A. INTRODUCTION

The potential for air quality impacts from the proposed project is examined in this chapter. Air quality impacts can be either direct or indirect. Direct impacts stem from emissions generated by stationary sources at a development site, such as emissions from fuel combustion on-site for heating and hot water systems. Indirect impacts could be caused by emissions from nearby existing stationary sources and the emissions from on-road vehicle trips generated by the proposed project or other changes to future traffic conditions due to the proposed project.

Potential effects of air toxic emissions on future visitors to the proposed park area also assessed. Potential for exposure to air toxic compounds includes both onsite and off-site air emission sources. Nearby industrial sites are the most likely off-site sources to be found in the area. Onsite sources include existing New York City Department of Sanitation (DSNY) facilities and other sources that are mostly related to the landfill gas collection and flare systems. These analyses are summarized in Chapter 21, "Public Health."

B. POLLUTANTS FOR ANALYSIS

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities are referred to as stationary source emissions. Ambient concentrations of CO are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (NO and NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and sources utilizing non-road diesel such as diesel trains, marine engines, and non-road vehicles (e.g., construction engines). On-road diesel vehicles currently contribute very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs.

CARBON MONOXIDE

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. Since CO is a reactive gas that does not persist in the atmosphere, CO concentrations can vary greatly over relatively short distances; elevated concentrations are usually limited to locations near crowded intersections, heavily traveled and congested roadways, parking lots, and garages. Consequently, CO concentrations must be predicted on a local, or microscale, basis.

The proposed project would result in changes in traffic patterns and an increase in traffic volume in the study area. Therefore, a mobile source analysis was conducted at critical intersections in the study area to evaluate future CO concentrations with and without the proposed project.

NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions. The change in regional mobile source emissions of these pollutants would be related to the total vehicle miles traveled added or subtracted on various roadway types throughout the New York metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).

The proposed project would potentially result in changes to the regional vehicular travel patterns in the study areas. Therefore, the change in regional NO_x and VOC emissions was analyzed.

There is a standard for average annual NO_2 concentrations, which is normally examined only for fossil fuel energy sources. An analysis of the potential NO_2 impacts from the proposed project's stationary sources of emissions was performed.

LEAD

Airborne lead emissions are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor vehicle related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one-quarter the level in 1975.

In 1985, EPA announced new rules that drastically reduced the amount of lead permitted in leaded gasoline. The maximum allowable lead level in leaded gasoline was reduced from the previous limit of 1.1 to 0.5 grams per gallon effective July 1, 1985, and to 0.1 grams per gallon effective January 1, 1986. Monitoring results indicate that this action has been effective in significantly reducing atmospheric lead concentrations. Effective January 1, 1996, the Clean Air Act (CAA) banned the sale of the small amount of leaded fuel that was still available in some parts of the country for use in on-road vehicles, concluding the 25-year effort to phase out lead in gasoline. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the national standard of 0.15 $\mu g/m^3$.

No significant sources of lead are associated with the proposed project, and, therefore, an analysis of this pollutant from stationary or mobile sources is not warranted.

RESPIRABLE PARTICULATE MATTER—PM_{10} AND $PM_{2.5}$

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. The constituents of PM are both numerous and varied, and they are emitted from a

wide variety of sources (both natural and anthropogenic). Natural sources include the condensed and reacted forms of naturally occurring VOC; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption of other pollutants, often toxic and some likely carcinogenic compounds.

As described below, PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers, or $PM_{2.5}$, and particles with an aerodynamic diameter of less than or equal to 10 micrometers, or PM_{10}, which includes the smaller $PM_{2.5}$. $PM_{2.5}$ has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from an exhaust pipe or stack) or from precursor gases reacting in the atmosphere to form secondary PM.

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is $PM_{2.5}$. PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel-powered vehicles. The proposed project would not result in any significant increases in truck traffic near the project site or in the region. The maximum number of projected automobile trips at an intersection is equivalent to approximately 18 additional truck trips based on MOBILE6.2 engine emission factors for the proposed project's 2036 analysis year. This is below the New York City Department of Environmental Protection's (NYCDEP) current threshold (19 trucks, based on the average daily traffic volume and type of roadway) for conducting a $PM_{2.5}$ microscale mobile source analysis. Therefore, an analysis of potential impacts from mobile sources of PM was not warranted.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. Monitored SO_2 concentrations in New York City are below the national standards. Due to the Federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore, an analysis of SO_2 from mobile sources was not warranted.

As part of the proposed project, fossil fuel would be burned in the proposed HVAC systems. Therefore, an analysis was performed to estimate the future levels of SO_2 with the proposed project.

AIR TOXICS

In addition to the criteria pollutants discussed above, non-criteria toxic air pollutants, also called air toxics, are regulated. Air toxics are those pollutants that are known or suspected to cause serious health effects in small doses. Air toxics are emitted by a wide range of man-made and naturally occurring sources. Emissions of air toxics from industries are regulated by EPA. Federal ambient air quality standards do not exist for non-criteria compounds. However, the New York State Department of Environmental Conservation (DEC) has issued standards for

certain non-criteria compounds, including beryllium, gaseous fluorides, and hydrogen sulfide. DEC has also developed ambient guideline concentrations for numerous air toxic non-criteria compounds. The DEC guidance document DAR-1 (December 2003) contains a compilation of annual and short term (1-hour) guideline concentrations for these compounds. The DEC guidance thresholds represent ambient levels that are considered safe for public exposure.

EPA has also developed guidelines for assessing exposure to air toxics. These exposure guidelines are used in health risk assessments to determine the potential effects to the public.

The potential impacts from adjacent industrial sources on air toxics concentrations within the project area were also examined.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS (NAAQS)

As required by the CAA, primary and secondary NAAQS have been established for six major air pollutants: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are intended to protect the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. For NO_2, ozone, lead, and PM, the primary and secondary standards are the same; there is no secondary standard for CO. The standards for these pollutants are presented in Table 18-1. These standards have also been adopted as the ambient air quality standards for New York State. In addition, New York State has established ambient air quality standards for total suspended particulate, non-methane hydrocarbons, beryllium, gaseous fluorides, and hydrogen sulfide.

On September 21, 2006, EPA revised the NAAQS for PM, effective December 18, 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and retaining the level of the annual fine standard at 15 $\mu g/m^3$. The PM_{10} 24-hour average standard was retained, and the annual average PM_{10} standard was revoked. EPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective in May 2008.

EPA lowered the primary and secondary standards for lead to 0.15 $\mu g/m^3$, effective January 12, 2009. EPA revised the averaging time to a rolling 3-month average and the form of the standard to not-to-exceed across a 3-year span. The current lead NAAQS will remain in place for one year following the effective date of attainment designations for any new or revised NAAQS before being revoked, except in current non-attainment areas, where the existing NAAQS will not be revoked until the affected area submits, and EPA approves, an attainment demonstration for the revised lead NAAQS.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS (SIP)

The CAA, as amended in 1990, defines non-attainment areas (NAAs) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA.

Table 18-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	$\mu g/m^3$	ppm	$\mu g/m^3$
Carbon Monoxide (CO)				
8-Hour Average (1)	9	10,000	None	
1-Hour Average (1)	35	40,000		
Lead				
Rolling 3-Month Average (5)	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average (2)	0.075	150	0.075	150
Respirable Particulate Matter (PM_{10})				
24-Hour Average (1)	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Average of 3 Annual Means	NA	15	NA	15
24-Hour Average (3,4)	NA	35	NA	35
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80	NA	NA
Maximum 24-Hour Average (1)	0.14	365	NA	NA
Maximum 3-Hour Average (1)	NA	NA	0.50	1,300

Notes:
ppm – parts per million
$\mu g/m^3$ – micrograms per cubic meter
NA – not applicable
PM concentrations are in $\mu g/m^3$ since ppm is a measure for gas concentrations. Concentrations of all gaseous pollutants are defined in ppm and approximately equivalent concentrations in $\mu g/m^3$ are presented.
(1) Not to be exceeded more than once a year.
(2) 3-year average of the annual fourth highest daily maximum 8-hr average concentration. EPA has reduced these standards down from 0.08 ppm, effective May 27, 2008.
(3) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(4) EPA has lowered the NAAQS down from 65 µg/m3, effective December 18, 2006.
(5) EPA has lowered the NAAQS down from 1.5 µg/m3, effective January 12, 2009.
Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

In 2002, EPA re-designated New York City as in attainment for CO, since the levels of CO had been consistently below the standards for a number of years. The CAA requires that a maintenance plan ensure continued compliance with the CO NAAQS for former non-attainment areas. New York City is also committed to implementing site-specific control measures throughout the City to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period.

Manhattan has been designated as a moderate NAA for PM_{10}. On December 17, 2004, EPA took final action designating the five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties as a $PM_{2.5}$ non-attainment area under the CAA due to exceedance of the annual average standard. New York State has submitted a draft SIP to EPA, dated April 2008, designed to meet the annual average standard by April 8, 2010, which will be finalized after public review.

As described above, EPA has revised the 24-hour $PM_{2.5}$ standard. In December 2008 EPA designated the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS, effective in April 2009. The nonattainment area includes the same 10-county area EPA designated as nonattainment with the 1997 annual $PM_{2.5}$ NAAQS. By April 2012 New York will be required to submit a SIP demonstrating attainment with the 2006 24-hour standard by 2014 (EPA may grant attainment date extensions for up to five additional years).

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA) and the five counties of New York City had been designated as a severe non-attainment area for ozone 1-hour standard. In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*, which was finalized and approved by EPA effective March 6, 2002, addressing attainment of the 1-hour ozone NAAQS by 2007. These SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard, and an update of the SIP estimates using the latest versions of the mobile source emissions model, MOBILE6.2, and the nonroad emissions model, NONROAD—which have been updated to reflect current knowledge of engine emissions and the latest mobile and nonroad engine emissions regulations.

On April 15, 2004, EPA designated these same counties as moderate non-attainment for the new 8-hour ozone standard, which became effective as of June 15, 2004 (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). EPA revoked the 1-hour standard on June 15, 2005; however, the specific control measures for the 1-hour standard included in the SIP will be required to stay in place until the 8-hour standard is attained. The discretionary emissions reductions in the SIP would also remain but could be revised or dropped based on modeling. On February 8, 2008, NYSDEC submitted final revisions to a new SIP for the ozone to EPA. NYSDEC has determined that achieving attainment for ozone before 2012 is unlikely, and has therefore made a request for a voluntary reclassification of the New York nonattainment area as "serious."

In March 2008 EPA strengthened the 8–hour ozone standards. EPA expects designations to take effect no later than March 2010 unless there is insufficient information to make these designation decisions. In that case, EPA will issue designations no later than March 2011. SIPs will be due three years after the final designations are made.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *City Environmental Quality Review (CEQR) Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected. In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see Table 18-1) would be deemed to have a potential significant adverse impact. In addition, in order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

DE MINIMIS CRITERIA REGARDING CO IMPACTS

New York City has developed *de minimis* criteria to assess the significance of the incremental increase in CO concentrations that would result from proposed projects or actions, as set forth in the *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Build 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline (i.e., No Build) concentrations and the 8-hour standard, when No Build concentrations are below 8.0 ppm.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

The number of project-generated and diverted vehicle trips exceeds the *CEQR Technical Manual* threshold of 100 at a number of locations in the primary and secondary traffic study areas. Therefore, a microscale analysis was conducted to assess the potential mobile source air quality impacts from the proposed project. In addition, to address long-term issues associated with new connections to the West Shore Expressway, critical locations were evaluated using the New York State's Department of Transportation's (NYSDOT) *Environmental Procedures Manual (EPM).*

MICROSCALE ANALYSIS

The prediction of vehicle-generated CO emissions and their dispersion in an urban environment incorporates meteorological phenomena, traffic conditions, and physical configurations. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and geometry combine to affect pollutant concentrations. The mathematical expressions and formulations contained in the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions, and it is necessary to predict the reasonable worst-case condition, most of these dispersion models predict conservatively high concentrations of pollutants.

The mobile source analyses for the proposed project employ models approved by EPA that have been widely used for evaluating air quality impacts of projects in New York City, other parts of New York State, and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels, resulting in a conservatively high estimate of expected pollutant concentrations that could result from the proposed project.

Dispersion Model for Microscale Analyses

Maximum CO concentrations adjacent to streets near the project site and rezoning area, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0. The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of pollutants from idling and moving vehicles. The queuing

algorithm includes site-specific traffic parameters, such as signal timing and delay calculations (from the 2000 *Highway Capacity Manual* traffic forecasting model), saturation flow rate, vehicle arrival type, and signal actuation (i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model is employed if maximum predicted future CO concentrations are greater than the applicable ambient air quality standards or when *de minimis* thresholds are exceeded using the first-level CAL3QHC modeling.

Meteorology

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability. Wind direction influences the accumulation of pollutants at a particular prediction location (receptor), and atmospheric stability accounts for the effects of vertical mixing in the atmosphere.

Following the EPA guidelines, CO computations were performed using a wind speed of 1 meter per second, a 1,000 meter mixing height and the neutral stability class D. Concentrations were calculated using a wind angle increment of 1 degree. The 8-hour average CO concentrations were estimated by multiplying the predicted 1-hour average CO concentrations by a factor of 0.70 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 1.27 meters was chosen, and a 43° Fahrenheit ambient temperature was assumed for the emissions computations, based on guidance provided in the *CEQR Technical Manual*. At each receptor location, the wind angle that maximized the pollutant concentrations was used in the analysis regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

Analysis Years

The microscale analyses were performed for existing conditions an interim analysis year of 2016, and 2036, the year for full implementation of the park. The future analysis was performed both with and without the proposed project.

Vehicle Emissions Data

Vehicular CO emission factors were computed using the EPA mobile source emissions model, MOBILE6.2. This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway types, number of starts per day, engine soak time, and various other factors that influence emissions, such as changes in fuel and tailpipe emission standards, and inspection maintenance programs. The inputs and use of MOBILE6.2 incorporates the most current guidance available from DEC and NYCDEP.

Appropriate credits were used to accurately reflect the New York State inspection and maintenance program, which requires inspections of automobiles and light trucks to determine if pollutant emissions from the vehicles' exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State.

Vehicle classification data were based on field studies conducted for the proposed project. The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative fleet-wide breakdown.

An ambient temperature of 43° F was used. The use of this temperature is recommended in the *CEQR Technical Manual* for the Borough of Staten Island and is consistent with current NYCDEP guidance.

Traffic Data

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the proposed project (see Chapter 16, "Traffic and Parking"). Traffic data for the future without and with the proposed project were employed in the respective air quality modeling scenarios. The weekday evening (5 to 6 PM), weekend midday (1 to 2 PM) and weekend evening (4 to 5 PM) peak periods were analyzed. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated and future Build traffic and, therefore, have the greatest potential for significant air quality impacts.

Background Concentrations

Background concentrations are those pollutant levels not directly accounted for through the modeling analysis (which directly accounts for vehicle-generated emissions on the streets within 1,000 feet and line-of-sight of the receptor location). Background concentrations must be added to modeling results to obtain total pollutant concentrations at a study site. The highest background concentrations monitored at the nearest DEC background monitoring station in the most recent 3-year period were used. It was conservatively assumed that the maximum background concentrations occur on all days.

The 8-hour average CO background concentration used in this analysis was 2.4 ppm, which is based on the second-highest 8-hour measurements over the most recent 3-year period for which complete monitoring data is available (2004–2006), using measurements obtained at the Perth Amboy monitoring station located in New Jersey. The 1-hour CO background employed in the analysis was 3.0 ppm.

Mobile Source Analysis Sites

Four intersection locations were selected for microscale analysis (see Table 18-2 and Figure 18-1). These intersections were selected because they are the locations in the study area where the largest levels of project-generated traffic are expected and, therefore, where the maximum changes in the concentrations would be expected and where the highest potential for air quality impacts would occur. Each of these intersections was analyzed for CO.

Table 18-2
Mobile Source Analysis Intersection Locations

Receptor Site	Location
1	Richmond Avenue @ Richmond Hill Road
2	Richmond Avenue @ Forest Hill Road
3	Richmond Hill Road @ Forest Hill Road
4	Richmond Avenue @ Yukon Avenue

Receptor Locations

Multiple receptors (i.e., precise locations at which concentrations are predicted) were modeled at each of the selected sites. Receptors were placed along the approach and departure links at spaced intervals. Local model receptors were placed at sidewalk or roadside locations near intersections with continuous public access and at residential locations.

MOBILE SOURCE AIR QUALITY SCREENING ANALYSIS

An assessment of the potential air quality effects of CO emissions that would result from vehicles coming to and departing from the proposed new interchanges along the West Shore Expressway within the proposed park was performed following the procedures outlined in the NYSDOT *EPM*. The study area includes six intersections for the CO microscale analysis. The screening procedure described below employed the traffic analysis results for the 2016 and 2036 analysis years.

CO Screening Criteria

Screening criteria described in the *EPM* were employed to determine whether the proposed project requires a detailed air quality analysis at the intersections in the study area. Before undertaking a detailed microscale modeling analysis of CO concentrations at the study area intersections, the screening criteria first determine whether the action would increase traffic volumes or implement any other changes (e.g., changes in speed, roadway width, sidewalk locations, or traffic signals) to the extent whereby significant increases in air pollutant concentrations could be expected. The following multi step procedure is suggested in the *EPM* to determine if there is the potential for CO impacts from the proposed project:

- **Level of Service (LOS) Screening:** If the Build condition LOS is A, B, or C, no air quality analysis is required. For intersections operating at LOS D or worse, proceed to Capture Criteria.
- **Capture Criteria:** If the Build condition LOS is at D, E, or F, then the following Capture Criteria should be applied at each intersection or corridor to determine if an air quality analysis may be warranted:
  - A 10 percent or more reduction in the distance between source and receptor (e.g., street or highway widening); or
  - a 10 percent or more increase in traffic volume on affected roadways for the analysis year; or
  - a 10 percent or more increase in vehicle emissions for the analysis year using emission factors provided in the *EPM*; or
  - any increase in the number of queued lanes for the analysis year (this applies to intersections); it is not expected that intersections in the Build condition controlled by stop signs would require an air quality analysis; or
  - A 20 percent reduction in speed when average Build speeds are below 30 miles per hour (mph).

If the project does not meet any of the above criteria, a microscale analysis is not required. If the project is located within a half mile of any intersections evaluated in the CO SIP Attainment Demonstration, (as identified in the NYSDOT *EPM*'s Chapter 1.1, Table 2 by county), more stringent screening criteria are applied at project-affected intersections. Should any one of the above criteria be met in addition to the LOS screening, then a Volume Threshold Screening is

performed, using traffic volume and emission factor data to compare with specific volume thresholds established in the *EPM*.

Both the Capture Criteria and Volume Threshold Screening were developed by the NYSDOT to be very conservative air quality estimates based on worst-case assumptions. The *EPM* states that if the project-related traffic volumes are below the volume threshold criteria, then a microscale air quality analysis is unnecessary even if the other Capture Criteria are met for a location with LOS D or worse, since a violation of the NAAQS would be extremely unlikely.

MOBILE SOURCE AIR QUALITY SCREENING RESULTS

The area roadway intersections were reviewed based on NYSDOT's *EPM* criteria for determining locations that may warrant a CO microscale air quality analysis. The screening analysis examined the LOS and projected volume increases by intersection approach. As described below, the results of the screening analysis show that none of the intersections affected by the project would require a detailed microscale air quality analysis.

LOS Screening Analysis

Results of the traffic capacity analysis performed for the 2016 and 2036 analysis year were reviewed for the weekday PM and weekend Midday/PM peak periods at each of the study area intersections to determine the potential need for a microscale air quality analysis. The LOS screening criteria were first applied to identify those intersections with approach LOS D or worse, which would result in positive traffic diversions resulting from the new interchanges along the West Shore Expressway. Based on the review of those intersections analyzed, the following intersections were projected to operate at a LOS D or worse on approaches for the weekday PM and/or weekend Midday/PM peak traffic periods:

- Victory Boulevard and the Route 440 Southbound Ramp
- Victory Boulevard and the Route 440 Northbound Ramp (2036 only)
- Muldoon Avenue and the Route 440 Southbound Service Road
- Arden Avenue and the Route 440 Southbound Service Road
- Richmond Hill Road and Forest Hill Road

Capture Criteria Screening Analysis

Further screening on the intersections identified in the LOS Screening Analysis was conducted using the Capture Criteria outlined above. This screening indicated that for three of the above five intersections, one of the listed Capture Criteria would be met for at least one of the project's Build years: a 10 percent or more increase in traffic volume on affected roadways for the Build year. Therefore, a volume threshold screening analysis was conducted for the following three intersections:

- Victory Boulevard and the Route 440 Southbound Ramp (2036 only)
- Arden Avenue and the Route 440 Southbound Service Road
- Richmond Hill Road and Forest Hill Road

Volume Threshold Screening

Since one of the capture criteria listed above was triggered, a volume threshold screening analysis was conducted to further determine the need for a microscale air quality analysis. The

volume thresholds (provided in the *EPM*) establish traffic volumes below which a violation of the NAAQs for CO is extremely unlikely. This approach uses project area specific emissions data to determine corresponding vehicle thresholds. For intersections where approach volumes are equal to or less than the applicable thresholds, microscale air quality analysis is not required. Based on the volume threshold screening, the project-related traffic volumes at each of the intersections would be below the volume threshold criteria. Therefore, a detailed CO microscale air quality analysis was not required based on the *EPM* screening criteria at these intersections.

STATIONARY SOURCES

As discussed earlier, existing stationary sources on or near the project site include a DSNY solid waste transfer station and landfill gas collection and management systems. Existing sources of sources of emissions from HVAC and air toxics sources are discussed and analyzed in Chapter 21, "Public Health."

E. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS

Monitored background concentrations of SO_2, NO_2, CO, ozone, lead, PM_{10}, and $PM_{2.5}$ for the study area are shown in Table 18-3. These values are the most recent monitored data that have been made available by DEC and the New Jersey Department of Environmental Protection (NJDEP). NJDEP sites were selected in cases where recent data at nearby sites in New York City were not available, and are representative of conditions in upwind urbanized areas and are therefore considered conservative indicators of background conditions within and near the proposed park. In the case of the 8-hour ozone and 24-hour $PM_{2.5}$, concentrations reflect the most recent three years of data, consistent with the basis for these standards. There were no monitored violations of NAAQS at these monitoring sites, with the exception of the maximum 8-hour ozone concentration. For modeling purposes, the analysis utilized the maximum values over the most recent three-year period.

Table 18-3
Representative Monitored Ambient Air Quality Data

Pollutants	Location	Units	Period	Concentration	Exceeds Federal Standard?	
					Primary	Secondary
CO	Perth Amboy, NJ	ppm	8-hour	2.4	N	N
			1-hour	3.0	N	N
SO_2	Perth Amboy, NJ	µg/m^3	Annual	16	N	-
			24-hour	58	N	-
			3-hour	117	-	N
Respirable particulates (PM_{10})	PS 59, Manhattan	µg/m^3	Annual	25	N	N
			24-hour	53	N	N
Respirable particulates ($PM_{2.5}$)	Port Richmond, SI	µg/m^3	Annual	13	N	N
			24-hour	34.6	N	N
NO_2	Elizabeth Lab, NJ	µg/m^3	Annual	60	N	N
Lead	JHS 126, Brooklyn	µg/m^3	3-month	0.02	N	-
Ozone (O_3)	Susan Wagner, SI	ppm	1-hour	0.105[(1)]	-	-
			8-hour	0.083	Y	Y

Notes:
[1] The 1-hour ozone NAAQS has been replaced with the 8-hour standard; however, the maximum monitored concentration is provided for informational purposes.
Source: DEC, 2007 New York State Ambient Air Quality Data; NJDEP, 2005 Air Quality Report.

PREDICTED CO CONCENTRATIONS IN THE STUDY AREA

As noted previously, receptors were placed at multiple sidewalk locations next to the intersections under analysis. The receptor with the highest predicted CO concentrations was used to represent these intersection sites for the existing conditions. CO concentrations were calculated for each receptor location, at each intersection, for each peak period specified above.

Table 18-4 shows the maximum predicted existing (2007) CO 8-hour average concentrations at the receptor sites. (No 1-hour values are shown, since predicted values are much lower than the 1-hour standard of 35 ppm.) At all receptor sites, the maximum predicted 8-hour average concentrations are well below the national standard of 9 ppm.

Table 18-4
Maximum Predicted Existing 8-Hour Average Carbon Monoxide Concentrations for 2007

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Richmond Avenue @ Richmond Hill Road	Weekday	5.2
2	Richmond Avenue @ Forest Hill Road	Weekday	5.3
3	Richmond Hill Road @ Forest Hill Road	Weekday	4.0
4	Richmond Hill Road @ Yukon Avenue	Weekday	5.3
Note: 8-hour standard is 9 ppm.			

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES ANALYSIS

2011 ANALYSIS

It is assumed that no significant changes in background air quality would occur through this analysis year.

2016 ANALYSIS

CO concentrations without the proposed project were determined for the 2016 analysis year using the methodology previously described. Table 18-5 shows future maximum predicted 8-hour average CO concentrations at the analysis intersections without the proposed project (i.e., No Build values). The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed. As shown in Table 18-5, No Build values are predicted to be well below the 8-hour CO standard of 9 ppm.

Table 18-5
Future (2016) Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Richmond Avenue @ Richmond Hill Road	Weekday	4.9
2	Richmond Avenue @ Forest Hill Road	Weekend	4.9
3	Richmond Hill Road @ Forest Hill Road	Weekday	4.4
4	Richmond Avenue @Yukon Avenue	Weekend	4.7
Note: 8-hour standard is 9 ppm.			

2036 ANALYSIS

CO concentrations without the proposed project were determined for the 2036 analysis year using the methodology previously described. Table 18-6 shows future maximum predicted 8-hour average CO concentrations at the analysis intersections without the proposed project (i.e., No Build values). The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed. As shown in Table 18-6, No Build values are predicted to be well below the 8-hour CO standard of 9 ppm.

Table 18-6
Future (2036) Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Richmond Avenue @ Richmond Hill Road	Weekday	5.1
2	Richmond Avenue @ Forest Hill Road	Weekday	5.3
3	Richmond Hill Road @ Forest Hill Road	Weekday	4.5
4	Richmond Avenue @Yukon Avenue	Weekend	4.8
Note: 8-hour standard is 9 ppm.			

STATIONARY SOURCE ANALYSIS

In the future without the proposed project, no development would occur on the project site beyond the installation of the final cover at Landfill Section 6/7 in accordance with the approved plan.

G. THE FUTURE WITH THE PROPOSED PROJECT

The proposed project would result in increased mobile source emissions in the immediate vicinity of the project site and rezoning area. This section describes the results of the studies performed to analyze the potential impacts on the surrounding community from these sources. The areas of concern are discussed below.

MOBILE SOURCES ANALYSIS

PROPOSED ROAD EMBANKMENT (2011)

Since no changes in vehicular travel would occur under the 2011 proposed landfill cover road embankment, no changes in air quality conditions would occur. Provided in Appendix E is an analysis of the potential additional air emissions that would be expected during the added duration of landfill closure under the proposed final cover plan. As described in that Appendix, the added emissions are negligible and would not result in a significant adverse air quality impact due to the proposed project. (Chapter 20, "Construction," provides a construction period analysis of the proposed project.)

YUKON AVENUE CONNECTION (2016)

CO concentrations with the proposed project were determined for the 2016 Build condition at traffic intersections using the methodology previously described. Table 18-7 shows the future maximum predicted 8-hour average CO concentration with the proposed project at the three intersections studied. (No 1-hour values are shown, since no exceedances of the NAAQS would

occur and the *de minimis* criteria are only applicable to 8-hour concentrations; therefore, the 8-hour values are the most critical for impact assessment.) The values shown are the highest predicted concentration for any of the time periods analyzed.

Table 18-7
Future (2016) Maximum Predicted 8-Hour Average
No Build and Build Carbon Monoxide Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Build	Build
4	Richmond Avenue @ Yukon Avenue	Weekday	4.7	5.2
Note: 8-hour standard is 9 ppm.				

The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations would be very small and, consequently, would not result in a violation of the CEQR *de minimis* CO criteria. (The *de minimis* criteria were previously described in Section D. of this chapter.) Therefore, the proposed project would not result in any significant adverse CO air quality impacts.

2036 ANALYSIS

Forest Hill Road and Richmond Hill Road Connections

The 2036 analysis was conducted for traffic conditions assuming three connections along Richmond Avenue (at Richmond Hill Road, Yukon Avenue, and Forest Hill Road) and the associated volumes of traffic in 2036. The volumes of traffic are common under these three-connection scenarios, regardless of whether the through roads contain two- or four-lane-wide roads.

Modeled CO concentrations assuming these conditions are presented below in Table 18-8. As shown in that table, the future maximum predicted 8-hour average CO concentration with the proposed project at the three intersections studied. (No 1-hour values are shown, since no exceedances of the NAAQS would occur and the *de minimis* criteria are only applicable to 8-hour concentrations; therefore, the 8-hour values are the most critical for impact assessment.) The values shown are the highest predicted concentration for any of the time periods analyzed.

Table 18-8
Future (2036) Maximum Predicted 8-Hour Average
No Build and Build Carbon Monoxide Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Build	Build
1	Richmond Avenue @ Richmond Hill Road	Weekend	4.9	5.8
2	Richmond Avenue @ Forest Hill Road	Weekday	5.3	6.5
3	Richmond Hill Road @ Forest Hill Road	Weekday	4.5	4.7
4	Richmond Avenue @ Yukon Avenue	Weekday	4.8	5.6
Note: 8-hour standard is 9 ppm.				

The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations would be very small and, consequently, would not result in a violation of the CEQR *de minimis* CO criteria. (The

de minimis criteria were previously described in Section D. of this chapter.) Therefore, the proposed project would not result in any significant adverse CO air quality impacts.

Yukon Avenue Connection

The analysis below examines air quality conditions under the Yukon Avenue Connection option that assumes a connection only at Yukon Avenue in 2036. Under this design option, in 2016 and 2036, there would be only one connection from the park road to Richmond Avenue, at the intersection of Yukon Avenue. The park road connections at Richmond Hill Road and Forest Hill Road which were previously analyzed as part of the proposed design would not exist.

To analyze air quality conditions under this option, a microscale analysis for carbon monoxide was conducted at the proposed intersection location of Yukon Avenue and Richmond Avenue. It is assumed for analysis purposes that since this intersection would handle all the park road traffic, air quality conditions at this intersection would represent worst case conditions. This analysis followed the same modeling methodology described above. The microscale analysis was performed for existing and future conditions. The future analysis was performed both with and without the proposed project. Three worst-case traffic peak periods were analyzed and receptors were placed at multiple sidewalk locations next to the intersection. CO concentrations were calculated for each receptor location, for each peak period.

Table 18-9, below, shows the maximum predicted CO 8-hour average concentrations at this proposed intersection under existing conditions and conditions in the future with and without the proposed project. (No 1-hour values are shown, since predicted values under the modeling were all predicted to be much lower than the 1-hour standard of 35 ppm.) The values shown in the table are the highest predicted concentration at any receptor for any of the time periods analyzed. As shown in the table, the maximum predicted 8-hour average concentrations are well below the national standard of 9 ppm. In addition, the incremental increases in 8-hour average CO concentrations would not result in a violation of the CEQR *de minimis* CO criteria. Therefore, under the Yukon Avenue Alternative, the proposed project would not result in any significant adverse CO air quality impacts.

Table 18-9
Existing (2007) and Future (2036) Maximum Predicted 8-Hour Average No Build and Build Carbon Monoxide Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)		
			Existing (2007)	No Build	Build
4	Richmond Avenue @ Yukon Avenue	Weekend MD	5.3	4.8	5.6
Note: 8-hour standard is 9 ppm.					

MESOSCALE ANALYSIS

The proposed project would provide new connections to the West Shore Expressway, including the extension of service roads. An analysis is required to quantify the net change in regional emissions of NO_x, CO and VOCs. Initial pollutant burdens were based on the expected emissions from the vehicle miles traveled (VMT) that would occur in the absence of the new interchanges along the West Shore Expressway within the proposed park. These were compared to the build pollutant burdens predicted from the project-generated traffic. The results of the analysis indicated a slight increase in emissions (less than 5 percent) for each of the analyzed

pollutants as compared to the no build condition. According to the NYSDOT *EPM*, projects with a VMT difference of 10 percent or more are considered to have a potential significant impact on regional emissions. This mesoscale analysis is conservative since it does not take into account vehicle emissions due to idling. The proposed new connections to the West Shore Expressway are expected to reduce traffic congestion on local roads, which will reduce idling at intersections. In sum, the slight increase in emissions from the proposed project is not considered to be regionally significant.

STATIONARY SOURCE ANALYSIS

IMPACTS FROM PARK FACILITIES

No new emissions from the landfill are anticipated nor would the proposed park facilities or roads affect the Fresh Kill Landfill Title V air permit.

The primary stationary source of air pollutants associated with the proposed park would be emissions from the combustion of fossil fuels by HVAC equipment. The proposed park structures would be located at least 200 feet from any off-site sensitive use, such as residences. Assuming the proposed structures would be largely one story in height, and using Figure 3Q-6 of the *CEQR Technical Manual* as guidance, it is not expected that any individual park structure would result in any potential significant adverse air quality impact.

IMPACTS FROM FRESH KILLS LANDFILL ON GREENHOUSE GAS EMISSION

At Fresh Kills Landfill, the collected gases are either sent to a gas recovery plant for re-use as pipeline natural gas after pre-treatment or directed to a flaring station. The primary objectives of the system are to control odors and prevent adverse impacts on air quality. The methane content of landfill gas (usually about 50 percent) is the reason why it can be flared or used as fuel. As with any combustion source, carbon dioxide, a greenhouse gas, is emitted as a by-product of burning the methane. However, methane is also a greenhouse gas and is considered to be at least 20 times more potent a greenhouse gas than carbon dioxide. Therefore, any release of carbon dioxide into the atmosphere from methane combustion would be a minimized impact when compared with the release of methane generated by the landfill, assuming no flaring or gas recovery reuse systems were in place. Current operations at the landfill rely predominantly on landfill gas recovery and re-use as pipeline natural gas. This re-use displaces the need for natural gas from other utility sources that would otherwise have been burned by local customers, providing an overall net benefit to air quality and providing a positive effect with regards to greenhouse gas reductions.

On September 9, 2008, DEC issued the report entitled *Draft Guide for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*. This report addresses the range of issues that are currently under consideration with respect to greenhouse gas emissions, global climate changes, and the affects on sea level rise. The report does not set a threshold for the determination of significance under SEQR, but it does begin to establish a framework for the evaluation of greenhouse gas emissions from larger projects. Among the large projects cited in the report are power-generating facilities and projects that generate millions of vehicle miles traveled or consume a substantial amount of energy. The six main greenhouse gases of concern are carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydroflourocarbons (HFCs), perflouracarbons (PFCs), and sulfur hexafluoride (SF_6). Of these, CO_2 accounts for an estimated 88 percent of the greenhouse emissions in New York State, of which the majority—

approximately 88 percent—come from fuel combustion. Other sources include distribution of energy, refrigerant substitutes, management of municipal waste, wastewater and agricultural activities (which generate methane and N_2O, natural gas leakage, and other sources).

The report recognizes that there are discrete actions that can be taken to reduce methane emissions from landfills. Among them are enhanced landfill gas collection, and flaring and re-use of landfill gas for energy production. The report states that each of these measures would have a positive impact on total greenhouse gas emissions in New York State with respect to landfill emissions.

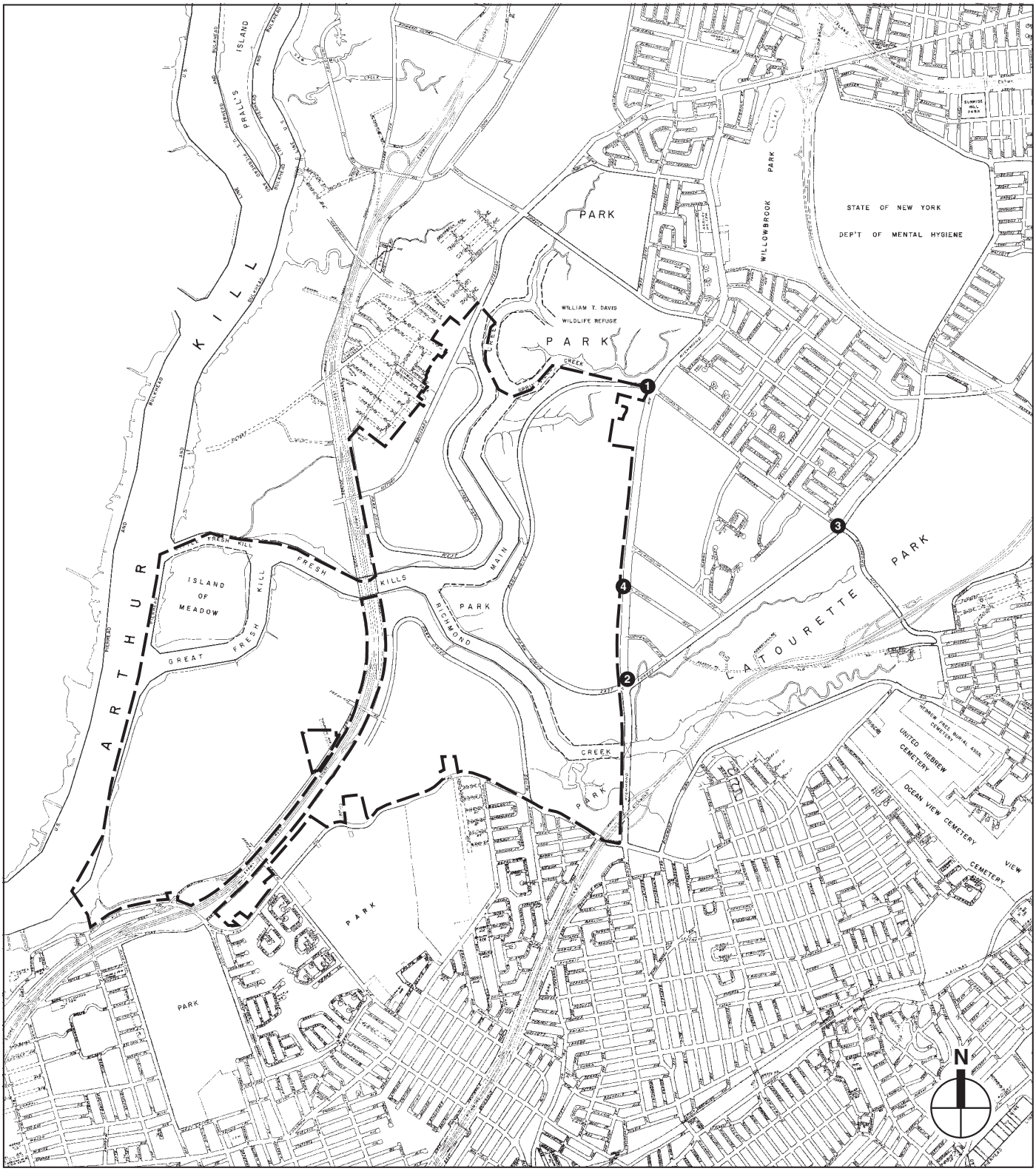
As described above and in Chapter 13 "Infrastructure," Fresh Kills Landfill incorporates such measures, including gas collection, flaring, and reuse for energy production. Also proposed with the Fresh Kills Park project, is a substantial landscaping and planting program that would further reduce the impacts of greenhouse gases.

As described in greater detail in Appendix E with respect to gas emissions during the construction period, the proposed project would not have a significant impact on greenhouse gas emissions.

CONCLUSIONS

Air quality modeling for the proposed project concluded that the proposed project would not result in any significant adverse air quality impacts on sensitive uses in the surrounding community. The maximum predicted pollutant concentrations and concentration increments from mobile sources with the proposed project would be below the corresponding air quality impact criteria in both 2016 and 2036 (all options). In addition, there would not be any impact from implementation of the Landfill Section 6/7 Final Cover Design Report, Addendum 1. ✷

6.3.09



Fresh Kills Project Site Boundary

❶ *Air Quality Receptor Locations*

Air Quality Receptor Locations

Figure 18-1