Chapter 16: Air Quality

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 are impacts that are caused by emissions from nearby existing stationary sources or by emissions from on-road vehicle trips generated by the project or other changes to future traffic conditions due to the project.

The proposed project would increase traffic in the vicinity of the proposed project site. Therefore, an analysis was performed on the potential impacts on air quality from motor vehicles. The proposed project would also include approximately 1,400 accessory parking spaces (1,347 garage parking spaces and 53 on-site surface parking spaces). Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the ventilation outlets of the proposed parking garages and surface lots.

The proposed project would include fossil fuel-fired heat and hot water systems for the proposed buildings. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations with the proposed heat and hot water systems. Portions of the proposed project site are located adjacent to a zoned industrial area; therefore, air quality impacts from nearby industrial sources of air pollution (e.g., from manufacturing or processing facilities) were also examined. The project site is also in the vicinity of the New York City Housing Authority (NYCHA) Astoria Houses central boiler plant. Therefore, potential air quality impacts from this source on the proposed project were evaluated.

PRINCIPAL CONCLUSIONS

The analyses conclude that the proposed project would not result in any significant adverse air quality impacts on sensitive uses in the surrounding community, and the proposed project would not be adversely affected by existing sources of air emissions in the project area. A summary of the general findings is presented below.

As discussed below, the maximum predicted pollutant concentrations and concentration increments from mobile sources with the proposed project would be below the corresponding guidance thresholds and ambient air quality standards. The project's parking facilities would also not result in any exceedances of guidance thresholds and ambient air quality standards. Therefore, the proposed project would not have significant adverse impacts from mobile source emissions.

Analysis of the emissions and dispersion of nitrogen dioxide (NO_2), CO, and particulate matter less than 10 microns on diameter (PM_{10}) from the proposed project's heating and hot water systems sources indicate that such emissions would not result in a violation of National Ambient Air Quality Standards (NAAQS). Emissions of particulate matter less than 2.5 microns in diameter

($PM_{2.5}$) were analyzed in accordance with the City's current $PM_{2.5}$ interim guidance criteria, which determined that the maximum incremental increases in $PM_{2.5}$ concentrations from stationary sources would be below the significant impact thresholds. To ensure the avoidance of impacts, limitations on fuel type, stack location and/or minimum stack heights would be required. For buildings on Applicant-controlled sites (Buildings 1 through 5), these restrictions would be mapped as (E) designations. For buildings within the NYCHA Astoria Campus (Buildings 6 through 8), which would be subject to a future disposition approval from the U.S. Department of Housing and Urban Development (HUD), the restrictions would be required through an agreement between NYCHA and the Applicant/developer.

Nearby existing sources from manufacturing or processing facilities were analyzed for their potential impacts on the proposed project. The results of the industrial source analysis demonstrated that there would be no significant adverse air quality impacts on the proposed project.

As noted above, the project site is in the vicinity of the NYCHA Astoria Houses central boiler plant. Air quality screening studies indicated that emissions from the NYCHA Astoria Houses central boiler plant through the existing approximately 75-foot stack would exceed the city's interim guidance criteria for $PM_{2.5}$ at elevated receptors along portions of the proposed project's building facades on the NYCHA Parcel and would have the potential to affect air quality on the proposed project. However, air quality dispersion modeling performed in connection with the preparation of this Draft Environmental Impact Statement (DEIS) demonstrates that the $PM_{2.5}$ exceedances resulting from this existing source would be eliminated if emissions from the NYCHA central boiler plant are rerouted to a new boiler stack which would be located on Building 7A.

An initial engineering evaluation has determined that this configuration is feasible. Implementation would be subject to the Applicant performing the modifications at the NYCHA Astoria Houses boiler plant pursuant to an agreement with NYCHA that will address access, responsibility for costs and liabilities incurred as a result of this initiative, construction risks, and other issues. Implementation would also be subject to obtaining the necessary permits. Permitting actions would occur after the Uniform Land Use Review Procedure (ULURP) process. The proposed project's Restrictive Declaration would include provisions requiring completion of the improvement during the construction of Building 7A.

The Applicant is also considering, in consultation with NYCHA, other options that would address emissions from the NYCHA Astoria Houses central boiler plant in a manner no less protective of the environment. In the event such other options are identified prior to issuance of the Final EIS (FEIS), they will be discussed in that document.

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 very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs.

CARBON MONOXIDE

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. Since CO is a reactive gas 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 project would result in changes in traffic patterns and an increase in traffic volume in the study area. Therefore, a mobile source analysis was conducted at critical intersections in the study area to evaluate future CO concentrations with and without the proposed project. A parking garage analysis was also conducted to evaluate future CO concentrations with the operation of the proposed parking garages.

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. An analysis of project-related emissions of these pollutants from mobile sources was therefore 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. Potential impacts on local NO_2 concentrations from the fuel combustion for the proposed project's heat and hot water boiler systems were 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 very 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, 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.

An analysis was conducted to assess the worst case PM impacts due to the increased traffic associated with the proposed project.

Stationary combustion by the proposed project's heating, ventilation, and air conditioning (HVAC) system would result in emissions of PM; therefore, the HVAC system was evaluated for potential impacts. Potential 24-hour and annual incremental impacts of $PM_{2.5}$ from the HVAC system were evaluated using an incremental microscale analysis.

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, distillate fuel oil would be burned in the proposed heating and hot water systems. Therefore, an analysis was performed to estimate the future levels of SO_2 with the proposed project.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary NAAQS have been established for six major air pollutants: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are 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 and lead, and there is no secondary standard for CO and the 1-hour NO_2 standard. The NAAQS are presented in **Table 16-1**. The NAAQS for CO, annual NO_2, and 3-hour 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), 24-hour and annual SO_2, and ozone which correspond to federal standards that have since been revoked or replaced, and for the non-criteria pollutants beryllium, fluoride, and hydrogen sulfide (H_2S).

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 $\mu g/m^3$ to 35 $\mu g/m^3$. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked. EPA recently announced a final decision to lowering the primary annual-average standard to 12 $\mu g/m^3$.

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. A final decision on this standard has been postponed but is expected to occur in 2013.

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

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 also 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.)

Table 16-1
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 [6]	NA	12	NA	15
24-Hour Average [7]	NA	35	NA	35
Sulfur Dioxide (SO_2) [8]				
1-Hour Average [9]	0.075	197	NA	NA
Maximum 3-Hour Average [1]	NA	NA	0.50	1,300

Notes:

ppm – parts per million (unit of measure for gases only)

µg/m^3 – micrograms per cubic meter (unit of measure for gases and particles, including lead)

NA – not applicable

All annual periods refer to calendar year.

Standards are defined in ppm. 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 the primary standard further to within the range 0.060-0.070 ppm, and adding a secondary standard measured as a cumulative concentration within the range of 7 to 15 ppm-hours aimed mainly at protecting sensitive vegetation. A final decision on this standard has been postponed but is expected to occur in 2013.

(6) EPA has lowered the primary standard to 12 µg/m^3, effective early 2013.

(7) Not to be exceeded by the annual 98th percentile when averaged over 3 years.

(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.

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

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 Clean Air Act, followed by a plan for maintaining attainment status once the area is in attainment.

In 2002, EPA re-designated New York City as in attainment for CO. Under the resulting maintenance plan, New York City is 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 January 30, 2013, New York State requested that EPA approve its withdrawal of the 1995 SIP and redesignation request for the 1987 PM_{10} NAAQS, and that EPA make a clean data finding instead, based on data monitored from 2009-2011 indicating PM_{10} concentrations well below the 1987 NAAQS. Although not yet a redesignation to attainment status, if approved, this determination would remove further requirements for related SIP submissions.

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 Clean Air Act 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. EPA has determined that the area has attained the 1997 annual $PM_{2.5}$ NAAQS, effective December 15, 2010. As stated earlier EPA, has recently lowered the annual average primary standard to 12 $\mu g/m^3$. EPA will make initial attainment designations by 2014.

In November 2009, EPA designated the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS. The nonattainment area includes the same 10-county area originally designated as nonattainment with the 1997 annual $PM_{2.5}$ NAAQS. Based on recent monitoring data (2007-2011), 24-hour average concentrations of $PM_{2.5}$ in this area no longer exceed the standard. New York has submitted a "Clean Data" request to the EPA. On August 29, 2012, EPA proposed to determine that the area has attained the standard; if this determination is finalized, certain requirements for related SIP submissions would be suspended.

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA), and the five New York City counties (the New York–New Jersey–Long Island, New York portion) had been designated as a severe non-attainment area for ozone (1-hour average standard, 0.12 ppm). 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. The 1-hour standard was revoked in 2004 when it was replaced by the 8-hour ozone standard, but certain further requirements remained ('anti-backsliding'). On December 7, 2009, EPA determined that the Poughkeepsie nonattainment area (Dutchess, Orange, Ulster, and Putnam counties) has attained the 1-hour standard. On June 18, 2012, EPA determined that the New York–New Jersey–Long Island NAA has also attained the standard. Although not yet a redesignation to attainment status, this determination removes further requirements under the 1-hour standard.

Effective June 15, 2004, EPA designated these same counties as moderate non-attainment for the 1997 8-hour average ozone standard (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). On February 8, 2008, NYSDEC submitted final revisions to the SIP to EPA to address the 1997 8-hour ozone standard. On December 7, 2009, EPA determined that the Poughkeepsie nonattainment area has attained the 1997 8-hour standard. On June 18, 2012, EPA determined that this area has attained the 1997 8-hour ozone NAAQS (0.08 ppm). Although not yet a redesignation to attainment status, this determination removes further requirements under the 8-hour standard.

In March 2008 EPA strengthened the 8–hour ozone standards. EPA designated the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT NAA) as a marginal non-attainment area for the 2008 ozone NAAQS, effective July 20, 2012. SIPs will be due in 2015.

New York City is currently in attainment of the annual-average NO_2 standard. EPA has designated the entire state of New York as "unclassifiable/attainment" of the new 1-hour NO_2 standard effective February 29, 2012. Since additional monitoring is required for the 1-hour standard, areas will be reclassified once three years of monitoring data are available (2016 or 2017).

EPA has established a 1-hour SO_2 standard, replacing the former 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 2013. SIPs for nonattainment areas will be due by June 2015.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The *CEQR Technical Manual* states 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 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 increase in CO concentrations that would result from the impact of proposed projects or actions on mobile sources, as set forth in the *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the

[1] *CEQR Technical Manual*, Chapter 1, section 222, June 2012

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.

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts[1]. This policy applies 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 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 the potential $PM_{2.5}$ impacts for projects subject to CEQR. The interim guidance criteria currently employed to determine the potential significant adverse $PM_{2.5}$ impacts 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
- 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 above interim guidance criteria will be considered to have a potential significant adverse impact.

The proposed project annual emissions of PM_{10} are estimated to be well below the 15-ton-per-year threshold under the New York State Department of Environmental Conservation's (NYSDEC) $PM_{2.5}$ policy guidance. The above interim guidance criteria have been used to evaluate the significance of predicted impacts of the proposed project on $PM_{2.5}$ concentrations.

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

CONFORMITY WITH STATE IMPLEMENTATION PLANS

The conformity requirements of the CAA and regulations promulgated thereunder (conformity requirements) limit the ability of federal agencies to assist, fund, permit, and approve projects that do not conform to the applicable SIP. When subject to this regulation, the federal agency is responsible for demonstrating conformity for its proposed action. Conformity determinations for federal actions other than those related to transportation plans, programs, and projects which are developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (49 U.S.C. 1601 et seq.) must be made according to the requirements of 40 CFR Part 93 (federal general conformity regulations). Since the development of Buildings 6, 7, and 8 would be facilitated by the disposition of NYCHA property, which is subject to Section 18 of the U.S. Housing Act of 1937 and approval by HUD, general conformity regulations would apply.

The general conformity regulations apply to those federal actions in non-attainment or maintenance areas where the action's direct and indirect emissions have the potential to emit one or more of the six criteria pollutants at rates equal to or exceeding the prescribed rates.

General conformity emissions threshold levels for various non-attainment areas and maintenance areas intersecting the project study area are presented in **Table 16-2**.

Table 16-2
General Conformity Threshold Levels (tons per year)

Ozone, other non-attainment areas inside an ozone transport region:	
VOC	50
NO_x	100
CO, maintenance areas	100
$PM_{2.5}$, any non-attainment area:	
$PM_{2.5}$ direct emissions	100
SO_2	100
NO_x	100
Sources: 40 CFR § 93.153(b)	

The general conformity requirements do not apply to federal actions that:

- Do not exceed the prescribed emissions threshold levels;
- Occur in an attainment area;
- Are related to transportation plans, programs, and projects developed, funded, or approved under Title 23 U.S.C. or the Federal Transit Act (49 U.S.C. 1601); or
- Qualify for exemptions or where the emissions are not reasonably foreseeable as defined in § 93.153.

The regulation assumes that a proposed federal action whose criteria pollutant emissions have already been included in the local SIP's attainment or maintenance demonstrations conforms to the SIP.

As stated earlier, the proposed project would not have a significant effect on the overall volume of vehicular travel in the metropolitan area. In addition, stationary source emissions of affected criteria are estimated to be well below the levels shown in Table 16-2. Therefore, the proposed project would conform to the relevant SIPs and maintenance plans, and does not require a general conformity determination.

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

VEHICLE EMISSIONS

Engine Emissions

Vehicular CO and PM engine emission factors are 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 NYSDEC and DEP.

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.

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

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° Fahrenheit was used. The use of this temperature is recommended in the *CEQR Technical Manual* for the Borough of Queens 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. In accordance with the $PM_{2.5}$ interim guidance criteria methodology, $PM_{2.5}$ emission rates are determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust is 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 are calculated according to the latest procedure delineated by EPA[2] and the *CEQR Technical Manual*.

Traffic Data

Traffic data for the mobile source 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 15, "Transportation"). Traffic data for the future without and with the proposed project were employed in the respective air quality modeling scenarios. The weekday morning (7:30 AM to 8:30 AM), and evening (4:30 PM to 5:30 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.

For particulate matter, off-peak traffic volumes in the future with and without the proposed project were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations.

Dispersion Model for Microscale Analyses

Maximum CO concentrations adjacent to the analysis sites resulting from vehicle emissions were predicted using the CAL3QHC model Version 2.0.[3] 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

[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, December 2003.

[3] 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.

(i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles.

To determine motor vehicle generated PM_{10} and $PM_{2.5}$ concentrations on sidewalks near the project site, the CAL3QHCR model was applied. This is a refined version of the CAL3QHC model Version 2.0. CAL3QHCR predicts emissions and dispersion of $PM_{2.5}$ 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 predict the number of idling vehicles. The CAL3QHCR model can utilize hourly traffic and meteorological data, and is therefore 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). 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[1], 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 0.70 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 3.21 meters was chosen, consistent with *CEQR Technical Manual*. 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.

Using the CAL3QHCR model, hourly concentrations were predicted based on hourly traffic data and five years (2007-2011) of monitored hourly meteorological data. The data consists of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York, which are the nearest National Weather Surface data collection sites. 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 2022, the year by which the proposed project is expected to be completed. The future analysis was performed both without the proposed project (the No Build condition) and with the proposed project (the Build condition).

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

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

concentrations are added to modeling results to obtain total pollutant concentrations at an analysis site. The 1-hour and 8-hour CO background concentrations used in this analysis, which were based on the second-highest concentrations recorded at the NYSDEC Queens College 2 monitoring station from 2007 to 2011, were 3.4 ppm and 2.0 ppm, respectively. The monitoring station at Queens College is the closest monitoring station to the project site that has available recorded data over a recent 5-year period.

The PM_{10} 24-hour background concentration of 44 $\mu g/m^3$ was based on the second-highest concentration, measured over the most recent three-year period for which complete data are available (2009–2011). The nearest NYSDEC monitoring site, at P.S. 19, was used. $PM_{2.5}$ impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ interim guidance criteria. Therefore, a background concentration for $PM_{2.5}$ is not included.

Analysis Sites

Three intersections were selected for microscale analysis (see **Table 16-3**). These sites were selected because they are the locations in the study area with the highest levels of project-generated traffic, and, therefore, where the greatest air quality impacts and maximum changes in concentrations would be expected. The potential impact from vehicle emissions of CO, PM_{10} and $PM_{2.5}$ was analyzed for each of these intersections.

Table 16-3
Mobile Source Analysis Sites

Analysis Site	Location	Pollutants Analyzed
1	27th Avenue and 4th Street	CO, PM_{10}, $PM_{2.5}$
2	27th Avenue and 8th Street	CO, PM_{10}, $PM_{2.5}$
3	Astoria Boulevard and 21st Street	CO, PM_{10}, $PM_{2.5}$

Receptor Placement

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. 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 approximately 1,400 accessory parking spaces (1,347 garage parking spaces and 53 on-site surface parking spaces). Table 1-1 of Chapter 1, "Project Description", includes a summary of the garage and surface lot parking capacity for each of the proposed buildings.

Emissions from vehicles using the proposed garages could potentially affect ambient levels of CO in the immediate vicinity of the ventilation outlets. Projected parking facility capacity and the peak hour arrivals and departures were used to identify the parking garage most likely to result in impacts on local air quality. The effect of proposed parking garages at Buildings 4 and 5, with a total parking capacity of 511 spaces and Building 6 with 52 surface parking spaces, were analyzed to assess maximum potential concentrations from parking facilities associated

with the proposed project. In addition, the proposed project would result in the displacement of surface parking due to the development of Buildings 6, 7 and 8, which would be replaced by an expanded surface parking lot south of Astoria Boulevard; therefore, this expanded surface lot was also analyzed.

Currently, there are no mechanical designs for these proposed parking garages. Therefore, it was conservatively assumed that each of the proposed garages analyzed would be vented through a single outlet at a height of approximately 10 feet. Representative receptor locations on the proposed buildings were also modeled. The vent face was modeled to directly discharge above the sidewalk, and receptors were placed along the sidewalks on both sides of the street (both near the vent and across the street) at a pedestrian height of six feet and at distances of 7.5 feet and 55 feet from the vent on Building 5 to account for receptors near the vent and for receptors on the opposite side of a street. The vent was also analyzed assuming a sensitive receptor located at a height of six feet above the vent. Receptors were placed at distances of 4 feet and 140 feet from the Building 6 surface parking lot and at distances of 7.5 feet and 70 feet from the expanded surface parking lot south of Astoria Boulevard to account for the near and far receptors.

The analysis of emissions from the outlet vents and their dispersion was performed using the methodology set forth in the *CEQR Technical Manual*. 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 based on analyses described in Chapter 15, "Transportation."

Emissions from vehicles entering, parking, and exiting the garages were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 43°F, as 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 garages 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 predicted for the maximum 8-hour and 1-hour averaging periods.

To determine pollutant concentrations, the outlet vents were analyzed as "virtual point sources" 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.

A persistence factor of 0.70 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 CO concentrations and concentrations from on-street traffic were added to the parking garage modeling results to obtain the total ambient CO levels.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

A stationary source analysis was conducted to evaluate potential impacts from the proposed project's heating and hot water systems. Boilers would generate hot water for building and

domestic hot water heating. The boilers would potentially utilize fuel oil or natural gas, except at Building 4 of the WF Parcel, which based on preliminary modeling, was assumed to utilize natural gas exclusively.

The stationary source air quality analysis assumed the maximum allowable building heights under the proposed rezoning and related land use actions. This is conservative when determining impacts on the proposed project (including project-on-project impacts), since maximum impacts from nearby elevated sources tend to occur on the upper floors of a receptor site (e.g., at window locations). In addition, maximizing building heights results in the greatest potential for building downwash conditions, which can result in higher concentrations at ground-level receptors and low-rise buildings.

For Building 1A, and 1B, it was assumed it would have a single boiler installation with the exhaust stack located on the roof of the taller building, while for all other buildings, individual boiler installations on each building was assumed. The proposed boiler stacks were assumed to exhaust to a single location on the tallest portion of each of the buildings.

For certain buildings, limitations on the type of fuel and/or stack height would be included in an (E) designation for buildings on Applicant-controlled sites (Buildings 1 through 5), and in an agreement for the buildings within the NYCHA Astoria Houses Campus (Buildings 6 through 8). In addition, these limitations would include the restrictions on the placement of heating and hot water exhaust stacks for buildings to ensure that no significant adverse air quality impacts occur.

Stack exhaust parameters and emission estimates for the proposed boiler installations were conservatively estimated based on a conceptual level of design. Boiler fuel usage was obtained from conceptual design estimates, based on the size (in square feet [sf]) and type of development. Emissions rates were calculated based on emissions factors obtained from the EPA *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources*. PM_{10} and $PM_{2.5}$ emissions include both the filterable and condensable fractions. **Table 16-4** and **Table 16-5** present the stack parameters and emission rates used in the analysis for Buildings 1 through 5, and Buildings 6 through 8, respectively.

Since the proposed project's boilers would operate primarily during colder periods, the short-term impact analysis used monthly energy estimates to adjust the boiler load for each month of the year to approximate the short-term boiler demand.

Dispersion Modeling

Potential impacts from the proposed project's heating and hot water system emissions were evaluated using the EPA/AMS AERMOD dispersion model. The AERMOD model was designed as a replacement to the EPA Industrial Source Complex (ISC3) model and has been approved for use by EPA. 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 and includes updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and handling of terrain interactions.

Table 16-4
Boiler Stack Parameters and Emission Rates
Applicant-Controlled Sites (Buildings 1 through 5)

Parameter		Building 1	2	3	4	5A	5B
Building Size (gsf)		503,863	359,516	444,766	264,338	255,361	322,753
Building Height (ft)		223.4	263.4	313.4	223.4	213.4	253.4
Stack Exhaust Temp. (°F)[3]		300	300	300	300	300	300
Stack Exhaust Height (ft)		238.4	298.4	323.4	258.4	248.4	288.4
Height Above Roof (ft)		15 [5]	35	10	35	35	35
Stack Exhaust Diameter (ft)		2.0	1.5	2.0	1.5	1.5	1.5
Stack Exhaust Flow (ACFM)[1)(3]		3676	2513	3676	2513	2513	2513
Stack Exhaust Velocity (ft/s)[3]		19.5	23.7	19.5	23.7	23.7	23.7
Fuel Type		Oil	Oil	Oil	Gas	Oil	Oil
Lb/hr[2]	NO_x	1.445	0.976	1.244	0.183	0.665	0.854
	SO_2 [4]	0.015	0.010	0.013	0.003	0.007	0.009
	PM_{10}	0.172	0.116	0.148	0.038	0.079	0.102
	PM_{25}	0.154	0.104	0.132	0.038	0.071	0.091

Notes:
(1) ACFM = actual cubic feet per minute.
Reference:
(2) Emission factors are based on AP-42, while stack parameters are based on conceptual design data.
(3) The stack diameter, exhaust velocity, and exhaust temperature are based on data obtained from a survey of New York City boilers from buildings of a similar size.
(4) SO_2 emissions were estimated based on the use of ultra low sulfur fuel for fuel oil firing (0.0015 percent or less), as per forthcoming NYSDEC Part 225 regulations.
(5) Exhaust stacks were assumed to be on Building 1B.

Table 16-5
Boiler Stack Parameters and Emission Rates
Buildings Within the NYCHA Astoria Houses Campus
(Buildings 6 through 8)

Parameter		Building 6A	6B	7A	7B	8
Building Size (gsf)		89,531	53,446	74,193	65,642	299,015
Building Height (ft)		110	130	140	140	270
Stack Exhaust Temp. (°F)[3]		300	300	300	300	300
Stack Exhaust Height (ft)		135	140	150	150	280
Height Above Roof (ft)		25	10	10	10	10
Stack Exhaust Diameter (ft)		1.0	1.0	1.0	1.0	1.5
Stack Exhaust Flow (ACFM)[1)(3]		1,206	1,206	1,206	1,206	2,513
Stack Exhaust Velocity (ft/s)[3]		25.6	25.6	25.6	25.6	23.7
Fuel Type		Oil	Oil	Oil	Oil	Oil
Lb/hr[2]	NO_x	0.298	0.184	0.255	0.225	0.784
	SO_2 [4]	0.003	0.002	0.003	0.002	0.008
	PM_{10}	0.035	0.022	0.030	0.027	0.093
	$PM_{2.5}$	0.032	0.020	0.027	0.024	0.083

Notes:
(1) ACFM = actual cubic feet per minute.
Reference:
(2) Emission factors are based on AP-42, while stack parameters are based on conceptual design data.
(3) The stack diameter, exhaust velocity, and exhaust temperature are based on data obtained from a survey of New York City boilers from buildings of a similar size.
(4) SO_2 emissions were estimated based on the use of ultra low sulfur fuel for fuel oil firing (0.0015 percent or less), as per forthcoming NYSDEC Part 225 regulations.

The AERMOD 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 analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, urban dispersion and surface roughness length (with and 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 which, under certain conditions, may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). The Building Profile Input Program (BPIP) program for the PRIME model (BPIPRM) was used to determine the projected building dimensions modeling with the building downwash algorithm enabled. The modeling of downwash from sources accounts for all obstructions within a radius equal to five obstruction heights of the stack.

The analysis was performed both with and without downwash in order to assess the worst case at elevated receptors close to the height of the sources, which would occur without downwash, as well as the worst case at lower elevations and ground level, which would occur with downwash.

Methodology Utilized for Estimating NO_2 Concentrations

Annual NO_2 concentrations from HVAC sources were estimated using a NO_2 to NO_x ratio of _0.75, as described in EPA's *Guideline on Air Quality Models* at 40 CFR part 51 Appendix W, Section 5.2.4.[1]

EPA has recently prepared guidance for assessing 1-hour average NO_2 concentrations for compliance with NAAQS.[2] Background concentrations are currently monitored at several sites within New York City, which are used for reporting concentrations on a "community" scale. Because this data is compiled on a 1-hour average format, it can be used for comparison with the new 1-hour standards. Therefore, background 1-hour NO_2 concentrations currently measured at the community-scale monitors can be considered representative of background concentrations for purposes of assessing the impact of the proposed project's HVAC systems.

EPA's preferred regulatory stationary source model, AERMOD, is capable of producing detailed output data that can be analyzed at the hourly level required for the form of the 1-hour standards. EPA has also developed guidance to estimate the transformation ratio of NO_2 to NO_x, applicable to HVAC sources, as discussed further below. Therefore, an analysis was prepared.

1-Hour average NO_2 concentration increments from the proposed project's HVAC systems were estimated using AERMOD model's Plume Volume Molar Ratio Method (PVMRM) module to analyze chemical transformation within the model. The PVMRM module incorporates hourly background ozone concentrations to estimate NO_x transformation within the source plume. Ozone concentrations were taken from the NYSDEC Queens College monitoring station that is the nearest ozone monitoring station and had complete five years of hourly data available. An initial NO_2 to NO_x ratio of 10 percent at the source exhaust stack was assumed, which is considered representative for boilers.

The results represent the five-year average of the annual 98th percentile of the maximum daily 1-hour average, added to background concentrations (see below).

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[1] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

[2] EPA Memorandum, "Additional Clarification Regarding Application of Appendix W, Modeling Guidance for the 1-Hour NO_2 National Ambient Air Quality Standard," March 1, 2011.

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at La Guardia Airport (2007–2011), 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 which 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

A comprehensive receptor network (i.e., locations with continuous public access) was developed for the modeling analyses. Discrete receptors were analyzed and included locations on the proposed project and other nearby buildings, and at operable windows, air intakes, and publicly accessible ground-level locations. The model also included elevated and ground-level receptor grids in order to address more distant locations and to identify the highest ground-level impact.

Background Concentrations

To estimate the maximum expected total pollutant concentrations, the calculated impacts from the emission sources must be added to a background value that accounts for existing pollutant concentrations from other sources (see **Table 16-6**). The background levels are based on concentrations monitored at the nearest NYSDEC ambient air monitoring stations over the most recent five-year period for which data are available (2007-2011), with the exception of PM_{10}, which is based on three years of data, consistent with current DEP guidance (2009-2011). For the 24-hour PM_{10} concentration the highest second-highest measured values over the specified period were used. The annual average background values are the highest measured average concentrations for these pollutants. The measured background concentration was added to the predicted contribution from the modeled source to determine the maximum predicted total pollutant concentration. It was conservatively assumed that the maximum background concentrations occur on all days.

Table 16-6
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2	1-hour	Queens College 2, Queens	(1)	100
	Annual	Queens College 2, Queens	43	100
SO_2	1-hour	Queens College 2, Queens	78.5	196
	3-hour	Queens College 2, Queens	89	1,300
PM_{10}	24-hour	P.S. 19, Manhattan	44	150

Notes:
(1) The 1-Hour NO_2 background concentration is not presented in the table since the AERMOD model determines the total 98th percentile 1-Hour NO_2 concentration at each receptor.
Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2007-2011.

Total 1-hour NO_2 concentrations were determined following methodologies that are accepted by the EPA, and which are considered appropriate and conservative for this review. The methodology used to determine the compliance of total 1-hour NO_2 concentrations from the

proposed sources with the 1-hour NO_2 NAAQS[1] was based on adding the monitored background to modeled concentrations, as follows: hourly modeled concentrations from proposed sources were first added to the seasonal hourly background monitored concentrations; then the highest combined daily 1-hour NO_2 concentration was determined at each receptor location and the 98th percentile daily 1-hour maximum concentration for each modeled year was calculated within the AERMOD model; finally the 98th percentile concentrations were averaged over the latest five years. These methodologies are recognized by EPA and the City and are referenced in EPA modeling guidance.

INDUSTRIAL SOURCE ANALYSIS

Potential effects on the project site from existing industrial operations in the surrounding area were analyzed. Industrial air pollutant emission sources within 400 feet of the development project site's boundaries were considered for inclusion in the air quality impact analysis, as recommended in the 2012 *CEQR Technical Manual*.

As the first step in this analysis, a request was made to DEP's Bureau of Environmental Compliance (DEP-BEC) and NYSDEC to obtain all the available certificates of operation for these locations and to determine whether manufacturing or industrial emissions occur. In addition, a search of federally and state-permitted facilities within the study area was conducted using EPA's Envirofacts database.[2]

Land use and Sanborn maps were reviewed to identify potential sources of emissions from manufacturing/industrial operations. Next, a field survey was conducted to identify buildings within 400 feet of the project site that have the potential for emitting air pollutants.

After compiling the information on facilities with manufacturing or process operations in the study area, maximum potential pollutant concentrations from different sources at various distances from the site were estimated based on the look-up values found in Table 3Q-3 in the 2012 *CEQR Technical Manual*. The database provides factors for estimating maximum concentrations based on emissions levels at the source, which were derived from generic ISC3 dispersion modeling for the New York City area. Impact distances selected for each source were the minimum distances between the boundary of the project site and the source site. Predicted worst-case impacts on the project site were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) recommended in NYSDEC's *DAR-1 AGC/SGC Tables.*[3] These guideline concentrations present the airborne concentrations, which are applied as a screening threshold to determine whether future occupants of the proposed project could be significantly impacted from nearby sources of air pollution.

ADDITIONAL SOURCES

The *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 *CEQR Technical Manual* include solid and medical waste incinerators, cogeneration plants, asphalt and concrete plants, or power plants), as well as commercial, institutional and residential developments within 400 feet. To assess the potential

[1] http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

[2] http://oaspub.epa.gov/enviro/ef_home2.air

[3] NYSDEC Division of Air Resources, Bureau of Stationary Sources, October 2010.

effects of these existing sources on the proposed project, a review of existing permitted facilities was conducted. Within the study area boundaries, sources permitted under DEC's Title V program and State Facility permit program were considered.

No large sources were identified within the 1,000 foot study area. Existing and proposed large-scale developments with emission sources within 400 feet of the project site were analyzed to assess the potential for air quality impacts on the proposed project's buildings, consistent with the recommendations in the *CEQR Technical Manual*. Sources with fossil fuel-fired combustion equipment having a total estimated heat input capacity of 20 million Btu/hr were included in the analysis. Based on this threshold, the NYCHA Astoria Houses central boiler plant was identified for analysis.

An analysis was performed using the EPA/AMS AERMOD dispersion model.[1] The AERMOD analysis was performed assuming the same options and assumptions as described previously for the analysis of the proposed project's emissions sources, except where indicated.

Emission Rates and Stack Parameters

Table 16-7 presents the emission rates and stack exhaust parameters used in the AERMOD analysis of the NYCHA Astoria Houses central boiler plant. EPA AP-42 emission factors were utilized based on usage of natural gas (No. 2 oil is used as a back-up fuel on a limited basis when natural gas is unavailable). Pollutant emission rates were estimated based on available monthly fuel usage information obtained for years 2010 and 2011. Since the boiler plant operates at a much higher load during colder periods, the short-term impact analysis used monthly factors to adjust the boiler load for each month of the year based on the actual fuel consumption data.

Table 16-7
Emission Rates and Stack Parameters

Parameter	NYCHA Astoria Houses Central Boiler System
Stack Height (ft) (1)	160
Stack Diameter (ft) (1)	3.7
Exhaust Velocity (ft/s)	30
Exhaust Temperature (F)	315
$PM_{2.5}$ Emission Rate (g/s)	0.032
PM_{10} Emission Rate (g/s)	0.032
NO_x Emission Rate (g/s)	0.417
Sources: (1) The exhaust stack height assumes the exhaust is ducted to proposed building 7A.	

To avoid potential significant adverse air quality impacts on the proposed project, the NYCHA Astoria Houses central boiler plant would be modified to duct the exhaust gas from the boiler exhausts to a new location at proposed Building 7A. The air quality analysis was performed assuming this modification would take place.

NO_2 concentrations were estimated using NO_2 to NO_x ratios of 0.8 for the maximum 1-hour concentration and 0.75 for the annual concentration, per EPA guidance.[2] For this analysis, the

[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.

[2] EPA, Memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard," March 1, 2011.

NO_2 concentrations were conservatively assumed to be same at the stack exhaust and at downwind locations, i.e., chemical transformation effects using the PVMRM module were not modeled.

Receptor Locations

Discrete receptors (i.e., locations at which concentrations are calculated) were modeled along the facades of the proposed buildings 6A/6B and 7A/7B to represent operable window locations, and otherwise accessible locations such as terraces. Rows of receptors were placed at spaced intervals on the proposed buildings at multiple elevations. In addition, receptors were placed at ground level and at existing buildings in the vicinity of the proposed stack, including the existing NYCHA buildings and the residential building housing Jamaica Hospital Medical Center space.

Background Concentrations

To estimate the maximum expected pollutant concentration at a given receptor, the predicted impact must be added to a background value that accounts for existing pollutant concentrations from other sources that are not directly accounted for in the model. Consistent with the form of the standard, for the 1-hour NO_2 averaging period, the 3-year average of the annual 98th percentile daily maximum 1-hour average concentration was used. $PM_{2.5}$ impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ interim guidance criteria. Therefore, a background concentration for $PM_{2.5}$ is not included.

E. EXISTING CONDITIONS

Representative criteria pollutant concentrations measured in recent years at NYSDEC air quality monitoring stations nearest to the proposed project site are presented in **Table 16-8**. The values presented are consistent with the NAAQS format. For example, the 8-hour ozone concentration shown is the 3-year average of the fourth highest daily maximum 8-hour average concentrations. The concentrations were obtained from the 2011 New York State Ambient Air Quality Report, the most recent report available. As shown in **Table 16-8**, the recently monitored levels did not exceed the NAAQS.

Table 16-8
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Queens College 2, Queens	ppm	8-hour	1.4	9
			1-hour	1.9	35
SO_2	Queens College 2, Queens[1]	µg/m^3	3-hour	77.7	1,300
			1-hour	79.8	196
PM_{10}	P.S. 19, Manhattan	µg/m^3	24-hour	40	150
$PM_{2.5}$	P.S. 19, Manhattan	µg/m^3	Annual	11.9	15
			24-hour	27	35
NO_2	Queens College 2, Queens[2]	µg/m^3	Annual	40.7	100
			1-hour	126.9	188
Lead	J.H.S. 126, Brooklyn	µg/m^3	3-month	0.019	0.15
Ozone	CCNY, Manhattan	ppm	8-hour	0.072	0.075

Notes:
(1) The 1-hour value is based on a three-year average (2009-2011) 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) The 1-hour value is based on a three-year average (2009-2011) of the 98th percentile of daily maximum 1-hour average concentrations.
Source: NYSDEC, New York State Ambient Air Quality Report (2009-2011).

MODELED CO CONCENTRATIONS FOR EXISTING TRAFFIC CONDITIONS

As noted previously, receptors were placed at multiple sidewalk locations next to the intersections selected for the 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 analyzed.

Table 16-9 shows the maximum modeled existing (2011) CO 8-hour average concentrations at the receptor sites for the peak period when those concentrations are greatest. (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 16-9
Modeled Existing 8-Hour Average CO Concentrations (ppm)

Receptor Site	Location	Time Period	8-Hour Concentration
1	27th Avenue and 4th Street	AM/PM	2.2
2	27th Avenue and 8th Street	PM	2.8
3	Astoria Boulevard and 21st Street	AM	3.7
Note:	8-hour standard (NAAQS) is 9 ppm.		

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

Carbon Monoxide

CO concentrations without the proposed project were determined for the build year using the methodology previously described. **Table 16-10** shows future maximum predicted 8-hour average CO concentrations, including background concentrations, at the analyzed intersections in 2022 without the proposed project. The values shown are the highest predicted concentrations at any receptor location for each of the time periods analyzed.

Table 16-10
Future Maximum Predicted 8-Hour Average CO Concentrations Without the Proposed Project (ppm)

Receptor Site	Location	Time Period	8-Hour Concentration
1	27th Avenue and 4th Street	AM/PM	2.1
2	27th Avenue and 8th Street	AM/PM	2.6
3	Astoria Boulevard and 21st Street	AM	3.1
Note:	8-hour standard (NAAQS) is 9 ppm.		

As shown in **Table 16-10**, 2022 CO concentrations without the proposed project are predicted to be well below the 8-hour CO standard of 9 ppm.

Particulate Matter

PM_{10} concentrations without the proposed project were determined for the 2022 build year using the methodology previously described. **Table 16-11** presents the future maximum predicted PM_{10} 24-hour concentrations, including background concentrations, at the analyzed intersections in 2022 without the proposed project. The values shown are the highest predicted concentrations for the receptor locations. As shown, 2022 PM_{10} 24-hour average concentrations without the proposed project are not predicted to exceed the NAAQS.

Table 16-11
Future Maximum Predicted 24-Hour Average
PM_{10} Concentrations Without the Proposed Project (µg/m^3)

Receptor Site	Location	Concentration
1	27th Avenue and 4th Street	48.9
2	27th Avenue and 8th Street	49.3
3	Astoria Boulevard and 21st Street	65.9

Note: NAAQS—24-hour average 150 µg/m^3.

STATIONARY SOURCES

Absent the approvals, there would be no change in the assumed development of the project site, the existing buildings would remain. In the future without the proposed project, heating and hot water emissions in the area would be similar to existing conditions.

G. PROBABLE IMPACTS OF THE PROPOSED PROJECT

MOBILE SOURCES

Carbon Monoxide

CO concentrations with the proposed project were determined for the 2022 build year using the methodology previously described. **Table 16-12** shows the future maximum predicted 8-hour average CO concentrations with and without the proposed project at the intersections analyzed. (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 and include the 8-hour CO ambient background concentration.

Table 16-12
Future Maximum Predicted 8-Hour Average
CO Concentrations With and Without the Proposed Project (ppm)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)			
			No Build	Build	Increment	*De Minimis Limit*
1	27th Avenue and 4th Street	AM	2.1	2.6	0.5	3.4
2	27th Avenue and 8th Street	AM	2.6	2.8	0.2	3.2
3	Astoria Boulevard and 21st Street	AM	3.1	3.3	0.2	2.9

Notes: 8-hour standard (NAAQS) is 9 ppm.

The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the increments 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.")

Particulate Matter

Using the methodology previously described, PM_{10} concentrations with and without the proposed project were determined for the 2022 build year. The values shown in **Table 16-13** are the highest predicted concentrations for all receptors analyzed and include the PM_{10} ambient background concentration. The results indicate that the vehicle trips generated by the proposed project would not result in PM_{10} concentrations that would exceed the NAAQS.

Table 16-13
Future Maximum Predicted 24-Hour Average
PM_{10} Concentrations With and Without the Proposed Project ($\mu g/m^3$)

Receptor Site	Location	No Build	Build
1	27th Avenue and 4th Street	48.9	51.1
2	27th Avenue and 8th Street	49.3	51.5
3	Astoria Boulevard and 21st Street	65.9	67.3
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 so that they could be compared to the interim guidance criteria that would determine the potential significance of any impacts from the proposed project. Based on this analysis, the maximum predicted localized 24-hour average and neighborhood-scale annual average incremental $PM_{2.5}$ concentrations are presented in **Table 16-14** and **Table 16-15**, respectively. $PM_{2.5}$ concentrations without the proposed project are not presented, since impacts are assessed on an incremental basis.

Table 16-14
Future Maximum Predicted 24-Hour Average $PM_{2.5}$ Increments ($\mu g/m^3$)

Receptor Site	Location	Increment
1	27th Avenue and 4th Street	0.57
2	27th Avenue and 8th Street	0.53
3	Astoria Boulevard and 21st Street	0.38
Note: $PM_{2.5}$ interim guidance criteria—24-hour average, 2 $\mu g/m^3$ (5 $\mu g/m^3$ not-to-exceed value).		

Table 16-15
Future Maximum Predicted Annual Average $PM_{2.5}$ Increments ($\mu g/m^3$)

Receptor Site	Location	Increment
1	27th Avenue and 4th Street	0.008
2	27th Avenue and 8th Street	0.008
3	Astoria Boulevard and 21st Street	0.006
Note: $PM_{2.5}$ interim guidance criteria—annual (neighborhood scale), 0.1 $\mu g/m^3$.		

The results show that the annual and daily (24-hour) $PM_{2.5}$ increments are predicted to be well below the interim guidance criteria. Therefore, there would be no potential for significant adverse impacts on air quality from vehicle trips generated by the proposed project for the 2022 analysis year.

PARKING FACILITIES

The CO levels from the parking garage and surface parking lot associated with the proposed project were predicted using the methodology set forth in the *CEQR Technical Manual*. **Table 16-16** shows the future maximum predicted CO concentrations from the parking facilities. The values shown represent the highest predicted concentrations for any of the time period analyzed and include the CO ambient background concentration.

Table 16-16
Future Maximum Predicted CO Concentrations from the Proposed Parking Facilites (ppm)

Parking Facility	Garage Only Concentration		Total Concentration	
	1-hour	8-Hour	1-hour	8-Hour
Building 5 Garage	4.1	1.6	7.5	3.6
Building 6 Surface Lot	0.01 / (0.4)[(1)]	0.003 / (0.3)[(1)]	3.8	2.3
Expanded Surface Lot South of Astoria Boulevard	0.02/ (0.2)[(1)]	0.01 / (0.1)[(1)]	3.6	2.1

Note: 1-hour standard (NAAQS) is 35 ppm and 8-hour standard (NAAQS) is 9 ppm.
[1] The value within parenthesis is the on-street contribution.

These maximum predicted CO levels are below the applicable CO standards and CEQR CO *de minimis* criteria. Therefore, the proposed project's parking facilities would not result in any significant adverse air quality impacts.

STATIONARY SOURCES

Heating and Hot Water Systems

Table 16-17 shows maximum overall predicted concentrations for NO_2, SO_2 and PM_{10} from the proposed project's heating and hot water systems, which were predicted to occur on elevated locations on the proposed project's buildings. Maximum predicted concentrations on other existing and proposed buildings, as well as at ground level receptors, would be much lower, as shown in **Table 16-18**. As shown in the tables, the maximum concentrations from stack emissions, when added to ambient background levels, would be well below the NAAQS.

Table 16-17
Future Maximum Modeled Pollutant Concentrations from the Proposed Project ($\mu g / m^3$)

Pollutant	Averaging Period	Concentration Due to Stack Emission	Maximum Background Concentration	Total Concentration	Standard
NO_2	1-Hour[(1)]		-	164.1	188
	Annual[(2)]	1.7	43	44.7	100
SO_2	1-Hour	1.0	78.5	79.5	196
	3-Hour	1.1	89	90.1	1,300
PM_{10}	24-hour	3.7	44	47.7	150

Notes:
[1] The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO_2 concentration predicted at any receptor using seasonal-hourly background concentrations.
[2] Annual NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.75 as per EPA guidance.

Table 16-18
Future Maximum Modeled Pollutant Concentrations from the Proposed Project at Existing and No Build Receptor Locations (µg /m^3)

Pollutant	Averaging Period	Concentration Due to Stack Emission	Maximum Background Concentration	Total Concentration	Standard
NO_2	1-Hour[1]			118.3	188
	Annual[2]	0.5	43	43.5	100
SO_2	1-Hour	0.3	78.5	78.8	196
	3-Hour	0.3	89	89.3	1,300
PM_{10}	24-hour	1.1	44	45.1	150

Notes:
[1] The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO_2 concentration predicted at any receptor using seasonal-hourly background concentrations.
[2] Annual NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.75 as per EPA guidance.

The air quality modeling analysis also determined the highest predicted increase in 24-hour average and annual average $PM_{2.5}$ concentrations from the proposed project's heating and hot water systems. As shown in **Table 16-19**, the maximum 24-hour incremental impacts at any discrete receptor location would be less than the applicable interim guidance criterion of 5 µg/m^3. On an annual basis, the projected $PM_{2.5}$ impacts would be less than the applicable interim guidance criterion of 0.3 µg/m^3 for local impacts, and the DEP interim guidance criterion of 0.1 µg/m^3 for neighborhood scale impacts. In addition, as shown in **Table 16-20**, maximum concentrations of $PM_{2.5}$ are predicted to be below the city's interim guidance criteria at elevated receptors on existing and No Build developments, and at ground level locations.

Table 16-19
Future Maximum Modeled $PM_{2.5}$ Concentrations from the Proposed Project(in µg/m^3)

Pollutant	Averaging Period	Maximum Concentration	Interim Guidance Threshold
$PM_{2.5}$	24-Hour	3.37	5/2[1]
	Annual (Discrete)	0.27	0.3
	Annual (Neighborhood Scale)	0.02	0.1

Note:
[1] 24-hour $PM_{2.5}$ interim guidance criterion, > 2 µg/m^3 (5 µg/m^3 not-to-exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.

Table 16-20
Future Maximum Modeled $PM_{2.5}$ Concentrations from the Proposed Project(in µg/m^3)

Pollutant	Averaging Period	Maximum Concentration	Interim Guidance Threshold
$PM_{2.5}$	24-Hour	0.95	5/2[1]
	Annual (Discrete)	0.08	0.3
	Annual (Neighborhood Scale)	0.02	0.1

Note:
[1] 24-hour $PM_{2.5}$ interim guidance criterion, > 2 µg/m^3 (5 µg/m^3 not-to-exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.

The 24-hour average $PM_{2.5}$ concentration increments with the proposed project were compared to the 24-hour average interim guidance criterion of 2 $\mu g/m^3$ for discrete receptor locations (see Section D., *Air Quality Standards, Regulations Benchmarks* for a description of the City's $PM_{2.5}$ interim guidance criteria). The assessment examined the magnitude, duration, frequency, and extent of the increments at locations where exposure above the 2 $\mu g/m^3$ threshold averaged over a 24-hour period could occur.

Building 1 - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 1, 2.50 $\mu g/m^3$ was predicted on the south facade of Building 2 at a height of 255 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 $\mu g/m^3$ was one time per year, with the average frequency of less than once per year, over five years. At the same elevation, on the north façade of the building, there were two locations (representing less than ½ half of the width of the façade at this elevation) with incremental concentrations exceeding 2 $\mu g/m^3$. At these locations, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 $\mu g/m^3$ at a maximum frequency of once per year, with an average frequency of less than once per year. One other floor on this building was found to have a location with incremental concentrations exceeding 2 $\mu g/m^3$, on the south façade at height of 245 feet. At this location, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 $\mu g/m^3$ at a maximum frequency of once per year, and an average frequency of less than once per year.

Building 2 - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 2, 3.08 $\mu g/m^3$, was predicted on the north facade of Building 3 at a height of 305 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 $\mu g/m^3$ was two times per year, with the average frequency of less than one time per year, over five years. At the same elevation, on the north façade of the building, there were four locations (representing the rest of the northern façade at this elevation)with incremental concentrations exceeding 2 $\mu g/m^3$. At these locations, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 $\mu g/m^3$ at a maximum frequency ranging from one to three times per year, with an average frequency of less than two times per year.

Building 4 - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 4, 3.37 $\mu g/m^3$, was predicted on the south facade of Building 3 at a height of 275 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 $\mu g/m^3$ was three times per year, with the average frequency of less than two times per year, over five years. At the same elevation, there were nine locations (five locations on the north façade, two on the east façade, one on the south facade and one on the west façade) with incremental concentrations exceeding 2 $\mu g/m^3$. At these locations, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 $\mu g/m^3$ at a maximum frequency ranging from one to six times per year, with an average frequency of less than four times per year. Six other floors on this building were found to have locations with incremental concentrations exceeding 2 $\mu g/m^3$, on the south, north and east façades at heights between 245 feet and 305 feet, and three floors on the west façade at heights of 285 feet to 305 feet. (Overall, $PM_{2.5}$ concentrations predicted to exceed 2 $\mu g/m^3$ at least once were found on all facades, and at from 4 to 7 floor elevations.) At these locations, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 $\mu g/m^3$ at a maximum frequency ranging from one to six times per year, but with an average frequency of less than four times per year.

Building 5A - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 5A, 2.50 µg/m^3, was predicted on the south façade of Building 5B at a height of 245 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 µg/m^3 was one time per year, with the average frequency of less than once per year, over five years.

Building 6A - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 6A, 2.48 µg/m^3, was predicted on the east façade of Building 6B at a height of 120 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 µg/m^3 was one time per year, with the average frequency of less than one times per year, over five years. At the same elevation, there were three locations (two on the north façade of the building, representing less than ½ of the width of the north façade at this elevation, and one on the south facade) with incremental concentrations exceeding 2 µg/m^3. At these locations, 24-hour average incremental concentrations from the proposed project were predicted to exceed 2 µg/m^3 at a maximum frequency of ranging from one to two times per year, with an average frequency of less than one time per year.

Building 8 - The maximum 24-hour average incremental $PM_{2.5}$ concentration from Building 8, 2.66 µg/m^3, was predicted on the south façade of Building 8 at a height of 265 feet. At the location where the maximum 24-hour average concentration was predicted, the maximum annual frequency of concentrations greater than 2 µg/m^3 was two times per year, with the average frequency of less than once per year, over five years.

Overall, the magnitude, extent, and frequency of 24-hour average $PM_{2.5}$ concentrations above 2.0 µg/m^3 are low. Therefore, it would not result in a significant impact based on the City's interim guidance criteria. Overall, the proposed project's heating and hot water systems would not result in any significant adverse air quality impacts.

To ensure that there are no significant adverse impacts of $PM_{2.5}$ from the proposed project's heating and hot water emissions, certain restrictions would be required regarding fuel type and exhaust stack location (no restrictions are required for Buildings 3, 6B and 8). A summary of these restrictions follows:

WF and Eastern Parcels

The (E) designations for the proposed buildings on these parcels would require the following:

- **Building 1**

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at Building 1B and are at least 238.4 feet above grade, and should be located at least 240 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 2, to avoid any potential significant air quality impacts.

- **Building 2**

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are at least 298.4 feet above grade, and should be located at least 303 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 3, to avoid any potential significant air quality impacts.

- **Building 4**

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment utilize only natural gas, and that heating and hot water equipment exhaust stack(s) are located at least 258.4 feet above grade, and should be located at least 171 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 3, and must be fitted with low NO_x burners with a maximum emission concentration of 30 ppm, to avoid any potential significant air quality impacts.

- **Building 5A**

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at least 248.4 feet above grade, and should be located at least 130 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 5B, to avoid any potential significant air quality impacts.

- **Building 5B**

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at least 288.4 feet above grade to avoid any potential significant air quality impacts.

NYCHA Parcel

The development agreement between NYCHA and the applicant/developer or a Restrictive Declaration would require the following:

- Building 6A

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at least 135 feet above grade to avoid any potential significant air quality impacts.

- Building 7A

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at least 150 feet above grade to avoid any potential significant air quality impacts.

- Building 7B

  Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment exhaust stack(s) are located at least 150 feet above grade to avoid any potential significant air quality impacts.

With these restrictions, emissions from the proposed project's boiler exhaust stacks would not result in any significant adverse air quality impacts.

To the extent permitted under Section 11-15 of the Zoning Resolution, the requirements of the (E) designations may be modified, or determined to be unnecessary, based on new information or technology, additional facts or updated standards that are relevant at the time each building is ultimately developed.

Industrial Sources

As discussed above, a study was conducted to identify manufacturing and industrial uses within the 400-foot study area. DEP-BEC and EPA permit databases were used to identify existing

sources of industrial emissions. One permitted facility was identified within 400 feet of the project site in the future with the proposed project condition.

The screening procedure used to estimate the pollutant concentrations from these businesses is based on information contained in the certificates to operate obtained from DEP-BEC and NYSDEC. The information describes potential contaminants emitted by the permitted processes, hours per day, and days per year in which there may be emissions (which is related to the hours of business operation), and the characteristics of the emission exhaust systems (temperature, exhaust velocity, height, and dimensions of exhaust).

Table 16-21 presents the maximum impacts at the proposed project. The table also lists the Short-Term Guideline Concentrations (SGC) and Annual Guideline Concentrations (AGC) for each toxic air pollutant. The results of the industrial source analysis demonstrate that there would be no predicted significant adverse impacts on the proposed project from existing industrial sources in the area.

Table 16-21
Maximum Predicted Impacts from Industrial Sources

Potential Contaminants	Estimated Short-term Impact (µg/m^3)	SGC[a] (µg/m^3)	Estimated Long-term Impact (µg/m^3)	AGC[a] (µg/m^3)
Toluene	4.89	380	0.014	45

Notes:
[a] NYSDEC DAR-1 (Air Guide-1) AGC/SGC Tables, October, 2010.
AGC-Annual Guideline Concentration.
SGC-Short-term Guideline Concentration.

CUMULATIVE IMPACTS

Since there are various source types (mobile and stationary sources) that may contribute to concentration increments concurrently, a cumulative assessment of all sources related to the proposed project was undertaken to determine the potential maximum effect of all sources combined.

Concentrations of pollutants from the proposed project's stationary sources near the mobile source analysis sites would be very low since the project's stationary sources are elevated sources located on the building rooftops and maximum concentrations occur at elevated receptors. The maximum predicted $PM_{2.5}$ 24-hour average cumulative concentration from the mobile and stationary sources is 0.78 µg/m^3, which is slightly more than those determined from mobile sources alone. Therefore, no significant adverse air quality impacts are predicted from the cumulative effects of the proposed project's emission sources.

ADDITIONAL SOURCES

Potential stationary source impacts on the proposed project from the existing NYCHA central boiler plant were determined using the AERMOD modeling methodology previously described. The maximum estimated concentrations from the modeling were added to the background concentrations to estimate total air quality concentrations on the proposed project. The results of this analysis are presented in **Table 16-22** for NO_2, and PM_{10}. As shown in the table, the predicted pollutant concentrations for all of the pollutant time averaging periods shown are well below their respective standards.

Table 16-22
Future Maximum Predicted Concentrations on the Proposed Project from Other Sources (in μg/m^3)

Pollutant	Averaging Period	Concentration Due to Stack Emission	Maximum Background Concentration	Total Concentration	Standard
NO_2	1-hour	30.9	126.1	157.0	188
	Annual	1.0	43.0	44.0	100
PM_{10}	24-hour	1.4	44	45.4	150

Note:
(1) NO_2 impacts were conservatively estimated using a NO2/NOx ratio of 0.80 for 1-hour and 0.75 for Annual.

The air quality modeling analysis also determined the maximum predicted increase in 24-hour and annual average $PM_{2.5}$ increments from the NYCHA boiler plant on the proposed project. **Table 16-23** presents the results of the analysis. As shown in the table, the maximum 24-hour incremental concentrations at any discrete receptor location would be below the applicable interim guidance criterion of 2 μg/m^3. On an annual basis, the maximum projected $PM_{2.5}$ increments would be below the applicable interim guidance criterion of 0.3 μg/m^3 for local impacts. Therefore, large-scale developments within 400 feet would not significantly impact air quality on the proposed project.

Table 16-23
Future Maximum Predicted $PM_{2.5}$ Increments on the Proposed Project from Other Sources (in μg/m^3)

Averaging Period	Maximum Increment	Incremental Threshold
24-Hour	1.37	5/2
Annual	0.10	0.30

Note: 24-hour $PM_{2.5}$ interim guidance criterion, > 2 μg/m^3 (5 μg/m^3 not-to-exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.

To ensure that there are no significant adverse impacts on the proposed project from the NYCHA Astoria Houses central boiler plant, the plant would be modified to duct the exhaust gas from the boiler exhausts to a new location at proposed Building 7A. Implementation of the modification to the NYCHA Astoria Houses central boiler plant exhaust would be subject to performing the modifications at the NYCHA Astoria Houses central boiler plant pursuant to an agreement with NYCHA that will address access, responsibility for costs and liabilities incurred as a result of this initiative, construction risks, and other issues. Implementation would also be subject to obtaining the necessary permits. Permitting actions would occur after the ULURP process. The project's Restrictive Declaration would include provisions requiring completion of modifications related to the NYCHA Astoria Houses central boiler plant. With this modification in place, there would be no significant adverse air quality impacts on the proposed project from the NYCHA Astoria Houses central boiler plant. ✷