A. INTRODUCTION

This chapter examines the potential for air quality impacts from the proposed and future actions. Air quality impacts can be either direct or indirect. Direct impacts could stem from emissions generated by stationary sources at a development site, such as emissions from fuel burned on site for heating, ventilation, and air conditioning (HVAC) systems. Indirect impacts could be caused by emissions from nearby existing stationary sources (impacts on the proposed and future actions) and the emissions due to mobile sources/vehicles vehicle generated by the proposed and future actions or other changes to future traffic conditions due to the proposed and future actions.

The proposed and future actions would also include parking facilities, which could potentially result in increases in carbon monoxide (CO) concentrations in the immediate vicinity of the facilities. Therefore, a parking analysis was conducted to evaluate potential future worst-case CO concentrations with the proposed parking facilities.

Because the proposed and future project sites are located near an area zoned for mixed residential/industrial use, nearby existing industrial facilities were examined for potential adverse impacts on future residents of the proposed and future actions. Based on the data available on the surrounding industrial uses, the proposed and future actions would not experience significant air quality impacts from these facilities.

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. Typically, ambient concentrations of carbon monoxide (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 such as construction engines. However, diesel-powered vehicles, primarily heavy duty trucks and buses, also currently contribute somewhat to SO_2 emissions; diesel fuel regulations which began to take effect in 2006 will reduce SO_2 emissions from mobile sources to extremely low levels. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs, emitted mainly from industrial processes and mobile sources.

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

A parking garage analysis was also conducted to evaluate future CO concentrations with the operation of the proposed parking garage.

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 and New Jersey metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).

The proposed and future actions would not have a significant effect on the overall volume of vehicular travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. An analysis of project related emissions of these pollutants from mobile sources was therefore not warranted.

In addition, there is a standard for average annual NO_2 concentrations, which is normally examined only for fossil fuel energy sources. Potential impacts from the fuel to be burned for the proposed and future actions' HVAC systems were evaluated.

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 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 1.5 micrograms per cubic meter (3–month average).

No significant sources of lead are associated with the proposed and future actions, and, therefore, analysis was 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 volatile organic compounds, 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 and future actions would not result in any significant increases in truck traffic near the project site or in the region. Furthermore, based on MOBILE6.2 engine emission factors, the total peak-hour volume of heavy-duty diesel trucks and other vehicles would not exceed NYCDEP's current threshold for conducting a $PM_{2.5}$ microscale mobile source analysis. Therefore, an analysis of potential impacts from mobile sources of PM is not warranted.

As part of the proposed and future actions, No. 2 or No. 4 fuel could be burned in the HVAC systems. Therefore, potential future levels of $PM_{2.5}$ from HVAC systems were examined.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur–containing fuels: oil and coal.

Due to the federal restrictions on the sulfur content in diesel fuel for on–road vehicles, no significant quantities are emitted from vehicular sources. Monitored SO_2 concentrations in New York City are below the national standards. Vehicular sources of SO_2 are not significant and therefore, an analysis of this pollutant from mobile sources was not warranted.

As part of the proposed and future actions, No. 2 or No. 4 fuel could be burned in the HVAC systems. Therefore, potential future levels of SO_2 from HVAC systems were examined.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the Clean Air Act, primary and secondary National Ambient Air Quality Standards (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 requisite 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. The primary and secondary standards are the same for NO_2, ozone, lead, and PM, and there is no secondary standard for CO. The NAAQS are presented in Table 16-1. The NAAQS for CO, NO_2, and SO_2 standards have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particulate matter (TSP) and ozone which correspond to federal standards which have since been revoked or replaced, and for settleable particles, beryllium, fluoride, and hydrogen sulfide (H_2S).

On September 21, 2006, EPA revised the NAAQS for PM. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from the current level of 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$ and retaining the level of the annual fine standard at 15 $\mu g/m^3$. EPA is not proposing an annual standard for $PM_{10-2.5}$. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS (SIP)

The Clean Air Act as amended in 1990 (CAA), defines non–attainment areas (NAA) 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.

EPA has re–designated New York City as in attainment for CO. 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.

Table 16–1
Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	ppm	µg/m^3	ppm	µg/m^3
Carbon Monoxide (CO)				
Maximum 8–Hour Concentration(1)	9	10,000	None	
Maximum 1–Hour Concentration(1)	35	40,000		
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months	NA	1.5	NA	1.5
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	100	0.053	100
Ozone (O_3)				
8–Hour Average(2)	0.08	157	0.08	157
Respirable Particulate Matter (PM_{10})				
24–Hour Concentration(1)	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Average of 3 Annual Arithmetic Means	NA	15	NA	15
24–Hour Concentration(3)	NA	65	NA	65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80	NA	NA
Maximum 24–Hour Concentration(1)	0.14	365	NA	NA
Maximum 3–Hour Concentration(1)	NA	NA	0.50	1,300

Notes:
ppm – parts per million
µg/m^3 – micrograms per cubic meter
NA – not applicable
PM concentrations are in µg/m^3. Concentrations of all gaseous pollutants are defined in ppm — approximately equivalent concentrations in µg/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.
(3)Not to be exceeded by the 98th percentile averaged over 3 years.
(4)EPA has reduced these standards down from 65 µg/m3, effective December 18, 2006.

Sources: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

On December 17, 2004, EPA took final action designating the five boroughs of New York City, Nassau, Suffolk, Rockland, Westchester and Orange Counties as $PM_{2.5}$ non-attainment areas under the CAA. State and local governments are required to develop SIPs by early 2008, which will be designed to meet the standards by 2010. As described above, EPA has proposed revisions for the PM standards. As described above, EPA has revised the PM standards. $PM_{2.5}$ attainment designations would be effective by April 2010, $PM_{2.5}$ SIPs would be due by April 2013, and would be designed to meet the $PM_{2.5}$ standards by April 2015, although this may be extended in some cases up to April 2020.

Nassau, Rockland, Suffolk, Westchester and the five counties of New York City had been designated as severe non–attainment areas 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. New York State has recently submitted revisions to the SIP; these SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard, and an update of the SIP estimates using two new EPA models—the mobile source emissions model MOBILE6, and the non–road emissions model NONROAD—which have been updated to reflect current knowledge of engine emissions and the latest mobile and non–road engine emission 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 (all of Orange County 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 are 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. A new SIP for ozone will be adopted by the state no later than June 15, 2007, with a target attainment deadline of June 15, 2010.

DETERMINING THE SIGNIFICANCE 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 16-1) 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 and future actions or actions, as set forth in the *City Environmental Quality Review (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 Action 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 Action) concentrations and the 8–hour standard, when No Action concentrations are below 8.0 ppm.

INTERIM GUIDANCE CRITERIA REGARDING $PM_{2.5}$ IMPACTS

The New York City Department of Environmental Protection (NYCDEP) is currently employing interim guidance criteria for evaluating the potential $PM_{2.5}$ impacts from NYCDEP projects subject to City Environmental Quality Review (CEQR). The interim guidance criteria currently employed by NYCDEP[1] for determination of potential significant adverse impacts from $PM_{2.5}$ are as follows:

[1] NYCDEP, Croton Water Filtration Plant EIS, January 2004.

- Predicted 24–hour (daily) average increase in $PM_{2.5}$ concentrations greater than 5 $\mu g/m^3$ at a discrete location where 24-hour long exposure can be reasonably expected (e.g., residences) or other sensitive locations (e.g., schools, nursing homes) would be considered a significant adverse impact on air quality
- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 2 $\mu g/m^3$ but no greater than 5 $\mu g/m^3$ at multiple sensitive locations where day-long exposure can reasonably be expected, and which are predicted to occur with a high probability and frequency of occurrence, would be considered a significant adverse impact on air quality
- Predicted annual average increase in ground–level $PM_{2.5}$ concentrations greater than 0.1 $\mu g/m^3$ on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating background monitoring stations) would be considered a significant adverse impact on air quality

In addition, NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts. This draft policy would apply only to facilities applying for permits or major permit modification under the State Environmental Quality Review Act (SEQRA) that emit 15 tons of PM_{10} or more annually. The interim guidance policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum predicted impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 $\mu g/m^3$ averaged annually or more than 5 $\mu g/m^3$ on a 24–hour basis. Projects that exceed either the annual or 24–hour threshold will be required to prepare an Environmental Impact Statement (EIS) to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

Actions under CEQR that would increase $PM_{2.5}$ concentrations more than the NYCDEP or NYSDEC interim guidance criteria above will be considered to have potential significant adverse impacts. NYCDEP recommends that its actions subject to CEQR that fail the interim guidance criteria prepare an EIS and examine potential measures to reduce or eliminate such potential significant adverse impacts.

As discussed previously, the total peak-hour volume of induced traffic would not exceed NYCDEP's current threshold for conducting a $PM_{2.5}$ microscale mobile source analysis. Short-term $PM_{2.5}$ concentrations would be below a 2.0 $\mu g/m^3$ threshold and annual $PM_{2.5}$ concentrations would be below the 0.1 $\mu g/m^3$ neighborhood scale threshold. Therefore, no significant $PM_{2.5}$ mobile source impacts are predicted due to the proposed and future actions, and no further analysis is warranted.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

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, particularly under adverse meteorological conditions.

The mobile source analyses for the proposed and future actions employ a model approved by EPA that has 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 ensue from the proposed and future actions.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Maximum CO concentrations adjacent to streets near the proposed and future actions, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0.[1] 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 CO 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, CAL3QHCR, 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 of 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.

CO calculations were performed using the CAL3QHC model. In applying the CAL3QHC model, the wind angle was varied to determine the wind direction resulting in the maximum concentrations at each receptor.

Following the EPA guidelines[2], CO computations were performed using a wind speed of 1 meter per second, and the neutral stability class D. 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

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[1] *User's Guide to CAL3QHC, A Modeling Methodology for Predicted Pollutant Concentrations Near Roadway Intersections,* Office of Air Quality, Planning Standards, EPA, Research Triangle Park, North Carolina, Publication EPA-454/R-92-006.

[2] *Guidelines for Modeling Carbon Monoxide from Roadway Intersections,* EPA Office of Air Quality Planning and Standards, Publication EPA-454/R-92-005.

of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

ANALYSIS YEAR

The microscale analyses were performed for existing conditions and 2009, the year by which the proposed and future actions are likely to be completed. The future analysis was performed both without the proposed and future actions (the No Build condition) and with the proposed and future actions (the Build condition).

VEHICLE EMISSIONS DATA

Vehicular CO engine emission factors were computed using the EPA mobile source emissions model, MOBILE6.2.[1] 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 inspection maintenance programs. The inputs and use of MOBILE6.2 incorporates the most current guidance available from NYSDEC and NYCDEP.

Vehicle classification data were based on field studies. The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative breakdown within the fleet.[2] All taxis were assumed to be in hot stabilized mode (i.e. excluding any start emissions).

Appropriate credits were used to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require 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.

An ambient temperature of 43.0° Fahrenheit was used. The use of this temperature is recommended in the *CEQR Technical Manual* for the Borough of the Bronx 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 and future actions (see Chapter 14, "Traffic and Parking"). Traffic data for the future without and with the proposed and future actions were employed in the respective air quality modeling scenarios. The weekday morning (7:45 to 8:45 AM), and evening (4:45 to 5:45 PM) peak periods were subjected to microscale analysis. These time periods were selected for the mobile

[1] EPA, User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model, EPA420-R-02-028, October 2002.

[2] The MOBILE6.2 emissions model utilizes 28 vehicle categories by size and fuel. Traffic counts and predictions are based on broader size categories, and then broken down according to the fleet-wide distribution of subcategories and fuel types (diesel, gasoline, or alternative).

source analysis because they produce the maximum anticipated project–generated traffic and therefore have the greatest potential for significant air quality impacts.

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations not directly accounted for through the modeling analysis, which directly accounts for vehicular emissions on the streets within 1,000 feet and in the 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 8-hour average background concentration used in this analysis was 2.0 ppm for the 2009 predictions. This value, obtained from NYCDEP, is based on CO concentrations measured at NYSDEC background monitoring stations and is adjusted to reflect the reduced vehicular emissions expected in the analysis year. For purposes of this adjustment, based on EPA guidance, it was assumed that 20 percent of the background value is caused by stationary source emissions that have remained relatively unchanged with time and that 80 percent of the background value is caused by mobile sources that decrease with time. This decrease reflects the reduction in permissible vehicular emission rates of new vehicles over the year, resulting in an overall decrease in the vehicle fleet emissions as older vehicles with higher emissions are retired (i.e., vehicle turnover), and the continuing benefits of the New York State inspection and maintenance program.

ANALYSIS SITES

Two analysis sites were selected for microscale analysis (see Table 16-2 and Figure 16-1). 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 greatest air quality impacts and maximum changes in concentrations would be expected. Each of these intersections was analyzed for CO.

Table 16-2
Mobile Source Intersection Analysis Locations

Analysis Site	Location
1	Melrose Avenue & East 161st Street
2	Third Avenue & East 163rd Street

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. Receptors were placed at sidewalk or roadside locations near intersections with continuous public access.

PARKING FACILITIES

The proposed and future actions would result in the operation of various parking facilities, including a 174 space accessory parking garage at Boricua Village. Since this development site has the largest parking capacity, it was selected for analysis to determine the potential for air quality impacts from parking facilities associated with the proposed and future actions.

The outlet air from the garage's ventilation systems could contain elevated levels of CO due to emissions from vehicular exhaust emissions in the garage. The ventilation air could potentially

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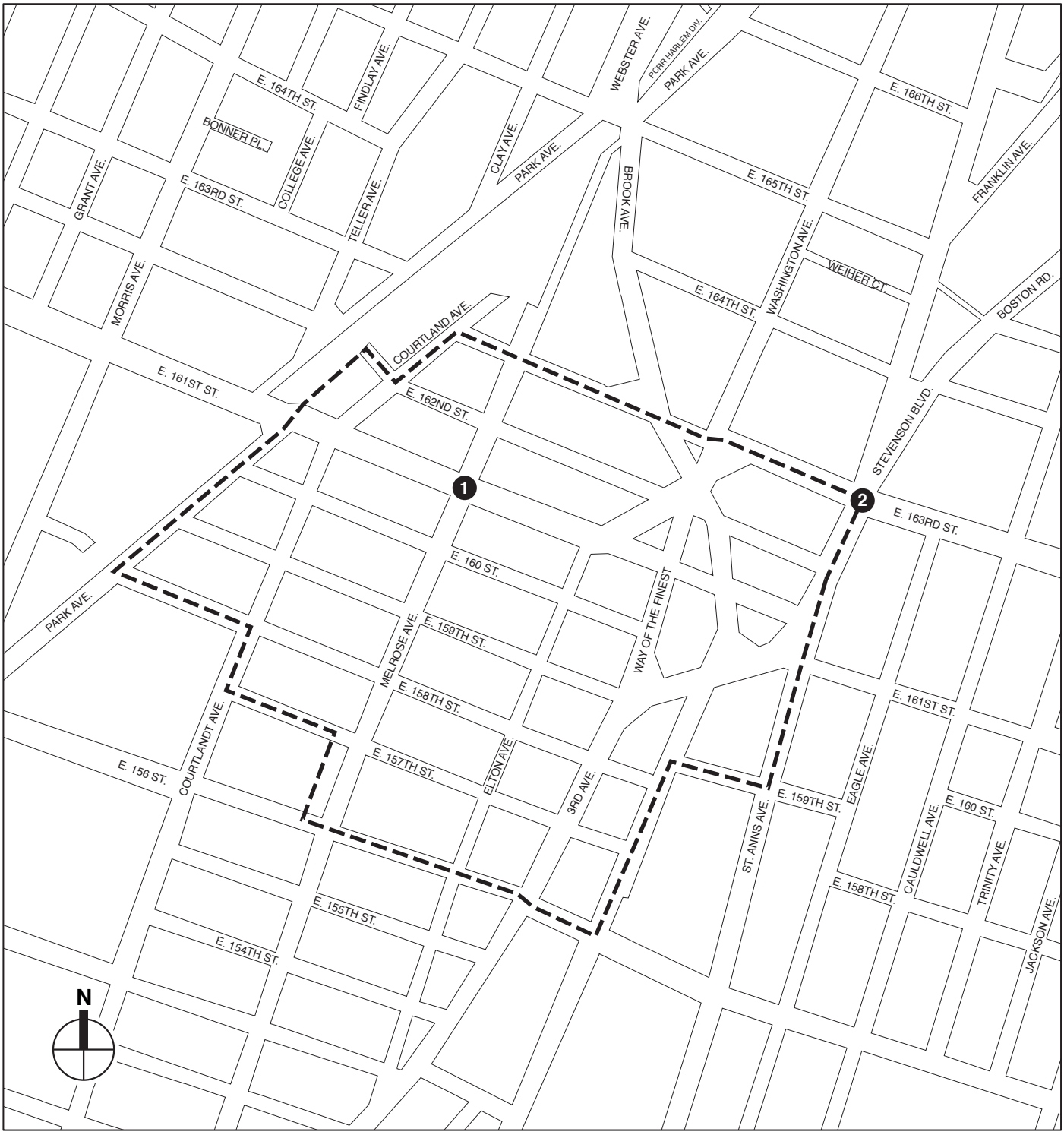

Air Quality Receptor Locations

Figure 16-1

affect ambient levels of CO at locations near the outlet vents. An analysis of the emissions from the outlet vents and their dispersion in the environment was performed, calculating pollutant levels in the surrounding area, using the methodology set forth in the *CEQR Technical Manual*.

Emissions from vehicles entering, parking, and exiting the garage were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 43°F. This temperature is based on the latest guidance from NYCDEP and is also referenced in the *CEQR Technical Manual*. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking garages. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. The concentration of CO within the garage was calculated assuming a minimum ventilation rate, based on New York City Building Code requirements, of 1 cubic foot per minute of fresh air per gross square foot of garage area. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 8-hour average period. (No exceedances of the 1-hour standard would occur and the 8-hour values are the most critical for impact assessment.)

To determine pollutant concentrations, the outlet vents were analyzed as a "virtual point source" using the methodology in EPA's *Workbook of Atmospheric Dispersion Estimates, AP-26*. This methodology estimates CO concentrations at various distances from an outlet vent by assuming that the concentration in the garage is equal to the concentration leaving the vent, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces.

The CO concentrations were determined for the time periods when overall garage usage would be the greatest, considering the hours when the greatest number of vehicles would exit the facility. Departing vehicles were assumed to be operating in a "cold-start" mode, emitting higher levels of CO than arriving vehicles. Traffic data for the parking garage analysis were derived from the trip generation analysis described in Chapter 14 "Traffic and Parking".

The location of the ventilation exhausts is not available at this time, so worst-case assumptions were used. Two receptor locations were modeled: a "near" receptor located five feet from the vent face at a height of approximately six feet, representing potential vent locations in the public open space within Boricua Village; and a "far" receptor placed along the sidewalk across the street from the proposed parking garage entrance, representing a vent face discharging directly towards Elton Ave. A persistence factor of 0.70, supplied by NYCDEP, was used to convert the calculated 1–hour average maximum concentrations to 8–hour averages, accounting for meteorological variability over the average 8-hour period.

Background and on–street CO concentrations were added to the modeling results to obtain the total ambient levels. The on–street CO concentration was determined using the methodology in Air Quality Appendix 1 of the *CEQR Technical Manual*, utilizing traffic volumes from the traffic study presented in the EIS.

STATIONARY SOURCES

HVAC SOURCE ANALYSIS

Screening

As described in Chapter 1, "Project Description," the proposed and future actions would facilitate the development of approximately 1,770 residential units, 99,900 square feet of retail space, and 140,000 square feet of community facility space as well as new publicly accessible open space. The new development would replace vacant land and vacant buildings as well as

some industrial and commercial businesses, and several community gardens with new residential, retail, and institutional buildings.

An analysis was performed to assess air quality impacts associated with emissions from the HVAC systems of the developments identified for the proposed and future actions. In cases where a development site would involve the construction of multiple buildings, project-on-project impacts were assessed. The methodology described in the *CEQR Technical Manual* was used for the analysis and considered impacts on sensitive uses. The screening analysis methodology determines the threshold of development size below which the HVAC system would not have a significant adverse impact. The screening procedures utilize information regarding the type of fuel to be burned, the maximum development size, and the HVAC exhaust stack height to evaluate whether a significant adverse impact is likely. Based on the distance from the development to the nearest building of similar or greater height, if the maximum development size is greater than the threshold size in the *CEQR Technical Manual,* there is the potential for significant air quality impacts, and a refined dispersion modeling analysis would be required. Otherwise, the source passes the screening analysis, and no further analysis is required.

Dispersion modeling

The screening analysis indicated potential significant air quality impacts associated with HVAC emissions from some of the proposed and future development sites. For these development sites, refined dispersion modeling was required. Potential impacts were re–evaluated using the Industrial Source Complex Short Term (ISCST3) dispersion model developed by EPA, and described in *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA-454/B-95-003a). The ISCST3 model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data, and has the capability of calculating pollutant concentrations at locations when the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. The ISCST3 analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, buoyancy-induced dispersion, gradual plume rise, urban dispersion coefficients and wind profile exponents, no collapsing of stable stability classes, and elimination of calms. ISCST3 was run without the building downwash algorithms enabled, since this option results in the calculation of worst-case impacts at elevated receptor locations. The meteorological data set consisted of the latest 5 years of concurrent meteorological data that are available: surface data collected at La Guardia Airport (2000-2004) and concurrent upper air data collected at Brookhaven, New York.

The primary pollutant of concern when burning natural gas is nitrogen dioxide, and when burning oil, sulfur dioxide. In addition, development sites that did not pass the screening analysis and which could fire fuel oil were analyzed to determine maximum $PM_{2.5}$ concentrations since these sites have the greatest potential for $PM_{2.5}$ impacts.

INDUSTRIAL SOURCE ANALYSIS

Potential effects from existing industrial operations in the surrounding area on the proposed and future actions were analyzed. All industrial air pollutant emission sources within 400 feet of the individual buildings associated with the proposed and future actions' boundaries were considered for inclusion in the air quality impact analyses. These boundaries were used to identify the extent of the study area for determining air quality impacts associated with the proposed.

A request was made to NYCDEP's Bureau of Environmental Compliance (BEC) and NYSDEC to obtain the most current information regarding the release of air pollutants from all existing

manufacturing or industrial sources within the entire study area. The NYCDEP and NYSDEC air permit data provided was compiled into a database of source locations, air emission rates, and other data pertinent to determining source impacts. A comprehensive search was also performed to identify NYSDEC Title V permits and permits listed in the EPA Envirofacts database.[1] Facilities that appeared in the Envirofacts database but did not also possess a NYCDEP certificate to operate were cross-referenced against NYSDEC's Air Guide-1 software emissions database, which presents a statewide compilation of permit data for toxic air pollutants, to obtain emissions data and stack parameters.

A field survey was conducted to determine the operating status of permitted industries and identify any potential industrial sites not included in the permit databases. The results of the field survey were compared against NYCDEP data sources.

An air quality dispersion model database, ISC3, was used to estimate maximum potential impacts from different sources at various distances. Impact distances selected for each source were the minimum distances between the property boundary of the development sites and the source sites. Predicted worst-case impacts on the proposed development sites were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) recommended in NYSDEC's DAR-1 AGC/SGC tables. These guideline concentrations present the airborne concentrations, which are applied as a screening threshold to determine if the future residents of the projected development sites could be significantly impacted by nearby sources of air pollution.

E. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS (2005)

Monitored background concentrations of CO, SO_2, particulate matter, NO_2, lead, and ozone ambient air quality data were obtained from NYSDEC. As shown in Table 16-3, these values are the most recent data that have been made available by NYSDEC for nearby monitoring stations. There were no observed violations of the NAAQS for the pollutants at these sites in 2005 (the maximum 24-hour $PM_{2.5}$ concentration is above the recently revised NAAQS, however).

PREDICTED EXISTING CO CONCENTRATIONS FOR MOBILE SOURCES

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 16-4 shows the maximum predicted existing (2005) 8-hour average CO concentrations at the analysis intersections (no 1-hour values are shown since predicted values are much lower than the standard). At all receptor sites, the maximum predicted 8-hour average CO concentrations are within the national standard of 9 ppm.

[1] EPA, Envirofacts Data Warehouse, http://oaspub.epa.gov/enviro/ef_home2.air

Table 16-3
Representative Monitored Ambient Air Quality Data

Pollutants	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	New York Botanical Gardens	ppm	8-hour	-	2.2	2.2	0	-
			1-hour	-	3.9	3.5	0	-
SO_2	I.S. 52	ppm	Annual	0.011	-	-	0	-
			24-hour	-	0.047	0.042	0	-
			3-hour	-	0.087	0.070	-	0
Respirable Particulates (PM_{10})	I.S. 52	$\mu g/m^3$	Annual	18 (1)	-	-	0	0
			24-hour	-	49 (1)	40	0	0
Respirable Particulates ($PM_{2.5}$)	I.S. 52	$\mu g/m^3$	Annual	13.7	-	-	-	-
			24-hour	-	52.4	44.4	-	-
NO_2	I.S. 52	ppm	Annual	0.029	-	-	0	0
Lead	Susan Wagner School	$\mu g/m^3$	3-month	-	0.01	0.01	0	-
O_3	I.S. 52	ppm	1-hour	-	0.108	0.101	0	0
		ppm	8-hour	-	0.077 (3)	NA	0	0

Notes:
[1] Ambient monitoring data are not yet available from DEC for 2005. The latest available value was used instead.
[2] The 1-hour ozone NAAQS has been replaced with the 8-hour standard; however, the maximum monitored concentration is provided for informational purposes.
[3] Represents the 4th highest daily 8-hour concentration.
Source: NYSDEC, 2004-2005 Annual New York State Air Quality Report.

Table 16-4
(2005) Maximum Predicted 8-Hour Average
Existing Carbon Monoxide Concentrations (parts per million)

Site	Location	Time Period	Existing 8-Hour CO Concentration (ppm)
1	Melrose Avenue & East 161st Street	PM	3.5
2	Third Avenue & East 163rd Street	PM	3.8

Notes: 8-hour CO standard is 9 ppm.

F. THE FUTURE WITHOUT THE PROPOSED AND FUTURE ACTIONS

MOBILE SOURCES ANALYSIS

CO concentrations without the proposed and future actions were determined for the 2009 Build year using the methodology previously described. Table 16-5 presents the future maximum predicted 8-hour average CO concentrations without the proposed and future actions (i.e., 2009 No Build values) at the analysis intersections in the project study area. The values shown are the highest predicted concentrations at the receptor locations for any of the time periods analyzed.

Compared to Table 16-4, predicted No Build values are lower than Existing Conditions. The decrease in CO concentrations primarily reflects the increasing proportion of newer vehicles with more effective pollution controls, as well as the continuing benefits of the New York State I&M Program.

Table 16-5
Future (2009) Maximum Predicted 8-Hour Average
No Build Carbon Monoxide Concentrations (parts per million)

Site	Location	Time Period	8-Hour CO Concentration (ppm)
1	Melrose Avenue & East 161st Street	PM	3.3
2	Third Avenue & East 163rd Street	PM	3.5
Notes: 8-hour CO standard is 9 ppm.			

G. THE FUTURE WITH THE PROPOSED AND FUTURE ACTIONS

INTRODUCTION

The proposed and future actions would result in increased mobile source emissions in the immediate vicinity of the project area. The proposed and future actions could also affect development sites and the surrounding community due to emissions from stationary sources. The following sections present the results of the studies performed to analyze the potential impacts on the surrounding community from project-related sources. In addition, the impacts of existing industrial sources on the proposed and future actions were evaluated.

MOBILE SOURCES

CO concentrations with the proposed and future actions were determined for the 2009 Build year using the methodology previously described. Table 16-6 presents the future maximum predicted 8-hour average CO concentrations with the proposed and future actions (i.e., 2009 Build values) at the two analyzed intersections. Since no violations of the 1-hour CO standard have been measured in New York City within the last 10 years, 1-hour averages were not summarized in this report (although all 1-hour predicted CO concentrations would be well within the applicable standard). The values shown are the highest predicted concentration for any of time periods analyzed. The results indicate that the proposed and future actions would not result in any violations of the CO standard or any significant impacts at the receptor locations.

Table 16-6
Future (2009) Maximum Predicted 8-Hour Average Project
Build Carbon Monoxide Concentrations (parts per million): No Build and Build

Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Build	Build
1	Melrose Avenue & East 161st Street	PM	3.3	3.3
2	Third Avenue & East 163rd Street	PM	3.5	3.5
Notes: 8-hour CO standard is 9 ppm.				

PARKING FACILITIES

Based on the methodology previously described, the maximum predicted CO concentrations from the proposed parking facilities were analyzed. The proposed parking garage at Boricua Village was modeled as a worst-case parking facility using two receptor points: a near side receptor on the same side of the street as the parking facility and a far side receptor on the opposite side of the street from the parking facility. The total CO impacts included both background CO levels and the far side receptor included contributions from traffic on adjacent roadways.

The maximum overall predicted future CO concentrations, with ambient background levels, at receptor locations, were predicted to be 7.3 ppm and 2.7 ppm for the 1- and 8-hour periods, respectively. The maximum 1- and 8-hour contribution from the proposed and future actions' parking facilities were predicted to be 1.3 ppm and 0.5 ppm, respectively. The values are the highest predicted concentrations for any time period analyzed.

The CO impacts from the parking garage were substantially below the applicable standard of 9 ppm. Therefore, it can be concluded that the proposed actions' parking facilities would not result in any significant adverse air quality impacts.

STATIONARY SOURCES

HVAC SYSTEMS

The primary stationary source of air pollutants associated with the development sites would be the emissions from natural gas or oil-fired HVAC systems. The primary pollutant of concern when burning natural gas is nitrogen dioxide, and when burning oil, sulfur dioxide. A summary of the results of the screening analysis is presented below for each of the proposed and future development sites.

Boricua Village

A total of nine buildings were analyzed using the screening methodology. The screening methodology in the *CEQR Technical Manual* was utilized for the size of the buildings in square feet and stacks that would be installed 15 feet above roof height. The HVAC systems would burn natural gas exclusively.

For Boricua College, as well as Buildings A1, A2, B, C, D and F, it was determined that the proposed development would not result in any significant stationary source air quality impacts because, at the nearest distances to buildings of a similar or greater height, the proposed development is below the maximum permitted size shown in Figure 3Q-9 of the *CEQR Technical Manual*. However, Boricua Village Buildings E North and E South are both closer to Buildings D and F than the minimum distance determined from the screening analysis.

Courtlandt Corners

For the future proposed Courtlandt Corners development the north and south sites were analyzed separately. The screening methodology in the *CEQR Technical Manual* was utilized for the size of the buildings in square feet and stacks that would be installed 10 feet above roof height. The HVAC systems would burn natural gas exclusively.

The nearest building of a similar or greater height was determined to be at a distance of approximately 62 feet and 114 feet from Courtlandt Corners North and Courtlandt Corners

South, respectively. For Courtlandt Corners South, burning natural gas would not result in any significant stationary source air quality impacts, based on the screening methodologies in the *CEQR Technical Manual*, because this site is below the maximum size determined using Figure 3Q-9 of Air Quality Appendix 7 of the *CEQR Technical Manual*.

For the Courtlandt Corners North development, potential significant air quality impacts were predicted using the screening procedure, assuming a single HVAC system is used for Buildings A, B and C. Therefore, potential stationary source impacts of the pollutant of concern (NO_x) from the HVAC systems of the proposed development site were analyzed using the EPA ISCST3 refined dispersion model. The estimated concentrations from the modeling were added to the ambient background concentrations to estimate air quality impacts at the projected development sites. The results of this analysis are presented in Table 16-7. The results of the refined modeling analysis indicated that no significant impacts would occur using the minimum distance of 62 feet from the future proposed taller building at URA Parcel 64.

Table 16-7
HVAC Dispersion Modeling Analysis
Maximum Predicted Pollutant Concentrations

Pollutants	Averaging Period	Background Concentration (ug/m^3)	Predicted Concentration (ug/m^3)	Total Predicted Concentration (ug/m^3)	Ambient Standard (ug/m^3)
Nitrogen Dioxide (NO_2)	Annual	60	11.0	71.0	100

If individual HVAC systems are utilized for each building, potential significant air quality impacts could occur since the six-story portion of the proposed development at Courtlandt Corners North (Building C) is directly adjacent to the taller portion of the development (Building A).

URA Parcel 15

For URA Parcel 15, the nearest distance to a building of a similar or greater height is approximately 125 feet. Using No. 4 oil or natural gas would not result in any significant stationary source air quality impacts, based on the screening methodologies in the *CEQR Technical Manual*, because they are below the maximum size determined using Figure 3Q-5 and 3Q-9 of Air Quality Appendix 7 of the *CEQR Technical Manual*, respectively.

URA Parcel 51

For URA Parcel 51, the nearest distance to a building of a similar or greater height is at URA Parcel 52, approximately 37 feet away. Using No. 4 oil or natural gas would not result in any significant stationary source air quality impacts, based on the screening methodologies in the *CEQR Technical Manual*, because they are below the maximum size determined using Figure 3Q-6 and 3Q-10 of Air Quality Appendix 7 of the *CEQR Technical Manual*, respectively.

URA Parcel 52

The nearest building of a similar or greater height from the development site at URA Parcel 52 is the future proposed development site at URA Parcel 53. Since the future proposed development site is directly adjacent to URA Parcel 53, potential significant air quality impacts could occur using either No. 4 oil or natural gas.

URA Parcel 53

For URA Parcel 53, the nearest distance to a building of a similar or greater height is approximately 361 feet. Using No. 4 oil or natural gas would not result in any significant stationary source air quality impacts, based on the screening methodologies in the *CEQR Technical Manual*, because they are below the maximum size determined using Figure 3Q-5 and 3Q-9 of Air Quality Appendix 7 of the *CEQR Technical Manual*, respectively.

URA Parcel 54

URA Parcel 54 would be developed as a one-story commercial building, and is adjacent to an existing two-story institutional building and a six-story residential building. Given the small size of the development (3,300 gross square feet) no significant air quality impacts are predicted to occur these adjacent sites or any other sites, assuming that applicable New York City Building Code requirements are followed with respect to exhaust stack placement and clearances.

URA Parcel 62

For URA Parcel 62, the nearest distance to a building of a similar or greater height is URA Parcel 64, approximately 74 feet. At this distance, potential significant impacts could occur using either No. 4 or No. 2 oil; however no significant adverse air quality impacts are predicted when using natural gas as the fuel type.

URA Parcel 64

For URA Parcel 64, the nearest distance to a building of a similar or greater height is greater than 400 feet. Using No. 4 oil or natural gas would not result in any significant stationary source air quality impacts, based on the screening methodologies in the *CEQR Technical Manual*, because they are below the maximum size determined using Figure 3Q-5 and 3Q-11 of Air Quality Appendix 7 of the *CEQR Technical Manual*, respectively.

Mitigation measures for potential impacts are presented in Chapter 18, "Mitigation."

INDUSTRIAL SOURCES

As discussed above, a review of land use, Sanborn maps, and a field survey was conducted to identify manufacturing and industrial uses within 400 feet of the project site. Addresses with potential industrial emissions were identified based on existing on-site businesses, as well as the presence of visible venting apparatus.

Of the 33 addresses identified to have the potential for pollutant emissions, only 1 business was on file with BEC or NYSDEC and determined to have potential air pollutant emissions. The screening methodology in the *CEQR Technical Manual* was utilized for the analysis, with the air contaminant emission rates from the source at the industrial facility and the distance to the proposed building. Table 16-8 shows the businesses' registered equipment, contaminants, estimated emissions, calculated concentrations, and the respective, recommended short-term (a 1-hour period, unless otherwise noted) and annual guideline concentrations.

The conservative screening procedure used to estimate maximum potential impacts from this business showed that its operations would not result in any predicted violations of the National Ambient Air Quality Standards (NAAQS) or any exceedances of the recommended SGC or AGC. Therefore, based on the data available on the surrounding industrial uses, development resulting from the proposed and future actions would not result in any significant air quality impacts on the proposed development.

Table 16-8
Businesses with BED Permits

Source ID	Potential Contaminants	CAS No.	Hours of Operation		Estimated Emissions (g/s)	Estimated Short-term Impact (ug/m^3)	SGC (ug/m^3)	Estimated Long-term Impact (ug/m^3)	AGC (ug/m^3)	Notes
			Hrs/day	Days/yr						
1)	Particulates	NY075-00-0	10	250	0.00013	0.397	380	0.0018	50	a
2)	Particulates	NY075-00-0	10	250	0.00013	0.397	380	0.0018	50	a
Total						0.79	380	0.00	50	a
Notes: a) NYSDEC DAR-1 (Air Guide-1) AGC/SGC Tables.										

CONSISTENCY WITH NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

Maximum predicted CO concentrations with the proposed and future actions would be less than the applicable ambient air standard. Therefore, the proposed and future actions would be consistent with the New York State Implementation Plan for the control of ozone and CO. ✶