11.0 Air Quality

A. INTRODUCTION

This chapter analyzes the potential the Proposed Action to result in significant adverse air quality impacts. Analyses were undertaken of the following emissions sources and receptors:

- Emissions from increased traffic or changes in traffic patterns associated with the Proposed Action;
- Emissions from the heating systems of the proposed project on existing nearby land uses;
- Emissions from the heating systems of the proposed project on other project elements;
- Emissions from the heating systems of existing and future No-Build developments on residential units of the proposed project;
- Air toxic emissions generated by existing nearby industrial and commercial uses on residential units of the proposed project;
- Emissions from the nearby Ravenswood power generating facility on the upper floors of the proposed residential towers;
- Emissions from vehicles traveling on the Queensboro Bridge on residential units of the proposed project;
- Emissions from the proposed parking facility; and
- The cumulative impacts of vehicular emissions, garage emissions, Ravenswood emissions, and Queensboro Bridge traffic emissions.

These air quality analyses were conducted, in accordance with the procedures outlined in the *CEQR Technical Manual*, to determine whether the proposed action would result in violations of the National Ambient Air Quality Standards (NAAQS) or health-related guideline values. The methodologies and procedures utilized in these analyses are described below.

B. PRINCIPAL CONCLUSIONS

1. Mobile Source Analysis

a) Carbon Monoxide (CO)

The Proposed Action would not cause any exceedance of the NAAQS for CO or cause any significant CO impact greater than the New York City Department of Environmental Protection (NYCDEP) "de minimis" criteria for CO.

b) Fine Particulate Matter ($PM_{2.5}$)

The Proposed Action would not cause any increase greater than NYSDEP's 24-hour or annual interim Significant Threshold Values (STVs) for $PM_{2.5}$ in 2009.

Accordingly, the Proposed Action would not have any significant adverse air quality impacts associated with mobile source emissions.

2. Stationary Source Analysis

a) HVAC Analysis

The analysis of combustion exhausts associated with the proposed project's HVAC systems demonstrates that these emissions would not result in any significant air quality impacts. In addition, emissions from the heating systems of existing and future No Build buildings would not result in significant adverse air quality impacts at the residential uses associated with the Proposed Action.

b) Air Toxics Analysis

The air toxics analysis of the Proposed Action demonstrates that receptors at the proposed project would not experience any significant adverse impacts from nearby industrial sources.

c) Ravenswood Power Plant Analysis

The Ravenswood power plant analysis indicates that no exceedances of the NAAQS are predicted at the upper floors of the proposed project's residential towers as the result of emissions from the facility, and therefore, there would be no significant adverse impacts to air quality at these receptors.

d) Queensboro Bridge Emission Analysis

The analysis of Queensboro Bridge traffic emissions on the proposed project's receptor sites indicates that CO, PM_{10}, and $PM_{2.5}$, and total pollutant concentrations are below the NAAQS, and air quality levels at these receptors would therefore not be significantly adversely affected.

e) Parking Garage Analysis

Emissions associated with the proposed parking garage would not cause any exceedance of the NAAQS at either an adjacent sidewalk receptor or at receptors located at operable windows of the proposed residential towers, and therefore, there would be no significant adverse impacts to air quality levels at these locations.

f) Cumulative Impact Analysis

The cumulative analysis, incorporating emissions from the garage exhaust, mobile source emissions generated by the traffic at the nearby intersection, mobile source emissions from the Queensboro Bridge, emissions from HVAC systems, and emissions from the Ravenswood power plant, indicates that these cumulative emissions would not result in any exceedances of the NAAQS and therefore would not significantly adversely affect air quality levels at sensitive land uses.

Accordingly, the Proposed Action would not have any significant adverse impacts associated with stationary sources.

3. Analysis of Variations

Emissions associated with project-related mobile source and HVAC emissions, air toxic releases from nearby industrial facilities, the proposed parking garage, and the Queensboro Bridge traffic, either separately or cumulatively, under the three variations would not have any significant adverse air quality impacts, since the impacts associated with these emissions sources would be essentially the same as those analyzed for the Preferred Development Program.

C. POLLUTANTS OF CONCERN

The following air pollutants have been identified by the U.S. Environmental Protection Agency (USEPA) as being of concern nationwide: carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), ozone (O_3), particulate matter, sulfur oxides (SO_x), and lead (Pb). Ambient concentrations of CO, HC, and photochemical oxidants in New York City are predominantly influenced by motor vehicle activity; NO_x are emitted from both mobile and stationary sources; emissions of SO_x are associated mainly with stationary sources; and emissions of particulate matter are associated with stationary sources, and to a lesser extent, diesel-fueled mobile sources (heavy trucks and buses). Lead emissions, which historically were principally influenced by motor vehicle activity, have been substantially reduced due to the elimination of lead from gasoline.

1. Carbon Monoxide

CO is a colorless and odorless gas that is generated in the urban environment primarily by the incomplete combustion of fossil fuels in motor vehicles. In New York City, more than 80 percent of CO emissions are from motor vehicles. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO concentrations can vary greatly over relatively short distances. Relatively high concentrations of CO are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban “street canyon” conditions. Because traffic generated by the Proposed Action could affect CO levels at nearby congested intersections, the potential localized effects associated with these emissions were considered.

2. Hydrocarbons, Nitrogen Oxides, and Photochemical Oxidants

Hydrocarbons include a wide variety of volatile organic compounds, emitted principally from the storage, handling, and use of fossil fuels. NO_x constitute a class of compounds that include nitrogen dioxide (NO_2) and nitric oxide, both of which are emitted by motor vehicles and stationary sources. Both hydrocarbons and NO_x are of concern primarily because of their reaction in sunlight to form photochemical oxidants, including O_3. This reaction occurs comparatively slowly and ordinarily takes place far downwind from the site of actual pollutant emission. The effects of these pollutants are normally examined on an area wide, or mesoscale, basis. Since the Proposed Action would not significantly affect the amounts of these pollutants generated within the region, an analysis of these pollutants is not warranted, with the exception of NO_2, which is emitted from heating systems. The potential NO_2 impacts associated with emissions from the Proposed Action were considered.

3. Particulate Matter

Particulate matter is a broad class of air pollutants that exist as liquid droplets or solids, with a wide range of sizes and chemical composition. Particulate matter is emitted by a variety of sources, both natural and man-made. Natural sources include the condensed and reacted forms of natural organic vapors, salt particles resulting from the evaporation of sea spray, wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and debris from live and decaying plant and animal life, particles eroded from beaches, desert, soil and rock, and particles from volcanic and geothermal eruptions and forest fires. Major man-made sources of particulate matter include the combustion of fossil fuels such as vehicular exhaust, power generation and home heating, chemical and manufacturing processes, all types of construction (including that from equipment exhaust and re-entrained dust), agricultural activities, and wood-burning fireplaces. Fine particulate matter is also derived from combustion material that has volatilized and then condensed to form primary particulate matter (often after release from a stack or exhaust pipes) or from precursor gases reacting in the atmosphere to form secondary particulate matter. It is also derived from mechanical breakdown of coarse particulate matter, e.g., from building demolition or roadway surface wear.

Of particular health concern are those particles that are smaller than or equal to 10 microns (PM_{10}) in size and 2.5 microns ($PM_{2.5}$) in size. The principal health effects of airborne particulate matter are on the respiratory system. The potential impacts of particulate matter emitted from mobile sources, from the heating systems of existing and future No Build land uses and the proposed project, and from the nearby Ravenswood power plant, were considered.

4. Sulfur Oxides

High concentrations of SO_2 affect breathing and may aggravate existing respiratory and cardiovascular disease. SO_2 emissions are generated from the combustion of sulfur-containing fuels—oil and coal—largely from stationary sources such as power plants, steel mills, refineries, pulp and paper mills, and nonferrous smelters. In urban areas, especially in the winter, smaller stationary sources such as space heating systems contribute to elevated SO_2 levels. Ambient SO_2 levels recorded in New York City have complied with ambient air quality standards for the past 22 consecutive years. The potential impacts of SO_2 emissions from the heating systems of existing and future No Build land uses and the proposed project, and from the nearby Ravenswood power plant, were considered.

5. Lead

Lead emissions are principally associated with industrial sources and motor vehicles using gasoline containing lead additives. As the availability of leaded gasoline has decreased, motor vehicle-related lead emissions have decreased resulting in a significant decline of concentrations of lead. Atmospheric lead concentrations in New York City are well below national standards. Lead concentrations are expected to continually decrease; therefore an analysis of lead is not warranted.

6. Air Toxics

In addition to criteria pollutants, small quantities of a wide range of the non-criteria air pollutants, known as toxic air pollutants, which are emitted from nearby industrial and commercial facilities, are also of potential concern. These pollutants can be grouped into two categories: carcinogenic air pollutants, and non-carcinogenic air pollutants. These include hundreds of pollutants, ranging from high to low toxicity. No federal ambient air quality standards have been promulgated for toxic air pollutants. However, the USEPA and the NYSDEC have issued guidelines that establish acceptable ambient levels for these pollutants based on human exposure criteria.

In order to evaluate short-term and annual impacts of non-carcinogenic toxic air pollutants, the NYSDEC has established short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) for exposure limits. These are maximum allowable 1-hour and annual guideline concentrations, respectively, that are considered acceptable concentrations below which there should be no adverse effects on the health of the general public.

Based on SGCs and AGCs, the USEPA also developed methodologies that can be used to estimate the potential impacts of air toxic pollutants from multiple emission sources. The "Hazard Index Approach" can be used to estimate the potential impacts of non-carcinogenic pollutants. If the combined ratio of estimated pollutant concentrations divided by the respective SGCs or AGCs value for each of the toxic pollutants is found to be less than 1, no significant air quality impacts are predicted to occur.

The project site is located in an area with industrial uses. Therefore, air toxic emissions from existing industrial uses near the Project Site were considered.

D. AIR QUALITY STANDARDS AND GUIDELINES

1. Standards

NAAQS have been established for six major air pollutants: CO, NO_2, ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), SO_2, and lead (Pb). These standards, which are summarized in Table 11-1, have also been established as the ambient air quality standards for the State of New York. The "primary" standards have been established to protect the public health. 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 general welfare.

TABLE 11-1: APPLICABLE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Period	National and NY State Standards	
		Primary	Secondary
Ozone	1 Hour	0.12 ppm (235 µg/m^3)	Same as Primary
	8 Hour	0.08 ppm (157 µg/m^3)	
Carbon Monoxide	8 Hour	9 ppm (10 mg/m^3)	Same as Primary
	1 Hour	35 ppm (40 mg/m^3)	Same as Primary Standard
Nitrogen Dioxide	Annual Average	0.053 ppm (100 µg/m^3)	Same as Primary
Sulfur Dioxide	Annual Average	80 µg/m^3 (0.03 ppm)	-
	24 Hour	365 µg/m^3 (0.14 ppm)	-a
	3 Hour	--	1,300 µg/m^3 (0.5 ppm)
Suspended Particulate Matter (PM_{10})	24 Hour	150 µg/m^3	Same as Primary
	Annual Arithmetic Mean	50 µg/m^3	Same as Primary
Suspended Fine Particulate Matter ($PM_{2.5}$)	24 Hour	65 µg/m^3	Same as Primary
	Annual Arithmetic Mean	15 µg/m^3	Same as Primary
Lead	Calendar Quarter	1.5 µg/m^3	Same as Primary

Source: *U.S. Environmental Protection Agency, "National Primary and Secondary Ambient Air Quality Standards." (49 CFR 50). New York Department of Environmental Conservation*

ppm: parts per million
µg/m^3: micrograms per cubic meter

2. Impact Criteria

In addition to the federal and State standards, under *New York City's Environmental Quality Review* (CEQR) guidelines, incremental impact criteria, known as "de minimis" criteria, have been established to measure the impact significance of estimated increments.

a) CO Thresholds

Significant CO increments are characterized as:

- An increase of 0.5 ppm or more for the 8-hour period, when baseline concentrations are above 8.0 ppm; or
- An increase of one-half the difference between the baseline and the standard concentration (9 ppm) for the 8-hour period when baseline concentrations are below 8 ppm.

Project-related impacts less than these values are not considered to be significant.

b) $PM_{2.5}$ Thresholds

In 1997, the USEPA established the NAAQS for fine particulates ($PM_{2.5}$). The annual standard is 15 micrograms per cubic meter, and the 24-hour standard is 65 micrograms per cubic meter. Until the NYSDEC proposes a State Implementation Plan (SIP) to address compliance with the $PM_{2.5}$ standards, USEPA's Office of Air Quality Planning and USEPA Region II have indicated that the states have no obligations under the Clean Air Act concerning $PM_{2.5}$.

In the absence of standards for the analysis of $PM_{2.5}$ emissions applicable to the New York Metropolitan Area, the values referenced in the NYSDEC Commissioner's Policy (CP-33) (NYSDEC, 2003) and NYCDEP's Interim Guidelines (February 2004) were reviewed. The policy defines "de minimis" criteria for evaluating the potential for significant adverse impacts resulting from the emission of fine particulate matter.

These interim significant threshold values (STVs) are as follows:

- Predicted incremental impacts of $PM_{2.5}$ greater than 5 µg/m3 averaged over a 24-hour (daily) period at a discrete location of public access, either at ground or elevated levels (microscale analysis); and
- Predicted incremental ground-level impacts of $PM_{2.5}$ greater than 0.1 $\mu g/m^3$ on an annual average neighborhood-scale basis.

Project-related impacts less than these values are not considered to be significant.

E. EXISTING CONDITIONS

1. Monitored Data

Representative monitored ambient air quality data for the vicinity of the project site are shown in Table 11-2. These data were compiled by the NYSDEC for 2005, the latest calendar year for which data are currently available. Monitored levels for pollutants that are considered for this analysis (i.e., SO_2, NO_2, PM_{10}, and $PM_{2.5}$) do not exceed the NAAQS (with the exception of $PM_{2.5}$). $PM_{2.5}$ annual levels exceed the NAAQS of 15 $\mu g/m^3$ at the Maspeth Library monitoring site.

TABLE 11-2: REPRESENTATIVE AMBIENT AIR QUALITY DATA (2004)

Pollutant	Monitor	Averaging Time	Value	NAAQS
CO	14439 Gravett Road	8-Hour	3.1	9 ppm
		1-Hour	2.1	35 ppm
NO_2	120-07 15th Avenue	Annual	.027	0.053 ppm
PM_{10}	JHS 126, 424 Leonard St., Kings Co.	Annual	17	50 µg/m^3
		24-Hour	47	150 µg/m^3
$PM_{2.5}$	Maspeth Library	Annual	15.3	15 µg/m^3
		24-Hour	37.2	65 µg/m^3
SO_2	14439 Gravett Road	3-Hour	0.053	0.50 ppm
		24-Hour	0.030	0.14 ppm
		Annual	.006	0.03 ppm

Source: *NYSDEC 2005 Annual Ambient Air Monitoring Report*

Notes:
1. Values are the highest pollutant levels recorded during the 2005 calendar year.
2. ~~PM_{10} monitored values are for 2004, the last year of complete data in NYSDEC Region 2.~~

2. Regulatory Setting

The federal Clean Air Act (CAA) defines nonattainment areas as geographic regions that have been designated as not meeting one or more of the NAAQS, and maintenance areas as previously designated nonattainment areas that have demonstrated compliance with the NAAQS. The Project Site is located in an area designated as a nonattainment area for ozone and $PM_{2.5}$, and a maintenance area for CO.

3. Background Values

In estimating total pollution concentrations with and without the proposed action, it is necessary to include consideration of the background pollutant levels for the study area. The background level is the component of the total concentration not accounted for through the microscale modeling analysis. Applicable background concentrations were added to the modeling results to obtain total pollutant concentrations at each receptor site for each analysis year. The CO background values, which are based on the most recent ambient monitoring data and future decreases in vehicular emissions due to federally mandated emission control programs and vehicle turnover, were provided by NYCDEP. The PM_{10} background values were based on the most recent NYSDEC monitoring data and USEPA calculation procedures. NO_2 and SO_2 background values were obtained from NYCDEP. The background values used in the following analyses are provided in Table 11-3.

TABLE 11-3: BACKGROUND CONCENTRATIONS

Pollutant	Averaging Time	Value
CO	8-hour	2.3 ppm
NO_2	Annual	49 µg/m^3
PM_{10}	Annual	20 µg/m^3
	24-hour	90 µg/m^3
$PM_{2.5}$	24-hour	37 µg/m^3
SO_2	3-hour	186 µg/m^3
	24-hour	107 µg/m^3
	Annual	18 µg/m^3

4. Mobile Source Analysis

The *CEQR Technical Manual* specifies that a detailed mobile source air quality analysis is required for this area of the City when the project-generated number of vehicular trips through any affected intersection is greater than 50 per hour for any peak period. Traffic estimates for this project indicate that changes in traffic volumes will be above this threshold at a number of intersections. A detailed mobile sources analysis was therefore conducted.

a) Selection of Analysis Sites

A microscale modeling analysis was conducted to estimate CO levels and potential project-related $PM_{2.5}$ impacts near analysis sites in the study area that are anticipated to be affected by the Proposed Action. The following scenarios were analyzed: Existing conditions (2003) and Future conditions (2009) with and without the Proposed Action.

Analysis site selection was based on a screening analysis that was conducted using the *CEQR Technical Manual* screening threshold criteria to determine where air quality levels would most greatly be affected by the Proposed Action. In order to select these analysis sites, traffic volumes, the levels of service and vehicular speeds at the major signalized intersections were evaluated with and without the Proposed Action. The intersection sites that were selected for analysis are shown in Table 11-4 and Figure 11-1.

TABLE 11-4: MICROSCALE INTERSECTION ANALYSIS SITES

Site Number	Intersection
1	Vernon Blvd/43rd Ave
2	Vernon Blvd/44th Drive
3	Queens Blvd/Northern Blvd/Jackson Ave
4	Queens Blvd/Thomson Ave/Van Dam Street
5	Van Dam Street/Borden Ave/Queens Midtown Expwy Service Rd
6	Jackson Ave/49th Ave/11th Street
7	Vernon Boulevard and 41st Avenue

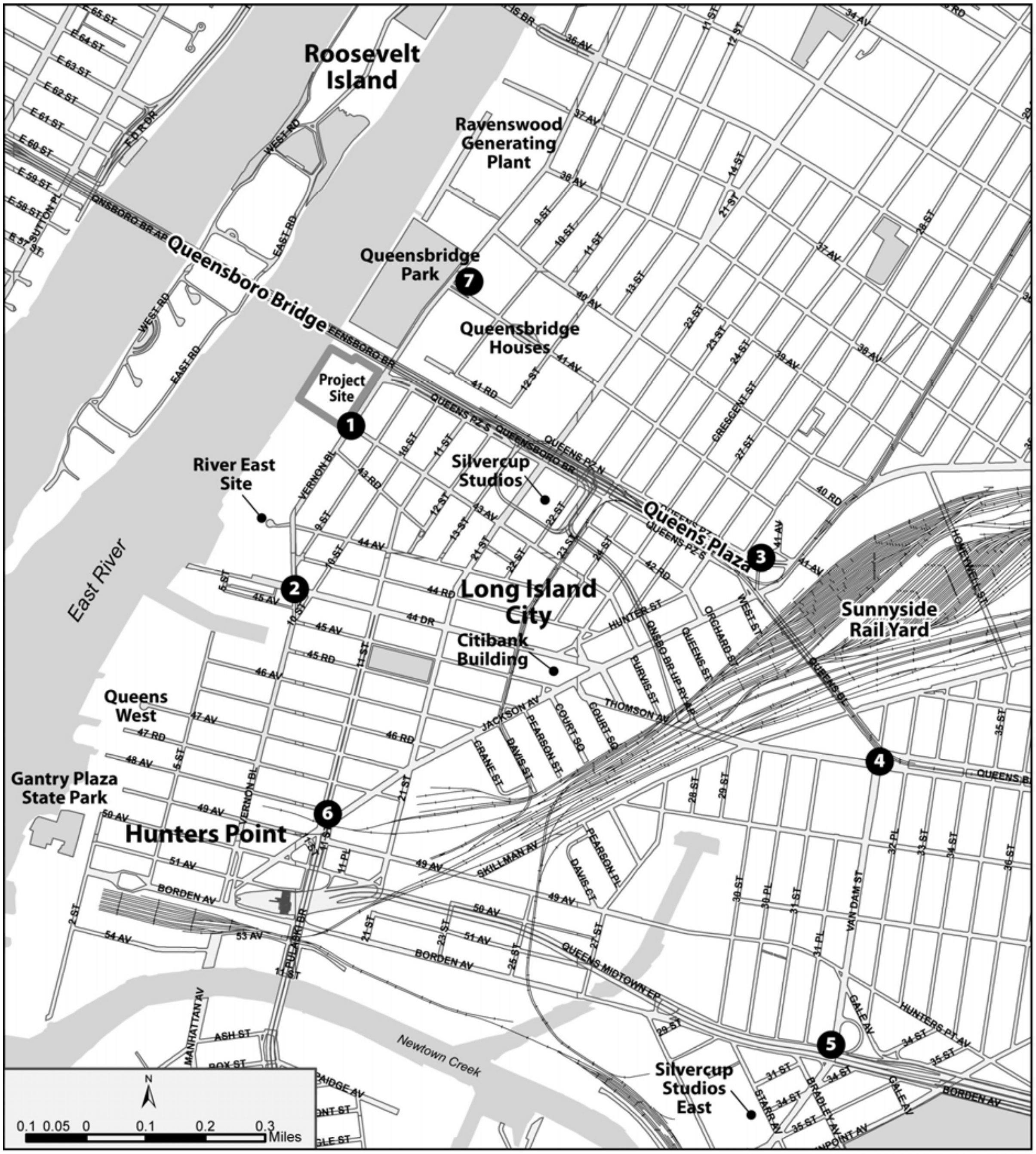
b) Receptors

The locations at which pollutant concentrations are estimated are known as “receptors.” Following guidelines established by the USEPA, receptors were located where the maximum concentration is likely to occur and where the general public is likely to have access. For this analysis, receptors were distributed along sidewalks near the intersections selected for analysis.

c) Traffic Data

Traffic data for the air quality analysis were derived from traffic counts and other information developed as part of the traffic study analysis, using *CEQR Technical Manual* guidelines. The weekday AM, MD, and PM peak traffic periods and a weekend Saturday afternoon (1 to 2 PM) peak period were considered. These are the periods when the maximum changes in pollutant concentrations are expected based on overall traffic volumes and anticipated changes in traffic patterns due to the proposed action.

The *2000 Highway Capacity Manual* and HCS 2000 software were used to develop the traffic data necessary for the air quality analysis. Existing vehicle speeds were obtained from field measurements for the area, and adjusted to estimate future free-flow speeds.



1 Vernon Boulevard and 43rd Avenue
2 Vernon Boulevard and 44th Drive
3 Queens Boulevard/Northern Boulevard and Jackson Avenue
4 Queens Boulevard/Thomson Avenue and Van Dam Street
5 Van Dam Street and Borden Avenue/QME Service Road
6 Jackson Avenue/49th Avenue and 11th Street
7 Vernon Boulevard and 41st Avenue

Figure 11-1: Air Quality Analysis Sites

d) Vehicle Classification Data

Vehicle classification data required to determine composite emission factors were based on traffic survey data for the following categories: light duty gasoline vehicles (LDGVs), sport utility vehicles (SUVs), medallion taxis, light-duty trucks, heavy-duty trucks, and buses.

Light duty gasoline trucks were divided into four groups (LDGT 1, 2, 3, and 4) based on local downstate registration data. Based on data from the NYSDEC, the registered split between LDGT 1 and 2 and LDGT 3 and 4 is 71 percent to 29 percent, respectively. As provided in the NYSDOT Environmental Procedures Manual (EPM) SUVs were classified as light-duty gasoline trucks with 75 percent of emissions considered as LDGT 1 and LDGT 2, with the remaining 25 percent as LDGT 3 and LDGT 4. The split between heavy-duty gasoline vehicles (HDGVs) and heavy-duty diesel vehicles (HDDVs) was based on NYSDEC's registration data for each appropriate analysis year. All buses were analyzed as HDDVs.

e) Vehicular Emissions

CO emission factors were estimated using the USEPA MOBILE 6.2.03 (the most current updated version) mobile emission factor algorithm model released by the USEPA May 2004. This version includes the effects of the new vehicle standards, vehicle turnover, and emission factors for particulate matter.

The following data were applied in using the MOBILE 6.2.03 model:

- NYSDEC input files, with engine operating start and distribution parameters and vehicle miles traveled (VMT) for Queens County;
- 2003 New York State registration and diesel sales fraction data;
- SUVs were assumed to be LDGTs with the same engine operating parameters as automobiles; and
- An average winter temperature of 51 degrees Fahrenheit was used, as approved by the NYCDEP and NYSDEC.

$PM_{2.5}$ emission factors were estimated using USEPA's MOBILE 6.2.03 emission model. Exhaust, brake, and tire-wear emissions from moving vehicles were estimated for all vehicle types; idle emissions, however, were estimated only for heavy-duty diesel trucks and buses, because this information is estimated only for these vehicles (PM idle emissions from other vehicle types are considered negligible).

Emissions of fugitive dust were estimated using the equation from the December 2003 version of USEPA Compilation of Air Pollutant Emission Factors (AP-42) for paved roads. This formula uses empirical data for fugitive dust and has recently been adjusted by the USEPA to discount the contribution from exhaust and brake and tire wear emissions. Emissions from fugitive dust are dependent on vehicle weight and the surface silt loading factor. Applying the latest NYCDEP guidelines, an average vehicle fleet weight of 6,000 pounds was used for all analyses, a silt loading factor of 0.1 was used for principal and minor arterials with more than 5,000 vehicles per day, and a silt loading factor of 0.4 was used for local roadway with fewer than 5,000 vehicles per day.

f) Dispersion Analysis

Mobile source dispersion models are the basic analytical tools used to estimate pollutant concentrations from the emissions generated by motor vehicles as expected under given conditions of traffic, roadway geometry, and meteorology. CAL3QHC Version 2 is a line-source dispersion model that predicts pollutant concentrations near congested intersection and heavily traveled roadways.

CAL3QHC input variables include free flow and calculated idle emission factors, roadway geometries, traffic volumes, site characteristics, background pollutant concentrations, signal timing, and meteorological conditions. CAL3QHC predicts inert pollutant concentrations, averaged over a one-hour period near roadways. This model was used to predict concentrations at affected study-area intersections.

CAL3QHC predicts peak one-hour pollutant concentrations using assumed meteorology and peak-period traffic conditions. Different emission rates occur when vehicles are stopped (idling), accelerating, decelerating, and moving at different average speeds. CAL3QHC simplifies these different emission rates into the following two components:

- Emissions when vehicles are stopped (idling) during the red phase of a signalized intersection; and
- Emissions when vehicles are in motion during the green phase of a signalized intersection.

CAL3QHCR, which is a refinement to CAL3QHC in that it uses actual meteorological data (as opposed to an assumed worst-case set of meteorological conditions), was used in all mobile source analyses. Five years of actual meteorological data from LaGuardia Airport (1998-2002) were used to estimate 8-hour CO concentrations, and peak 24-hour and annual average $PM_{2.5}$ concentrations.

The analyses followed USEPA's Intersection Modeling Guidelines (EPA-454/R-92-005) for CO modeling methodology and receptor placement. All major roadway segments (links) within approximately 1,000 feet from each analysis site (i.e., congested intersection) were considered. A mixing height of 1,000 meters and a surface roughness factor of 321 centimeters were included in all calculations.

A conservative analysis, which assumes that peak period vehicular emissions, traffic volumes, and intersection operating parameters occur every hour of each analysis year, was utilized. Use of peak hour baseline and project-generated conditions results in conservative predictions of pollutant levels and project impacts.

g) Results

The results of the mobile source air quality modeling analysis under existing (2003) conditions are provided in Table 11-5. The values shown are the maximum CO concentrations estimated near each analysis site.

TABLE 11-5: 2003 EXISTING CONDITIONS – MAXIMUM 8-HOUR CO LEVELS

Site #	Analysis Site	8-hr CO Level (ppm)	Maximum Time Period
1	Vernon Blvd/43rd Ave	3.40	PM
2	Vernon Blvd/44th Drive	3.43	MD
3	Queens Blvd/Northern Blvd/Jackson Ave	5.30	PM
4	Queens Blvd/Thomson Ave/Van Dam Street	5.61	PM
5	Van Dam Street/Borden Ave/Queens Midtown Expwy Service Rd	6.13	PM
6	Jackson Ave/49th Ave/11th Street	4.36	PM
7	Vernon Boulevard and 41st Avenue	3.30	PM

Notes:
1. Maximum results of all time periods analyzed.
2. All values include appropriate background concentration.
3. 8-hour CO background concentration = 2.9 ppm

Time Periods: MD – Midday peak traffic period (12-1 PM) PM - PM peak traffic period (5-6 PM)

The results are summarized as follows:
- Carbon monoxide levels do not exceed the 8-hour CO standard of 9 ppm; and
- The highest estimated concentration (5.53 ppm) occurs near the intersection of Van Dam Street, Borden Avenue, and the Queens Midtown Expressway Service Road (Analysis Site #5) under the PM peak period.

F. FUTURE CONDITIONS WITHOUT THE PROPOSED ACTION

Future air quality conditions in the area are anticipated to remain approximately the same as under Existing conditions, with improvements that may result from the following developments:
- Mobile source (automobile and truck) emissions are anticipated to decrease as a result of federally mandated vehicular emission reduction requirements and vehicle turnover;
- Stationary source (power plant) emissions are anticipated to decrease as a result of State mandated emission reduction requirements;
- Emissions generated by local manufacturing facilities are anticipated to decrease as a result of conversion of these sites to other uses; and
- Emissions generated by the New York State Power Authority's gas turbines, which are currently operating on the Project Site but which will be removed from the area, will be eliminated.

Any reductions, however, may be offset by increases in residential and commercial traffic volumes and congestion, and emissions generated by the heating systems of additional development.

A mobile source analysis was conducted to estimate future concentrations without the project near the microscale intersection analysis sites using the same methodologies and assumptions as those used for the Existing conditions analysis. This analysis incorporated decreases in future year CO emission factors due to increasingly stringent emission control requirements and increases in traffic volumes due to anticipated increases in travel demand.

A summary of the results of the mobile source air quality modeling analysis for the Future without the Proposed Action in 2009 is provided in Table 11-6. The values shown are the maximum CO concentrations estimated near each analysis site.

TABLE 11-6: FUTURE CONDITIONS WITHOUT THE PROPOSED ACTION (2009) – MAXIMUM 8-HOUR CO LEVELS

Site #	Analysis Site	8-hr CO Level (ppm)	Maximum Time Period
1	Vernon Blvd/43rd Ave	2.91	PM
2	Vernon Blvd/44th Drive	2.81	PM
3	Queens Blvd/Northern Blvd/Jackson Ave	3.77	PM
4	Queens Blvd/Thomson Ave/Van Dam Street	4.19	PM
5	Van Dam Street/Borden Ave/Queens Midtown Expwy Service Rd	4.42	PM
6	Jackson Ave/49th Ave/11th Street	3.46	AM
7	Vernon Boulevard and 41st Avenue	3.14	AM

Notes:
1. Maximum results of all time periods analyzed.
2. All values include appropriate background concentration.
3. 8-hour CO background concentration = 2.3 ppm

Time Periods: AM – AM peak traffic period (8-9 AM)
MD – Midday peak traffic period (12-1 PM)
PM – PM peak traffic period (5-6 PM)

The results are summarized as follows:

- CO levels would not exceed the 8-hour standard at any of the analysis sites; and
- The highest estimated concentration (4.42 ppm) would occur near the intersection of Van Dam Street, Borden Avenue, and the Queens Midtown Expressway Service Road (Analysis Site #5) under the PM peak period.

G. FUTURE CONDITIONS WITH THE PROPOSED ACTION

1. Mobile Source Results

A mobile source analysis was conducted to estimate future concentrations near the microscale intersection analysis sites with the proposed project using the same methodologies and assumptions as those used for the future No Build analysis, with the following additions:

- Project-generated traffic volumes were superimposed on the future No Build traffic network;
- For project-generated outbound light-duty vehicles (LDGVs), emission factors with 100 percent cold-start conditions were used; and
- For project-generated inbound LDGVs, emission factors with 100 percent hot-stabilized conditions were used.

A summary of the results of the mobile source air quality modeling analysis for the Future with the Proposed Action in 2009 is provided in Table 11-7. The values shown are the maximum CO concentration increments predicted near each analysis site with the Proposed Action.

TABLE 11-7: FUTURE CONDITIONS WITH THE PROPOSED ACTION (2009) – MAXIMUM 8-HOUR CO LEVELS

Site #	Analysis Site	No Build 8-hr CO Level (ppm)	Build 8-hr CO Level (ppm)	Maximum Time Period
1	Vernon Blvd/43rd Ave	2.91	2.91	PM
2	Vernon Blvd/44th Drive	2.81	2.81	PM
3	Queens Blvd/Northern Blvd/Jackson Ave	3.77	3.77	PM
4	Queens Blvd/Thomson Ave/Van Dam Street	3.97	4.30	MD
		4.19	4.19	PM
5	Van Dam Street/Borden Ave/Queens Midtown Expwy Service Rd	4.42	4.42	PM
6	Jackson Ave/49th Ave/11th Street	3.46	3.49	AM
7	Vernon Boulevard and 41st Avenue	3.14	3.20	AM
		3.07	3.31	PM

Notes:
1. Maximum results of all time periods analyzed.
2. All values include appropriate background concentration.
3. 8-hour CO background concentration = 2.3 ppm

Time Periods:
AM – AM peak traffic period (8-9 AM) MD – Midday peak traffic period (12-1 PM) PM – PM peak traffic period (5-6 PM)

The results of this analysis are summarized as follows:

- CO levels would not exceed the 8-hour standard at any of the analysis sites;
- The highest estimated 8-hour concentration (4.42 ppm) would occur near the intersection of Van Dam Street/Borden Avenue/Queens Midtown Expressway Service Road (Analysis Site #5) under the PM peak period; and
- The NYCDEP CO "de minimis" values would not be exceeded at any analysis site, indicating that the Proposed Action would not cause any significant adverse CO emissions impacts.

In addition, in accordance with NYCDEP interim guidance procedures, a $PM_{2.5}$ analysis was conducted. The intersection with the highest estimated number of project-generated vehicles during any peak traffic hour, i.e., Vernon Boulevard and 43rd Avenue (Analysis Site #1), was selected as the "worst-case" location to determine incremental $PM_{2.5}$ 24-hour and annual impacts. The CAL3QHCR model was used with the same methodology described above.

The maximum predicted annual and 24-hour concentrations, shown in Table 11-8, predicted near this intersection are below NYCDEP's annual and 24-hour STVs of 0.1 and 5 $\mu g/m^3$, respectively. The results of this analysis indicate that the Proposed Action would not cause increases in concentrations above the 24-hour and annual $PM_{2.5}$ significant threshold values (STVs) at any of the analysis sites.

TABLE 11-8: FUTURE WITH THE PROPOSED ACTION (2009) – MAXIMUM $PM_{2.5}$ INCREMENTAL IMPACTS ($\mu g/m^3$)

Site #	Analysis Site	24-hour Increment	Annual Increment	Significant Threshold Value
1	Vernon Blvd/43rd Ave	3.2	--	5
		--	0.022	0.1

Based on the results of the mobile source analysis, emissions associated with increased traffic and changes in traffic patterns as a result of the Proposed Action would not cause any significant adverse air quality impacts.

2. Analysis of Project-Generated Heating System Emissions

Emissions from the heating (and hot water) systems of the proposed Project were evaluated to determine whether they may affect air quality levels at nearby existing land uses. Emissions from the heating systems of existing land uses and future No-Build developments were also evaluated to determine whether they may affect air quality levels at the proposed project. Potential for impacts to result is a function of fuel type, stack height, size of development, and location of the emission sources relative to nearby buildings. Fuel uses may include natural gas for cooking and natural gas or oil for space heating and hot water. Since the fuel types that will supply heat and hot water to the new developments have not been determined, it was conservatively assumed that Number #4 fuel oil, as opposed to natural gas, would be used.

a) Impacts on Existing Land Uses

Applying *CEQR Technical Manual* procedures, a screening analysis was performed to determine the potential air quality impacts of the heating systems of the proposed project on surrounding land uses. As there are no nearby existing or proposed buildings that are as tall or taller than the proposed project's towers within 400 feet of the development, no existing land uses would be significantly affected by heating plant emissions of the proposed project, and no detailed analysis is warranted.

The result of this analysis is that the heating emissions of the proposed project would not cause any significant adverse impacts on nearby land uses.

b) Impacts on Proposed Project's Sensitive Receptors

Evaluations were made to determine whether the heating systems in the proposed project would have the potential to significantly adversely impact air quality levels at any receptors (residential units with operable windows) to be created under the Proposed Action.

Analyses were conducted to estimate the potential impacts of the:

- Proposed commercial tower in the North Complex (with a floor area of approximately 820,000 square feet) on the 600-foot-tall proposed residential tower of the South Complex; and
- Proposed 517-foot-tall residential tower in the South Complex (with a floor area of approximately 520,000 square feet) on the proposed 600-foot-tall residential tower in the South Complex.

A screening level analysis was conducted using the CEQR Technical Appendix procedures to determine potential for significant SO_2 (i.e., the critical pollutant for facilities burning fuel oil) impacts. The estimated maximum sizes of the shorter towers were plotted against the distances to the closest taller towers. Then, using the nomograph on Figure 3Q-5, threshold distances for each location of the proposed development at which a potentially significant impact may occur were estimated. For the commercial tower in the North Complex, a minimum distance of 180 feet was estimated; for the 517-foot-tall residential tower in the South Complex, a minimum distance of 135 feet was estimated.

Since the distance from the commercial tower in the North Complex to the 600-foot-tall residential tower in the South Complex is greater than the threshold distance indicated on the nomograph (265 feet), no detailed dispersion analysis is warranted. However, since the distance from the 517-foot-tall residential tower in the South Complex to the 600-foot-tall residential tower is less than the threshold distance indicated on the nomograph (110 feet), a detailed analysis, according to *CEQR Technical Manual* procedures, is required.

The following detailed analysis was conducted:

- The fuel consumption rate for the 517-foot-tall residential tower was estimated using factors presented in NYCDEP's Report T.S. #12. These factors were then multiplied by the square foot area of the proposed tower to estimate total gallons of fuel consumed annually. Separate factors for hot water and space heating uses were used.
- Emission factors for pollutants considered were obtained from USEPA's "Compilation of Air Pollutant Emission Factors" (AP-42), assuming that fuel oil #4, with a sulfur content of 0.2 percent, would be used. It was conservatively assumed that all emissions of NOx released from the stack would be in form of NO2 at the receptor sites.
- A dispersion modeling analysis was conducted using the USEPA's ISC-PRIME model. This model incorporates enhanced plume rise and building downwash algorithms, and calculates the concentration of pollutants in both the cavity and wake regions of the exhaust plume.

Because highest impacts are likely to occur along the plume centerline, elevated receptors were placed along the 600-foot-tall residential tower, vertically centered on the estimated stack height of the heating plant of the shorter tower. It was assumed that the taller tower would have operable windows at these levels, which were considered as potential sensitive receptor sites.

Other modeling parameters (e.g., stack temperature, diameter, and exit velocity) were developed using conservative *CEQR Technical Manual* default values. For the purpose of this analysis, it was conservatively assumed that a single-roof top stack would be located on the edge of roof of the 517 foot tall residential tower at the minimum distance from the 600-foot tall residential tower. Other modeling assumptions were utilized as follows:

- Urban dispersion coefficient and flat terrain;
- Downwash effect on plume dispersion;
- Gradual plume rise and buoyancy-induced dispersion, and
- No gravitational settling and deposition of particulate matter.

The latest five consecutive years of meteorological data from LaGuardia Airport (2000-2004) were used. Background concentrations were added to estimated project impacts, and the resulting total concentrations were compared with the appropriate NAAQS.

Table 11-9 summarizes the predicted maximum short-term (i.e., 3-hr and 24-hr) and annual pollutant concentrations at the receptors on the 600 foot tall residential tower. As shown, no exceedances of the NAAQS are predicted as a result of emissions from proposed heating systems on sensitive receptors within the proposed project.

c) Analysis of Emissions of Existing Land Uses on the Proposed Project

Land uses and building heights were surveyed within 400 feet of all proposed building sites to determine whether detailed analyses of large-scale sources of boiler emissions onto proposed residential uses are necessary. Applying *CEQR* guidelines (page 3Q-36), no large source of boiler emissions (i.e., facilities with heat input than 2.8 million BTU/hour or greater) is located within the 400-foot radius, and no future No Build developments would result in a new large source locating within this radius. Therefore, no detailed analysis of such sources is needed. However, the Ravenswood power generating station, which is a major stationary emission source, is located approximately 1,800 feet from the development site, and a separate analysis, which is discussed later in this section, was conducted to estimate the potential impact of the emissions from that facility on the proposed project.

d) Summary of Heating System Impacts

Based on the results of the stationary source analysis, no significant adverse impacts on air quality would result from building heating systems under the Proposed Action.

3. Impacts of Air Toxics

This section addresses the potential for existing toxic emission sources to significantly affect proposed residential uses. These emissions are of potential concern because the project site is in an area close to existing manufacturing zones. The following procedures were used to estimate the potential air quality impacts of these air toxic emissions:

- An analysis area with a radius of approximately 1,000 feet around the boundary of the project site was selected for analysis;
- Air permits for all facilities within this analysis area that are identified on NYSDEC and NYCDEP databases were acquired and reviewed; and
- Dispersion analyses were conducted to determine whether any toxic emissions released from these permitted emission sources had the potential to have significant adverse impacts on new residential uses.

TABLE 11-9: BUILDING-ON-BUILDING IMPACTS

Pollutant	Averaging Period	Actual Emission Rate (g/sec)	Estimated Maximum Pollutant Concentrations at the 600-Foot-Tall Residential Tower			NAAQS[2] (µg/m³)
			Estimated Pollutant Concentrations (µg/m³)	Background Pollutant Concentrations (µg/m³)	Total Pollutant Concentrations (µg/m³) [1]	
NO_2	Annual	0.13	1	49	50	100
SO_2	3-hr	0.55	72	186	258	1,300
	24-hr	0.55	20	107	127	365
	Annual	0.30	2	18	20	80
PM_{10}	24-hr	0.09	3	90	93	150
	Annual	0.05	0.4	20	20	50

Notes:
(1) The total concentration is a sum of background concentration and estimated concentration.
(2) NAAQS - National Ambient Air Quality Standards.

a) Permit Information

Information on emission data for the manufacturing and industrial facilities within the air toxics study area was developed as follows:

- NYSDEC's Air Guide-1 (AG-1), which includes a database with information on all facilities in the state that have an air quality permit (as of 1996), was searched to identify facilities located within the area that had received state air quality permits; and
- The NYCDEP Bureau of Air Resource's (BAR) files of current air quality permits for all facilities operating within the air toxics study area were examined.

The information on the NYCDEP BAR permits (e.g., pollutant emission rates and stack parameters) was considered to be the most current and comprehensive, and served as the primary database for this analysis.

Ten facilities identified in the AG-1 and BAR databases were considered in this analysis. Of the 10 facilities, emission data for six of them that were included in the AG-1 database were updated using BAR permit information. Data for the remaining four facilities were obtained directly from BAR permits, and converted into AG-1 format.

Emissions of 11 toxic air pollutants (released from these 10 facilities) were considered in this analysis.

b) Analysis

AG-1 contains a screening-level algorithm that can be used to determine whether the permitted facilities currently operating within the air toxics study area would have the potential to significantly adversely affect the proposed residential uses of the proposed project. In addition to containing a database, AG-1 includes software that was used to conservatively evaluate, using permitted emission limits, whether emissions from nearby industrial facilities have the potential to exceed short-term or annual guidelines values (i.e., SGCs or AGCs).

The result of this analysis is that a potential exceedance of a NYSDEC AGC was predicted for only one of the 11 toxic pollutants considered – dioctyl phthalate. Accordingly, following AG-1 procedures, a more refined analysis, using the ISCLT algorithm in AG-1, was conducted to estimate potential long-term annual impacts of the dioctyl phthalate. The result of this analysis is that no exceedance of the NYSDEC AGC acceptable limits was predicted.

Cancer risk and hazard index evaluations for all of the pollutants combined were conducted using the ISCLT algorithm in AG-1. The maximum total estimated cancer risk and the total hazard index caused by all of the pollutants emitted from all of sources combined is below the levels that USEPA considers to be significant. Therefore, the result of this analysis is that nearby industrial facilities would not have any significant adverse air quality impacts on the proposed residential units.

c) Summary of Air Toxic Analysis Results

Based on the results of the air toxics analysis, emissions generated by existing nearby industrial and commercial sources would not significantly adversely affect air quality levels at the residential units of the proposed development.

4. Impacts of Ravenswood Power Plant Emissions

A detailed air quality analysis was performed, applying the procedures outlined in the *CEQR Technical Manual*, to determine whether the emissions released from the existing Ravenswood power generating facility, which is located approximately 1,800 feet north of the project site, would significantly impact air quality at the upper floors of the proposed residential towers.

The Ravenswood facility consists of three large steam boiler turbine/generators sets, a steam plant, a recently permitted 250 megawatts combustion turbine, and 17 simple cycle combustion turbines. The three large boilers are rated at 4204, 4171, and 9379 million BTU/hr. The boilers can use #2, #4, or #6 oil, with the maximum sulfur content of 0.3 percent, natural gas, and waste fuel. The current permit allows the facility to burn fuel oil #6 one hundred percent of the time. The design capacity of the 250 megawatts combustion turbine, which can burn distillate fuel oil #1, #2 oil and/or natural gas, is rated at 2,028 million BTU/hr. The seventeen simple cycle combustion turbines are rated between 235 and 282 million BTU/hr, and use distillate oil.

a) Emission Parameters

Emissions from the boilers are released into the atmosphere via three 500-foot tall stacks; emissions from the steam plant are released via two 150-foot-tall stacks. The seventeen simple cycle combustion turbines have stacks that range from 35 to 60 feet in height.

While there are no emission controls on the emissions from the large boilers, the 250 megawatt combustion turbine is equipped with a catalytic converter to control NO_x and VOC emissions. The facility's emissions of particulate matter, NO_2, SO_2, and CO exceed the major source pollutant thresholds listed in 6 NYCRR Subpart 201-6, and the facility, therefore, operates pursuant to a Title V permit.

Stack parameters (i.e., temperature, diameter, and exit velocity) and emission rates of SO_2 and NO_x for the large steam boilers and steam plant were obtained from NYSDEC Title V permit data. PM_{10} and $PM_{2.5}$ emission factors for steam boilers and steam plants were obtained from AP-42 (1998) for utility boilers firing residual oil. Emission factors of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ for combustion turbines firing distillate oil were obtained from AP-42 (2000). Table 11-10 provides the stack parameters and emission rates utilized in the analysis.

b) Site Geometry and Receptors

This analysis was conducted using the Preferred Development Program, though assuming that both residential towers to be located along the southern end of the development site would be 600 feet in elevation, (a conservative assumption, as one of the towers is proposed to be approximately 517.5 feet in elevation). Sensitive receptor sites (e.g., operable windows, terraces, air intakes, etc.) would be located along the northern faces of the towers. Because the highest impacts are likely to occur along the plume centerline, these receptors were placed at the upper floor levels – at heights ranging from 450 to 600 feet.

c) Dispersion Analysis

Detailed dispersion modeling analysis was conducted using the USEPA's Industrial Source Complex (ISC) model and the five latest consecutive years (2000–2004) of meteorological data from LaGuardia Airport. The effects on plume dispersion of the proposed and existing building structures were incorporated into the analysis using ISC wake dispersion algorithms.

Following current USEPA guidance, regulatory default modeling options were used in the analysis, including the use of urban algorithms, flat terrain, no gravitational settling or deposition of particulate matter, and final plume rise.

d) Results

Table 11-10 provides the estimated maximum short-term (i.e., 3-hr, 24-hr) and annual pollutant concentrations at the receptors facing direct plume impacts on upper floors of the residential towers to be located at the southern part of the project site. Estimated maximum pollutant concentrations, together with the appropriate background concentrations, are compared with appropriate NAAQS. As shown, no exceedances of the NAAQS are predicted as the result of Ravenswood power plant stack emissions.

e) Summary of Impacts from Ravenswood Power Plant Emissions

Based on the results of this analysis, emissions generated by the existing nearby Ravenswood power plant would not significantly adversely affect air quality levels in the residential units of the proposed project.

The result of this analysis is that Ravenswood power plant stack emissions would not have any significant adverse air quality impacts on residential uses in the proposed project.

5. Impacts of the Proposed Parking Garage

An analysis was conducted, using USEPA's ISC model and *CEQR Technical Manual* procedures, to determine the potential impacts of emissions generated by vehicles traveling within the proposed garage and released to the atmosphere via mechanical ventilation. Emissions were calculated using the USEPA MOBILE 6.2.03 mobile emission factor algorithm and the same assumptions as those used for the microscale mobile source analysis previously discussed in this section (i.e., vehicles exiting the garage were assumed to be operating in a cold-start mode; vehicles entering were assumed to be hot stabilized.) For the purpose of this analysis, it was conservatively assumed that all of the emissions generated within the garage would be released through one exhaust duct.

A maximum 8-hour CO concentration of 4.4 ppm was predicted at a receptor site located 5 feet from the exhaust duct, which represents the maximum concentration at both the nearby sidewalk and at a possible residential window location. This value is below the NAAQS.

The result of this analysis is that the garage exhaust emissions would not have any significant adverse air quality impacts at nearby sensitive land uses.

6. Impacts of Queensboro Bridge Emissions

An analysis was conducted, using USEPA's ISC model, to estimate the potential of traffic-related emissions generated on the Queensboro Bridge to significantly impact air quality levels at sensitive receptors (e.g., operable windows, air intakes, etc.) in the proposed project. The analysis employed the very conservative assumption that the 600- and 517-foot residential towers proposed for the Southern Complex would be located on the northern side of the project site, closer to the bridge. It was also conservatively assumed that these receptors would be located at the same height as the vehicular traffic on the bridge. Emissions were estimated using the USEPA MOBILE 6.2.03 mobile emission factor algorithm and the same assumptions as those used for the microscale mobile source analysis previously discussed in this section.

TABLE 11-10: AIR QUALITY IMPACTS OF THE RAVENSWOOD POWER PLANT STACK EMISSIONS ON THE PROPOSED PROJECT'S SENSITIVE RECEPTORS

Pollutants	Aver. Time Period	Pollutant Emission Rates Used in the Analysis (grams per second)(1)							Impacts of the Ravenswood Stack Emissions (2) (µg/m³)	Bkgrd. Pollutant Conc. (µg/m³)	Highest Estimated Total Pollutant Conc. (µg/m³)	NAAQS (3) (µg/m³)
		Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6	Turbines				
Nitrogen Dioxide (NO_2) (4)	Annual	63.55	46.41	171.51	5.74	5.74	3.07	6.43	9	49	58	100
Particulate Matter (PM_{10})	24-hr	14.71	14.59	32.82	2.97	2.97	1.10	2.30	15	90	105	150
	Annual	6.41	4.69	17.32	0.74	0.74	0.55	1.15	1	20	21	50
Particulate Matter ($PM_{2.5}$)	24-hr	10.72	10.64	23.92	2.16	2.16	1.01	2.12	11	37	48	65
Sulfur Dioxide (SO_2)	3-hr	164.21	162.92	366.34	33.12	33.12	8.43	17.67	831	186	1,017	1,300
	24-hr	164.21	162.92	366.34	33.12	33.12	8.43	17.67	234	107	341	365
	Annual	71.63	52.31	193.34	8.28	8.28	4.22	8.84	10	18	28	80

Notes:

(1) Emission rates were estimated as follows:
- For boiler stacks 1 thru 5, emission rates from the Ravenswood facility under its current Title V permit for SO_2 and NO_x, as provided in a letter to NYCDEP from Con Edison, dated February 7, 1992.
- For boiler stacks 1 thru 5, Title V permit information and current USEPA AP-42 (1998) emission factors for utility boilers firing residual oil #6 for PM_{10} and $PM_{2.5}$.
- For 3-hr and 24-hr SO_2 analysis, emission rates under maximum load; for annual SO_2 and NOX analysis emission rates under annual average load.
- For 24-hr PM_{10} and $PM_{2.5}$ analysis, size-specific AP-42 (1998) emission factors for utility boilers firing residual oil #6 based on particle size distribution.
- For stack #6 and 17 combustion turbines, emission factors for SO_2 and PM_{10} from stationary turbines firing distillate oil, as provided in AP-42-2000.

(2) Results shown are for the proposed South Complex , conservatively assuming two 600-foot-tall residential towers located at the southern side of the property). The following modeling results correspond to the NAAQS time periods:
- 3-hr and 24-hr SO_2 concentrations are the second highest estimated concentrations;
- 24-hr PM_{10} concentration is the 6th high highest estimated concentration;
- 24-hr $PM_{2.5}$ concentration is the 8th high highest estimated concentration under worst analysis year.

(3) NAAQS = National Ambient Air Quality Standards.

(4) It was assumed that all NO_x would be in the form of NO_2 at the receptor sites.

Even using these conservative assumptions, the impacts of bridge traffic emissions on receptor sites located in the proposed project would be minimal—less than one percent of the applicable NAAQS for CO, PM_{10}, and $PM_{2.5}$—and total pollutant concentrations would be below the NAAQS.

The result of this analysis, therefore, is that the Queensboro Bridge traffic emissions would not have any significant adverse air quality impacts on the proposed project.

7. Cumulative Impact Analysis

A cumulative impact analysis was conducted to estimate the potential cumulative impacts of emissions generated by vehicles traveling within the proposed garage and released to the atmosphere via mechanical ventilation, the mobile source emissions generated by the traffic at the nearby intersection of Vernon Boulevard and 43rd Avenue and on the Queensboro Bridge, and Ravenswood power plant emissions. The resulting worst-case cumulative 8-hour CO concentration, 5.6 ppm, is below the NAAQS.

The result of this analysis is that the cumulative emissions from all of these emission sources would not have any significant adverse impacts on nearby sensitive land uses.

H. VARIATIONS

In addition to the Preferred Development Program, under which residential uses would be located at the southern end of the development site and office uses that do not have operable windows would be located on the northern end of the site, air quality analyses were also conducted for three development program variations. Under Variation 1, residential uses would replace commercial uses on the upper floors of the tower located at the northern end of the development site. Under Variation 2, equivalent studio space would replace the community facility. Variation 3 would be a combination of the project changes proposed under Variations 1 and 2. The results of these additional analyses are as follows:

- The mobile source impacts of all variations would be the same or less than those predicted for the Preferred Development Program, because the peak period traffic generated under the variations would be approximately the same or less than the traffic generated under the Preferred Development Program.
- The potential impacts of the project-generated heating system emissions for the three variations would be the same as those predicted for the Preferred Development Program, because emissions were predicted based on building square footage and not on particular uses.
- The potential impacts of the existing air toxic emissions for the three variations would be the same as those predicted for the Preferred Development Program, because the minimum distances from these land uses to the project site as a whole were used in the analysis, not distances to the individual towers.
- The potential impacts of the Ravenswood power plant emissions could be slightly higher under Variations 1 and 3 because the upper floors of the proposed 537 foot tall residential tower on the north side of the Project Site, which would have operable windows, would be closer to the Ravenswood facility than the residential towers located on the southern end of the project site considered for the Preferred Development Program. As such, a detailed dispersion modeling analysis was conducted that estimated pollutant concentrations on upper floors of the north face of the north tower using the same procedures and assumptions that were used in the Preferred Development Program analysis. The result of this analysis is that estimated air quality

concentrations under Variations 1 and 3 would be less than the NAAQS. Therefore, emissions from the Ravenswood power plant would not have and significant adverse air quality impacts on sensitive receptors under the three Variations.

- The potential impacts of the proposed parking garage for the three variations would be the same as those predicted for the Preferred Development Program because the size of the garage, the estimated traffic volumes, and the receptor locations would be the same as under the Preferred Development Program.
- The potential impacts of Queensboro Bridge emissions for the three variations would be the same as those predicted for the Preferred Development Program. The analysis conducted for the Preferred Development Program assumed, conservatively, that residential uses with operable windows would be located at the northern side of the project site, as would be the case for Variations 1 and 3. Therefore, the analysis conducted for the Preferred Development Program would also apply to these Variations, as well as Variation 2, under which the residential uses would, as for the Preferred Development Program, be located only in the South Complex.
- The cumulative impacts of emissions generated by vehicles traveling within the proposed garage and released to the atmosphere via mechanical ventilation, the mobile source emissions generated by the traffic at the nearby intersection of Vernon Boulevard and 43rd Avenue and on the Queensboro Bridge, and the Ravenswood power plant emissions would be the same or less under the variations than the impacts under the Preferred Development Program. While the Ravenswood power plant emissions would be the same, emissions from the garage and intersection traffic would be the same or less, because of lower peak hour traffic volumes associated with the variations.
- Under Variation 1, 37 more vehicle trips will be generated during the Saturday Midday peak period compared to the Preferred Development Program. Under Variation 2, 20 more vehicle trips will be generated during the peak period compared to the Preferred development Program. No significant adverse air quality impacts are expected with these increases.

In summary, the result of these analyses is that the variations would not have any significant adverse air quality impacts.