Chapter 2.1: Methodology for All Drainage Plan EIS Analyses

A. INTRODUCTION

The proposed project involves three proposed amended drainage plans that have been developed for each watershed with the objectives of reducing flooding and erosion, improving water quality, and enhancing wetlands and wildlife habitats. Study area boundaries for each of the technical areas are the limits of the three watersheds—Oakwood Beach, New Creek and South Beach—or lands immediately adjacent (within 400 feet). The watershed boundaries are based on the limits of the proposed amended drainage plans, which take into account topography and the drainage system that would be created by under the proposed amended drainage plans.

Each watershed was examined for potential environmental impacts in accordance with the Final Scope of Work (September 2010) and the methodologies of the *City Environmental Quality Review* (*CEQR) Technical Manual*. The impact analyses are a three-step approach: 1) develop an inventory of the existing (baseline) conditions; 2) project future conditions without the proposed project (referred to as the No Action condition); and 3) conduct an impact assessment based on the proposed drainage plan. Future conditions are projected for each technical analysis through the proposed build year, or the year when the proposed project is assumed to be fully completed (that analysis year is 2043). Based on DEP's' experience in conducting environmental reviews for other Bluebelt watershed proposals (i.e., South Richmond EISs), only a screening level of analysis is necessary for the following technical areas since no significant environmental impacts are expected:

- Socioeconomic Conditions;
- Community Facilities;
- Shadows;
- Solid Waste and Sanitation Services;
- Energy;
- Air Quality;
- Greenhouse Gases;
- Noise;
- Public Health; and.
- Neighborhood character.

B. LAND USE, ZONING, AND PUBLIC POLICY

OVERVIEW

The examination of land use, zoning, and public policy addresses current and future land coverage, zoning districts, and public policy issues within the watersheds. This analysis assesses the project's potential to impact these conditions in each watershed and describes the land use patterns of the watershed as a whole, with details as to the uses on and adjacent to proposed BMP sites. Existing land use and zoning data are important not only for understanding the land uses in the vicinity of the proposed BMPs, but also in setting the context for other technical analyses, such as natural resources. Stormwater runoff volumes, for example, also vary depending on the land cover because natural cover, such as woodlands and open fields, allow more percolation to groundwater and generate less surface runoff than a paved surface or building roof. For determining future runoff volumes, zoning is therefore an important factor in predicting runoff rates, particularly with respect to underdeveloped or undeveloped lands.

ANALYSIS METHODOLOGY

Existing land use data are presented based on geographic information system (GIS) land coverages developed from the City's GIS database for the watershed as a whole and were also presented for the areas within 400 feet of the sites of the proposed BMPs and outfalls. Land uses were grouped in the following categories:

- Residential (principally one- and two-family)
- Residential with ground floor retail (along commercial corridors)
- Parkland and open space (both City and state, both mapped and unmapped)
- Bluebelt property (both acquired and to be acquired)
- Commercial (primarily retail with some office),
- Industrial (mix of light industry or warehousing, generally limited in these watersheds)
- Community Facility/Institutional (services that support the neighborhood, including schools and places of worship)
- Transportation (e.g., the Staten Island Railway line),
- Streets; and
- Vacant lands.

In developing the land use database, the City's GIS data was updated based on field surveys and Bluebelt property boundaries (including lands both acquired and to be acquired). Land uses were then mapped and aggregated into tables for each chapter. These tables provide a total acreage for the watershed with a breakdown by land use category.

Zoning for the watersheds reflects current zoning maps of the New York City Zoning Resolution. Zoning in the watersheds includes traditional City zoning districts (e.g., residential, commercial and manufacturing) as well as special districts including the Special South Richmond Development District designated in 1975 to protect natural features and undeveloped open spaces within this part of Staten Island, and the Special Staten Island Natural Area District (see also the description below under "Natural Resources").

Parkland identification and park acreages were developed based on the City's GIS database as well as the City map, the DPR database and information from NYSDEC which also has open spaces in the New Creek watershed. Information on development trends and pending projects was gathered from DCP and other City agencies.

The only project elements with the potential to affect land use are the proposed BMPs (the sewers would be installed in the street). Some of the factors considered in determining impacts from of BMPs on land use include the following:

- Compatibility of the proposed BMPs with adjacent land uses;
- Need for demapping City streets;
- Zoning regulations and the need to comply with specific provisions of the City's zoning resolution; and
- Potential direct or indirect impacts on land use, such as transformation of natural resource features in parkland.

WATERFRONT REVITALIZATION PROGRAM (WRP)

Most of the watershed area is within the City's coastal zone. Therefore, a consistency determination was performed based on the City's WRP policies. Those policies establish a framework for managing waterfront resources in the public interest, and address issues of flood management and erosion control, cultural and recreational resources, and natural resources management. Because there are City, state and federal actions necessary to implement the proposed amended drainage plans, a watershed-level consistency determination was prepared.

C. SOCIOECONOMIC CONDITIONS

Based on prior environmental reviews for other Bluebelt watershed projects (e.g., the South Richmond watersheds), no significant adverse impacts due to the proposed project are expected with respect to socioeconomic conditions. This task therefore, provides a CEQR screening level for assessing any potential for direct or indirect impacts on population, housing, employment, business or industries as a result of the proposed project.

D. COMMUNITY FACILITIES AND SERVICES

Potential impacts on community facilities resulting from the proposed project are generally positive, since City and public service facilities would be provided with improved infrastructure services and would benefit from reduced flooding. No community facilities would be directly impacted by the proposed project. Therefore, a screening analysis was performed for community facilities and services.

E. OPEN SPACE

The proposed project would not generate any additional population or employees that would place added demands on open spaces or recreational facilities. However, certain BMPs are proposed to be sited in parkland or open space that is under the jurisdiction of DPR or NYSDEC. This analysis therefore focuses on potential direct impacts related to the use of open space for siting a BMP. Therefore, in conjunction with the land use task above, this task includes a baseline survey of open spaces along with the current programming, facilities and uses. The parklands are described as to their primary functions (e.g., natural area, passive space, active

recreational facilities) as well as the location, size and general information on the park based on the City's GIS data, field surveys, and DPR data and communications. In these three watersheds, much of the parkland acreage is wooded or wetland open space that provides natural features protection. For the No Build condition, any anticipated projects that may apply to the study area open space, including any parkland improvements or habitat restoration projects proposed by DPR or NYSDEC are then described.

The proposed amended drainage plans were then reviewed for any potential impacts on open space users, activities or facilities. The impact analyses considered, for example, if a BMP would displace a DPR recreational facility, inhibit or reduce public access, or conflict with the overall function and purpose of each open space. This analysis also includes an assessment of any potential impacts on beach access within waterfront parks due to the proposed Lower Bay outfalls.

F. SHADOWS

The proposed BMPS are comprised of generally at-grade structures supported by wetland plantings and landscaping. There are no structures that would create shadows. This analysis is therefore limited to a CEQR screening.

G. HISTORIC AND CULTURAL RESOURCES

ARCHAEOLOGICAL RESOURCES

The proposed project could result in potential impacts on historic archaeological resources due to in-ground construction. This impact assessment therefore focused on the BMP areas of disturbance under the proposed project. As the first step in this analysis, maps were developed showing the in-ground disturbance areas for the BMPs plotted on a two-foot topographic map. This analysis then examined areas that have been previously disturbed, and areas that could be disturbed under the proposed project. As a result of this analysis, areas with significant previous disturbance were screened from further consideration. However, those areas without previous disturbance, and which are more likely to host archaeological resources, were provided additional investigation and research.

A determination was then sought from the New York City Landmarks Preservation Commission (LPC) as to the potential for archaeological sensitivity in the areas of disturbance. It was the opinion of LPC that the analysis for each watershed required a Phase 1A investigation. Phase 1 archaeology investigations develop a data base of documentary research to assess the potential for archaeological sensitivity of a site or area. Documentary research was also conducted to assess the potential presence of archaeologically sensitive areas in accordance with LPC guidelines and procedures. This research included such sources as the Staten Island Institute of Arts and Sciences, the Map Division of the New York Public Library, the U.S. Army Corps of Engineers, and designation files at LPC. Accepted source material for data on prehistoric settlements, US census and City directory data, and land transfer records were also researched. Project impacts were then assessed based on the potential for a BMP site to possess archaeological sensitivity. If the analysis disclosed the potential for significant impacts on archaeological resources (i.e., disturbance at locations determined to have medium or high archeological sensitivity), Phase 1B work was recommended to be incorporated into the project.

ARCHITECTURAL RESOURCES

According to the *CEQR Technical Manual*, historic architectural resources include officially recognized (or listed) historic structures or landscapes including properties listed on the State and National Registers of Historic Places (S/NR), or determined eligible for such listing; National Historic Landmarks (NHL); New York City Landmarks (NYCL) or properties pending such designation; and potential historic resources that have been identified as having significant historic characteristics by local organizations (Richmond County Historical Society, Preservation League of Staten Island), but not officially listed or registered as historic resources. Of the potentially eligible resources, reports prepared by SHPO for the study area were reviewed to determine if there were any pending State listings. Defining an area of potential effect for historic architectural resources depends on project designs and potential impacts. For the proposed project, given that the proposed BMPs are generally at grade and landscaped, a study area of 400 feet from each proposed BMP site was deemed appropriate. Projections of the future without the proposed project condition considered any pending applications for New York City or SHPO historic landmark status within the watersheds. The potential for any impacts on historic resources was then assessed for the proposed BMPs. This impact analysis was limited to indirect (or contextual) affects on any historic architectural resources. Since the proposed sewers are below grade and the BMPs are primarily natural landscapes, these contextual impacts were generally limited.

H. URBAN DESIGN AND VISUAL RESOURCES

Based on environmental review analyses developed for the South Richmond Bluebelt projects, a detailed analysis of potential urban design and visual resource impacts is performed only for larger or more visually prominent BMPs located in public parks or open spaces. Potential urban design or visual resources impacts were not an issue for the smaller BMPs or with the installation of below-grade sewers—one exception being the headwall for the Lower Bay outfalls. For sites subject to a more detailed visual analysis, views of the larger BMP sites are described from both the public and private viewing experiences. In order to determine if significant impacts would occur, this analysis then considered any extensive or significant changes in the physical or natural conditions, such as topography and natural habitats (e.g., removal of woodlands or established tree canopy), particularly at locations that possess significant public views or are within significant public viewsheds and those sites within public open space. This analysis considered pre- and post-project conditions and the landscaping and restoration plans that are proposed at each BMP location. In each case, the impact analyses examined, from both the public and private view perspective:

- Potential changes in the physical conditions, such as grading and changes in topography; and
- Potential changes in natural landscapes and features, such as clearing of woodlands, tree canopy and existing wetlands.

I. NATURAL RESOURCES

INTRODUCTION AND APPLICABLE REGULATIONS

INTRODUCTION

While the proposed amended drainage plans would benefit natural resources in many ways, certain BMP sites and features require site-specific disturbances of wetlands and woodlands that required a detailed analysis of potential impacts or vegetative cover and trees. These impacts were examined for each BMP as part of this analysis and presented at both the site specific and watershed levels. In this way, the natural resources analysis provides a comprehensive and cumulative impact assessment of natural resource impacts of the proposed amended drainage plans. The discussion below presents the methodologies that were used in determining existing natural resources conditions and project impacts.

APPLICABLE REGULATIONS

Introduction

Important natural features of the watersheds are protected by a number of regulations at the City, state and Federal levels. This includes, for example, the State of New York, which has freshwater and tidal wetlands protections programs as well as rare and endangered species protection programs; the Federal government, which regulates wetlands and water quality under the Clean Water Act and the Endangered Species Act; and the City of New York, which provides natural resources protection through the Special South Richmond Development and Staten Island Special Natural Area zoning districts. Each of these regulatory programs is summarized below.

New York State

Freshwater Wetlands

The State of New York began regulating activities in and around freshwater wetlands in the mid-1970s following the passage of the Freshwater Wetlands Act (Article 24 of the Environmental Conservation Laws of the State of New York). The agency responsible for the regulatory oversight is NYSDEC. Their rules and regulations for freshwater wetlands are found at Title 6 of the New York State Codified Rules and Regulations, Parts 662, 663, 664, and 665.

The freshwater wetland permitting program supports the protection of the streams, ponds, and floodplains. The minimum size wetland for regulation is 12.4 acres. Under State law, wetlands smaller than 12.4 acres can also be protected if the NYSDEC Commissioner has determined that they have unusual local importance and may also be protected through this protection of waters program.

Any activity within or adjacent to NYSDEC-mapped wetlands requires a permit. The NYSDEC-regulated adjacent area is 100 feet from the wetland boundary. The primary purpose of the adjacent area is to buffer the wetlands from the impacts of development. At the directive of the DEC commissioner, these regulated adjacent areas can also be extended. (These greater setbacks are referred to as an extended adjacent area.) Many amphibians, reptiles, and macro-invertebrates use freshwater wetlands and adjacent areas during different stages of their life.

DEC identifies freshwater wetlands by four classes. Class I is the most critical for preservation and protection; Classes II, III, and IV have a progressively diminishing importance. The Staten

Island wetlands inventory found the majority of wetlands to be Class I and II because, as remnant wetlands in an urban setting, they are considered especially important. These classifications are also used in determining standards to be met in the review of wetland applications and the issuance of permits.

Tidal Wetlands

State regulation of tidal wetlands began in the mid-1970s and is based on the Tidal Wetlands Act (Article 25 of the Environmental Conservation Law) and the implementing Tidal Wetland Land Use Regulations. The categories of tidal wetlands, the regulation and restriction of activities in the wetlands and the adjacent areas, and the standards for review of applications and permit issuance are defined in detail in 6 NYCRR Part 661.

Tidal wetlands generally consist of all the tidal (littoral zone) waters of the state out to a depth of six feet and including benthic zones, tidal marshes, flats, and shoals that are subject to tidal inundation. In addition, NYSDEC regulates tidal wetlands adjacent area. In New York City, regulated adjacent areas extend up to 150 feet inland from the upland limit of the wetland boundary, or to elevation ten National Geodetic Vertical Datum (NGVD). A tidal wetlands permit is required from NYSDEC for almost any activity proposed within tidal wetlands or the adjacent areas. Regulated structures and activities include piers, bulkheads, platforms, buildings and dredging. New York State also regulates activities in immediately adjacent uplands, unless the site's uplands are separated from the wetlands by a significant man-made structure that was present in 1976 and is still functioning, such as roadways and bulkheads. Dredging in tidal wetlands, as may be required for the proposed outfalls, requires a tidal wetlands permit.

Protection of Waters

DEC administers the State's Protection of Waters regulations. The purpose of the program is to prevent adverse water quality impacts due to activities within surface waters (rivers, streams, lakes, and ponds). The Protection of Waters permit program regulates five different categories of activities: disturbance of stream beds or banks of a protected stream or other watercourse; construction, reconstruction or repair of dams and other impoundment structures; construction, reconstruction or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the Federal Clean Water Act.

State Pollutant Discharge Elimination System

Title 8 of Article 17, of the State's Environmental Conservation Law, Water Pollution Control, authorized the creation of the State Pollutant Discharge Elimination System (SPDES) to regulate discharges to the State waters. Activities requiring a SPDES permit include: point source discharges of wastewater into surface or ground waters of the State, including the intake and discharge of water for cooling purposes; constructing or operating a disposal system (sewage treatment plant); discharge of stormwater; and construction activities that disturb one acre or more.

Rare and Endangered Species

Under the New York State Environmental Conservation Law and its implementing regulations (6 NYCRR, Part 193 and Part 182), NYSDEC through the New York Natural Heritage Program maintains a list of plant and animal species that are considered rare, endangered, threatened, or of special concern. The classifications are slightly different for plants and animals—e.g., plants can be listed as endangered, threatened, rare, or exploitably vulnerable, while animals can be listed endangered, threatened, or of special concern. These State designations have legal status,

providing protection for plants and animals that are endangered, threatened, or rare; species considered to be vulnerable or of special concern have no legal protection. (Species determined to be of special concern are those that are candidates for listing as rare or endangered, but for which insufficient data exist for a final determination.) It is a violation of the law to pick, damage, or destroy any protected plants, or to apply defoliant or herbicides, or to carry these plants away without the owner's consent. Wildlife protections are stronger, and species designated as endangered or threatened are protected from hunting, importing, exporting, or possession. DEC also regulates protected wildlife under an incidental taking permit for endangered and threatened species of fish and wildlife and species of special concern in accordance with Environmental Conservation Law 11-0535 Part 182.

Coastal Erosion Hazard Areas Act

In response to concerns regarding coastal erosion and flooding hazards to human life and property as well as the need to protect natural protective features the State of New York enacted Article 34 of the Environmental Conservation Law, "Coastal Erosion Hazards Areas" (Chapter 841, Laws of 1981), which went into effect in July 1981 (amended in 1985). The legislation implements, in part, several of the State's CMP policies relating to flooding and erosion hazards, and in conjunction with Article 42 of the Executive Law:

Regulations implementing the act were adopted in March 1983 and amended in March 1988 (6 New York Codified Rules and Regulations part 505, "Coastal Erosion Hazard Area Regulations"). Procedures for regulating activities in the CEHA include permitting standards and procedures, oversight, standards for monitoring local programs, and amendments to coastal erosion hazard area maps.

Regulated activities are defined by the act in great detail for both structural hazard areas and natural protective features. For natural protective features, these regulations were adopted to protect nearshore areas, beaches, bluffs, primary dunes, and secondary dunes and the physical features they are dependent upon, in order to protect these areas. There are also standards for erosion protection structures.

Along Staten Islands's Lower Bay shoreline a CEHA is mapped as a natural protective feature. In natural protective areas, all new structures and development are prohibited waterward of the line, except elevated walkways, docks, piers, wharves, groins, jetties, seawalls, bulkheads, breakwaters, or other water-related structures which may be authorized if they meet the appropriate criteria.

Federal Regulations

Wetlands

The Federal government, through the U.S. Army Corps of Engineers (USACE), regulates activities in wetlands; specifically the dredging, construction, and/or replacement of any dredged or fill material in any fresh or marine waters of the United States; or any work affecting the course, location, condition, or capacity of such areas. Activities in wetlands are regulated in accordance with Title 33 of the Code of Federal Regulations, Parts 320-330, which are implemented pursuant to Section 404 of the 1977 Clean Water Act amendments. Under the regulations of the nationwide permitting program, the review of permits for federally regulated wetlands generally addresses projects that impact headwater (freshwater) wetlands between 0.10 and 0.5 acres in size or more. National Fish and Wildlife Service (FWS), the U.S. Environmental Protection Agency's (EPA) Marine Wetlands Protection Branch, and the National Oceanic and

Atmospheric Administration's National Marine Fisheries Service, by interagency agreement, are active in the review of applications for Federal wetland permits. [1]

Threatened and Endangered Species

As part of the 1974 Endangered Species Act (50 CFR 17), several categories of Federal status for plants and animals are identified as plants and animals can be listed in the Federal Register and protected as endangered or threatened. It is illegal to pick, damage, or destroy any protected plants, or to hunt, import, export, or possess protected animals. In addition, federally assisted or sponsored projects that would affect protected species must be reviewed by FWS for a determination of impacts. Other categories exist for species that require further study before determining whether they are endangered or threatened.

The National Marine Fisheries Service (NMFS) and FWS share the responsibility of implementing the Endangered Species Act. Species that are listed by these federal entities are defined as threatened or endangered with special concern species defined as "candidate species."

City of New York

Special South Richmond Development District

The Special South Richmond Development District was established in 1975 to guide future development and land use in the South Richmond section of Staten Island and to protect natural resources. Overall goals are to guide development; promote balanced land use; avoid destruction of irreplaceable natural and recreational resources; and promote a desirable use of land.

These objectives are accomplished through the review of all new development and site alterations. Natural features are protected by limiting changes in topography to two feet (unless there are special circumstances), by regulating the removal of trees, and by requiring clustered development to maximize the preservation of natural features. The CPC must also certify that all new developments meet applicable preservation standards. Only a small portion, about 5 acres, of the Oakwood Beach watersheds is within this district. It does not apply to the other watersheds.

Special Natural Area District (Staten Island)

The purpose of this special district is to manage new development and site alterations with the purpose of preserving unique natural characteristics, such as forests, rock outcrops, steep slopes, creeks, and a variety of botanic and aquatic environments. In these districts, CPC reviews proposals for all new development, enlargements, and site alterations to determine if they comply with these objectives. In this review it must be determined that natural features are protected by limiting modifications in topography, preserving trees, plants, marine life, and natural water courses, and encouraging clustered development. In addition, pursuant to Section 105-91 of the ZR, when an NA-1 district is designated on a public park, any natural feature existing on December 19, 1974, cannot be removed, destroyed, or altered unless authorized by CPC. The Staten Island NA-1 district covers the areas of Dongan Hills and Todt Hill within the New Creek watershed. It does not apply to the other watersheds.

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[1] Due to outfalls proposed in tidal waters, Section 10 of the Rivers and Harbors Act of 1899 would also apply. Due to the presence of seawalls along the South Shore, 33 CFR Section 320.2(e) Section 14 of the Rivers and Harbors Act of 1899(33 U.S.C.408) would also apply. This requires Federal coordination for projects that may impact a Federal project where the USACE has the ultimate responsibility for the protection of navigation.

New York City Tree Regulations

In September. 2010 the City of New York approved additional rules pertaining to the removal of any trees under the jurisdiction of DPR. regarding the removal of trees within the City. These rules address tree clearing on City property and the details on how to determine such impacts including the tree size, condition and health, speciation, and location and the number of trees based on the caliper method. Under these rules, DPR will determine a tree replacement program that is necessary to address the clearing impacts of the proposed BMP including the timing of the planting and the size of the replacement trees.

HYDROLOGY

The proposed amended drainage plans are intended to address stormwater management and erosion control needs in each watershed. To meet these objectives, the proposed plans would capture and control stormwater flows and runoff to surface waters. In addition to these modifications in surface water hydrology, developing the design of the proposed BMP's also takes into consideration the local groundwater conditions. Therefore, each watershed was examined for the purposes of understanding the potential effects of the proposed amended drainage plans on local surface water hydrology—including the affects on flooding and erosion potential—as well as groundwater. The methodology used in these analyses included use of modeling and engineering standards for the purposes of determining impacts.

The discussion below details the modeling that was performed for each watershed relative to the changes in hydrology. The more complex hydrologic-hydraulic modeling was performed for the lower watersheds, since these are currently the areas of greatest flooding impacts. Additional modeling was performed for the upper watershed in order to analyze the impact of the proposed amended drainage plans on these stream channels and open waters, such as ponds.

To develop of the hydrologic and hydraulic models, DEP collected extensive data, including channel, floodplain and culvert surveys, stream flow and water surface elevation measurements at various sites, tidal water surface elevations at the outfall, and 5-minute rainfall series data. Additionally, a GIS database was compiled of available data, such as edge-of-pavement and structures layers, aerial topographical surveys and photos.

In developing the runoff model, subdrainage areas were identified through a detailed analysis of existing grades and sewers. This data was used to establish a number of subdrainage areas in each watershed. Using HEC-HMS, a calibration exercise matched observed runoff hydrographs for three watersheds in order to model output by varying two parameters, curve number (CN) and time of concentration (T_c). Once calibrated, the CN and T_c were correlated with the observable parameters of imperviousness and subdrainage area size. For the remaining ungauged watersheds, these correlations were used to develop runoff parameters despite the lack of flow data.

The second step in correlating the model was to match the observed and computed water surfaces. Flow hydrographs from HEC-HMS for the various subdrainage areas were entered into the HEC-RAS stream model, along with observed tidal conditions. The HEC-RAS model included all geometric data from the surveys of channels and culverts. Calibration was performed by adjusting the loss factors to account for culverts being in good or poor condition, and adjusting Manning's *n* values for stream reaches. In addition,, during astronomical and high tides, drainage from the watersheds is impeded due to a lack of hydraulic head, and the water surface therefore rises at a faster rate—this is also a factor in the analysis.

Using these models, it was possible to quantify the impacts of the proposed amended drainage plan under a number of design storms. Typically, conveyance capacity for the piping in a New York City storm sewer plan is designed for the five-year storm (4.5 inches of rain over 24 hours), which is the City's design storm. Based on historical rainfall data, a five-year stormwater management plan is effective in handling 95 percent of the storms that occur in the City. In the case of these proposed amended drainage plans, the standard New York City five-year design storm is used in calculating storm sewer pipe sizes for all pipes draining into existing trunk sewers. For those storm sewers that drain into the lower watershed BMPs in all three watersheds, the 10-year design storm was used. The larger pipe sizes that were calculated using the larger design storm provides an extra margin of safety in the BMP areas which are low lying and subject to flooding. To meet the 10-year, 24-hour duration storm, observed hourly rainfall from April 16, 2007, with a total volume of 5.06 inches, were used as it closely matches the statistical 10-year storm. This design storm was run through the HEC-HMS and HEC-RAS models to generate runoff hydrographs and water surface elevations. A 10-year storm event was used for modeling purposes for all lower watershed analyses. Since the 10-year storm is larger than the five-year storm, it is assumed to be more conservative and therefore the five-year storm event was not modeled for the lower watershed. Modeled flow rates and water surface elevations under the five-year storm event are anticipated to be lower than those modeled for the 10-year storm. For the upper watershed, the five-year storm was identified and run in a similar method to the 10-year storm. For this storm, historical rainfall and tidal information were used from a storm occurring on September 21, 1966, since that storm closely matched the five-year, 24-hour event. The storm rainfall volume was 4.71 inches. For the purposes of ensuring that the proposed amended drainage plans do not impact conditions during extreme (100-year return period) events, a synthetic SCS Type III storm 100-year, 24-hour event was also modeled. **Table 2.1-1** presents rainfall data for New York City that were used in this analysis.

Table 2.1-1
Periods of Storm Events

Rainfall (In inches)	Return period	Probability of occurring in a given year (Percent)
3.0	1 year	100
3.5	2 years	50
4.71	5 years	20
5.06	10 years	10
8.1	100 years	1

Source: Hazen and Sawyer, 2010.

The objectives of the modeling were to evaluate the proposed amended drainage plans in terms of their impact on peak water surface elevations. The design goal was to reduce the peak water surface elevations in the downstream portions of the watershed (which are currently impacted by backwater conditions), to at a minimum one foot below the existing low lying streets, two feet below, if possible.

Several types of drainage system improvements were considered in the analysis. Among these were upstream detention BMPs, located at the head of the stream branches to control runoff. The model incorporated these BMPs as widened channels, with weirs to control high flows and low-flow orifices to release the extended detention volume over a 24-hour period.

Another control was the downstream storage wetlands of the lower watersheds. These BMPs would be large but shallow due to the lack of topographic relief. The models assume that

excavation would occur to create more storage volume, down to approximately the groundwater interface. These BMPs were modeled as simple storage areas, and a stage-volume relationship was entered for each BMP. The detention volume was defined as "0" at the permanent pool elevation. The permanent pool was assumed to occupy one-third of the BMP footprint, and at the extended detention volume of a 6-hour period, to allow for complete drain-down during the tidal cycle.

The models also incorporated channel and culvert improvements which would serve to reduce localized flooding, and are modeled by reconfiguring the channel, or resizing the culverts, or lowering the Manning's *n* of the channel segments.

Outlet stilling basins were not explicitly modeled because their relatively small size would not significantly impact the hydraulic behavior of the stream. The storm sewers were also not modeled explicitly; instead, flows from the catchment area were discharged to the creek at the location of the outfalls.

Project conditions in the future without the proposed project incorporated several conservative assumptions. First, the analyses assumed that all unbuilt lots and all mapped, but unbuilt, streets in each watershed would be developed in accordance with the current zoning; these include those lots with wetlands or other potential development restraints. This assumption determined future runoff coefficients and the amount of impervious surfaces. As a result, the assumption for full development conservatively reflects the worst-case increases in future runoff. Mapped parkland and open space were assumed to remain as open space.

Potential impacts from the proposed amended drainage plans on local flooding and stream bank erosion, as well as impacts on wetland and stream hydrology were analyzed as follows:

- Changes in the floodplain and water surface elevations;
- Effects on stream hydraulics, such as the extent and duration of stormwater inundation, stream flow velocities (especially those resulting from slope changes that could lead to scouring and/or changes in sedimentation patterns);
- Determining potential impacts on erosion and sedimentation, which may result from changes in stream velocity and the potential for increased sedimentation.

In the Oakwood Beach watershed, there are no stream channels exhibiting erosive flows. The intermittent stream in the Willowbrook Parkway (the location of BMP OB-5) has no signs of erosion, and the lower watershed (BMPs OB-1 through OB-4) are generally flat and stream velocities are not an issue of concern. As a result, modeling of stream velocities was not conducted for Oakwood Beach. Likewise, in the South Beach watershed, development has eliminated most active open channel streams. There are intermittent streams that currently fill with water during storm events, though they are disconnected and none are considered open channels that convey water downstream. As a result, modeling of existing stream velocities was not conducted for this watershed, as well.

In addition, the Federal Emergency Management Agency has not calculated 100-year flood zones for the upper watershed, typically indicating that those areas do not experience significant extreme flooding. Therefore, the upper watersheds were not evaluated for a 100-year storm event.

One pond of particular concern was Brady's Pond in the South Beach Watershed since the proposed project calls for directing some stormwater away from this pond to Cameron's Lake. Thus, an assessment of this individual element of the proposed project was also performed. In

addition, in the New Creek Watershed an analysis was undertaken of any potential indirect impacts on the hydrology of Priory Pond (no direct impacts would occur on Priory Pond).

GROUNDWATER

In order to understand the baseline groundwater conditions, groundwater data was gathered from the U.S. Geological Survey, soils borings (as available), literature searches, and field reconnaissance in order to understand the general groundwater regime and the water table elevations in the three watersheds. In addition, eleven one-inch diameter monitoring wells were installed to determine the water table elevation at multiple BMP sites. Wells were sited at downstream locations within the New Creek, South Beach, and Oakwood Beach watersheds, in low-lying areas where groundwater is expected to have the most influence.

Once installed, the wells were monitored over one four-week period and two two-week periods to establish water table elevation variations over the tidal cycle. Monitoring was conducted during spring (April 27, 2010 to May 20, 2010), summer (July 14, 2010 to July 22, 2010) and fall (October 25, 2010 to November 5, 2010). It is important to note that this spring monitoring was performed after March 2010, which was the wettest March on record in New York City.[1] Summer monitoring was also performed in July 2010, which was particularly dry (2.2 inches of rain,[2] while the average monthly rainfall is 4.8 inches[3]). Therefore, extreme conditions were part of the baseline data collection. Monitoring during the fall was representative of a typical October, but drier November than average (4.13 inches of rain in October and 1.89 inches of rain in November[4] compared to the historical average of 3.4 and 4.3 inches of rain[5] over these months). Each well was monitored twice a week for a total of eight monitoring days for the spring monitoring period and a total of four monitoring days for the summer and fall monitoring periods. On each monitoring day, wells were monitored in the morning and the evening, in order to also capture the range in tidal influence on groundwater levels. The data was collected in order to understand the influence of groundwater on surface water systems and the BMPs. Based on these data and the proposed designs, potential changes in groundwater with the proposed amended drainage plans were assessed including any changes in groundwater contribution to local streams and ponds, the associated wetlands, and isolated wetlands.

As part of this analysis, maximum groundwater baseflows into the BMPs were estimated. This calculation was based on the difference between the measured water table and the proposed BMP elevations, the size of the BMP, and the soil types of the watershed. Darcy's Law was used to calculate the flow rate of groundwater towards the BMPs when the BMP permanent pool is extended into groundwater. Possible land subsidence associated with a depressed water table was also evaluated, based on worst-case assumptions of groundwater drawdown and soil conditions at the BMPs.

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[1] United States Historical Climatological Network data for Central Park weather station.

[2] Average of quality controlled climatological data from NOAA National Climactic Data Center for John F. Kennedy Airport and Newark Airport weather stations.

[3] http://countrystudies.us/united-states/weather/new-york/staten-island.htm

[4] Average of quality controlled climatological data from NOAA National Climactic Data Center for John F. Kennedy Airport and Newark Airport weather stations.

[5] http://countrystudies.us/united-states/weather/new-york/staten-island.htm

WATER QUALITY

The study areas for water quality were the three drainage plan watersheds. To assess the potential impacts of the proposed project with respect to water quality a literature review was conducted and empirical data from the South Richmond watersheds were used to determine potential project impacts on the water quality of watershed streams and ultimately Lower Bay. The water quality analysis qualitatively describes future conditions (i.e., no comprehensive stormwater management or BMPs) for the purposes of providing a general baseline for identifying potential water quality impacts. The water quality impact analysis then assesses the potential impacts of the proposed project based on a documented literature with regard to pollutant removal efficiencies associated with the BMPs in the proposed amended drainage plans. To that end, data from monitoring studies, completed for existing Bluebelt BMPs in South Richmond was also utilized. The water quality analysis also examined the proposed amended drainage plan for any potential for impacts on the water quality of Cameron's Lake and Brady's Pond in the South Beach watershed.

WETLANDS

Wetlands in each watershed were identified and mapped based on 1987 DEC wetland sketch maps and descriptions, National Wetland Inventory (NWI) maps, and were confirmed by field observations at each BMP site during the spring and Fall 2009-2010 field surveys. All BMP site-specific data were based on "area of disturbance" two-foot contour maps developed for each of the BMP sites.

Watershed-wide wetland information was also assembled through a review of published literature sources, including those maintained by federal, state, and local agencies and institutions, such as the DPR's Natural Resources Group and the Staten Island Institute of Arts and Sciences. The data from the literature was used to supplement the BMP site-specific data gathered through the field surveys.

NYSDEC tidal wetlands were based on the tidal wetland maps for Staten Island and field observations. USACE and NYSDEC wetland definitions are essentially similar and are based on the presence of hydric soil, hydrophytic vegetation, and hydrology. However, the USACE manual requires all three parameters be present for wetland status and, therefore, generally resulting in less extensive wetlands. The NYSDEC method is based more on vegetation and is therefore more inclusive. However, wetlands less than 12.4 acres in size are typically not regulated by NYSDEC, but are regulated by USACE (see the regulatory discussion above).

A future without the proposed project scenario was developed to present any expected future changes in the watershed wetlands that may be expected in the absence of the proposed amended drainage plans. These changes could include proposed development or continuing trends and conditions with respect to stormwater runoff and pollutant loadings—including frequency of inundation and adverse water quality impacts, with the resulting adverse effects on natural resources.

Potential impacts were determined based on the nature and extent of the physical alteration of the affected areas, including the acreage of affected wetlands, or potential changes in wetland boundaries; site-specific effects including the removal of fill; the direct loss or gain of wetland acreage with the installation of sewers or BMPs; transformation of uplands to wetlands with the proposed BMPs; and indirect impacts, such as the potential impacts from changes in the

frequency and duration of inundation or water quality changes; and cumulative impacts within a watershed.

Direct impacts would occur at BMP locations, which in many cases contain existing designated freshwater wetlands. In these areas, wetland losses and gains were calculated based on DEC and NWI wetland maps and the potential habitat changes with the proposed project. These acreage data were then compiled for each BMP site and at a watershed level. At many BMP sites there are no changes in wetland acreage, given that the sites are already mapped wetlands. However, in some cases, there were wetland gains as upland areas are converted to wetland habitats as part of a BMP or to account for the removal of fill that would be implemented by the proposed project. Impacts from berms were also accounted for in the analysis based on a reasonable worst-case scenario (i.e., the largest berm is installed in all cases). For tidal wetlands, direct impacts could also occur when sewers are proposed across tidal wetlands, such as the outfalls in the Lower Bay. For the outfalls, structural footprints were examined as permanent impacts for which a compensatory wetland plan would be developed and construction areas were examined as temporary impacts that would be addressed through restoration of the affected areas.

An analysis was also undertaken to determine the potential for indirect impacts from the proposed storm sewers on existing wetlands. Indirect impacts of storm sewers could occur when the local wetland hydrology changes as a result of storm sewering where surface runoff is intercepted by storm sewers in the wetland tributary areas, thus diminishing that hydrologic input which may reduce the size of the wetlands.

Indirect impacts could also occur from changes in pond water levels. In certain BMPs, larger ponds are proposed as receiving areas for stormwater runoff (e.g., Cameron's Lake). In these cases, the hydrologic analyses were reviewed to assess if the proposed project would alter water surface elevations in these water bodies which could, in turn, potentially affect existing natural communities along the shoreline edge.

VEGETATION AND TREES

Data on vegetation and trees including the woodland cover of the watersheds was gathered from existing literature, field investigations, and aerial photographs. At most BMP locations the potential for tree impacts was limited when considering either the size of the BMP footprint or the predominant habitat at the BMP site (e.g., *Phragmites* dominated emergent marsh with few trees). However, there are two BMP sites where the potential for tree clearing was more extensive, these sites are BMPs NC-6: Boundary Avenue and NC-11: Last Chance Pond. Both of these sites contain woodlands and are within City parkland (NC-11 is a combination of City parkland and Bluebelt property). At both sites, field surveys involved determining tree density estimates within the existing current habitats and the data were then used for determining the potential tree clearing impacts of the proposed project. Tree densities were determined along seven 100-foot by five-foot transects at the Boundary Avenue site and eight 100-foot by five-foot transects at the Last Chance Pond site. Transects were sited in representative habitat within each proposed BMP. The number and sizes of trees were then tabulated, speciated, and grouped by caliper at breast height as follows: 4-6 inches, 7-12 inches, 13-24 inches and greater than 24 inches. These data were then used to extrapolate total number of trees in the various vegetative community types at each BMP location. For example, if a transect in a portion of mature forest habitat at Boundary Avenue yielded a count of 15 trees in the 4-6 inch diameter at breast height group, it can be assumed that this density is representative of the tree density across the entirety

of the mature forest habitat at Boundary Avenue. These data were then used for determining tree clearing impacts in these habitats and for the BMPs as a whole based on the BMP design.

WILDLIFE

Wildlife data were gathered from published literature, reports, and field data. Data on terrestrial and avian wildlife were gathered from a literature search for the Staten Island coastal area as well as the 2009 and 2010 field surveys. During each field visit, all avifauna (birds), herptofauna (amphibians and reptiles), and mammalian observations and evidence (e.g., nests, tracks) were noted. Any potential for the presence of threatened or endangered species or species of concern as defined by Federal and State regulations was also noted.

The impact assessment for wildlife was primarily based on the projected changes in habitats at each BMP site. These impacts could occur directly due to immediate habitat clearings, or indirectly (over time), as a result of more gradual changes in the surrounding habitat. For wetlands and adjacent areas, these impacts could occur due to changes in hydrology, water quality (e.g., increases or decreases in pollutant loads), or modifications in vegetative cover or composition. In upland areas, impacts were examined for any changes in the vegetative composition, such as the tree loss or clearing of the understory.

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), DPR data, other literature sources, and field observations. Impacts were determined based on the potential presence of such species at each site or the potential for a species to use a particular habitat that may have been observed at a site as measured against the proposed area of clearing an/or installation of structures, such as the outfalls to the Lower Bay.

J. HAZARDOUS MATERIALS

OVERVIEW

Investigations of the potential presence of hazardous materials were conducted for the purposes of assessing any soil or groundwater impacts that may have resulted from prior and present uses within each watershed that may be disturbed by the proposed project. In order to identify any potential sources of hazardous materials, the following tasks were performed:

- A preliminary land use survey to identify commercial, industrial and vacant uses;
- A review of federal and state databases regarding hazardous materials to identify the use, generation, storage, treatment and/or disposal of hazardous materials and chemicals, or releases of such materials that may impact the study area;
- A review of available historical land use maps of commercial and/or industrial areas of each watershed to determine historic land uses; and
- BMP designs were reviewed in order to determine the areas that would be affected by excavation under the proposed project.

The analyses targeted the identification of potential or current land uses in each watershed that could have contributed to the contamination of soil and/or groundwater in areas where excavation for new infrastructure could occur. No standing structures would be affected by the construction activities and, therefore, building demolition materials were not considered as potential hazardous materials of concern under this assessment. A specific discussion of the methods for each element of the analysis is presented below.

BASELINE DATA COLLECTION

LAND USE SURVEY

Current land use maps were reviewed to determine possible sources of contamination (see also "Land Use, Zoning, and Public Policy," above). In general, industrial and commercial land uses have a greater potential for hazardous materials conditions rather than residential land or open space. However, vacant and residential lands can present a potential for undocumented environmental conditions that could affect subsurface conditions. For example, hazardous materials may have been illegally dumped on vacant property and leaking fuel oil tanks can be associated with residences. In addition to land use maps, Sanborn Maps were also reviewed (see the discussion below).

DATABASE RESEARCH

Overview

As part of this analysis, hazardous materials databases were also reviewed for each watershed. This included a review of federal records including the National Priority List (NPL) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); Emergency Response Notification System (ERNS); Toxic Chemical Release Inventory System (TRIS); the Permit Compliance System of Toxic Wastewater Discharges (WWD); and the EPA Civil Enforcement Docket. The federal listing of facilities which are subject to corrective action under the Resource Conservation and Recovery Act (CORRACTS) is discussed with the State databases of RCRA listings. A more detailed description of these listing is provided below.

Federal Records Search

National Priority List (NPL)

The NPL is the EPA's database of some of the most serious uncontrolled or abandoned hazardous waste sites identified for probable remedial action under the Superfund Program. These sites may constitute an immediate threat to human health and the environment. Due to the amount of public attention focused on NPL sites, they pose a significant risk of stigmatizing surrounding properties and potentially impacting property values.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS)

CERCLIS is a compilation of known or suspected, uncontrolled or abandoned hazardous waste sites which the EPA has investigated, or plans to investigate, for a release or threatened release of hazardous substances pursuant to the Superfund Act of 1980 (CERCLA). Some of these sites may constitute a potential threat to human health and the environment. While it has been determined by the EPA that some CERCLIS sites require no action, others could pose a real or perceived environmental threat to public health.

Emergency Response Notification System (ERNS)
This federal database compiled by the Emergency Response Notification System records and stores information on reported releases of petroleum and other potentially hazardous substances.

Toxic Chemical Release Inventory System (TRIS)
The TRIS contains information reported to the EPA and/or DEC by a variety of industries on their annual estimated releases of certain chemicals to the environment. The TRIS was mandated by Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986. Available information includes the maximum amount of chemicals stored on-site; the estimated quantity emitted into the air, discharged into bodies of water, injected underground, or released to land; methods used in waste treatment and their efficiency; and data on the transfer of chemicals off-site.

Permit Compliance System of Toxic Wastewater Discharges (WWD)
This federal- and state- maintained database contains a listing of sites which discharge wastewater containing potentially hazardous chemicals.

United States Environmental Protection Agency Civil Enforcement Docket
This database is the EPA's system for tracking civil judiciary cases filed on behalf of the agency by the Department of Justice.

The state records reviewed included the listings of hazardous material spills (SPILLS), Resource Conservation and Recovery Act Notifiers (RCRA), Chemical Bulk Storage (CBS), Solid Waste Facilities (SWF), Petroleum Bulk Storage (PBS), State Inactive Hazardous Waste Disposal Sites (SHWS), Major Oil Storage Facilities (MOSF), and Air Discharge Facilities (ADF).

New York State Records Search

New York SPILLS Database
The New York SPILLS database includes a list of releases reported to the DEC, including those attributed to tank test failures and tank failures. The list of tank test failures only covers tanks that are below ground, while the tank failures list includes tanks that are either below or above ground. This database also lists spills that occur during the transportation of chemicals.

Resource Conservation and Recovery Act (RCRA) Notifiers Listings
The DEC's Bureau of Hazardous Waste Facility Compliance regulates hazardous waste from the point of generation to the point of disposal. The identified sites tracked on this list are those that which have filed notification forms in accordance with RCRA requirements regarding their hazardous waste activity. These sites include treatment, storage and disposal facilities (TSDs); small-quantity and large-quantity generators; and transporters of hazardous waste regulated under RCRA. The discussion below includes the CORRACTS listings (if any) of facilities which are subject to corrective action under RCRA.

Chemical Bulk Storage (CBS) Database
The New York State CBS is a list of facilities that store regulated non-petroleum substances in aboveground tanks with capacities greater than 185 gallons and/or in underground tanks of any size.

Solid Waste Facilities (SWF)
This database includes a listing of landfills, incinerators, transfer stations, recycling centers, and other sites that manage solid waste.

Petroleum Bulk Storage (PBS) Database
The New York State PBS lists commercial facilities with registered petroleum tanks located either above or below ground in excess of 1,100 gallons and less than 400,000 gallons.

State Inactive Hazardous Waste Disposal Site Registry (SHWS)
This database maintains information and aids decision-making regarding the investigation and clean-up of hazardous sites. The registry's information includes the clean-up status, type of clean-up, types and quantities of contaminants involved, and the assessment of health and environmental concerns.

Major Oil Storage Facilities (MOSF) Database
These are facilities with petroleum storage capacities of 400,000 gallons or more.

Air Discharge Facilities Index (ADF)
This listing of sites tracked by the New York State Regulatory Compliance Information System includes address information on each facility and the source of its associated air emissions.

REVIEW OF PRIOR REPORTS

In addition to the database search, a number of reports were reviewed that provided information from prior site investigations, including:

- Oakwood Beach watershed—Oakwood Beach—Section A Phase II Environmental Site Investigation, Louis Berger and Associates, P.C. (LBA), June 26, 2008 (BMP sites OB-3 and OB-4); and
- Oakwood Beach watershed—Oakwood Beach—Section B Phase II Environmental Site Investigation, LBA, July 1, 2009 (BMP site OB-1). (A Phase I Environmental Site Assessment (ESA) prepared by Parsons Brinckerhoff Quade & Douglas (PB) in April 2006 for the BMP sites OB-1, OB-3 and OB-4 was not available for review, but was referenced and reviewed as part of the Louis Berger Reports).
- New Creek watershed—*Midland Beach - Phase I Environmental Site Assessment (ESA)*, May 6, 2003, AKRF, Inc. (BMP sites NC-6 through NC-19);
- New Creek watershed—*Midland Beach - Limited Subsurface Site Investigation Report*, March 2004, Emteque Corp. (Emteque) (BMP sites NC-13 and NC-17 through NC-19);
- New Creek watershed—*Midland Beach - Limited Subsurface Investigation Report* , March 2005, Metcalf & Eddy of New York, Inc. (M&E) (BMP sites NC-10 and NC-15 through NC-17).
- South Beach Watershed—*South Beach - Modified Phase I Environmental Site Assessment (ESA)*, February 2005, Metcalf & Eddy of New York, Inc. (M&E) (SBE-1);
- South Beach Watershed—*South Beach - Phase II Environmental Site Assessment*, December 2005, Louis Berger and Associates, PC (LBA) (SBE-1).

HISTORICAL SANBORN MAP REVIEW

In addition to the databases, available historical Sanborn Maps were reviewed for areas of industrial and commercial land uses in each watershed. As much of the land in each watershed was not developed until the latter half of the twentieth century, maps from the early 20th Century were not available for many areas. Available maps were reviewed for indications of

industrial usage or other evidence suggesting the use or disposal of hazardous materials on or adjacent to the study area.

FIELD INSPECTION

Field investigations were conducted at each BMP site to identify potential undocumented sources or indications of chemical contamination, or to document current uses of concern such as gasoline filling stations, auto repair facilities, contractor and/or scrap metals yards). All areas not publicly accessible were inspected from the sidewalk for visible signs of illegal dumping and abandoned drums and site use.

IMPACT ANALYSIS

Under CEQR, potentially contaminated soil or groundwater that may be disturbed during excavation could pose a hazard to construction workers and the general public, particularly if the material requires special handling. For each watershed, this analysis therefore identified areas of potential impact which included locations where hazardous materials may present a potential concern for construction workers as well as the public health and safety. Potential sources of contamination that were identified include gas stations, dry cleaners or urban fill and illegal dumping.

A conclusion was then made as to whether BMPs sites or areas of disturbance would have "low," "medium," or "high" probability for the presence of hazardous materials in the soil or groundwater. For locations of "medium" or "high" probability, in order to avoid potential significant impacts to construction workers and the surrounding neighborhood, and to ensure the proper handling and disposal of soils and residual groundwater from dewatering operations that may occur during construction, DEP would perform additional research, site testing and remediation, as necessary, to address the potential contamination issues at each of these sites. Hazardous materials investigations for future capital projects would build upon the work performed and presented in this EIS, taking into account possible changes in environmental conditions, other potential pollutant sources, and any changes in regulated constituents that are in effect at the time of final design and capital project implementation. DEP would coordinate this task work with DDC during the capital project implementation phase.

K. WATER AND SEWER INFRASTRUCTURE

No significant adverse impacts are expected from the proposed project with respect to water supply. This analysis was therefore limited to a CEQR screening level that focused on the added sanitary and storm sewer elements of the proposed amended drainage plans. To that end, the analysis focused on the various modifications under the proposed amended drainage plans (e.g., the collection sewers, BMPs, berms) and their affects on local drainage patterns as well as the Oakwood Beach Wastewater Treatment Plant (i.e., how operations at the plant may improve with the stormwater management system in place since with less floodwater entering the sanitary sewers).

L. SOLID WASTE AND SANITATION SERVICES

No significant adverse impacts are expected from the proposed project with respect to solid waste and sanitation services since there are no added demands on these services. This task, therefore, provides a CEQR screening level of analysis.

M. ENERGY

No significant adverse impacts are expected under the proposed project with respect to energy since there are no added demands for energy with the proposed project. This task therefore provides a CEQR screening level of analysis.

N. TRANSPORTATION

TRAFFIC

The proposed BMPs and sewers would not generate any traffic. Therefore, this analysis focused on examining the potential for any traffic impacts that may result from the proposed street demappings which would eliminate certain mapped streets through protected Bluebelt properties to be used for BMPs. To assess the impact of the proposed street demappings, current and future street configurations were examined on the City map, and a field survey of local traffic patterns was undertaken. The potential for traffic impacts was then qualitatively examined by assessing the long term effects on future traffic patterns from the proposed demappings.

PARKING

The proposed BMPs would not generate any parking demands. Therefore, this analysis focused on examining the potential for any on-street parking impacts that may result from the proposed street demappings. The potential for parking impacts was examined qualitatively.

TRANSIT

The proposed project would not generate any additional transit trips. In the event that any bus or rail service is permanently affected by the siting of a BMP and the resulting street closures (see the discussion above), modifications to these services were described. This task also addresses any need for potential coordination with the MTA with respect to the construction within the right of way of the Staten Island Railway property and operations.

PEDESTRIANS

The proposed project would not generate any additional pedestrian trips. In the event that any sidewalks or pedestrian circulation patterns would be permanently affected by the siting of a BMP and the resulting street closures (see the discussion above) these modifications were described.

O. AIR QUALITY

The proposed amended drainage plans would not generate any air emissions and traffic diversions from modifications to the street grid are expected to be limited. Therefore, only a screening analysis of potential air quality impacts was performed for this EIS.

P. NOISE

The proposed amended drainage plans would not generate any air emissions and traffic diversions from modifications to the street grid are expected to be limited. Therefore, only a screening analysis of potential noise impacts was performed for this EIS.

Q. GREENHOUSE GAS EMISSIONS

The proposed amended drainage plans would not generate any air emissions. Therefore, only a screening analysis of potential greenhouse gas emission impacts was performed for this EIS.

R. PUBLIC HEALTH

Based on the conclusions of prior environmental reviews in the South Richmond watersheds, no significant adverse impacts on public health are expected from the proposed project. Therefore, this assessment was limited to a screening analysis in accordance with the *CEQR Technical Manual.*

S. NEIGHBORHOOD CHARACTER

Neighborhood character impacts are assessed based on the cumulative impacts of socioeconomic conditions, historic resources, urban design, community facilities, traffic and noise. Based on the work performed for prior Bluebelt EISs in the South Richmond area found no significant adverse neighborhood character impacts were disclosed. Therefore, this analysis was limited to a CEQR screening.

T. CONSTRUCTION IMPACTS

The construction program for each proposed capital project would vary depending on the extent of the proposed sewer and BMP design covered by that particular project. Measures that may be implemented as part of each capital project to reduce construction impacts (e.g., soil erosion and sediment control, dust suppression, noise controls) were also taken into account in this analysis. Therefore, for this analysis a generic description of the construction program was provided that examined:

- A typical construction program;
- Directly and indirectly impacted areas;
- Open space (for BMPs proposed in parkland) and any temporary loss of use;
- Historic archaeological and architectural resources;
- Natural resources protections measures;
- Hazardous materials;
- Transportation including trip generation and traffic management;
- Air quality and airborne particulates; and
- Noise and vibration.

U. GROWTH-INDUCING ANALYSES

An analysis was conducted to determine if the proposed project could "induce" growth, primarily through the introduction of new infrastructure that may result in land development that might otherwise not occur. To determine if growth would be induced by the proposed plan and, if so, to what extent, this analysis includes:

- An examination of baseline land use and zoning conditions to determine the presence and extent of any vacant land and the allowable developable density base on zoning;

- Research on development patterns and trends, including an examination of population and housing trends; and
- Identification of potential impediments to development on remaining vacant lots (e.g., the presence of freshwater or tidal wetlands).

Vacant lots identified as potentially developable were evaluated for the likelihood of development in the future both with and without the proposed project in place. The difference, if any, between those two conditions represents the potential induced growth. ✷