A. INTRODUCTION

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

The maximum hourly traffic generated by the proposed project would exceed the 2010 *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide screening threshold of 160 peak hour vehicle trips at an intersection in the study area. In addition, the particulate matter emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the 2010 *CEQR Technical Manual* would be exceeded. Therefore, a quantified assessment of the potential impact on air quality from project- generated traffic was conducted. The proposed project would also include a surface parking lot. Therefore, an analysis of emissions from vehicles using the parking lot was conducted to assess the potential for a significant impact on air quality.

A stationary source analysis was conducted to evaluate the potential for impacts on air quality from the heat and hot water systems that would serve the proposed project. The potential of existing sources, including the nearby Brooklyn Navy Yard Cogeneration Plant, to result in a significant adverse air quality impact on the proposed project was also analyzed.

The mobile source analysis of vehicular emissions that would be generated by the proposed project concluded that carbon monoxide and particulate matter levels resulting from the proposed project would not be significant. The proposed parking lot also would not result in carbon monoxide concentrations that would be significant. With the implementation of fuel type and exhaust stack placement restrictions for the heat and hot water systems that would serve the proposed supermarket, there would be no potential for significant adverse impacts from the proposed project's heat and hot water systems on the air quality at surrounding or proposed uses. None of the surrounding existing uses would result in a significant adverse impact on air quality at the proposed project. Therefore, there would be no significant adverse air quality impacts from the proposed project.

B. POLLUTANTS FOR ANALYSIS

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

CARBON MONOXIDE

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

The proposed project would result in peak vehicle trips that would exceed the 2010 *CEQR Technical Manual* screening analysis threshold for CO. Therefore, a quantified assessment of air quality impacts from project generated traffic was conducted.

NITROGEN OXIDES, VOCS, AND OZONE

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

The proposed project would 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. Per the 2010 *CEQR Technical Manual* analysis of project-related emissions of these pollutants from mobile sources is not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may become of greater concern for this pollutant. The potential for significant adverse impact from the existing Brooklyn Navy Yard Cogeneration Plant on the NO_2 levels at the proposed project was evaluated.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Effective January 1, 1996, the Clean Air Act (CAA) banned the sale of the small amount of leaded fuel that was still available in some parts of the country for use in on-road vehicles, concluding a 25-year effort to phase out lead in gasoline. Even at locations in the New York City area where traffic volumes are high, atmospheric lead concentrations are far below the 3-month average national standard of 0.15 micrograms per cubic meter ($\mu g/m^3$).

No significant sources of lead are associated with the proposed project and, therefore, per the 2010 *CEQR Technical Manual* 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 VOC; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) 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 ($PM_{2.5}$), and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). $PM_{2.5}$ 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 a source exhaust) or from precursor gases reacting in the atmosphere to form secondary PM.

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel powered vehicles. The proposed project would not result in a large increase in truck traffic. However, the proposed project would potentially result in $PM_{2.5}$ that would exceed the $PM_{2.5}$ vehicle emissions screening threshold as defined in Chapter 17, Sections 210 and 311 of the 2010 *CEQR Technical Manual*. Therefore, an analysis of potential impacts from PM emissions from project-generated traffic was conducted. In addition, the potential for significant adverse impacts from the PM emissions at the existing Brooklyn Navy Yard Cogeneration Plant was evaluated.

SULFUR DIOXIDE

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

As part of the proposed project, it is anticipated that natural gas would be burned in the proposed heat and hot water systems. SO_2 emissions from natural gas combustion are not a concern. However, as a conservative worst-case procedure, a screening analysis was conducted to assess the impact of SO_2 emissions that would be associated with use of fuel oil in heat and hot water systems. The potential for significant adverse impact from the existing Brooklyn Navy Yard Cogeneration Plant on the SO_2 levels at the proposed project was also evaluated.

NONCRITERIA POLLUTANTS

In addition to the criteria pollutants discussed above, noncriteria pollutants are emitted by a wide range of man-made and naturally occurring sources. Emissions of noncriteria pollutants from industries are regulated by EPA. Federal ambient air quality standards do not exist for noncriteria pollutants; however, the New York State Department of Environmental Conservation (DEC) has issued standards for certain noncriteria compounds, including beryllium, gaseous fluorides, and hydrogen sulfide. DEC has also developed guideline concentrations for numerous noncriteria pollutants. The DEC guidance document DAR-1 (October 2010) contains a compilation of annual and short term (1-hour) guideline concentrations for these compounds. The DEC guidance thresholds represent ambient levels that are considered safe for public exposure. Noncriteria pollutant emissions were considered in the assessment of existing industrial sources.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, 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 (annual), ozone, lead, and PM, and there is no secondary standard for CO or the 1-hour NO_2 standard. The NAAQS are presented in **Table 10-1**. The NAAQS for CO, annual NO_2, and SO_2 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), settleable particles, non-methane hydrocarbons (NMHC), and ozone, which correspond to federal standards that have since been revoked or replaced, and for beryllium, fluoride, and hydrogen sulfide (H_2S).

Table 10-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	μg/m^3	ppm	μg/m^3
Carbon Monoxide (CO)				
8-Hour Average [1]	9	10,000	None	
1-Hour Average [1]	35	40,000		
Lead				
Rolling 3-Month Average [2]	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-Hour Average [3]	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average [4,5]	0.075	150	0.075	150
Respirable Particulate Matter (PM_{10})				
24-Hour Average [1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean	NA	15	NA	15
24-Hour Average [6,7]	NA	35	NA	35
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean [8]	0.03	80	NA	NA
Maximum 24-Hour Average [8]	0.14	365	NA	NA
1-Hour Average[9]	0.075	196	NA	NA
Maximum 3-Hour Average [1]	NA	NA	0.50	1,300

Notes:
ppm – parts per million
μg/m^3 – micrograms per cubic meter
NA – not applicable
All annual periods refer to calendar year.
PM concentrations (including lead) are in μg/m^3 since ppm is a measure for gas concentrations.
Concentrations of all gaseous pollutants are defined in ppm and approximately equivalent concentrations in μg/m^3 are presented.

(1) Not to be exceeded more than once a year.
(2) EPA has lowered the NAAQS down from 1.5 μg/m^3, effective January 12, 2009.
(3) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.
(4) 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
(5) EPA has proposed lowering this standard further to within the range 0.060-0.070 ppm.
(6) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(7) EPA has lowered the NAAQS down from 65 μg/m^3, effective December 18, 2006.
(8) EPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.
(9) 3-year average of the annual 99th percentile daily maximum 1-hr average concentration. Effective August 23, 2010.

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

EPA has revised the NAAQS for PM, effective December 18, 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 and retaining the level of the annual standard at 15 µg/m^3. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked.

EPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective as of May 2008. On January 6, 2010, EPA proposed a change in the 2008 ozone NAAQS, lowering the primary NAAQS from the current 0.075 ppm level to within the range of 0.060 to 0.070 ppm. EPA is also proposing a secondary ozone standard, measured as a cumulative concentration within the range of 7 to 15 ppm-hours, aimed mainly at protecting sensitive vegetation.

EPA lowered the primary and secondary standards for lead to 0.15 µg/m^3, effective January 12, 2009. EPA revised the averaging time to a rolling 3-month average and the form of the standard to not-to-exceed across a 3-year span.

EPA established a 1-hour average NO_2 standard of 0.100 ppm, effective April 12, 2010, in addition to the annual standard. The statistical form is the 3-year average of the 98th percentile of daily maximum 1-hour average concentration in a year.

EPA established a 1-hour average SO_2 standard of 0.075 ppm, replacing the 24-hour and annual primary standards, effective August 23, 2010. The statistical form is the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations (the 4th highest daily maximum corresponds approximately to 99th percentile for a year).

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, 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.

In 2002, EPA 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.

Manhattan has been designated as a moderate NAA for PM_{10}. On December 17, 2004, EPA took final action designating the five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties as a $PM_{2.5}$ non-attainment area under the CAA due to exceedance of the annual average standard. Based on recent monitoring data (2006-2009), annual average concentrations of $PM_{2.5}$ in New York City no longer exceed the annual standard.

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

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA), and the five New York City counties had been designated as a severe non-attainment area for ozone (1-hour average 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.

On April 15, 2004, EPA designated these same counties as moderate non-attainment for the 8-hour average ozone standard which became effective as of June 15, 2004 (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). EPA revoked the 1-hour standard on June 15, 2005; however, the specific control measures for the 1-hour standard included in the SIP 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. On February 8, 2008, DEC submitted final SIP revisions to EPA to address the 1997 8-hour ozone. DEC has determined that achieving attainment for ozone before 2012 is unlikely, and has therefore made a request for a voluntary reclassification of the New York nonattainment area as "serious."

In March 2008 EPA strengthened the 8–hour ozone standards. SIPs will be due three years after the final designations are made. On March 12, 2009, DEC recommended that the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester be designated as a non-attainment area for the 2008 ozone NAAQS.

New York City is currently in attainment of the annual-average NO_2 standard. EPA has promulgated a 1-hour standard. The existing monitoring data for New York City indicates background concentrations below the standard. DEC has determined that the present monitoring does not meet the requirements of the revised rule in all respects and has recommended a designation of "unclassifiable" for the entire state. Therefore, it is likely that New York City will be designated by EPA as "unclassifiable" at first (January 2012), and then classified once three years of monitoring data are available (2016 or 2017).

EPA has established a 1-hour SO_2 standard, replacing the 24-hour and annual standards, effective August 23, 2010. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. Additional monitoring will be required. EPA plans to make final attainment designations in June 2012, based on 2008 to 2010 monitoring data and refined modeling. SIPs for nonattainment areas will be due by June 2014.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the 2010 *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[1] In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see **Table 10-1**) would be deemed to have a potential significant adverse impact. In addition, to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be

[1] *CEQR Technical Manual*, Chapter 17, section 400, May 2010; and State Environmental Quality Review Regulations, 6 NYCRR § 617.7

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 increase in CO concentrations that would result from the impact of proposed projects or actions on mobile sources, as set forth in the 2010 *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Build 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline (i.e., No Build) concentrations and the 8-hour standard, when No Build concentrations are below 8.0 ppm.

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

DEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts[1]. This policy would apply only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. The policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum 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.

In addition, New York City uses interim guidance criteria for evaluating potential $PM_{2.5}$ impacts for projects subject to CEQR. The interim guidance criteria currently employed under CEQR are as follows:

- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 5 $\mu g/m^3$ at a discrete receptor location would be considered a significant adverse impact on air quality under operational conditions (i.e., a permanent condition predicted to exist for many years regardless of the frequency of occurrence);
- 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 $\mu g/m^3$ would be considered a significant adverse impact on air quality based on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations;
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.1 $\mu g/m^3$ at ground level 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 ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or

[1] CP33/Assessing and Mitigating Impacts of Fine Particulate Emissions, DEC 12/29/2003.

- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete receptor location (elevated or ground level).

Actions under CEQR predicted to increase $PM_{2.5}$ concentrations by more than the interim guidance criteria above will be considered to have potential for significant adverse impacts.

The proposed project's annual emissions of PM_{10} are estimated to be well below the 15-ton-per-year threshold under the DEC $PM_{2.5}$ policy guidance. The New York City interim guidance criteria have been used to evaluate the significance of predicted impacts of the proposed project on $PM_{2.5}$ concentrations and determine the need to minimize particulate matter emissions from the proposed project.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

The prediction of vehicle-generated emissions and their dispersion in an urban environment incorporates meteorological phenomena, traffic conditions, and physical configuration. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and physical configuration 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 since it is necessary to predict the reasonable worst-case condition, most dispersion analyses predict conservatively high concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analysis for the proposed project employs 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 project. The assumptions used in the analysis are based on the latest $PM_{2.5}$ interim guidance developed by the New York City Department of Environmental Protection (DEP).

VEHICLE EMISSIONS

Engine Emissions

Vehicular CO and PM 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 incorporate the most current guidance available from DEC and DEP.

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[1] EPA, User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model, EPA420-R-03-010, August 2003.

Vehicle classification data were based on field studies. 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 each vehicle exhaust system are lower than emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State.

All taxis were assumed to be in hot stabilized mode (i.e., excluding any start emissions). The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative breakdown within the fleet.[1]

An ambient temperature of 43°F was used. The use of this temperature is recommended in the 2010 *CEQR Technical Manual* for the Borough of Brooklyn and is consistent with current DEP guidance.

Road Dust

The contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant; therefore, the PM_{10} estimates include both exhaust and road dust. $PM_{2.5}$ emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust was not included in the neighborhood scale $PM_{2.5}$ microscale analyses, since DEP considers it to have an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA[2] and the 2010 *CEQR Technical Manual*.

TRAFFIC DATA

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the proposed project (see Chapter 9, "Transportation"). Traffic data for the future without the proposed project (No Build) and with the proposed project (Build) were employed in the respective air quality modeling scenarios. The weekday morning (8 to 9 AM), midday (12 to 1 PM), evening (5 to 6 PM), and Saturday midday (1 to 2 PM) peak periods were analyzed. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

Off-peak traffic volumes in the future without the proposed project and off-peak increments from the proposed project were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations. For annual impacts, average weekday and weekend 24-hour distributions were used to more accurately simulate traffic patterns over longer periods.

[1] 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).

[2] EPA, Compilations of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Ch. 13.2.1, NC, http://www.epa.gov/ttn/chief/ap42, January 2011.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Maximum CO concentrations adjacent to streets near the proposed project site 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.

To determine motor vehicle generated PM concentrations adjacent to streets near the proposed project site, the CAL3QHCR model was applied. This refined version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating 24-hour and annual average concentrations.

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 direction in which pollutants are dispersed, and atmospheric stability accounts for the effects of vertical mixing in the atmosphere. These factors, therefore, influence the concentration at a particular prediction location (receptor).

Tier I Analyses—CAL3QHC

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] CAL3QHC 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 0.81 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness 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.

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

Tier II Analyses—CAL3QHCR

A Tier II analysis performed with the CAL3QHCR model includes the modeling of hourly concentrations based on hourly traffic data and five years of monitored hourly meteorological data. The data consists of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York for the period 2005-2009. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for existing conditions and 2014, the year by which the proposed project is likely to be completed. The future analysis was performed both for the No Build and Build conditions.

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations originating from distant sources that are not directly included in the modeling analysis, which directly accounts for vehicular emissions on the streets within 1,000 feet and in the line of sight of the analysis site. Background concentrations must be added to modeling results to obtain total pollutant concentrations at an analysis site.

The background concentrations used in the mobile source analysis were based on maximum second highest concentrations recorded at the DEC P.S. 219 / Queens College 2 monitoring station from 2005 to 2009. The monitoring station at P.S. 219 / Queens College is the closest monitoring station to the proposed project site that has available recorded data over a recent 5-year period.

ANALYSIS SITES

Two intersections were selected for microscale analysis (see **Table 10-2**). Consistent with the 2010 *CEQR Technical Manual,* these sites 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. The greatest number of overall project generated trips is expected at Site 1 in the weekday PM and weekend midday peak periods. The potential impact from vehicle emissions of CO, PM_{10}, and $PM_{2.5}$ was therefore analyzed at Site 1. The greatest number of truck trips is expected at Site 2 during the weekday AM and midday peak traffic periods. An analysis of particulate matter emissions was performed for Site 2 because $PM_{2.5}$ emissions from diesel vehicles (primarily trucks) are of concern.

Table 10-2
Mobile Source Analysis Sites

Analysis Site	Location	Pollutants Analyzed	Peak Periods Analyzed
1	Flushing Avenue and Carlton Avenue	CO PM_{10} $PM_{2.5}$	PM Midday Saturday
2	Sands Street and Navy Street	PM_{10} $PM_{2.5}$	AM Midday

RECEPTOR PLACEMENT

Multiple receptors (i.e., precise locations at which concentrations are predicted) were modeled at each site; 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. Receptors in the analysis models for predicting annual average neighborhood-scale $PM_{2.5}$ concentrations were placed at a distance of 15 meters from the nearest moving lane at each analysis location, based on the DEP procedure for neighborhood-scale corridor $PM_{2.5}$ modeling.

PARKING FACILITIES

The proposed project would include 295 accessory parking spaces in a surface lot with entrances on Navy Street and Nassau Street. Emissions from vehicles using the parking areas could potentially affect ambient levels of pollutants at receptors adjacent to the parking lot. An analysis was performed using the methodology delineated in the 2010 *CEQR Technical Manual* to calculate pollutant levels. Since the parking lot would be used by automobiles, the primary pollutant of concern is CO.

Potential impacts from the proposed parking lot on CO concentrations were assessed at multiple receptor locations. The CO concentrations were determined for the weekday PM peak period and the weekend midday peak period, when overall lot 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. Emissions from vehicles entering, parking, and exiting the parking lots were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 43°F, as referenced in the 2010 *CEQR Technical Manual*. All arriving and departing vehicles were conservatively assumed to travel at an average speed of 5 miles per hour within the parking facility. In addition, all departing vehicles were assumed to idle for 1 minute before exiting.

A “near” and “far” receptor was placed at the façade of the proposed Building C, closest to the parking lot, and at the Sands Street sidewalk, respectively. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 1- and 8-hour average periods. A persistence factor of 0.81 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.

STATIONARY SOURCES

HEAT AND HOT WATER SYSTEM SCREENING ANALYSIS

To assess air quality impacts associated with emissions from the proposed project’s heat and hot water systems, a screening analysis was performed for each of the proposed buildings. The methodology described in the 2010 *CEQR Technical Manual* was used for the analysis, which determines the threshold of development size below which the action would not have a significant adverse impact. The screening procedure considers the fuel to be used, the maximum development size, type of development, and the stack height, to evaluate whether a significant adverse impact is likely. Based on the distance from the proposed project to the nearest building of similar or greater height, if the maximum development size is greater than the threshold size in the 2010 *CEQR Technical Manual,* there is the potential for significant adverse 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.

Cumulative Analysis of Heat and Hot Water Systems

A cumulative impact analysis for the proposed project's heat and hot water systems was conducted to assess whether the combined emissions from those systems would have the potential to impact the air quality at nearby uses.

Dispersion Model

The analysis of the potential for cumulative impacts from the heat and hot water systems was conducted using the EPA/AMS AERMOD dispersion model[1]. AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatment of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of the interaction between the plume and terrain.

The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data, and has the capability to calculate pollutant concentrations at locations where the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. The analyses of potential impacts from the exhaust stacks were made assuming stack tip downwash, urban dispersion and surface roughness length, without building downwash, and elimination of calms.

The AERMOD model also incorporates the algorithms from the PRIME model, which is designed to predict impacts in the "cavity region" (i.e., the area around a structure that under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region).

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at La Guardia Airport (2005–2009) and concurrent upper air data collected at Brookhaven, New York. The meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevation over the five-year period. These data were processed using the EPA AERMET program to develop data in a format that can be readily processed by the AERMOD model. The land uses around the site where meteorological surface data were available were classified using categories defined in digital United States Geological Survey (USGS) maps to determine surface parameters used by the AERMET program.

Receptor Placement

Discrete receptors (i.e., locations at which concentrations are calculated) were modeled along the existing building façades to represent potentially sensitive locations such as operable windows

[1] EPA, AERMOD: Description Of Model Formulation, 454/R-03-004, September 2004; and
EPA, User's Guide for the AMS/EPA Regulatory Model AERMOD, 454/B-03-001, September 2004 and Addendum December 2006.

and intake vents. Rows of receptors were placed in the model at spaced intervals on the proposed buildings at multiple elevations.

Emission Estimates and Stack Parameters

Annual emission rates for NO_2 , SO_2, and PM (the pollutants of concern with combustion of fuel oil) were developed using annual fuel oil consumption data referenced in the 2010 *CEQR Technical Manual Air Quality Appendix*, originally developed by the Energy Information Administration, and emission factors listed in Compilations of Air Pollutant Emission Factors AP-42.[1] To calculate the short-term emission rates, the annual average emission rates were adjusted to reflect greater fuel usage during the heating season, assumed to be 100 days. The 2010 *CEQR Technical Manual* default stack parameters were used.

Background Concentrations

As with the mobile source analysis, the predicted impacts from stationary sources analyzed must be added to a background value that accounts for existing pollutant concentrations from sources that are not directly accounted for in the model to estimate the maximum expected pollutant concentration at a given location (receptor). All background concentrations used in the stationary source analysis are based on data collected at the DEC P.S. 219/Queens College 2 monitoring station from 2005 to 2009. The annual NO_2 background is based on the maximum annual average value measured over the five years. The 1-hour CO, 8-hour CO, and 3-hour SO_2 background levels are based on maximum second-highest concentrations recorded over the five year period. The 24-hour average PM_{10} background concentration is based on the maximum second-highest 24-hour average concentration measured over the most recent 3-year period for which monitoring data are available (2007-2009). The 1-hour average SO_2 concentration is based on the 3-year average of the annual 99th percentile of the daily maximum 1-hour SO_2 concentrations, and the NO_2 1-hour average background concentrations is based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour NO_2 concentrations, consistent with the NAAQS.

INDUSTRIAL SOURCES

To assess air quality impacts from emissions from nearby industrial sources on the proposed project, a screening analysis is performed using the methodology described in the 2010 *CEQR Technical Manual*. The first step in this analysis is to perform a field survey to identify any processing or manufacturing facilities located within 400 feet of the project site. Once identified, information regarding the release of air contaminants from these facilities is obtained from the DEP Bureau of Environmental Compliance (BEC). A comprehensive search is also performed to identify DEC Title V permits and permits listed in the EPA Envirofacts database.[2] In the next step, if there are emission sources of concern, the potential ambient concentrations of each air toxic contaminant are determined using the 2010 *CEQR Technical Manual* screening procedures or the AERMOD dispersion model. Estimates of worst-case short-term (1 hour) and annual average concentrations are predicted and then compared with the short-term (SGC) and annual (AGC) guideline concentrations. The guideline concentrations are established by DEC and represent levels that are considered safe for inhalation exposure by the public. A significant impact occurs if the predicted concentration exceeds an SGC or AGC. Industrial source

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[1] EPA, Compilations of Air Pollutant Emission Factors AP-42, Chapter 1.3, Fuel Oil Combustion, May 2010.

[2] EPA, Envirofacts Data Warehouse, http://oaspub.epa.gov/enviro/ef_home2.air, 10/1/2010

emissions of criteria pollutants are also considered and the potential for impact is assessed by comparing the predicted pollutant levels to NAAQS, or for $PM_{2.5}$ to the interim guidance criteria.

ADDITIONAL SOURCES

The 2010 *CEQR Technical Manual* requires an assessment of any actions that could result in the location of sensitive uses within 1,000 feet of a "large" emission source (examples of large emission sources provided in the 2010 *CEQR Technical Manual* include solid and medical waste incinerators, cogeneration plants, asphalt and concrete plants, or power plants) or within 400 feet of emission sources associated with commercial, institutional, or large-scale residential developments where the proposed structure would be of a height similar to or greater than the height of an existing emission stack. Facilities that warrant consideration typically operate pursuant to the DEC's Title V program or the State Facility permit program. Sources for consideration are also identified through review of DEP permit data and the EPA Envirofacts database. Two facilities within 1,000 feet of the proposed project were identified for further assessment—the Brooklyn Navy Yard Cogeneration Plant, and the Red Hook Water Pollution Control Plant (WPCP).

Brooklyn Navy Yard Cogeneration Plant

The Brooklyn Navy Yard Cogeneration Plant, a 286-megawatt (MW) power plant, is located within 400 feet of the project site and is permitted to operate through the Title V program. The major emissions sources for the facility are two Siemens V84.2 gas turbines, each equipped with a Heat Recovery Steam Generator, which can run on natural gas, distillate oil, or digester gas from the Red Hook WPCP. The turbine exhaust is released through two stacks, at a height of 310 feet, well above the height of any of the proposed project buildings. Based on the Cogeneration Plant stack height and the height of the proposed project, a significant air quality impact from the Cogeneration Plant on the proposed project was not expected. However, an analysis was conducted, due to the proximity of the Cogeneration Plant to the project site, to verify that there would be no potential for significant adverse impacts. As with the cumulative analysis of heat and hot water systems, the AERMOD dispersion model was used in the analysis of the Cogeneration Plant, with the same set of meteorological data and the same background concentration values.

Emission Estimates and Stack Parameters

A worst case analysis of combustion of distillate oil simultaneously in both turbines was performed. The emission rates used in the analysis were based on the maximum emissions allowed by the Title V permit. The stack height and the stack diameter were also obtained from the Title V permit, while the stack exit velocity and exhaust temperature, which were not specified in the permit, were obtained from a cumulative impact study of large sources, which included the Brooklyn Navy Yard Cogeneration Plant, conducted by Con Edison in 2001.[1] The short-term emission rates are based on the upper permit limit (pounds per hour) provided in the Title V for each pollutant. Annual emissions are calculated using the Title V limit of 17,082 hours of combined total hours of operation of the two turbines. The stack parameters and emission rates used for the Brooklyn Navy Yard Cogeneration Plant are shown in **Table 10-3**.

[1] East River Repowering Project New York, New York, "Cumulative Impact Air Quality Analysis Under the New York City Environmental Review Technical Manual," April 2001.

Table 10-3
Stack Parameters and Emission Rates
for the Brooklyn Navy Yard Cogeneration Plant

Parameter	Value
Stack Height	310 feet
Stack Diameter	17 feet
Stack Exit Velocity[1]	70 feet/second
Stack Exit Temperature[1]	290 ºF
PM_{10} emission rate (short term)	1.701 grams/second
$PM_{2.5}$ emission rate (annual)	1.658 grams/second
NO_x emission rate (short term)	7.308 grams/second
NO_x emission rate (annual)	7.125 grams/second
SO_2 emission rate (short term)	7.651 grams/second
SO_2 emission rate (annual)	7.459 grams/second
CO emission rate (short term)	2.268 grams/second

Notes:
1. Based on parameters provided in the East River Repowering Project conducted in 2001.
2. Emission rates are for a single stack. The two stacks have the same stack parameters and emission rates.

Red Hook Water Pollution Control Plant

The Red Hook WPCP is located partially within 1,000 feet of the project site. The Red Hook WPCP is capable of providing secondary treatment for 60 million gallons of sewage per day. The plant has three boilers, one digester gas flare, and is in the process of obtaining permits for two emergency generators that may be used in the New York State Peak Load Management (PLM) Program.

The Red Hook WPCP has an agreement to provide treated effluent to the Brooklyn Navy Yard Cogeneration Plant in exchange for hot water to supply the WPCP's heating needs. This agreement is included in the WPCP's DEC Facility Registration. Because of this agreement, the WPCP does not need to operate its boilers unless an emergency occurs and the cogeneration plant shuts down. Based on DEP fuel records from 2000 through 2005, the boilers did not operate for 5.5 years and are not expected to operate in the future.

As such, total facility emissions are less than 50 percent of the major source thresholds, and the facility is therefore considered a minor source, operating under a DEC Facility Registration. Per the 2010 *CEQR Technical Manual* criteria pollutant emissions from minor sources beyond 400 feet of a proposed use do not have the potential for significant impact.

The WPCP odor control systems include dual-bed and single-bed carbon vessels at the headwork screening, thickeners, dewatering building and at the truck loading area to limit the levels of malodorous compounds in the surrounding area. Given these existing odor control systems and the distance from the WPCP to the project site, there would be no potential for adverse odor impacts on the proposed project. Therefore, the WPCP would not result in any significant adverse impacts on the proposed project and further assessment is not required.

E. EXISTING CONDITIONS

The most recent concentrations of all criteria pollutants at DEC air quality monitoring stations nearest to the project site are presented in **Table 10-4**. As shown, the recently monitored levels did not exceed the NAAQS. It should be noted that these values are somewhat different from the background concentrations used in the analyses. For most pollutants the concentrations presented in **Table 10-4** are based on recent measurements obtained in 2009, the most recent year for which data are available; the background concentrations are obtained from several years of monitoring data and represent a conservative estimate of the highest background concentrations for future conditions.

Table 10-4
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Queens College 2, Queens	ppm	8-hour	1.7	9
			1-hour	2.8	35
SO_2	Queens College 2, Queens[1]	μg/m³	3-hour	89	1,300
			1-hour	91.4	196
PM_{10}	Queens College 2, Queens	μg/m³	24-hour	46	150
$PM_{2.5}$	JHS 126, Brooklyn[2]	μg/m³	Annual	12.2	15
			24-hour	30	35
NO_2	Queens College 2, Queens[3]	μg/m³	Annual	39.5	100
			1-hour	126.7	188
Lead	J.H.S. 126, Brooklyn[4]	μg/m³	3-month	0.019	0.15
Ozone	Queens College 2, Queens[5]	ppm	8-hour	0.074	0.075

Notes:
(1) The 1-hour value is based on a three-year average (2007-2009) of the 99th percentile of daily maximum 1-hour average concentrations. EPA replaced the 24-hr and the annual standards with the 1-hour standard.
(2) Annual value is based on a three-year average (2007-2009) of annual concentrations. The 24-hour value is based on the 3-year average of the 98th percentile of 24-hour average concentrations.
(3) The 1-hour value is based on a three-year average (2007-2009) of the 98th percentile of daily maximum 1-hour average concentrations.
(4) Based on the highest quarterly average concentration measured in 2009.
(5) Based on the 3-year average (2007-2009) of the 4th highest daily maximum 8-hour average concentrations.
Source: DEC, New York State Ambient Air Quality Data.

MODELED CO CONCENTRATIONS FOR EXISTING TRAFFIC CONDITIONS

As noted previously, receptors were placed at multiple sidewalk locations next to the intersection selected for the analysis. **Table 10-5** shows the maximum modeled existing (2010) CO 8-hour average concentration for each peak period analyzed. (No 1-hour values are shown since predicted values are much lower than the 1-hour standard of 35 ppm.) At all receptor sites, the maximum predicted 8-hour average concentrations are well below the national standard of 9 ppm.

Table 10-5
Modeled Existing 8-Hour Average
CO Concentrations (2010)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Flushing Avenue and Carlton Avenue	PM	2.7
1	Flushing Avenue and Carlton Avenue	Midday Saturday	2.3
Note: 8-hour standard (NAAQS) is 9 ppm.			

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

CO concentrations without the proposed project were determined for the 2014 Build year using the methodology previously described. **Table 10-6** shows future maximum predicted 8-hour average CO concentrations at the analyzed intersections in 2014 without the proposed project. The values shown are the highest predicted concentrations at any receptor location for each of the time periods analyzed.

As shown in **Table 10-6**, 2014 CO concentrations without the proposed project are predicted to be well below the 8-hour CO standard of 9 ppm.

Table 10-6
Future Modeled 8-Hour
Average CO Concentrations Without the Proposed Project (2014)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Flushing Avenue and Carlton Avenue	Weekday PM	2.6
1	Flushing Avenue and Carlton Avenue	Midday Saturday	2.3
Note: 8-hour standard (NAAQS) is 9 ppm.			

PM_{10} concentrations without the proposed project were determined for the 2014 Build year using the methodology previously described. **Table 10-7** presents the future maximum predicted 24-hour concentrations at the analyzed intersections in 2014 without the proposed project. The values shown are the highest predicted concentrations for the receptor locations.

Table 10-7
Future Modeled
24-Hour PM_{10} Concentrations Without the Proposed Project (2014)

Receptor Site	Location	Concentration ($\mu g/m^3$)
1	Flushing Avenue and Carlton Avenue	62.63
2	Sands Street and Navy Street	61.72
Note: NAAQS—24-hour average 150 $\mu g/m^3$. The annual average standard was revoked in 2006.		

STATIONARY SOURCES

In the future without the proposed project, the project area by 2014 would likely remain in its present condition. Stationary source emissions in the future without the proposed project would likely be similar to existing conditions. Existing industrial emission sources would likely remain unchanged without the proposed project.

G. PROBABLE IMPACTS OF THE PROPOSED PROJECT

MOBILE SOURCE ANALYSIS

CO concentrations with the proposed project were determined for the 2014 Build year using the methodology previously described. **Table 10-8** shows the future maximum predicted 8-hour average CO concentration with and without the proposed project at the intersection studied. (No 1-hour values are shown, since no exceedances of the NAAQS would occur and the *de minimis* criteria are only applicable to 8-hour concentrations; therefore, the 8-hour values are the most critical for impact assessment.) The values shown represent the highest predicted concentrations for any of the receptors analyzed.

The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations are small and consequently would not exceed the *de minimis* CO criteria. (The *de minimis* criteria are described above in Section C, "Air Quality Regulations, Standards, and Benchmarks.")

Table 10-8
Future Modeled 8-Hour Average CO Concentrations
With and Without the Proposed Project

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)			
			No Build	Build	Increment	*De Minimis*
1	Flushing Avenue and Carlton Avenue	Weekday PM	2.6	2.7	0.1	5.8
	Flushing Avenue and Carlton Avenue	Midday Saturday	2.3	2.5	0.2	5.7
Notes: 8-hour standard (NAAQS) is 9 ppm.						

Using the methodology previously described, PM_{10} concentrations with and without the proposed project were predicted for the 2014 Build year. The values shown in **Table 10-9** are the highest predicted concentrations for all locations analyzed and include the PM_{10} ambient background concentration. The results indicate that the proposed project generated vehicle trips would not result in PM_{10} concentrations that would exceed the NAAQS.

Table 10-9
Future (2014) Maximum Predicted 24-Hour Average PM_{10} Concentrations ($\mu g/m^3$)

Receptor Site	Location	No Build	Build
1	Flushing Avenue and Carlton Avenue	62.63	63.10
2	Sands Street and Navy Street	61.72	61.72
Note: The National Ambient Air Quality Standard for PM_{10} is 150 $\mu g/m^3$, for a 24-hour average.			

Future maximum predicted 24-hour and annual average $PM_{2.5}$ concentration increments were calculated for comparison with the interim guidance criteria. The maximum predicted localized 24-hour average and neighborhood-scale annual average incremental $PM_{2.5}$ concentrations are presented in **Tables 10-10** and **10-11**, respectively. Note that $PM_{2.5}$ concentrations without the proposed project are not presented, since impacts are assessed on an incremental basis.

Table 10-10
Maximum Predicted 24-Hour Average $PM_{2.5}$ Concentration Increments

Receptor Site	Location	Increment
1	Flushing Avenue and Carlton Avenue	0.12
2	Sands Street and Navy Street	0.06

Note: $PM_{2.5}$ interim guidance criteria—24-hour average, 2 μg/m^3 (5 μg/m^3 not-to-exceed value).

Table 10-11
Maximum Predicted Annual Average $PM_{2.5}$ Concentration Increments

Receptor Site	Location	Increment
1	Flushing Avenue and Carlton Avenue	0.02
2	Sands Street and Navy Street	0.02

Note: $PM_{2.5}$ interim guidance criteria—annual (neighborhood scale), 0.1 μg/m^3.

The results show that the annual average and 24-hour average $PM_{2.5}$ increments would be well below the interim guidance criteria and, therefore, the proposed project would not result in significant adverse air quality impacts from mobile sources.

PARKING FACILITIES

A screening analysis was performed to assess potential impacts from the proposed project parking lot. Based on the methodology previously discussed, the maximum future CO 1-hour and 8-hour average concentrations, including ambient background levels and potential contributions from nearby on-street traffic, would be 3.9 ppm and 2.6 ppm, respectively. The contribution from the proposed parking lot to the total 1-hour and 8-hour average concentrations is 0.02 ppm and 0.01 ppm, respectively. These maximum predicted CO levels are in compliance with the applicable CO standards and *de minimis* criteria.

CONSISTENCY WITH THE NEW YORK STATE IMPLEMENTATION PLAN

As addressed above, maximum predicted pollutant concentrations and concentration increments with the proposed project would comply with the applicable ambient air standards or local guidance criteria. Therefore, the proposed project would be consistent with the New York State Implementation Plans for the pollutants of concern.

STATIONARY SOURCES

HEAT AND HOT WATER SYSTEM SCREENING ANALYSIS

A screening analysis was performed to assess the potential for air quality impacts from each of the proposed project buildings. Although it is anticipated that natural gas and electricity would be used for building heat and hot water systems, the analysis was conservatively performed assuming the use of No. 4 fuel oil.

The total floor area of the proposed Building C (34,602 gross square feet) was analyzed as having a single heat and hot water system, with a stack exhaust at a height of 31 feet (3 feet above the proposed rooftop, the 2010 *CEQR Technical Manual* default assumption when specific design information is not available). The closest building of equal or greater height was determined to be the proposed supermarket and light industrial building, approximately 112 feet away. There would be no potential for significant adverse air quality impacts because the proposed Building C would be below the maximum permitted size shown in Figure 17-4 of the 2010 *CEQR Technical Manual*.

The total floor area of the proposed Building E (31,786 gross square feet) was analyzed as having a single heat and hot water system, with a stack exhaust at a height of 45 feet (3 feet above the proposed rooftop). The closest building of equal or greater height was determined to be an existing 14-story building across Navy Street, at a distance of approximately 100 feet. There would be no potential for significant adverse air quality impacts because the proposed Building E would be below the maximum permitted size shown in Figure 17-4 of the 2010 *CEQR Technical Manual*.

The analysis of the heat and hot water systems for the proposed Building A was based on the total supermarket and light industrial use floor area of 201,525 gross square feet. The exhaust height was modeled to be 96 feet (3 feet above the rooftop). The nearest building of a similar or greater height was determined to be beyond 400 feet; therefore, in accordance with the guidance provided in the 2010 *CEQR Technical Manual*, the 400-foot distance was chosen for the analysis. There would be no potential for significant adverse air quality impacts because the proposed Building A would be below the maximum permitted size shown in Figure 17-4 of the 2010 *CEQR Technical Manual*.

The heating and cooling systems for the supermarket would likely be separate from the light industrial use systems. Therefore, in addition to analyzing the potential impacts from the entire Building A, with the heat and hot water system exhaust location assumed at the tallest portion of the building (as described above), the potential impacts from the supermarket heat and hot water systems were analyzed assuming that the exhaust stacks or vents would be located at the lower (supermarket) rooftop. To preclude the potential for impacts on air quality, the proposed supermarket heating and cooling systems would use natural gas as fuel, and the Brooklyn Navy Yard Development Corporation (BNYDC) would include this restriction into the lease or other legally binding agreement between it and a developer to be designated pursuant to a Request for Proposals. BNYDC and the developer to be designated would also ensure that any combustion exhaust stacks or vents for heating and cooling systems on the lower roof of proposed Building A would be located as far as possible from any existing or proposed uses of a similar or greater height (such as operable windows or air intakes). Based on Figure 17-8 of the 2010 *CEQR Technical Manual*, and the proposed supermarket floor area of 74,161 gross square feet, the distance between the combustion exhaust stacks or vents and uses at a similar or greater height would need to be at least 65 feet. A refined air quality assessment could be conducted in the future when more information on the proposed heating and cooling systems becomes available. It is expected that the proposed systems would be highly efficient and low-emitting, and that once these factors are considered, the fuel type and stack placement conditions specified above could be refined.

Cumulative Analysis of Heat and Hot Water Systems

A cumulative analysis of the heat and hot water systems was conducted, conservatively assuming the use of No. 4 oil in each of the proposed project buildings. The results of the cumulative analysis are shown in **Table 10-12**, along with background values, total pollutant levels, and the applicable significant impact criteria.

Table 10-12
Potential Cumulative Impacts from Heat and Hot Water Systems (in µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS / $PM_{2.5}$ Interim Guidance
NO_2	1-hour	37.2	126.7	164	188
	Annual	1.08	47	48	100
SO_2	1-hour	83.9	91.4	175	196
	3-hour	69.6	128	198	1,300
PM_{10}	24-hour	3.9	51	55	150
$PM_{2.5}$	24-hour	0.91	N/A	N/A	5/2
	Annual (discrete)	0.09	N/A	N/A	0.3

Notes: Maximum modeled NO_2 impact is based on the conservative assumption that all NO_x is transformed to NO_2.

The results indicate that the total NO_2, SO_2, and PM_{10} concentrations would be below the NAAQS, and that the $PM_{2.5}$ concentration increments would be below the interim guidance thresholds. Therefore, the heat and hot water systems for the proposed uses would not have the potential for significant adverse impacts on air quality.

INDUSTRIAL SOURCES

A field survey was conducted on October 11, 2010 to determine whether there are any industrial sources in the project study area and to identify potential sites that might have DEP permits. Information regarding sources of noncriteria pollutant emissions located anywhere on Block 2023, which is approximately 235 acres and encompasses the project site and a portion of the 400 foot study area, was requested from DEP.

The only source with a DEP permit within 400 feet of the project site is a dry cleaning facility. Emissions from the facility are not directly vented. The dry cleaning equipment is operated in a closed loop system. Emissions are fugitive only and are not quantified in the permit. The facility emissions are minimized through the use of 4th generation controls—a spill tank and drying sensor and an integral carbon adsorber. Based on the information from the DEP permit, the facility does not use teracholoroethylene (PERC), but rather a less toxic fluid, Exxon DF-2000. No toxicological information is available for this chemical, classified as hydrotreated naphtha. According to EPA, DF-2000 does not contain any hazardous air pollutants (HAPs) or a significant amount of VOCs. Environmental agencies recommend the use of hydrocarbon alternatives, such as DF-2000, over PERC, for their lower potential impacts on health and the environment. Considering the lower toxicity and low emission potential from this operation, there would be no potential for a significant adverse air quality impact on the proposed project from industrial sources.

ADDITIONAL SOURCES

Brooklyn Navy Yard Cogeneration Plant

The potential for impacts from the Brooklyn Navy Yard Cogeneration Plant was evaluated using the AERMOD model. The maximum predicted pollutant concentrations from the modeling analysis were added to the maximum ambient background concentrations and compared to the NAAQS. The results of the analysis are presented in **Table 10-13**.

Table 10-13
Potential Impacts from Brooklyn Navy Yard Cogeneration Plant (in μg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS/Guideline Concentrations
NO_2	1-hour	2.33	126.7	129.03	188
	Annual	0.01	47	47.0	100
SO_2	1-hour	2.44	91.4	93.8	196
	3-hour	1.37	128	129.4	1,300
PM_{10}	24-hour	0.06	51	51.1	150
CO	1-hour	0.72	3,550.1	3,550.8	40,000
	8-hour	0.20	2,290.4	2,290.6	10,000
Notes:	Maximum modeled NO_2 impact is based on the conservative assumption that all NO_x is transformed to NO_2.				

Maximum concentrations of $PM_{2.5}$ from the Cogeneration Plant were also determined. $PM_{2.5}$ concentrations were compared to the City's interim guidance criteria for $PM_{2.5}$. The maximum predicted 24-hour and localized annual average incremental $PM_{2.5}$ concentrations are presented in **Table 10-14**.

Table 10-14
Maximum Predicted $PM_{2.5}$ Concentrations (in μg/m^3)
at the Proposed Project from the Brooklyn Navy Cogeneration Plant

Pollutant	Averaging Period	Maximum Concentration	Interim Guidance Threshold
$PM_{2.5}$	24-hour	0.06	5/2
	Annual (discrete)	0.002	0.3

As shown in **Table 10-13** the total predicted concentrations at the proposed project would be less than their respective NAAQS. The results shown in **Table 10-14** indicate that the predicted annual and daily (24-hour) $PM_{2.5}$ increments are below the interim guidance criteria. Therefore, there would be no potential for significant adverse air quality impacts from the Brooklyn Navy Yard Cogeneration Plant on the proposed project. ✷