://www.nyc.gov/html/dep/html/wastewater/wwsystem-plants.shtml>

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- Middle Tributary Area—The middle Tributary Area extends from Main Street to Bedell Avenue.
- Eastern Tributary Area—The eastern Tributary Area extends from east of Bedell Avenue to the western portion of Mount Loretto Unique Area.

As currently understood on the basis of discussions held with NYCDEP, NYCDEP is preparing an Amended Drainage Plan for the middle Tributary Area (Main Street to Bedell Avenue) which will be consistent with the Amended Drainage Plans for the eastern and western portions of Tottenville.

The stormwater collection system for the western Tributary Area consists of storm sewers varying in size from 12 inch diameter to a 60 inch by 38 inch sewer in Finlay Street. The storm sewer collection system from this area discharges into the Conference House Park Bluebelt stormwater management system,<sup>5</sup> an open channel within an the approximately 2.4-acre marsh within Conference House Park just south of Clermont Avenue (see additional details in Chapter 9, “Natural Resources”). Stormwater flows into a best management practice (BMP) detention pond located just north of a future extension of Billop Avenue west of Swinnerton Street. The detention pond discharges into a 12 ft by 4 ft culvert under the Billop Avenue extension to an open channel just south of Billop Avenue, which flows through Conference House Park and tidal wetlands prior to discharging into Raritan Bay.

Within the middle Tributary Area, from Main Street to Loretto Street, runoff is collected from the street system via catch basins. The runoff is then discharged to pipe-and-box storm sewers and conveyed to a large-box sewer in Loretto Street, which discharges to Raritan Bay through a 13 ft by 5 ft 6 inch stormwater outfall located in the extension of Loretto Street south of Surf Avenue.

The NYCDEP Drainage Plan for the area between Loretto Street and Bedell Avenue shows existing storm sewers in portions of Sprague Avenue, Hylan Boulevard, Joline Avenue and Bedell Avenue. There is an existing 5 ft by 3 ft stormwater outfall leading into Raritan Bay south of the Surf Avenue right-of-way in the extension of Joline Avenue, and an existing 36 inch stormwater outfall leading into Raritan Bay in the extension of Bedell Avenue south of the Surf Avenue right-of-way. Additionally, there is an existing 36 inch diameter stormwater outfall at the end of Sprague Avenue that discharges to Raritan Bay.

While there is no existing stormwater infrastructure east of Bedell Avenue within the eastern Tributary Area, NYCDEP Drainage Plans indicate a future 83 inch by 53 inch stormwater outfall in the extension of Page Avenue south of the Surf Avenue right-of-way serving an upland area of approximately 65 acres. To the east of the study area is the Butler Manor Bluebelt stormwater management system that is serving an upland area of approximately 160 acres and discharges into Raritan Bay.

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<sup>5</sup> [http://www.nyc.gov/html/dep/pdf/brochures/si\\_bluebelt\\_brochure.pdf](http://www.nyc.gov/html/dep/pdf/brochures/si_bluebelt_brochure.pdf)

## 11.4 EFFECTS ASSESSMENT

### 11.4.1 ALTERNATIVE 1—NO ACTION ALTERNATIVE

The No Action alternative assumes that no new structural risk reduction projects or marine habitat restoration projects will be implemented in the study area. The existing wastewater and stormwater collection systems and outfalls would be as described under the existing condition, with the implementation of any infrastructure improvements approved by NYCDEP as per the existing and/or future amendments to the Drainage Plans and constructed by the 2020 build year. This alternative also assumes that current trends with respect to coastal conditions at Tottenville—i.e., relating to erosion and wave action—will continue. Under the No Action Alternative, the existing man-made temporary dune system would remain. These dunes and the Tottenville shoreline would remain vulnerable to intense wave energy and thus continue to be at risk from storm wave damage. Under the No Action condition, the Tottenville shoreline is expected to continue to erode in certain locations. Numeric simulation of shoreline changes revealed that in the southwestern portions of the site (southwest of Sprague Avenue) both the overall pattern and rates of shoreline erosion and accretion are likely to continue into the future, including erosion rates of 1.0 to 2.0 feet per year between Loretto Street and Manhattan Street, and between 2.0 and 3.5 feet per year in Conference House Park between Main Street and Wards Point. Northeast of Sprague Avenue, the general pattern of erosion and accretion appear to remain the same, though rates of change simulated are slightly lower in the future than those historically observed.

### 11.4.2 ALTERNATIVE 2 (PREFERRED ALTERNATIVE)—THE LAYERED TOTTENVILLE SHORELINE RESILIENCY STRATEGY: LIVING BREAKWATERS AND TOTTENVILLE SHORELINE PROTECTION PROJECT (LAYERED STRATEGY)

As described in Chapter 1, “Purpose and Need and Alternatives,” Alternative 2 consists of the implementation of two individual projects: Breakwaters Project and the Shoreline Project, as a layered strategy that would increase the overall resiliency of the Tottenville shoreline. The preferred layout of the breakwaters would attenuate wave energy and reduce shoreline erosion at the water’s edge, effectively holding, or in some locations increasing, beach width. The primary goal of the Shoreline Project is to reduce the risk of wave energy along the shoreline. Nevertheless, it would reduce or delay flooding of inland areas during certain storm events, and reduce damage to inland structures. It is expected that during coastal storm events, in cases where over-topping from storm surge does not occur, some level of risk reduction from coastal flooding would be provided by the Shoreline Project.

#### *BREAKWATERS PROJECT*

The proposed Breakwaters Project comprises the ecologically enhanced breakwater system, which would include approximately 10 breakwater segments of varying size, the proposed area of shoreline restoration, the in-water oyster nursery, the proposed seasonally placed floating dock, and the proposed Water Hub at Proposed Locations 1 and 2 with water access via an accessory seasonal boat launch, or permanent floating dock at Proposed Location 2 if connected to the reconstructed Conference House Park Pavilion (**Figure 11-1**). The proposed breakwaters would have a total length of approximately 3,900 linear feet within Raritan Bay and would be located between 500 and 2,100 feet from the shoreline. Additionally, the vast majority of the

breakwater structures would be located more than 1,500 feet and at least 500 feet inshore from the Federal Navigation Channel with one breakwater segment located more than 700 feet from the channel. Considering up to 30 inches sea level rise, these breakwaters would be able to reduce wave heights to less than 3 feet in a 100-year storm event, thereby reducing shoreline erosion and structural damage.

The proposed shoreline restoration would extend along approximately 806 feet of shoreline between Manhattan Street and Loretto Street. This 3.8-acre area was selected for one-time shoreline restoration because of high historical and projected erosion rates, narrow beach width and the presence of adjacent vulnerable assets (tidal wetlands and homes) in the FEMA V and Limit of Moderate Wave Action zones. The shoreline restoration approximate the historic 1978 shoreline position, augment the accretion potential that can be provided by the breakwaters and add sediment to the overall system, particularly contributing to one of the narrowest and most erosion-prone areas of beach in the site and generally enhancing overall beach growth potential.

Wave attenuation provided by the breakwaters on a day-to-day basis would help to maintain beach conditions by reducing long term beach erosion rates, reducing exposure of shoreline structures to erosion, and encouraging accretion in priority beach zones. The breakwater system would help to minimize down-drift erosion by holding sand in the system through wave energy reduction along the shoreline. At the western tip of the study area near Ward's Point, the breakwaters would likely reduce sand migration into the Federal Navigation Channel. The breakwaters were also designed to encourage shoreline growth, or accretion, in places where the beach is most narrow and/or projected erosion rates are high. One-time shoreline restoration proposed for the narrow section of shoreline between Loretto Street and Manhattan Street would augment the accretion potential that could be provided by the breakwaters.

As described previously under "Water Supply," the proposed Water Hub facility at Proposed Location 1 would be an enclosed approximately 5,000-square-foot building elevated above the 100-year flood elevation and approximately 35,500 square feet of site improvements. At Proposed Location 2, the Water Hub would include the adaptive reuse of one of two existing NYC Parks buildings (either the Henry-Hogg Biddle House or the Rutan-Beckett House). At either location, the Water Hub would be used by the New York Harbor Foundation, NYC Parks, and schools and community groups. The new facility will host restoration and educational programs including field science monitoring activities for local community and school groups, as well as expand on the existing stewardship, educational and other community activities which currently take place in Conference House Park.

### *SHORELINE PROJECT*

The proposed Shoreline Project would consist of a series of shoreline protection measures that would include an earthen berm, hybrid dune system, eco-revetment, and a raised edge (revetment with trail) along with wetland enhancements, and landscaping with coastal plant species, as described in greater detail below. It would extend from approximately west of the intersection of Swinnerton Street and Billop Avenue to Page Avenue (**Figure 11-1**). The proposed earthen berm would be located from approximately Carteret Street to Brighton Street where it would transition to a reinforced, planted dune system that would extend to Loretto Street. The proposed hybrid dune system would transition to an eco-revetment along Surf Avenue and would extend to approximately Sprague Avenue, where a stretch of edge (revetment with trail) would continue the rest of the length of the Shoreline Project to Page Avenue (near the site of the proposed Water Hub). Transition nodes would connect each project element; these

would consist of concrete pavers connected to sidewalks or trails and stairways to allow shoreline access. The transition node between the earthen berm and the hybrid dune system would consist of a newly-constructed bridge over the 0.8-acre unmapped wetland.

Along the length of the Shoreline Project, additional shoreline treatments would be implemented, such as wetland enhancements and additional shoreline plantings. Green infrastructure would be implemented wherever possible and permeable path materials would be used throughout the project. The Shoreline Project has been designed to withstand storm wave action and overtopping of the shoreline structures, and to be resilient to sea level rise of 30 inches and provide some level of risk reduction from coastal flooding.

### *CONSTRUCTION*

As described above, the proposed shoreline restoration associated with the Breakwaters Project would extend along the length of shoreline between Manhattan Street and Loretto Street. During the placement of sand for shoreline restoration, measures would be implemented to protect the existing stormwater outfall in Raritan Bay at the end of Loretto Street. During construction of the Shoreline Project, measures would be implemented to protect the stormwater outfalls at the ends of Loretto Street, Sprague Avenue, Joline Avenue, and Bedell Avenue. This includes consideration of potential physical effects of the additional sand and associated additional loads that would be placed on these outfalls. These measures to avoid potential adverse effects to the stormwater outfalls would be coordinated with NYCDEP.

Construction of shoreline elements (Shoreline Project and proposed Water Hub at Location 1 and ADA access to the shoreline at Location 2 of the Breakwaters Project) would be undertaken in accordance with erosion and sediment control plans and best management practices (e.g., silt fencing and hay bales) incorporated into the SWPPP prepared for the Proposed Actions under the SPDES General Permit GP-0-15-002 for Stormwater Discharges from Construction Activity and would not result in adverse impacts to storm sewers from stormwater discharge during construction. This would include all staging areas, and any areas used for the temporary storage of excavated material. With these measures in place, construction of Alternative 2 would not have the potential to result in significant adverse impacts to storm sewers or to the Conference House Park Bluebelt project. Construction of Alternative 2 would not have the potential to adversely affect the sanitary sewer system.

### *OPERATION*

#### *Wastewater*

Should the sanitary sewer be constructed in Page Avenue as indicated in the approved Drainage Plan by the 2020 build year, the discharge of approximately 1,350 gpd of sanitary waste from the Proposed Water Hub at Location 1 as estimated in accordance with the *CEQR Technical Manual*<sup>6</sup> would not be expected to adversely affect the operation of this sanitary sewer. Should a sanitary sewer not be available to receive sanitary waste from the proposed Water Hub at Location 1, similar to other areas within the study area, sanitary waste would be discharged to a septic system designed in accordance with NYCDEP, NYCDOB, DOHMH, NYSDEC, and NYSDOH requirements and standards. The Proposed Water Hub at Location 2, if selected,

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<sup>6</sup> *CEQR Technical Manual*, March 2014, p. 13-12.

would discharge to the existing septic system of the repurposed NYC Parks building and would not, therefore, have the potential to affect the NYCDEP sanitary sewer system. As part of the repurposing either NYC Parks structure, the septic system will be evaluated and upgrades made as necessary to accommodate the new use.

*Stormwater*

The Breakwaters Project has been designed to reduce wave energy at the shoreline, and prevent or reverse shoreline erosion, without adversely affecting tidal flushing within the study area. Therefore, the Breakwaters Project component of Alternative 2 would not result in significant adverse impacts to the operation of the stormwater outfalls on Loretto Street, Sprague Avenue, Joline Avenue, and Bedell Avenue due to increased sedimentation at the outfalls. The Breakwaters Project will be designed to avoid interfering in the current functionality of the existing outfalls maintained by NYCDEP.

The Shoreline Project has been designed to reduce risk for the shoreline area of Tottenville from wave action, but is not being designed to protect the shoreline from storm surge in Raritan Bay. These measures would be porous in nature, and seepage through the system (earthen berm, hybrid dune, eco-revetment) is likely to be slowed and of lower volume than with free flowing water entering the land without the project. In these situations, high water in Raritan Bay would penetrate through and under these risk-reduction structures to the approximate elevation of the storm tide. This would occur with or without the implementation of the Shoreline Project, however the Shoreline Project would provide a benefit by reducing or delaying this flooding. Therefore, the Shoreline Project would not adversely affect the way the existing stormwater collection system operates. While the Shoreline Project would address the impacts of coastal flooding, during extreme surge events, stormwater outfalls along the coastline may experience backflow inundation leading to flooding of inland catch basins. Backflow flooding along the shoreline would be experienced with or without the Shoreline Project.

Additionally, the measures integrated into the Shoreline Project in consultation with NYCDEP to address the increased loads on stormwater outfalls within the Shoreline Project footprint would avoid potential impacts to the stormwater infrastructure.

The Shoreline Project has integrated green infrastructure measures such as bioswales into the design for the eco-revetment and the raised edge where possible to minimize potential impacts to storm sewers from Alternative 2. Similarly the parking lot design for the Water Hub at Location 1 would incorporate green infrastructure measures. Other green infrastructure measures will be considered, as necessary, as design progresses. With these measures in place, runoff resulting from Alternative 2 would not have the potential to significantly adverse impacts the storm sewer collection system. The Water Hub at Location 2, if selected, would adaptively reuse one of two existing NYC Parks buildings and would not result in land disturbance that would require post-construction stormwater management.

**11.4.3 ALTERNATIVE 3—BREAKWATERS WITHOUT SHORELINE PROTECTION SYSTEM**

Alternative 3 would develop the Breakwaters Project components as described in Alternative 2, including the in-water breakwaters, shoreline restoration and the Water Hub at Locations 1 or 2. None of the Shoreline Protection Project components would be developed under Alternative 3.

Under Alternative 3, sanitary waste from the proposed Water Hub at Locations 1 or 2 would not have the potential to adversely affect the sanitary sewer for the reasons discussed under Alternative 2.

Under Alternative 3, the Breakwater Project would minimize sedimentation of stormwater outfalls but without the Shoreline Project, the eroding barrier bags that comprise the temporary man-made dune would remain the only shoreline risk reduction feature. The barrier bags would not provide the same level of shoreline resilience as Alternative 2 and the remaining portions of the shoreline within the study area would remain in their current condition of being subject to wave energy and erosion. Additionally, Alternative 3 would not provide the benefit to the existing storm water collection system during periods of high wave action as described under Alternative 2. Therefore, under Alternative 3, the storm sewer collection system would remain as vulnerable during periods of high wave action as Alternative 1.

#### **11.4.4 ALTERNATIVE 4—SHORELINE PROTECTION SYSTEM WITHOUT BREAKWATERS**

Alternative 4 would develop the Shoreline Project components as described in Alternative 2, including the earthen berm, hybrid dune, wetland enhancement, eco-revetment, and raised edge. None of the Breakwaters Project components would be developed under Alternative 4.

##### *WASTEWATER*

Under Alternative 4, the proposed Water Hub would not be developed and there would be no discharge of sanitary waste resulting from the Proposed Actions.

##### *STORMWATER*

Under Alternative 4, the same measures discussed under Alternative 2 for the Shoreline Project would be such that construction and operation of Alternative 4 would not result in significant adverse impacts to the storm sewer system.

### **11.5 MINIMIZATION AND MITIGATION OF IMPACTS**

The Proposed Actions would not result in significant adverse impacts to wastewater and stormwater infrastructure within the study area; therefore, no mitigation is needed for the Proposed Actions. Measures incorporated into the Proposed Actions to minimize adverse impacts to stormwater infrastructure include:

- Implementing erosion and sediment control measures and stormwater management measures in accordance with the SWPPP prepared as required under the SPDES General Permit GP-0-15-002 for Stormwater Discharges from Construction Activity.
- Incorporating permeable pathways where practicable and bioswales and other green infrastructure stormwater management measures to allow infiltration of runoff.
- Designing the Breakwaters Project to reduce wave energy at the shoreline, and prevent or reverse shoreline erosion, without resulting in sedimentation of stormwater outfalls. The Breakwaters Project will be designed to avoid interfering in the current functionality of the existing outfalls maintained by NYCDEP.
- Incorporating measures to protect the stormwater outfall in Raritan Bay at the end of Loretto Street during the placement of sand for shoreline restoration.

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- Incorporating measures, developed in consultation with NYCDEP, to protect the stormwater outfalls at the end of Loretto Street, Sprague Avenue, Joline Avenue and Bedell Avenue, from the physical impact of the additional fill and associated additional loads that would be placed on these outfalls. \*