Chapter 3.1: Project Description for the Oakwood Beach Drainage Plan

A. WATERSHED DESCRIPTION

The Oakwood Beach watershed is generally bounded to the west by Great Kills Park in the Gateway National Recreation Area (GNRA), the Willowbrook Parkway right-of-way, and Tanglewood Drive; to the north by Cotter Avenue; to the east by New Dorp Lane; and to the south by the Lower Bay (see **Figures 3.1-1** and **3.1-1a**). It covers approximately 1,329 acres (or 2.5 square miles), with approximately 61 acres of DEP Bluebelt property including lands already acquired or to be acquired, the majority of which is in the lower watershed, south of Hylan Boulevard and north and east of DEP's Oakwood Beach Wastewater Treatment Plant (WWTP).

Land uses and zoning in the watershed are predominantly residential with commercial uses and zoning along the major thoroughfares, such as Hylan Boulevard and Richmond Road. A portion of the northwestern watershed is within the Special South Richmond Development District (SSRDD). This zoning overlay district is used to protect natural resources such as wetlands, woodlands, and natural topographic features. There is also substantial DPR parkland in the lower watershed within the City's Great Kills Park. The Staten Island Railway runs east to west across the northern portion of the watershed along land under the jurisdiction of the Metropolitan Transportation Authority (MTA).

The unbuilt Willowbrook Parkway right-of-way extends between Hylan Boulevard on the south and Richmond Road on the north. For most of this length, the right-of-way is between 200 and 300 feet in width and uninterrupted except for a crossing at Amboy Road/Savoy Street (Staten Island Railway crossing is elevated). Since the parkway was never built, the corridor is largely vegetated, and DPR has a public trail system along the right-of-way. DPR manages lands in right-of-way for public access, and because the parkway remains on the official City map, NYSDOT also retains land jurisdiction.

The topography of the watershed conveys stormwater flows from the northeast to the southwest and ultimately to the Lower Bay via three stream branches. The West Branch originates along the Willowbrook Parkway in the hillier upper watershed and flows south into Great Kills Park in the GNRA where a stream channel and storm sewer converge. This channel flows east and then south to eventually reach the Lower Bay below the Oakwood Beach WWTP. Another drainage system is the East Branch which begins in Great Kills Park east of Kissam Avenue. This stream flows south and west to a tide gate that is situated immediately south of the Oakwood Beach WWTP. Lastly, there is a smaller branch in the center of the watershed draining a wide channel that originates at Hylan Boulevard. This man-made channel runs along the mapped but unbuilt bed of Adelaide Avenue before turning west into the unbuilt bed of Falcon Avenue. This stream then turns south to connect with the West Branch near the WWTP.

Much of the lower watershed is at a very low elevation—within five feet or less of sea level. This low-lying area is primarily in the vicinity of Mill Road, Fox Lane, Kissam Avenue, and the adjacent streets.

A portion of the Oakwood Beach drainage area, west of the Willowbrook Parkway, is tributary to but outside the area of the proposed drainage plan amendments (see **Figure 3.1-1**). Currently, some stormwater runoff from this area makes its way to the watershed streams; however, the existing drainage plan for this area, which has a full network of storm sewers, would not be altered by the proposed project and no Bluebelt features are proposed there. Although this portion of the Oakwood Beach drainage area is not within the area of the proposed amended drainage plan, the stormwater flows from this area are accounted for in the DGEIS analyses.

B. PROPOSED AMENDED DRAINAGE PLAN

STORMWATER MANAGEMENT PLAN

PROPOSED STORM WATER MANAGEMENT PLAN BUILD-OUT

The proposed amended drainage plan includes storm sewers to collect runoff with five BMPs at the points of discharge and outfalls to the Lower Bay. The outfalls include one new outfall from OB-1 while two existing outfalls, one at Ebbitts Street and the other at Tysens Lane, would have a secondary barrel added to accommodate increased flows projected under the amended drainage plan (see **Figure 3.1-2**). Total length of the proposed storm sewers is approximately 233,500 linear feet (about 44.2 miles) with the continued operation of approximately 47,900 linear feet (about 9.1 miles) of existing storm sewers and three trunk sewers at New Dorp Lane, Tysens Lane, and Ebbitts Street.

Under the proposed amended drainage plan, existing trunk sewers that convey stormwater to the Lower Bay via outfalls would continue to have their one-way flap-tide gates that prevent high tides from entering the sewer system, while allowing outflow discharge when the water surface elevation in the sewers is above the tide. The built system to remain also includes a major storm sewer that runs along the Willowbrook Parkway right-of-way from a housing development upgradient of the Staten Island Railway viaduct south to Hylan Boulevard. This sewer daylights in Great Kills Park (in the GNRA) and ultimately drains into the West Branch (**see Figure 3.1-2**).

STORMWATER DRAINAGE PLAN OBJECTIVES

As described in greater detail in Chapter 1.1, 'Project Description of the Overall Program," there are a number of objectives to the proposed project including: to provide a comprehensive stormwater management plan that reduces local flooding through the installation of stormwater collection sewers and BMPs in a watershed that is largely unsewered; to reduce local flooding through lower watershed BMPs that are designed to detain storm flows that otherwise cannot drain to the Lower Bay during high tide events when the outfall tide gates are closed; to amend the current drainage plan so that street elevations remain as close to the existing street grade as possible; and to provide ecological enhancements in Bluebelt wetlands that are used for BMPs.

PROPOSED BEST MANAGEMENT PRACTICES

The proposed Oakwood Beach watershed BMPs are listed in **Table 3.1-1** and the locations are shown on **Figure 3.1-1**. A more detailed description of the proposed BMPs is provided below.

Table 3.1-1
Proposed BMPs in the Oakwood Beach Watershed

Oakwood Beach BMP Descriptions						
BMP	**Size (ac)**	**Location**	**Drainage Area (ac)**	**Description**	**Function / Objective**	**Ownership / Jurisdiction**
OB-1: Kissam Avenue	28.2	Southeast of Mill Road, between Kissam Avenue and Fox Lane	66.4	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt / DPR Parkland
OB-2: Tysens Lane	27.9	Northeast of Kissam Avenue, southwest of end of Milton Avenue	455.0	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DPR Parkland
OB-3: Riga Street	29.0	Southwest of Aviston Avenue, between Riga Street and Brook Avenue	263.6	Extended Detention Wetland, forebays at sewer discharges	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt
OB-4: Ithaca Street	1.4	Unbuilt Adelaide Avenue Right-of-Way between Hylan Boulevard and Falcon Avenue	182.8	Pocket wetland at Hylan Blvd outfall and forebays at other sewer discharges with Stream Stabilization	Velocity attenuation, improved conveyance and stream corridor restoration	DEP Bluebelt
OB-5: North Railroad Avenue	3.2	Willowbrook Parkway Right-of-Way at Staten Island Railroad viaduct	25.4	Stormwater Basin Retrofit and Channel Restoration	Stormwater detention, velocity attenuation, improved conveyance and stream corridor restoration	NYSDOT/ DPR

Note: DEP Bluebelt includes lands acquired by DEP or to be acquired.
Source: DEP, Hazen and Sawyer, January 2011.

OB-1: KISSAM AVENUE

BMP OB-1 would be located on Bluebelt lands (to be acquired) as well as some land currently under the jurisdiction of the DPR. The proposed BMP site is bounded approximately by Kissam Avenue to the east, Fox Lane to the west, Mill Road to the north, and the Lower Bay shoreline (which is DPR parkland as part of the City's Great Kills Park) to the south. Storm flows to the BMP would come from Promenade Avenue, Kissam Avenue (three proposed storm sewer outlets), and Fox Lane (two proposed storm sewer outlets, see **Figures 3.1-4** and **3.1-4a**). This proposed BMP would occupy about 28.2 acres and handle storm flow inputs from a drainage area of about 66 acres.

The principal objective of this proposed BMP is to provide a large extended detention function that would serve an extremely low lying area of the watershed. Although it currently contains some mall ponds, the site of the proposed BMP is hydraulically separated from the East Branch of the Oakwood Beach East Branch. Design of the proposed BMP maintains this separation with a berm (6 to 36 inches in height) that would prevent the stream from spilling into the BMP. Forebays to attenuate the force of incoming storm flows and capture sediment from the proposed storm sewer are a key design feature of this BMP; they would be installed at each of the six proposed storm sewer outlets to the BMP.

Outflow from the forebays would then discharge to low-flow stream channels that would extend across a permanent pool. The channels would provide flow conveyance to a micropool at the BMP outlet. The permanent pool would be at a lower elevation than the other Oakwood Beach BMPs in order to facilitate drainage from the low lying streets.

A large area of extended detention (providing about 22.5 acre-feet of detention to a depth of 1.5 feet during large storm events) would be created by excavating the existing common reed marsh within the footprint of the BMP. The extended detention wetland would have large shelves that would be inundated during storm events. During high tides, when the outfall tide gates are closed, floodwaters would be stored in the extended detention wetlands, thereby reducing street flooding. Once the tide recedes and the gates reopen, the stored water would then drain from the BMP out to the Lower Bay via the outfall.

A micropool would be sited at the end of the low-flow channel to remove sediment and allow debris to settle out for removal by DEP maintenance forces. The weir length of 40 feet is proposed to be accommodated in a riser box. A low-flow orifice in the riser box would establish the permanent pool elevation within the BMP while the weir elevation would set the depth of stored water during periods of extended detention. The BMP would discharge into the Lower Bay via a new outfall equipped with a tide gate.

Construction access to be provided from Fox Lane would remain post-construction and provide maintenance access to the BMP and the micropool/weir including both regular maintenance as well as inspections. Maintenance access for the forebays would be from the existing streets (Promenade and Kissam Avenues and Fox Lane).

Currently the site of the proposed BMP is largely dominated by a common reed monoculture. The proposed BMP design would transform the hydrology and ecology of this site with the objective of not only improving its stormwater management functions, but also its habitat values. The proposed project would also expand the acreage of wetlands in the southwest portion of the project site (along Fox lane) and by removing a mounded area in the central portion of the site and incorporating both into the proposed BMP wetland zones. Chapter 1.1, "Project Description of the Overall Program," provides a description of the ecological design objectives that are common to these lower watershed BMPs. This BMP would impede the spread of brush fires, which break out periodically in the common reed monoculture.

OB-2: TYSENS LANE

BMP OB-2 would be located on DPR's Great Kills Park property on the portion that is generally bounded by Mill Road to the north (and also by the rear yards of the developed properties fronting on Mill Road), residential properties to the east (and the rear yards of the developed properties generally fronting on Tysens Lane, Milton Avenue, and Roberts Drive), and residential properties to the west (and the rear yards of properties that front along Kissam Avenue). The southern boundary is also City parkland (the berm and beach of Great Kills Park). Most of the proposed BMP OB-2 site is located above the open water channel of the Oakwood Beach Watershed East Branch.

The principal objective for this BMP is to provide a large extended detention function at the head of the East Branch with wide wetland shelves that would be inundated during rainfall and high-tide events when the tide is high and the outfall tide gates are closed (see **Figure 3.1-5**). During these events, flood waters would be stored in the BMP rather than causing flooding on local streets and private properties. The proposed BMP would occupy about 27.9 acres and handle storm flow inputs from a drainage area of about 455 acres. The extended detention

wetlands would be fed by a storm sewer in the bed of Milton Avenue, which would convey local flows from that street. More importantly, the Milton Avenue sewer would also convey high level storm flows from the existing Tysens Lane trunk sewer. A flow splitter chamber, to be installed at the intersection of Tysens Lane and Milton Avenue, would divert stormwater into the BMP, thus preventing surcharging of the Tysens Lane trunk during large storms and high tides then the tide gates are closed. Lastly, the proposed BMP would be protected from tidal storm surges by the existing tide gate located downstream near the Oakwood Beach WWTP.

BMP OB-2 is similar in design to OB-1 and would include a forebay at the Milton Avenue inlet into the BMP. Outflow from the forebay would then discharge to a low-flow stream channel that would extend across a permanent pool. The channel would provide flow conveyance to a micropool at the BMP outlet.

A large area of extended detention (providing about 50 acre-feet of detention to a depth of two feet during large storm events) would be created by excavating the existing common reed marsh within the footprint of the BMP. The extended detention wetlands would have large shelves that would be inundated during storm events. When the tide gates are closed, floodwaters would be stored in the BMP extended detention wetland, thereby preventing street flooding. Once the tide recedes and the tide gates reopen, the stored water would drain from the BMP out to the Lower Bay.

A micropool would be sited at the end of the low-flow channel to remove sediment and allow debris to settle out before obstructing the proposed weir that would be about 120 feet in length. A low-flow orifice in the weir would establish the permanent pool elevation, while the weir elevation would set the stormwater storage depth of water during periods of extended detention.

Below the BMP, the outflow would continue west along the East Branch channel that runs parallel to the Lower Bay. The flow eventually reaches Lower Bay after passing through an existing tide gate where no modifications are proposed.

Construction access from Kissam Avenue would remain post-construction to provide maintenance access to the BMP micropool/weir for both regular maintenance as well as inspections. Maintenance access for the forebay would be from Milton Avenue.

A low landscaped berm would be constructed along the Kissam Avenue boundary (to a height approximately 6 to 36 inches above existing grade) for the purposes of containing storm flows within the BMP footprint while preventing the flooding of adjoining properties and streets. The proposed berm would connect to the existing berm along the shoreline.

Currently, the site of the proposed BMP is predominantly a common reed monoculture. The proposed project would transform the hydrology and ecology of this site with the objective of not only improving its stormwater management functions, but also its ecological habitats. Chapter 1.1, “Project Description of Overall Program,” provides a description of the ecological design objectives that are common to the lower watershed BMP. This BMP would also impede the spread of brushfires, which break out periodically in the common reed monoculture.

OB-3: RIGA STREET

BMP OB-3 would be located on Bluebelt property, portions of which are in the process of being acquired for DEP Bluebelt purposes. The site is bounded by residential properties to the northwest (the rear yards of the developed properties fronting on Brook Avenue and Grayson Avenue), Aviston Street to the northeast, residential properties to the southeast (to the rear yards of properties that front along Lynn Street, Amherst Street, and Riga Street), and the western

boundary is Great Kills Park in the GNRA. The Main Channel of the Oakwood Beach watershed extends along the western and northern boundaries of the proposed BMP site. Thus, there is the potential for these stream reaches, particularly at the southern end, to contain fish that have been observed within the Oakwood Beach watershed.

Under the proposed drainage plan, local storm sewer connections would provide drainage into this BMP via sewer outlets from Grayson Avenue, Brook Avenue, Aviston Street (two), Riga Street, and Merkel Place (see **Figures 3.1-6** and **3.1-6a**). In addition, there would be inflow via the channel leading downstream from OB-4 (see the discussion below). This proposed BMP would occupy about 29 acres and would handle storm flow inputs from a drainage area of about 263 acres.

The principal objective for this BMP is to provide a large extended detention function with an on-line BMP and large wetland shelves that would be inundated during storm events to provide extended detention when the outfall tide gates are closed. During these occurrences, flood waters would be stored in the BMP rather than causing flooding in local streets and properties.

BMP OB-3 is similar in design to OB-1 and OB-2. Forebays would be constructed at each of the eight proposed storm sewer outlets to the BMP to attenuate the force of incoming flows from the proposed storm sewers and to capture sediment. Outflow from the forebays would discharge to low-flow stream channels that would extend across a permanent pool. The channels would provide flow conveyance to a micropool at the BMP outlet.

A large extended detention wetland (providing about 75 acre-feet of detention to a depth of 3.5 feet during large storm events) would be created by excavating the existing common reed marsh within the footprint of the BMP. The extended detention wetland would have expansive shelves that would be inundated during storm events and high tide. When the tide recedes and the tide gates reopen, the stored water would drain from the proposed BMP out to the Lower Bay.

A micropool would be sited at the end of the low-flow channels to remove sediment and allow debris to settle out before obstructing the proposed weir that would be 80 feet long. The weir structure would be installed for the purpose of establishing the water surface elevation during extended detention while a low-flow orifice in the weir would establish the permanent pool elevation. The proposed BMP would also be protected from tidal storm surges traveling up the creek by a proposed tide gate to be placed just below to the weir.

Outflow from the BMP would continue south along the Middle Branch. Channel stabilization would be installed in this reach of the stream, as necessary.

Construction access from Merkel Place would remain post-construction to provide maintenance access for the micropool/weir including both regular maintenance and inspections. Maintenance access for the forebays would be from the stub ends of the streets.

Currently the site of the proposed BMP is largely dominated by a common reed monoculture. The proposed project would transform the hydrology and habitats of this site with the objective of not only improving its stormwater management, but also its ecological value. The existing reach of the Middle Branch, which is a man-made ditch, would also be incorporated into the proposed extended detention wetland, which would be of greater natural resource value than the existing ditch. The proposed project would also expand wetlands at the site mostly through the expansion of the proposed BMP in the northeastern portion of the site (between Lynn Street and Riga Street). Chapter 1.1, "Project Description of Overall Program," provides a description of the ecological design objectives that are common to the proposed BMPs, particularly those in the

lower watershed. This BMP would also impede the spread of brushfires, which break out periodically in the common reed monoculture.

OB-4: ITHACA STREET

BMP OB-4 is proposed to be located on Bluebelt property to be acquired. The proposed site is bounded by Hylan Boulevard to the north and extends south along the mapped, but unbuilt, Adelaide Avenue right-of-way to Falcon Avenue where the man-made drainage ditch takes a 90-degree turn west. Under the proposed drainage plan, local storm sewer connections would drain through this BMP via multiple outlets (see **Figure 3.1-6**). This proposed BMP would occupy about 1.4 acres and handle storm flow inputs from a drainage area of about 183 acres.

The principal design objective for this BMP is to provide stormwater conveyance from Hylan Boulevard and local streets to BMP OB-3. Under the proposed design, an existing storm sewer outlet at Hylan Boulevard would be reconstructed with a pocket wetland to reduce velocities and intercept sediment and debris for removal by Bluebelt field management.

The existing channel in the bed of Adelaide Avenue would be cleared of debris and the banks would be stabilized and re-vegetated as necessary. Along the proposed Adelaide channel, storm sewers would discharge at the following locations: the eastern end of Medina Street, the northeastern end of Tarrytown Avenue and one discharge point at the intersection of Falcon Avenue and Adelaide Avenue just above the 90-degree turn into BMP OB-3. Each of these discharge points would have an outlet stilling basin to provide velocity attenuation and sediment/debris interception.

Construction access from each of the street ends (Hylan Boulevard, Medina Street, Tarrytown and Falcon Avenues) would remain post-construction to provide BMP maintenance access including both regular maintenance and inspections.

Currently the site of the proposed BMP is a man-made drainage ditch with debris and limited natural resource values. The proposed project would remove this debris and reconstruct this stream channel thereby improving its conveyance capability and expanding and enhancing its wetlands and ecological value.

OB-5: NORTH RAILROAD AVENUE

BMP OB-5 is proposed to be located on property within the Willowbrook Parkway right-of-way. The site is bounded by residential properties to the east and west and stretches from Savoy Street on the north to the existing stream in the right-of-way on the south. The parkway was never built, and although it remains a mapped right-of-way, DPR has taken over management of the corridor and has developed a trail system along its length. Therefore, DEP would secure the approvals of both DPR and NYSDOT for any work within the right-of-way. The proposed BMP would occupy about 3.2 acres, including the storm basin retrofit and stream channel enhancements that are described below.

The proposed BMP would begin on the north at Amundsen Circle Park, which was installed by DPR in the Willowbrook Parkway right-of-way. Under the proposed BMP design, the existing catch basins in the circle would be refurbished and the existing outlet at Savoy Street would be upgraded with an outlet stilling basin and the existing intermittent stream, down gradient from the Savoy Street outfall, would be stabilized as necessary (see **Figure 3.1-7**).

The intermittent stream flows into a large existing basin in the parkway right-of-way located at the intersection of Riedel and North Railroad Avenues. That basin has steep side slopes and

appears to be man-made, but its origin cannot be confirmed. Under the proposed amended drainage plan, the extant basin would be retrofitted into a stormwater pond, accepting flow from storm sewers draining an area about 25 acres in size. An outlet stilling basin at the end of the discharge pipe off of Riedel Avenue would capture sediment and attenuate velocities before the stormwater collects in the basin. A controlled outlet riprap spillway would also be installed on the downstream side of the basin.

Below the riprap spillway, the existing informal swale would be enhanced and stabilized to accommodate the increased flows. This channel would run under the Staten Island Railway viaduct. Downstream, it would connect to the existing well-defined channel that begins at about Fairbanks Avenue. A large mound of fill would have to be removed to make this connection. Any excavation necessary for this stream work would be designed to not interfere with an existing 48-inch storm sewer that crosses the parkway right-of-way at Montreal Avenue and runs south in the parkway right of way to Hylan Boulevard. With the proposed plan, this existing storm sewer and the proposed stream channel would continue to share the Willowbrook Parkway right-of-way.

Construction access from North Railroad Avenue would remain post-construction to provide maintenance access to the stormwater basin for both regular maintenance as well as inspections.

In addition to the hydrologic improvements, this BMP design would provide a substantial ecological restoration of the existing basin and intermittent stream corridor. These improvements, coupled with the proposed BMP design would expand the acreage of freshwater wetlands at this site along with improving the current wetland habitats and value.

Upstream of BMP OB-5 in the Willowbrook Parkway right-of-way, two small freshwater wetlands currently accept street runoff from Combs Avenue. Under the proposed project, those ponds would continue to exist with stormwater inputs from proposed storm sewers in Combs Avenue.

LOWER BAY OUTFALLS

The proposed outfall from BMP OB-1 would be constructed across the beach out into the Lower Bay **(see Figure 3.1-8)**. It would be located across DPR's Great Kills Park, which runs along the Lower Bay waterfront. The outfall, which would be about ten feet wide and five feet high, would be installed beneath the tidal creek and berm before daylighting on the sandy beach and ending at the bulkhead line in the Lower Bay. In addition to this new outfall, the proposed project calls for a supplemental outfall (about five feet wide and five feet high) to be added at the existing Ebbitts Avenue outfall with another supplemental outfall (about eight feet wide and five feet high) to be added at the Tysens Lane outfall.

Site specific engineering designs, with detailed grading and topography, would more definitively establish the areas affected by construction as well as the tidal wetlands that may be impacted both during construction and then permanently occupied by the outfall structures. Because this area is public parkland, the proposed designs would be subject to DPR review and approval. In addition, these outfalls would require permits from the NYSDEC and the USACE. DEP would also map a 40-foot sewer corridor across DPR property to ensure future maintenance access.

PROPOSED STREET DEMAPPINGS

A number of segments of mapped but unbuilt streets are proposed for demapping in order to accommodate construction of the BMPs and as a measure necessary to consolidate Bluebelt property acquisitions and land transfers (see **Table 3.1-2**). Future ULURP actions are required to formally demap these unbuilt streets and would be implemented by DEP at a later date.

PROPOSED EASEMENTS

No easements across private property are necessary to implement the proposed Oakwood Beach Drainage Plan.

MODIFICATIONS TO STREET GRADES

The proposed project would require the modification of street grades along certain street segments in order to provide positive drainage in the stormwater collection system and adequate street cover over the sewers. The street segments affected by these proposed modified street grades are presented in **Figures 3.1-9a** and **3.1-9b**. Along these street segments the maximum change in grade would range between 6 inches and up to 24 inches above the existing street surface (the greater increases would be nearer the downstream outlet to the system).

Table 3.1-2
Mapped but Unbuilt Streets To be Demapped Under Proposed Project (Oakwood Beach Watershed)

BMP	BMP Location	Street Segment to be Demapped
OB-1	Kissam Ave.	2nd St. from Promenade Ave. to end
		3rd St. from Promenade Ave. to end
		4th St. from Promenade Ave. to end
		5th St. from Promenade Ave. to end
		6th St. from Promenade Ave. to end
		7th St. from Promenade Ave. to end
		8th St. from Promenade Ave. to end
		Promenade Ave. from paved stub end to Cedar Grove Av.
N/A	N/A	Cedar Grove Ave. between Emmet Ave. and Tarlton St.
	Kissam Ave.	Cedar Grove Ave. between Fox Lane and Kissam Av.
OB-2	Tysens Lane	Cedar Grove Ave. between Kissam Av. and a point about 1,000 feet east of Kissam Ave.
	N/A	Emmet Ave. between Cedar Grove Ave. and Great Kills Lane
	N/A	Great Kills Lane between Emmet Ave. and Fox Lane
	N/A	Fox Lane between Cedar Grove Ave. and Great Kills Lane
OB-3	Riga Street	Amherst Ave. between Emmet Ave. to a point about 280 feet to the east of Dugdale St.
		Brook Ave. between Emmet Ave. and Fairbanks Ave.
		Lynn St. between Brook Ave. and Aviston St.
		Dugdale St. between Brook Av. and Riga Street
		Emmet Ave. between Grayson St. and Mill Road
		Fairbanks Ave. between Brook Av. and Merkel Place
		Falcon Ave. between Brook Ave. and Aviston St.
		Riga St. between Emmet Ave. and Fairbanks Ave.
		Unpaved portion of Riga St. between Fairbanks Ave. and Dugdale St.
		Tarrytown Ave. between Brook Av. and Aviston St.
		Unpaved portion of Aviston St. between Tarrytown Ave. and Lynn St.
		Falcon Av. between Aviston St. and Adelaide Ave.
OB-4	Ithaca Street	Adelaide Ave. between Falcon Ave. and Hylan Blvd.
		Unpaved portion of Ithaca St. at Hylan Blvd.

Source: DEP Staten Island Bluebelt Unit, January 2011.

It is standard procedure to raise streets in low-lying areas in order to provide proper cover over the proposed storm sewers, and the City has done this on many projects. As part of the capital project design, site specific surveys would be performed to determine the actual street elevation conditions for each individual project and all design techniques would be utilized to limit the raising of street grades to the maximum extent possible. During this process, DEP and the New York City Department of Design and Construction (DDC), the agency that would manage the project through design and construction, would meet with each individual homeowner prior to construction to limit the impacts of street grade changes and to assist homeowners in developing the best drainage solution possible.

SANITARY SEWER NETWORK

While the Oakwood Beach watershed sanitary sewer system is largely built, the proposed amended drainage plan does include sanitary sewers as well (existing and proposed sanitary sewers in the watershed are shown in **Figure 3.1-11**). Implementation of future capital improvement projects within the watershed would complete any remaining segments of sanitary sewers in accordance with the proposed project. The sanitary sewer segments to be constructed are widely scattered throughout the watershed. Once these sewer lines are installed, individual sanitary connections would then be made by property owners, and individual septic systems would be decommissioned. In addition, the proposed project includes sanitary sewer upgrades that would increase the size of several existing pipes to comply with current standards.

C. DRAINAGE PLAN CONSTRUCTION PHASING

Due to the interconnected hydrology of the watershed, constructed improvements upstream have the potential to affect downstream hydrology and potential flooding. This is particularly the case if additional conveyance is provided without increased flood storage. Given these important phasing considerations, construction is anticipated to proceed as follows.

BMP OB-1, and its accompanying outfall, must be constructed along with OB-2 to prevent inundation in areas along Kissam Avenue. The proposed detention in OB-2 would provide relief against surcharging and allow the sewers to be built in low-lying neighborhoods near the wetlands. Therefore, the construction sequence under consideration is to first build BMPs OB-1 and -2. Once they are complete, the balance of the storm sewer network tributary to these BMPs could be completed without concern that the drainage system would not function as planned.

In addition, BMP OB-3 as the outlet for OB-4 should be constructed concurrently or before BMP OB-4. These two BMPs could be constructed before or after the construction of OB-1 and OB-2. BMP OB-5 at North Railroad Street is largely independent of the other sites and can be constructed at any time. ✷

Proposed BMP Site

Existing Lower Bay Outfall

Existing Tidal Gate

Proposed Lower Bay Outfall

Drainage Area Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

Existing Stream

Parks & Open Space (City, State & Federal)

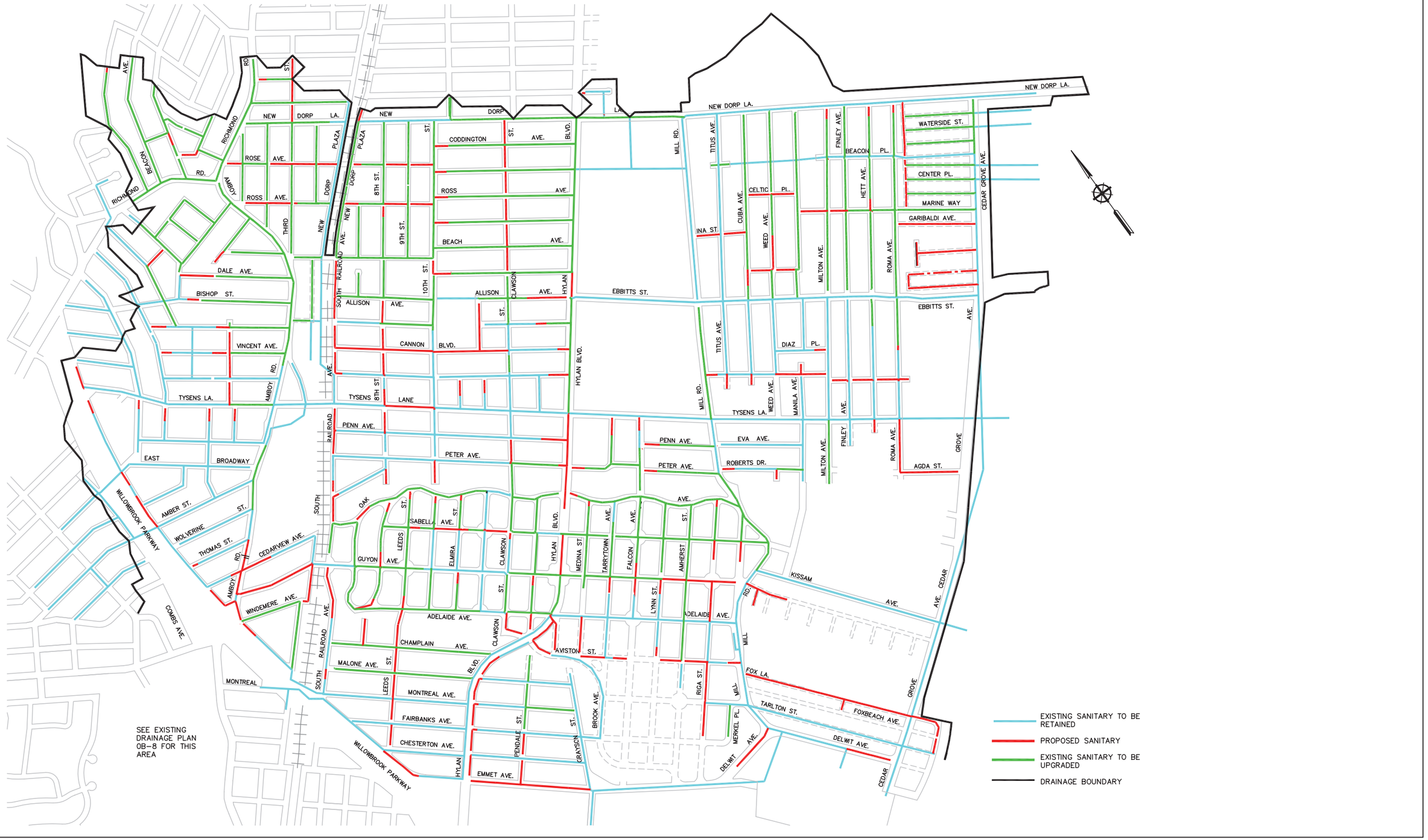
Rail Line/Rail Station

DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

Oakwood Beach Watershed - Proposed BMP Sites

Figure 3.1-1

4.2.13



Oakwood Beach Watershed:
Existing and Proposed Sanitary Sewers
Figure 3.1-2

Oakwood Beach Watershed:
Existing and Proposed Storm Sewers
Figure 3.1-3

SOURCE: Hazen & Sawyer, 2013

BMP OB-1:
Extended Detention Wetland at Kissam Avenue

Figure 3.1-4

SOURCE: Hazen & Sawyer, 2013

BMP OB-2:
Extended Detention Wetland at Tysens Lane

Figure 3.1-5

5.28.13

SOURCE: Hazen & Sawyer, April 2012

BMPs OB-3 and OB-4:
Extended Detention Wetland at Riga Street and
Pocket Wetland/Stream Stabilization at Ithaca Street

Figure 3.1-6

BMP OB-5:
Stormwater Basin Retrofit and Channel Restoration at N. Railroad Avenue

Figure 3.1-7

3.29.11

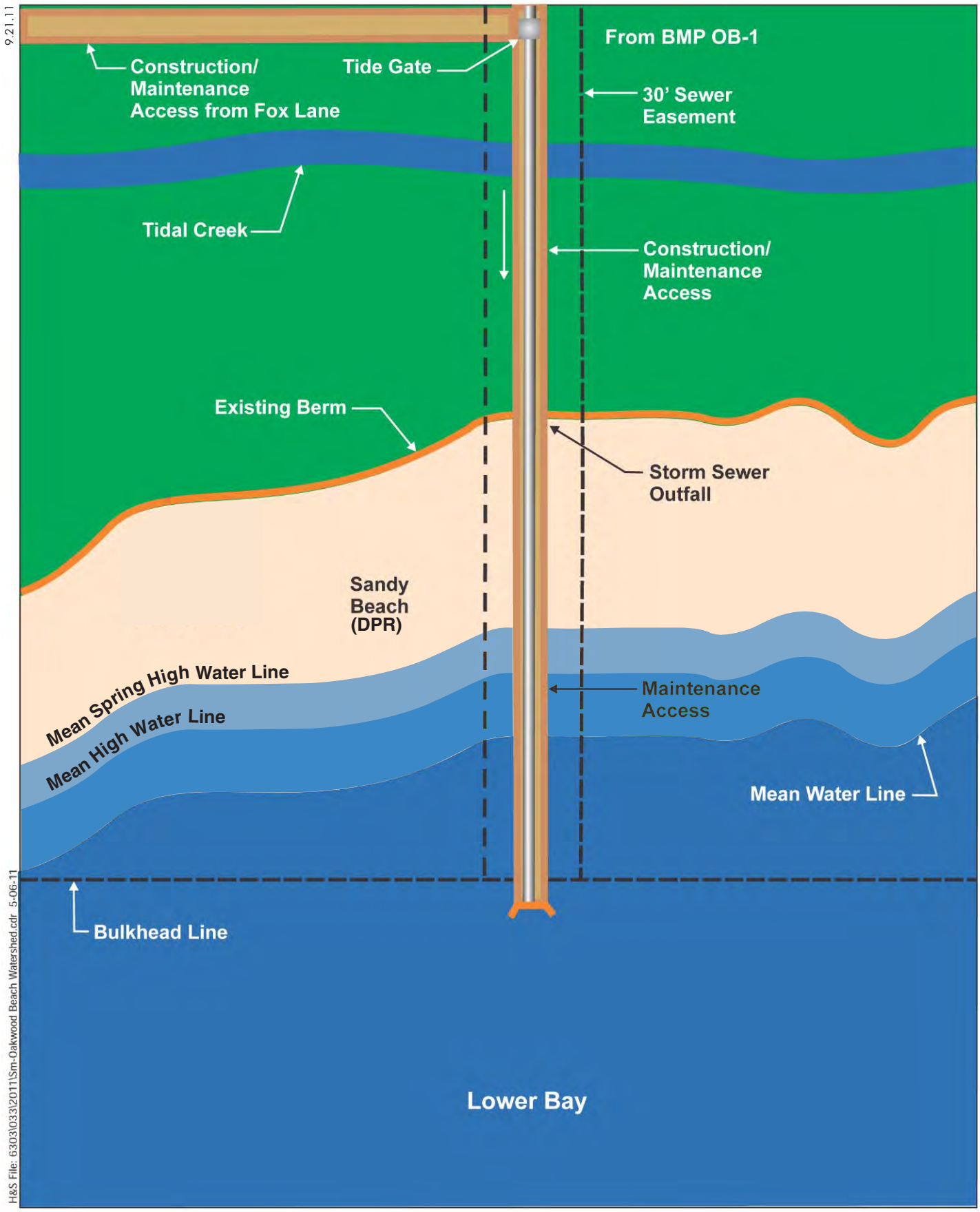
View of Site for Proposed BMP OB-1 Looking Northwest
from the end of Kissam Avenue

Aerial View of Proposed BMPs
OB-1 and OB-2 Looking Northwest

Figure 3.1-4b

View of Site for Proposed BMP OB-3 Looking North from the end of Delwit Avenue

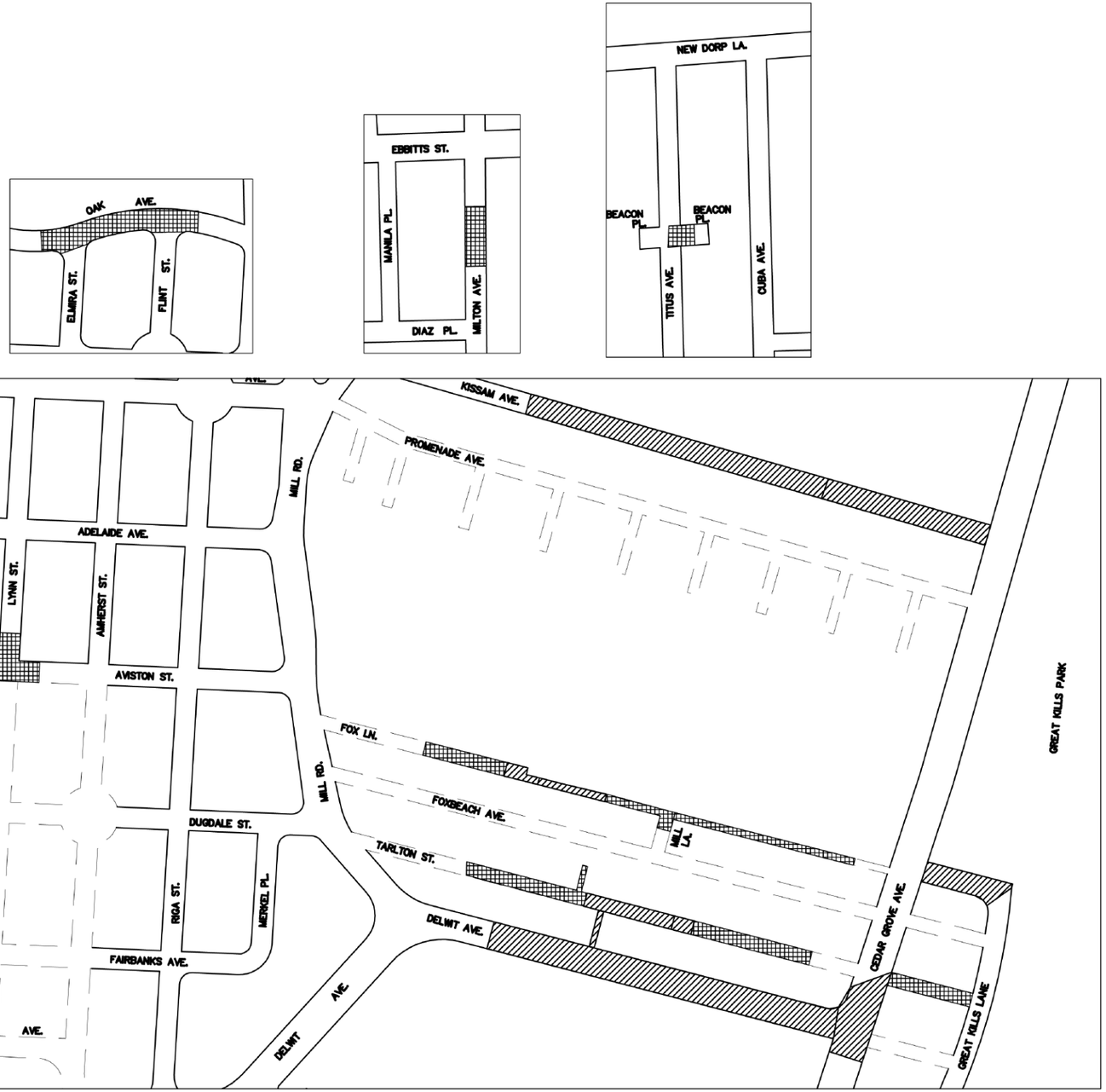
Figure 3.1-6a

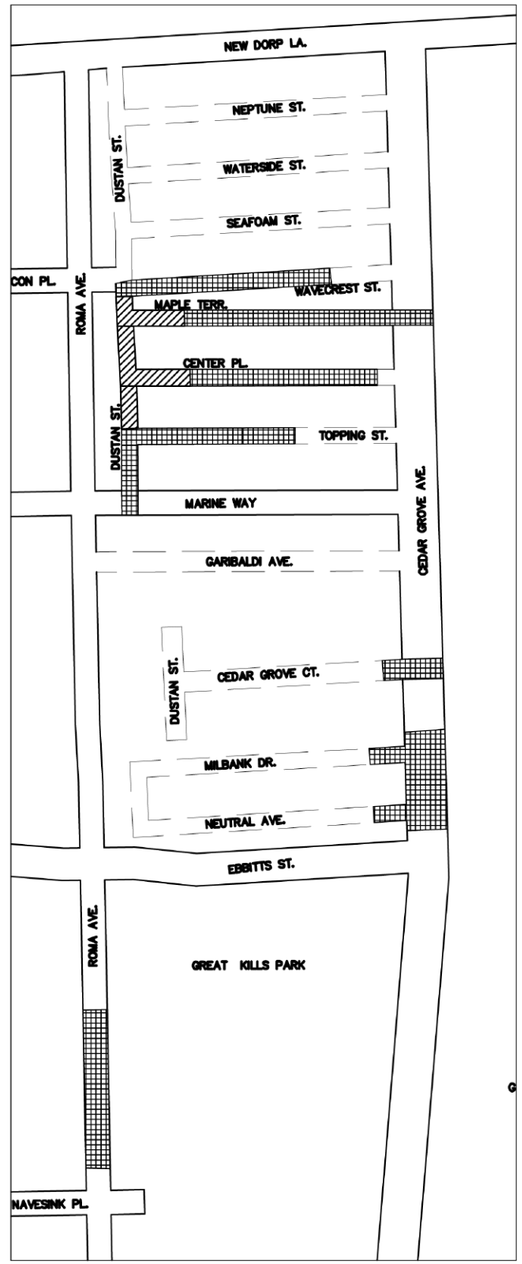


Lower Bay Outfall
Oakwood Beach Watershed
Figure 3.1-8

9.26.11

Proposed Modified Street Grades:
Oakwood Beach Watershed (Location Map)
Figure 3.1-9a





ROAD TO BE RAISED GREATER THAN 1 FT, LESS THAN 2 FT (MAX. 2 FT @ KISSAM AVE.)

ROAD TO BE RAISED LESS THAN 1 FT (MIN. 0.1 FT @ CEDARGROVE AVE. AT WAVECREST ST.)

Proposed Modified Street Grades:
Oakwood Beach Watershed (Detail Map)
Figure 3.1-9b

Chapter 3.2: Land Use, Zoning, and Public Policy of the Oakwood Beach Drainage Plan

A. INTRODUCTION

This analysis of land use, zoning, and public policy describes the existing conditions in the watershed as a whole and within 400 feet of the proposed BMP sites and outfalls. The 400 foot study area is the area that, based on the *CEQR Technical Manual*, has the greatest potential to be affected by the proposed action. This chapter also characterizes anticipated changes in these areas independent of the proposed project and the proposed project's consistency with future land uses, ongoing development trends, zoning, and public policies. Sources used to conduct this analysis include field surveys; evaluation of land use and zoning maps; and consultation with other sources, such as the New York City Zoning Resolution. To determine future conditions without the proposed action, those changes in land use, zoning, and public policy that are likely to occur by 2043, were evaluated based on discussions with public agencies involved in development in the area.

B. EXISTING CONDITIONS

LAND USE

The Oakwood Beach watershed is the second largest of the Mid-Island watersheds. As shown in **Figure 3.2-1** and **Table 3.2-1**, the 1,329-acre watershed is developed and urbanized and is comprised of residential (about 47 percent), open space (8.5 percent), commercial (about 5 percent) and developed roadbed (about 21 percent) uses. Table 4.2-2 shows the existing land use conditions at each BMP site and within the 400 foot study area.

Table 3.2-1
Land Use in the Oakwood Beach Watershed

Land Use	Acres	Percentage of total watershed
Residential	621.2	46.7
Road bed/sidewalks	278.8	20.9
Open space *	113.4	8.7
Vacant **	93.3	7.0
Commercial	68.7	5.2
Public facilities/institutional	40.9	3.1
Transportation/utility	27.8	2.1
Mixed residential/commercial	10.1	0.8
Other (industrial, parking, etc.)	75.1	5.5
Total Area	**1,329.3**	**100.0**

Notes: ***** Open Space includes City parkland and NYSDEC property.
**Vacant land includes Bluebelt property which totals about 61 acres.
Source: New York City Department of City Planning, MapPLUTO (2010)

Residential uses are predominantly single-family detached homes, although there are also some two-family homes and multi-family apartment buildings in the watershed. Commercial uses include restaurants, food markets, small offices and a larger commercial center at the intersection of Hylan Boulevard and New Dorp Lane. Public facilities and institutional uses, including places of worship and public and private schools, comprise a small portion of the watershed.

Major access roads within the watershed include Hylan Boulevard and Amboy Road which run east to west, and New Dorp Lane, which runs north to south. The Staten Island Railway, a rail service operated by the Metropolitan Transit Authority (MTA), parallels Amboy Road and offers transit service between Tottenville and St. George. Transit stations in the watershed are located in the New Dorp and Oakwood Heights communities. In addition, the Oakwood Beach Wastewater Treatment Plant (WWTP) is located in the southwest portion of the watershed.

Most of the watershed's vacant land is located in the blocks south of Hylan Boulevard, east of Tysens Lane, north of Mill Road and west of New Dorp Lane (see **Figure 3.2-1**). This vacant land is a combination of abandoned commercial properties and undeveloped land. Some of these vacant parcels also have development constraints due to freshwater wetlands that are regulated by NYSDEC and the USACE. DEP Bluebelt property totals about 61 acres.

Great Kills Park, the City parkland under the jurisdiction of DPR, comprises much of the open space in the watershed. The park is about 306 acres in size and includes the Lower Bay shoreline between the Gateway National Recreation Area's (GNRA) Great Kills Park (a federal park), on the west and New Dorp Lane/Miller Field on the east. Inland from the shoreline, Great Kills Park, includes common reed dominated freshwater wetlands and ponds in the area south of Mill Road and east of Kissam Avenue.

Also located in the watershed is the mapped but unbuilt segment of the Willowbrook Parkway right-of-way (ROW), which runs along the western boundary of the watershed. This mapped roadway is under the jurisdiction of the New York State Department of Transportation (NYSDOT), but is currently managed by DPR.

Table 3.2-2 shows the land use and zoning conditions at each BMP site and within 400 feet of each site. Much of this land is DEP-owned, acquired for the purposes of implementing the proposed project.

Table 3.2-2
Land Use and Zoning Conditions at the Proposed Oakwood Beach BMP Sites (and within 400 feet)

BMP Number	BMP Name/Location	Approximate BMP Footprint (acres)	BMP Land Uses	Predominant Land Uses within 400 feet	Zoning at the BMP sites
OB-1	Kissam Avenue	29.1	DPR Parkland/ DEP Bluebelt	Parkland/residential	R3X
OB-2	Tysens Lane	27.9	DPR Parkland	Parkland/residential	N/A
OB-3	Riga Street	28.3	DEP Bluebelt	Residential	R3-1
OB-4	Ithaca Street	1.4	DEP Bluebelt	Parkland/residential	R3-2
OB-5	N. Railroad Avenue	3.0	NYSDOT/ DPR Parkland	Mapped right of way/residential	R3X/SSRDD
N/A	New outfall from OB-1**	0.6	DPR Parkland	DPR Parkland	N/A
N/A	Expanded outfall at Tysens Lane	Within existing sewer corridor	DPR Parkland	DPR Parkland	N/A
N/A	Expanded outfall at Ebbitts Street	Within existing sewer corridor	DPR Parkland	DPR Parkland	N/A

Notes: *DEP Bluebelt refers to vacant lands owned by DEP or pending acquisition.
** The area of the proposed outfall corridor is assumed to be 40 feet wide and between the BMP and the bulkhead line.

ZONING

As shown in **Figure 3.2-2**, the Oakwood Beach watershed contains a mix of lower-density residential zoning districts including R3-1, R3-2, R3X and R2, with a commercial zoning district (C4-1) and a manufacturing zoning district (M3-1).

R3-1 zoning districts are mapped throughout the watershed. This district allows 1- and 2-family detached or semi-attached houses (the predominant housing type in the watershed) with a maximum floor area ratio (FAR) of 0.5. The R3-2 district is found along Hylan Boulevard, New Dorp Lane and Amboy Road and allows a variety of housing types, including garden apartments and rowhouses, in addition to 1- and 2-family residences. The R3-2 district permits a maximum FAR of 0.5 and corner lots are limited in coverage to 60 percent of the lot. This zoning designation is intended to allow greater density than the R3-1 district. The R3X district is mapped primarily in the central portion of the watershed. This district was mapped as a contextual zoning district to allow 1- and 2-family detached houses on lots with a minimum width of 35 feet. This zoning district has a maximum FAR of 0.5, with an additional attic allowance of 0.2 FAR. R2 districts are also common in the central portion of the watershed. This district is exclusively for single-family homes and has an allowable FAR of 0.5.

C4-1commercial districts (FAR of 1.0) typically allow larger buildings and specialty stores such as furniture retailers and shopping centers. This zoning district is on the south side of Hylan Boulevard, at the intersection with New Dorp Lane.

M3-1 manufacturing typically allow large manufacturing buildings with a FAR of 1.0. The southwest corner of the watershed, where the Oakwood Beach WWTP is located, is zoned M3-1.

SPECIAL SOUTH RICHMOND DEVELOPMENT DISTRICT (SSRDD)

About five acres of the watershed, in the vicinity of and including OB-5, are within the SSRDD. The SSRDD was initiated in the1970s to guide future development and land use. General goals of the district are to promote balanced and desirable land uses while minimizing impacts to natural resources. Changes in topography are generally limited to two feet and the district seeks to limit impacts on trees, lakes and other natural features. In addition, development must be clustered to minimize footprint and preserve natural features. Under the SSRDD, the City Planning Commission (CPC) must authorize that all new development meets applicable preservation standards. All new development and site alteration proposals are reviewed for consistency with these objectives.

PUBLIC POLICY

The proposed project is located within the boundaries of New York City's coastal zone. The New York City Waterfront Revitalization Program (WRP) is the City's principal coastal zone management tool and establishes policies for management of the coastal zone. The WRP policies also provide a framework for evaluating discretionary actions. The proposed project is located in the City's coastal zone and was therefore analyzed for its consistency with the WRP (see below and Appendix A).

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

There are currently no land use planning studies in development for the Oakwood Beach watershed. It is expected that over the next 30 years, additional residential and commercial development will occur. In addition, DPR is proposing improvements at Cedar Grove Beach

(within Great Kills Park) that would expand accessible open space within the park as well as recreational facilities. However, given the limited number of vacant and underdeveloped lots, development is expected to be limited. Portions of the watershed could be rezoned for a variety of purposes by 2043. However, at this time, no rezoning proposals are under review by DCP. In addition, no changes to public policy in the watershed are expected in the future without the proposed action, although given the long term build year for the proposed project additional amendments to the City's Comprehensive Waterfront Plan would be expected. However, no substantive changes in land use, zoning or public policy are anticipated in the future without the proposed action.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

LAND USE

Proposed street demappings associated with the proposed project would be subject to the City's Uniform Land Use Review Procedures (ULURP) and recorded on the City map. The streets proposed for demapping are on Bluebelt land (acquired or to be acquired) and are the proposed sites of the BMPs. BMP OB-1 is proposed in both City parkland and Bluebelt property and OB-2 would be entirely within City parkland. OB-3 and OB-4 are proposed entirely within Bluebelt property and OB-5 is proposed within the mapped ROW of the Willowbrook Parkway. The proposed outfall to the Lower Bay would be below grade and would not affect land uses in Great Kills Park; the proposed enlarged outfalls would result in larger footprints and headwalls but would be constructed at the same elevation below ground and location as the existing outfalls. Thus, the proposed BMPs and street demappings would not result in land use impacts. Rather, the proposed BMPs and outfall would preserve and restore existing open space including wetlands and buffer areas for habitats and stormwater management. Therefore, the proposed project would not result in potential significant adverse impacts to land use.

ZONING

None of the proposed BMPs or outfalls would require any zoning text amendments. Where proposed street demappings are recorded on the City map the City would likewise modify the zoning map. Where special permits are necessary for construction (e.g., OB-5 is in the SSRDD), all required approvals from DCP would be obtained by DEP prior to construction. Therefore, the proposed project would not result in potential significant adverse impacts to zoning.

PUBLIC POLICY

NEW YORK CITY WATERFRONT REVITALIZATION PROGRAM POLICIES

The proposed project was analyzed for consistency with the WRP and a Consistency Assessment Form was prepared (see Appendix A). The Oakwood Beach Drainage Plan would be consistent with all of the policies that would be applicable to it, and would advance several goals of the WRP as follows:

- Policy 4: "Protect and restore the quality and function of ecological systems within the New York City coastal area" by implementing the Bluebelt Program which would reduce the adverse impacts of uncontrolled runoff, flooding, erosion, and sedimentation, while enhancing freshwater wetlands and habitats throughout the watershed.

- Policy 5: "Protect and improve water quality in the New York City coastal area" with the implementation of proposed amended drainage plans calling for infrastructure improvements that would control and treat stormwater runoff before discharge into the Lower Bay.
- Policy 6: "Minimize the loss of life, structures, and natural resources caused by flooding and erosion," through a comprehensive stormwater management program that reduces localized street flooding.

NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN

In March 2011, the New York City Department of City Planning released "Vision 2020: New York City Comprehensive Waterfront Plan." This plan outlines goals for improving New York City's waterfront, and recognizes the range of waterfront uses and opportunities created from the City's approximately 520 miles of shoreline. The following components of the proposed project would be compatible with and would support Vision 2020 goals: improving water quality through measures that benefit natural habitats and enhance waterfront communities; expansion of the Bluebelt program to the Mid-Island area of Staten Island; restoring and protecting wetlands and shorefront habitats; acquiring and supporting protection of wetlands, along Staten Island's south shore; improving water quality and protecting natural resources; and improving public access to the waterfront.

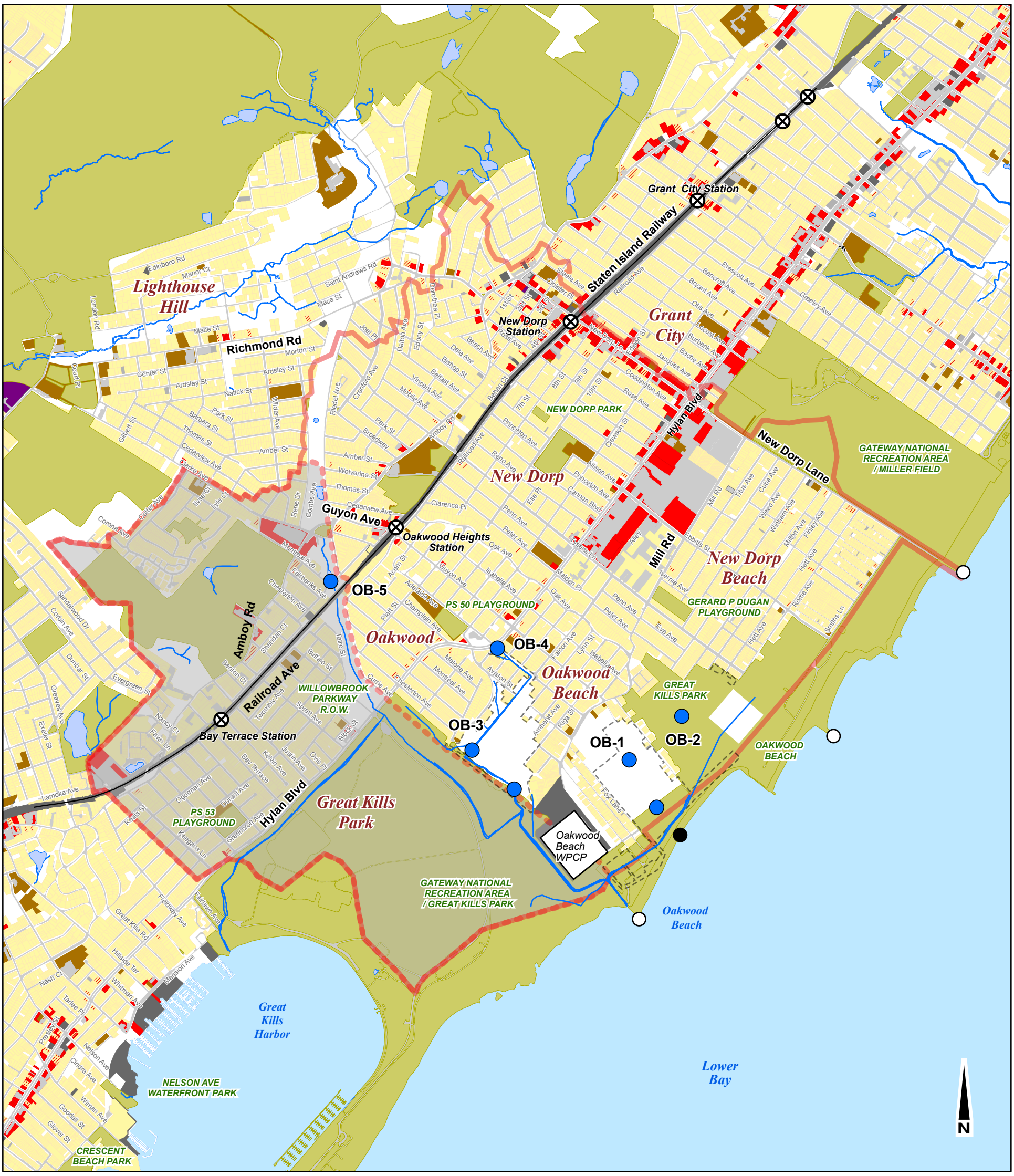
E. CONCLUSIONS

The proposed project would provide stormwater management infrastructure in areas that currently experience flooding and erosion and sedimentation. The proposed BMPs would be installed in areas that are currently wetlands or natural areas managed by DPR or DEP. Each BMP would be designed with planted buffers to blend in with existing and adjacent land uses. The proposed outfalls would provide discharge points for the stormwater runoff and would be largely below grade within DPR's Great Kills Park. Any permits necessary for the implementation of BMP OB-5, which may be subject to the SSRDD, would be obtained prior to construction. The proposed BMPs and outfall would not affect current land uses or require any zoning text amendments. Rather, the proposed BMPs would maximize the preservation and restoration of existing open spaces, wetlands and buffer areas while providing natural stormwater conveyance and treatment features.

As part of the proposed amended drainage plan, a number of segments of mapped but unbuilt streets would be demapped. Chapter 3.1, "Project Description," describes the proposed street demappings. The streets proposed for demapping are on lands that would support the permanent protection of wetlands and buffer areas. In all cases, the street demappings would meet all ULURP requirements, would not conflict with local land uses and the zoning map would also be amended to reflect the changes in the City map.

The proposed project would also be consistent City's WRP and with the NYC Comprehensive Waterfront Plan and would assist the City in advancing several goals of the WRP and the plan.

Therefore, the proposed project would not result in potential significant adverse impacts to land use, zoning and public policy. ✷

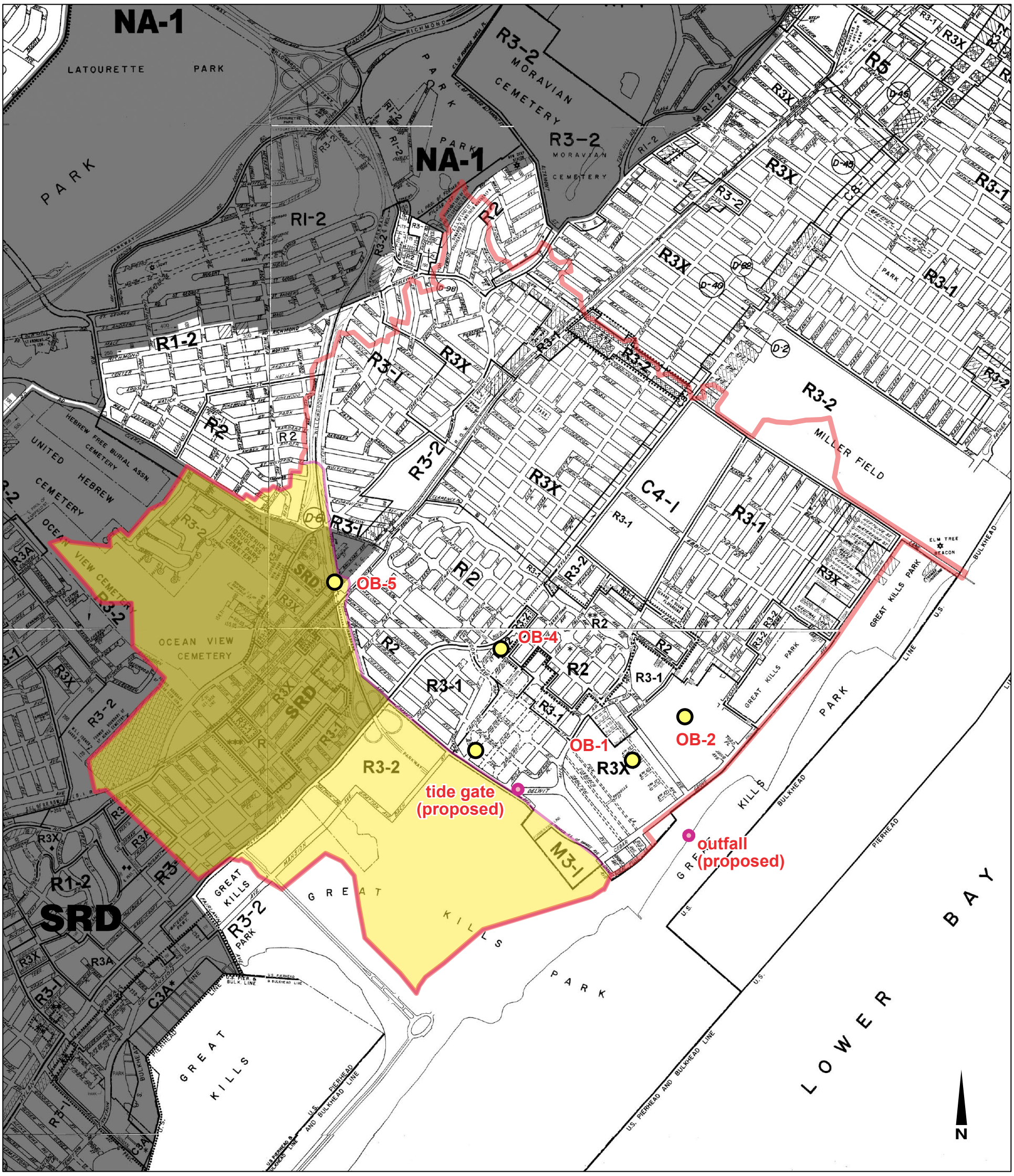


- Proposed BMP Site
- Existing Lower Bay Outfall
- Proposed Lower Bay Outfall
- Drainage Areas Tributary to Oakwood Beach Bluebelt
- Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment
- DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

Land Uses

- Residential
- Residential with Commercial Below
- Commercial, Office and Retail Buildings
- Industrial and Manufacturing
- Transportation and Utility
- Public Facilities and Institutions
- Parking & Roads
- Open Space and Outdoor Recreation
- Stream / Open Water
- Rail Line / Rail Station

Oakwood Beach Watershed Land Uses
Figure 3.2-1



Proposed BMP (Best Management Practice) Site

Proposed Outfalls & Tide Gates

Drainage Areas Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

Zoning

Zoning District Boundary

C1-1 Overlay

C2-1 Overlay

C2-2 Overlay

Special Purpose District

SPECIAL SOUTH RICHMOND DEVELOPMENT DISTRICT (SRD)

The letter(s) within the shaded area designate the special purpose district as described in the text of the Zoning Resolution.

Oakwood Beach Watershed Zoning

Figure 3.2-2

Chapter 3.3: Socioeconomic Conditions of the Oakwood Beach Drainage Plan

The proposed project would not result in new development in the study area. In addition, the proposed project would neither directly nor indirectly displace existing residential, business and employee populations, nor would it have adverse effects on real estate or specific industry conditions. A complete analysis of the potential for secondary impacts is presented in Chapter 3.20, "Growth Inducing Impacts." Therefore, the proposed project would not result in potential significant adverse impacts to socioeconomic conditions. ✷

Chapter 3.4: Community Facilities and Services of the Oakwood Beach Drainage Plan

According to the *City Environmental Quality Review* (*CEQR) Technical Manual*, a community facilities analysis is needed if there would be potential direct or indirect effects on community facilities. The proposed project would not result in an increase in residential units or population, nor would it directly or indirectly affect any community facilities. None of the proposed BMPs are located adjacent to any community facilities and the proposed BMPs would not require any community services. Therefore, the proposed project would not result in potential significant adverse impacts to community facilities and services. ✷

Chapter 3.5: Open Space of the Oakwood Beach Drainage Plan

A. INTRODUCTION

This chapter examines the potential impacts of the proposed project on open space. Based on the *CEQR Technical Manual*, an open space analysis is necessary if a proposed project could directly or indirectly impact open space. Direct impacts include a reduction of public open space acreage or alterations of open space such that it no longer provides the same facilities or serves the same user population. Indirect open space impacts include added noise, air, or odor emissions, shadows, or increased user demands. The proposed project would not generate any open space users, nor would it generate any environmental effects (air, noise or shadow impacts) that would indirectly impact open space. However, a portion of OB-1 and all of OB-2 and OB-5 would be constructed in City parkland. The remaining BMPs would be located on DEP Bluebelt property, and therefore are not included in this analysis. Chapter 6.1, "Impacts During Construction," assesses the potential for temporary impacts on open space during construction (i.e., the temporary loss of open space, seasonal waterfront uses)

B. EXISTING CONDITIONS

Table 3.5-1 lists the large open spaces within Oakwood Beach watershed and also identifies the location of any BMP sites within these parks (see also (see also **Figure 3.2-1**).

Table 3.5-1
Open Space in the Oakwood Beach Watershed

Name	BMP Site	Total Acreage	Ownership/ Jurisdiction
Great Kills Park	OB-1/OB-2/Lower Bay Outfalls	306.6*	DPR
PS 50 Playground	N/A	0.75*	DPR
New Dorp Park	N/A	0.78 *	DPR
Gerard P. Dugan Playground	N/A	3.3*	DPR
Willowbrook Parkway	OB-5	N/A	NYSDOT
Notes: *Sizes of parkland shown are total park acreages and not just the portion within the watershed.			

The City's Great Kills Park is the largest park in the watershed with over 300 acres. It is owned separately and is jurisdictionally distinct from the Gateway National Recreational Recreation Area (GNRA) Great Kills Park. However, the City parkland does abut the GNRA Great Kills Park on the west. The City's Great Kills Park is almost entirely a natural area comprised of freshwater wetlands and shoreline along Lower Bay. The beachfront is generally accessible within the park, although there are no formal public access facilities such as a ramps or boardwalks. The park boundary along the Lower Bay shoreline extends between GNRA Great Kills Park on the west and New Dorp Lane on the east and includes the beaches of Fox Beach, Oakwood Beach, Cedar Grove Beach and New Dorp Beach from west to east. There are no

active recreational facilities or comfort stations within the park although there are informal trails, including one that begins at Kissam Avenue and leads to the beach. Natural resource habitats within the park are described in Chapter 3.9, "Natural Resources," under the baseline conditions for BMP OB-2: Tysens Lane.

In addition to the City's Great Kills Park, DPR also manages the Willowbrook Parkway right-of-way (ROW). Although this is land under the jurisdiction of NYSDOT, the parkway is mapped but not built and currently maintains the "White Trail" which connects to the Staten Island Greenbelt parklands to the north.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, DPR is proposing improvements in the Cedar Grove Beach area of Great Kills Park. Proposed is the rehabilitation of Cedar Grove Beach for the purposes of improving access for the general public. Currently, the site contains a number of structures including bungalows that were used by the Cedar Grove Beach Club. These bungalows were vacated by agreement between the club and DPR in September 2010. Under the proposed Cedar Grove Beach improvement project, some of these bungalows would be adaptively reused while others would be demolished to expand public access. Phase one of the project involves demolition and adaptive reuse for park purposes along with the decommissioning of utilities and improved public parking. Phase two would involve construction of a new playground and bike path that would be part of a larger waterfront greenway along the stretch of the south shore. The assumed build year for this project is 2014. In addition to this project, no other park improvement projects are currently proposed at study area parks through the 2043 build year. However, with respect to open space, it is possible that undeveloped segments of the Willowbrook Parkway may become parkland under the jurisdiction of either DPR or NYSDEC (there is a state bill that is pending). If the bill is approved, the site of the proposed BMP OB-5 could officially be designated as parkland.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

BMP OB-1: KISSAM AVENUE AND OB-2: TYSENS LANE

A portion of OB-1 and all of OB-2 would be located within the City's Great Kills Park. Upon completion, the BMPs would occupy about 36 acres of this parkland. Since this is City parkland proposed for BMPs, DPR would continue to manage these two sites in accordance with agreements between DPR and DEP. A full analysis of natural resources impacts at these sites is presented in Chapter 3.9, "Natural Resources of the Oakwood Beach Drainage Plan."

The proposed BMPs would not interfere with DPR operations at the property, nor would they displace any DPR structures or facilities. The proposed BMPs would not modify any formal trail networks or impede public access opportunities at the property, as it is currently managed by DPR as a natural area with no formal public access. Maintenance accessway or walkways to be constructed as part of proposed berms could be utilized by DPR and the community as trails dependent on DPR's future programming within the park. DEP would maintain all berms designed and constructed on City-owned property as part of the proposed BMPs. DEP and DPR would coordinate on the final design of the proposed BMPs as well as the tree replacement plan to be developed based on final design and tree surveys. In addition, DEP would obtain the necessary permits from DPR for all construction and operational activities in City parkland. Therefore, BMPs OB-1 and OB-2 would not result in potential significant adverse impacts to open space.

BMP OB-5: N. RAILROAD AVENUE

BMP OB-5 would occupy about 3 acres within the Willowbrook Parkway ROW. Currently, the proposed BMP site is dominated by a dry basin and an eroded and intermittent stream channel. The proposed BMP design would create a BMP landscaped pond and restore the intermittent stream corridor. A full analysis of the potential impacts on natural resource habitats at this site is presented in Chapter 3.9, "Natural Resources."

The proposed BMP would not interfere with any existing DPR operations at the property, nor would it displace any DPR structures or facilities. DEP would coordinate with DPR and NYSDOT on the final design of the proposed BMP including the continuance of the "White Trail" across the site and its integration into the BMP final design as well as a tree replacement plan to be developed based on final design and tree surveys. In addition, DEP would obtain the necessary permits from DPR and NYSDOT (assuming NYSDOT is property owner at that time) for all construction and operational activities in the parkway. Therefore, BMP OB-5 would not result in potential significant adverse impacts to open space.

LOWER BAY OUTFALLS

The proposed new outfall in the Oakwood Beach watershed would occupy a narrow corridor about 40 feet wide in the City's Great Kills Park, extending south of BMP OB-1 out to the Lower Bay. The footprint of the outfalls at Ebbitts Avenue and Tysens Lane would be expanded. However, the expanded outfalls would be constructed at the same elevation below ground and adjacent to the existing outfalls. As part of the outfall designs, the upland corridor would be restored, and the only portion of the outfall that would be visible within the park would be segment of the outfall and the headwall at the shoreline that extends into the water. The potential natural resources impacts of the proposed outfalls within Great Kills Park are analyzed in Chapter 3.9, "Natural Resources."

The proposed outfalls would not interfere with any existing DPR operations at the property, nor would they displace any DPR structures or facilities. The proposed outfalls would also not impede public access along the shoreline since all outfalls would be designed consistent with the existing outfalls and constructed below grade. Any grade changes necessary to bury the outfall in sand along the beach would be minor and not visually distinguishable and would not impede public access. The beach would remain accessible to the public. DEP and DPR would coordinate on the final design of the proposed outfalls with the objective of minimizing potential impacts to recreation, access and natural resources and any proposed designs for future improvements at Cedar Grove Beach Park. All activities within the park would require a permit from DPR, which DEP would obtain prior to construction. Therefore, the proposed Lower Bay outfalls would not result in potential significant adverse impacts to open space.

E. CONCLUSIONS

The proposed project would include infrastructure improvements in two City-owned properties currently managed by DPR, Great Kills Park and the unbuilt segment of Willowbrook Parkway. There are no DPR facilities within these parks that would be impacted by the proposed project. DEP would coordinate with DPR on the alignment of the 'White Trail," which is in the vicinity of BMP OB-5. With the proposed project this trail would be incorporated into the final BMP site design in order to maintain public access across the site. No other public access to parklands would be affected. All natural areas affected by the proposed project would be restored and

enhanced as part of the proposed BMP designs which would require approvals from and be coordinated with DPR. DEP would also coordinate with DPR on the final BMP designs as well as a tree replacement plan that would be developed based on final design and tree surveys. In addition, DEP would obtain the necessary permits from DPR for all construction and operational activities in City parkland. The proposed project would also install a new outfall and would enlarge the Ebbitts Street and Tysens Lane outfalls across Great Kills Park out to the Lower Bay. The proposed outfalls would not impact any recreational facilities; they would also be buried and the only exposed above-grade structure at the shoreline would not impact public access along the beach, nor would they adversely impact swimming beaches. Therefore, the proposed project would not result in potential significant adverse impacts on open space. ✷

Chapter 3.6: Shadows of the Oakwood Beach Drainage Plan

The *City Environmental Quality Review (CEQR) Technical Manual* states that an assessment of shadows is needed for actions that would result in new structures or additions to existing structures of 50 feet or more in height. The proposed project would not result in any structures 50 feet in height or greater, nor would it result in any structures that would create shadows. The proposed storm sewer connections would be below grade and the proposed BMPs are largely at or below grade and are natural constructs. Therefore, the proposed project would not result in potential significant adverse impacts to shadows. ✷

Chapter 3.7: Historic and Cultural Resources of the Oakwood Beach Drainage Plan

A. INTRODUCTION

Preliminary amended drainage plans have been developed for the Oakwood Beach watershed with the objectives of improving water quality, reducing flooding and erosion, and enhancing vegetative communities and wildlife habitats. The proposed project would require site-specific and subsurface changes on private and public properties. This chapter considers the potential effects of the proposed project on historic and cultural resources in the Oakwood Beach watershed. As described in Chapter 2.1, "Methodology," the proposed amended drainage plan has been examined to determine if there would be potential significant adverse impacts to architectural and archaeological resources within the Oakwood Beach watershed.

B. EXISTING CONDITIONS

ARCHAEOLOGICAL RESOURCES[1]

PRECONTACT ARCHAEOLOGICAL SENSITIVITY

BMP OB-1

Portions of the footprint of the proposed BMP site that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. There are areas of the proposed BMP site, along the site's southwestern side, nearest to Fox Lane, that have slightly raised topography and may contain undisturbed soils, according to soil borings. Therefore, it is concluded that that this naturally elevated portion of the proposed BMP site has limited precontact archaeological sensitivity, while the existing wetlands in the proposed site are less likely to contain archaeological resources.

BMP OB-2

Portions of the footprint of the proposed BMP site that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. There is a peninsular hummock of land extending into the northern side of the proposed BMP from Old Mill Road. Although there have not been any soil borings conducted within the proposed site of BMP OB-2, it is assumed that this area could contain natural soils with minimal disturbance. Therefore, it is concluded that this naturally elevated portion of the proposed BMP site has precontact archaeological sensitivity, while the existing wetlands are less likely to contain archaeological resources.

[1] Provided below is a summary of the report "Oakwood Beach Phase IA Archaeological Documentary Study," Historical Perspectives, January 2011. The Phase 1A was reviewed and accepted as complete by the New York City Landmarks Preservation Commission on April 18, 2011.

BMP OB-3

Portions of the footprint of the proposed BMP site that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. Although there are areas of the proposed BMP site along the site's eastern and western sides that historic maps show had slightly raised topography, soil borings and twentieth century aerial photographs suggest that most of these areas have been disturbed from past grading and filling for construction of former roads and structures in these areas. Therefore, it is concluded that any precontact archaeological sensitivity once exhibited at this proposed BMP site has diminished due to later disturbance. The remaining drainage and wetlands on the proposed BMP site are less likely to contain archaeological resources.

BMP OB-4

This proposed BMP site has been significantly altered from its original condition. Marshlands have been filled in and an artificial drainage ditch was constructed along its length. Therefore, it is concluded that this proposed BMP site does not contain any precontact archaeological sensitivity.

BMP OB-5

Historical maps show that significant disturbance to the proposed BMP site occurred in the 1960s, when the land was slated to become the Willowbrook Parkway. Vegetation was cleared and the land was graded in preparation for the highway. Although highway construction was never completed, this clearing and grading has eliminated any precontact archaeological sensitivity in this area. Therefore, it is concluded that this proposed BMP site does not contain any precontact archaeological sensitivity.

HISTORIC PERIOD ARCHAEOLOGICAL SENSITIVITY

BMP OB-1

There is no indication that this proposed BMP has had any historic period development within or adjacent to its boundaries, although a nineteenth century road was once located along the southwestern side of the proposed BMP site. This road led from Old Mill Road to the Oakwood Beach waterfront and may still exist in places, although it could not be seen due to thick common reed vegetation at the time of the field survey. This road, if extant, would not likely provide any substantive data on historic archaeological resources. Therefore, it is concluded that this proposed BMP site contains no historic period archaeological sensitivity.

BMP OB-2, OB-3 and OB-4

These BMPs never had any historic period development within or adjacent to their boundaries. Therefore, it is concluded that this sites contain no historic period archaeological sensitivity.

BMP OB-5

There is no indication that historic period development occurred at this proposed BMP site. Additionally, there was significant disturbance to the area in the 1960s, when the land was proposed to become the Willowbrook Parkway and the area was cleared of vegetation and graded in preparation for the highway. Therefore, it is concluded that this proposed BMP site contains no historic period archaeological sensitivity.

ARCHITECTURAL RESOURCES

DESIGNATED AND POTENTIALLY ELIGIBLE RESOURCES

There are no known resources within the study areas of proposed BMPs OB-1 through OB-5. There is one known architectural resource in the vicinity of the proposed Tysens Lane and Ebbitts Street outfalls. This resource is the Cedar Grove Beach Club Historic District. It has been identified as potentially eligible by the State Historic Preservation Officer (SHPO) because of its historic role in New York City as a beach club. The community was established around 1907 and was largely constructed between 1920 and 1940.

POTENTIAL RESOURCES

No potential architectural resources were identified within the study areas of proposed BMPs OB-1, OB-2, OB-3 and OB-5. There are two potential architectural resources located within the study area of proposed BMP OB-4. These potential resources are described below.

The **Oakwood Heights Community Church** is located at 345 Guyon Avenue, on the northwest corner of Guyon and Falcon Avenues (Block 4020, Lot 1). The church is clad in red brick and has its main entrance on Guyon Avenue through a crenellated square tower. A shallow brick stoop leads to the entrance. The main façade of the building, on Guyon Avenue, is centered around a large, arched stained glass window. On the interior of the building, an organ was installed by the Wicks Organ Company in 1937.

309 Guyon Avenue (Block 4018, Lot 1) was built ca. 1901. It is a Victorian-style, wood frame, 2-story house on a corner lot. The main entrance to the building is on Guyon Avenue off a narrow porch. The building has gingerbread detail around its eaves and a turret at the southwest corner. On its Medina Street frontage, there is a larger porch that has been screened in. The building's windows do not appear to be original.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, additional structures and sites could potentially be designated as historic resources through the year 2043. However, there are no known pending designations at this time. In addition, it is assumed there would be no site disturbance at any of the proposed BMP sites.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

ARCHAEOLOGICAL RESOURCES

A Phase IA study was prepared for the study area for the purposes of identifying areas of potential archaeological sensitivity. This Phase IA study concluded that a portion of the proposed site of BMP OB-2 contains discrete areas of precontact archaeological sensitivity. The remaining proposed BMPs contain no precontact period archaeological sensitivity. None of the proposed BMPs contain historic period archaeological sensitivity. The Phase 1A study recommends that Phase1B archaeology testing be performed at this proposed BMP site. This testing would involve several shovel tests that would be used to determine the presence or absence of any Native American archaeological resources. The Phase 1B archaeological field testing would be implemented as part of the proposed project and would not commence until review and approval of a testing protocol by LPC and SHPO. All Phase 1B testing would be performed by a certified professional archaeologist and in accordance with a protocol that meets LPC's Guidelines for Archaeological Work in New York City (2002), the recommendations of

the New York State Education Department, Cultural Resources Survey Program, and SHPO standards. The archaeology team would also be required to notify both LPC and SHPO when testing is scheduled to begin and it is anticipated that staff from each agency may visit the site during the testing process. Once the testing is completed, the archaeologist would also be required to submit a Phase 1B report that documents the field investigations and findings to LPC and SHPO.

To avoid impacts, this investigation would be performed after final design is completed and the contract is awarded, but prior to the start of construction. With these measures in place, the proposed project would not result in potentially significant adverse archaeology impacts.

ARCHITECTURAL RESOURCES

The proposed project would not have any direct or indirect impacts on historic architectural resources. It would install a new storm sewer collection system with five new proposed BMPs, two of which are located near two potential architectural resources and one new outfall with two enlarged outfalls. The majority of these improvements would be below grade with the exception of the outlet structures to the proposed BMPs and the associated plantings and the outfalls would be exposed at the shoreline and in the water of the Lower Bay.

The proposed BMPs are largely natural constructs. They include grade contouring and landscaping with new plantings that would screen the structural elements. As the proposed BMP landscaping matures, it would visually integrate into the surroundings and become part of the local visual setting. Thus, the proposed BMPs would not alter the setting of the identified potential historic architectural resources. In addition, sight lines from the historic architectural resources to the proposed BMPs, and from the proposed BMPs to the potential resources, are limited. There are no historic resources in the vicinity of the proposed new outfall; there is one resource at the site of the proposed outfall enlargements at Tysens Lane and Ebbitts Street. The proposed outfall enlargement (or secondary outfalls) would be constructed adjacent to existing outfalls and would be below grade with the exception of the section at the shoreline and out into the waters of the Lower Bay. Given that these would be enlargements of exiting structures across the site, and that they would be mostly buried, it is not expected that the proposed secondary outfalls would have a significant impact on the potentially eligible Cedar Grove Beach Historic District. Therefore, the proposed project would not have potential significant adverse impacts on historic architectural resources.

E. CONCLUSIONS

With respect to archaeological resources, a Phase IA study was conducted to determine if the proposed BMPs have archaeological sensitivity. This study concluded that a portion of the proposed BMP OB-2 site contains discrete areas of precontact archaeological sensitivity. Therefore, Phase IB archaeological testing would be conducted at these sites, if these areas would experience subsurface impacts as part of the proposed BMP construction. The Phase 1B report would be submitted to LPC for review and approval and recommendations would be implemented as part of the proposed capital project.

With respect to architectural resources, the proposed BMPs would not alter the setting of the identified potential historic architectural resources. In addition, sight lines from the identified historic architectural resources to the proposed BMPs, and from the proposed BMPs to the resources, are limited.

Therefore, the proposed project would not result in potential significant adverse impacts to historic and cultural resources.

Chapter 3.8: Urban Design and Visual Resources of the Oakwood Beach Drainage Plan

A. INTRODUCTION

This chapter examines the potential effects of the proposed project on urban design and visual resources in the Oakwood Beach watershed. The analysis of the proposed project was completed to identify potential changes to the urban setting or local visual experience from the perspective of adjacent residences, pedestrians and open space users. The proposed amended drainage plan would install new storm sewers, one new and two expanded outfalls, and five BMPs. The proposed sewers would be below grade. However, certain structures within the BMPs (e.g., weirs) and proposed berms would be above grade. In addition, outfall improvements would be partially above grade. There are also limited segments of local streets where the street grades would need to be raised in order to install the proposed storm sewers. This analysis examines BMP OB-1, OB-2, OB-3 and OB-4 together as the "lower watershed BMPs," because of similar baseline conditions and proposed designs.

B. EXISTING CONDITIONS

LOWER WATERHSED BMPS

The proposed lower watershed BMPs would be sited in the lower coastal plain of the Oakwood Beach watershed where there is little topographical relief. The proposed sites are bordered by the Lower Bay shoreline of Great Kills Park to the south, residential areas to the north and east and Great Kills Park (part of the Gateway National Recreation Area [GNRA]) to the west. The sites have no formal public access (e.g. trails) into the properties and there are limited public views are from the adjoining streets (e.g. Kissam Avenue, Mill Pond, Fox Lane). Private views from residential homes are also limited to the edges of the proposed BMP sites. Views from the street and adjacent private properties are limited because of the flat topography, the absence of public vantage points and the thick common reed vegetation at the street edges, which can grow up to and above average eye level (i.e., equal to or greater than five feet above grade).

The proposed sites are visually dominated by common reed emergent wetlands with some partially visible channels, creeks and open water habitats. Large stands of common reed obscure much of the street level public view into the sites. Transitional areas between the common reed stands and adjacent sidewalks or residential properties are often characterized by southern hardwood trees comprised of elms, maples and birch, with canopy heights ranging from 10 to 30 feet. Due to unmanaged runoff from local streets, debris and loose litter are found along street edges. Visual conditions at the proposed site of OB-4 are somewhat different: this site is a drainage swale off of Hylan Boulevard that is a more wooded corridor with some urban debris.

OB-5: WILLOWBROOK PARKWAY

The proposed location of OB-5 is in the upper watershed along a wooded corridor, about 200 feet wide that is bordered by residential uses. It is within a portion of the mapped, but unbuilt, segment of the Willowbrook Parkway, and the "White Trail," which connects to the Staten Island Greenbelt, crosses the site. The site is visually characterized by wooded wetlands with a detention basin and a narrow stream channel with herbaceous cover downstream of the basin. The basin is bordered by a canopy consisting of mature trees (20-30 dbh). Pedestrian views along the adjoining streets, such as Riedel Avenue, are primarily of a wooded streetscape along the west side of the street (the side with the unbuilt parkway), and private single family residences on the east side. Views from these residences to the west are of the mostly wooded Willowbrook Parkway ROW. Trail users along the parkway ROW would primarily experience a combination of shrub and low herbaceous growth and a view that is generally open to the sky along an intermittent stream corridor, with a more closed canopy of high and mature trees around the excavated basin, which itself is largely a denuded with a corrugated inlet pipe.

LOWER BAY OUTFALLS

The site of the proposed new Lower Bay outfall would be located seaward of the proposed site of BMP OB-1. This site is characterized as a sandy beach with an upland low berm that was installed as a flood control measure. Public views of the shoreline are open to the east and west along the beach. The views are primarily of a sandy beach, the waters of the Lower Bay to the south, and a low berm or dune to the north. The berm separates the common reed marsh of the proposed site of OB-1 from Lower Bay. In the vicinity of the proposed Tysens Lane and Ebbitts Street outfall enlargements there are a series of low rise structures that are part of the Cedar Grove Beach Club, which is a seasonal bungalow community. These sites also have existing outfalls and are also characterized by a sandy beach along with the existing outfall structures that extend several hundred feet out into the bay.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, no major changes in the built form of the watershed are expected as no major developments are currently proposed. It is also assumed that stormwater flows will remain unabated with regular flooding during storms and high tides. Wetlands currently degraded with debris, erosion, and invasive plant species, would remain in a similar or declining condition without an improvement or maintenance program in place. As a result, episodic brush fires across the common reed-dominated habitats would continue to occur. It is also proposed by DPR in the future without the proposed project to provide additional public open space with the removal of some structures and addition of new facilities in the Cedar Grove Beach area of Great Kills Park (see also Chapter 3.5 "Open Space of Oakwood Beach Drainage Plan"). This would potentially provide more public access to the beach and a more natural landscaped setting along this stretch of the shoreline.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

LOWER WATERHED BMPS

The proposed lower watershed BMPs would diversify the vegetation and habitat of existing open spaces by expanding open water wetlands and improving stream corridors. The transformation of the existing common reed marsh into a more diverse planted landscape would provide

aesthetically diverse and pleasing views for the surrounding community. With respect to landscape and visual enhancements, the proposed project would provide the lower watershed with greater herbaceous and shrub diversity. The newly landscaped areas and wetlands within the proposed BMPs would have mature vegetation after a brief grow-in period. Existing wooded tree stands on the perimeters of Bluebelt properties and at specific BMPs would be protected as visual screens and borders to the greatest extent possible during final design. The Bluebelt monitoring and maintenance program would also secure the site, provide regular maintenance and cleanup, and monitor the success of the planted vegetation and replace plantings as necessary.

In addition, physical structures at the proposed BMP sites would be installed, including piped outlets, forebays, berms, outlet stilling basins and weirs. These structures would be at or below grade and would not be prominent in views of the BMPs. Visually prominent structures would be stone-faced, similar to existing Staten Island Bluebelt designs in South Richmond. The proposed berms would be about 6 to 36 inches high and planted with a vegetated cover, which would better integrate the berms into the existing vegetation. The weirs would be between 40 and 120 feet in length and generally at or below grade and the berms would be consistent with the surrounding landscape and would not be visible from the surrounding streets or residences.

Final design of the proposed BMPs within parklands (i.e., a portion of OB-1 and all of OB-2) would be made to enhance natural features and natural aesthetics through a diverse planting program with appropriate tree planting locations to be determined in conjunction with DPR .In addition, planting locations would be located as close to the BMP sites as possible. Therefore, these proposed BMPs would not result in potential significant adverse impacts to urban design and visual resources.

OB-5: WILLOWBROOK PARKWAY

The proposed BMP would enhance the existing drainage basin and intermittent stream below the basin, thereby, increasing wetland habitat. While there may be the clearing of some canopy trees, this would be limited and the final BMP design would include a detailed tree survey to minimize tree impacts within the proposed BMP area. There would also be a buffer of protected woodlands flanking the proposed BMP. Tree removal would therefore be partially screened by existing trees that would remain. In addition, existing access via the White Trail would remain, offering public views of the diverse BMP landscaping. Private views of the site from nearby residences would be largely unaffected since the wooded edges of the BMP would continue to be provided, offering public views of the diverse landscaping, including wildlife attractors associated with the proposed wetland restoration. The existing denuded basin would be restored and planted along with the downstream intermittent channel which is a visual benefit. Therefore, the proposed project would not impact private views from the east side of Riedel Avenue.

Final design of the proposed BMP in the Willowbrook Parkway ROW as well as appropriate tree planting locations would be determined in conjunction with DPR and NYSDOT and located as close to the BMP site as possible. Therefore, the proposed BMP would not result in potential significant adverse impacts to urban design and visual resources.

LOWER BAY OUTFALLS

The proposed project would install new and supplemental storm sewer outfalls out to Lower Bay that would be buried below ground and not visible as they extend out beneath the City's Great Kills Park to the bulkhead line. Any grade changes necessary to bury the outfall in sand along

the beach would be minor and not visually distinguishable. The proposed outfall from OB-1 would be about ten feet wide and five feet high and the proposed enlarged outfalls at Ebbitts Street and Tysens Lane outfalls would be about five feet wide and eight feet wide (respectively) and five feet high at the shoreline where the structures would first appear from below grade. The segments of the proposed outfalls that would be visible would be along the shoreline and at the headwall (a concrete encasement installed at the end of outfall). The sections of the outfalls between the shoreline and the water line would be designed and constructed similar to the existing outfalls and would not be significant structural additions to the public beach. Therefore, the proposed outfall would not result in potential significant adverse impacts to urban design and visual resources.

SEWER IMPROVEMENTS AND STREET RAISINGS

The proposed project would require the modification of existing street grades in order to install the proposed storm sewers. Some street segments would be raised from current street grades by between 6 and 24 inches. Given the limited number and length of street segments that would be affected (see Chapter 3.1 "Project Description of the Oakwood Beach Drainage Plan") as well as the small increase in grade, these increased street elevations would not be perceptible from a visual or urban design perspective and would not impact urban view corridors or streetscapes along affected streets. The design of the street cross-section would be determined during the final sewer (and street) design for these affected streets in order to minimize differences between the proposed street grade and adjacent private property grade. This would limit transitions between local property and sidewalk elevations. Therefore, the proposed modified street grades would not result in potential significant adverse impacts to urban design and visual resources.

E. CONCLUSION

The proposed lower watershed BMPs would transform existing views of large vegetated monocultures into more visually diverse landscapes that combine surface water features with a variety of plantings. Views from adjacent streets and private homes would potentially be opened up at street ends in cases where common reed currently grows to eye level and obscures views into these sites. The Bluebelt monitoring and maintenance program would also secure the sites, provide regular maintenance and cleanup and monitor the success of the planted vegetation and replace plantings as necessary. This would be a visual benefit for the community.

With respect to tree stands and visual borders at the other lower watershed BMP sites, these sites have less woodland, but do have trees along their borders and within the interior hummocks. To protect, to the extent feasible, existing trees and woodland stands, final BMP designs would include detailed tree surveys to minimize tree impacts, particularly at those BMP sites where wooded borders are part of the local visual landscape or could potentially screen the BMP site during the grown-in phase. The structures at the BMPs would be at or below grade and not visually prominent. In addition, the proposed lower watershed berms would be low-rise features and landscaped such that they are not visually prominent in public views from streets or private views from adjoining properties. DEP would also develop a tree planting plan in coordination with DPR and NYSDOT to replace trees onsite to the greatest feasible that may need to be removed for the construction of the proposed BMPs. Visually prominent structures in the BMPs would be stone-faced, similar to existing Staten Island Bluebelt designs in South Richmond. Final landscape design of the proposed BMP would be made to enhance natural features and natural aesthetics through a diverse planting program. For these reasons, the proposed project

would contribute positively to the local visual character, particularly along the public street frontages. In addition, brush fires would also be controlled which would limit potential visual scarring of the landscape as is caused by fires that have occurred historically in this area.

The proposed project would not significantly alter urban design features or visual character conditions of the upper watershed. The one upper watershed BMP, OB-5, is small in size and would restore natural features. The proposed BMP structures would be at or below grade such that they would not impact the visual setting or public views in along trails in the Willowbrook Parkway nor would private views from across the street be impacted. Perimeter trees and wood borders would also be protected in the final BMP design.

The proposed sewer segments would be below grade. The proposed new and enlarged outfalls and headwall would be visible as the outfalls extend from the shoreline into the Lower Bay; however, given the presence of existing outfalls and the limited size of the proposed structures (the proposed expanded outfalls would also be adjacent to existing outfalls), the proposed outfalls would not be expected to significantly impact public views along the beach.

Given the anticipated limited increases in street grades, the proposed modified street grades would not impact view corridors or streetscapes along the affected streets. In addition, the final design of the street cross-sections would be based on site specific topographic information to minimize transitions between adjacent properties and the street and sidewalk.

Therefore, the proposed project would not result in potential significant adverse impacts to urban design and visual resources. ✷

Chapter 3.9: Natural Resources of the Oakwood Beach Drainage Plan

A. INTRODUCTION

Preliminary amended drainage plans have been developed for the Oakwood Beach watershed (**Figure 3.9-1**) with the objectives of improving water quality, reducing flooding and erosion, and enhancing vegetative communities and wildlife habitats. Although the proposed project would benefit natural resources, certain project elements do require site-specific changes to hydrology, groundwater, water quality, wetlands, vegetation and trees, wildlife, and endangered and threatened species. The proposed site alterations to natural resources conditions have been examined in this section to determine if there would be potential significant adverse environmental impacts to natural resources within the Oakwood Beach watershed as a result of the proposed project.

B. EXISTING CONDITIONS

HYDROLOGY

UPPER WATERSHED

The upper watershed includes drainage along the mapped, but not built, Willowbrook Parkway right-of-way (see **Figure 3.9-2**). For most of this length, the right-of-way is between 200 and 300 feet in width. It is largely vegetated, undeveloped, and crossed only by Amboy Road/Savoy Street and the Staten Island Railroad (the rail crossing is elevated). The portion of the watershed to the west of the Willowbrook Parkway is built for the most part, and is not included in this analysis (see Chapter 3.1, "Project Description").

There are several surface water features along this right-of-way, among them two ponds in the northern portion, one at Park Street and the other at Thomas Street. The first pond, dominated by buttonbush plants, receives street runoff from the intersection of Park Street and Maplewood Avenue. After especially heavy rains when the pond very occasionally spills over it banks, the overflow drains into a catch basin at the intersection of Riedel Avenue and Park Street. A field inspection found no evidence of this overflow occurring on a regular basis. The second pond, which is mostly open water without much emergent vegetation, receives street runoff from the intersection of Thomas Street and Combs Avenue. Overflow from that pond runs along the highway right-of-way towards Amundsen Circle, where catch basins pick up the runoff.

Those catch basins in the traffic circle, which is in the highway right-of-way, feed an intermittent channel located off of Savoy Street just downstream of the circle. That intermittent channel in turn feeds a deep basin located at North Railroad Avenue, just above the railroad crossing. That basin appears to be an old stormwater basin, but its actual history is unknown. The basin receives flow from that stormwater pipe off of Savoy Street, discharging flows from catch basins around Amundsen Circle and daylighting just south of the circle. The basin spills into a swale that flows under the railroad tracks in the unusual occurrence of the basin being full.

Below the basin, the intermittent channel runs beneath the elevated rail trestle and continues downstream along the right-of-way. It grows gradually larger and more defined as it approaches Hylan Boulevard, finally crossing under the Boulevard to feed the West Branch of Oakwood Beach creek in the vicinity of Great Kills Park. Records show that a 48-inch storm sewer flows in this right-of-way from a drainage area to the northwest of Montreal Avenue. This storm sewer continues in the right-of-way before discharging to an existing channel below Hylan Boulevard.

There is no noticeable erosion in the intermittent stream channel, and there is no existing flooding in this area.

LOWER WATERSHED

The lower portion of the Oakwood Beach watershed (see **Figure 3.9-3**), below Hylan Boulevard, is at a very low elevation –primarily in the vicinity of Mill Road, Fox Lane, Kissam Avenue and other adjacent streets.

Runoff within the lower watershed flows south into the Lower Bay via three branches of the Oakwood Beach drainage system. One is the West Branch, which originates at the culvert under Hylan Boulevard at the end of the Willowbrook Parkway and a culvert under Buffalo Street and flows through the western edge of Great Kills Park. A smaller subwatershed (approximately 40 acres) exists north of Hylan Boulevard that drains via two culverts into the Middle Branch of Oakwood Beach Creek, in the mapped but unbuilt Adelaide Avenue. The channel is obviously man-made given the straightness of the bed and the presence of two 90-degree turns. The first of the two turns occurs at the unbuilt portion of Falcon Ave where the channel runs southwest until it makes a second 90 degree turn west of Chesterton Avenue, where it becomes more sinuous. From here, water flows along the boundary of Great Kills Park, combining with the West Branch of Oakwood Beach Creek just north of the Wastewater Treatment Plant (WWTP). Lastly, the East Branch of Oakwood Creek begins in the portion of Great Kills Park east of Kissam Avenue. The East Branch parallels the Lower Bay shoreline, flowing south and west to combine with water from the East and Middle Branch to form Oakwood Beach Creek before discharging to Lower Bay. Discharge from East Branch is regulated by a tide gate, maintained by the U.S. Army Corps of Engineers (USACE), thereby preventing inland flooding along the East Branch during high tide events. There are no tidal gates controlling the middle or west branch outlets. When high tide events and large intensity storms occur simultaneously, water in the channels of Oakwood Beach Creek backs up, typically causing flooding.

Under the existing conditions, existing water surface elevations were determined for the Tysens Lane trunk sewer near Hett Avenue, within the East Branch of Oakwood Beach Creek near the end of Kissam Avenue and Fox Lane, and within the Middle Branch of Oakwood Beach Creek near the intersection of Adelaide Avenue and Falcon Avenue. The West Branch of Oakwood Beach Creek was included in the model, but the channel runs exclusively through Great Kills Park and flooding in this location does not impact streets or houses. Under existing conditions, modeling shows that the 10-year design storm (**Figure 3.9-4**) produces peak water surface elevations shown in **Table 3.9-1**. This table also shows the existing street elevations at these locations. Therefore, modeling shows that under 10-year storm conditions, portions of the Oakwood Beach lower watershed would flood, particularly at Kissam and Fox Avenues. Falcon Avenue would not flood, but the ends of Lynn and Riga Streets are approximately elevation 2.0, and they are adjacent to the wetland area, though not the Middle Branch itself. Although the elevation of water at Tysens Lane does not exceed the street elevation under the modeled 10-year storm event, DEC field reconnaissance has observed surcharging sewers in this area.

Table 3.9-1
Peak Water Surface During the 10-Year Event (Existing Conditions)

Street Location	Street Elevation (ft. SI)	Peak Water Surface Elevation (ft. SI)
Tysens Lane and Roma Avenue	7.4	4.20
East Branch at Kissam Avenue	-0.4	1.48
East Branch at Fox Lane	-0.4	1.47
Adelaide Avenue and Falcon Avenue	7.0	2.71

Source: Hazen and Sawyer, January 2011.
Note: All elevations in Staten Island Datum unless otherwise noted.

FLOODPLAINS

Figure 3.9-5 presents the 100-year floodplain (area with a 1 percent chance of being inundated within any given year and 500-year flood plain (area with a 0.2 percent of being inundated within any given year) boundaries within the watershed. New York City is affected by local (e.g., flooding of inland portions of the City from short-term, high-intensity rain events in areas with poor drainage), fluvial (e.g., rivers and streams overflowing their banks), and coastal flooding (e.g., long and short wave surges that affect oceans and bays such as Lower Bay, and tidally influenced rivers, streams and inlets). Much of the lower watershed is within the 100-year floodplain, which extends north to Hylan Boulevard and Mill Road. Standing water in the streets and slumping of soil and pavement in low lying areas is evidence of frequent local flooding within the study area.

Based on an examination of the Flood Insurance Rate Maps (FIRM) for the watershed (#3604970336F), the 100-year flood elevation varies based on location from 10 feet to 11 NGVD (6.8 feet to 7.8 feet Staten Island Datum) in the lower watershed. The Federal Emergency Management Agency (FEMA) has not calculated 100-year flood elevations for the upper watershed, indicating that there are no known major storm flooding issues in the upper watershed.

GROUNDWATER

In order to describe groundwater conditions in the Oakwood Beach watershed, monitoring wells were installed along Fox Lane between Mill Lane and Cedar Grove Avenue, at the end of Kissam Avenue, and near the intersection of Riga and Dugdale Streets (see **Figure 3.9-6**). These wells roughly correspond to Oakwood Beach proposed BMPs OB-1, -2, and -3, respectively.

Groundwater elevations at each well were averaged for the spring, summer, and fall monitoring periods and shown as a range of levels (see **Figure 3.9-7** and **Table 3.9-2**). Groundwater monitoring results indicate that the water table is not far from surface elevations in the downstream section of the Oakwood Beach watershed. Water table elevations are, not surprisingly, highest during the wet period in April and May. Highest recorded elevations at Fox Lane, Kissam Avenue, and Riga Street are -1.00, -0.82, and 0.64 feet, respectively). The summer and fall water table elevations are fairly similar, with July observations slightly lower or about equal to October-November elevations. Lowest observed groundwater elevations at OB-1, OB-2, and OB-3 are -1.38, -1.43, and -0.06 feet, respectively. In general, spring water table elevations average about 0.5 feet higher than at the same well in the summer and fall.

Table 3.9-2
Range of Observed Groundwater Elevations During 2010 Monitoring Period

Location	Highest Levels (Spring)	Lowest Levels (Summer/Fall)
Fox Lane	-1.00	-1.38
Kissam Avenue	-0.82	-1.43
Riga Street	0.64	-0.06

Source: Hazen and Sawyer, January 2011.
Note: All elevations in Staten Island Datum.

Groundwater elevations were also found to fall between typical low- and high-tide elevations, which is consistent with the assumption that the low tide elevation sets the minimum water table elevation. However, no correlation was found between the tide elevation at the time of measurement and the groundwater elevation. This finding indicates that while the sea level controls the broader water table elevation, individual tidal cycles do not impact the movement of groundwater in the wetland areas of the watersheds.

WATER QUALITY

Many water bodies in the Oakwood Beach watershed are small, and as a result, many are not classified by NYSDEC. For unclassified streams and ponds there are no legally mandated water quality goals. In the upper watershed, there are no classified water bodies. In the lower Watershed, all three branches of Oakwood Beach Creek are classified as I/C or C, marine or fresh waters that support fisheries and are appropriate for fishing and secondary contact activities (such as boating, see **Figure 3.9-8**). In general, activities in these designated waters cannot degrade water quality, introduce new contaminants or reduce flow or oxygen concentrations to a level that impairs the designated functions. The Lower Bay is classified as SB, marine waters and the designated functions (or best uses) are swimming and boating.

Under existing conditions, pollutants that enter the local waterways, which in turn flow to the Lower Bay, include organic matter which can increase the biochemical oxygen demand (BOD) within the water column thereby resulting in a reduction in the dissolved oxygen (DO) concentrations that stresses natural communities. It also causes an increase in coliform bacteria, and nutrients. Although nutrients such as nitrogen and phosphorus are essential to the growth of phytoplankton and act as a base for supporting higher tropic levels, in excess concentrations these nutrients can result in a condition known as eutrophication. This can result in phytoplankton blooms, including nuisance algal forms, which further depresses DO levels in water bodies. With large stormwater runoff volumes that are not attenuated in any way, as under current conditions, more of these pollutants coming from rooftops, lawns, roadway surfaces and other urban areas are transported directly to local streams and ultimately to the Lower Bay. There are also the erosive forces of unmanaged runoff which leads to sedimentation in local waterbodies.

WETLANDS

Figures 3.9-7 and **3.9-8** show the NYSDEC and NWI wetlands within the watershed that may be affected by the proposed BMPs. Also provided below is a brief description of the wetland based on the NYSDEC designation report.

NYSDEC MAPPED WETLANDS

NA-10 (Oakwood Beach)

NYSDEC-mapped NA-10 is a 242-acre freshwater wetland that covers the lower portion of the Oakwood Beach watershed (the sites of proposed BMPs OB-1, OB-2, OB-3, and OB-4). Historically, this wetland was a tidal marsh until the construction of berms along the shoreline restricted its connection with the estuarine waters of Lower Bay. During the period of disturbance to this wetland, common reed invaded all wetland areas. In 1987, at the time of the mapping of this wetland, a number of native plant species were also present within the common reed marsh including cattails, sedges, rushes, bulrushes, arrowheads, grasses, swamp milkweed, Turks-cap lily, and earth loosestrife, among others (NYSDEC 1987). Deciduous swamp communities were documented at the northern edges of the wetland in and near groundwater-fed springs (NYSDEC 1987).

Wetland NA-10 is a Class I wetland and has three main characteristics: 94 percent of the wetland is categorized as an emergent marsh; 4 percent is deciduous swamp; and 2 percent is wetland open water[1]. The wetland supports an abundance of wildlife, some of which may be rare, threatened, or endangered, as stated in the designation report.

NYSDEC TIDAL WETLANDS

In addition to the freshwater wetlands, NYSDEC regulates tidal wetlands in the littoral zone of the bay (see **Figure 3.9-9**).

NWI MAPPED WETLANDS

NWI-mapped wetlands are found throughout the watershed, but generally in the same locations as the NYSDEC wetlands, and include palustrine wetlands that characterize the upper watershed (PUBHh) and emergent (common reed dominated) wetlands of the lower watershed (PEM5Fh). There are also NWI mapped freshwater wetlands in the right-of-way of the Willowbrook Parkway (there are no NYSDEC wetlands in the right of way). Estuarine intertidal wetlands are mapped along the shoreline and within the bay. **Figure 3.9-10** shows the locations of these wetlands within the watershed. See Appendix C for the definitions of the wetlands.

WILDLIFE

BIRDS

The Oakwood Beach Watershed has been surveyed as part of the New York State Breeding Bird Atlas and 70 species have been identified. Those species can be found in the mudflats, shores, salt marshes, uplands, ponds, and wetlands. Appendix C provides the breeding bird atlas inventory data for this watershed.

Breeding bird species expected in the forested upper reaches of the watershed include a number of aerial foragers, such as flycatchers, and canopy birds (i.e., warblers) as well as cover and foraging for ground feeders such as the brown thrasher, American robin, and wood thrush.

[1] NYSDEC identifies four classes of wetlands. Class I is the most critical for preservation and protection typically because it is a diminishing resource in an urban setting and provides flood controls and important wildlife habitat.

Woodpeckers (e.g., hairy woodpecker, downy woodpecker) and a variety of songbirds (e.g., scarlet tanager, white-breasted nuthatch, indigo bunting, Baltimore oriole, and white-eyed vireo) are common to the watershed[1].

Breeding bird species expected within the lower reaches of the watershed include passerines common in edge and forested habitats, such as gray catbird, northern flicker, American crow, Carolina wren, eastern phoebe, tufted titmouse, American robin, yellow warbler, common yellowthroat, common grackle, song sparrow, and northern cardinal; and common passerines associated with aquatic habitats, including barn swallow and red-winged blackbird.

Waterbirds that would be more common in the lower watershed include mallard, double crested cormorant, and great egret. Species of waterbirds not listed in the breeding bird atlas quadrants but that would also be expected, include black-crowned night-heron and glossy ibis. Long-legged wading birds, such as herons, egrets and ibis, also have the potential to forage within the open waters and wetlands of this watershed.

REPTILES AND AMPHIBIANS

The Amphibian and Reptile Atlas Project has compiled information on the current geographic distribution of species based upon field data collected from 1990 through 1998. The Amphibian and Reptile Atlas Project survey blocks encompass an entire USGS 7.5 minute quadrangle. Appendix C provides the inventory of reptiles and amphibians for this surveyed area.

With respect to amphibians, Staten Island boasts the highest salamander species diversity of the five boroughs. Historically, Staten Island has nine documented species of salamanders, six of which are present on Staten Island (Pehek 2007). Three of these species of salamanders have been listed for the “The Narrows” quadrangle including the northern two-lined salamander, red salamander, and eastern red-backed salamander. The other three species of salamanders that are known to occur on Staten Island include the spotted salamander, northern dusky salamander, and eastern newt.

Breeding populations of northern dusky and northern red salamanders have been documented in the New Creek watershed to the east (Pehek 2007); however, they would not be expected in this watershed. Northern red salamanders are found in and near streams, springs, ponds, and bogs in deciduous, conifer, and mixed forests (Gibbs et. al. 2007). Northern dusky salamanders are common in and around streams and seeps in mature deciduous and mixed forests (Gibbs et. al. 2007). Both the northern dusky and northern red salamanders are unusual on Staten Island. The northern two-lined salamander is also found along streams in deciduous forests of the watershed (Gibbs et. al. 2007). Ponds are the primary habitat for the spotted salamander and the red spotted newt on Staten Island. The spotted salamander is listed as a "Species of Special Concern" by NYSDEC.

The eastern red-backed salamander would be expected at the proposed BMP sites of the lower and upper watersheds. It is one of the most abundant and widespread salamanders on Staten Island (Pehek 2007) and is the only amphibian in its range that does not require water for egg laying (Gibbs et. al. 2007). It is tolerant of moderately disturbed sites and is often found under downed logs and in moist soils under household debris (Conant and Collins 1998).

[1] Latin species names are provided in Appendix C.

Toad and frog species that would be expected in both the upper and lower portions of the watershed include the Fowler's toad, spring peeper, American bull frog, and green frog. Both bull frogs and green frogs are dependent on permanent water and inhabit the shallows and edges of ponds, lakes, wetlands, and other slow moving bodies of water (Gibbs et. al. 2007). Spring peepers have been described as habitat generalists that are tolerant of human disturbance. Spring peepers utilized semi-permanent pools of water for breeding (Gibbs et. al. 2007). Fowler's toads are common in disturbed areas but prefer dry, sandy soils in lowlands and breed in semi-permanent water (Conant and Collins 1998).

Four species of snakes have also been identified in the upper and lower portions of the watershed. The eastern milk snake and common garter snake are tolerant of human disturbance and are frequently found in and around residential areas and shrubby borders of forests (Gibbs et. al. 2007). The northern water snake is common in a variety of permanent freshwater sources (Gibbs et. al. 2007) and the northern brown snake is typically found in an array of terrestrial habitats including marshy areas with an abundance of cover objects (Gibbs et. al. 2007). No lizard species were reported for the study area.

Three species of turtle would also be expected in the Oakwood Beach watershed. The snapping turtle, painted turtle, and red-eared slider are habitat generalists and may appear in almost any type of permanent freshwater wetlands (Conant and Collins 1998).

FISH

The NYSDEC wetland designation report for the Oakwood Beach wetlands, NA-10: Oakwood Beach, identified the channel wetlands of the Oakwood Beach watershed as potential habitat for small fish. Fish identified in the designation report include bullhead catfish, gambusia, pumpkinseed goldfish, goldfish and mummichog. Both the East Branch and the lower West Branch of the Oakwood Beach watershed contain water on a perennial basis. The East Branch is tide-gate controlled near the outlet to the bay and therefore, would not be expected to contain fish habitat. The lower reach of the Main Channel near the outlet to Lower Bay, however, has a greater potential for fish resources because of the extensive water area and the observed tidal exchange with the bay. In addition to these inland streams, Lower Bay is an important marine fishery resource. Species common to the bay include winter flounder, bluefish, Atlantic butterfish, Atlantic mackerel, summer flounder, black sea bass, Spanish mackerel, and sandbar shark, all of which are considered part of the Essential Fish Habitat designation for Lower Bay (see also Appendix C).

MAMMALS

There is limited mammalian diversity within the Oakwood Beach watershed. Mammalian species tend to be habitat generalists and may be present in a variety of habitats. Among these species are raccoons, white-footed mouse, Norway rat, mole, opossum, groundhog, gray squirrel, chipmunk, muskrat, eastern cottontail rabbit, little brown bat, and feral domestic cat. White-tailed deer may also be present throughout the watershed.

BMP SITES

BMP OB-1: KISSAM AVENUE

This site is associated with the eastern portion of NYSDEC-mapped wetland NA-10 and also includes National Wetlands Inventory (NWI)-mapped estuarine wetlands. OB-1 is a large open

marsh dominated by common reed, with some ponded areas on the southern side (this site is off-line from the East Branch stream and does not contain any streams). The marsh would be defined as a reedgrass (i.e., common reed) marsh, by Edinger et. al. (2002). A common reed marsh is a marsh has typically been disturbed by activities such as changes in hydrology and filling such that common reed has become the dominant species (Edinger et. al. 2002). The open marsh is located within a shallow basin formed by the surrounding topography and a berm/maritime dune. Within this basin, isolated hummocks of upland vegetation and pockets of emergent marsh are present along the southwestern, western, and northern boundaries. Substantial dumping activity of construction debris and household waste is evident at the southern end of Kissam Avenue.

Since the site was completely burned in a fire in March 2009, common reed regeneration has been substantial with average common reed height greater than seven feet throughout much of the central area. New recruitment of porcelain-berry, violet species, pin oak, Virginia creeper, cat greenbrier, and red maple, and a few stems of swamp rose mallow, are present within the otherwise dense cover of common reed. In addition, it is reported that the 2009 fire cleared away the common reed thereby allowing the spread of state-listed species including northern gamma grass and turks-cap lily (Lynch 2009). In 2008, only a small number of turks-cap lily stems were present in the area, but after the fire between 2,000 and 4,000 stems were reported (Lynch 2009).

Along a hummock area between Kissam Avenue and the common reed marsh (approximately halfway between Mill Road and Oakwood Beach shore), a diverse wet meadow area is present, and includes woolgrass, soft rush, marsh St. Johnswort, swamp rose mallow, cinnamon fern, Canadian burnet, swamp rose, red chokeberry, elderberry, switch grass, and other species.

Along the northern boundary, a hummock area south of Mill Road includes an open meadow of cinnamon fern, narrow-leaved goldenrod, sumac species, switch grass, and path rush. Several small wooded stands with pin oaks in the overstory and black cherry and gray birch in the understory are also present in this area.

In general, the perimeter of the common reed dominated area consists of a successional southern hardwoods community. This community is defined by Edinger et. al. (2002) as “a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees and shrubs include any of the following: American elm, slippery elm, white ash, red maple, box elder, silver maple, sassafras, gray birch, hawthorns, eastern red cedar, and choke-cherry. Certain introduced species are commonly found in successional forests, including black locust, tree-of- heaven, and buckthorn.” The observed canopy and subcanopy species surrounding the perimeter of the central common reed-dominated area include a mix of invasive and native species such as black locust, tree-of-heaven, pin oak, gray birch, red maple, sassafrass, black gum, sumac, and black cherry. The shrub layer in those areas is dominated by arrowwood and invasive species such as Japanese knotweed and multiflora rose. In perimeter woodlands, the herbaceous layer, where not completely covered by blackberry, porcelainberry and other shrub/vine growth, is composed of small white aster, seaside goldenrod, mugwort, rough-leaved thoroughwort, switch grass, and beardgrass. Along the eastern and southern borders, a thick mat of roundleaf greenbrier, porcelainberry, and Japanese honeysuckle is present and, in many places, blanketing the trees at this location. Dominant species in the shrub stratum along open edges of the common reed marsh include groundsel bush, elderberry, winged sumac, bayberry, multi-flora rose, Japanese knotweed, and autumn olive.

Birds of the lower watershed would be expected at this site (see Appendix C). Birds observed during the 2009 and 2010 site reconnaissance visits include Cooper’s hawk, downy woodpecker,

Carolina wren, northern mockingbird, golden-crowned kinglet, blue jay, Swainson's thrush, hermit thrush, American robin, Nashville warbler, yellow-rumped warbler, blackpoll warbler, palm warbler, song sparrow, Lincoln's sparrow, white-throated sparrow, swamp sparrow, red-winged blackbird, and American goldfinch. Waterbirds such as the glossy ibis and double-crested cormorant were observed flying over during spring 2010 site visits.

Several species of reptiles and amphibians would also be expected in the wetlands and adjoining uplands (see Appendix C). For example, eastern red-backed salamanders may utilize cover objects such as downed logs in the peripheral wooded uplands year round. The mix of forested upland and wetland habitat of OB-1 may provide habitat for species dependent on wet areas for breeding. Spring peepers and Fowler's toads would also be expected to use the wetlands of the site as breeding habitat and utilize the uplands for both summer and overwintering habitat with American bullfrogs and green frogs near open waters. The common garter snake, northern brown snake, and the milk snake would be expected along the peripheral boundaries of the site while the northern water snake may inhabit the open wetland. Vocalizing spring peepers were detected in moderate numbers (approximately 15-20 individuals) in the western and southern portion of this proposed BMP.

All of the mammals potentially in this watershed would be expected in the wetland and upland edges of this site. Both native (i.e., muskrat and eastern gray squirrel) and introduced (feral cat) were observed at this site.

OB-2:TYSENS LANE

This site is associated with the eastern portion of NYSDEC-mapped NA-10 and is mapped as an NWI estuarine wetland. The site of proposed BMP OB-2 is similar to the site of proposed BMP OB-1, as it characterized as a common reed marsh with a perimeter of successional southern hardwoods along it northern and western boundaries. Drainageways are present on the southern and western boundaries, but the site is located primarily above the open water channel of the East Branch. In addition to the reed dominated wetlands, there with wooded hummocks along the western edge of the proposed BMP. In general, the upland hummocks present at this site are larger than those observed at OB-1, and several hummocks (identified by the presence of mature oaks in the canopy above the common reed marsh) are located within the central portion of the common reed area. These hummocks have similar species profiles as for OB-1, though with more apparent oak diversity (in terms of species and age structure).

Dominant species in the shrub layer along the eastern and southern boundaries often include groundsel bush, winged and smooth sumac, and bayberry.

Dominant canopy and subcanopy species in the upland edges at the northern and western edges of the common reed-marsh include pin oak, gray birch, sassafras, black cherry, black locust, red, silver, and Norway maples, willow, and big-toothed aspen. Japanese knotweed and multi-flora rose form dense stands in the understories, although native species such as spicebush, arrowwood, and dogwood species are represented. Poison ivy, Japanese honeysuckle, Asiatic bittersweet, porcelain-berry, and blackberry, cover herbaceous, shrub, and subcanopy vegetation in many locations. In the herbaceous layer, where not completely covered by shrub/vine growth, pockets of native species consisting of small white aster, seaside goldenrod, mugwort, milkweed species, orchard grass, rough-leaved thoroughwort, jewelweed, white snakeroot, and cat greenbrier are present.

At the proposed outfall location at the end of Hett Avenue, common species include mugwort, Japanese knotweed, small white aster, seaside goldenrod, porcelainberry, Japanese honeysuckle, Virginia creeper, groundsel bush, and smooth sumac with a low canopy of black locust and white mulberry. Dominant canopy species include black locust, tree-of-heaven, and Norway maple. Japanese knotweed, Japanese honeysuckle, Asiatic bittersweet, and multi-flora rose are also common species in the shrub and vine layers. Although this area is dominated by non-native species, remnant native vegetation including green ash, dogwood, arrowwood, elderberry, trillium, and spicebush is present at the wetland edges.

To the north and west of Milton Street, in the vicinity of Roberts Drive and Barry Court, there is a large damp meadow that is not dominated by common-reed. This area has minimal tree cover and is dominated by a number of native species including cinnamon fern, Canadian burnet, and royal fern in the herbaceous layer with dead sumacs scattered within the shrub layer. Other species observed include iris, yellow star grass, Virginia rose, meadow rue, goldenrod, wild geranium, wild yam, and sedges.

Several resident and migrant bird species were observed along the upland-wetland transition area and within the common reed-dominated marsh including downy woodpecker, Carolina wren, belted kingfisher, northern mockingbird, eastern phoebe, blue jay, and American crows, American robin, song sparrow, swamp sparrow, red-winged blackbird, American goldfinch, northern cardinal, and European starling. Waterbirds, including mallard, and gadwall, were observed along the open channel bordering the southern and western portions of the proposed BMP. In addition, bird species observed at OB-2 but not included in the Breed Bird Atlas include golden-crowned and ruby-crowned kinglets, Swainson's thrush, yellow-rumped warbler, blackpoll warbler, palm warbler, and great egret.

All of the species listed as occurring in OB-1 would be expected to occur in OB-2. Vocalizing spring peepers were detected in moderate numbers (approximately 15-20 individuals) in the northern portion of this proposed BMP, suggesting that this site may be inhabited by other amphibian populations, as described for the watershed.

All of the mammals described for this watershed would be expected to occur in the wetland and upland edges of this site. Several muskrats were observed at this site.

BMP OB-3: RIGA STREET

The central area of this site is an open common reed marsh. In general, the surrounding upland areas of OB-3 adjacent to residential development are more densely colonized by introduced and invasive species (i.e., mugwort, Japanese knotweed, Japanese honeysuckle, and porcelain-berry) than at OB-1 and OB-2. Evidence of substantial dumping activity of construction debris and household waste is present at street ends within the proposed BMP area. Several residences along Brook Avenue have constructed patios, fences and other features directly adjacent to the contributing drainageway, which is now filled with debris and bordered by Japanese knotweed.

Along the perimeter the canopy and subcanopy is comprised of black locust, cottonwood, white mulberry, tree-of-heaven, silver maple, box elder, gray birch, black cherry, American elm, and pin oak. The shrub layer consists of substantial coverage by Asiatic bittersweet, porcelain-berry, Japanese honeysuckle and other invasive vines. However, there are pockets, such as the open channels at Ithaca Street and Hylan Boulevard that are populated with arrowwood, greenbriers, and other native species.

The herbaceous layer is dominated in most areas by mugwort, Japanese knotweed and other invasive species. Certain areas, including the intersection of Dugdale and Riga Streets, are less disturbed, and have more of a native character, with sweetgum, pin oak, black cherry, and gray birch in the canopy and subcanopy, and goldenrod species, and blackberry in the understory.

Within the reedgrass marsh, particularly at the northeastern edge of the site, there is a large damp meadow containing several native shrub and herbaceous species including goldenrods, cinnamon fern, royal fern, soft rush, switch grass, lance-leaved violet, jewelweed, and yellow star grass. Scattered throughout this wet meadow is northern bayberry, arrowwood, sumacs, swamp rose, groundsel bush, sweet pepperbush, and sweetgum pockets in the shrub layers. In these areas, there are small open water ponds, some of which contain duckweed and are bordered by some of the abovementioned species. Common reed coverage is less evident in these areas.

In mounded soil at the northeastern portion of the site, more than 100 stems of mountain mint were observed. Associated species include switch grass, milkweeds, goldenrods, sumacs, and common reed.

Many of the resident and migrant bird species of the lower watershed have the potential to occur within this site. Species observed in fall 2010 along the upland-wetland transition area and within the common reed dominated marsh, including red-tailed hawk, Cooper's hawk, hermit thrush, gray-cheeked thrush, yellow-rumped warbler, white-throated sparrow, northern cardinal, and substantial flocks of blue jays (greater than75), red-winged blackbirds (greater than 500) and American robins (greater than 200). Waterbirds, including mallard, gadwall, and green-winged teal, were observed along the open channel bordering the southern portion of this proposed BMP. As with other BMPs proposed within this watershed, this site is expected to support foraging waterbirds. In spring 2010, birds observed at this site included Canada goose, American goldfinch, night heron species, American robin, European starling, and red-winged blackbird.

All of the reptiles and amphibians of the lower watershed (see description above) would potentially use OB-3. During site reconnaissance investigations, vocalizing spring peepers were detected in small numbers (approximately 5 individuals) in the northern portion and two snapping turtles were observed in the drainage channel along the eastern boundary of the proposed BMP suggesting that this site may be inhabited by other reptile and amphibian populations. The Main Channel of the Oakwood Beach watershed extends along the western and northern boundaries of the proposed BMP site. Thus, there is the potential for these stream reaches, particularly at the southern end, to contain fish that have been observed within the Oakwood Beach watershed. In addition, the mammals described above for the Oakwood Beach watershed may also be present at OB-3. Muskrat, eastern gray squirrel, and feral cat were observed during the field investigations.

BMP OB-4: ITHACA STREET

OB-4 is not located within the footprint of NYSDEC-mapped wetland NA-10, but is associated with the northeastern portions of Holme's Mill Creek which drains to wetland NA-10. The creek area bordering Hylan Boulevard has been mapped by NWI as a palustrine emergent wetland, although this wetland was not observed during the field reconnaissance. Runoff that supports the site drainage comes from upland storm sewers and drainage from Hylan Boulevard that combines to form the beginnings of the headwaters of the Oakwood Beach Main Channel.

The creek is framed by a narrow wooded area backed by residential development. Between Medina Street and Hylan Boulevard there is a gully that parallels the main channel of Holme's Mill Creek and which meets the main channel of the creek at Medina Street. The woodland associated with the creek can be described as a successional southern hardwoods community on top of a disturbed substrate containing mounds of concrete and rubble. Silver maple, white mulberry, tree-of-heaven, and black locust are present in the canopy with American elm and hackberry in the subcanopy. Multi-flora rose forms dense walls in the herbaceous, shrub, and sub-canopy in many locations. Japanese honeysuckle and garlic mustard are also dominant in areas of the understory.

This narrow corridor provides a limited habitat. Birds that would utilize this site would most likely be those that are common to urban yard habitats. Birds observed in spring 2010 include gray catbird, house sparrow, European starling, swamp sparrow, American robin, common grackle, mallard, and mourning dove. Reptiles and amphibians of the watershed would be expected along the wooded channel and stream corridor that connects with OB-3. Given the presence of adjacent residences, use of the channel and mammals is expected to be limited to small urban-dwelling mammals. Given that the water sources are intermittent and dependent in part on drainage from Hylan Boulevard, it is not expected that this site provides any fish habitat.

BMP OB-5: NORTH RAILROAD AVENUE

This site is not associated with NYSDEC-mapped wetlands, but contains a NWI-mapped palustrine flooded and controlled wetland associated with the detention basin that appears to collect drainage from the local streets. Several black plastic pipes appear to contribute stormwater from surrounding streets, and flow also appears to arrive from the north through an eroding drainageway. To the south of the railroad tracks, a relatively narrow (~3 to 6 ft) stream channel traverses the central portion of the site, where it eventually crosses under Hylan Boulevard. This stream channel and drainage basin were observed as dry during the fall 2009 and spring 2010 site investigations and water flow at this proposed BMP is more intermittent and seasonal.

The detention basin is surrounded by larger mature sweetgum (up to 20 inches dbh), ash (up to 30 inches dbh), and red maples in the canopy with Japanese knotweed, multi-flora rose, garlic mustard, Asiatic bittersweet, and Virginia creeper common in the understory. South of the detention basin there is a mugwort-dominated open area with a few scattered tulip, ash, and oak saplings. These saplings appear to have been planted.

Small meadow pockets composed of toad rush and switchgrass edged by Japanese knotweed and pin oak are present immediately south of the railroad. Within the stream corridor south of the meadow areas, the overstory is typically composed of sweetgum, red and silver maples, ash, with occasional weeping willow, black cherry, tree-of-heaven, sycamore maple, and Callery pear. In general, the understory is dominated by invasive species, including autumn olive, multi-flora rose, porcelain-berry, mugwort, and Japanese knotweed, which in some locations forms a monoculture. However, native shrubs (i.e., bayberry) and herbaceous species are present in small numbers.

The northern portion of OB-5 is characterized by a fairly mature, southern bottomland forest habitat of the Staten Island Greenbelt that may provide limited habitat for forest interior breeding birds (e.g., red-eyed vireo, scarlet tanager). No breeding birds are expected in the stream channel. Several resident and migrant bird species were observed within the upland corridor of this site, including mourning dove, ruby-crowned kinglet, eastern kingbird, eastern

phoebe, cedar waxwing, American robin, Swainson's and hermit thrushes, white-throated sparrow, yellow-rumped warbler, common grackle, and red-winged blackbird.

With respect to reptiles and amphibians, eastern red-backed salamanders may utilize cover objects such as downed logs in the peripheral wooded uplands year round. Spring peepers and Fowler's toads would be expected in the intermittently flooded drainageways and detention basin, which are potential breeding habitat and may utilize the adjacent uplands for both summer and overwintering habitat. The common garter snake, Northern brown snake, and the Eastern milk snake, may inhabit the wooded upland areas and small meadow pockets of the project site. Due to the lack of permanent water, American bullfrog, green frog, northern water snake, painted turtle, snapping turtle, and the red-eared slider would not be expected at this site. In addition, given the site location in the upper watershed and its intermittent stream characteristics, this site would not provide any fish habitat or any significant habitat for aquatic resources.

All of the mammals described for the Oakwood Beach watershed may potentially use this site, although this location does not provide a habitat that is particularly attractive to any of the mammalian species of the watershed and species such as muskrat would not be expected at this site.

LOWER BAY OUTFALL

The Lower Bay is mapped by NYSDEC as littoral zone tidal wetlands. It is mapped by NWI as estuarine subtidal waters with unconsolidated bottoms that are permanently flooded. The shoreline along the bay is mapped as estuarine intertidal unconsolidated shore that is regularly flooded.

The ecological community in the vicinity of the proposed outfall consists of the abovementioned tidal wetlands with a sand beach and an eroding berm supported by riprap. As described above for NYSDEC-mapped wetland NA-10, this berm separates the common reed marsh of OB-1 from Lower Bay. While the berm is very pronounced to the east of Kissam Avenue, it tapers down to the sand beach to the west nearing Fox Lane.

The majority of this beach is best defined as a sand beach shore and an estuarine riprap/artificial shore by Edinger et al. (2002). Typically this community consists of minimal vegetative cover and low species diversity. Observations of the site of the proposed outfall indicated that vegetation is absent and flotsam is present at the high water line at the toe of the berm. Vegetative cover and species diversity are low compared to natural estuarine shores (Edinger et. al. 2002). With respect to the proposed outfall site, the toe of the berm consists of riprap and the majority of the top of the berm is a sand substrate. Dominant species on the berm, on the landward side, include monotypic stands of mugwort and Japanese knotweed. However, in addition to the cultural ecological communities described above, the upper portions of the berm in some locations along the seaward edge contain small pockets of maritime dune habitat. A maritime dune community is "dominated by grasses and low shrubs that occur on active and stabilized dunes along the Atlantic coast. This community consists of a mosaic of vegetation patches (Edinger et al. 2002)." Species observed in this habitat include American beachgrass, seaside goldenrod, and sheep fescue. In general, the small patchy nature of this community is unable to provide erosion protection for the berm and, as a result, this community is in poor condition.

Wildlife expected to utilize this site would be a variety of shorebirds including killdeer, American oystercatcher, spotted sandpiper, and willet among others. Other shorebirds such as

the piping plover and ruddy turnstones have also been observed in the vicinity of Oakwood Beach (NYSDEC 1987). This site would also support waterbird foraging. The Oakwood Beach/Lower Bay shoreline is known to support breeding horseshoe crab populations during the spring and early summer, and various shorebirds species are typically present during this season. During the 2009 and 2010 site reconnaissance visits, waterbirds, including mallard, black-crowned night-heron and great blue heron, were observed along the open channel bordering the southern portion of this proposed BMP. Along the beach to the south of the proposed outfall site, a large raft of Atlantic brant (approximately 400 individuals) was observed within 100 yards of the shore; this location is a common wintering spot for this species.

The benthic zone of Lower Bay would also be expected to include a variety of worms and mollusks common to the bay. Fish would also be expected in the shallow waters of the bay out to the pierhead line. Potential fish species are provided in Appendix C.

The shoreline is expected to provide limited habitat to species of reptiles, amphibians, and mammals.

ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES AND COMMUNITIES

Information on endangered, threatened, special concern, and rare species was obtained from the National Marine Fisheries Service (NMFS), the New York Natural Heritage Program (NYNHP) and the U.S. Fish and Wildlife Service (USFWS). A review of that data found that one maritime protected species, the shortnose sturgeon is listed for the Lower Bay. There are also four species of federally threatened or endangered sea turtles that may be found seasonally. NMFS also lists several species of whales that occur seasonally in the offshore waters of New York, but concludes that the depths near the inshore waters are too shallow to be occupied by any of the listed whales.

Database results furnished by DPR indicate that three state-listed plant species have been recorded within the Oakwood Beach watershed since 2009. In addition, one state-listed plant species was identified during the literature review. The Breeding Bird Atlas has listed four state protected species for the watershed area. Two state-listed “exploitably vulnerable” plants, the royal fern and cinnamon fern, and one state-listed “special concern” species, the Cooper’s hawk, were observed during the 2009-2010 reconnaissance efforts.

Table 3.9-3 list the federally and state protected species of the watershed (such as endangered or threatened wildlife, or rare plants) along with their potential to occur at each proposed BMP site. **Appendix C** provides a brief description of these species along their ranking and status as well as description of other species that may be special concern species or species or habitats of interest. In addition, there are 15 state-listed species including dragonflies, damselflies, amphibians, and plants are historically known to occur in one or more locations within the watershed. Data on these species is also provided in **Appendix C**.

Table 3.9-3
Potential for Federal- and State-listed Protected Species within the Oakwood Beach Watershed

Species	Source	NYNHP Status	Habitat	Potential Yes/No
Marine Species				
Shortnose Sturgeon	USFWS	E*		Not expected.
Birds				
Osprey	Breeding Bird Atlas	SC	Coastlines; lakes; rivers; dead trees; human-made structures	Potential to occur at OB-1, OB-2, OB-3, and OB-4 (low potential: OB-5)
Coopers Hawk	Observed	SC	Coastlines; lakes; rivers; dead trees; human-made structures	Observed at OB-1 with potential to occur at OB-2 and OB-3 (low potential at OB-4 and OB-5)
Northern Harrier	Breeding Bird Atlas	T	Coastal marshes, grasslands, meadows and cultivated fields	Potential to use OB-1, OB-2, and OB-3 (low potential at OB-4 and OB-5)
Plants				
Slender Blue Iris	NYCDPR	T	Fresh and brackish marsh of coastal areas	Observed at OB-1 (Potential to occur in OB-2 and OB-3, low potential at OB-4 and OB-5)
Northern Gamma Grass	Literature Review	T	Moist places such as ditches, depressions, swales, and the edges of salt marshes	Potential to occur at OB-1, OB-2, and OB-3 (Low potential at OB-4 and OB-5)
Turks-cap-Lily	NYCDPR	EV	Wet meadows; woods	Observed at OB-1 (moderate potential at OB-2 and OB-3, low potential: OB-4 and OB-5)
Cinnamon Fern	Recent Observations	EV	Wet meadows	Observed at OB-1, OB-2, OB-3 along woodland edges and areas with minimal common reed cover (low potential at OB-4 and OB-5)
Royal Fern	Recent Observations	EV	Emergent wetlands, red-maple hardwood swamp, shrub-dominated wetlands; areas with low common reed coverage	Observed in OB-1, OB-2, OB-3 along woodland edges and areas with minimal common reed cover (low potential at OB-4 and OB-5)
Slender Blue Flag	DPR	T	Marshes (fresh, brackish, salt)	Observed in vicinity of OB- and OB-2

Notes: (*) Also federally endangered. NYNHP ranks and codes: (E) Endangered; (T) Threatened: (EV) Exploitably Vulnerable; (R) Rare. Observed=observed during the 2009/2010 BMP site surveys.
Sources: NYNHP (2009; 2010); DPR (2009) unless otherwise noted.

C. FUTURE WITHOUT THE PROPOSED PROJECT

HYDROLOGY

In the future without the proposed project it is assumed that stormwater flows will remain uncontrolled and regular storm-event flooding will continue within the watershed particularly in the streets and properties of the lower watershed.

In addition, no major changes in runoff patterns are expected in the future without the proposed project. Therefore, the issues of local street and property flooding are assumed to continue through the 2043 analysis year.

GROUNDWATER

Without the proposed project, groundwater elevations within the Oakwood Beach watershed are not anticipated to change. Driven largely by constant factors such as the low-lying nature of the

watershed and the influence of the tide, the levels of the groundwater table in the area are not anticipated to change in the future.

WATER QUALITY

Water quality conditions are expected to most likely remain unchanged or decline as stormwater remains uncontrolled.

WETLANDS

In the future without the proposed project, wetlands that are now degraded with debris, erosion, and invasive plant species are assumed to remain in a similar condition and current native plant communities may decline as a result of the spread of invasive plants and uncontrolled runoff. There would also be only limited maintenance of the Bluebelt properties since they would not be adapted to the proposed BMPs.

In addition, the common reed dominated BMP sites proposed in the lower watershed have been the scene of many brush fires in recent years. Those fires have occurred as recently as fall 2010. In the future without the proposed project, these fires are expected to continue on a regular basis through the 2043 analysis year.

VEGETATION AND TREES

In the future without the proposed project, no major changes in vegetative cover are expected in the watershed. While the Bluebelt and public open space are protected from development, there could be some reduction in vegetative cover and trees due to development in the watershed; however, there is little remaining undeveloped land in the watershed.

WILDLIFE

No major change in wildlife cover or habitat are expected in the future without the proposed project. Under this condition, the wetland would remain unimproved and the current common reed dominated habitat of the lower watershed would remain.

ENDANGERED, THREATENED AND SPECIAL CONCERN SPECIES AND COMMUNITIES

No major changes in the habitats of protected species within the watershed are expected in future without the proposed project. Thus, it is assumed that the wetland would remain unimproved and the current common reed-dominated habitat of the lower watershed would remain intact.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

HYDROLOGY

UPPER WATERSHED

The proposed amended drainage plan calls for a new stormwater outlet into the Willowbrook Parkway right-of-way at the intersection of Riedel Avenue and North Railroad Avenue, and the retrofit of the existing basin into proposed BMP OB-5. As part of this work, construction of a more formal outlet from the basin to the intermittent channel in the right-of-way is also

proposed. In addition, the intermittent channel below the basin would be stabilized as necessary to ensure safe conveyance of stormwater flows from OB-5 to Hylan Boulevard. In addition, the proposed channel enhancement would improve the natural resource value of the stream corridor. The existing 48" storm sewer would remain in place, and any stream enhancement in the area of the railroad trestle would limit excavation for the purposes of maintaining sufficient cover over the existing sewer located here, thereby avoiding potential impacts to the sewer. No drainage impacts from the installation of OB-5 are anticipated because the existing detention pond would be retrofitted under the proposed project, but the size of existing detention volume is large enough to control the increased flow, thereby avoiding downstream impacts.

The proposed amended drainage plan also calls for catch basins to be installed at a few intersections along Combs Avenue to direct stormwater currently flowing overland into the ponds in the Willowbrook Parkway right-of-way north of Amboy Road. These catch basins would maintain the hydrology of the two ponds by preserving the stormwater flow that reaches them under existing conditions via overland flow. At each discharge point into one of the ponds, a small outlet stilling basin would be installed to reduce stormwater velocities and to capture sediment and trash for collection by DEP maintenance crews. Thus, the existing storm sewer under Amboy Road would be maintained, or replaced as needed, across the Amundsen Circle to the existing outfall at Savoy Street which would be retrofitted with an outlet stilling basin. Therefore, the proposed project would not result in potential significant adverse impacts on the hydrology of the upper watershed.

LOWER WATERSHED

10 Year Storm Event

In the lower watershed, proposed BMPs are predominately comprised of large, shallow, extended detention wetlands at problem areas for flooding, specifically Kissam Avenue. The results of modeling in the lower watershed with the proposed plan in place under the 10-year storm event are presented in **Figures 3.9-11** through **3.9-13**. These figures show the existing and proposed conditions during the 10-year event at three locations: (1) OB-1 and the East Branch of Oakwood Beach Creek at Kissam Avenue and Fox Lane (**Figure 3.9-11**); (2) OB-2 and the East Branch of the Creek at Kissam Avenue and the Tysens Lane Trunk Sewer at Roma Avenue (**Figure 3.9-12**); and (3) OB-3 and the Middle Branch at the intersection of Adelaide Avenue and Falcon Avenue (**Figure 3.9-13**).

Table 3.9-4 provides a summary of peak water surface elevations for existing and proposed conditions during the 10-year storm event with the proposed project. The results show that the proposed project would reduce the peak water surface elevations in the lower watershed between one and five feet during a 10-year event. Most importantly, the peak water surface elevations would remain below -2.0 feet at OB-1, thereby protecting the low-lying streets of Fox Lane and Kissam Avenue. Water surface elevations at OB-2 could not be lowered to the same levels as OB-1 while still maintaining its outlet connection to the East Branch of, so a berm would be required to protect Kissam Avenue, but the proposed BMP would succeed in lowering water levels in the Tysens Lane trunk sewer, thereby reducing surcharging in the nearby streets. OB-3 would also reduce the peak water surface levels at the ends of the Riga and Lynn Street, thereby improving potential flooding conditions around that proposed BMP as well.

All of the proposed BMPs have peak water surface elevations that are below the target peak water surface elevation of the proposed amended drainage plan. This reduction in peak water surface elevations, combined with the installation of storm sewers in the streets, would

dramatically improve the surface drainage of these streets and reduce flooding impacts on local streets and properties in the neighborhood.

Affects of Sea Level Rise

New York City has an extensive coastal zone with billions of dollars of private and public investments,making sea level rise an important long-term planning issue. The potential impacts of sea level rise on the City were a major focus of the City's PlanNYC report which recommended preparation of a comprehensive climate change adaptation study and examination of climate change resiliency options.

Warming global temperatures are considered extremely likely over the coming decades and through the course of the next century. It is anticipated that this warming will be at a faster rate than past trends which will have the effect of increasing the rate of global sea level rise. Given the long-term nature of sea level rise effects and the variables intrinsic to predicting global carbon emissions, global climate conditions, and the resulting effects on sea level, there are ranges in sea level rise projections that take into account various scenarios. In February 2009, the City's Panel on Climate Change released its report "*Climate Risk Information*" which was prepared with the assistance of the Mayor's Office of Long Term Sustainability. That report presents sea level rise projections that take into account the predicted ranges of both global climate change and local land subsidence. The central range of these projections are sea level increases of 2 to 5 inches by the 2020's, 7 to 12 inches by the 2050's, and 12 to 23 inches by the 2080's.[1] Impacts of sea level rise as identified in the report include the risk of increased coastal flooding and precipitation. A report released by the *New York State Sea Level Rise Task Force—Report to the Legislature* (December 31, 2010) accepts similar sea level rise projections.

The proposed BMPs are the type of infrastructure design and investment for the City that is climate change resilient and reduces expansion and reliance on hard infrastructure, which is less adaptable to increasing sea level and more susceptible to the effects of submersion under higher tides. In contrast, the proposed BMPs can adapt to sea level rise while preserving and restoring coastal floodplains as wetlands (there are approximately 61 acres of permanently preserved Bluebelt property in the Oakwood Beach Watershed) and the limited structural elements that are necessary (e.g., weirs or valves) are more adaptable to changes in surface water elevations that may result from increasing sea levels. For example, the proposed BMP weir or valve structures are designed with flexible weir plates and adjustable valves so that discharge rates can be modified in response to changes in BMP surface water elevations. Thus, the proposed project would be more adaptable to changing tidal conditions than the conventional stormwater piped systems, which cannot be adjusted. It is projected that the proposed BMP designs can accommodate a 9-inch increase in sea level--which is within the central range of the City and State projection and is used by DEP at the direction of the New York City Panel on Climate Change. The BMP weirs or valves are sized to drain the extended detention storage volume in about 6 hours (under current sea level conditions). However, assuming a 9-inch increase in sea level and the associated effects of groundwater inflow to the BMP, the weirs or valves can also be adjusted to drain the BMP in as little as 4 hours—which is the estimated reduced duration of drainage assuming that the tide gates are closed longer due to higher tides.

[1] Extreme ranges presented in the report that assume rapid ice melt yielded projections of sea level increases of 5 to 10 inches by the 2020's, 19 to 29 inches by the 2050's, and 41 to 55 inches by the 2080's.

While increasing the rate of drawdown may reduce BMP detention time, it would preserve the BMP function of flood protection and would address both the potential effects of rising sea levels on the outfall operations (such as a shorter duration that the tide gate is open) and the higher local groundwater levels that may also result from increase in sea level. Finally, the proposed BMPs are designed to maximize stormwater management effectiveness in an existing low-lying developed coastal area where the street and property grades are essentially fixed and cannot be modified. The alternative to the proposed BMPs is either hard infrastructure, which is almost inflexible to increasing sea level because the pipes are fixed in-place, or no storm water management system, which would leave the developed lower watersheds of Mid-Island facing greater flooding impacts with no remedy.

In sum, the proposed project would reduce flood levels during the 10 year storm event and operation of the proposed BMPs would not be impacted by sea level rise. Therefore, the proposed project would not result in any significant adverse impacts on hydrology in the Oakwood Beach watershed.

Table 3.9-4
Peak Water Surface Reductions During the 10-Year Event Under the Proposed Amended Drainage Plan

BMP Peak Stages (ft. SI)			
Location	**Existing Peak Stage (Elevation)**	**Peak Stage with the Proposed Project (Elevation)**	**Reduction (ft)**
OB-1 (between Kissam Avenue and Fox Lane)	1.48	-2.20	3.68
OB-2 (between Tysens Lane and Kissam Avenue)	4.20	0.96	3.24
OB-3 (at Adelaide Avenue and Falcon Avenue)	2.71	0.79	1.92

Note: Elevations are in Staten Island Datum.
Source: Hazen and Sawyer, January 2011.

100 Year Storm Event

In addition to the 10-year storm event, the 100-year storm event was modeled for the lower watershed in order to assess potential impacts associated with the proposed drainage plan under larger storm events. As shown in **Table 3.9-5**, when the 100-year storm was modeled with the proposed amended drainage plan in place, the resulting water surface elevations remained well below the FIRM 100-year flood stage. The peak water surface elevations presented in the table for the proposed project do not take into account the effect of high tide storm surges in a 100-year storm. Thus, the proposed project would have a positive impact on flooding conditions in the lower watershed by significantly improving the detention and conveyance of runoff during such large storm events.

Table 3.9-5
100-Year Storm Water Surface Elevations Under the Proposed Amended Drainage Plan

Location (Branch)	**Existing Peak Stage Water Surface Elevation (FEMA)**	**Peak Stage Water Surface Elevation with the Proposed Project[(1)]**
Kissam Avenue (East Creek)	7.80	1.49
Fox Avenue (East Creek)	7.80	1.49
Tysens Lane (Trunk Sewer)	6.80	1.48
Hylan Boulevard and Adelaide Avenue (Middle Branch)	7.80	5.09
Hylan Boulevard and Buffalo Street (West Branch)	6.80	6.06
Outlet	7.80	2.87

Notes:
Elevations are in Staten Island Datum.
(1) For rainfall event only. Does not take into account the effect of high tide storm surges in a 100-year storm
Sources: Hazen and Sawyer, January 2011, FEMA and FIRM maps (September 5, 2007).

Therefore the proposed project would not have a potential significant impact on flooding conditions under the 100 year storm event.

MODIFIED STREET GRADES

It is expected to be necessary to modify the street existing grades along certain segments of the streets in order to ensure proper drainage and cover over the proposed storm sewers. Chapter 3.1 "Project Description" shows the locations of the proposed street grade modifications which are expected to increase the street grade between 6 inches and 24 inches, depending on the location.

It is standard DEP procedure to raise streets in low-lying areas in order to provide proper cover over the proposed storm sewers, and the City has done this on many projects. As part of the future capital project designs, site specific topographic survey will be performed to determine the actual street elevation conditions for each individual project and all design techniques will be utilized to minimize the raising of street grades to the extent possible. During this process, DEP and DDC, the agency that would manage the capital project through design and construction, will meet with each individual homeowner prior to construction to limit the impacts of street grade changes and to assist homeowners in developing the best drainage solution possible.

Therefore, the proposed street grade modifications would not result in potential significant impacts on hydrology.

PROPOSED BERMS

As part of the proposed BMPs for the Oakwood Beach watershed, DEP is proposing to install berms along the proposed lower watershed BMPs to provide protection of property during large storm events. These berms between 6 and 36 inches high would be installed along OB-1 between the proposed BMP and the East Branch of the Oakwood Beach Creek, along OB-2 on the Kissam Avenue side of the proposed BMP, and along the Buffalo Street side of OB-3. The berms would be designed and constructed with careful attention to avoid affecting existing drainage patterns in local yards. In some cases, yard drainage, especially for the rear yards, may now flow into the Bluebelt wetlands unimpeded. However, the proposed berms may also have the potential to impede drainage coming from adjacent private properties. Possible techniques for addressing any water accumulating inside the private property against the berms could include drain tiles, French drains, swales, or yard outlets as appropriate to convey runoff parallel to or from the berm to the closest storm sewer inlet.

The berms would also be classified as "dams" under NYSDEC regulations and would be constructed according to NYSDEC standards. However, since the berms would be less than six ft in height, no permits would be required for construction and maintenance of the berms.

Therefore, the proposed berms would not have potential significant adverse impacts on hydrology.

IMPACTS ON STREAM VELOCITIES

In the upper watershed, minimal increases in stream flow are expected in the Willowbrook Parkway downstream of OB-5, and the lower watershed streams have negligible slope and are not susceptible to erosion. Therefore, the proposed project would not have potential significant adverse impacts on stream velocities or the resulting sedimentation and erosion impacts.

GROUNDWATER

BMP OPERATIONS

Proposed BMPs OB-1, -2, and -3 in the lower watershed would require excavation below the groundwater table. Therefore, groundwater inflow to the proposed BMPs is expected to generate a constant baseflow that would slowly enter the proposed BMPs during high tide, before the water surface elevation returns to about the permanent pool elevation during low tide.

In order to understand the potential effects of groundwater on the BMP proposed functions, groundwater inflow rates and volumes were projected. These results are presented in **Table 3.9-6** as a percentage of the proposed BMP low-flow discharge rate and storage capacity that could be consumed by groundwater inflow. The ranges in the estimates reflect the uncertainty of data regarding soil conductivity and hydraulic gradient at each proposed BMP site. For example, the more conservative estimate (i.e., the higher percentage) presents a worst-case scenario in which the hydraulic conductivity of the soils is assumed to be high (i.e., porous sandy soil) with a high hydraulic head gradient, thereby producing large inflow rates to the proposed BMPs. The less conservative estimate (i.e., the lower percentage) assumes a sand/silt mixed soil with less of a hydraulic gradient.

Table 3.9-6
Characteristics of Groundwater Baseflows into the Proposed BMPs

BMP	Percent of Low-Flow Discharge	Percent of Storage Capacity
Fox Lane (OB-1)	4-85%	15-100%
End of Kissam Avenue (OB-2)	0-45%	0.2-30%
Riga Street (OB-3)	2-44%	4-51%
Source: Hazen and Sawyer, January 2011.		

As shown in the table, under the less conservative assumptions, groundwater inflow consumes only a small fraction of the BMP proposed storage capacity. However, in the more conservative assumption, higher groundwater inflow rates would have the potential to reduce proposed BMP storage capacity (particularly during a high-tide event). In the less conservative case, the proposed BMP orifices are sized with adequate conveyance capacity to accommodate both the groundwater baseflow plus the proposed BMP storage of flood waters. However, if field data gathered during final design indicate that a higher rate of inflow may occur at a proposed BMP, then the hydraulic structures may need to be upsized during final design for the purposes of enlarging the low-flow orifices. The soils surrounding the proposed BMP may also need to be amended as well to reduce the hydraulic conductivity, thereby acting similar to the less conservative assumptions. Flow rates during final design would be determined using test pits and soil borings and monitoring of groundwater movement would also be conducted during the dewatering and construction of the proposed BMPs.

Therefore, the proposed BMPs would not result in potential significant adverse impacts on groundwater flows.

ANALYSIS OF POTENTIAL IMPACTS ON GROUNDWATER TABLE

The proposed amended drainage plan was also examined for potential impacts on the groundwater table in the immediate vicinity of the proposed BMPs. With the proposed BMPs, some groundwater

would inflow to the proposed BMPs to become surface water. Because the proposed BMPs would provide a less restrictive hydraulic path for groundwater to leave the watershed, this hydraulic affect was examined for potential impacts on the groundwater table. Based on a preliminary worst case analysis, the magnitude of the impact would be the difference between the proposed BMP permanent pool water surface elevation and the existing water table elevation, which ranges between 0 to 2.5 feet at OB-1, -2, and -3. However, the actual effect the groundwater table is expected to be less than this range. This is due to several factors, including the hydraulic conductivity of the soils and the proximity of the proposed BMPs to the Lower Bay, where the bay elevation ultimately controls the groundwater table. Any impact to the vertical groundwater table elevation would also decrease with increasing distance from the proposed BMPs. Therefore, the proposed project would not result in potential significant adverse impacts on the groundwater table.

In extreme cases, a lowered water table can lead to the consolidation of soils and ground subsidence, which on large scales can cause damage to property and infrastructure. Based on available data about the types of soils in the watershed and the anticipated minor changes in the groundwater table, ground subsidence with the proposed project is estimated to be negligible. Under worst-case assumptions, subsidence in the immediate vicinity of the proposed BMPs is calculated to be at most 0.4 inches, which would not cause any damage to neighboring structures. As with impacts to the water table, any subsidence would dissipate with increasing distance from the proposed BMPs. Also proposed is the collection of additional groundwater data to inform the design of the lower watershed BMPs (see also Chapter 8.1, “Mitigation).

Therefore, the proposed project would not result in potential significant adverse impacts on groundwater volumes, the groundwater table, or land subsidence.

WATER QUALITY

The proposed project is expected to result in improved water quality in the watershed over the condition in the future without the proposed project condition. This conclusion is supported by a literature review and data collected for the South Richmond Bluebelt projects. Supporting data is provided in Appendix D.

In the future without the proposed project, runoff is not collected and directed to the proposed BMPs. In contrast, proposed BMPs function as wetlands that provide physical, chemical, and biological treatment of pollutants contained within runoff; flow rates into wetlands are attenuated, allowing sediment and organic debris to settle. During this process, nutrients undergo both chemical and biological transformation in a wetland. Nitrogen can be naturally altered into forms that are more favorable to uptake by wetland plants and phosphorus is readily precipitated out of water in many of its chemical forms, depending on the pH of the water and is also utilized by plants. Proposed extended detention BMPs can also reduce fecal coliform concentrations by detaining water, allowing for die-off of microorganisms. Pollutant removal efficiencies of up to 77 percent for certain pollutants are reported with the proposed BMPs in place.

As presented in the appendix, data gathered by the American Society of Civil Engineers (ASCE), the U.S. Environmental Protection Agency (USEPA), Water Environment Research Foundation (WERF), the American Public Works Association (APWA), and the Federal Highway Administration (FHWA) indicate that pollutant concentrations are reduced by storm flows filtered through wetlands. A Center for Watershed Protection (CWP) report on updated BMP removal efficiency also shows reduction in pollutant loading with BMP wetlands.

In addition, analyses of BMPs previously constructed and operating on Staten Island (in the South Richmond Bluebelt) show general water quality improvement resulting from BMPs. Data from a 2003 water quality study of three Staten Island BMPs installed in the South Richmond Bluebelt (including two extended detention wetlands and one wetland retrofit BMP) show that extended detention wetlands are performing as a typical stormwater wetland, achieving good pollutant removal efficiencies. In addition, in the Richmond Creek watershed of South Richmond, it has been found that outlet stilling basins and other velocity attenuating structures can provide a 10 to 20 percent pollutant removal efficiency that is attributable to velocity reductions that allow sediment and other debris present in the water to settle instead of being transported downstream.[1]

The proposed wetland BMPs also include a vegetated buffer as part of the design. In addition to being planted with flood-tolerant species, the buffer zone helps filter overland flow into the proposed BMP from neighboring properties. This helps reduce nutrient loads from adjacent properties such as ball fields or lawns from directly entering the wetlands as currently occurs in most BMP proposed locations, thereby improving the water quality over the existing conditions.

Therefore, the proposed project would not result in potential significant adverse impacts to water quality.

WETLANDS

The objective of the proposed project is to use existing freshwater wetlands and their adjacent areas to improve stormwater management, reduce flooding and erosion, and improve the overall ecological value of the watershed through the proposed amended drainage plan and its proposed BMPs. To that end, the proposed larger BMPs of the lower watershed, specifically proposed BMP OB-1 through proposed BMP OB-4, would improve and diversify wetland habitats transforming the existing common reed dominated wetlands into a variety of open water and emergent periodically inundated wetlands along with upland buffer areas (see **Tables 3.9-7a and 3.9-7b**). As shown in these tables, there are project increases in wetland acreage as well as wetland enhancement and increased diversity with expanded open water (low-flow channels and ponds) and permanent pool (emergent wetlands) habitats. These features have the hydrologic objective of storing and detaining stormwater that periodically inundates wetlands with runoff during storm events. Thus, the proposed BMPs would provide extended detention that would not only alternately flood during storm events and gradually release stormwater afterwards, but would expand and enhance wetlands. All wetland areas of the proposed BMPs graded for permanent pools and extended detention would also be replanted with wetland appropriate plants to support nutrient uptake and provide wildlife habitat. BMP proposed designs also involve the relocation/creation of stream channels as well as stabilization of some existing channels. In addition, wetland buffers on Bluebelt properties that currently protect higher-quality existing (or proposed) wetlands from adjacent uses would be preserved as part of the proposed BMP final designs (see also "Water Quality" above regarding the buffer protections).In addition to the natural systems within the proposed BMPs, structures to be constructed within the proposed BMPs include new stormwater outlets to convey storm flows to the proposed BMPs, outlet stilling basins to minimize erosion at the sewer discharge locations, micropools to control flows at the proposed BMP outlets and access maintenance corridors. These would be minor structural

[1] O'Connor, T.P., and Rossi, J. "Monitoring of a Best Management Practice Before and After Maintenance," *American Society of Civil Engineer's Journal of Environmental Engineering*, November 2009, Vol. 135, Issue 11.

systems within the proposed individual BMPs. Overall, the proposed project would result in an increase in freshwater wetland acreage in the watershed (primarily due to proposed new extended detention BMPs in the upper watershed) along with improvements in wetland quality.

Table 3.9-7a
Freshwater Wetland Habitat Impacts: Oakwood Beach Watershed (in acres)

				Existing Conditions				Conditions with Proposed BMP					
										Extended Detention Wetland[3]			
BMP	Name/ Location	BMP Type	BMP Size (Acres)	Open Water (ponded or stream corridor)	Common Reed Dominated Wetlands (or previously disturbed)	Wooded Wetlands (a)	Wooded Island/ Upland Edge (a)	Open Water[1]	Permanent Pool[2]	Wooded Wetlands	Emergent Wetlands	Upland Buffers[4]	Wetland Impacts
OB-1	Kissam Avenue	Extended Detention Wetland	28.2	1.2	20.3	2.5	4.2	4.5	10.7	2.5	8.0	2.5	+6.38 acres (NYSDEC)/habitat improvements
OB-2	Tysens Lane	Extended Detention Wetland	27.9	0.2	24.0	0.0	3.7	2.6	11.1	0.0	12.0	2.2	-1.68 acres (NYSDEC)/ habitat improvements
OB-3	Riga Street	Extended Detention Wetland; Forebays at storm Sewer outlets	29.0	1.0	22.3	0.0	5.7	4.5	9.7	0.0	11.8	2.3	+4.44 acres (NYSDEC)/habitat improvements
OB-4	Ithaca Street	Pocket Wetland at Hylan Blvd Outfall and Forebays at Other storm sewer outlets with Stream Stabilization	1.4	0.5	0.0	0.0	0.9	0.7	0.3	0.0	0.2	0.2	+0.73 acres (NYSDEC)/ habitat improvements
OB-5	North Railroad Avenue	Stormwater Basin Retrofit and Channel Restoration	3.2	0.0	1.1	0.0	2.1	0.1	0.0	0.0	1.0	2.1	+0.33 acres (NYSDEC)/ habitat improvements
												Total	**+10.20 acres (NYSDEC)/ with habitat improvements (see Table 3.9-7b)**

Notes: This table presents the created and enhanced wetlands and upland habitats at each BMP site with the proposed project, as follows:
(a) Wooded wetlands are palustrine forested wetlands. Wooded islands are elevated islands that rise in elevation above an otherwise *Phragmites* dominated marsh where the dominant trees species are sumac, oak, black cherry and birch. Upland edge is where the wetlands have transitioned to upland, which at many BMP sites is identifiable by changes in grade and vegetation such as filling at street edges and yards.
(1) Open water includes low-flow channels and ponds that would be permanently inundated with no vegetation.
(2) Permanent pool habitats are always inundated and have emergent wetland vegetation.
(3) Extended detention wetlands are the zones that are flooded in storms and would be occasionally inundated and planted with species that can tolerate periodic inundation/saturation.
(4) Upland buffers are defined as the upland perimeters of the BMP sites. Upland buffer zones have trees and shrubs and are typically drier than the extended detention zone.
Assumptions made when calculating potential DEC wetland impacts include the net effects of installing the proposed BMPs and the berms at OB-1 and OB-2. The net increase shown above is conservative in that the assumed dimensions for the proposed berms is based on the worst case largest berm in all cases, when there are three possible berm types, two of which would be smaller in size than that assumed in determining these impacts (see also Chapter 1.1. for a description of the proposed berms).
Source: Hazen and Sawyer, AKRF and DEP, July 2013.

Table 3.9-7b
Freshwater Wetland Acreage Impacts: Oakwood Beach Watershed

BMP	BMP type	Total BMP Size	Portion of BMP within DEC Mapped Wetlands (existing conditions)	Wetland Reductions for Proposed BMP Berms and Structures	Wetland Expansion with Proposed BMP (fill removal or conversion of upland)	Net change in Wetland Acreage (1)	Acreage of Existing Wetlands to be Enhanced with BMP (2)
OB-1: Kissam Avenue	Extended Detention Wetland	28.2	21.82	-0.69	+7.07	+6.38	21.13
OB-2: Tysens Lane	Extended Detention Wetland	27.9	27.9	-1.68	N.A.	-1.68	26.22
OB-3: Riga Street	Extended Detention Wetland; Forebays at Sewer Discharges	29.0	24.31	-0.25	+4.69	+4.44	24.06
OB-4: Ithaca Street	Pocket Wetland at Hylan Blvd Outfall and Forebays at Other Sewer Discharges with Stream Stabilization	1.4	0.7	0	+0.73	+0.73	0.7
OB-5: North Railroad Avenue	Stormwater Basin Retrofit and Channel Restoration	3.2	2.86	-0.01	+0.34	+0.33	2.85
Total						**+10.20 acres (NYSDEC wetlands)**	

Notes: (1) Quantification does not take into account the qualitative wetland enhancement. **(2)** Improvements in common reed dominated (*phragmites*) or otherwise degraded wetlands and exclusive of berms and structures.

Sources: Hazen and Sawyer, AKRF, DEP, April, 2013.

The proposed project would also have a limited impact on tidal wetlands due to the proposed outfalls. Impacts on tidal wetlands would be minimized in final design and a wetland restoration plan would be developed at that outfall, as necessary. DEP has also identified potential sites for tidal wetland restoration as part of the proposed project (**Table 3.9-8** provides the quantitative impacts relative to tidal wetlands and Chapter 8.1 "Mitigation" provides a description of the potential tidal wetlands restoration program).

Table 3.9-8
Areas of Tidal Wetland Impacts for Proposed Outfalls

Outfall	Linear Feet Below the Water Line	Width of Pipe (feet)	Estimated Area of Permanent Impact From Outfall Structure (square feet)	Width of Outfall Easement/Corridor (feet)	Estimated Area of Temporary Wetland Impact From Construction Easement Area (square feet)
OB-2 outfall (new outfall)	800	10	8,000	40	32,000
Ebbitts Avenue (expanded outfall)	175	5	875	Within existing outfall corridor	3,500
Tysens Lane (expanded outfall)	510	8	4,080	Within existing outfall corridor	10,200

Notes: Areas determined based on proposed drainage plan designs and aerial photographs for the watershed with new outfalls extended to bulkhead line and supplemental outfalls extended to length of existing outfall. Area of wetland impact not adjusted for depth of water greater than six feet. For work within existing outfall corridors the work area is assumed to be 20 feet wide.

VEGETATION AND TREES

Under the proposed amended drainage plans, impacts on vegetative cover, in particular woodlands and trees of the watershed is limited as most of BMP proposed sites are common reed dominated (except OB-4 and OB-5) and the proposed BMPs can be shaped to avoid woodland edges and borders. Nonetheless, DEP has the objective of minimizing the clearing of woodland and trees at all sites (and all proposed BMP sites requiring tree clearing) in the final design of all proposed BMPs. To that end, DEP would coordinate with DPR in the final design of sites located within DPR parkland for the purposes of both minimizing the total extent of woodland cover and tree impacts and to develop a tree mitigation program for all BMPs where tree clearing is proposed (see also Chapter 8.1, "Mitigation").

WILDLIFE

As is the case throughout the region, Staten Island has lost much of its historic freshwater and tidal wetlands and the Mid-Island watersheds are no exception. Therefore, the preservation of remaining wetlands under the Bluebelt Program, coupled with the created and enhanced wetlands of the proposed project, provides an opportunity to protect and reinvigorate important natural resources habitats in the Mid-Island region, including the Oakwood Beach watershed. To achieve the goal of habitat enhancements, natural features and wildlife attractors have been designed into the proposed BMPs for the purposes of providing ecological diversity in addition to (and in support of) the BMP proposed functions of stormwater management. The objective of these diverse design elements is to enhance the overall habitat complexity and ecological values at each proposed BMP site. For example, irregularly shaped wetland edges with coves and peninsulas have been included in the lower watershed proposed BMPs in order to create a more complex shoreline edge. Irregular shorelines increase the linear footage of edge habitats available for feeding and provides smaller secluded areas preferred by more reclusive species (see the discussion below). Small islands have also been included in the proposed BMP designs as ecological features called hummocks, aimed at diversifying the otherwise permanent pool habitat.

Wildlife observed during field surveys as well as the current literature and survey data suggests that the proposed BMPs could provide habitat to a wide range of avian species. It is the objective

of the proposed project to build upon the opportunities created by the current ecological features of the watershed, by expanding and diversifying these habitats and wildlife attractors. To this end, proposed BMP designs would provide, for example, habitat attractors for coastal nesting and feeding birds (once prey populations such as invertebrates and fish colonize the proposed BMPs).

There are also species, including rails and secretive marsh birds, migratory waterfowl species, and a variety of passerines (particularly marsh-obligate species) that require existing wetland structure for nesting and these species inhabit the Bluebelt properties during breeding, migratory, and overwintering periods. Additionally, existing wetlands provide habitat for reptiles and amphibians. Since some portion of the approximately 61 acres that comprise the large Bluebelt properties of the lower Oakwood Beach watershed would remain as a buffer area of protected Bluebelt property, the common reed habitat would continue to provide this wildlife function, thereby supplying an overall mix of beneficial habitats on DEP Bluebelt property.

Since the Oakwood Beach watershed lies within the Eastern Flyway migration route it presents an opportunity to enhance habitat for migratory birds and other avifauna. Several of the critical stormwater wetland design elements currently employed by the Staten Island Bluebelt program for flood control and water treatment are similar to the restoration criteria used in waterfowl habitat creation projects around the region. These include deep water zones, shallow water zones with emergent vegetation and fluctuating water levels. Shallow water zones with a diverse native wetland plant community are preferred feeding areas for dabbling ducks, herons, and egrets. Other species prefer to forage along the edge of the deep and shallow water areas, such as wood ducks. These proposed “nesting islands” provide predator-free nesting, resting, and feeding sites for mallard ducks and other waterfowl. The incorporation of wildlife habitat improvement techniques such as these would increase the habitat value of the stormwater detention wetlands in these otherwise heavily altered watersheds. Given that the proposed lower watershed BMP sites are along the migratory flyway, there is the potential to attract to these habitats some of the 325 species of waterfowl and other bird species that are reported in the Jamaica Bay wetlands to the east.

Lastly, a variety of other wildlife species, including reptiles and amphibians (spring peeper, green frog), migratory passerines (warblers, sparrows, etc), mammals (including water-dependent species), and insects are also present in various populations within these wetlands under existing conditions. Assuming suitable vegetative cover with complexity in understory/overstory is integrated into the proposed BMPs, and with the proposed open water, wooded island, and other ecological enhancements of the proposed BMP designs, the project would support and enhance native habitat values for terrestrial wildlife species, along with open water habitat for water-dependent mammals, reptiles and amphibians, and insects.

With respect to fish and other aquatic resources, as shown in the BMP proposed conceptual designs (and also summarized in **Table 3.9-7**), the proposed project would widen and improve the overall hydrologic functions of the Lower Oakwood Beach watershed streams and would improve water quality over the No Action condition, thus improving aquatic habitats with the addition of stormwater that would be filtered by the proposed BMPs. In the absence of the proposed project, hydrology and water quality conditions are expected to further decline. However, under the proposed BMP designs, the enhanced hydrology of the proposed streams and wetlands would avoid adverse impacts to streams and would also provide expanded water area along with a variety of aquatic habitats (e.g., expanded shoreline and deep pools) that would provide expanded and enhanced habitat for fish that have been reported in the Oakwood Beach

watershed and the Mid-Island area as a whole. This would, in turn, support wading birds that may feed upon these fish. In sum, the proposed project would provide multiple benefits for aquatic resources of the Mid-Island watersheds as it converts degraded (and in some cases filled) wetlands and highly stressed streams into contributing habitats for aquatic resources. In addition, to avoid any potential impacts on fishery resources along the Oakwood Beach Main Channel, the proposed tide gate at BMP OB-3 would be designed to minimize impacts to fish passage and would allow for the movement of fish along the Main Channel (see also Chapter 8.1, "Mitigation").

A more detailed description of potential impacts at each proposed BMP site follows.

IMPACTS AT INDIVIDUAL BMPS

BMP OB-1: KISSAM AVENUE

This proposed BMP site is associated with the eastern portion of NYSDEC-mapped wetland NA-10 and NWI-mapped emergent, common reed-dominated wetlands. With the proposed BMP, existing stream channels and open water at this site would be fully reconstructed for the purposes of improving both wetland hydraulic and ecological functions. In keeping with the objective of the proposed project, efforts in the final design for the proposed BMP would be taken to avoid the existing more diverse, natural habitats where feasible, although some impacts to upland hummock and perimeter mature trees are expected along with some native scrub-shrub and non- common reed emergent marsh. However, given that the site is predominantly common reed marsh, the expanded habitats created by the permanent pool (open water habitat), and extended detention habitat (periodic inundation) habitats along with the proposed planting programs would increase the diversity of vegetation at this site. In addition the proposed project would include restoration of area previously filled and currently occupied by surface parking. With the proposed BMP, this area, about 0.22 acres of land that is currently within the DEC sketch map wetlands, would be restored and planted as a wetland community which is a positive impact of the proposed project. With the mature hardwoods and hummock rises within this proposed BMP, preservation of the trees and wooded patches would preserve natural habitat that contribute positively to the ecological values and diversity at this site. While it is expected that some tree clearing may be necessary, overall the clearing of trees at this site is expected to be limited. Therefore the proposed BMP would not result in potential significant adverse impacts on vegetation and trees.

During the spring/summer 2009/2010 field observations, proposed BMP OB-1 was observed to support waterbird concentrations (waterfowl, wading birds, gulls, and terns) in and around the small open water ponds on the southerly portion of the site. The proposed BMP would expand open water acreage that would support increased populations of these species with expanded habitat and foraging opportunities (once prey populations including invertebrates and fish have colonized the proposed BMP). A variety of other wildlife species, including reptiles and amphibians (spring peeper, green frog), migratory passerines (warblers, sparrows, etc), some mammals (including water-dependent species), and insects would also benefit from the proposed improved habitats of the proposed BMP with the added and diversified vegetative cover and a complex understory/overstory proposed in the proposed BMP design. These areas would provide enhanced habitat for a variety of wildlife species.

Other species, including rails and other secretive marsh birds, migratory waterfowl species, and a variety of passerines (particularly marsh-obligate species that require structure for nesting) that

currently inhabit or use the common reed marsh during breeding, migratory, and overwintering periods would continue to use the mix of habitat types at this proposed BMP site as well as the preserved existing wildlife habitats with the protected Bluebelt property.

With respect to fish and other aquatic resources, this proposed BMP would be located off-line from the East Branch and would not require any disturbance of the existing stream channel. However, as shown in Table 3.9-7 the proposed project would expand water area at the proposed BMP site which would benefit aquatic resources.

Therefore, the proposed BMP would not result in potential significant adverse impacts on wildlife.

BMP OB-2: TYSENS LANE

With the proposed BMP OB-2, existing stream channels and wetlands would be fully reconstructed for the purposes of improving both their hydraulic and ecological functions. As with OB-1, above, final design would utilize the existing natural resources conditions to create the proposed BMP footprint to avoid the more diverse existing habitats at the site where possible. Although some impacts to upland hummock and perimeter with mature trees, native scrub-shrub, and non- common reed emergent marsh would be expected. However, given that the site is predominantly common reed marsh, the expanded habitats created by the proposed permanent pool (open water habitat) along with the proposed planting programs would establish more enhanced habitat diversity at this site with respect to ecological communities. Due to a number of mature hardwoods present within upland hummocks and perimeter areas within this proposed site, preservation of some tree perimeter would also limit tree clearing at this location and would preserve natural habitat that contributes positively to the ecological values and diversity of this site. While it is expected that some tree clearing may be necessary, overall the clearing of trees at this site is expected to be limited. Therefore the proposed BMP would not result in potential adverse impacts on vegetation and trees.

During the spring/summer 2009/2010 field observations, proposed BMP OB-2 was observed to support waterbird concentrations (waterfowl, wading birds, gulls, and terns) in and around the small open water ponds. The proposed BMP would expand open water acreage that would support increased populations of these species with expanded habitat and foraging opportunities (once prey populations including invertebrates and fish have colonized the proposed BMP). A variety of other wildlife species, including reptiles and amphibians (spring peeper, green frog), migratory passerines (warblers, sparrows, etc), some mammals (including water-dependent species), and insects would also benefit from the proposed improved habitats of the proposed BMP with the added and diversified vegetative cover and a complex understory/overstory proposed in the proposed BMP design. These areas would provide enhanced habitat for a variety of wildlife species.

Other species, including rails and other secretive marsh birds, migratory waterfowl species, and a variety of passerines (particularly marsh-obligate species that require structure for nesting) that currently inhabit or use the common reed marsh during breeding, migratory, and overwintering periods would continue to use the mix of habitat types at the proposed BMP site as well as the preserved existing wildlife habitats with the protected Bluebelt property.

This proposed BMP would be located upstream of the East Branch and would cause only minimal disturbance to the existing stream channel. As shown in Table 3.9-7, the proposed BMP would include deep pools and a low flow channel that would extend across the proposed BMP to

the proposed storm sewer outlet at Milton Avenue. Thus, the proposed BMP would expand surface waters and aquatic habitats and would increase hydrologic inputs and the length of stream channel of the East Branch. The proposed BMP would also control runoff and improve downstream water quality over existing conditions. Therefore, the proposed BMP would benefit aquatic resources, including fish and fish habitat in the East Branch.

Therefore, the proposed BMP would not result in potential significant adverse impacts on wildlife.

BMP OB-3: RIGA STREET

With the proposed BMP, existing stream channels and wetlands across this property would be fully reconstructed for the purposes of improving both their hydraulic and ecological functions. As with OB-1, above, final design would use the existing natural resources conditions to create the BMP proposed footprint in the final design that avoids the more diverse existing habitats at the site where possible. Although some impacts to upland hummock and perimeter with mature trees, including native scrub-shrub, and non- common reed emergent marsh would be expected, given that the site is predominantly common reed marsh (with some open water), the expanded habitats created by the proposed permanent pool (open water habitat) along with the proposed planting programs of the proposed BMP would establish a more enhanced habitat diversity at this site with respect to its ecological communities. Due to a number of mature hardwoods present within upland hummocks and perimeter areas within this proposed site, preservation of some tree perimeter would also limit the trees clearing at this location and would preserve natural habitat that would contribute positively to the ecological values and diversity at this site. While it is expected that some tree clearing may be necessary, overall the clearing of trees at this site is expected to be limited. Therefore the proposed BMP would not result in potential adverse impacts on vegetation and trees.

During the spring/summer 2009/2010 field observations, proposed BMP OB-3 was observed to support waterbird concentrations (waterfowl, wading birds, gulls, and terns) in and around the small open water ponds on the central portion of the site. The proposed BMP would expand open water acreage that would support increased populations of these species with expanded habitat and foraging opportunities (once prey populations including invertebrates and fish have colonized the proposed BMP). A variety of other wildlife species, including reptiles and amphibians (spring peeper, green frog), migratory passerines (warblers, sparrows, etc), some mammals (including water-dependent species), and insects would also benefit from the proposed improved habitats of the proposed BMP with the added and diversified vegetative cover and a complex understory/overstory proposed in the proposed BMP design. These areas would provide enhanced habitat for a variety of wildlife species.

Other species, including rails and other secretive marsh birds, migratory waterfowl species, and a variety of passerines (particularly marsh-obligate species that require structure for nesting) that currently inhabit or use the common reed marsh during breeding, migratory, and overwintering periods would continue to use the mix of habitat types at the proposed BMP as well as the preserved existing wildlife habitats with the protected Bluebelt property.

The proposed project would widen and improve the overall hydrologic functions of the Lower Oakwood Beach watershed and would also improve water quality and aquatic habitats because of increased stormwater inputs that would be filtered by the proposed BMPs. The proposed project would also provide a greater variety of aquatic habitats, including extended shorelines and deep pools, for fish that have been reported in the Oakwood Beach watershed and Mid-

Island area as a whole. This enhancement would also support wading birds that may feed upon these fish. Therefore, the proposed project would provide multiple benefits for aquatic resources in the Mid-Island watersheds by converting degraded wetlands and highly stressed streams into enhanced habitats for aquatic resources. In the absence of the proposed project, hydrology and water quality conditions in the Mid-island watersheds would be expected to further decline. In addition, to avoid any potential impacts on fishery resources in the Oakwood Beach Main Channel, which is currently not tide-gate controlled, the design of the proposed tide gate at proposed BMP OB-3 would incorporate features that allow for fish passage along the channel (see also Chapter 8.1, "Mitigation").

Therefore, the proposed BMP would not result in potential significant adverse impacts on wildlife.

BMP OB-4: ITHACA STREET

With the proposed BMP, the existing stream channel across this site would be fully reconstructed for the purposes of improving both the hydraulic and ecological functions of the stream as it passes through this property.

While the proposed project would improve the ecological conditions along the channel, preservation of individual large tree and stands of trees along the site corridor as part of the final design would also contribute positively to the ecological values and diversity at this site. Otherwise, the proposed project would provide the positive benefits of a new open-water flowing stream channel that would be planted and stabilized along its length. While it is expected that some tree clearing may be necessary, overall the clearing of trees at this site is expected to be limited. Therefore the proposed BMP would not result in potential adverse impacts on vegetation and trees.

A variety of wildlife species, including reptiles and amphibians (spring peeper, green frog), migratory passerines (warblers, sparrows, etc), mammals (including water-dependent species), and may also use this stream corridor under the proposed project. Provided suitable vegetative cover and habitat complexity in understory/overstory is developed with the proposed BMP, it would provide habitat for a variety of water-dependent mammals, reptiles and amphibians, and insects.

This proposed BMP would be located in the headwaters of the Main Channel and would relocate and realign the stream. The stream would be supported by a number of low flow channels that would begin at the proposed storm sewer outlets at the ends of streets, including Riga Street, and Merkel Place (see Figure 3.1-6). The proposed low flow channels and permanent pools, as shown in Table 3.9-7, would expand water area at this proposed BMP site and would also control runoff, thereby improving downstream water quality. The proposed design of the weir and tide gate would be developed with features that would allow for fish passage between the site of the proposed BMP and the downstream reaches of the Main Channel and the West Branch of the Oakwood Beach system. Therefore, the proposed BMP would benefit aquatic resources, including fish and fish habitat downstream of the Main Channel.

Therefore, the proposed BMP would not result in potential significant adverse impacts on wildlife.

BMP OB-5: NORTH RAILROAD AVENUE

Currently the site of the proposed BMP is largely dominated by a dry pond and eroded informal and intermittent stream channel. This proposed BMP design would provide a substantial ecological restoration element for this existing informal drainage system. Under the proposed BMP design, the existing basin would be regraded and vegetated to enhance its hydrologic function as well as its wetland habitat and operational features.

As the principal activities within this proposed BMP involve enhancing and retrofitting existing structures there would not be limited clearing of vegetation. There would, however, be the positive impacts of the proposed BMP planting plan that would increase groundcover and stabilize the banks of the existing detention pond at this proposed BMP. With the above-described improvements, the existing stream channel would also be fully reconstructed for the purposes of improving its hydraulic and ecological functions as it passes through this site. Due to a number of mature hardwoods in the perimeter of this proposed BMP, preservation of the trees and woodland borders would also preserve natural habitats that contribute positively to the ecological values and diversity at this proposed BMP site.

Upstream and downstream of the pond, the proposed BMP is largely an eroded channel. Therefore, the stabilization and planting plans of the proposed BMP would be a positive impact of the proposed project on these ecological communities.

While it is expected that some tree clearing may be necessary, overall the clearing of trees at this site is expected to be limited. Therefore the proposed BMP would not result in potential adverse impacts on vegetation and trees.

OB-5 has mature trees dominated by oaks, tulip poplar, sweetgum, and other species that provide habitat for forest-dwelling birds (red-eyed vireo, scarlet tanager, cavity nesting species such as owls and woodpeckers). By preserving the tree perimeter, impacts on these species would be limited. With respect to the upstream and downstream channel enhancements, the added cover and planting programs of the proposed project are expected to provide positive wildlife benefits. Restoration of the existing detention pond with added ecological landscaping would also support wildlife habitat. Plants that are in the proposed BMP planting schedule, such as sedge, wool grass and pickerel weed that provides a food source, arrowood arum and soft stem bulrush that provide shelter and coverage would provide benefits for local wildlife.

With respect to fish and other aquatic resources, this proposed project would provide additional stormwater to this proposed BMP and would restore the existing stormwater basin with an enhanced stream channel. The proposed BMP would also control runoff and improve downstream water quality. Thus, the proposed BMP would benefit aquatic resources (this reach of West Branch does not provide any fish habitat).

Therefore, the proposed project would not result in potential significant adverse impacts on wildlife at this proposed BMP site.

LOWER BAY OUTFALLS

There would be one new outfall to the Lower Bay within the Oakwood Beach watershed. That outfall would be constructed within a proposed outfall corridor between OB-1 and the bulkhead line (about 40 feet wide and 1,255 linear feet) of which about 450 linear feet would cross beach and low bluff habitat and the balance, about 800 linear feet, would be in the water to the bulkhead line. In addition, two secondary outfalls would be constructed, one to augment the

existing outfall from Ebbitts Avenue and the other to augment the existing outfall from Tysens Lane. The Ebbitts Avenue outfall would be five feet wide and the Tysens Lane outfall would be eight feet wide, and both would be built adjacent to and the same length as the existing outfall.

Upland of the water line, post construction, the outfall structures would be buried and the outfall corridors would be restored to preconstruction conditions. For the in-water segment, **Table 3.9-8** shows the potential area of impact of the proposed outfalls on tidal wetlands within the Lower Bay. Temporary impacts (as shown in the table) would only occur during construction; this area would then be restored to pre-construction conditions. The area occupied by the proposed outfall structures would be a permanent impact of the structure. As shown in the table, the area of the proposed structure within tidal wetlands is estimated to be about 12,955 square feet (about 0.30 acres) and the work area (within the area of the proposed easement) is estimated to be about 45,700 square feet. No salt marsh vegetation would be temporarily or permanently impacted by the proposed project and the impacted area is essentially a limited area of sand beach and benthic habitat. Assuming a wetland restoration of two to one for sub-tidal habitat, the proposed project would then incorporate approximately 25,910 square feet (about 0.59 acres) of tidal wetland restoration for the impact of the proposed outfall structure.

No significant adverse impacts would be occur with respect to terrestrial wildlife with the proposed outfall given the relatively limited area of impact and the area would be restored to pre-construction conditions. The segment of the outfall along the beach could impact species such as horseshoe crab; the beach habitat in the vicinity of OB-1 is a known nesting location for horseshoe crabs, and also provides suitable habitat for diamondback terrapin nesting. However given the limited area that is affected this impact is not expected to be significant. Moreover, this impact could be avoided if construction was limited to the non-nesting seasons. The area of impact on aquatic resources is expected to amount to about 12,955 square feet and the proposed project would include a tidal wetland restoration plan for this structural impact to tidal wetlands and aquatic habitat. Since the area of impact is primarily along the shoreline, the proposed outfall structure would have a limited and insignificant impact on fish habitat of Lower Bay with no significant adverse impacts on the essential fish habitat. In addition, no indirect impacts on aquatic habitat are expected as no adverse water quality impacts would occur with the proposed project (see "Water Quality" above).

Therefore, the proposed outfall would not result in potential significant adverse impacts on natural resources.

Shoreline Erosion

As stated above, the proposed project would extend an outfall into the Lower Bay and across (perpendicular to) the shoreline. Therefore, the proposed outfall raises the potential for indirect impacts on beaches and shorelines, particularly with respect to the littoral drift of sand. A prevailing east to west littoral drift of sand is a known pattern on the South Shore of Staten Island. However, the proposed outfall is not expected to significantly alter or interrupt these drift patterns since there are already multiple existing outfall structures immediately updrift to the east (e.g., extending out into the bay from approximately the end of Penn and Isabella Avenues, see **Figure 3.9-1**) and to the west (e.g., extending out into the bay from approximately the end of Chesterson Avenue, see **Figure 3.9-1**) that have already altered the natural littoral drift pattern along this reach of the shoreline. The USACE's Storm Reduction Impact Techniques, a study of engineering strategies for designing coastal areas, would also be referenced and applied during the design of this outfall in order to minimize impacts.

Therefore, the proposed outfall would not result in potential significant impacts on beach conditions.

Therefore, the proposed outfall would not result in potential significant indirect impacts on shoreline conditions and littoral drift.

ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES AND COMMUNITIES

With respect to the marine related species, shortnose sturgeon is not expected within the New Creek watershed streams. Although it may use Lower Bay in some way during the migratory seasons, given the limited nearshore area that would be directly impacted by the proposed outfall and that it would be located in shallow habitat, no significant adverse impacts on this species would be expected with the proposed project. Similarly, the proposed outfall (construction and operation) would not result in a significant adverse impact on Kemp's ridley sea turtles, loggerhead sea turtles, green sea turtles, or leatherback sea turtles as all four species are not likely to occur in the vicinity of the proposed outfall site. Similarly, no significant adverse impacts are expected on marine mammals.

Because osprey and northern harrier have the potential to nest, forage or flyover the proposed lower watershed BMPs, a pre-construction survey would be conducted for these species at OB-1, OB-2 and OB-3 sites. If these species are observed or nesting, measures would be taken to avoid impacting these species during construction and operation of the proposed BMPs.

In addition, with respect to protected plant species, a pre-construction survey for slender blue iris and northern gamma grass, as well as exploitably vulnerable turks-cap-lily would be performed at OB-1 with a pre-construction survey for two exploitably vulnerable ferns royal fern and cinnamon fern would be performed for proposed BMPs OB-1, OB-2, and OB-3.

If protected species are identified during the final design/pre-construction stage, DEP would explore the possibility of refining the proposed BMP design to avoid these species or their habitats and, with respect to plants, plant salvage may also be implemented as a technique for relocating plants to avoid impacts. Additional details on mitigation for the protection of rare, threatened and endangered species is presented in Chapter 8.1, "Mitigation."

E. CONCLUSIONS

The proposed amended drainage plan would not result in potential significant adverse impacts on surface or groundwater hydrology. Rather, the proposed project is expected to reduce local stream flooding that currently affects streets and private properties. Modeling of storm events has disclosed that the proposed project would not adversely impact the 10-year or 100-year floodplain (in fact reductions in water surface elevations and reduced flooding is projected), nor would it have any adverse impacts on local surface drainage due to the proposed BMP berms or modified street grades. The proposed project would also not result in any erosive stream velocities downstream of the proposed BMPS. In addition, the proposed project would not adversely impact local groundwater flows or the local water table. Also proposed is the collection of additional groundwater data to inform the design of the lower watershed BMPs (see also Chapter 8.1, "Mitigation").

The proposed amended drainage plan would also not result in potential significant adverse water quality impacts. Rather, it would provide water quality improvements through the proposed

BMPs that would otherwise not occur under the "no action" condition. The proposed BMPs of the amended drainage plan are anticipated to provide water quality benefits through the removal of nitrogen and phosphorous from the runoff along with reductions in runoff velocity and uncontrolled runoff that can cause scouring and erosion in the watershed with the resulting sedimentation in local water bodies. Therefore, through the use of proposed BMPs, the proposed amended drainage plan would not result in any direct or indirect significant adverse water quality impacts on either the local streams or the ultimate receiving waters of the Lower Bay.

The proposed BMPs, particularly in the lower watershed (OB-1 through OB-4), would substantially enhance and diversify existing wetlands by creating more open water and improving and realigning stream corridors. The proposed expansion of wetlands at OB-1 would remove fill along Kissam Avenue which is expected to recreate about 0.22 acres wetlands that had been previously impacted by fill (this area of wetlands is already mapped). The proposed BMPs would also provide substantially improved wetland wildlife habitat (particularly for fish and other aquatic resources) through modified grading, changes in hydrology, and diversified planting programs at each proposed BMP. This would include new open water and island habitats in the proposed lower watershed BMPs. Final designs for the proposed BMPs would also incorporate existing currently contributing habitats (such as small ponds, existing wooded edges, secluded hummocks) and minimize or avoid impacts to these habitats while integrating them into the proposed BMP designs. In the upper watershed, it is expected that there would be improved wetlands at OB-5 through a widened and meandering stream corridor. The proposed BMP designs would also incorporate measure to protect and maintain fisheries of t he watershed and movement along the channel (see also Chapter 8.1, "Mitigation").

With respect to vegetation and trees, the overall habitat of the watershed, in particular the lower watershed, contains limited woodlands. However, certain proposed BMP sites do currently contain wooded borders along the borders as well as (in limited cases) wooded hummocks within the proposed BMP OB-1 through OB-3 sites. To protect, to the extent feasible, existing trees and woodland stands at these sites, final designs for proposed BMPs would include survey details for the purposes of minimizing tree impacts, particularly at those proposed BMP sites where wooded borders could potentially provide ecological benefits and support the diversity of habitats within not only the proposed BMP, but the watershed as a whole. DEP would also develop a tree mitigation plan with DPR, as necessary, to replace trees that may need to be cleared to develop the proposed BMPs within parkland (see also Chapter 8.1, "Mitigation)

Regarding any protected wildlife or plant species that have been identified at the proposed BMP sites, the proposed project would include a preconstruction survey that would determine the presence or absence of such species at the proposed BMP sites where these species have been identified. Based upon that preconstruction survey, the final designs for the proposed BMPs may be modified to avoid particular habitats, or plant rescue could be used as a technique to avoid impacts to protected plant species(see also Chapter 8.1, "Mitigation").

The proposed BMP planting programs would include ongoing maintenance and monitoring by the Staten Island Bluebelt Unit (see Chapter 1.1, "Overall Description of the Proposed Program") for the purposes of maintaining the proposed BMP hydrologic functions and the habitat benefits. This would include monitoring of new plantings, replacement and transplanted vegetation, as necessary.

Impacts of the proposed BMPs, while analyzed in one analysis year (2043), would actually be phased in over a 30-year period, thereby allowing for the created habitats of the proposed BMPs to become established as other proposed BMPs enter into a design and construction phase.

Moreover, once completed, the proposed BMPs are expected to provide ecological benefits at a watershed level.

Finally, as stated above, the proposed lower watershed BMP sites have historically experienced brush fires. By removing the large stands of common reed that have been prone to brush fires in the Mid-Island area and replacing it with open water, maintenance corridors and maintained berms, the proposed project would provide firebreaks against the spread of brushfires at these sites, along with access in the event of emergency, which would be a beneficial impact of the proposed project.

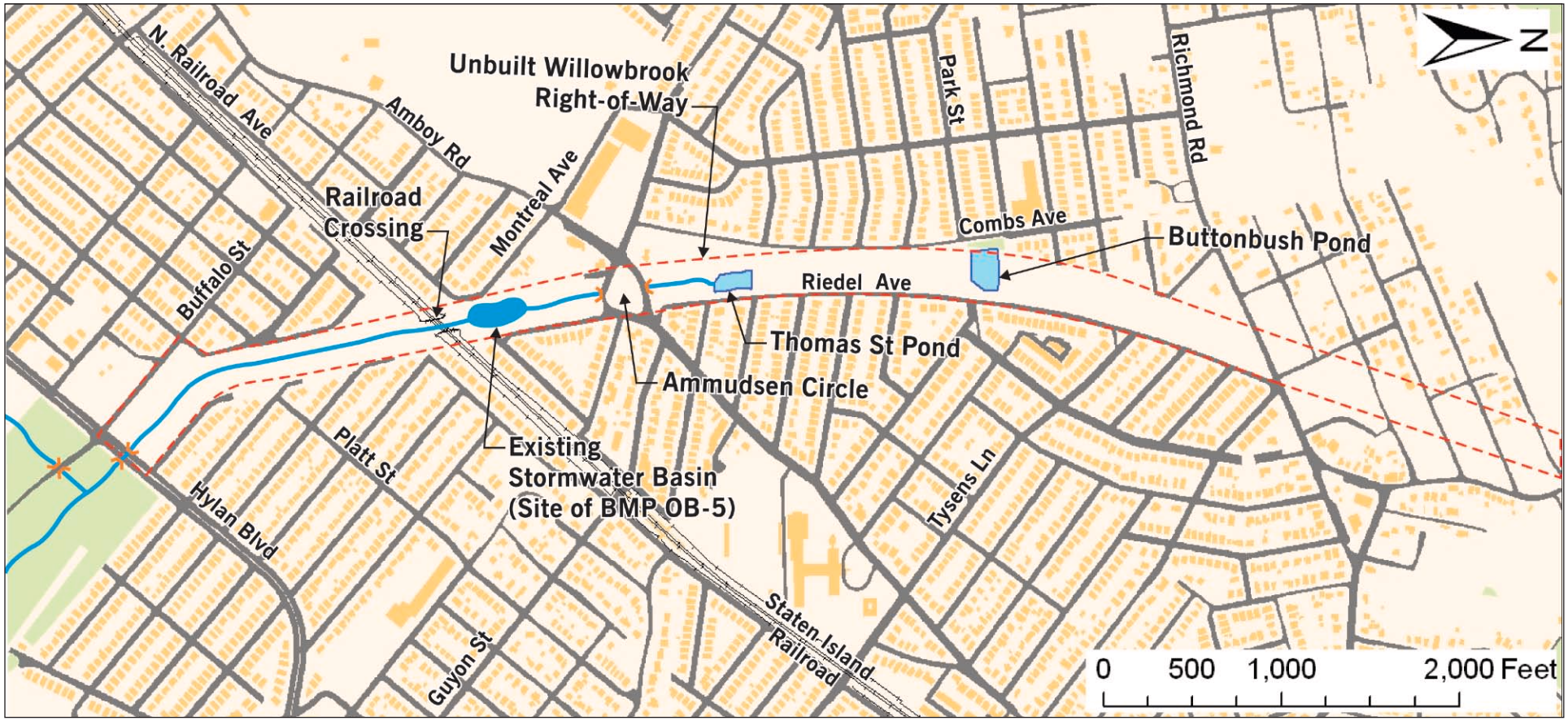
The proposed project would also include a plan for the restoration of tidal wetlands due to the proposed new and expanded outfalls. DEP would identify additional potential sites for expanded tidal wetlands in the Mid-Island area, including Great Kills Park, if necessary.

Thus, the proposed project would not result in potential significant adverse impacts on hydrology, groundwater, wetlands, vegetation and trees, or wildlife. Therefore, the proposed project would not result in potential significant adverse impacts on natural resources. ✷

Aerial Photograph — Oakwood Beach Watershed

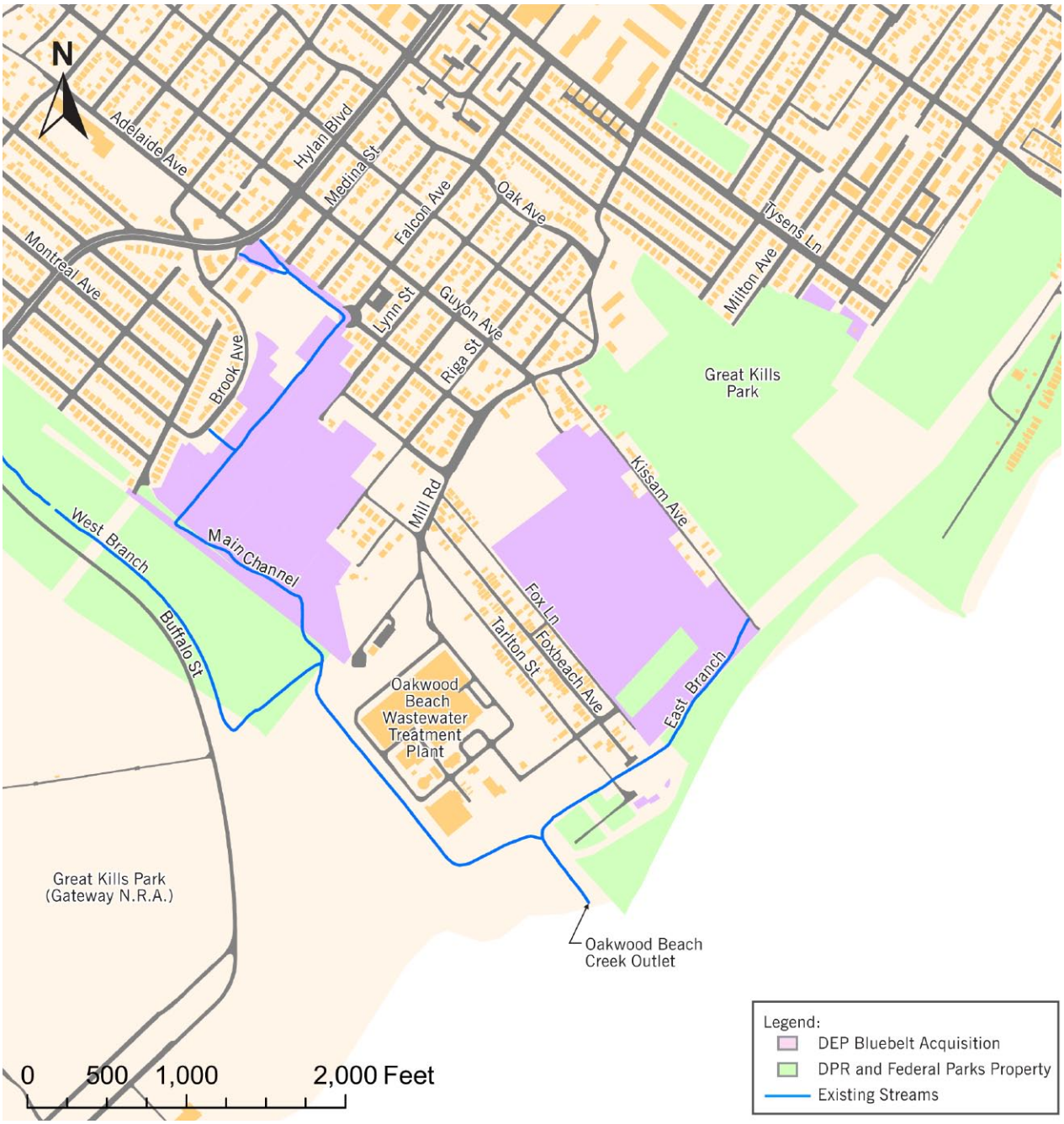
Figure 3.9-1

9.22.11



Existing Upper Watershed Drainage System:
Oakwood Beach Watershed

Figure 3.9-2

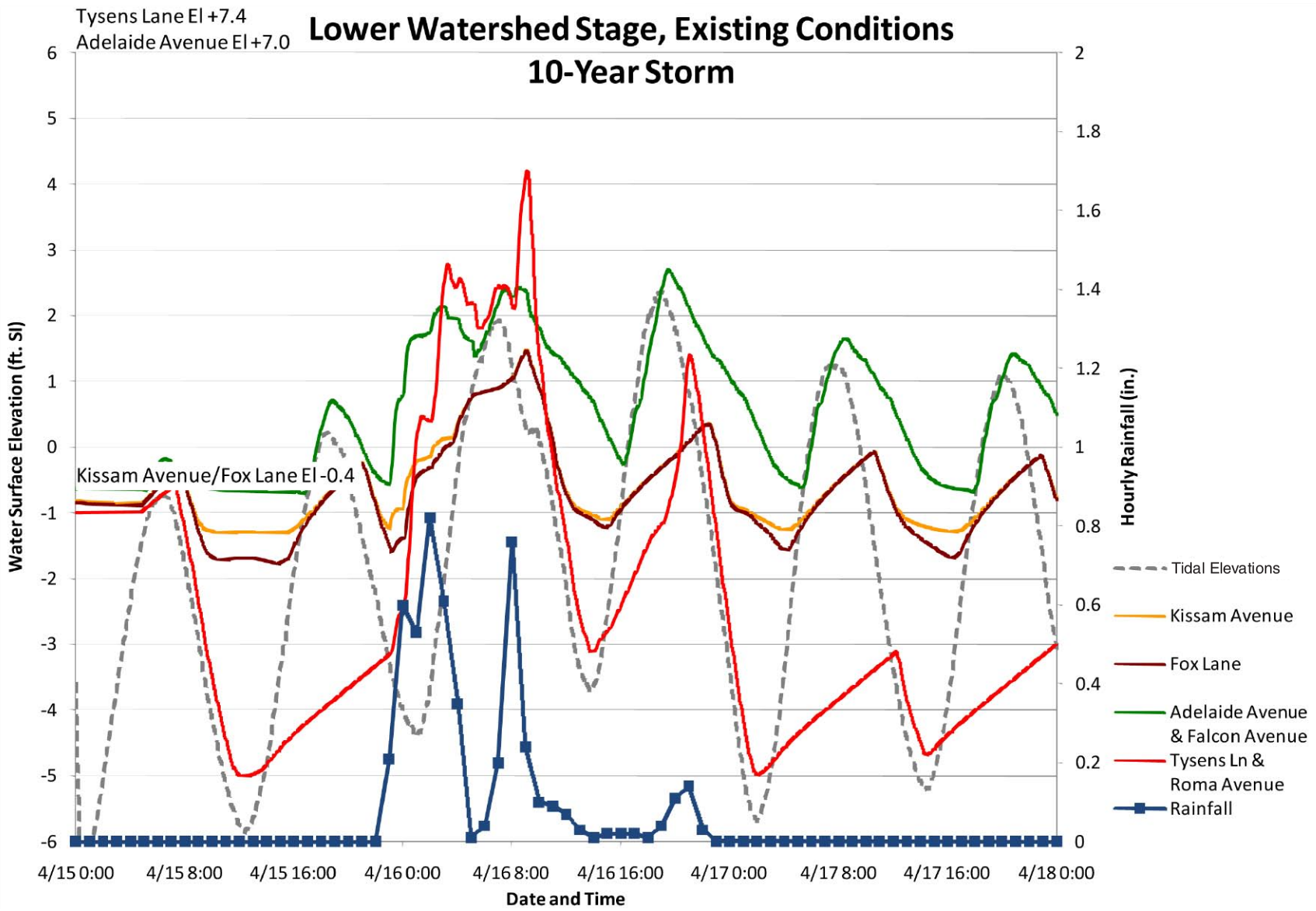


SOURCE: Hazen & Sawyer, 2010

Existing Lower Watershed Drainage System:
Oakwood Beach Watershed

Figure 3.9-3

3.30.11



Oakwood Beach Lower Watershed Water Surface Elevations: Existing Conditions

Figure 3.9-4

Flood Data source: Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (DFIRM) 2007

0 1000 2000 FEET
SCALE

Proposed BMP Site

Existing Outfall *Proposed Outfall*

Drainage Area Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

100 Year Flood Zone (1 % Annual Chance Flood Risk Zone)

500 Year Flood Zone (0.2 % Annual Chance Flood Risk Zone)

Flood Codes:

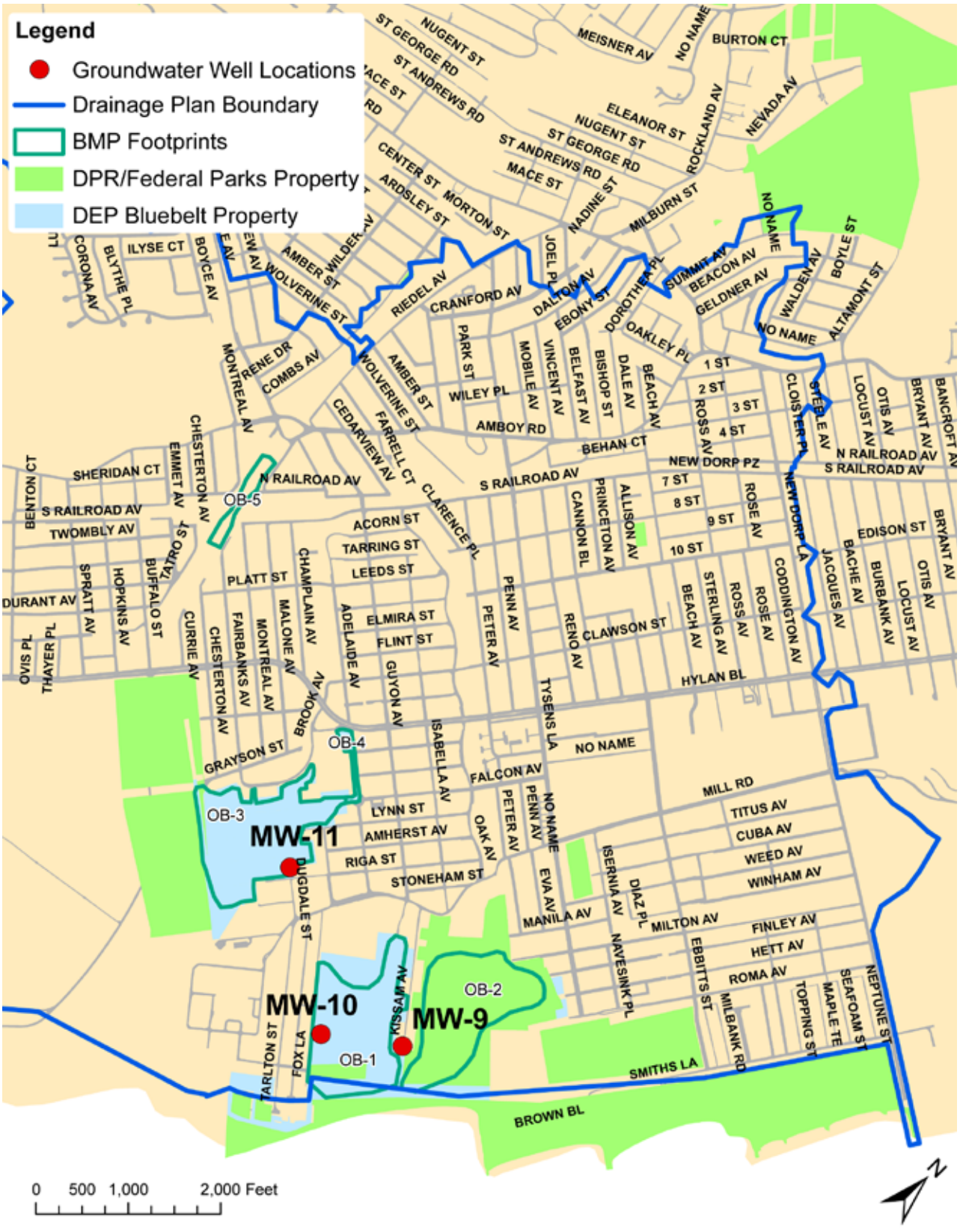
VE *An area inundated by 100-year flooding with velocity hazard (wave action); BFEs (Base Flood Elevations) have been determined.*

A *An area inundated by 100-year flooding, for which no BFEs have been determined.*

AE *An area inundated by 100-year flooding, for which BFEs have been determined.*

NOTE: This map is based on the current Flood Insurance Rate Maps (FIRM) that FEMA is currently in the process of reevaluating for the New York City area. Since the issuance of the DEIS (September 2011), FEMA has released Advisory Base Flood Elevation (ABFE) Maps that reflect the effects of Hurricane Sandy in October 2012. The information presented on the ABFE Maps will be incorporated into official updates to the FIRMs that FEMA expects to release at a later date.

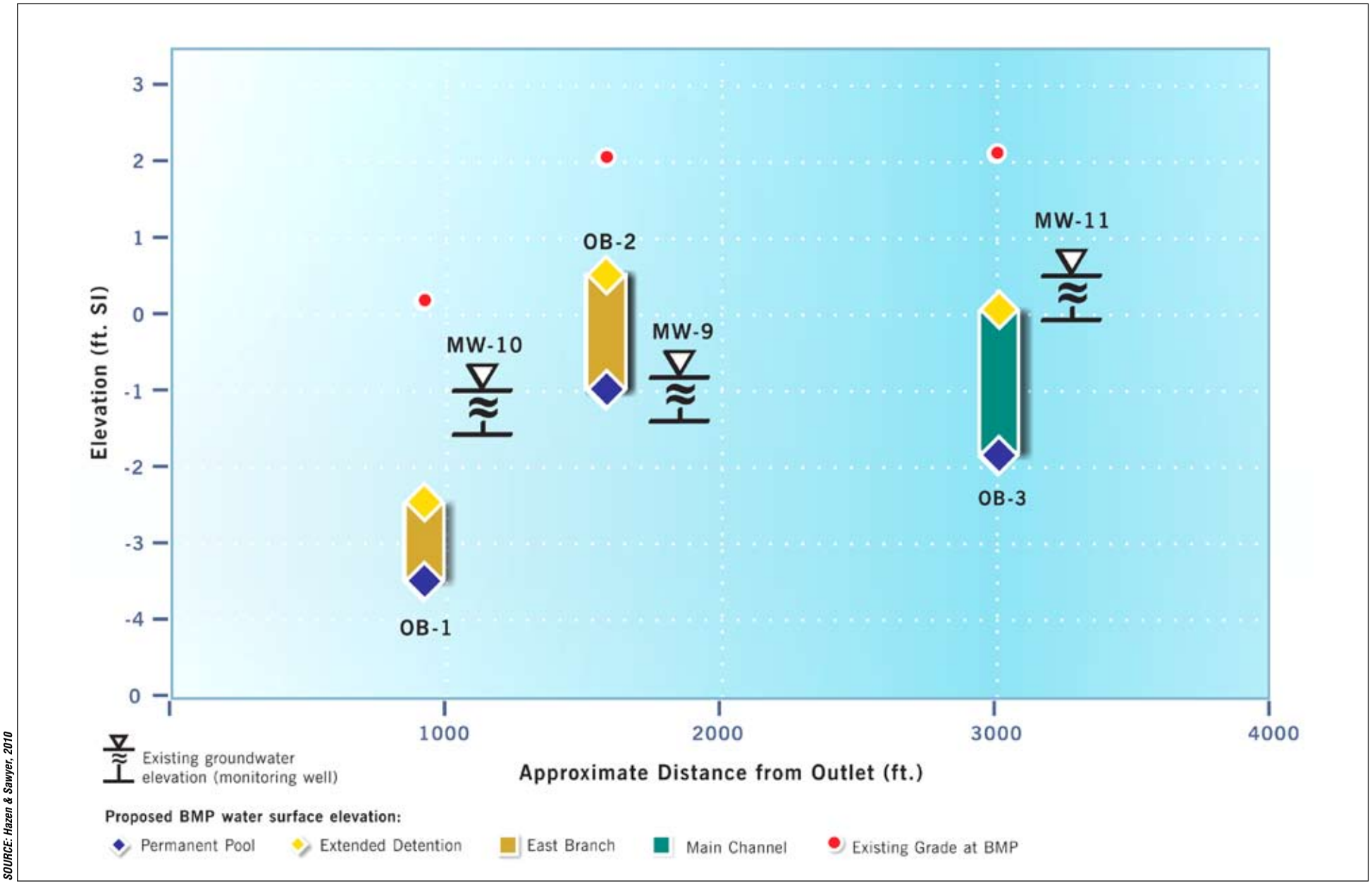
FEMA Flood Zones
Figure 3.9-5



SOURCE: Hazen & Sawyer, 2010

Groundwater Well Locations
Oakwood Beach Watershed

Figure 3.9-6



SOURCE: Hazen & Sawyer, 2010

Comparison of the Lower Watershed Oakwood Beach BMP Elevations with Observed Groundwater Table Elevations (Average of High and Low Tides) During the Spring-Fall 2010 Monitoring Period

Proposed BMP Site

Existing Outfall *Proposed Outfall*

Drainage Area Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

I / C *Classified Streams*

Parks Property (City, State & Federal)

DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

SB / SA, B, I / C **NYSDEC Water Quality Standard Rating (2007)**

Class B waters - primary and secondary contact recreation and fishing.These waters shall be suitable for fish propagation and survival.

Class C waters - best usage is fishing. These waters shall be suitable for fish propagation and survival.

Class SA waters - shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class SB waters - primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class SC waters - best usage is fishing. These waters shall be suitable for fish propagation and survival.

Class I waters - best usages are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

NYSDEC Water Use Classifications
Figure 3.9-8

9.21.11

Proposed BMP Site

Existing Outfall

Proposed Outfall

Drainage Area Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

Tidal Wetlands

Intertidal Marsh

Coastal Shoals, Bars, Mudflats

Littoral Zone

Freshwater Wetlands

Class I

Class II

Staten Island Bluebelt Mid-Island Watersheds

NYSDEC Wetlands

Figure 3.9-9

Proposed BMP Site

Existing Outfall *Proposed Outfall*

Drainage Area Tributary to Oakwood Beach Bluebelt

Area Tributary to Oakwood Beach Bluebelt but Outside of Proposed Drainage Plan Amendment

DEP Bluebelt Property (Acquired or in the Process of Being Acquired)

Wetland Types

Estuarine and Marine Deepwater

Estuarine and Marine Wetland

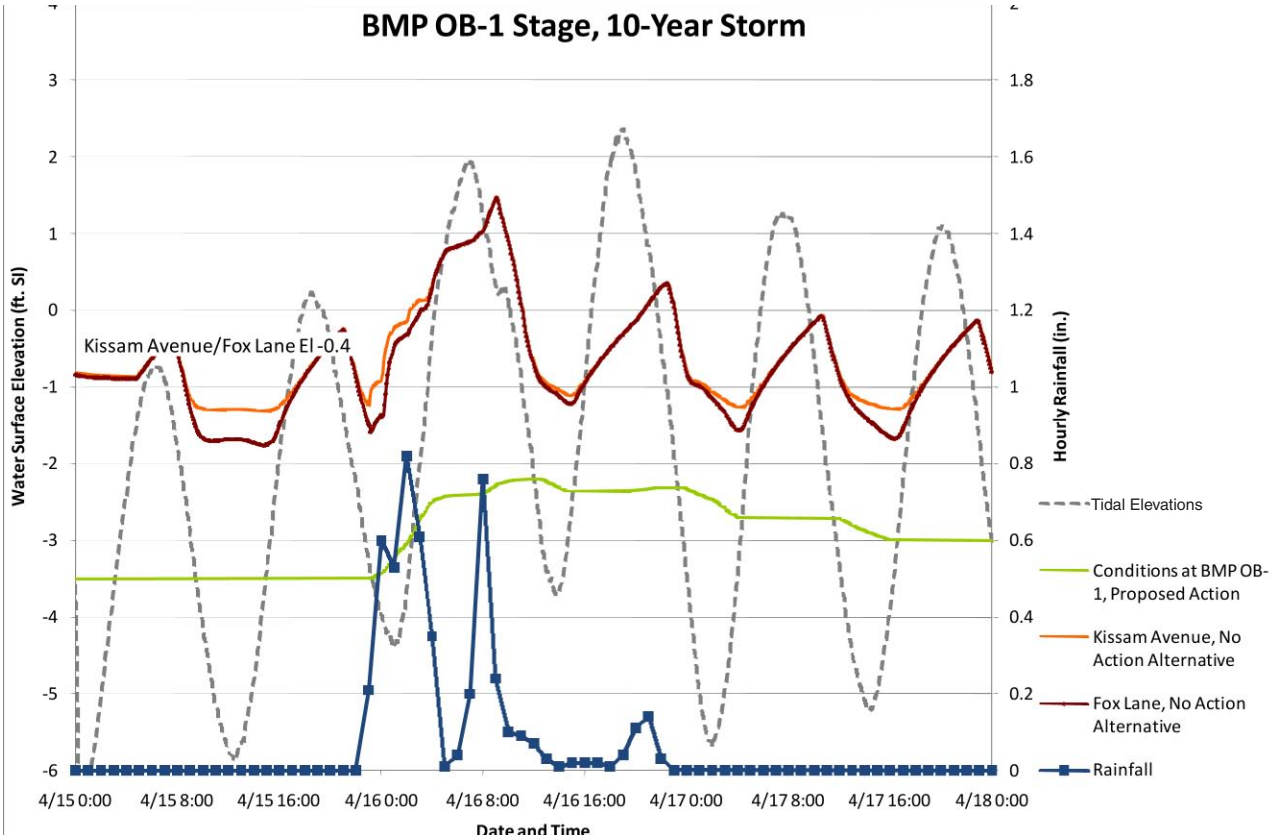
Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

0 1000 2000 FEET
SCALE

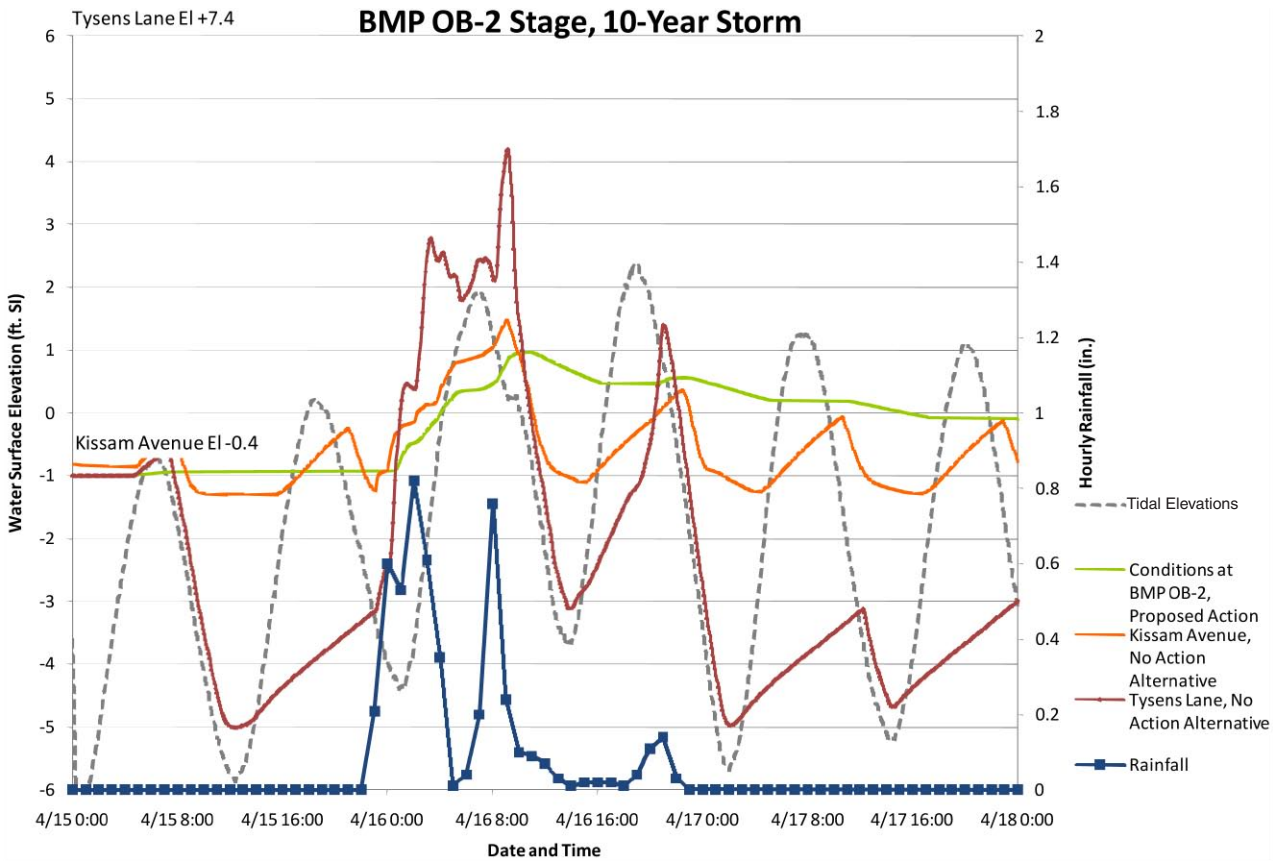
NWI Wetlands
Figure 3.9-10



SOURCE: Hazen & Sawyer, 2010

BMP OB-1: Water Surface Elevations During the 10-Year Storm

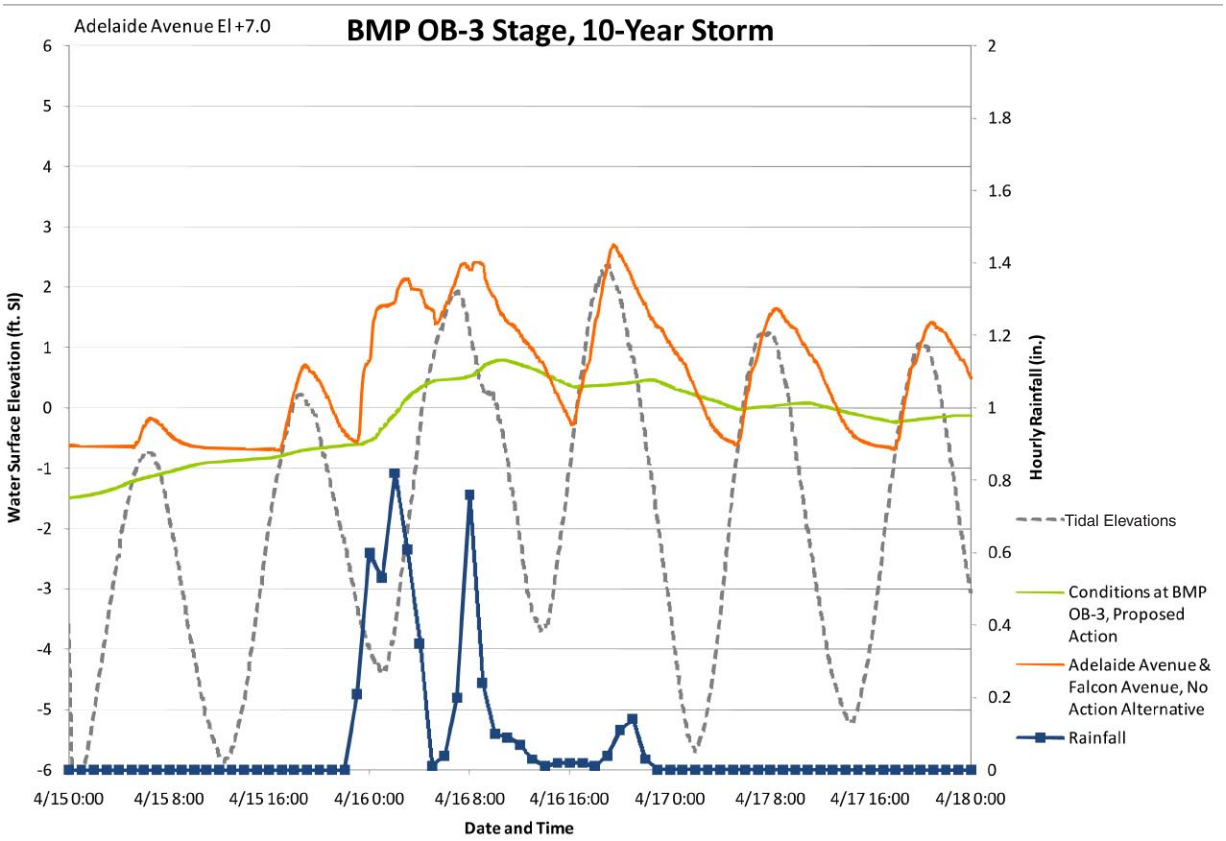
Figure 3.9-11



SOURCE: Hazen & Sawyer, 2010

BMP OB-2: Water Surface Elevations During the 10-Year Storm

Figure 3.9-12



SOURCE: Hazen & Sawyer, 2010

BMP OB-3: Water Surface Elevations:
During the 10-Year Storm

Figure 3.9-13

Chapter 3.10: Hazardous Materials of the Oakwood Beach Drainage Plan

A. INTRODUCTION

This chapter examines the potential for the presence of subsurface hazardous materials at each of the proposed BMP sites and the potential for these materials to be disturbed by the proposed project. The analysis focuses on hazardous materials that may have resulted from historic and existing land use conditions and activities at the proposed BMP sites and in their respective study areas; if such contamination is present, the section provides a summary of potential impacts and recommendations that through project implementation measures would avoid impacts to workers, the community and the environment.

B. EXISTING CONDITIONS

SUBSURFACE CONDITIONS

The Oakwood Beach watershed elevations range from approximately 100 above sea level in the upper watershed to less than 10 feet above mean sea level in the lower watershed. Groundwater is expected to flow toward the surface waters of the watershed. Depth of groundwater and flow direction may be affected by past filling activities, underground utilities, other subsurface openings or obstructions such as basements, tidal fluctuations, and other factors. Groundwater in Staten Island is not used as a source of drinking water.

Phase II investigations performed within the watersheds have encountered groundwater at approximately 0 to 6 feet below grade. Depth to groundwater at the proposed site of OB-2 is also expected to be shallow given that it has apparent surface water Additional data on groundwater conditions is also provided in Chapter 3.9, “Natural Resources.” Prior Phase II investigations performed in the area also encountered fill materials beneath portions of the tested areas, generally along the periphery of the proposed BMP sites.

CURRENT LAND USES

Land use in the watershed is mostly residential, institutional or open space uses, with commercial uses concentrated along Hylan Boulevard east of Tysens Lane and along New Dorp Lane; the Staten Island Railway runs east/west across the watershed. Commercial uses that can potentially impact groundwater include auto repair facilities, filling stations and dry cleaners.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project it is expected that there would not be any significant changes in environmental conditions at the proposed BMP sites, nor would any project-related soil disturbance be undertaken.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

POTENTIAL FOR SITE CONTAMINATION

OB-1

Phase 1 Results

Dumped materials (trash, auto parts, tires and construction/demolition debris) and evidence of small fires were observed in the accessible portions of proposed BMP site OB-1. Portions of the proposed site of OB-1 which could not be visually inspected due to dense vegetation and/or being obscured by residences on the site perimeter may also contain dumped materials. Sanborn maps indicated the historical presence of small dwellings in currently undeveloped wetland areas adjacent to the proposed site of OB-1; fill or demolition debris may be associated with these.

Phase II Results

A 2009 Phase II investigation of OB-1 found low concentrations of Volatile Organic Compounds (VOCs), including VOCs typically associated with petroleum, which were present in soil and sediment samples. The detected VOCs did not appear to indicate an on-site petroleum spill, and may have been associated with fill materials and/or off-site sources. Elevated concentrations of semi-volatile organic compounds (SVOCs) and metals were identified in the soil and sediment samples, also likely due to the presence of fill beneath and/or adjacent to the proposed site of OB-1, but toxicity characteristic leaching procedure TCLP analysis of six soil samples and all sediment samples containing elevated lead concentrations determined that these samples would not be classified as hazardous wastes. One groundwater sample contained the SVOC bis(2-ethylhexyl)phthalate (a potential laboratory contaminant) above the Class GA standard, two groundwater samples and one surface water sample were analyzed for DEP sewer discharge parameters. Concentrations of total suspended solids potentially exceeding sewer discharge limits were identified in both groundwater samples. Based on these findings, the proposed site of OB-1 has a high potential for contamination above NYSDEC Part 375 Soil Cleanup Objectives for Unrestricted Use (USCOs).

OB-2

Phase I Results

Regulatory databases identified a closed-status spill involving illegal dumping of soil and construction/demolition debris on Hett Avenue (potentially at or adjacent to the proposed site of BMP OB-2). Portions of the proposed site of OB-2 could not be visually inspected due to dense vegetation and/or being obscured by residences on the site perimeter (these areas may contain fill or dumped materials). A large golf course, which may use or historically has used pesticides, was shown on historical Sanborn maps approximately 1,100 feet north of the proposed site of OB-2 (potentially upgradient), and regulatory databases identified an active-status gasoline spill with impact to groundwater approximately 2,800 feet north of the proposed site of OB-2 (potentially upgradient). However, based on its distance from the proposed site of OB-2, this facility is not likely to have significantly impacted this proposed BMP location. Based on the findings, the proposed location for OB-2 has a moderate potential for contamination.

Phase II Results

No Phase II ESA was previously performed at OB-2.

OB-3 AND OB-4

Phase I Results

Dumped materials (trash and construction/demolition debris) were observed in accessible portions of both proposed sites. Portions of the proposed BMP sites which could not be visually inspected due to dense vegetation and/or being obscured by residences on the proposed BMP perimeter may also contain dumped materials. The 2006 PB Phase I ESA noted that a road may have historically passed near the creek within the proposed BMP area, and that small dwellings were located in the southeastern portion of the proposed BMP area and on currently undeveloped land to the south of the proposed BMP sites. Fill of unknown origin, or demolition debris, may have been associated with these. Regulatory databases identified one minor potentially on-site spill of automotive fluids on Merkel Place, and noted a generator of hazardous waste (spent halogenated solvents used in degreasing) approximately 660 feet north of the proposed BMP sites (potentially upgradient).

Phase II Results

A 2008 Phase II investigation of the proposed sites of OB-3 and OB-4 revealed low concentrations of VOCs, including some typically associated with petroleum use, which were found in soil and sediment samples. Acetone exceeded its USCO levels in four soil samples and all sediment samples. Concentrations of several VOCs associated with petroleum use were identified in one groundwater and one surface water sample, but at levels below Class GA standards. Elevated concentrations of SVOCs and metals were identified in the soil and sediment samples, which is likely due to the presence of fill and/or runoff from nearby filled areas. One soil sample on the periphery of the proposed site contained elevated PCBs, and 12 soil samples on the periphery of the proposed BMP site and all sediment samples contained elevated levels of pesticides. None of the composite soil samples would be classified as hazardous wastes. One groundwater sample contained benzo(b)fluoranthene above the Class GA standard and concentrations of metals exceeding Class GA standards were detected in groundwater samples and surface water samples. Such exceedances are attributable to suspended sediment particles and/or natural background concentrations. Pesticide concentrations above Class GA standards were detected in three of the surface water samples. Based on the findings, including known elevated metal, SVOC and pesticide concentrations with respect to USCOs, the proposed sites of OB-3 and OB-4 have a high potential for contamination.

OB-5

Phase I Results

Dumped materials (trash and construction/demolition debris) were observed in accessible portions of the proposed site of BMP OB-5. Portions of the proposed site of OB-5 could not be visually inspected due to dense vegetation and may contain dumped materials. A Staten Island Railroad overpass runs above the proposed site of OB-5 from east to west. Suspect lead-based paint was observed flaking onto the soil from the overpass. Regulatory databases indicated an active-status spill involving groundwater contamination with gasoline, methyl tertiary buthyl ether ([MTBE]a gasoline additive), and floating petroleum on groundwater at a filling station located approximately 530 feet north of the proposed site of OB-5 (potentially upgradient). Three dry cleaners were observed approximately 900 to 1000 feet northeast and northwest of the proposed site of OB-5 (potentially upgradient). A spill was reported at one of the dry cleaners. According to the spill report, a caller reported dumping of dry cleaning chemicals into soil, but

the report was not confirmed by a site visit and the listing was subsequently closed. A "transformer house" (an enclosure for electrical transformers) was shown northwest of the proposed site of OB-5 across the railroad on historical Sanborn maps. A closed-status spill involving an oily substance in the soil had been reported at this facility. Based on these findings, the proposed site of OB-5 has a high potential for contamination above the USCOs.

Phase II Results

No Phase II ESA was previously performed at OB-5.

LOWER BAY OUTFALL

Phase I Results

Debris that had washed ashore in the vicinity of the proposed outfall location included trash, a car tire, an empty 55-gallon plastic drum, and lumber. Historical Sanborn maps showed small dwellings on the beach in the vicinity of the proposed outfall location. The dwellings were demolished by the mid-20th century; associated demolition debris may remain beneath the upland portion of the outfall location. Regulatory databases identified closed-status spills involving raw sewage, petroleum and, in one case, medical waste impacting Staten Island beaches. However, insufficient information was provided to determine whether any of these spills occurred in the vicinity of the proposed outfall location. Based on the findings, the proposed outfall site has a moderate potential for contamination.

Phase II Results

No Phase II ESA was previously performed for Lower Bay outfall corridor.

SUMMARY OF POTENTIAL FOR BMP SITE CONTAMINATION

Table 3.10-1 identifies the potential for contamination at each proposed BMP site based on the above data. These results are as follows:

- Proposed site of BMP OB-1: prior Phase II testing has identified contaminants in soil and groundwater;
- Proposed site of BMP OB-2: historical uses and the regulatory databases have indicated the need for site testing to identify any potential impacts on soil and groundwater conditions;
- Proposed site of BMP OB-3; prior Phase II testing has identified contaminants in soil and groundwater;
- Proposed site of BMP OB-4: prior Phase II testing has identified contaminants in soil and groundwater;
- Proposed site of BMP OB-5: historical uses and the regulatory databases have indicated the need for site testing to identify any potential impacts on soil and groundwater conditions; and
- Proposed site of the Lower Bay outfall: historical uses and the regulatory databases have indicated the need for site testing to identify any potential impacts on soil and groundwater conditions.

Table 3.10-1
Oakwood Beach Amended Drainage Plan: Conclusions and Recommendations Summary for Hazardous Materials

BMP Number	BMP Name/Location	Potential for Contamination	Recommendations	Notes
OB-1	Kissam Avenue	High	Conduct work in accordance with a CHASP	Testing performed (2009) – elevated S, M, P (soil), S, M (sediment), M (groundwater)
OB-2	Tysens Lane	Moderate	Conduct work in accordance with a CHASP	Potential impact from filling and dumping in BMP area, off-site uses with potential to affect BMP
OB-3	Riga Street	High	Conduct work in accordance with a CHASP	Testing performed (2008) – elevated S, M, P (soil), S, M (sediment), S, M (groundwater), M, P (surface water)
OB-4	Ithaca Street	High	Conduct work in accordance with a CHASP	Testing performed (2008) – elevated S, M, P (soil), S, M (sediment), S, M (groundwater), M, P (surface water)
OB-5	N. Railroad Avenue	High	Conduct subsurface testing	Spills and off-site uses with potential to affect BMP, potential impact from dumping in BMP area
Proposed OB-1 Tidal Outfall	Kissam Avenue	Moderate	Conduct work in accordance with a CHASP	Spills with minor potential to affect outfall site, potential demolition debris

Notes:
CHASP – Construction Health and Safety Plan
M – metals, S – semi-volatile organic compounds, V – volatile organic compounds, P – pesticides

RECOMMENDATIONS TO BE IMPLEMENTED AS PART OF THE PROPOSED PROJECT

Table 3.10-1 provides recommendations for each of the proposed BMP sites. For the proposed BMP sites where additional subsurface testing is recommended because no Phase II soil or groundwater testing has been performed to date, Phase II subsurface investigations including the collection and laboratory analysis of soil and groundwater samples would be conducted as part of the proposed project. Based on the results of testing conducted to date for the proposed sites of BMPs OB-1, OB-3 and OB-4, site-specific Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) would be implemented prior to all soil disturbing activities. These documents would specify procedures for managing any identified or unexpectedly encountered contamination (including procedures for stockpiling and off-site transportation and disposal) and appropriate health and safety procedures to be used during construction. Similar measures may also be necessary for the proposed sites of OB-2, OB-5 and the Lower Bay outfall depending on the results of the site testing which would be performed with each capital project, as necessary.

In addition, excavated soil at the proposed BMP sites may include urban fill materials, and would therefore need to be managed in accordance with all applicable regulations. All material that needs to be disposed of (e.g., both petroleum-contaminated soil and excess fill including demolition debris) would be properly handled and disposed of off-site in accordance with all applicable federal, state, and City regulations.

Dewatering may also be required during construction. If discharge to sanitary sewers is proposed, testing would need to be performed to ensure that the groundwater would meet DEP

sewer discharge requirements. If necessary, the water would be pretreated prior to discharge to the City's sewer system. Should discharge to surface water bodies or to a storm sewer not connecting to a treatment plant be proposed, dewatering activities would be subject to NYSDEC State Pollution Discharge Elimination System (SPDES) requirements.

Lastly, any dumped materials in the areas to be disturbed must be properly disposed of in accordance with all applicable federal, state and City regulations. If dumped building materials potentially containing asbestos are identified, such materials would be tested for asbestos prior to disposal.

E. CONCLUSIONS

The proposed project would involve the disturbance of soil and groundwater in areas where prior uses and regulatory database searches have indicated a potential for the presence of hazardous materials in the soil and/or groundwater. At some proposed BMP locations, this conclusion is based on Phase II testing and in some locations site testing is necessary in order to determine if the proposed project would result in any impacts by disturbing soil or groundwater. At all sites where the proposed project may disturb contaminated soil or groundwater, the proposed project would implement a CHASP and RAP to avoid impacts on workers or the community.

All excavated soil would need to be handled and managed in accordance with all federal, state and City regulations. If any dewatering is necessary during construction and discharge to sanitary sewers is proposed, the residual water would need to meet DEP standards for discharging to a City sanitary line and pretreatment would need to be performed as necessary. If residual water is proposed to be discharged to a stream or waterway, it would need to meet NYSDEC SPDES standards for such discharges. In addition, any previously dumped materials would also need to be handled and disposed of in accordance with all applicable regulations (i.e., asbestos containing materials). With these measures in place, the proposed project would not result in potential significant adverse impacts to hazardous materials. ✷

Chapter 3.11: Water and Sewer Infrastructure of the Oakwood Beach Drainage Plan

A. INTRODUCTION

Preliminary amended drainage plans have been developed for the Oakwood Beach watershed with the objectives of improving water quality, reducing flooding and erosion, collecting all sanitary waste for the purpose of conveying it to the Oakwood Beach Wastewater Treatment Plant (WWTP) and enhancing vegetative communities and wildlife habitats. The proposed project would not introduce new residents or employees that would generate any added demands on water supply, nor would it install any significant impervious coverage that would generate additional runoff. However, the proposed project would include the installation of sanitary and storm sewers and this chapter examines the potential effects of the proposed project on water and sewer infrastructure in the Oakwood Beach watershed.

B. EXISTING CONDITIONS

SANITARY SEWERS

The Oakwood Beach watershed is largely sewered for sanitary service. There are sections of the watershed, in most cases one or two block lengths, where sanitary sewers have not yet been installed. In these areas, septic systems would be currently used to provide on-site sanitary wastewater management. The general direction of sanitary sewer flow in the watershed is south, toward the lower elevations of the watershed where an interceptor conveys collected flows to the WWTP, which has a treatment capacity of 40 million gallons per day (mgd).

STORMWATER MANAGEMENT

OVERVIEW

The Oakwood Beach watershed covers about 2.5 square miles and has a topography that conveys stormwater flows from the northwest to the southeast. Impervious surfaces (e.g., building rooftops and streets) account for about 32 percent of the watershed. With the exception of some trunks and their contributing sewers (see discussion below), there is no storm sewer infrastructure in the watershed. Approximately 20 percent of the watershed has existing storm sewers and these completed sewer segments are scattered throughout the watershed.

UPPER WATERSHED

In addition to the sewered areas, there are a number of surface water features in the upper watershed, including two ponds, one at Park Street and the other at Thomas Street. The Park Street pond receives street runoff from the intersection of Park Street and Maplewood Avenue. After unseasonably heavy rains, this pond overflows into a catch basin located at the intersection of

Riedel Avenue and Park Street. The second pond, the Thomas Street pond, receives street runoff from the intersection of Thomas Street and Combs Avenue. Overflow from this pond flows toward Amundsen Circle, where there are catch basins that capture flow and feed an intermittent stream channel located off of Savoy Street, downstream of Amundsen Circle. This intermittent channel leads to a basin located in the Willowbrook Parkway right-of-way (ROW), near Railroad Avenue. Overflow from the basin empties into an existing swale that flows south, under the railroad tracks.

Below the basin, the intermittent channel continues southward along the Willowbrook Parkway ROW, gradually enlarging as it approaches Hylan Boulevard. At its southerly end, the stream passes through a culvert under Hylan Boulevard and contributes flow to the West Branch of the Oakwood Beach stream system, which originates in the vicinity of Great Kills Park.

In addition to the streams and ponds, a 48-inch storm sewer also flows in the Willowbrook Parkway ROW. This pipe conveys drainage that is captured from a subdrainage area to the northwest of Montreal Avenue. This storm sewer continues in the ROW before discharging to an existing channel below Hylan Boulevard.

LOWER WATERSHED

In the lower watershed, stormwater is primarily conveyed by several small streams that converge into a common outlet channel that flows to the bay. This channel is located near the Oakwood Beach WWTP. As a result, in the low-lying drainage subareas and in areas where no storm sewers are provided, the primary drainage mechanism during wet weather is overland flow, directly into streams or wetlands. This overland flow results in unmanaged runoff, leading to flooding impacts on local streets and properties.

In addition, there are several trunk storm sewers in the lower watershed. These sewers run along New Dorp Lane, Ebbitts Street and Tysens Lane and convey stormwater to existing Lower Bay outfalls, located downstream of the sewers. One-way flap gates within the outfalls allow discharge to Lower Bay when the water surface elevation in the sewers is greater than that of the bay. However, these gates also block stormwater outflow when there is an extreme high tide, coupled with a rainfall event. During these times of combined high tide and storm events, local properties and streets become flooded by trunk sewer surcharges. As a result of this localized flooding, excess stormwater flows may infiltrate nearby sanitary sewers, resulting in increased flows to the Oakwood Beach WWTP.

C. FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, the existing drainage patterns in the watershed would remain essentially unchanged through the year 2043. Therefore, under this condition, flooding is expected to continue and other benefits of the proposed project with respect to sanitary wastewater and stormwater management would not be achieved.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

SANITARY SEWERS

While the sanitary sewer system is largely built in the Oakwood Beach watershed, the proposed drainage plan would build additional sanitary sewer segments that would be completed under future capital improvement projects. With the proposed project, all wastewater generated in the watershed would be conveyed to the Oakwood Beach WWTP for treatment prior to discharge,

which is what currently occurs under existing conditions. With the installation of sanitary sewers in the fronting street, property owners who currently have septic systems would then be required to connect to the sanitary collection sewer. In addition, the proposed amended drainage plan would increase the size of some existing sanitary collection sewers from 8 inches to 10 inches in diameter, in order to conform to current DEP standard sewer sizes. The expansion of sanitary service would be limited to street sections one or two blocks in length; remaining sewer segments to be built under the proposed project are scattered throughout the watershed. This added service would not significantly increase sanitary flows to the WWTP (which currently handles an average of about 29 mgd and has a permitted capacity of 40 mgd).

Therefore, the proposed project would not result in potential significant adverse impacts to sanitary sewer infrastructure.

STORMWATER MANAGEMENT

The proposed project would not introduce any new development or any significant new impervious surface coverage that would generate runoff. Rather, this project would improve local stormwater management with the implementation of BMPs. The proposed amended drainage plan would provide storm sewers throughout the watershed with storm sewers that would flow to wetland BMPs, thereby providing flood volume and velocity control along with enhanced ecological conditions through the protection and restoration of wetlands.

Hydrologic and hydraulic modeling of the proposed project was performed for the watershed. In the upper watershed, the proposed drainage plan would provide a storm sewer system that integrates the existing water bodies and stormwater features to create a comprehensive drainage system, with stormwater conveyance and detention. In the lower watershed, modeling shows that the proposed amended drainage plan would lower water surface elevations in the low-lying areas, to a level that provides positive drainage to the BMPs and wetlands, thereby reducing local street flooding. Reductions in street flooding would thus reduce events where sanitary sewers are impacted by street flooding. The proposed project would also relieve flows to the existing trunk sewers during large storm events as some stormwater would flow to the proposed BMPs for extended detention.

The proposed BMPs would be mapped as part of the drainage plan and are designed to handle the City's 5 year storm in the upper watershed and the 10-year design storm in the lower watershed (the larger design storm in the lower watershed is proposed to address tidal influence on the system). They would be important elements of the City's drainage system and, in conjunction with the storm sewers feeding into them, would be key elements in the City's infrastructure.

Therefore, the proposed project would not result in potential significant adverse impacts to stormwater management infrastructure.

E. CONCLUSIONS

The proposed project would upgrade local sanitary sewers to current design standards and would extend sewer service to areas of the watershed where there is no sanitary service. The extension of this sewer service would not impact the Oakwood Beach WWTP. The proposed project would also provide a comprehensive stormwater management plan for the watershed. This would result in positive impacts with reductions in local street and property flooding.

Therefore, the proposed project would not result in potential significant adverse impacts to water and sewer infrastructure. ✷

Chapter 3.12: Solid Waste and Sanitation Services of the Oakwood Beach Drainage Plan

Operation and maintenance of the proposed drainage plan would not generate a significant volume of additional solid waste. Solid waste generated from the maintenance of the proposed BMPs would be disposed of in accordance with the City's Solid Waste Management Plan (SWMP). The maintenance debris generated by the proposed BMPs would be primarily comprised of vegetative waste and street accumulated litter. The volume of these materials would not significantly add to the solid waste volumes generated in New York City. Waste materials would then be handled by DEP, and disposed of in accordance with all applicable federal, state, and City regulations. If practical and economic, residual tree limbs and branches would be reused, and chipped into mulch. Potential solid waste impacts during construction are presented below in Chapter 6.1, "Impacts During Construction." Therefore, the proposed project would not result in potential significant adverse impacts to the City's solid waste and sanitation services. ✷

Chapter 3.13: Energy of the Oakwood Beach Drainage Plan

Operation of the proposed Oakwood Beach drainage plan would require minimal energy. The proposed BMPs are natural systems, with the exception of occasional maintenance. Chapter 6.1, "Impacts During Construction," assesses the potential impacts of the proposed project as it relates to energy demands during construction. Therefore, the proposed project would not result in potential significant adverse impacts to energy. ✷

Chapter 3.14: Transportation of the Oakwood Beach Drainage Plan

A. INTRODUCTION

Preliminary amended drainage plans have been developed for the Oakwood Beach watershed with the objectives of improving water quality, reducing flooding and erosion, and enhancing vegetative communities and wildlife habitats. The proposed project would not generate any vehicular, transit, or pedestrian trips; however, it would require the demapping of a number of street segments within the watershed, which may modify circulation patterns in the watershed. This chapter therefore analyzes the potential transportation impacts of the proposed project in the Oakwood Beach watershed. Chapter 2.1, "Methodology," describes in greater detail the procedures used in this analysis.

B. EXISTING CONDITIONS

TRAFFIC

The general boundaries of this watershed are Great Kills Park within the Gateway National Park Recreation Area (GNRA) and Tanglewood Drive to the west, Oceanview Cemetery to the north, Peter Avenue to the east, and Lower Bay to the south. The major east and west collector roads through the watershed are Amboy Road to the north and Hylan Boulevard through the center. The southern portion of the watershed is served by Old Mill Road which functions as a collector road as well. Guyon Avenue is one of the few roads that run north and south. Guyon connects Amboy Road on the north with Old Mill Road on the south and intersects with Hylan Boulevard along the way. The major collector roads are more heavily traveled and carry larger volumes of traffic during the morning, afternoon and evening peak traffic hours.

The remaining streets in the watershed are primarily local residential streets, some of which dead-end or are interrupted by the mapped, but unbuilt, segment of the Willowbrook Parkway, or the large open spaces of the watershed including Great Kills Park GNRA, Great Kills Park (the City park), or the Oceanview Cemetery. The Staten Island Railway which runs east and west across the watershed also interrupts the street grid at certain locations. For the most part, however, the street grid is complete in the upper portion of the watershed (i.e., Hylan Boulevard and above), while certain street segments in the lower portion of the watershed remain incomplete. These street segments have not been completed because of the presence of freshwater wetlands and streams that have restricted development of these properties, thus largely eliminating the need for a local access road. In addition, these wetlands have also impeded the construction of roads, due to physical and regulatory constraints faces when building through wetlands. Currently, these wetlands have been or are in the process of being acquired by DEP under the Bluebelt program. The incomplete street grid is generally near the sites of BMPs OB-1, OB-3 and OB-4.

PARKING

There are few on-street parking restrictions in this area. Most parking needs are met off-street in residential driveways, although some denser areas of residential development do use on-street parking to address local parking needs. Another exception is along the commercial corridors, such as Hylan Boulevard, where on-street parking is metered or time-restricted along certain segments.

TRANSIT

The Oakwood Beach watershed is served by both rail and bus service. Rail service is provided by the Staten Island Railway and there is one stop in the study area, Grant City, Oakwood Heights. Bus service is also provided along the major roads such as Amboy Road, Hylan Boulevard and Mill Road.

PEDESTRIANS

Sidewalks and formal crosswalks are provided throughout much of the watershed although there are segments of streets where no sidewalks are provided. With the exception of the major commercial corridors in the watershed, like Hylan Boulevard, Pedestrian traffic is generally light in the watershed.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, no major changes are expected with respect to local transportation conditions. It is expected that there would be local street improvement projects (e.g., the intersection of New Dorp Lane and Hylan Boulevard is proposed for improvement), as is the area of New Dorp Beach between New Dorp Lane on the east, Milton Avenue on the north, Ebbitt Street on the west, and Great Kills Park on the south), as well as potential improvements associated with the Amboy Road Corridor Study. Modifications in transit service may also be implemented through the No Build year (2043), but no major changes in service or facilities are proposed at this time..

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

TRAFFIC

It is not expected that the proposed project would result in impacts on traffic conditions for a number of reasons, including that the site access is maintained to all existing privately held properties, where necessary. The watershed is also largely built-out under the current zoning and there is little remaining developable land. No additional large development is expected in the watershed that would generate a large traffic demand on local streets. Finally, acquisition of the remaining vacant land by DEP under the Bluebelt program would preserve these lands for Bluebelt purposes which generate no traffic and eliminates additional traffic demands that might otherwise occur on these properties under development densities allowed under the current zoning.

The proposed BMPs would not conflict with any major east and west collector streets, but would affect limited segments of local streets (see (see **Figures 3.14-1a** and **3.14-1b**) that would no longer be necessary since the adjoining lands would be preserved and undeveloped under the Bluebelt program. Thus, the proposed project would not adversely impact any through or local

traffic circulation patterns in the neighborhood, but would preserve some of the lightly traveled local streets that characterize the lower watershed.

In addition, although OB-5 is located in the bed of the mapped, but unbuilt, Willowbrook Parkway, it is not expected that the mapped parkway would be constructed and therefore the proposed BMP would not conflict with any plans to develop the parkway.

Therefore, the proposed project would not result in potential significant impacts to traffic.

PARKING

The proposed project would not modify any local parking regulations, nor would it eliminate any existing on-street parking or generate new added parking demand. Therefore, the proposed project would not result in potential significant adverse impacts to parking.

TRANSIT

The proposed project would not place any added demands on transit facilities in the study area as it would not generate any transit trips. It would also not result in any long term (operational) impacts on transit facilities as the proposed project would not permanently impact any local streets served by these facilities. Therefore, the proposed project would not result in potential significant adverse impacts to transit.

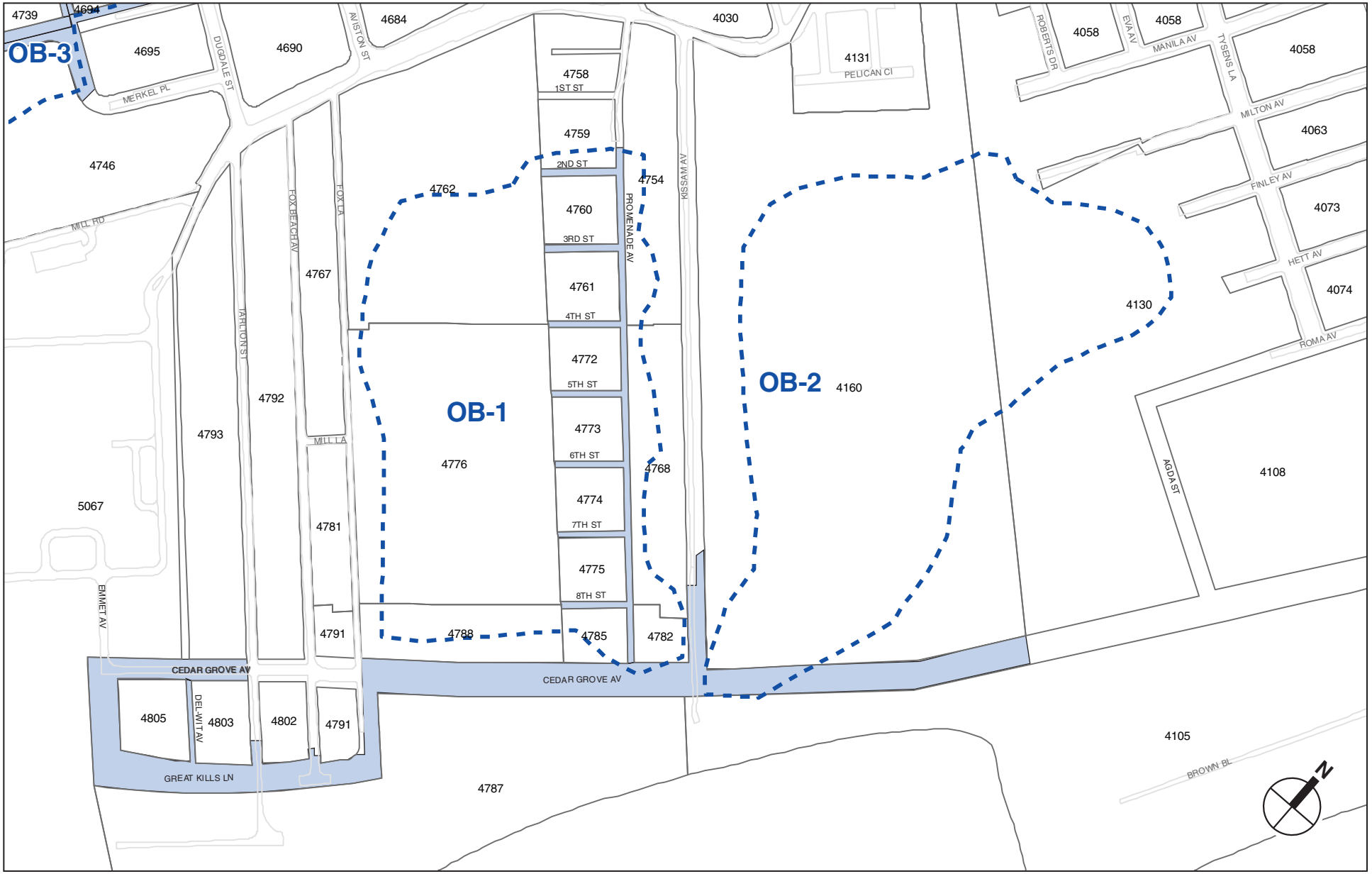
The proposed project would require construction within local right-of-way (ROW) and streets serviced by public transit. This includes OB-1 and OB-2 along Mill Road as well as OB-5 which is proposed under the right-of-way of the Staten Island Railway (the rail line passes over the OB-5 site). Chapter 6.1, “Impacts During Construction” addresses the potential for temporary construction period impacts on these facilities. Therefore, the proposed project would not result in potential significant adverse impacts to pedestrians.

PEDESTRIANS

The proposed project would not affect any pedestrian facilities such as sidewalks or crosswalks. Therefore, the proposed project would not result in significant impacts to pedestrians.

E. CONCLUSIONS

The proposed project would not affect any collector roads and would reduce vehicular trip generation and the need for certain local streets since the Bluebelt would preserve these sites as BMP wetlands. The proposed project would also not affect local on-street parking, transit systems or pedestrian circulation. Therefore, the proposed project would not result in potential significant adverse impacts to transportation. ✷



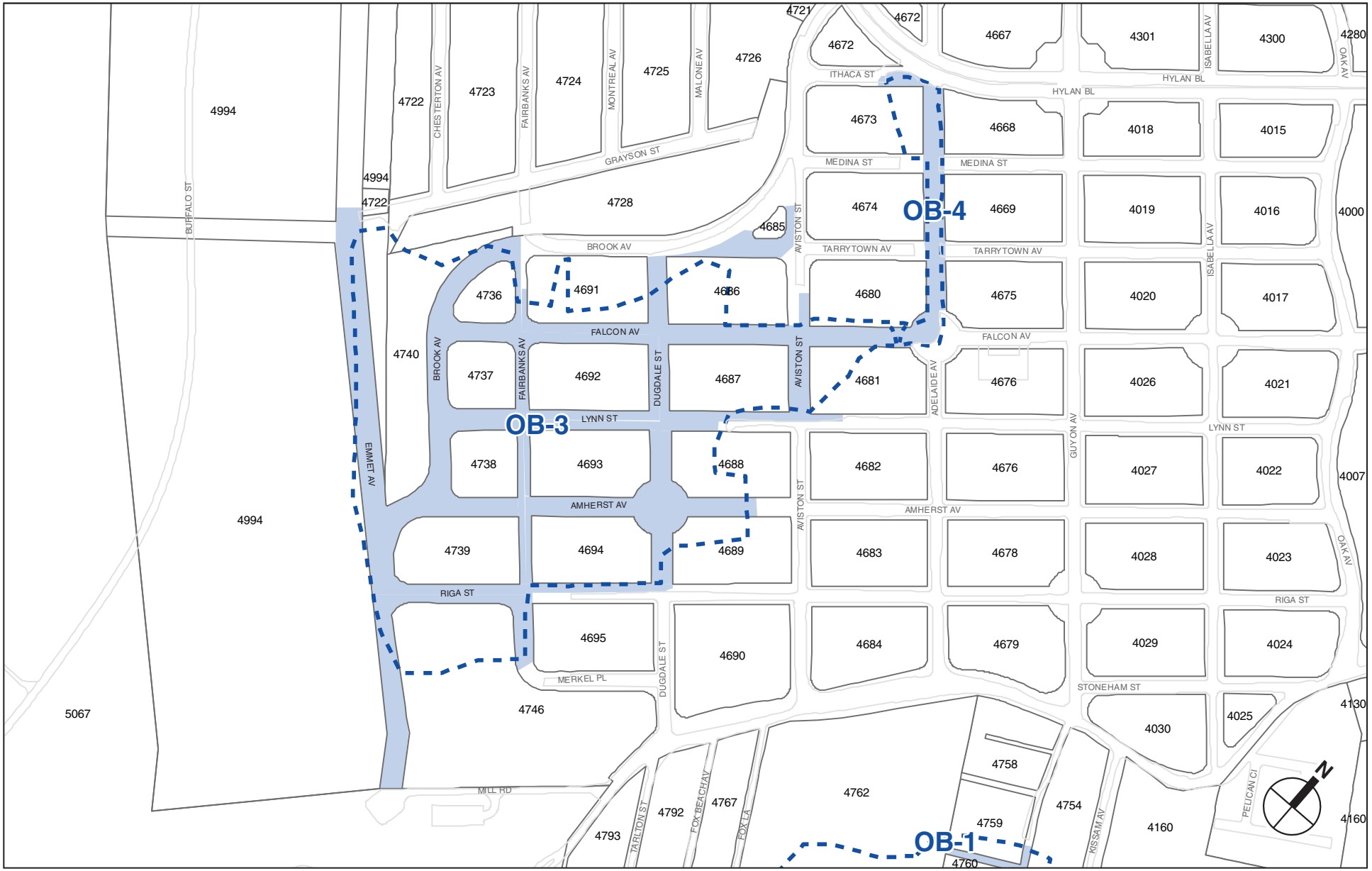
Proposed BMP Footprint

Street Area to be Demapped

Unbuilt Streets to be Demapped in the Oakwood Watershed

Figure 3.14-1a

9.20.11



Proposed BMP Footprint

Street Area to be Demapped

Unbuilt Streets to be Demapped in the Oakwood Watershed

Figure 3.14-1b

Staten Island Bluebelt Mid-Island Watersheds

Chapter 3.15: Air Quality of the Oakwood Beach Drainage Plan

Ambient air quality is affected by air pollutants produced by both vehicles (i.e., mobile sources) and fixed facilities (i.e., stationary sources). The proposed drainage plans would not result in any new vehicular traffic or any new significant stationary sources of airborne emissions. Potential air quality impacts during construction are addressed in Chapter 6.1, "Impacts During Construction." Therefore, the proposed project would not result in potential significant adverse impacts to air quality. ✷

Chapter 3.16: Greenhouse Gasses of the Oakwood Beach Drainage Plan

The *CEQR Technical Manual* recommends a greenhouse gas analysis for development projects greater than 350,000 gross square feet in size, or projects that have unique energy demands (e.g., power plants, major modifications in transportation). The proposed project would not develop any square footage and would not have any measureable energy demand during operation. In addition, the proposed project would not result in any mobile or stationary sources of air emissions. Thus, no further analysis of greenhouse gas emissions is required. Therefore, the proposed project would not result in potential significant adverse impacts related to greenhouse gasses. ✷

Chapter 3.17: Noise of the Oakwood Beach Drainage Plan

The proposed drainage plan amendments would not result in any new mobile source noises (e.g., vehicular traffic) and would not introduce any new stationary source noises. Noise impacts during construction are addressed below in Chapter 6.1, "Impacts During Construction." Therefore, the proposed project would not result in potential significant adverse impacts to noise. ✷

Chapter 3.18: Public Health of the Oakwood Beach Drainage Plan

According to the *CEQR Technical Manual*, public health may be impacted by poor air quality resulting from traffic or stationary sources, hazardous materials in soil or groundwater used for drinking water, significant adverse impacts related to noise or odors, solid waste management practices that attract vermin and pest populations, and actions that exceed federal, state, or City standards.

The proposed project would not result in significant adverse impacts to traffic, air quality, or noise, nor would any applicable federal, state, or City standards be exceeded. The proposed project would also not involve solid waste management practices that would attract vermin or pest populations. In addition, any hazardous materials encountered during construction would be handled in accordance with all federal, state, and City regulations, and in accordance with the protection measures in place within the proposed project. Therefore, the proposed project would not result in potential significant adverse impacts to public health. ✷

Chapter 3.19: Neighborhood Character of the Oakwood Beach Drainage Plan

The *CEQR Technical Manual* defines neighborhood character as a number of combined elements that together define a community. These elements include land use, urban design and visual resources, socioeconomics, traffic, air quality and noise. The proposed project would reduce street flooding and improve storm sewer conditions while implementing BMPs that provide both an ecological and stormwater management benefit. These are positive changes for the neighborhood and would help benefit existing residential, commercial, and open space uses in the area. Therefore, the proposed project would not result in potential significant adverse impacts to neighborhood character. ✷

Chapter 3.20: Growth Inducing Impacts of the Oakwood Beach Drainage Plan

A. INTRODUCTION

Preliminary amended drainage plans have been developed for the Oakwood Beach watershed with the objectives of improving water quality, reducing flooding and erosion, collecting all sanitary waste for the purpose of conveying it to the WWTP, and enhancing vegetative communities and wildlife habitats. This chapter considers the potential effects of the proposed project on growth-inducing aspects in the Oakwood Beach watershed. As described in Chapter 2.1, "Methodology," the proposed amended drainage plans have been examined to determine if potential significant adverse growth-inducing impacts within the Oakwood Beach watershed would result.

B. EXISTING CONDITIONS

LAND USE AND ZONING CONDITIONS

The watershed is primarily zoned for lower-density residential uses (R2, R3-1, R3-2, and R3X). Commercial districts are located along major thoroughfares and in an area mapped between Hylan Boulevard, New Dorp Lane, Mill Road, and Tysens Lane.

The watershed is urbanized and the developed land uses are predominantly residential (621 acres or 46.7 percent of the study area is in residential use). Approximately 8.6 percent of the watershed (or 114 acres) is open space, including Great Kills Park. Within the entire watershed only an estimated 7.0 percent (or 93 acres) is vacant land. Vacant land is concentrated in the southern portion of the watershed in the area generally bounded by Gateway National Recreation Area (GNRA) Great Kills Park on the west, Brook Avenue and Mill Road to the north, DPR's Great Kills Park to the east, and Lower Bay to the south. As discussed in Chapter 3.9, NYSDEC-mapped freshwater wetland covers much of this vacant land. In addition, the vacant land includes property now under the ownership of DEP, or to be acquired as such.

POPULATION GROWTH: 1980 TO 2010

Table 3.20-1 shows the population trends in the study area between 1980 and 2010. Overall, the study area population increased by 15.4 percent from 16,362 residents in 1980 to 18,876 residents in 2010. This growth rate was below the 33.1 percent population growth experienced in Staten Island, but was comparable to the 15.6 percent growth rate in New York City over the same time period.

While the population in the study area remained fairly constant between 1980 and 1990, it increased by 11.8 percent between 1990 and 2000. Within the study area, Census Tract 128.03 and Census Tract 128.04 had higher population growth, increasing by 14.6 percent and 15.2 percent, respectively (these census tracts cover the area south of Hylan Boulevard in the lower

watershed, see **Figure 3.20-1**). Between 2000 and 2010, the study area's growth rate was 4.1 percent, which was lower than Staten Island's 5.6 percent population growth rate but higher than New York City's 2.1 percent population growth rate. Census Tract 128.04 experienced the most significant growth during this time period, increasing by 9.9 percent.

Table 3.20-1
Total Population: 1980 to 2010

Geography (2010 Census Tracts)	Total Population				Percentage Change			
	1980	1990	2000	2010	1980-1990	1990-2000	2000-2010	1980-2010
2010 CT 128.05 & 2010 CT 128.06 or CT 128.03 (prior years)[1]	7,598	7,818	8,961	9,113	2.9	14.6	1.7	19.9
CT 128.04[1]	3,170	3,363	3,874	4,259	6.1	15.2	9.9	34.4
CT 132.01	1,853	1,504	1,569	1,558	-18.8	4.3	-0.7	-15.9
CT 134	3,741	3,528	3,721	3,946	-5.7	5.5	6.0	5.5
Study Area	16,362	16,213	18,125	18,876	-0.9	11.8	4.1	15.4
Staten Island	352,121	378,977	443,728	468,730	7.6	17.1	5.6	33.1
New York City	7,071,639	7,322,564	8,008,278	8,175,133	3.5	9.4	2.1	15.6

Notes: [1] Some census tract boundaries were altered for the 2010 Census (see Figures 3.20-1 and 3.20-2). As of the 2010 Census, most of the area that had been defined as Census Tract 128.03, is defined by the 2010 Census as Census Tracts 128.05 and 128.06. In addition, the former Census Tract 128.03 includes is a small landscaped portion to the north east that is now part of Census Tract 128.04. This area includes only landscaped areas, and does not contain any residential units or businesses.

Sources: U.S. Bureau of the Census, 1980, 1990, 2000, and 2010 Census.

HOUSING GROWTH: 1980 TO 2010

Table 3.20-2 provides data on housing trends for the study area, Staten Island, and New York City. Between 1980 and 2010, the number of housing units in the study area increased by 32.7 percent (or 1,879 units). This growth was over two-times greater than New York City's 14.4 percent housing growth rate. However, the study area's housing growth was lower than the 48.5 percent growth rate in Staten Island.

Table 3.20-2
Total Housing Units, 1980 to 2010

Geography (2010 Census Tracts)	Housing Units				Change from 1980 to 1990		Change from 1990 to 2000		Change from 2000 to 2010	
	1980	1990	2000	2010	Number	Percent	Number	Percent	Number	Percent
2010 CT 128.05 & 2010 CT 128.06 or CT 128.03 (prior years)[1]	2,761	3,179	3,672	3,723	418	15.1	493	15.5	51	1.4
CT 128.04[1]	1,108	1,282	1,456	1,702	174	15.7	174	13.6	246	16.9
CT 132.01	573	544	599	599	-29	-5.1	55	10.1	0	0.0
CT 134	1,309	1,426	1,543	1,606	117	8.9	117	8.2	63	4.1
Study Area	5,751	6,431	7,270	7,630	680	11.8	839	13.0	360	5.0
Staten Island	119,000	139,726	163,993	176,656	20,726	17.4	24,267	17.4	12,663	7.7
New York City	2,946,410	2,992,169	3,200,912	3,371,062	45,759	1.6	208,743	7.0	170,150	5.3

Notes: [1] Some census tract boundaries were altered for the 2010 Census (see Figures 3.20-1 and 3.20-2). As of the 2010 Census, most of the area that had been defined as Census Tract 128.03, is defined by the 2010 Census as Census Tracts 128.05 and 128.06. In addition, the former Census Tract 128.03 includes is a small landscaped portion to the north east that is now part of Census Tract 128.04. This area includes only landscaped areas, and does not contain any residential units or businesses.

Sources: U.S. Bureau of the Census, 1980, 1990, 2000, and 2010 Census.

In 2000, half of the study area housing units were concentrated in the southernmost census tract, Census Tract 128.03. In the 1980s and in the 1990s, the housing stock in this area increased at a consistent rate of 15 percent, which was slightly lower than the county's growth rate of 17.4 percent.

Census Tract 128.04 also had among the top housing growth rates in the Oakwood Beach watershed between 1980 and 1990 and between 1990 and 2000. In the 1980s, its housing stock increased by 15.7 percent from 1,108 units to 1,282 units. It experienced slightly lower growth in the 1990s at 13.6 percent.

Between 2000 and 2010, there was a 5.0 percent increase in housing units in the study area, from 7,270 housing units in 2000 to 7,630 housing units in 2010. Census Tract 128.04 experienced the highest housing growth rate during this time period, increasing by 16.9 percent from 1,456 housing units in 2000 to 1,702 housing units in 2010.

HOUSEHOLD GROWTH: 1980 TO 2010

Between 1980 and 2010, the number of households in the study area increased by 27.4 percent from 5,638 households in 1980 to 7,183 households in 2010 (see **Table 3.20-3**). In 2010, the average household size in the study area was 2.63 people per household—lower than Staten Island's average household size (2.78 people per household).

Table 3.20-3
Household Characteristics, 1980 to 2010

Geography (2010 Census Tracts)	Households				Percent change from			Average Household Size			
	1980	1990	2000	2010	1980 to 1990	1990 to 2000	2000 to 2010	1980	1990	2000	2010
2010 CT 128.05 & 2010 CT 128.06 or CT 128.03 (prior years)[1]	2,742	3,048	3,528	3,546	11.2	15.7	0.5	2.79	2.56	2.53	2.57
CT 128.04[1]	1,050	1,183	1,397	1,522	12.7	18.1	8.9	2.98	2.84	2.77	2.8
CT 132.01	535	537	587	578	0.4	9.3	-1.5	3.21	2.80	2.66	2.68
CT 134	1,311	1,331	1,491	1,537	1.5	12.0	3.1	2.89	2.65	2.49	2.57
Study Area	5,638	6,099	7,003	7,183	8.2	14.8	2.6	2.89	2.66	2.58	2.63
Staten Island	114,485	130,519	156,341	165,516	14.0	19.8	5.9	3.00	2.85	2.78	2.78
New York City	2,792,614	2,819,401	3,021,588	3,109,784	1.0	7.2	2.9	2.49	2.54	2.59	2.57

Notes: [1] Some census tract boundaries were altered for the 2010 Census (see Figures 3.20-1 and 3.20-2). As of the 2010 Census, most of the area that had been defined as Census Tract 128.03, is defined by the 2010 Census as Census Tracts 128.05 and 128.06. In addition, the former Census Tract 128.03 includes is a small landscaped portion to the north east that is now part of Census Tract 128.04. This area includes only landscaped areas, and does not contain any residential units or businesses.

Sources: U.S. Bureau of the Census, 1980, 1990, 2000, and 2010 Census.

In the 1990s, the study area experienced 14.8 percent growth in the number of households, which was significantly higher than the 8.2 percent growth experienced in the 1980s. In the 1980s and 1990s, Census Tract 128.04 had the highest growth, with a 12.7 percent growth rate in the 1980s and an 18.1 percent growth rate in the 1990s. Census Tract 128.03 followed with an 11.2 percent growth rate in the 1980s and a 15.7 percent growth rate in the 1990s.

In 2010, the study area had 7,183 households, which was 2.6 percent higher than the number of households in 2000. This household growth rate was comparable to New York City's 2.9 percent household growth rate; however, it was lower than Staten Island's 5.9 percent household growth rate.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

Historically, as the data above show, there was significant development (housing growth) in the study area. According to NYMTC projections, the population in the study area is expected to increase by 12.8 percent from 20,391 residents in 2015 to 22,993 residents in 2035.[1] In comparison, the population growth between 1990 and 2010 was 16.4 percent. In addition, based on NYMTC projections, the number of households in the study area is expected to increase by 14.7 percent over a twenty year period from 7,707 households in 2015 to 8,844 households in 2035. This growth rate is lower than the 17.8 percent growth rate between 1990 and 2010.

It is expected that in the future without the proposed project the vacant land would be subject to growth pressure. However, new construction in the watershed is also limited due to the

[1] NYMTC projections are for the Transportation Analysis Zones (TAZ) that best represent the Oakwood Beach watershed: 1600, 1601, and 1605.

availability of developable land, as many of the existing wetlands are either state-owned or registered as City-owned. Since much of the vacant land is mapped as regulated wetland, development would require discretionary actions (permits) in addition to the physical development constraints of this property.

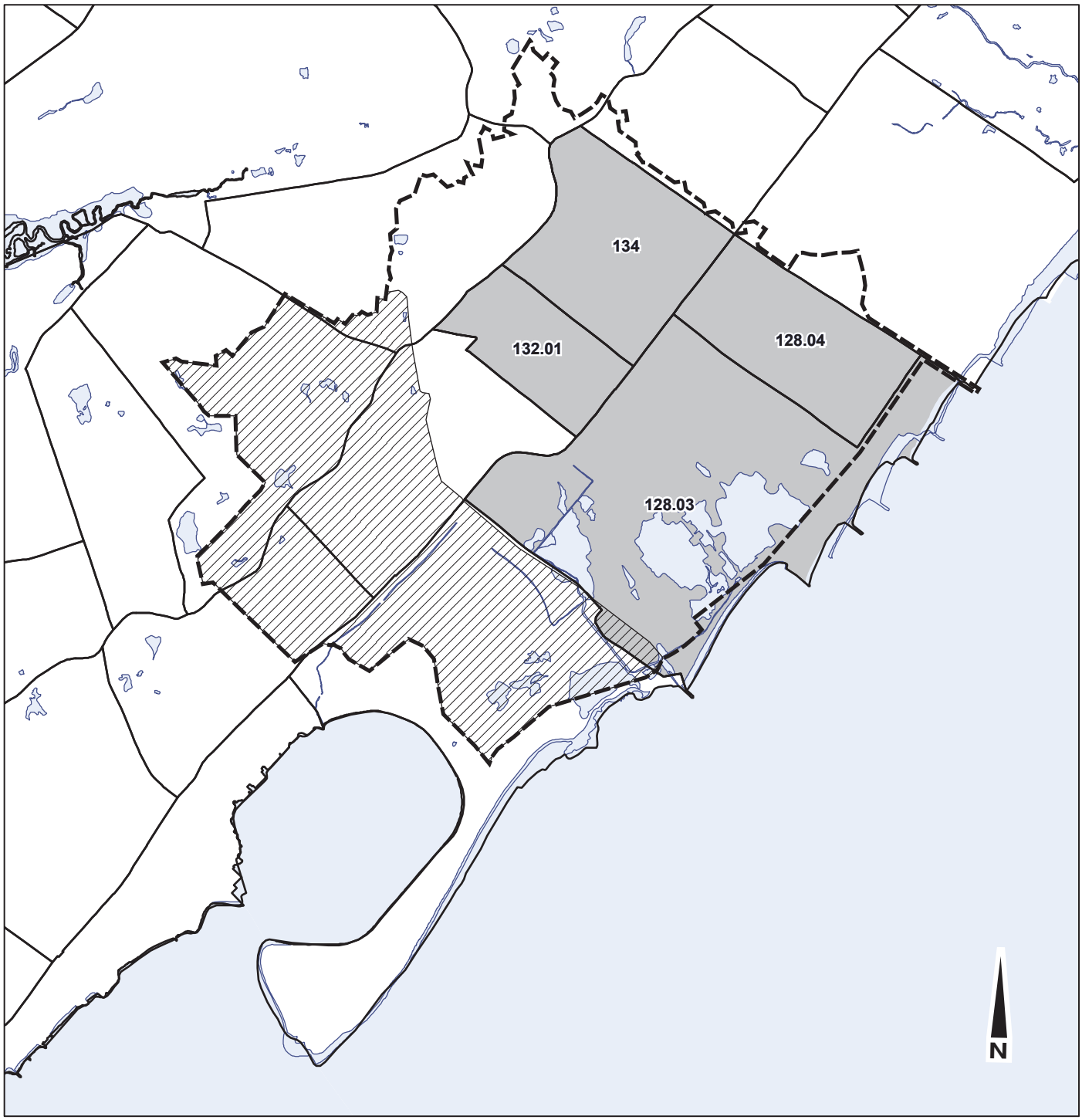
D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

Implementation of the proposed amended Oakwood Beach drainage plan would provide a stormwater management plan for the watershed and would enhance natural resources through habitat restoration and protection. The proposed project does not involve any rezonings, new residential or commercial development, or an increase in development density within the watershed.

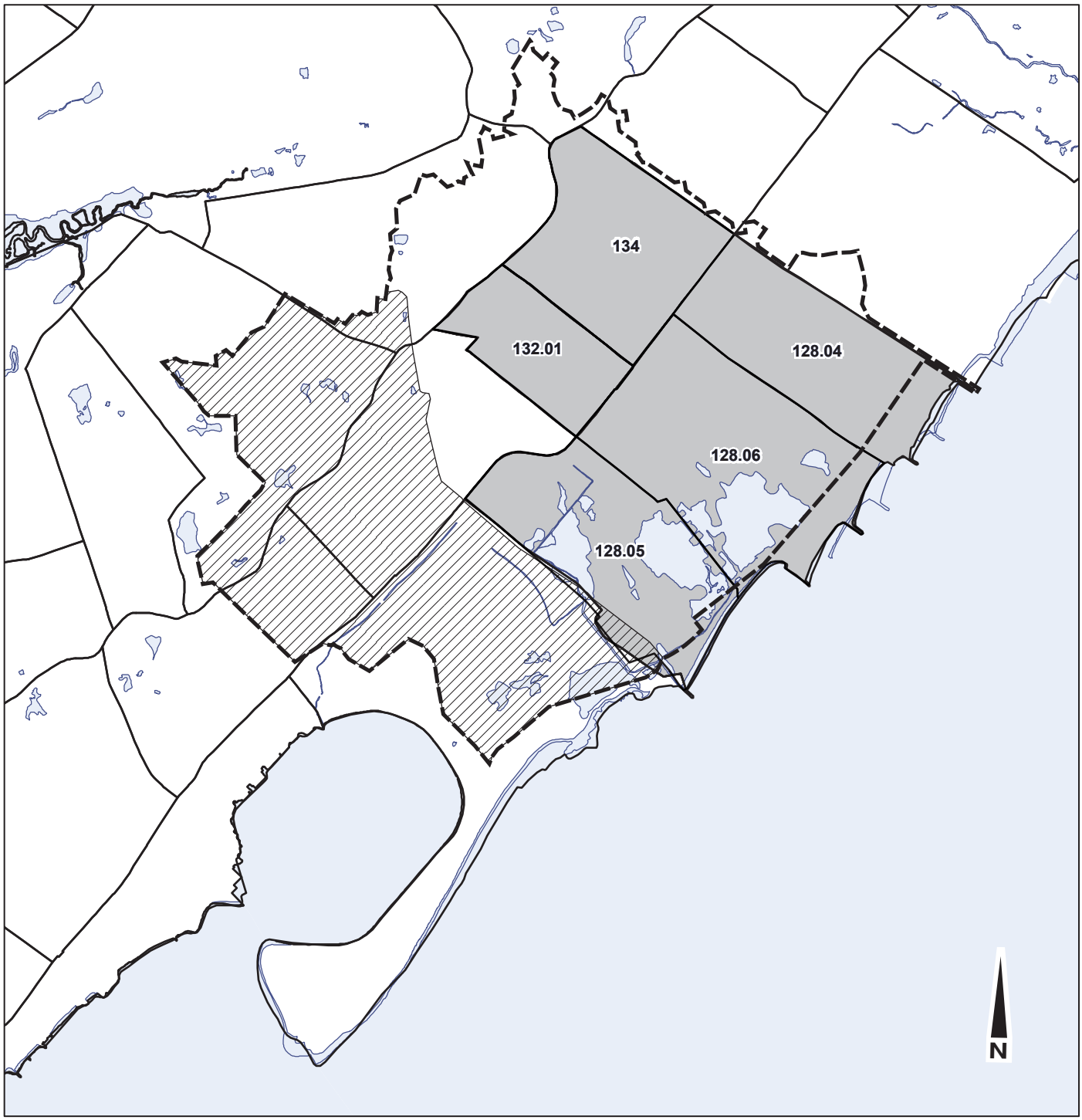
As stated above, there is historical development pressure in the watershed that would be expected to continue in the future without the proposed project were it not for the presence of freshwater wetlands and the otherwise limited supply of vacant land. In addition to the regulatory restrictions that limit development in these wetlands, many of the wetland acres are also preserved as City or state open space or Bluebelt properties which would also preclude their development. Moreover, the watershed is already provided with substantial infrastructure including sanitary sewers, water supply, developed streets, and transit service. While the proposed project would enhance natural resources in the study area and would preserve wetlands for stormwater management, these actions are not expected to contribute any additional growth pressure. Therefore, the proposed project would not result in potential significant adverse impacts to growth inducing characteristics.

E. CONCLUSIONS

There is historical development pressure in the watershed and what remains of the vacant land includes freshwater wetlands where development is restricted either due to regulations or public ownership (i.e., Bluebelt properties). Much of the watershed is considered urbanized and already provided with substantial infrastructure including sanitary sewers, water supply, developed streets, and transit service and the proposed project is not expected to generate any additional growth pressure. Therefore, the proposed project would not result in potential significant adverse growth-inducing impacts. ✷



2000 Census Tracts:
Oakwood Beach Watershed
Figure 3.20-1



2010 Census Tracts:
Oakwood Beach Watershed
Figure 3.20-2